

ALL INDIA COORDINATED RESEARCH NETWORK  
ON POTENTIAL CROPS

# *Progress Report*

.....  
**KHARIF**

**2015**

QRT 3rd yr



**NATIONAL BUREAU OF PLANT GENETIC RESOURCES**

PUSA CAMPUS, NEW DELHI 110 012

*For Official Use Only*

# **ALL INDIA COORDINATED RESEARCH NETWORK ON POTENTIAL CROPS**

## **PROGRESS REPORT KHARIF 2015**

*Compiled by*

**H.L. Raiger**

**B.S. Phogat**

**S.K. Kaushik**

**M.C. Singh**

**S.K. Yadav**

**T.V. Prasad**

**M. Khabiruddin**

**Y.S. Dhaliwal**

**K.C. Bansal**



**NATIONAL BUREAU OF PLANT GENETIC RESOURCES  
PUSA CAMPUS, NEW DELHI 110 012**

**Citation:**

Raiger HL, BS Phogat, SK Kaushik, MC Singh, SK Yadav, TV Prasad, M. Khabiruddin, Y.S. Dhaliwal and KC Bansal (2016). Kharif Report 2015. All India Coordinated Research Network on Potential Crops, NBPGR, New Delhi. 198p.

**Published by:**

Network Coordinator  
All India Coordinated Research Network  
on Potential Crops  
NBPGR, New Delhi 110012

**Published:** May 2016

**For further information:**

Dr. B.S. Phogat  
Network Coordinator  
All India Coordinated Research Network  
on Potential Crops  
NBPGR, New Delhi 110012  
Telefax: 011-25841835  
E-mail: [phogatbs@nbpgr.ernet.in](mailto:phogatbs@nbpgr.ernet.in)

# CONTENTS

	<b>Pages</b>
<b>I PREAMBLE</b>	<b>1-3</b>
<b>II PLANT GENETIC RESOURCES MANAGEMENT</b>	<b>4-83</b>
2.1 Exploration and Collection of Germplasm	4
2.2 Germplasm Introduction and Quarantine	5
2.3 Germplasm Evaluation	5-82
2.3.1 Hills	5-58
2.3.2 Plains	59-82
2.4 Germplasm Conservation	83
2.5 Seed Supply	83
<b>III CROP IMPROVEMENT</b>	<b>84-136</b>
3.1 Hills	84-100
3.2 Plains	101-136
<b>IV CROP PRODUCTION AND PROTECTION</b>	<b>137-149</b>
4.1 Crop Production	137-145
4.2 Crop Protection	146-149
<b>V QUALITY ANALYSIS</b>	<b>150-160</b>
<b>VI VALUE ADDITION</b>	<b>161-168</b>
<b>VII CENTRE REPORT</b>	<b>169-175</b>
7.1 Hills	169-170
7.2 Plains	171-175
<b>VIII SUMMARY</b>	<b>176-184</b>
<b>ANNEXURES (I – IX)</b>	<b>185-198</b>

# PREAMBLE

---

## **I. PREAMBLE**

Living in close contact with the nature, human beings learnt to use plants for food, fodder, fibre, medicine and other economic purposes. Since the dawn of agriculture, domestication and necessity based gathering of plant species have helped in the evolution of specially useful plant species. Over the years, these biological resources have been generously exploited for the benefit of humankind and the dependence of human kind on plant resources is likely to continue in the foreseeable future. So far, out of the estimated global wealth of 80,000 edible plant species, only about 150 have been widely used and of these only about 30 species provide 90 per cent of the food for the world's population. Consequently, a large number of plant species still remain under/unutilized. This has resulted in narrowing down of our food basket and restricted the options for unforeseen times that may arise from the unpredictable global climatic changes and other natural catastrophes in future. Therefore, the potential plant species of economic importance are the key to sustainable agriculture in most of the developing countries facing acute resource crunch as well as rapid depletion of natural resources due to ever-increasing population, rapid industrialization and urbanization. The population experts have predicted that the world population will grow by an unprecedented 90 million people per year, which is equivalent to Mexico's entire population in 1995. Unfortunately, changing land use patterns, rapidly increasing pressure on land both for agriculture and forestry, massive development projects as well as expanding demand for industrial and urban sectors have posed serious threat to the existing agro-biodiversity, including the plant species that hold immense potential for the future.

These plant species do not require high input technology and can be raised with comparatively lower management cost on marginal, submarginal, degraded and various categories of wastelands on a sustainable basis. There are about 158 million hectares of wastelands of different kinds in India such as sand dunes, ravines, saline, alkali and acidic soils, marshy and marginal lands, which are unfit for supporting cultivation of high input demanding elite crops. Such lands can easily be put to use for growing low-input requiring potential crops to

diversify present day agriculture in order to support ever-increasing population and to cater to the fast changing human needs.

The Consultative Group on International Agricultural Research (CGIAR) sponsored Workshop on the Role of Underutilized Crops in Enlarging the Basis of Food Security held at MSSRF, Chennai during 1999 which also underlined the need to widen the species composition in the food basket and conserve important food and other plants for posterity.

Potential crops or crops for the future constitute those plant species that occur as life support species in extreme environmental conditions or threatened habitats, having appropriate genetic make up to survive under such adverse situations and also possess promising nutritional or industrial utility for a variety of purposes for the present as well as future needs of human kind. Their cultivation is restricted to specialized geographical pockets in different agro-ecological regions mainly by the poor farming communities, who have little access to modern agro-inputs and well organized marketing and communication infrastructure. Having superior nutritional quality, these crops provide household food and nutritional security to the millions of impoverished people living in remote corners of the country often in inhospitable terrains, where public food distribution system is not yet strong.

Recognizing the need for organized research effort on less common, under exploited crops, the All India Coordinated Research Project on Under Utilized and Under Exploited Plants was initiated during 1982 by ICAR. The Project was later redesignated as AICRP on Underutilized Crops and recently rechristened as AICRN on Potential Crops. At present, the network is conducting research on 14 crops of food, fodder and industrial value through 13 main, 6 cooperating and 3 voluntary centres located in diverse agro-climatic zones of the country. So far, 34 varieties in different crops have been released/identified in this project, besides identifying desirable genetic donors and accumulating indigenous and exotic germplasm collections. Planned multi-locational evaluation of the germplasm and breeding lines is a continuous process for developing high yielding superior genotypes and their improved production technologies suitable for various agro-ecological situations representing high mountains to the desert

plants. Quality analysis of selected germplasm and breeding lines are also undertaken to facilitate crop improvement programme.

The present report embodies results of research work undertaken on germplasm evaluation, breeding and agronomic aspects, quality evaluation and other studies in various potential crops at different centres during *kharif* 2014. The compiled report is an outcome of the concerted efforts made by the scientists of AICRN, cooperating and voluntary centres. I express my sincere thanks to Drs. J.C. Rana, Sheela Mary, M.C. Singh, T.V. Prasad, M. Khabiruddin and Dr. H.L. Raiger the Principal Investigators for PGR management, Crop Improvement, Crop Production, Crop Protection, Quality Analysis and Documentation and Database Management, respectively for compilation of results and preparation of the report

I would like to acknowledge with reverence and gratitude the encouragement and guidance received on all aspects of management and functioning of the project from Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR; Prof. J.S. Sandhu, DDG (Crop Science), ICAR; Dr. I.S. Solanki, ADG (FFC), ICAR, Dr. J.S. Chuahan, ADG(Seeds), ICAR and Dr. K.C. Bansal, Director, NBPGR.

I wish to record my appreciation to Mr. Ranvir Singh and Mr. Pankaj for neatly typing the report.

**B.S. Phogat**  
**Network Coordinator**

# **PLANT GENETIC RESOURCES MANAGEMENT**

---

## II. PLANT GENETIC RESOURCES MANAGEMENT

During the year 2015-16, a total of 43 accessions of potential crops germplasm were collected, one accession was introduced, 218 accessions were supplied, 164 accessions were evaluated, 219 accessions were conserved in the National Genebank and 80 accessions were maintained with the field genebank:

### 2.1 EXPLORATION AND COLLECTION OF GERMPLASM

During the period April 2015 to March 2016, a total of 43 accessions comprising Amaranth (13), Job's tear (1), Spine gourd (2), Perilla (14), Winged bean (1), Rice bean (8) and Pillipesara bean (4) were collected from different part of country. The areas and the diversity collected are presented in table 1.

**Table 1: Details of germplasm collected during 2015-16.**

Period of Collection	Area Surveyed District. Wise	Diversity crop wise	Total
9.10.15 to 11.10.15	<b>Uttarakhand:</b> Udham Singh Nagar, Nainital	<b>Pseudocereals:</b> <i>Amaranthus spinosus</i> (2), <i>Amaranthus hybridus</i> (1), <i>Amaranthus dubius</i> (1)	4
27.10.15 to 1.11.15	<b>Uttarakhand:</b> Nainital, US Nagar, Pauri, Haridwar, Deharadun	<b>Pseudocereals:</b> <i>Amaranthus spinosus</i> (1), <i>Amaranthus viridis</i> (1) <b>Oil Seeds:</b> <i>Perilla frutescens</i> (5), <b>Pulse:</b> <i>Vigna umbellata</i> (1)	8
12.1.16 to 19.1.16	<b>Nagaland:</b> Dimapur, Kohima, Wokha, Zunhebeto, Mokokchung, Dimapur	<b>Pseudocereals:</b> <i>Amaranthus caudatus</i> (1), <i>Amaranthus cruentus</i> (2), <i>Amaranthus viridis</i> (1), <i>Amaranthus hypochondriacus</i> (1), <i>Coix lacryma-jobi</i> (1) <b>Oil seeds:</b> <i>Perilla frutescens</i> (7) <b>Vegetable Crop:</b> <i>Psophocarpus tetragonolobus</i> (1) <b>Pulse:</b> <i>Vigna unmbellata</i> (1)	15
30.10.15 to 4.11.15	<b>Nagaland:</b> Tuensang, Kiphire, Phek	<b>Pulse:</b> <i>Vigna umbellata</i> (6)	6
29.10.15 to 5.11.15	<b>A.P.:</b> Visakhapatnam, East Godavari	<b>Vegetable Crop:</b> <i>Momordica dioica</i> (2), <b>Pseudo cereals:</b> <i>Amaranthus tristis</i> (1)	3
	<b>A.P.:</b> Kondapalli hills of Krishna district	<b>Pulse:</b> <i>Phaseolus-trilobus</i> (4)	4
2.10.15	<b>Maharashtra:</b> Nandurbar	<b>Pseudo cereals:</b> <i>Amaranthus hypochondriacus</i> (1)	1
<b>Total</b>			<b>41</b>

## 2.2 GERMLASM INTRODUCTION AND QUARANTINE

(1) **Import Permits Issued:** During the period under report 77 import permits were issued, details of which are presented in table 2.

**Table 2: Import Permits Issued.**

Crop	IP Issued	Country
<i>Parthenium argentatum</i> (Guayule)	2	USA
<i>Vicia faba</i> (Faba bean)	2	Lebanon, Australia
<i>Chenopodium quinoa</i> (Quinoa)	2	USA, UAE
<i>Amaranthus spp.</i> (Amaranthus)	1	USA
<i>Jatropha curcas</i> (Jatropha)	70	Honduras
<b>Total</b>	<b>77</b>	

(2) **Import of Germplasm:** One accession of Amaranth was introduced from Tajikistan and sent to NBPGR RS Shimla.

(3) **Important interceptions:** In *Jatropha*, incidence of mites and leaf webber, *Jatropha mosaic virus*, *anthracnose* (*Colletotrichum lindemuthianum*), *Cercospora sp.*, *Alternaria raphani* and *Phoma sp* was noticed in many accessions. All the germplasm accessions were salvaged.

## 2.3 GERMLASM EVALUATION

### 2.3.1 Hills

Multilocal germplasm evaluations were planned to be conducted on grain amaranth (25), buckwheat (25), chenopods (25), Quinoa (14), adzuki bean (25), Coix (25) and Perilla (25) during Kharif 2015. A total of 164 accessions were evaluated in augmented design with standard checks.

#### 2.3.1.1 Grain Amaranth (*Amaranthus spp.*)

Germplasm screening nursery consisting of 25 accessions supplied by NBPGR, Shimla was planned to be evaluated at four locations viz. UUHF, Ranichauri, KVK, CSKHPKV, Sangla, VPKS, Almora and NBPGR, RS, Shimla. The results were received from all locations. The checks used were PRA 2, PRA 3,

Annapurna and Durga. The list of promising lines for all the characters has been presented in Table 3 and the range and means in Table 4.

At UUHF, Ranichauri a set of 25 genotypes alongwith four checks were evaluated for 9 characters. The longest inflorescence (43.60 cm) was recorded in the genotype IC321281 followed by IC278919. No genotypes were found earlier in flowering and maturity as compare to check variety Durga. The maximum plant height was observed in the entry IC321281 (155.80 cm) followed by IC279965. The check variety PRA-2 was observed as the highest yielder per plant with 149.02 g.

A set of 25 genotypes and four checks were screened at NBPGR, RS, Shimla for 10 quantitative and 12 qualitative characters (Table 5). No entry was earlier to the check variety Durga (61.50 days) for days to 50% flowering and maturity (126.50 days). Maximum plant height (305.00 cm) was recorded in the EC278966. The longest inflorescence was recorded in the genotype, IC278919 (81.10 cm) followed by IC278913. The genotypes IC274451 (224.86 g) were found superior to the best check variety in respect of grain yield per plant.

A set of 25 accessions and four checks were evaluated for 10 quantitative at KVK, CSKHPKV, Sangla. The entry IC258250 (7.20 g/plant) was observed to be the highest grain yielder. The maximum plant height (125.00 cm) was observed in the genotype, IC274451. The longest inflorescence (27.06 cm) was recorded in the check PRA-2. The entry IC313269 was the earliest in flowering (62.00 days) and genotype IC313205 was earliest in maturity (140.00 days) as compared to check variety Durga (147.80 days).

A set of 50 genotypes and four checks were screened at VPKS, Almora for 9 quantitative characters. The genotype IC313269 (41.00 days) was found superior to the check variety for days to 50% flowering. Maximum plant height (199.33 cm) was recorded in the genotype, IC274467. No genotype was found superior to the check variety Durga (14.74 g) in respect of seed yield per plant.

The performance of entries based on adjusted value and average over the locations has been summarized in the following paragraphs:

Significant differences were observed among the accessions for seed yield per plant at all centres. Seed yield per plant (g) was low at Sangla (3.52 g) and very high at Shimla (107.72 g). Based on average, the entry IC274451 (73.56 g) was the highest seed yielder.

Plant height was the highest at Shimla (271.90 cm) and lowest at Ranichauri (109.00 cm) on the basis of average over the four locations, the entry IC274451 had the highest plant height (176.07 cm).

Flowering time showed considerable variation among the locations and high variation among the accessions within a location. The mean flowering time was the lowest (50.98 days) at Almora while it was the longest (87.44 days) at Shimla. The entry IC313269 showed consistency for early flowering over the locations and ranked first (61.00 days) based on the overall performance.

Maturity period was the earliest at Almora (90.90 days) followed by at Ranichauri (133.00 days). The check variety, Durga (121.08 days) was earliest maturing line based on average over four locations.

The length of inflorescence of the accessions was the highest at Shimla (63.28 cm) followed by Almora (39.06 cm). Inflorescence length was the lowest (25.09 cm) at Sangla. Based on the average over four locations, the entry IC278919 had the longest inflorescence (46.71cm).

Test weight expressed in terms of weight of 10ml seed in g recorded at four centres showed that it was the highest at Ranichauri (10.81 g/10ml) and low at Sangla (5.83 g/10ml). Based on the average over three locations, the check Durga (8.62 g/10ml) showed the highest test weight.

### **2.3.1.2 Buckwheat (*Fagopyrum* spp.)**

A set of 25 accessions was planned to be screened at four locations viz. NBPGR, RS, Shimla, UUHF, Ranichauri, CSKHPKV, Sangla and VPKS, Almora along with four checks Himpriya, VL 7, PRB 1 and Shimla B-1. The results were received from all locations. The list of promising accessions for all the characters has been presented in Table 6 and mean and range in Table 7.

A set of 25 genotypes and four checks Himpriya, VL-7, PRB 1 and Shimla B-1 were evaluated at CSKHPKV, Sangla for yield and its related characters. The entry IC329202 was found superior IC313172 (98.00 days) for days to flowering and maturity. The genotype IC313138 (3.00 g) was recorded higher seed yielder per plant. Maximum plant height (155.02 cm) was observed in genotype IC329190.

At NBPGR, RS, Shimla a set of 25 accessions was evaluated for fourteen quantitative characters along with four checks Himpriya, PRB 1, Shimla B-1 and VL-7. No entry was superior to the check variety in flowering and in maturity and yeild. The same set of 25 accessions was also characterized for 10 qualitative traits (Table 8).

A set of 25 genotypes and four checks Himpriya, VL-7, PRB 1 and Shimla B-1 were evaluated at UUHF, Ranichauri for yield and its related characters. The entry IC313134 was superior to the check variety in flowering (35.00 days) while no entry in maturity. Maximum plant height (146.80 cm) was recorded in the genotype IC329190 while maximum seed yield (50.52 g/plant) was observed in genotype IC313136.

At VPKS, Almora a set of 25 accessions was evaluated for twelve quantitative characters along with four checks Himpriya, PRB 1, Shimla B-1 and VL-7. No entry was superior to the check variety in flowering and maturity. The maximum plant height (149.33 cm) was found in check Shimla B-1 while IC319193 showed highest seed yield per plant (7.80 g).

The performance of the accessions as compared to the checks over locations viz. Almora, Ranichauri, Shimla and Sangla has been summarized below.

Significant difference was observed among the entries for seed yield per plant at four locations. Mean seed yield per plant was high at Ranichauri (26.72 g) but very low at Shimla (0.98 g). Based on the average over locations, the entry IC313136 (15.25 G) was superior to the check variety VL-7.

Average plant height of the entries was the highest at Sangla (140.65 cm) followed by at Almora (113.79 cm). Based on average over four locations, entry IC329190 was taller than the check variety (145.69 cm).

Flowering time varied from centre to centre but mean flowering time was the earliest at Almora (31.24 days) followed by at Shimla (43.07 days). On the basis of average over four locations, no accession was found superior to the best check VL-7 (33.98 days).

Maturity period also showed similar trend to that of the flowering time. Average maturity period was the earliest at Almora (66.09 days) followed by at Sangla (102.71 days). On the basis of average over the locations, no entry was found superior to the best check variety VL-7 (83.42 days).

### **2.3.1.3      *Chenopods (Chenopodium spp.)***

Twenty five genotypes were planned for screening at three locations viz. NBPGR, RS, Shimla, CSKHPKV, Sangla, UUHF, Ranichauri along with three local checks. Data were received from all centres. The list of promising lines for all the characters have been presented in Table 9 and mean and range in Table 10.

Twenty five genotypes along with three local checks were evaluated for 8 quantitative characters at UUHF, Ranichauri. The entry, IC507733 (56.00) was significantly superior to the check varieties in flowering and while EC201680 (140.00 days) in maturity. The entry EC507730 (172.60 cm) was recorded for maximum plant height and maximum seed yield per plant was observed in genotype NIC22517 (20.12 g).

Twenty five genotypes along with three local checks were evaluated for eight quantitative and ten qualitative characters at NBPGR, RS, Shimla (Table 11). No entry was superior to the check varieties in flowering and in maturity. The entry EC341714 (364.20 cm) was recorded for maximum plant height and maximum seed yield per plant was observed in genotype NIC22514 (67.13g).

Twenty five genotypes along with three local checks were evaluated for four quantitative characters at CSKHPKV, Sangla. The entry IC507734 was significantly superior to the check varieties in flowering and while NIC15022

(119.00 days) in maturity. The entry EC507734 (175.00 cm) was recorded for maximum plant height and maximum seed yield per plant was observed in genotype IC007213 (7.00 g).

The performance of the accessions as compared to the checks over locations viz. Shimla and Ranichauri has been summarized below.

Significant difference was observed among the entries for seed yield per plant at two locations. Mean seed yield per plant was high at Shimla (23.57 g) but very low at Sangla (3.71 g). Based on the average over locations, the entry NIC22514 (30.13 g) was superior to the check variety.

Average plant height of the entries was the highest at Shimla (238.57 cm) followed by at Ranichauri (94.29 cm). Based on average over two locations, entry EC507730 was taller than the check variety (214.72 cm).

Mean flowering time was the earliest at Ranichauri (63.50 days) followed by at Sangla (73.25 days). On the basis of average over two locations, the entry IC007958 was found superior to the best check (65.67 days).

Maturity period also showed similar trend to that of the flowering time. Average maturity period was the earliest at Sangla (124.50 days) followed by at Ranichauri (126.20 days). On the basis of average over the locations, the entry IC007958 was found superior to the best check variety (118.67 days).

#### **2.3.1.4 Chenopods (*Chenopodium quinoa*)**

Twenty five genotypes were planned for screening at three locations viz. NBPGR, RS, Shimla, CSKHPKV, Sangla, UUHF, Ranichauri along with three local checks. Data were received from only one centre. The list of promising lines for all the characters have been presented in Table 12 and mean and range in Table 13.

Fourteen genotypes along with three local checks were evaluated for four quantitative characters at CSKHPKV, Sangla (Table 13). The entry IC411824 was significantly superior to the check varieties in flowering and while EC507738 (120.00 days) in maturity. The entry EC507738 (187.80 cm) was recorded for

maximum plant height and maximum seed yield per plant was observed in check PRC-9801 (5.35 g).

### **2.3.1.5 Adzuki Bean (*Vigna angularis*)**

A set of 25 accessions supplied by NBPGR, RS, Shimla was planned to be evaluated along with two local checks at three locations viz. NBPGR, RS, Shimla; UUHF, Ranichauri and CSKHPKV, Palampur. Data have been received from two locations only. The list of promising accessions for all the characters has been presented in Table 14 and the mean and range in Table 15.

A total of 25 genotypes were evaluated along with checks HPU 51 and Totru Local at NBPGR, RS, Shimla for eleven qualitative (Table 16) and ten quantitative characters. The tallest plant (120.10 cm) was found in the genotype EC034264. Early flowering (64.00 days) was recorded in the genotype, EC087896 whereas early maturity (105.00 days) was recorded in the entry IC341949. The entry IC024522 was observed as the highest seed yielder (66.43 g/plant).

At CSKHPKV, Palampur twenty five accessions were evaluated along with checks HPU 51 and Totru Local for eleven yield related characters and eleven qualitative characters. The entry EC059489 (55.67 days) was superior to best check variety in flowering while EC340254 was early maturing (123.67 days). The EC018257 was found to be the highest seed yielder (410.00 g/plant). The maximum plant height (106.67 cm) was found in the genotype EC015257.

The performance of the entries based on three centres (Shimla, Ranichauri and Palampur) has been summarized as under:

Flowering time varied from, 64.00 to 89.00 days at Shimla and from 55.67 to 76.00 days at Palampur. Mean flowering time was the earliest at Ranichauri (63.68 days) followed by at Shimla (71.46 days). On the basis of average over three locations, the entry EC087896 was the earliest in flowering from best check (60.50 days).

Average maturity period was the earliest at Shimla (112.72 days) and longest at Palampur (126.22 days). The entry IC341944 was superior to the check variety based on average over two locations (114.67 days).

Average plant height was recorded to be the highest at Palampur (88.96 cm) followed by at Shimla (79.63 cm) and Ranichauri (41.94 cm). Based on average over three locations, the EC034264 was the tallest (110.55 cm) entry.

#### **2.3.1.6 Job's Tear (*Coix lacryma-jobi*)**

Germplasm lines comprising 25 accessions were planned to be evaluated at two locations viz. NBPGR, RS, Shillong and UUHF, Ranichauri. The results have been received from one location only. The list of promising genotypes has been presented in Table 17 and the mean and range in Table 18.

Five yield related characters were recorded at UUHF, Ranichauri. The highest seed yield per plant was found to be 50.33 g in the genotype IC029280. Highest No. of tillers per plant was found in the genotype IC089393 (4.40). The highest plant height was found in the entry IC089389 (302.20 cm).

#### **2.3.1.7 Perilla (*Perilla frutescens*)**

Germplasm lines comprising 25 accessions were planned to be evaluated at two locations viz. NBPGR, RS, Shillong and UUHF, Ranichauri. The results have been received from one location only. The list of promising genotypes has been presented in Table 19 and the mean and range in Table 20.

Eight yield related characters were recorded at UUHF, Ranichauri. The highest seed yield was found to be 4.63 g in the genotype IC526701. The highest plant height was found in the genotype IC526701 (116.20 cm). The entry IC374593 (107.00 days) was found early flowering as compare to check variety, while IC521284 (117.00 days) was early in maturity.

**Table 3: Promising lines in grain amaranth germplasm for various characters at various locations: Kharif 2015 (Hills)**

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
VPKAS, Almora (Accessions 25)					
1	Leaf length (cm)	10.47	17.17	IC274471 ,IC279965 ,IC313273 ,IC278921 ,IC329588 ,IC274451 ,IC278922 (>14.07)	Durga (14.05)
2	Leaf width (cm)	4.63	8.97	IC278921 ,IC279965 (>7.23)	Durga (7.10)
3	Days to 50% flowering	41.00	65.00	IC313269 ,IC274471 ,IC278913 ,IC278919 ,IC278922 ,IC279966 ,IC274467 (<47.00)	PRA-3 (50.00)
4	Inflorescence length (cm)	20.33	79.33	IC274467 ,IC274451 ,IC278922 ,IC258250 ,IC274471 ,IC279965 ,IC313269 ,IC279966 (>42.33)	PRA-3 (41.50)
5	No of fingers / plant	26.00	118.33	IC258250 ,IC321281 ,IC274471 ,IC274451 ,IC278913 ,IC326898 ,IC278919 (>64.67)	PRA-3 (64.00)
6	Plant height (cm)	96.33	199.33	IC274467 ,IC274451 ,IC258250 ,IC279965 (>150.33)	PRA-3 (149.83)
7	Days to 80% maturity	79.00	101.00	IC274471 ,IC278913 ,IC313269 ,IC274467 (<85.00)	Durga (85.00)
UUHF, Ranichuari (Accessions 25)					
1	Days to 50% flowering	64.40	78.00		Durga (64.40)
2	Inflorescence length (cm)	16.20	43.60	IC321281 ,IC278919 ,IC279965 (>36.20)	PRA-3 (35.56)
3	Finger length(cm)	5.20	16.60	IC313273 ,IC321281 ,IC278919 (>11.80)	PRA-3 (11.68)
4	No of fingers / plant	15.80	41.20	IC258250 ,IC321281 ,IC313265 ,IC278913 ,IC279965 (>35.80)	Annapurna (35.44)
5	No. of leaves / plant	11.20	32.60	IC258250 ,IC313265 ,IC274451 ,IC279965 ,IC279966 ,IC279968 (>18.20)	PRA-3 (18.12)
6	Plant height (cm)	72.20	155.80	IC321281 ,IC279965 ,IC278922 ,IC313265 (>129.00)	Annapurna (128.28)
7	Seed volume (g/10ml)	10.36	11.18	IC333211 (>11.16)	PRA-3 (11.16)
CSKHPKV Sangla (Accessions 25)					
1	Days to 50% flowering	62.00	78.00	IC313269 ,IC322201 ,IC321281 ,IC333108 (<64.00)	Durga (66.80)
2	Number of branches per plant	4.00	11.00	IC326898 ,IC278919 ,IC274451 (>8.00)	Durga (7.00)
3	Plant height (cm)	92.33	125.00	IC274451 (>123.47)	PRA-2 (123.47)

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
4	Days to 80% maturity	140.00	155.00	IC313265 ,IC258250 ,IC321281 ,IC322201 ,IC278921 ,IC333108 (<147.00)	Durga (147.80)
5	Seed yield per plant (g)	1.20	7.20	IC258250 ,IC278922 ,IC333108 ,IC341551 ,IC321281 ,IC278921 ,IC326896 ,IC274451 ,IC329588 ,IC313265 ,IC322201 ,IC333173 ,IC313273 (>3.00)	PRA-2 (2.64)
6	Seed volume (g/10ml)	5.00	7.00	IC278913 (>6.80)	PRA-2 (6.80)
<b>NBPGR, RS, Shimla (Accessions 25)</b>					
1	Stem thickness	1.90	3.58	IC279965 ,IC279966 ,IC326898 (>3.29)	Durga (3.12)
2	Inflorescence length (cm)	51.20	81.10	IC278919 ,IC278913 ,IC329588 (>74.80)	Durga (74.25)
3	Finger length(cm)	1.20	18.20	IC278919 ,IC223659 ,IC313265 ,IC329588 ,IC333108 ,IC279968 ,IC333173 ,IC258250 ,IC278922 (>7.30)	PRA-2 (7.05)
4	Plant height (cm)	225.10	305.00	IC279966 ,IC333108 ,IC278919 ,IC326898 ,IC313273 ,IC223659 ,IC321281 ,IC333173 ,IC313265 ,IC278921 ,IC326896 (>278.00)	PRA-3 (272.85)
5	Seed yield per plant (g)	65.33	224.86	IC274451 ,IC313265 (>137.78)	Durga (131.30)
<b>Best entries over locations (Accessions 25)</b>					
1	Days to 50% flowering	61.00	78.50	IC313269 (<61.05)	Durga (61.05)
2	Inflorescence length (cm)	29.63	46.71	IC278919 ,IC279965 ,IC274467 ,IC278913 ,IC278922 (>42.73)	PRA-3 (42.56)
3	Finger length(cm)	3.80	16.50	IC278919 ,IC313273 (>9.70)	PRA-2 (9.25)
4	No of fingers / plant	26.10	79.77	IC258250 ,IC321281 ,IC278913 ,IC274471 ,IC278919 ,IC274451 ,IC326898 (>47.40)	PRA-3 (47.02)
5	Plant height (cm)	137.23	176.07	IC274451 ,IC321281 ,IC279965 ,IC279966 ,IC313265 (>167.43)	PRA-3 (166.05)
6	Seed yield per plant (g)	33.73	73.56	IC274451 (>66.54)	PRA-2 (66.54)

**Table 4: Multilocation evaluation of germplasm lines in grain amaranth at different locations: Kharif 2015 (Hills)**

S.No.	Accession No.	Leaf length (cm)			Petiole length (cm)			Days to 50% flowering					Inflorescence length (cm)				
		Shimla	Almora	Mean	Shimla	Almora	Mean	Almora	Shimla	Sangla	Ranichuari	Mean	Shimla	Sangla	Almora	Ranichuari	Mean
1	EC223659	21.60	11.67	<b>16.63</b>	12.80	6.47	<b>9.63</b>	47.00	89.00	73.00	73.00	<b>70.50</b>	57.00	19.33	34.33	23.00	<b>33.42</b>
2	IC258250	21.50	12.40	<b>16.95</b>	14.20	5.17	<b>9.68</b>	47.00	88.00	64.00	68.00	<b>66.75</b>	68.00	19.67	52.67	30.60	<b>42.73</b>
3	IC274451	19.60	14.53	<b>17.07</b>	13.10	5.90	<b>9.50</b>	55.00	75.00	70.00	76.00	<b>69.00</b>	53.40	19.67	58.00	28.40	<b>39.87</b>
4	IC274467	22.00	11.00	<b>16.50</b>	13.20	3.73	<b>8.47</b>	46.00	75.00	70.00	77.00	<b>67.00</b>	51.30	18.33	79.33	32.60	<b>45.39</b>
5	IC274471	25.20	17.17	<b>21.18</b>	13.30	5.00	<b>9.15</b>	42.00	84.00	72.00	72.00	<b>67.50</b>	70.60	24.67	49.00	24.80	<b>42.27</b>
6	IC278913	24.70	11.40	<b>18.05</b>	13.40	4.97	<b>9.18</b>	42.00	89.00	70.00	67.00	<b>67.00</b>	76.00	25.00	40.00	33.60	<b>43.65</b>
7	IC278919	23.70	12.07	<b>17.88</b>	10.90	6.10	<b>8.50</b>	44.00	91.00	73.00	68.00	<b>69.00</b>	81.10	25.00	42.33	38.40	<b>46.71</b>
8	IC278921	24.70	15.43	<b>20.07</b>	12.20	7.33	<b>9.77</b>	47.00	91.00	70.00	71.00	<b>69.75</b>	67.10	25.33	35.33	34.00	<b>40.44</b>
9	IC278922	23.00	14.37	<b>18.68</b>	12.40	5.67	<b>9.03</b>	44.00	91.00	70.00	68.00	<b>68.25</b>	62.20	26.00	53.33	30.60	<b>43.03</b>
10	IC279965	27.80	16.70	<b>22.25</b>	13.50	7.70	<b>10.60</b>	58.00	87.00	75.00	72.00	<b>73.00</b>	74.80	23.33	46.33	37.20	<b>45.42</b>
11	IC279966	23.60	13.57	<b>18.58</b>	12.80	6.33	<b>9.57</b>	44.00	84.00	74.00	67.00	<b>67.25</b>	61.20	23.67	43.00	36.20	<b>41.02</b>
12	IC279968	27.40	12.87	<b>20.13</b>	13.00	4.53	<b>8.77</b>	47.00	89.00	78.00	75.00	<b>72.25</b>	57.10	19.67	20.33	30.40	<b>31.88</b>
13	IC313265	23.80	12.97	<b>18.38</b>	13.60	5.33	<b>9.47</b>	51.00	86.00	72.00	73.00	<b>70.50</b>	58.10	20.00	33.00	27.20	<b>34.58</b>
14	IC313269	23.50	12.03	<b>17.77</b>	13.60	4.70	<b>9.15</b>	41.00	76.00	62.00	65.00	<b>61.00</b>	53.40	24.67	44.33	32.80	<b>38.80</b>
15	IC313273	24.90	16.47	<b>20.68</b>	12.80	5.60	<b>9.20</b>	47.00	88.00	78.00	67.00	<b>70.00</b>	71.10	22.00	27.67	32.80	<b>38.39</b>
16	IC321281	21.00	13.10	<b>17.05</b>	11.40	5.13	<b>8.27</b>	47.00	91.00	63.00	70.00	<b>67.75</b>	58.60	22.33	39.33	43.60	<b>40.97</b>
17	IC322201	19.00	14.07	<b>16.53</b>	11.40	7.03	<b>9.22</b>	60.00	95.00	62.00	70.00	<b>71.75</b>	61.20	24.00	32.33	26.60	<b>36.03</b>

S.No.	Accession No.	Finger length(cm)			No of fingers / plant			Plant height (cm)					Days to 80% maturity				
		Ranichuari	Shimla	Mean	Ranichuari	Almora	Mean	Shimla	Sangla	Almora	Ranichuari	Mean	Almora	Ranichuari	Shimla	Sangla	Mean
1	EC223659	6.20	12.00	<b>9.10</b>	26.00	40.00	<b>33.00</b>	286.0	112.0	128.3	86.6	<b>153.2</b>	93.0	134.0	158.0	150.0	<b>133.8</b>
2	IC258250	9.00	8.00	<b>8.50</b>	41.20	118.33	<b>79.77</b>	225.1	104.7	171.3	90.4	<b>147.9</b>	87.0	129.0	149.0	142.0	<b>126.8</b>
3	IC274451	5.20	2.40	<b>3.80</b>	24.00	80.67	<b>52.33</b>	258.6	125.0	191.7	129.0	<b>176.1</b>	97.0	137.0	141.0	152.0	<b>131.8</b>
4	IC274467	8.00	1.20	<b>4.60</b>	32.20	38.00	<b>35.10</b>	233.6	110.3	199.3	90.8	<b>158.5</b>	84.0	138.0	141.0	155.0	<b>129.5</b>
5	IC274471	10.00	7.30	<b>8.65</b>	28.00	82.67	<b>55.33</b>	259.4	110.3	132.3	78.6	<b>145.2</b>	79.0	133.0	144.0	155.0	<b>127.8</b>
6	IC278913	10.60	6.10	<b>8.35</b>	37.60	78.33	<b>57.97</b>	278.0	116.3	111.7	106.0	<b>153.0</b>	81.0	128.0	143.0	155.0	<b>126.8</b>
7	IC278919	14.80	18.20	<b>16.50</b>	31.40	74.67	<b>53.03</b>	290.9	120.0	131.0	127.8	<b>167.4</b>	85.0	129.0	152.0	155.0	<b>130.3</b>
8	IC278921	10.80	5.40	<b>8.10</b>	21.20	44.33	<b>32.77</b>	280.3	112.0	118.3	112.0	<b>155.7</b>	92.0	132.0	153.0	145.0	<b>130.5</b>
9	IC278922	7.00	7.70	<b>7.35</b>	35.80	44.00	<b>39.90</b>	260.8	110.7	150.3	132.8	<b>163.7</b>	91.0	129.0	143.0	154.0	<b>129.3</b>
10	IC279965	8.80	7.00	<b>7.90</b>	37.20	47.00	<b>42.10</b>	266.1	116.3	162.7	138.0	<b>170.8</b>	95.0	133.0	153.0	155.0	<b>134.0</b>
11	IC279966	10.80	6.40	<b>8.60</b>	30.80	35.67	<b>33.23</b>	305.0	114.0	139.0	121.2	<b>169.8</b>	85.0	128.0	145.0	155.0	<b>128.3</b>
12	IC279968	10.00	8.20	<b>9.10</b>	35.40	38.00	<b>36.70</b>	271.4	104.0	107.3	115.8	<b>149.6</b>	99.0	136.0	154.0	150.0	<b>134.8</b>
13	IC313265	7.20	10.60	<b>8.90</b>	40.80	54.00	<b>47.40</b>	281.4	121.3	144.0	131.0	<b>169.4</b>	97.0	134.0	155.0	140.0	<b>131.5</b>
14	IC313269	11.80	3.20	<b>7.50</b>	31.20	48.33	<b>39.77</b>	271.0	108.3	138.3	114.6	<b>158.1</b>	83.0	126.0	154.0	150.0	<b>128.3</b>
15	IC313273	16.60	6.20	<b>11.40</b>	32.60	42.00	<b>37.30</b>	286.4	92.3	124.7	100.0	<b>150.8</b>	85.0	128.0	153.0	153.0	<b>129.8</b>
16	IC321281	16.00	1.20	<b>8.60</b>	41.00	83.67	<b>62.33</b>	284.1	104.0	142.0	155.8	<b>171.5</b>	85.0	131.0	154.0	142.0	<b>128.0</b>
17	IC322201	8.00	3.20	<b>5.60</b>	32.00	58.67	<b>45.33</b>	270.2	102.0	125.0	117.6	<b>153.7</b>	96.0	131.0	154.0	142.0	<b>130.8</b>

S.No.	Accession No.	Seed yield per plant (g)					Seed volume (g/10ml)				Leaf width (cm)	Stem thickness	Number of branches / plant	No. of leaves / plant
		Ranichuari	Sangla	Shimla	Almora	Mean	Ranichuari	Shimla	Sangla	Mean	Almora	Shimla	Sangla	Ranichuari
1	EC223659	86.36	2.20	115.65	3.88	<b>52.02</b>	10.78	7.00	6.50	<b>8.09</b>	5.47	2.75	7.00	14.00
2	IC258250	59.97	7.20	90.36	5.89	<b>40.85</b>	10.52	6.50	6.50	<b>7.84</b>	5.07	2.89	7.00	32.60
3	IC274451	55.19	5.00	224.86	9.17	<b>73.56</b>	10.53	5.80	6.00	<b>7.44</b>	5.90	2.56	9.00	23.20
4	IC274467	69.97	2.40	76.91	7.46	<b>39.18</b>	11.14	5.50	5.00	<b>7.21</b>	4.90	2.40	4.50	16.00
5	IC274471	60.90	2.20	83.92	3.36	<b>37.60</b>	10.88	6.50	6.00	<b>7.79</b>	6.37	1.90	5.00	15.20
6	IC278913	57.46	2.40	74.07	0.98	<b>33.73</b>	10.36	6.20	7.00	<b>7.85</b>	5.93	2.60	4.00	17.00
7	IC278919	83.33	2.40	83.06	4.11	<b>43.22</b>	10.40	6.50	5.00	<b>7.30</b>	6.20	2.06	10.00	16.00
8	IC278921	50.13	5.20	121.31	1.87	<b>44.63</b>	10.81	6.00	6.00	<b>7.60</b>	8.97	2.65	7.00	15.40
9	IC278922	100.12	6.60	78.81	4.66	<b>47.55</b>	10.36	6.00	6.00	<b>7.45</b>	6.33	2.13	4.00	17.60
10	IC279965	83.33	2.40	137.78	5.52	<b>57.26</b>	10.80	6.00		<b>8.40</b>	7.83	3.58	7.00	21.00
11	IC279966	49.46	2.40	87.04	4.87	<b>35.94</b>	10.54	5.50	6.00	<b>7.35</b>	7.23	3.49	8.00	19.40
12	IC279968	50.12	1.20	108.16	1.67	<b>40.29</b>	10.56	5.90	5.50	<b>7.32</b>	6.63	2.72	5.00	18.80
13	IC313265	69.98	3.40	151.08	3.04	<b>56.88</b>	11.00	6.00	5.50	<b>7.50</b>	6.37	2.98	8.00	25.40
14	IC313269	66.67	3.00	65.33	1.26	<b>34.06</b>	10.86	6.80	5.50	<b>7.72</b>	5.00	2.16	5.00	13.40
15	IC313273	77.63	3.20	97.65	3.71	<b>45.55</b>	10.84	6.00	5.00	<b>7.28</b>	5.73	2.16	6.00	15.80
16	IC321281	83.12	6.20	112.05	4.25	<b>51.40</b>	11.00	6.00	6.00	<b>7.67</b>	5.33	2.99	6.00	17.40
17	IC322201	73.42	3.40	124.54	3.16	<b>51.13</b>	11.09	6.00	5.50	<b>7.53</b>	7.00	2.85	6.00	18.20

S.No.	Accession No.	Leaf length (cm)			Petiole length (cm)			Days to 50% flowering					Inflorescence length (cm)				
		Shimla	Almora	Mean	Shimla	Almora	Mean	Almora	Shimla	Sangla	Ranichuari	Mean	Shimla	Sangla	Almora	Ranichuari	Mean
18	IC326896	23.50	10.47	<b>16.98</b>	16.70	3.83	<b>10.27</b>	47.00	86.00	64.00	72.00	<b>67.25</b>	67.10	25.67	40.33	28.00	<b>40.28</b>
19	IC326898	20.00	12.17	<b>16.08</b>	11.50	5.97	<b>8.73</b>	50.00	92.00	70.00	75.00	<b>71.75</b>	59.10	25.00	40.33	28.60	<b>38.26</b>
20	IC329550	24.60	11.10	<b>17.85</b>	16.70	4.43	<b>10.57</b>	47.00	88.00	72.00	70.00	<b>69.25</b>	51.20	20.00	36.00	26.80	<b>33.50</b>
21	IC329588	23.40	14.83	<b>19.12</b>	14.20	6.73	<b>10.47</b>	59.00	95.00	70.00	75.00	<b>74.75</b>	75.10	23.00	33.00	29.60	<b>40.18</b>
22	IC333108	24.00	13.60	<b>18.80</b>	14.00	5.37	<b>9.68</b>	64.00	93.00	63.00	76.00	<b>74.00</b>	58.60	24.33	22.33	28.00	<b>33.32</b>
23	IC333173	19.10	14.07	<b>16.58</b>	11.00	5.67	<b>8.33</b>	62.00	92.00	72.00	77.00	<b>75.75</b>	67.10	24.00	33.00	28.40	<b>38.13</b>
24	IC333211	22.20	11.40	<b>16.80</b>	13.14	4.67	<b>8.90</b>	65.00	93.00	78.00	78.00	<b>78.50</b>	56.30	24.67	21.33	16.20	<b>29.63</b>
25	IC341551	20.70	13.53	<b>17.12</b>	12.40	6.27	<b>9.33</b>	62.00	88.00	70.00	75.00	<b>73.75</b>	53.30	26.00	34.33	24.60	<b>34.56</b>
<b>Mean for check variety</b>																	
	Annapurna	25.05	11.62	<b>18.33</b>	14.75	5.27	<b>10.01</b>	55.50	92.00	74.80	<b>75.00</b>	<b>74.33</b>	59.70	26.47	31.17	<b>34.20</b>	<b>37.88</b>
	Durga	30.75	14.05	<b>22.40</b>	21.25	8.92	<b>15.08</b>	51.50	61.50	66.80	<b>64.40</b>	<b>61.05</b>	74.25	23.27	37.17	<b>28.00</b>	<b>40.67</b>
	PRA-2	23.00	11.87	<b>17.43</b>	13.75	5.30	<b>9.53</b>	56.50	94.00	70.20	<b>76.00</b>	<b>74.18</b>	64.50	27.06	31.67	<b>33.78</b>	<b>39.25</b>
	PRA-3	20.35	12.25	<b>16.30</b>	12.45	5.28	<b>8.87</b>	50.00	92.00	73.60	<b>77.40</b>	<b>73.25</b>	66.65	26.53	41.50	<b>35.56</b>	<b>42.56</b>
<b>Minimum</b>		<b>19.00</b>	<b>10.47</b>	<b>16.08</b>	<b>10.90</b>	<b>3.73</b>	<b>8.27</b>	<b>41.00</b>	<b>61.50</b>	<b>62.00</b>	<b>64.40</b>	<b>61.00</b>	<b>51.20</b>	<b>18.33</b>	<b>20.33</b>	<b>16.20</b>	<b>29.63</b>
<b>Maximum</b>		<b>30.75</b>	<b>17.17</b>	<b>22.40</b>	<b>21.25</b>	<b>8.92</b>	<b>15.08</b>	<b>65.00</b>	<b>95.00</b>	<b>78.00</b>	<b>78.00</b>	<b>78.50</b>	<b>81.10</b>	<b>27.06</b>	<b>79.33</b>	<b>43.60</b>	<b>46.71</b>
<b>Mean</b>		<b>23.23</b>	<b>13.20</b>	<b>18.21</b>	<b>13.43</b>	<b>5.67</b>	<b>9.55</b>	<b>50.98</b>	<b>87.43</b>	<b>70.36</b>	<b>72.06</b>	<b>70.21</b>	<b>63.28</b>	<b>23.40</b>	<b>39.06</b>	<b>30.50</b>	<b>39.06</b>
<b>CD (0.05)</b>										<b>1.50</b>	<b>2.00</b>			<b>3.02</b>		<b>10.89</b>	
<b>CV (%) Error</b>										<b>0.79</b>	<b>1.02</b>			<b>4.39</b>		<b>12.41</b>	
<b>CV (%) Phen.</b>		<b>11.48</b>	<b>13.38</b>	<b>9.65</b>	<b>15.19</b>	<b>20.06</b>	<b>12.98</b>	<b>14.03</b>	<b>8.38</b>	<b>6.62</b>	<b>5.58</b>	<b>5.68</b>	<b>12.97</b>	<b>10.82</b>	<b>30.61</b>	<b>17.50</b>	<b>11.00</b>

S.No.	Accession No.	Finger length(cm)			No of fingers / plant			Plant height (cm)					Days to 80% maturity				
		Ranichuari	Shimla	Mean	Ranichuari	Almora	Mean	Shimla	Sangla	Almora	Ranichuari	Mean	Almora	Ranichuari	Shimla	Sangla	Mean
18	IC326896	11.60	6.20	<b>8.90</b>	22.40	64.67	<b>43.53</b>	280.2	104.7	125.7	90.8	<b>150.3</b>	85.0	133.0	155.0	147.0	<b>130.0</b>
19	IC326898	7.80	7.00	<b>7.40</b>	22.80	76.00	<b>49.40</b>	289.4	110.0	122.7	94.2	<b>154.1</b>	89.0	136.0	156.0	155.0	<b>134.0</b>
20	IC329550	11.60	6.80	<b>9.20</b>	15.80	59.33	<b>37.57</b>	270.4	118.0	114.0	86.4	<b>147.2</b>	92.0	131.0	156.0	153.0	<b>133.0</b>
21	IC329588	7.80	9.30	<b>8.55</b>	31.20	43.67	<b>37.43</b>	250.2	100.0	109.0	89.7	<b>137.2</b>	100.0	136.0	157.0	150.0	<b>135.8</b>
22	IC333108	7.20	9.00	<b>8.10</b>	26.20	26.00	<b>26.10</b>	298.6	103.0	96.3	102.6	<b>150.1</b>		137.0	157.0	145.0	<b>146.3</b>
23	IC333173	11.20	8.20	<b>9.70</b>	20.80	37.67	<b>29.23</b>	282.4	97.7	124.0	96.2	<b>150.1</b>	101.0	138.0	159.0	150.0	<b>137.0</b>
24	IC333211	8.40	3.20	<b>5.80</b>	18.20	39.67	<b>28.93</b>	260.0	120.0	112.0	72.2	<b>141.1</b>		139.0	157.0	154.0	<b>150.0</b>
25	IC341551	5.60	6.30	<b>5.95</b>	28.40	49.33	<b>38.87</b>	271.0	114.0	137.3	92.4	<b>153.7</b>	97.0	136.0	157.0	150.0	<b>135.0</b>
<b>Mean for check variety</b>																	
	Annapurna	<b>10.64</b>	6.25	<b>8.45</b>	<b>35.44</b>	49.33	<b>42.39</b>	267.4	116.6	116.7	<b>128.3</b>	<b>157.2</b>	94.0	<b>136.0</b>	156.0	152.0	<b>134.5</b>
	Durga	<b>9.04</b>	3.35	<b>6.20</b>	<b>25.48</b>	61.17	<b>43.32</b>	265.6	115.6	145.8	<b>118.6</b>	<b>161.4</b>	85.0	<b>125.0</b>	126.5	147.8	<b>121.1</b>
	PRA-2	<b>11.44</b>	7.05	<b>9.25</b>	<b>35.08</b>	32.17	<b>33.62</b>	269.7	123.5	124.7	<b>122.6</b>	<b>160.1</b>	96.5	<b>137.0</b>	156.0	153.0	<b>135.6</b>
	PRA-3	<b>11.68</b>	5.80	<b>8.74</b>	<b>30.04</b>	64.00	<b>47.02</b>	272.9	123.4	149.8	<b>118.1</b>	<b>166.1</b>	99.5	<b>138.4</b>	155.5	152.4	<b>136.5</b>
<b>Minimum</b>		<b>5.20</b>	<b>1.20</b>	<b>3.80</b>	<b>15.80</b>	<b>26.00</b>	<b>26.10</b>	<b>225.1</b>	<b>92.3</b>	<b>96.3</b>	<b>72.2</b>	<b>137.2</b>	<b>79.0</b>	<b>125.0</b>	<b>126.5</b>	<b>140.0</b>	<b>121.1</b>
<b>Maximum</b>		<b>16.60</b>	<b>18.20</b>	<b>16.50</b>	<b>41.20</b>	<b>118.33</b>	<b>79.77</b>	<b>305.0</b>	<b>125.0</b>	<b>199.3</b>	<b>155.8</b>	<b>176.1</b>	<b>101.0</b>	<b>139.0</b>	<b>159.0</b>	<b>155.0</b>	<b>150.0</b>
<b>Mean</b>		<b>9.82</b>	<b>6.65</b>	<b>8.23</b>	<b>30.01</b>	<b>55.56</b>	<b>42.79</b>	<b>271.9</b>	<b>111.4</b>	<b>134.3</b>	<b>109.0</b>	<b>156.7</b>	<b>90.9</b>	<b>133.0</b>	<b>151.5</b>	<b>150.3</b>	<b>132.4</b>
<b>CD (0.05)</b>		<b>4.15</b>			<b>11.17</b>				<b>4.0</b>		<b>34.8</b>			<b>1.5</b>		<b>3.6</b>	
<b>CV (%) Error</b>		<b>14.53</b>			<b>13.28</b>				<b>1.3</b>		<b>10.7</b>			<b>0.4</b>		<b>0.9</b>	
<b>CV (%) Phen.</b>		<b>28.77</b>	<b>51.35</b>	<b>27.45</b>	<b>22.86</b>	<b>36.70</b>	<b>26.74</b>	<b>6.3</b>	<b>7.4</b>	<b>17.8</b>	<b>18.5</b>	<b>6.2</b>	<b>7.2</b>	<b>3.0</b>	<b>4.8</b>	<b>3.1</b>	<b>4.3</b>

S.No.	Accession No.	Seed yield per plant (g)					Seed volume (g/10ml)				Leaf width (cm)	Stem thickness	Number of branches / plant	No. of leaves / plant
		Ranichuari	Sangla	Shimla	Almora	Mean	Ranichuari	Shimla	Sangla	Mean	Almora	Shimla	Sangla	Ranichuari
18	IC326896	83.67	5.20	93.71	2.16	<b>46.18</b>	10.72	6.00	6.00	<b>7.57</b>	5.10	2.41	7.00	16.80
19	IC326898	77.32	1.80	131.09	1.98	<b>53.05</b>	11.14	6.00	6.00	<b>7.71</b>	6.60	3.46	11.00	14.20
20	IC329550	92.46	2.00	111.39	2.68	<b>52.13</b>	10.86	7.00	5.00	<b>7.62</b>	5.03	2.60	7.00	12.40
21	IC329588	73.75	4.20	67.05	3.69	<b>37.17</b>	10.70	6.00	5.00	<b>7.23</b>	6.63	2.76	7.00	13.60
22	IC333108	73.83	6.40	84.67	0.00	<b>41.23</b>	10.71	6.00	6.50	<b>7.74</b>	5.97	2.35	7.00	17.00
23	IC333173	82.67	3.40	126.28	3.72	<b>54.02</b>	10.96	7.00	5.00	<b>7.65</b>	6.53	2.60	7.00	11.20
24	IC333211	92.13	2.10	96.45	0.00	<b>47.67</b>	11.18	6.50	5.50	<b>7.73</b>	4.63	2.24	8.00	12.00
25	IC341551	79.19	6.40	120.19	5.47	<b>52.81</b>	10.92	6.50	5.50	<b>7.64</b>	6.80	3.29	5.00	13.40
<b>Mean for check variety</b>														
	Annapurna	<b>95.44</b>	2.44	95.70	3.32	<b>49.23</b>	<b>11.02</b>	8.00	6.40	<b>8.47</b>	5.73	2.65	6.60	<b>17.76</b>
	Durga	<b>114.27</b>	2.36	131.30	14.74	<b>65.67</b>	<b>10.87</b>	9.00	6.00	<b>8.62</b>	7.10	3.12	7.00	<b>16.88</b>
	PRA-2	<b>149.02</b>	2.64	112.21	2.29	<b>66.54</b>	<b>10.76</b>	7.25	6.80	<b>8.27</b>	6.02	2.81	6.40	<b>18.02</b>
	PRA-3	<b>136.97</b>	2.48	121.20	5.39	<b>66.51</b>	<b>11.16</b>	7.50	6.60	<b>8.42</b>	6.18	2.51	6.40	<b>18.12</b>
<b>Minimum</b>		<b>49.46</b>	<b>1.20</b>	<b>65.33</b>	<b>0.00</b>	<b>33.73</b>	<b>10.36</b>	<b>5.50</b>	<b>5.00</b>	<b>7.21</b>	<b>4.63</b>	<b>1.90</b>	<b>4.00</b>	<b>11.20</b>
<b>Maximum</b>		<b>149.02</b>	<b>7.20</b>	<b>224.86</b>	<b>14.74</b>	<b>73.56</b>	<b>11.18</b>	<b>9.00</b>	<b>7.00</b>	<b>8.62</b>	<b>8.97</b>	<b>3.58</b>	<b>11.00</b>	<b>32.60</b>
<b>Mean</b>		<b>80.27</b>	<b>3.52</b>	<b>107.72</b>	<b>3.94</b>	<b>48.86</b>	<b>10.81</b>	<b>6.45</b>	<b>5.83</b>	<b>7.73</b>	<b>6.16</b>	<b>2.68</b>	<b>6.69</b>	<b>17.16</b>
<b>CD (0.05)</b>		<b>15.06</b>	<b>0.64</b>				<b>0.96</b>		<b>0.94</b>				<b>1.69</b>	<b>5.22</b>
<b>CV (%) Error</b>		<b>4.55</b>	<b>9.68</b>				<b>3.28</b>		<b>5.48</b>				<b>9.58</b>	<b>11.05</b>
<b>CV (%) Phen.</b>		<b>29.16</b>	<b>48.64</b>	<b>29.48</b>	<b>74.11</b>	<b>21.12</b>	<b>2.23</b>	<b>11.91</b>	<b>10.24</b>	<b>5.05</b>	<b>15.43</b>	<b>16.22</b>	<b>24.19</b>	<b>25.22</b>

**Table 5: Characterization of germplasm lines in grain amaranth at Sangla and Shimla: Kharif 2015 (Hills)**

S. No.	Accession No.	Early plant vigour	Plant growth habit	Leaf colour	Inflorescence colour	Inflorescence compactness	Stem colour	Stem surface	Inflorescence shape	Inflorescence spininess	Seed shattering	Seed transparency	Seed colour
1	IC223659	3	1	5	11	5	2	2	4	4	3	1	1
2	IC258250	2	1	5	4	5	2	2	4	4	3	1	1
3	IC274451	2	1	5	7	5	2	2	3	1	7	2	4
4	IC274467	2	1	5	6	5	2	2	3	1	7	2	4
5	IC274471	2	1	8	9	5	6	2	4	4	3	2	1
6	IC278913	2	1	5	4	5	2	2	4	4	3	1	1
7	IC278919	2	1	8	9	5	5	2	4	4	3	1	1
8	IC278921	2	1	8	9	5	5	2	4	4	3	1	1
9	IC278922	2	1	8	9	5	5	2	4	4	3	1	1
10	IC279965	1	1	5	11	5	2	2	4	4	3	1	1
11	IC279966	2	1	8	9	5	5	2	4	4	3	2	1
12	IC279968	2	1	5	11	5	2	2	4	4	3	1	1
13	IC313265	2	1	5	11	5	2	2	4	4	3	1	1
14	IC313269	2	1	5	11	5	2	2	4	4	3	2	2
15	IC313273	3	1	5	11	5	2	2	4	4	3	1	1
16	IC321281	3	1	5	11	5	2	2	4	4	3	1	1
17	IC322201	3	1	5	7	5	2	2	4	1	3	1	1
18	IC326896	3	1	5	11	5	2	2	4	4	3	1	1
19	IC326898	2	1	5	11	5	2	2	4	4	3	1	1
20	IC329550	3	1	5	11	5	2	2	4	4	3	1	1

S. No.	Accession No.	Early plant vigour	Plant growth habit	Leaf colour	Inflorescence colour	Inflorescence compactness	Stem colour	Stem surface	Inflorescence shape	Inflorescence spininess	Seed shattering	Seed transparency	Seed colour
21	IC329588	2	1	8	11	5	2	2	4	4	3	1	1
22	IC333108	2	1	8	9	5	5	2	4	4	3	1	1
23	IC333173	2	1	8	9	5	4	2	4	4	3	1	1
24	IC333211	2	1	5	11	5	2	2	4	4	3	1	1
25	IC341551	3	1	5	11	5	2	2	4	4	3	1	1
<b>Mode for check variety</b>													
1	Annapurana	3	1	5	11	5	2	2	4	1	3	1	1
2	Durga	3	1	5	7	5	2	2	1	2	7	1	1
3	PRA-2	3	1	5	11	5	2	2	4	4	3	1	1
4	PRA-3	3	1	5	11	5	2	2	4	4	3	1	1
<b>Minimum</b>		1	1	5	4	5	2	2	1	1	3	1	1
<b>Maximum</b>		3	1	8	11	5	6	2	4	4	7	2	4
<b>Mode</b>		2	1	5	11	5	2	2	4	4	3	1	1
<b>Qualitative characters :</b> <i>Early plant vigour:</i> 1-Poor, 2-Good, 3-Very good; <i>Plant growth habit:</i> 1-Erect, 2-Spreading, 3-Drooping, 99-Others; <i>Leaf colour:</i> 1-Yellow, 2-Yellowish orange, 3-Yellowish green, 4-Orange, 5-Green, 6-Greenish orange, 7-Pink, 8-Pinkish green, 9-Reddish yellow, 10-Reddish green, 11-Red, 12-Dark red, 99-Others; <i>Seed colour:</i> 1-White, 2-Creamish, 3-Pale yellow, 4-Pink, 5-Red, 6-Brown, 7-Black, 8-Golden, 99-Others; <i>Inflorescence colour:</i> 1-Light yellow, 2-Yellow, 3-Yellowish orange, 4-Yellowish green, 5-Orange, 6-Pink, 7-Pinkish green, 8-Purple, 9-Red, 10-Reddish green, 11-Green, 99-Others; <i>Inflorescence compactness:</i> 3-Lax, 5-Intermediate, 7-Dense, 99-Others; <i>Inflorescence shape:</i> 1-Globose, 2-Semi drooping, 3-Completely drooping, 4-Straight, 99-Others; <i>Inflorescence spininess:</i> 1-Smooth, 2-Glabrous, 3-Prickly, 4-Spiny, 99-Others; <i>Stem colour:</i> 1-Yellow, 2-Yellowish green, 3-Orange, 4-Pink, 5-Red, 6-Reddish green, 7-Reddish orange, 99-Others; <i>Stem surface:</i> 1-Smooth, 2-Ridged, 99-Others; <i>Seed shattering:</i> 3-Low (%), 5-Intermediate (10-50%), 7-High (50%), 99-Others; <i>Popping ability of seed:</i> 3-Poor, 5-Medium, 7-Good, 99-Others													

**Table 6: Promising lines in buckwheat germplasm for various characters at various locations: Kharif 2015 (Hills)**

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
VPKS, Almora (Accessions 25)					
1	Days to 50% flowering	22.00	38.00		VL-7 (22.00)
2	Days to 80% maturity	56.00	77.00		VL-7 (56.00)
3	Leaf length (cm)	4.63	8.03	IC313142 (>7.43)	PRB-1 (7.38)
5	Length of cyme (cm)	1.60	3.50	IC313134, IC328910, IC329195 (>2.90)	Himpriya (2.67)
6	Number of Inflorescence per plant	50.50	135.33	IC318859, IC328910 (>112.33)	PRB-1 (109.50)
7	Number of leaves per plant	65.50	203.33	IC328910 (>175.67)	PRB-1 (147.50)
8	Number of primary branches per plant	4.00	8.00	IC313136 (>7.67)	PRB-1 (7.50)
9	Number of nodes per plant	10.33	23.00	IC329193, IC313134 (>21.33)	Himpriya (20.83)
10	Petiole length	3.07	6.40	IC329191 (>6.30)	PRB-1 (6.20)
11	Plant height (cm)	77.67	149.33		Shimla-B-1 (149.33)
12	Seed yield per plant (g)	1.03	7.80	IC329193 (>7.70)	Himpriya (7.21)
UUHF, Ranichuari (Accessions 25 )					
1	Days to 50% flowering	35.00	72.00	IC313134 (<36.00)	VL-7 (37.33)
2	Days to 80% maturity	86.67	118.00		VL-7 (86.67)
3	Number of leaves per plant	7.20	32.60	IC329190, IC329197, IC329191, IC329193 (>28.40)	VL-7 (27.73)
4	Number of secondary branches per plant	3.80	7.20	IC328692, IC329195 (>6.80)	VL-7 (6.60)
5	Number of primary branches per plant	3.60	6.60	IC328692, IC329195, IC329202 (>6.00)	Himpriya (5.93)
6	Plant height (cm)	58.60	146.80	IC329190, IC313152, IC329202, IC328910, IC329195, IC329199 (>125.20)	VL-7 (123.80)
7	Seed yield per plant (g)	14.22	50.52	IC313136 (>38.63)	PRB-1 (38.63)
8	1000-seed weight(g)	12.90	18.93		PRB-1 (18.93)
CSKHPKV, Sangla (Accessions 25 )					

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
1	Days to 50% flowering	35.00	54.00	IC 329202(<35.00)	Shimla-B-1 (37.20)
2	Days to 80% maturity	98.00	107.60	IC313142 (<100.00)	VL-7 (100.00)
3	Number of Inflorescence per plant	4.20	56.20	IC329195, IC313141, IC329199 (>50.00)	Shimla-B-1 (49.44)
4	Number of primary branches per plant	5.00	6.60	IC329190, IC328691 (>6.20)	Himpriya (6.16)
6	Plant height (cm)	112.00	155.02	IC329190, IC328691, IC329401, IC329202, IC329193, IC313141 (>150.00)	Himpriya (149.52)
7	Seed yield per plant (g)	2.00	3.00	IC313138, IC313141, IC313152, IC329202, IC313134, IC313139, IC313149 (>2.60)	Himpriya (2.60)
8	1000-seed weight(g)	12.00	26.00	IC318859, IC328692 (>22.00)	Himpriya (20.40)
<b>NBPGR, RS, Shimla (Accessions 25)</b>					
1	Days to 50% flowering	33.00	74.00		VL-7 (33.00)
2	Days to 80% maturity	91.00	140.00		Shimla-B-1 (91.00)
3	Leaf length (cm)	4.40	10.10	IC329195, IC329190, IC329198, IC328691, IC318859 (>9.00)	Himpriya (7.20)
4	Leaf width (cm)	4.90	12.00	IC329195, IC329198, IC329401, IC329190, IC328910, IC328691 (>9.20)	Shimla-B-1 (9.10)
5	Length of cyme (cm)	1.30	7.60		Shimla-B-1 (7.60)
6	Number of Inflorescence per plant	6.00	22.00		Shimla-B-1 (22.00)
7	Number of leaves per plant	9.00	14.00		Shimla-B-1 (14.00)
8	Number of primary branches per plant	0.00	2.00	IC313134, IC329197, IC329199, IC313138, IC329190, IC329195 (>0.00)	Himpriya (0.00)
9	Number of seeds per inflorescence	2.00	9.00		Shimla-B-1 (9.00)
10	Number of nodes per plant	7.00	13.00	(>13.00)	Shimla-B-1 (13.00)
11	Petiole length (cm)	3.00	11.70	IC329401, IC329198 (>11.00)	Shimla-B-1 (10.40)
12	Plant height (cm)	53.20	155.20	IC329193, IC329190, IC329199, IC313134, IC329202 (>145.10)	Shimla-B-1 (144.20)
13	Seed yield per plant (g)	0.21	3.21		Shimla-B-1 (3.21)
14	1000-seed weight(g)	14.50	27.23	IC329191, IC313152 (>25.70)	VL-7 (25.13)
<b>Best entries over all locations (Accessions 25)</b>					

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
1	Days to 50% flowering	33.98	53.75		VL-7 (33.98)
2	Days to 80% maturity	83.42	109.11		VL-7 (83.42)
3	Leaf length (cm)	4.62	8.45	IC329195, IC329190, IC329401, IC329198, IC318859 (>8.08)	PRB-1 (7.14)
4	Leaf width (cm)	5.00	8.93	IC329198, IC329195, IC329401 (>8.05)	Shimla-B-1 (7.92)
5	Length of cyme (cm)	1.57	5.10	(>5.10)	Shimla-B-1 (5.03)
6	Number of Inflorescence per plant	42.00	562.00	IC329195, IC313141, IC329199 (>500.00)	Shimla-B-1 (494.40)
7	Number of leaves per plant	72.00	326.00	IC329190, IC329197, IC329191, IC329193 (>284.00)	VL-7 (277.33)
8	Number of primary branches per plant	3.57	4.97	(>4.97)	PRB-1 (4.86)
9	Number of seeds per inflorescence	3.50	9.46		Shimla-B-1 (9.46)
10	Number of nodes per plant	9.17	16.25		Shimla-B-1 (16.25)
11	Petiole length (cm)	3.68	8.45	IC329198 (>8.10)	Shimla-B-1 (8.08)
12	Plant height (cm)	89.97	145.69	IC329190, IC329202, IC329193, IC329199 (>134.18)	Shimla-B-1 (130.95)
13	Seed yield per plant (g)	5.50	15.25	IC313136 (>15.25)	PRB-1 (11.75)
14	1000-seed weight(g)	120.00	260.00	IC318859, IC328692 (>220.00)	Himpriya (204.00)

**Table 7: Multilocation evaluation of germplasm lines in buckwheat at different locations: Kharif 2015 (Hills)**

S.No.	Accession No.	Days to 50% flowering					Days to 80% maturity					Leaf length (cm)		
		Almora	Ranichuari	Sangla	Shimla	Mean	Almora	Ranichuari	Sangla	Shimla	Mean	Almora	Shimla	Mean
1	IC313134	24.00	35.00	52.00	38.00	<b>37.25</b>	59.00	102.00	104.00	124.00	<b>97.25</b>	5.50	7.90	<b>6.70</b>
2	IC313136	37.00	55.00	42.00	50.00	<b>46.00</b>	71.00	101.00	100.00	124.00	<b>99.00</b>	6.80	7.70	<b>7.25</b>
3	IC313137	34.00	49.00	54.00	42.00	<b>44.75</b>	67.00	98.00	104.00	124.00	<b>98.25</b>	5.07	4.40	<b>4.73</b>
4	IC313138	34.00	47.00	42.00	41.00	<b>41.00</b>	67.00	97.00	101.00	104.00	<b>92.25</b>	4.83	4.40	<b>4.62</b>
5	IC313139	24.00	39.00	49.00	36.00	<b>37.00</b>	61.00	109.00	104.00	124.00	<b>99.50</b>	6.80	8.50	<b>7.65</b>
6	IC313140	38.00	48.00	50.00	40.00	<b>44.00</b>	73.00	110.00	104.00	119.00	<b>101.50</b>	5.30	5.50	<b>5.40</b>
7	IC313141	24.00	38.00	49.00	36.00	<b>36.75</b>	59.00	109.00	100.00	121.00	<b>97.25</b>	7.07	6.00	<b>6.53</b>
8	IC313142	24.00	36.00	40.00	37.00	<b>34.25</b>	57.00	98.00	98.00	121.00	<b>93.50</b>	8.03	7.40	<b>7.72</b>
9	IC313145	25.00	38.00	52.00	37.00	<b>38.00</b>	59.00	97.00	104.00	124.00	<b>96.00</b>	6.50	6.80	<b>6.65</b>
10	IC313149	36.00	56.00	50.00	40.00	<b>45.50</b>	67.00	111.00	102.00	124.00	<b>101.00</b>	4.63	6.90	<b>5.77</b>
11	IC313152	23.00	38.00	48.00	36.00	<b>36.25</b>	57.00	116.00	102.00	124.00	<b>99.75</b>	5.87	7.80	<b>6.83</b>
12	IC318859	35.00	56.00	51.00	43.00	<b>46.25</b>	69.00	118.00	105.00	138.00	<b>107.50</b>	7.07	9.10	<b>8.08</b>
13	IC328691	36.00	56.00	52.00	43.00	<b>46.75</b>	69.00	114.00	102.00	137.00	<b>105.50</b>	4.77	9.20	<b>6.98</b>
14	IC328692	34.00	49.00	50.00	41.00	<b>43.50</b>	72.00	116.00	103.00	135.00	<b>106.50</b>	5.53	5.00	<b>5.27</b>
15	IC328910	37.00	60.00	45.00	44.00	<b>46.50</b>	75.00	114.00	102.00	135.00	<b>106.50</b>	6.67	7.90	<b>7.28</b>
16	IC329190	26.00	40.00	52.00	37.00	<b>38.75</b>	63.00	116.00	107.00	125.00	<b>102.75</b>	6.73	10.00	<b>8.37</b>
17	IC329191	24.00	44.00	49.00	39.00	<b>39.00</b>	60.00	114.00	104.00	125.00	<b>100.75</b>	7.20	8.40	<b>7.80</b>
18	IC329193	26.00	48.00	51.00	35.00	<b>40.00</b>	61.00	113.00	104.00	125.00	<b>100.75</b>	7.17	8.30	<b>7.73</b>
19	IC329195	37.00	62.00	42.00	74.00	<b>53.75</b>	77.00	114.00	100.00	134.00	<b>106.25</b>	6.80	10.10	<b>8.45</b>
20	IC329196	38.00	62.00	50.00	52.00	<b>50.50</b>	77.00	112.00	104.00	131.00	<b>106.00</b>	5.83	7.00	<b>6.42</b>
21	IC329197	38.00	72.00	49.00	41.00	<b>50.00</b>	70.00	114.00	102.00	127.00	<b>103.25</b>	6.43	6.10	<b>6.27</b>

S.No.	Accession No.	Leaf width (cm)			Length of cyme (cm)			No of Inflorescence per plant				No of leaves / plant			
		Almora	Shimla	Mean	Almora	Shimla	Mean	Almora	Sangla	Shimla	Mean	Almora	Ranichuari	Shimla	Mean
1	IC313134	4.83	9.20	<b>7.02</b>	3.50	6.70	<b>5.10</b>	105.67	40.00	20.00	<b>55.22</b>	123.00	18.00	11.00	<b>50.67</b>
2	IC313136	6.30	7.80	<b>7.05</b>	2.90	3.70	<b>3.30</b>	112.33	40.60	12.00	<b>54.98</b>	141.33	13.40	12.00	<b>55.58</b>
3	IC313137	4.80	5.20	<b>5.00</b>	2.53	2.40	<b>2.47</b>	76.33	35.20	9.00	<b>40.18</b>	92.33	7.20	11.00	<b>36.84</b>
4	IC313138	3.93	6.50	<b>5.22</b>	2.23	1.70	<b>1.97</b>	90.67	40.20	12.00	<b>47.62</b>	106.67	9.00	11.00	<b>42.22</b>
5	IC313139	4.80	8.00	<b>6.40</b>	1.80	5.90	<b>3.85</b>	94.00	40.20	20.00	<b>51.40</b>	112.00	8.40	10.00	<b>43.47</b>
6	IC313140	4.57	7.80	<b>6.18</b>	1.97	1.90	<b>1.93</b>	88.67	44.00	10.00	<b>47.56</b>	100.67	10.00	9.00	<b>39.89</b>
7	IC313141	6.00	4.90	<b>5.45</b>	2.00	3.90	<b>2.95</b>	91.67	50.40	16.00	<b>52.69</b>	119.33	14.60	12.00	<b>48.64</b>
8	IC313142	6.67	6.90	<b>6.78</b>	2.50	4.10	<b>3.30</b>	92.00	45.20	15.00	<b>50.73</b>	111.00	16.20	11.00	<b>46.07</b>
9	IC313145	5.63	5.20	<b>5.42</b>	2.17	3.50	<b>2.83</b>	72.00	4.20	16.00	<b>30.73</b>	78.00	15.60	10.00	<b>34.53</b>
10	IC313149	4.77	6.70	<b>5.73</b>	2.33	2.20	<b>2.27</b>	93.00	30.50	17.00	<b>46.83</b>	127.67	17.40	11.00	<b>52.02</b>
11	IC313152	4.50	8.00	<b>6.25</b>	2.07	3.00	<b>2.53</b>	91.67	35.00	22.00	<b>49.56</b>	107.33	25.80	12.00	<b>48.38</b>
12	IC318859	5.83	8.30	<b>7.07</b>	2.20	4.20	<b>3.20</b>	135.33	50.00	12.00	<b>65.78</b>	175.67	22.80	11.00	<b>69.82</b>
13	IC328691	4.17	9.60	<b>6.88</b>	2.27	2.60	<b>2.43</b>	93.33	42.20	9.00	<b>48.18</b>	128.33	20.60	12.00	<b>53.64</b>
14	IC328692	5.03	5.20	<b>5.12</b>	1.83	1.30	<b>1.57</b>	68.00	34.00	11.00	<b>37.67</b>	90.67	23.80	10.00	<b>41.49</b>
15	IC328910	5.93	9.80	<b>7.87</b>	3.03	3.00	<b>3.02</b>	119.67	34.00	13.00	<b>55.56</b>	203.33	27.60	12.00	<b>80.98</b>
16	IC329190	6.00	10.10	<b>8.05</b>	2.27	5.90	<b>4.08</b>	107.00	36.00	21.00	<b>54.67</b>	130.33	32.60	11.00	<b>57.98</b>
17	IC329191	6.40	7.90	<b>7.15</b>	1.97	3.20	<b>2.58</b>	94.67	30.00	13.00	<b>45.89</b>	110.33	28.60	13.00	<b>50.64</b>
18	IC329193	4.63	8.50	<b>6.57</b>	2.03	2.50	<b>2.27</b>	74.33	40.20	11.00	<b>41.84</b>	81.67	28.60	10.00	<b>40.09</b>
19	IC329195	5.70	12.00	<b>8.85</b>	2.97	5.30	<b>4.13</b>	82.00	56.20	9.00	<b>49.07</b>	119.00	26.60	13.00	<b>52.87</b>
20	IC329196	5.47	8.60	<b>7.03</b>	2.00	2.40	<b>2.20</b>	100.00	20.00	7.00	<b>42.33</b>	121.33	27.20	11.00	<b>53.18</b>
21	IC329197	4.93	7.00	<b>5.97</b>	2.13	3.10	<b>2.62</b>	73.33	45.20	11.00	<b>43.18</b>	127.33	29.80	13.00	<b>56.71</b>

S.No.	Accession No.	No. of primary branches/plant					No. of seeds/inflorescence			Number of nodes per plant			Petiole length		
		Almora	Ranichuari	Sangla	Shimla	Mean	Sangla	Shimla	Mean	Almora	Shimla	Mean	Almora	Shimla	Mean
1	IC313134	6.67	5.20	6.00	2.00	<b>4.97</b>	5.20	3.00	<b>4.10</b>	22.00	10.00	<b>16.00</b>	4.60	8.80	<b>6.70</b>
2	IC313136	8.00	4.00	5.40	0.00	<b>4.35</b>	6.60	3.00	<b>4.80</b>	20.67	11.00	<b>15.83</b>	5.63	9.10	<b>7.37</b>
3	IC313137	5.67	3.60	5.00	0.00	<b>3.57</b>	5.60	2.00	<b>3.80</b>	15.33	10.00	<b>12.67</b>	4.37	5.00	<b>4.68</b>
4	IC313138	6.67	4.20	6.00	1.50	<b>4.59</b>	5.00	3.50	<b>4.25</b>	19.67	10.00	<b>14.83</b>	4.63	4.90	<b>4.77</b>
5	IC313139	6.00	4.20	6.00	0.00	<b>4.05</b>	5.00	2.66	<b>3.83</b>	19.67	10.00	<b>14.83</b>	5.07	8.00	<b>6.53</b>
6	IC313140	7.33	5.40	6.20	0.00	<b>4.73</b>	5.40	3.00	<b>4.20</b>	19.67	8.00	<b>13.83</b>	3.27	5.20	<b>4.23</b>
7	IC313141	6.33	4.80	6.20	0.00	<b>4.33</b>	8.20	3.33	<b>5.77</b>	19.33	11.00	<b>15.17</b>	6.30	6.10	<b>6.20</b>
8	IC313142	5.00	5.00	5.00	0.00	<b>3.75</b>	5.00	3.00	<b>4.00</b>	18.33	10.00	<b>14.17</b>	6.17	6.10	<b>6.13</b>
9	IC313145	5.67	5.20	5.00	0.00	<b>3.97</b>	6.60	4.00	<b>5.30</b>	16.33	10.00	<b>13.17</b>	4.17	3.20	<b>3.68</b>
10	IC313149	6.33	5.40	6.20	0.00	<b>4.48</b>	8.00	3.00	<b>5.50</b>	17.00	10.00	<b>13.50</b>	4.53	5.90	<b>5.22</b>
11	IC313152	4.67	3.80	6.00	0.00	<b>3.62</b>	5.20	3.66	<b>4.43</b>	15.00	11.00	<b>13.00</b>	3.57	9.10	<b>6.33</b>
12	IC318859	5.67	5.80	6.00	0.00	<b>4.37</b>	8.20	2.50	<b>5.35</b>	21.33	10.00	<b>15.67</b>	5.50	8.40	<b>6.95</b>
13	IC328691	4.00	4.80	6.40	0.00	<b>3.80</b>	8.00	2.66	<b>5.33</b>	16.00	11.00	<b>13.50</b>	4.20	9.00	<b>6.60</b>
14	IC328692	5.67	6.60	5.80	0.00	<b>4.52</b>	6.60	2.50	<b>4.55</b>	16.67	10.00	<b>13.33</b>	4.53	3.00	<b>3.77</b>
15	IC328910	7.00	5.60	5.00	0.00	<b>4.40</b>	8.00	2.33	<b>5.17</b>	18.33	11.00	<b>14.67</b>	4.53	8.50	<b>6.52</b>
16	IC329190	4.67	5.60	6.60	1.50	<b>4.59</b>	5.00	3.00	<b>4.00</b>	19.33	10.00	<b>14.67</b>	4.87	9.40	<b>7.13</b>
17	IC329191	5.33	5.60	6.00	0.00	<b>4.23</b>	5.00	2.00	<b>3.50</b>	18.67	12.00	<b>15.33</b>	6.40	5.70	<b>6.05</b>
18	IC329193	5.67	6.00	6.20	0.00	<b>4.47</b>	5.60	2.33	<b>3.97</b>	23.00	8.00	<b>15.50</b>	4.17	7.50	<b>5.83</b>
19	IC329195	5.67	6.40	5.60	1.50	<b>4.79</b>	5.60	2.66	<b>4.13</b>	16.00	11.00	<b>13.50</b>	5.20	11.00	<b>8.10</b>
20	IC329196	7.00	5.60	6.20	0.00	<b>4.70</b>	6.00	2.00	<b>4.00</b>	16.67	11.00	<b>13.83</b>	3.07	8.80	<b>5.93</b>
21	IC329197	4.33	5.40	6.00	2.00	<b>4.43</b>	6.50	3.00	<b>4.75</b>	17.67	13.00	<b>15.33</b>	3.23	5.10	<b>4.17</b>

S.No.	Accession No.	Plant height (cm)					Seed yield per plant (g)					1000-seed weight(g)				
		Almora	Ranichuari	Sangla	Shimla	Mean	Almora	Ranichuari	Sangla	Shimla	Mean	Ranichuari	Sangla	Shimla	Mean	Ranichuari
1	IC313134	122.33	114.40	150.00	150.00	<b>134.18</b>	3.21	26.55	2.80	1.46	<b>8.50</b>	16.70	15.00	24.40	<b>18.70</b>	4.00
2	IC313136	140.33	79.60	146.60	94.60	<b>115.28</b>	7.70	50.52	2.00	0.80	<b>15.25</b>	15.70	15.00	20.03	<b>16.91</b>	5.60
3	IC313137	87.67	65.60	149.00	57.60	<b>89.97</b>	1.03	42.46	2.40	0.36	<b>11.56</b>	13.70	20.00	19.00	<b>17.57</b>	4.80
4	IC313138	77.67	123.00	150.00	53.20	<b>100.97</b>	1.82	16.46	3.00	0.73	<b>5.50</b>	16.20	22.00	15.61	<b>17.94</b>	4.80
5	IC313139	127.00	58.60	140.00	145.10	<b>117.68</b>	2.62	22.32	2.80	1.20	<b>7.24</b>	17.20	15.00	23.33	<b>18.51</b>	4.60
6	IC313140	88.67	114.00	145.00	56.20	<b>100.97</b>	1.89	26.22	2.00	0.46	<b>7.64</b>	17.70	22.00	15.51	<b>18.40</b>	5.00
7	IC313141	119.67	118.20	150.20	116.80	<b>126.22</b>	4.48	32.16	3.00	1.21	<b>10.21</b>	17.60	18.00	23.71	<b>19.77</b>	3.80
8	IC313142	129.33	115.80	142.20	111.30	<b>124.66</b>	5.83	14.22	2.00	1.18	<b>5.81</b>	14.60	20.00	24.21	<b>19.60</b>	5.80
9	IC313145	117.67	104.00	145.20	139.00	<b>126.47</b>	3.73	26.17	2.60	1.36	<b>8.46</b>	15.20	22.00	24.42	<b>20.54</b>	5.40
10	IC313149	93.67	110.40	145.00	95.50	<b>111.14</b>	3.06	29.15	2.80	1.05	<b>9.01</b>	16.70	20.00	20.93	<b>19.21</b>	4.20
11	IC313152	120.33	145.00	112.00	122.30	<b>124.91</b>	6.00	16.22	3.00	2.81	<b>7.01</b>	14.70	20.00	26.02	<b>20.24</b>	5.80
12	IC318859	130.67	112.00	115.20	96.40	<b>113.57</b>	4.58	22.17	2.40	0.52	<b>7.42</b>	16.70	26.00	21.43	<b>21.38</b>	6.80
13	IC328691	82.00	121.80	154.60	90.00	<b>112.10</b>	1.48	24.32	2.00	0.51	<b>7.08</b>	13.20	20.00	20.41	<b>17.87</b>	5.80
14	IC328692	88.67	116.20	135.20	63.40	<b>100.87</b>	2.80	29.16	2.00	0.38	<b>8.59</b>	14.20	24.00	16.22	<b>18.14</b>	7.20
15	IC328910	131.33	140.00	138.02	90.00	<b>124.84</b>	4.33	24.28	2.60	0.58	<b>7.95</b>	15.70	22.00	19.81	<b>19.17</b>	6.20
16	IC329190	129.33	146.80	155.02	151.60	<b>145.69</b>	5.83	32.22	2.20	1.56	<b>10.45</b>	14.60	22.00	24.61	<b>20.40</b>	6.20
17	IC329191	133.33	92.40	140.00	138.10	<b>125.96</b>	4.10	16.19	2.00	0.68	<b>5.74</b>	12.90	20.00	27.23	<b>20.04</b>	5.80
18	IC329193	124.00	111.00	152.00	155.20	<b>135.55</b>	7.80	35.26	2.20	0.63	<b>11.47</b>	14.60	12.00	25.70	<b>17.43</b>	6.40
19	IC329195	115.67	134.00	115.00	98.60	<b>115.82</b>	6.01	17.21	2.20	0.47	<b>6.47</b>	16.20	20.00	19.20	<b>18.47</b>	7.20
20	IC329196	102.00	95.40	120.00	93.20	<b>102.65</b>	2.28	22.24	2.40	0.21	<b>6.78</b>	13.70	20.00	14.50	<b>16.07</b>	6.40
21	IC329197	94.67	108.00	135.00	79.20	<b>104.22</b>	1.85	26.22	2.40	0.60	<b>7.77</b>	13.70	15.00	18.60	<b>15.77</b>	6.40

S.No.	Accession No.	Days to 50% flowering					Days to 80% maturity					Leaf length (cm)		
		Almora	Ranichuari	Sangla	Shimla	Mean	Almora	Ranichuari	Sangla	Shimla	Mean	Almora	Shimla	Mean
22	IC329198	38.00	65.00	52.00	51.00	<b>51.50</b>	72.00	113.00	105.00	136.00	<b>106.50</b>	6.80	9.60	<b>8.20</b>
23	IC329199	25.00	48.00	40.00	36.00	<b>37.25</b>	59.00	115.00	101.00	137.00	<b>103.00</b>	6.67	8.30	<b>7.48</b>
24	IC329202	27.00	70.00	35.00	43.00	<b>43.75</b>	62.00	113.00	100.00	125.00	<b>100.00</b>	6.50	8.70	<b>7.60</b>
25	IC329401	37.00	48.00	52.00	46.00	<b>45.75</b>	73.00	115.00	105.00	125.00	<b>104.50</b>	7.43	9.00	<b>8.22</b>
<b>Mean for check variety</b>														
	<b>1 Himpriya(C)</b>		61.33	50.00	60.00	<b>57.11</b>	73.50	115.33	107.60	140.00	<b>109.11</b>	5.95	7.20	<b>6.58</b>
	<b>2 PRB-1 (C)</b>		56.67	48.80	59.00	<b>54.82</b>	72.00	116.67	103.80	125.00	<b>104.37</b>	7.38	6.90	<b>7.14</b>
	<b>3 Shimla-B1 (C)</b>		42.67	37.20	39.00	<b>39.62</b>	59.00	96.67	100.20	91.00	<b>86.72</b>	6.98	6.90	<b>6.94</b>
	<b>4 VL-7 (C)</b>		37.33	43.60	33.00	<b>37.98</b>	56.00	86.67	100.00	91.00	<b>83.42</b>	6.92	5.90	<b>6.41</b>
	<b>Minimum</b>	<b>23.00</b>	<b>35.00</b>	<b>35.00</b>	<b>33.00</b>	<b>34.25</b>	<b>56.00</b>	<b>86.67</b>	<b>98.00</b>	<b>91.00</b>	<b>83.42</b>	<b>4.63</b>	<b>4.40</b>	<b>4.62</b>
	<b>Maximum</b>	<b>38.00</b>	<b>72.00</b>	<b>54.00</b>	<b>74.00</b>	<b>57.11</b>	<b>77.00</b>	<b>118.00</b>	<b>107.60</b>	<b>140.00</b>	<b>109.11</b>	<b>8.03</b>	<b>10.10</b>	<b>8.45</b>
	<b>Mean</b>	<b>31.24</b>	<b>50.24</b>	<b>47.50</b>	<b>43.07</b>	<b>43.57</b>	<b>66.09</b>	<b>109.11</b>	<b>102.71</b>	<b>124.66</b>	<b>100.64</b>	<b>6.39</b>	<b>7.48</b>	<b>6.93</b>
	<b>CD (0.05)</b>			<b>8.70</b>					<b>10.02</b>					
	<b>CV (%) Error</b>			<b>7.26</b>					<b>3.65</b>					
	<b>CV (%) Phen.</b>	<b>19.37</b>	<b>21.12</b>	<b>10.66</b>	<b>20.89</b>	<b>14.12</b>	<b>10.17</b>	<b>7.51</b>	<b>2.22</b>	<b>9.53</b>	<b>6.00</b>	<b>13.86</b>	<b>20.87</b>	<b>15.07</b>

S.No.	Accession No.	Leaf width (cm)			Length of cyme (cm)			No of Inflorescence per plant				No of leaves / plant			
		Almora	Shimla	Mean	Almora	Shimla	Mean	Almora	Sangla	Shimla	Mean	Almora	Ranichuari	Shimla	Mean
22	IC329198	6.67	11.20	<b>8.93</b>	2.17	3.20	<b>2.68</b>	65.33	38.20	12.00	<b>38.51</b>	78.67	19.40	12.00	<b>36.69</b>
23	IC329199	5.63	9.20	<b>7.42</b>	1.73	6.10	<b>3.92</b>	65.00	50.20	20.00	<b>45.07</b>	78.33	20.30	11.00	<b>36.54</b>
24	IC329202	5.30	8.40	<b>6.85</b>	1.80	4.20	<b>3.00</b>	57.67	40.30	16.00	<b>37.99</b>	69.33	28.40	12.00	<b>36.58</b>
25	IC329401	5.93	11.10	<b>8.52</b>	1.60	4.00	<b>2.80</b>	72.67	35.20	17.00	<b>41.62</b>	114.67	27.40	12.00	<b>51.36</b>
<b>Mean for check variety</b>															
	<b>Himpriya(C)</b>	5.82	7.90	<b>6.86</b>	2.67	2.50	<b>2.58</b>	105.50	38.44	6.00	<b>49.98</b>	146.50	20.33	9.00	<b>58.61</b>
	<b>PRB-1 (C)</b>	6.38	7.00	<b>6.69</b>	1.78	3.90	<b>2.84</b>	109.50	35.48	14.00	<b>52.99</b>	147.50	22.40	11.00	<b>60.30</b>
	<b>Shimla-B1 (C)</b>	6.73	9.10	<b>7.92</b>	2.47	7.60	<b>5.03</b>	75.83	49.44	22.00	<b>49.09</b>	90.00	21.73	14.00	<b>41.91</b>
	<b>VL-7 (C)</b>	6.15	7.70	<b>6.93</b>	2.22	3.80	<b>3.01</b>	50.50	43.40	9.00	<b>34.30</b>	65.50	27.73	9.00	<b>34.08</b>
	<b>Minimum</b>	<b>3.93</b>	<b>4.90</b>	<b>5.00</b>	<b>1.60</b>	<b>1.30</b>	<b>1.57</b>	<b>50.50</b>	<b>4.20</b>	<b>6.00</b>	<b>30.73</b>	<b>65.50</b>	<b>7.20</b>	<b>9.00</b>	<b>34.08</b>
	<b>Maximum</b>	<b>6.73</b>	<b>12.00</b>	<b>8.93</b>	<b>3.50</b>	<b>7.60</b>	<b>5.10</b>	<b>135.33</b>	<b>56.20</b>	<b>22.00</b>	<b>65.78</b>	<b>203.33</b>	<b>32.60</b>	<b>14.00</b>	<b>80.98</b>
	<b>Mean</b>	<b>5.50</b>	<b>8.10</b>	<b>6.80</b>	<b>2.25</b>	<b>3.72</b>	<b>2.98</b>	<b>88.20</b>	<b>38.76</b>	<b>13.86</b>	<b>46.94</b>	<b>113.72</b>	<b>21.09</b>	<b>11.24</b>	<b>48.68</b>
	<b>CD (0.05)</b>														
	<b>CV (%) Error</b>														
	<b>CV (%) Phen.</b>	<b>14.35</b>	<b>22.29</b>	<b>15.59</b>	<b>19.49</b>	<b>41.81</b>	<b>28.53</b>	<b>22.05</b>	<b>25.63</b>	<b>33.10</b>	<b>15.87</b>	<b>27.22</b>	<b>33.64</b>	<b>11.06</b>	<b>22.39</b>

S.No.	Accession No.	No. of primary branches/plant					No. of seeds/inflorescence			Number of nodes per plant			Petiole length		
		Almora	Ranichuari	Sangla	Shimla	Mean	Sangla	Shimla	Mean	Almora	Shimla	Mean	Almora	Shimla	Mean
22	IC329198	5.67	5.60	6.00	0.00	<b>4.32</b>	7.20	3.00	<b>5.10</b>	18.00	11.00	<b>14.50</b>	5.50	11.40	<b>8.45</b>
23	IC329199	5.67	5.80	5.20	2.00	<b>4.67</b>	6.20	3.00	<b>4.60</b>	17.33	7.00	<b>12.17</b>	3.83	9.80	<b>6.82</b>
24	IC329202	5.67	6.40	5.60	0.00	<b>4.42</b>	10.20	3.33	<b>6.77</b>	17.67	11.00	<b>14.33</b>	3.67	7.20	<b>5.43</b>
25	IC329401	7.67	5.60	6.00	0.00	<b>4.82</b>	8.20	3.00	<b>5.60</b>	17.67	10.00	<b>13.83</b>	4.50	11.70	<b>8.10</b>
<b>Mean for check variety</b>															
	<b>Himpriya(C)</b>	7.33	5.93	6.16	0.00	<b>4.86</b>	4.68	3.00	<b>3.84</b>	20.83	9.00	<b>14.92</b>	4.68	7.10	<b>5.89</b>
	<b>PRB-1 (C)</b>	7.50	5.87	6.08	0.00	<b>4.86</b>	7.96	3.00	<b>5.48</b>	19.67	10.00	<b>14.83</b>	6.20	9.50	<b>7.85</b>
	<b>Shimla-B1 (C)</b>	5.67	5.13	5.56	0.00	<b>4.09</b>	9.92	9.00	<b>9.46</b>	19.50	13.00	<b>16.25</b>	5.77	10.40	<b>8.08</b>
	<b>VL-7 (C)</b>	4.83	5.40	5.68	0.00	<b>3.98</b>	6.08	4.50	<b>5.29</b>	10.33	8.00	<b>9.17</b>	4.28	7.00	<b>5.64</b>
	<b>Minimum</b>	<b>4.00</b>	<b>3.60</b>	<b>5.00</b>	<b>0.00</b>	<b>3.57</b>	<b>4.68</b>	<b>2.00</b>	<b>3.50</b>	<b>10.33</b>	<b>7.00</b>	<b>9.17</b>	<b>3.07</b>	<b>3.00</b>	<b>3.68</b>
	<b>Maximum</b>	<b>8.00</b>	<b>6.60</b>	<b>6.60</b>	<b>2.00</b>	<b>4.97</b>	<b>10.20</b>	<b>9.00</b>	<b>9.46</b>	<b>23.00</b>	<b>13.00</b>	<b>16.25</b>	<b>6.40</b>	<b>11.70</b>	<b>8.45</b>
	<b>Mean</b>	<b>5.98</b>	<b>5.31</b>	<b>5.83</b>	<b>0.36</b>	<b>4.37</b>	<b>6.58</b>	<b>3.14</b>	<b>4.86</b>	<b>18.20</b>	<b>10.24</b>	<b>14.22</b>	<b>4.70</b>	<b>7.65</b>	<b>6.18</b>
	<b>CD (0.05)</b>			<b>0.93</b>			<b>4.51</b>								
	<b>CV (%) Error</b>			<b>5.96</b>			<b>23.59</b>								
	<b>CV (%) Phen.</b>	<b>17.30</b>	<b>14.37</b>	<b>7.65</b>		<b>8.79</b>	<b>23.23</b>	<b>40.13</b>	<b>24.09</b>	<b>13.73</b>	<b>13.22</b>	<b>10.00</b>	<b>19.99</b>	<b>30.41</b>	<b>21.45</b>

S.No.	Accession No.	Plant height (cm)					Seed yield per plant (g)					1000-seed weight(g)				
		Almora	Ranichuari	Sangla	Shimla	Mean	Almora	Ranichuari	Sangla	Shimla	Mean	Ranichuari	Sangla	Shimla	Mean	Ranichuari
22	IC329198	115.67	125.20	142.20	107.00	<b>122.52</b>	2.06	32.32	2.00	0.70	<b>9.27</b>	14.90	18.00	20.91	<b>17.94</b>	6.00
23	IC329199	127.00	131.60	130.00	151.60	<b>135.05</b>	5.67	22.16	2.50	1.35	<b>7.92</b>	15.60	20.00	22.32	<b>19.31</b>	6.20
24	IC329202	119.33	142.80	152.20	147.30	<b>140.41</b>	3.69	21.24	3.00	1.11	<b>7.26</b>	12.90	12.00	21.10	<b>15.33</b>	6.80
25	IC329401	99.67	108.60	153.40	119.60	<b>120.32</b>	3.31	22.21	2.40	1.04	<b>7.24</b>	13.80	12.00	20.71	<b>15.50</b>	5.30
<b>Mean for check variety</b>																
	<b>Himpriya(C)</b>	121.17	102.80	149.52	92.20	<b>116.42</b>	7.21	35.83	2.60	0.31	<b>11.49</b>	16.70	20.40	17.90	<b>18.33</b>	5.70
	<b>PRB-1 (C)</b>	128.17	95.20	138.80	132.20	<b>123.59</b>	5.24	38.63	2.36	0.78	<b>11.75</b>	18.93	20.00	19.43	<b>19.45</b>	4.93
	<b>Shimla-B1 (C)</b>	149.33	92.40	137.88	144.20	<b>130.95</b>	4.13	25.17	2.36	3.21	<b>8.72</b>	16.30	18.20	16.70	<b>17.07</b>	5.40
	<b>VL-7 (C)</b>	83.50	123.80	139.68	111.00	<b>114.50</b>	3.72	25.59	2.20	1.15	<b>8.16</b>	17.30	17.80	25.13	<b>20.08</b>	6.60
	<b>Minimum</b>	<b>77.67</b>	<b>58.60</b>	<b>112.00</b>	<b>53.20</b>	<b>89.97</b>	<b>1.03</b>	<b>14.22</b>	<b>2.00</b>	<b>0.21</b>	<b>5.50</b>	<b>12.90</b>	<b>12.00</b>	<b>14.50</b>	<b>15.33</b>	<b>3.80</b>
	<b>Maximum</b>	<b>149.33</b>	<b>146.80</b>	<b>155.02</b>	<b>155.20</b>	<b>145.69</b>	<b>7.80</b>	<b>50.52</b>	<b>3.00</b>	<b>3.21</b>	<b>15.25</b>	<b>18.93</b>	<b>26.00</b>	<b>27.23</b>	<b>21.38</b>	<b>7.20</b>
	<b>Mean</b>	<b>113.79</b>	<b>112.02</b>	<b>140.65</b>	<b>110.43</b>	<b>119.22</b>	<b>4.05</b>	<b>26.72</b>	<b>2.42</b>	<b>0.98</b>	<b>8.54</b>	<b>15.45</b>	<b>18.91</b>	<b>21.00</b>	<b>18.45</b>	<b>5.69</b>
	<b>CD (0.05)</b>			<b>16.60</b>					<b>0.51</b>				<b>3.82</b>			
	<b>CV (%) Error</b>			<b>4.39</b>					<b>7.97</b>				<b>7.48</b>			
	<b>CV (%) Phen.</b>	<b>17.12</b>	<b>19.29</b>	<b>8.59</b>	<b>28.36</b>	<b>11.06</b>	<b>46.52</b>	<b>31.12</b>	<b>14.22</b>	<b>69.14</b>	<b>25.61</b>	<b>10.32</b>	<b>18.58</b>	<b>16.47</b>	<b>8.54</b>	<b>15.95</b>

**Table 8: Characterization of germplasm lines in buckwheat at Shimla: Kharif 2015(Hills)**

<b>S.No.</b>	<b>Accession No.</b>	<b>Early plant vigour</b>	<b>Plant growth habit</b>	<b>Flower colour</b>	<b>Leaf colour</b>	<b>leaf margin colour</b>	<b>Leaf blade shape</b>	<b>Stem colour</b>	<b>Seed shattering</b>	<b>Seed shape</b>	<b>Seed colour</b>
1	IC313134	2	3	5	3	5	2	3	7	1	5
2	IC313136	2	3	1	3	5	2	5	7	2	5
3	IC313137	1	3	1	3	5	2	3	7	2	3
4	IC313138	2	3	1	3	5	2	3	5	2	3
5	IC313139	3	3	5	3	5	2	3	7	1	5
6	IC313140	2	3	1	3	5	2	3	5	3	3
7	IC313141	3	3	5	3	5	2	5	7	1	5
8	IC313142	3	3	5	3	5	2	7	7	1	3
9	IC313145	3	3	5	3	5	2	7	7	1	3
10	IC313149	1	3	1	3	5	2	3	7	2	3
11	IC313152	3	3	5	3	5	2	5	7	1	5
12	IC328691	2	3	1	3	5	2	3	7	2	5
13	IC328692	2	3	1	3	5	2	3	5	3	3
14	IC318859	2	3	1	3	5	2	3	7	2	3
15	IC328910	2	3	1	3	5	2	3	7	2	3
16	IC329190	3	3	5	3	5	2	3	7	1	5
17	IC329191	3	3	5	3	5	2	3	7	1	5
18	IC329196	2	3	1	3	5	2	3	5	3	5
19	IC329198	2	3	1	3	5	2	3	7	3	7
20	IC329199	3	3	5	3	5	2	3	7	1	5
21	IC329195	3	3	1	3	5	2	3	7	2	5

S.No.	Accession No.	Early plant vigour	Plant growth habit	Flower colour	Leaf colour	leaf margin colour	Leaf blade shape	Stem colour	Seed shattering	Seed shape	Seed colour
22	IC329193	3	3	5	3	5	2	3	7	1	5
23	IC329197	2	3	1	3	5	2	3	7	2	3
24	IC329202	3	3	5	3	5	2	3	7	1	5
25	IC329401	2	3	1	3	5	2	3	7	2	3
<b>Mean for check variety</b>											
	<b>Himpriya(C)</b>	3	3	1	3	5	2	3	7	2	3
	<b>PRB-1 (C)</b>	2	3	5	3	5	2	3	7	1	5
	<b>Shimla-B1 (C)</b>	2	3	1	3	5	2	7	5	1	3
	<b>VL-7 (C)</b>	3	3	1	3	5	2	7	7	1	5
	<b>Minimum</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>5</b>	<b>2</b>	<b>3</b>	<b>5</b>	<b>1</b>	<b>3</b>
	<b>Maximum</b>	<b>3</b>	<b>3</b>	<b>5</b>	<b>3</b>	<b>5</b>	<b>2</b>	<b>7</b>	<b>7</b>	<b>3</b>	<b>7</b>
	<b>Mode</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>5</b>	<b>2</b>	<b>3</b>	<b>7</b>	<b>1</b>	<b>5</b>

**Qualitative characters:-** *Early plant vigour:* 1-Poor, 2-Good, 3-Very good; *Plant growth habit:* 3-Erect, 5-Semi-erect, 7-Spreading, 99-Others; *Flower colour:* 1-White, 3-Greenish yellow, 5-Pink, 7-Red, 99-Others; *Leaf colour:* 3-Green, 5-Pink, 7-Red, 99-Others; *Leaf margin colour:* 3-Green, 5-Pink, 7-Red, 99-Others; *Leaf blade shape:* 1-Ovate, 2-Hastate, 3-Sagittate, 4-Coradate, 99-Others; *Stem colour:* 3-Green, 5-Pink, 7-Red, 99-Others; *Seed shattering:* 0-Non-shattering, 3-Low, 5-Moderate, 7-High, 99-Others; *Seed shape:* 1-Triangular, 2-Ovate, 3-Conodial, 99-Others; *Seed colour:* 3-Grey, 5-Brown, 7-Black, 9-Mottled, 99-Others; *Biotic stress susceptibility:* 1-Very low or Visible sing of susceptibility, 3-Low, 5-Intermediate, 7-High, 9-Very high

**Table 9: Promising lines in chenopodium germplasm for various characters at various locations: Kharif 2015 (Hills)**

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
UUHF, Ranichauri (Accessions 25)					
1	Days to 50% flowering	56.00	69.00	EC507733, EC201680, NIC22492 (<58.00)	NIC-22503 (58.50)
2	Days to 80% maturity	107.00	140.00	EC201680, EC507733, NIC22492, EC359445, IC007958, IC007213, IC341714 (<111.00)	NIC-22503 (120.00)
3	Inflorescence length (cm)	13.70	28.50	IC007962, IC007213, IC007960, NIC22515, IC007959, IC109249 (>21.00)	NIC-22503 (20.50)
4	Plant height (cm)	57.00	172.60	EC507730, IC007962, IC007959, IC007213, IC109249, NIC22517, IC007958, EC359445, IC007961, EC507734, IC007960, NIC22515 (>113.00)	NIC-22503 (112.20)
5	Seed yield per plant (g)	12.46	20.12	NIC22517, EC507730, NIC22515, EC507733, IC007961, NIC22514, IC007959, IC007957, EC507734, NIC22507, EC359445, IC007962 (>15.54)	PRC-9801 (14.72)
6	Seed Volume (g/ml)	4.54	8.64	NIC22517, IC007959, NIC15022, IC007958, EC201680, NIC22492, IC341707, IC341714, EC359445, EC507730 (>6.68)	PRC-9801 (6.67)
7	No. of Primary branches/plant	11.70	31.00	IC007962, NIC22515, IC007213, EC359445 (>26.60)	PRC-9801 (24.25)
8	No. of leaves/ plant	6.00	27.00	IC007959, IC007961, IC007213, IC109249, IC007962, EC359445, IC007960, NIC22514 (>18.40)	EC-507741 (18.24)
CSKHPKV Sangla (Accessions 25)					
1	Days to 50% flowering	60.00	89.00	EC507734, IC007958, EC359445, IC007959, IC007960, EC507737 (<64.00)	NIC-22503 (65.50)
2	Days to 80% maturity	119.00	131.00	NIC15022, EC322024, IC007957, IC007958, IC007960, IC341714 (<122.00)	NIC-22503 (123.25)
3	Plant height (cm)	49.33	175.00	EC507734, EC201680, EC507733, NIC15022, IC007962, EC359445, IC341714, IC007957, EC507730, EC201618, IC007961, NIC22514, NIC22515 (>113.50)	EC-507741 (111.13)
4	Seed yield per plant (g)	1.40	7.00	IC007213 (>5.50)	PRC-9801 (5.35)
NBPGR, RS, Shimla (Accessions 25)					
1	Days to 50% flowering	66.50	110.00		EC-507741 (66.50)
2	Days to 80% maturity	108.00	156.00		EC-507741 (108.00)

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
3	Inflorescence length (cm)	44.50	67.20	EC359445, IC007213, IC341714, IC007957, NIC22517 (>62.20)	NIC-22503 (61.20)
4	Plant height (cm)	142.00	364.20	IC341714, NIC22517, EC507730, EC359445, IC007960, IC007213, IC341707, IC007957 (>321.20)	PRC-9801 (320.30)
5	Seed yield per plant (g)	4.35	67.13	NIC22514, EC507733, IC415405, EC201680, IC341714, IC007961, NIC22507, NIC22492, NIC15022, IC007958 (>22.65)	PRC-9801 (21.86)
6	Seed Volume (g/ml)	5.00	12.50		EC-507741 (12.50)
7	Leaf length (cm)	9.85	20.10	IC007959 (>19.40)	PRC-9801 (17.05)
8	Leaf width (cm)	9.10	19.60	IC007961, EC201618, NIC22492, EC322024, EC507737, IC007959, EC507734 (>16.50)	NIC-22503 (16.40)
<b>Best entries over all locations (Accessions 25)</b>					
1	Days to 50% flowering	65.67	86.00	IC007958, EC201680, IC007960 (<68.00)	EC-507741 (69.08)
2	Days to 80% maturity	118.67	143.00	IC007958 (<121.00)	EC-507741 (121.83)
3	Inflorescence length (cm)	29.75	58.30	EC507737, IC007213, EC359445, NIC22515, IC007962, IC341714, IC007957(>41.10)	NIC-22503 (40.85)
4	Plant height (cm)	109.71	214.72	EC507730, EC359445, IC007962, IC341714, IC007213, NIC22517, EC507734, IC007960, IC007961, NIC22507, NIC15022, EC507737, EC201680 (>178.47)	PRC-9801 (176.82)
5	Seed yield per plant (g)	7.04	30.13	NIC22514, EC507733, NIC22507, EC507737, IC415405, IC007961, EC201680, IC341714, NIC22517, NIC22492 (>14.29)	PRC-9801 (13.98)
6	Seed Volume (g/ml)	4.77	9.73	(>9.73)	EC-507741 (9.23)

**Table 10: Multilocation evaluation of germplasm lines in chenopodium at different locations: Kharif 2015 (Hills)**

S.No.	Accessions No	Days to 50% flowering				Days to 80% maturity				Inflorescence length (cm)		
		Ranichuari	Sangla	Shimla	Mean	Ranichuari	Sangla	Shimla	Mean	Ranichuari	Shimla	Mean
1	EC201618	68.00	75.00	86.00	<b>76.33</b>	132.00	130.00	140.00	<b>134.00</b>	16.60	52.40	<b>34.50</b>
2	EC201680	57.00	70.00	74.00	<b>67.00</b>	107.00	124.00	137.00	<b>122.67</b>	17.80	58.20	<b>38.00</b>
3	EC322024	69.00	79.00	110.00	<b>86.00</b>	133.00	120.00	152.00	<b>135.00</b>	17.00	57.20	<b>37.10</b>
4	EC359445	58.00	61.00	108.00	<b>75.67</b>	109.00	124.00	152.00	<b>128.33</b>	19.60	67.20	<b>43.40</b>
5	EC507730	67.00	89.00	88.00	<b>81.33</b>	133.00	131.00	156.00	<b>140.00</b>	18.80	49.20	<b>34.00</b>
6	EC507733	56.00	82.00	70.00	<b>69.33</b>	108.00	124.00	131.00	<b>121.00</b>	13.70	53.10	<b>33.40</b>
7	EC507734	69.00	60.00	110.00	<b>79.67</b>	138.00	122.00	152.00	<b>137.33</b>	21.00	58.20	<b>39.60</b>
8	EC507737		63.00	90.00	<b>76.50</b>		124.00	148.00	<b>136.00</b>		58.30	<b>58.30</b>
9	IC007213	58.00	81.00	85.00	<b>74.67</b>	110.00	128.00	137.00	<b>125.00</b>	23.40	67.00	<b>45.20</b>
10	IC007957	62.00	80.00	104.00	<b>82.00</b>	134.00	120.00	150.00	<b>134.67</b>	18.20	65.20	<b>41.70</b>
11	IC007958	60.00	60.00	77.00	<b>65.67</b>	109.00	120.00	127.00	<b>118.67</b>	19.20	57.60	<b>38.40</b>
12	IC007959	66.00	62.00	108.00	<b>78.67</b>	133.00	125.00	153.00	<b>137.00</b>	22.00	60.20	<b>41.10</b>
13	IC007960	62.00	62.00	79.00	<b>67.67</b>	140.00	120.00	136.00	<b>132.00</b>	23.00	58.10	<b>40.55</b>
14	IC007961	66.00	70.00	90.00	<b>75.33</b>	111.00	128.00	151.00	<b>130.00</b>	19.00	59.00	<b>39.00</b>
15	IC007962	65.00	82.00	86.00	<b>77.67</b>	132.00	128.00	136.00	<b>132.00</b>	28.50	56.00	<b>42.25</b>

S.No.	Accessions No	Plant height (cm)				Seed yield per plant (g)				Seed Volume (g/ml)			Ranichuari		Shimla	
		Ranichuari	Sangla	Shimla	Mean	Ranichuari	Sangla	Shimla	Mean	Ranichuari	Shimla	Mean	No. of Primary branches/ plant	No. of leaves/ plant	Leaf length (cm)	Leaf width (cm)
1	EC201618	106.80	120.33	287.20	<b>171.44</b>	14.37	4.20	9.68	<b>9.42</b>	6.68	8.00	<b>7.34</b>	21.20	11.00	14.90	18.00
2	EC201680	83.40	171.00	281.20	<b>178.53</b>	13.22	3.20	34.31	<b>16.91</b>	7.72	8.00	<b>7.86</b>	22.80	17.40	19.40	16.50
3	EC322024	113.00	96.00	297.20	<b>168.73</b>	12.72	5.00	20.96	<b>12.89</b>	4.54	5.00	<b>4.77</b>	17.00	14.40	15.60	17.40
4	EC359445	138.60	141.00	347.00	<b>208.87</b>	16.20	4.00	13.13	<b>11.11</b>	6.72	6.80	<b>6.76</b>	28.20	20.60	16.40	15.90
5	EC507730	172.60	122.45	349.10	<b>214.72</b>	19.72	4.00	16.94	<b>13.55</b>	6.70	7.50	<b>7.10</b>	22.60	17.00	16.10	15.80
6	EC507733	57.00	150.00	252.20	<b>153.07</b>	18.67	4.00	50.04	<b>24.24</b>	5.84	11.00	<b>8.42</b>	12.30	15.70	16.00	14.30
7	EC507734	125.00	175.00	255.20	<b>185.07</b>	16.77	3.00	14.81	<b>11.53</b>	4.62	5.00	<b>4.81</b>	18.00	16.00	15.00	16.80
8	EC507737		69.00	290.20	<b>179.60</b>			20.78	<b>20.78</b>		5.50	<b>5.50</b>			16.40	17.00
9	IC007213	157.40	113.50	326.20	<b>199.03</b>	14.52	7.00	19.80	<b>13.77</b>	5.38	8.00	<b>6.69</b>	28.60	22.60	14.80	16.30
10	IC007957	68.60	130.00	321.60	<b>173.40</b>	16.93	3.80	16.05	<b>12.26</b>	6.04	11.00	<b>8.52</b>	19.20	18.20	16.20	13.60
11	IC007958	139.00	61.67	247.20	<b>149.29</b>	12.82	3.00	24.53	<b>13.45</b>	8.20	10.00	<b>9.10</b>	20.40	16.80	15.20	15.30
12	IC007959	157.80	49.33	215.60	<b>140.91</b>	17.19	3.20	16.20	<b>12.20</b>	8.50	8.00	<b>8.25</b>	21.20	27.00	20.10	17.00
13	IC007960	123.20	97.60	329.60	<b>183.47</b>	13.73	3.00	16.83	<b>11.19</b>	6.20	7.00	<b>6.60</b>	19.00	20.20	13.10	13.50
14	IC007961	127.60	120.20	301.20	<b>183.00</b>	17.87	3.50	30.02	<b>17.13</b>	5.16	6.00	<b>5.58</b>	22.20	23.40	15.70	19.60
15	IC007962	162.50	144.80	300.00	<b>202.43</b>	15.77	4.00	16.98	<b>12.25</b>	6.08	6.00	<b>6.04</b>	31.00	21.00	13.80	12.70

S.No.	Accessions No	Days to 50% flowering				Days to 80% maturity				Inflorescence length (cm)		
		Ranichuari	Sangla	Shimla	Mean	Ranichuari	Sangla	Shimla	Mean	Ranichuari	Shimla	Mean
16	IC109249	63.00	80.00	90.00	<b>77.67</b>	132.00	125.00	153.00	<b>136.67</b>	21.60	50.00	<b>35.80</b>
17	IC341707	67.00	64.00	86.00	<b>72.33</b>	134.00	124.00	154.00	<b>137.33</b>	19.00	54.70	<b>36.85</b>
18	IC341714	65.00	79.00	87.00	<b>77.00</b>	110.00	120.00	137.00	<b>122.33</b>	16.60	67.00	<b>41.80</b>
19	IC415405	67.00	84.00	88.00	<b>79.67</b>	132.00	128.00	153.00	<b>137.67</b>	18.00	52.00	<b>35.00</b>
20	NIC15022	65.00	72.00	90.00	<b>75.67</b>	134.00	119.00	152.00	<b>135.00</b>	15.20	52.20	<b>33.70</b>
21	NIC22492	57.00	76.00	71.00	<b>68.00</b>	108.00	125.00	152.00	<b>128.33</b>	16.60	56.20	<b>36.40</b>
22	NIC22507	66.00		89.00	<b>77.50</b>	137.00		149.00	<b>143.00</b>	16.60	56.00	<b>36.30</b>
23	NIC22514	58.00	78.00	84.00	<b>73.33</b>	139.00	125.00	141.00	<b>135.00</b>	14.20	60.10	<b>37.15</b>
24	NIC22515	67.00	80.00	109.00	<b>85.33</b>	132.00	128.00	152.00	<b>137.33</b>	22.80	62.20	<b>42.50</b>
25	NIC22517	65.00	74.00	86.00	<b>75.00</b>	134.00	128.00	135.00	<b>132.33</b>	18.60	63.00	<b>40.80</b>
<b>Mean for check varieties</b>												
1	<b>EC507741 (C)</b>	65.50	75.25	66.50	<b>69.08</b>	133.50	124.00	108.00	<b>121.83</b>	15.00	44.50	<b>29.75</b>
2	<b>NIC-22503 (C)</b>	58.50	65.50	87.00	<b>70.33</b>	120.00	123.25	145.00	<b>129.42</b>	20.50	61.20	<b>40.85</b>
3	<b>PRC-9801 (C)</b>	67.50	74.00	90.00	<b>77.17</b>	133.00	124.25	151.00	<b>136.08</b>	16.50	52.15	<b>34.33</b>
	<b>Minimum</b>	<b>56.00</b>	<b>60.00</b>	<b>66.50</b>	<b>65.67</b>	<b>107.00</b>	<b>119.00</b>	<b>108.00</b>	<b>118.67</b>	<b>13.70</b>	<b>44.50</b>	<b>29.75</b>
	<b>Maximum</b>	<b>69.00</b>	<b>89.00</b>	<b>110.00</b>	<b>86.00</b>	<b>140.00</b>	<b>131.00</b>	<b>156.00</b>	<b>143.00</b>	<b>28.50</b>	<b>67.20</b>	<b>58.30</b>
	<b>Mean</b>	<b>63.50</b>	<b>73.25</b>	<b>88.88</b>	<b>75.41</b>	<b>126.20</b>	<b>124.50</b>	<b>144.29</b>	<b>132.00</b>	<b>18.85</b>	<b>57.43</b>	<b>38.85</b>
	<b>CV(%) Pheno.</b>	<b>6.56</b>	<b>11.50</b>	<b>13.66</b>	<b>7.02</b>	<b>9.42</b>	<b>2.67</b>	<b>7.52</b>	<b>4.81</b>	<b>17.41</b>	<b>9.82</b>	<b>13.54</b>

S.No.	Accessions No	Plant height (cm)				Seed yield per plant (g)				Seed Volume (g/ml)			Ranichuari		Shimla	
		Ranichuari	Sangla	Shimla	Mean	Ranichuari	Sangla	Shimla	Mean	Ranichuari	Shimla	Mean	No. of Primary branches/ plant	No. of leaves/ plant	Leaf length (cm)	Leaf width (cm)
16	IC109249	144.40	108.75	271.00	<b>174.72</b>	13.67	3.20	7.94	<b>8.27</b>	5.74	6.50	<b>6.12</b>	22.00	21.60	13.00	12.30
17	IC341707	92.00	86.00	322.60	<b>166.87</b>	14.52	3.00	18.92	<b>12.15</b>	7.04	5.50	<b>6.27</b>	21.80	15.60	15.00	16.10
18	IC341714	98.00	135.00	364.20	<b>199.07</b>	13.67	3.40	31.49	<b>16.19</b>	6.78	7.50	<b>7.14</b>	22.00	17.60	14.50	12.00
19	IC415405	86.60	95.00	321.20	<b>167.60</b>	13.67	3.00	38.58	<b>18.42</b>	5.94	10.00	<b>7.97</b>	20.80	6.00	13.00	13.30
20	NIC15022	79.00	150.00	310.20	<b>179.73</b>	15.54	1.80	25.53	<b>14.29</b>	8.30	7.00	<b>7.65</b>	23.00	17.00	14.50	13.30
21	NIC22492	92.60	107.50	224.40	<b>141.50</b>	13.22	1.40	29.70	<b>14.77</b>	7.46	12.00	<b>9.73</b>	12.40	18.40	16.00	17.80
22	NIC22507	90.40		275.60	<b>183.00</b>	16.67		29.91	<b>23.29</b>	5.52	5.00	<b>5.26</b>	24.00	16.60	15.70	15.90
23	NIC22514	80.20	120.00	321.20	<b>173.80</b>	17.77	5.50	67.13	<b>30.13</b>	5.52	7.50	<b>6.51</b>	19.40	19.60	12.30	10.80
24	NIC22515	120.40	120.00	295.00	<b>178.47</b>	19.17	2.50	20.05	<b>13.91</b>	6.42	6.00	<b>6.21</b>	29.80	17.40	10.40	9.70
25	NIC22517	139.80	91.60	350.60	<b>194.00</b>	20.12	2.80	22.65	<b>15.19</b>	8.64	6.00	<b>7.32</b>	26.60	16.20	15.30	13.10
<b>Mean for check varieties</b>																
1	<b>EC507741 (C)</b>	76.00	111.13	142.00	<b>109.71</b>	12.46	4.30	4.35	<b>7.04</b>	5.95	12.50	<b>9.23</b>	11.70	18.24	9.85	9.10
2	<b>NIC-22503 (C)</b>	112.20	107.00	304.20	<b>174.47</b>	13.32	5.20	20.78	<b>13.10</b>	6.64	6.90	<b>6.77</b>	23.40	17.80	14.65	16.40
3	<b>PRC-9801 (C)</b>	107.85	102.30	320.30	<b>176.82</b>	14.72	5.35	21.86	<b>13.98</b>	6.67	6.35	<b>6.51</b>	24.25	16.23	17.05	15.55
	<b>Minimum</b>	<b>57.00</b>	<b>49.33</b>	<b>142.00</b>	<b>109.71</b>	<b>12.46</b>	<b>1.40</b>	<b>4.35</b>	<b>7.04</b>	<b>4.54</b>	<b>5.00</b>	<b>4.77</b>	<b>11.70</b>	<b>6.00</b>	<b>9.85</b>	<b>9.10</b>
	<b>Maximum</b>	<b>172.60</b>	<b>175.00</b>	<b>364.20</b>	<b>214.72</b>	<b>20.12</b>	<b>7.00</b>	<b>67.13</b>	<b>30.13</b>	<b>8.64</b>	<b>12.50</b>	<b>9.73</b>	<b>31.00</b>	<b>27.00</b>	<b>20.10</b>	<b>19.60</b>
	<b>Mean</b>	<b>113.04</b>	<b>114.67</b>	<b>293.69</b>	<b>175.40</b>	<b>15.52</b>	<b>3.71</b>	<b>23.57</b>	<b>14.76</b>	<b>6.48</b>	<b>7.56</b>	<b>7.00</b>	<b>21.66</b>	<b>17.76</b>	<b>15.00</b>	<b>14.82</b>
	<b>CV(%) Pheno.</b>	<b>27.69</b>	<b>26.27</b>	<b>16.20</b>	<b>12.62</b>	<b>14.85</b>	<b>32.49</b>	<b>54.39</b>	<b>33.63</b>	<b>17.15</b>	<b>28.20</b>	<b>18.61</b>	<b>22.49</b>	<b>22.08</b>	<b>14.53</b>	<b>17.42</b>

**Table 11: Multilocation evaluation of germplasm lines in chenopodium at Shimla: Kharif 2015 (Hills)**

S.No.	Accession No.	Early plant vigour	Plant growth habit	Inflorescence colour	Inflorescence shape	Stem branching	Stem colour	Leaf colour	Leaf tip	Leaf shape	Seed colour
1	EC201618	2	1	1	1	1	3	1	2	2	4
2	EC201680	3	1	3	1	2	3	1	1	6	4
3	EC322024	2	1	1	2	2	1	1	2	2	4
4	EC359445	1	1	1	2	2	1	1	1	5	4
5	EC507730	3	1	2	2	1	3	1	1	6	3
6	EC507733	3	1	1	1	2	1	1	1	6	4
7	EC507734	1	1	1	2	1	99	1	2	2	4
8	EC507737	1	1	1	2	2	3	1	2	5	4
9	IC007213	3	1	1	2	2	1	1	2	2	4
10	IC007957	3	1	3	2	2	3	1	2	2	3
11	IC007958	3	1	3	1	1	3	1	1	6	4
12	IC007959	3	1	3	2	1	3	1	2	2	4
13	IC007960	3	1	1	2	1	1	1	2	2	4
14	IC007961	3	1	3	2	2	1	1	2	2	4
15	IC007962	2	1	1	2	2	3	1	2	5	4
16	IC109249	1	1	2	1	2	3	1	2	2	4
17	IC341707	2	1	1	2	2	3	1	2	5	4
18	IC341714	3	1	1	2	2	99	1	1	6	3

S.No.	Accession No.	Early plant vigour	Plant growth habit	Inflorescence colour	Inflorescence shape	Stem branching	Stem colour	Leaf colour	Leaf tip	Leaf shape	Seed colour
19	IC415405	3	1	2	1	1	3	1	2	2	3
20	NIC15022	2	1	1	2	2	3	1	2	5	4
21	NIC22492	3	1	1	1	2	1	1	1	6	3
22	NIC22507	1	1	2	1	2	3	1	2	2	4
23	NIC22514	2	1	1	1	2	3	1	2	5	4
24	NIC22515	1	1	1	2	1	99	1	2	2	4
25	NIC22517	3	1	1	2	2	1	1	2	5	4
<b>Mean for check varieties</b>											
	<b>IC415477 ( C )</b>	3	1	1	1	2	3	1	1	1	1
	<b>NIC-22503 (C)</b>	3	1	1	2	1	3	1	2	2	4
	<b>PRC9801 (C)</b>	3	1	3	2	1	3	1	2	2	4
	<b>Minimum</b>	1	1	1	1	1	1	1	1	1	1
	<b>Maximum</b>	3	1	3	2	2	99	1	2	6	4
	<b>Mode</b>	3	1	1	2	2	3	1	2	2	4

**Qualitative characters :** *Early plant vigour:* 1-Poor, 2-Good, 3-Very good; *Plant growth habit:* 1-Erect, 2-Semi-erect, 3-Angled, 99-Others; *Inflorescence colour:* 1-Yellowish green, 2-Reddish, 3-Pinkish green, 99-Others; *Inflorescence shape:* 1-Globose, 2-Slender with axillary cluster, 3-Terminal, 4-Paniced spike, 99-Others; *Flower clusters:* 3-Lax, 7-Dense, 99-Others; *Stem branching:* 1-Unbranched, 2-Moderately branched, 3-Profusedly branched, 99-Others; *Stem colour:* 1-Yellow, 2-Red, 3-Pink, 99-Others (Pinkish green); *Leaf colour:* 1-Green, 2-Red, 3-Pink, 99-Others; *Leaf tip:* 1-Obtuse, 2-Rounded, 99-Others; *Leaf shape:* 1-Triangular, 2-Hestate, 3-Deltoid, 4-Cordate, 5-Ovate, 6-Oblong, 7-Rhombic, 8-Deeply unequally toothed, 99-Others; *Seed colour:* 1-White, 2-Pink, 3-Brown, 4-Black, 99-Others; *Biotic stress susceptibility :* 1-Very low or Visible sing of susceptibility, 3-Low, 5-Intermediate, 7-High, 9-Very high

**Table 12: Promising lines in Quinoa germplasm for various characters at Sangla: Kharif 2015 (Hills)**

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
CSKHPKV, Sangla					
1	Days to flowering	60.00	84.00	IC411824	NIC-22503 (65.50)
2	Days to maturity	120.00	130.00	EC507738, EC507739-1, IC411824	NIC-22503 (123.25)
3	Plant height (cm)	45.00	187.80	EC507738, EC507740-2, IC411824, EC507748, EC507739-1, EC507749, EC507740-1, EC507740, EC507746, EC507743	EC-507741 (111.13)
4	Seed yield per plant (g)	2.00	5.35		RRC-9801(5.35)

**Table 13: Evaluation of germplasm lines in Quinoa at Sangla: Kharif 2015 (Hills)**

S. No	Accessions	Days to 50% flowering	Days to 50% maturity	Plant height (cm)	Seed yield per plant(g)
1	EC507738	70.00	120.00	187.80	3.00
2	EC507739-1	73.00	120.00	157.20	2.80
3	EC507740	83.00	130.00	136.60	2.00
4	EC507740-1	80.00	124.00	148.20	3.60
5	EC507740-2	70.00	124.00	168.20	4.00
6	EC507742	79.00	130.00	45.00	3.00
7	EC507743	84.00	124.00	126.60	2.20
8	EC507746	68.00	130.00	134.80	3.60
9	EC507747	79.00	128.00	100.00	4.00
10	EC507748	84.00	124.00	158.20	4.20
11	EC507749	72.00	126.00	150.00	2.60
12	IC411825	73.00	126.00	100.00	3.60
14	IC411824	60.00	122.00	162.80	3.60
<b>Mean for check variety</b>					
<b>1</b>	EC-507741©	75.25	124.00	111.13	4.30
<b>2</b>	NIC-22503©	65.50	123.25	107.00	5.20
<b>3</b>	RRC-9801©	74.00	124.25	102.30	5.35
	<b>Minimum</b>	<b>60.00</b>	<b>120.00</b>	<b>45.00</b>	<b>2.00</b>
	<b>Maximum</b>	<b>84.00</b>	<b>130.00</b>	<b>187.80</b>	<b>5.35</b>
	<b>Mean</b>	<b>74.36</b>	<b>124.97</b>	<b>130.99</b>	<b>3.57</b>
	<b>CV(%) Phenotypic</b>	<b>9.24</b>	<b>2.56</b>	<b>27.09</b>	<b>26.76</b>

**Table 14: Promising lines in adzuki bean germplasm for various characters at various locations: Kharif 2015 (Hills)**

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
CSKHPKV, Palampur (Accessions 25)					
1	Days to 50% Flowering	55.67	76.00	EC059489, EC080850, EC015257, EC036070, EC087896, IC108857 (<62.00)	HPU-51 (66.33)
2	Days to 80% maturity	123.67	129.67	EC340254, EC340287, IC030270 (<124.33)	Totru Local (124.33)
3	Number of Clusters per plant	10.07	15.80	EC034264, IC108854 (>15.40)	HPU-51 (15.13)
4	Number of Pods per plant	20.60	35.43	EC087896, IC030270, EC080850 (>31.40)	HPU-51 (30.40)
5	Number of Seeds per pod	7.20	9.87	EC000372, IC341944, EC340254, EC340288, EC036070, EC340286 (>9.40)	Totru Local (8.40)
6	Number of primary branches per plant	1.27	2.53	EC018257, EC034264, EC000372, EC340286 (>2.20)	Totru Local (1.80)
7	Plant height (cm)	71.67	106.67	EC015257, EC087815, EC018257, EC034264 (>97.67)	HPU-51 (90.67)
8	Seed yield per plant (g)	80.00	410.00	EC018257, EC340286, EC015257, IC341941, EC034264, EC087071, EC036070, EC087815 (>346.00)	HPU-51 (266.67)
9	100 Seed weight (g)	6.65	11.71	EC018257, EC000249, EC340288, EC000248 (>10.56)	HPU-51 (9.09)
10	Pod length (cm)	8.03	9.77	EC034264, EC008707, EC080850 (>9.53)	Totru Local (9.20)
11	Pod width(cm)	0.30	1.93	EC080850, EC015257, EC034264 (>1.23)	Totru Local (0.43)
NBPGR, RS, Shimla (Accessions 25)					
1	Days to 50% Flowering	64.00	89.00	EC087896, EC000372, EC340286 (<66.00)	HPU-51 (69.50)
2	Days to 80% Maturity	105.00	124.00	IC341944, EC087896, EC340286, IC108857 (<107.00)	HPU-51 (110.50)
3	Number of Clusters per plant	9.50	20.50		Totru Local (20.50)
4	No. of pod per plant	27.50	70.50	IC108884 (=70.50)	Totru Local (67.50)
5	Number of Seeds per pod	5.50	10.50	EC087815, IC024522, EC340287 (>8.50)	Totru Local (8.25)
6	Number of primary branches per plant	2.50	6.00	EC018257, EC034264, EC087896, EC080850, EC087071, IC024522 (>3.50)	HPU-51 (3.50)
7	Plant height (cm)	50.80	120.10	EC034264, EC059489, IC341944, EC340245 (>92.70)	Totru Local (91.50)

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
8	Seed yield per plant (g)	13.10	66.43	IC024522, EC340254, EC087815, IC108857, IC341944 (>51.25)	HPU-51 (42.69)
9	100 Seed weight (g)	4.56	16.07	EC281186, EC000248, EC087896, EC008707, EC340254 (>11.08)	HPU-51 (10.22)
10	No. of Pod/Cluster	2.40	6.00	EC340254, EC059489, EC034264, EC087071, IC108854 (>3.50)	Totru Local (3.48)
<b>Best entries over locations (Accessions 25)</b>					
1	Days to 50% Flowering	60.50	82.50	EC087896, EC080850, EC036070, EC340286, EC059489, IC108857 (<64.00)	HPU-51 (67.92)
2	Days to 80% maturity	114.67	125.00	IC341944, EC087896, EC340286 (<117.00)	HPU-51 (118.08)
3	Number of Clusters per plant	10.02	17.32		HPU-51 (17.32)
4	Number of Pods per plant	27.02	50.97	EC087896, IC108854, IC030270 (>46.72)	Totru Local (46.72)
5	Number of Seeds per pod	6.90	9.55	IC024522, EC000372, IC341944, EC340287 (>9.08)	Totru Local (8.33)
6	Number of primary branches per plant	2.38	4.27	EC018257, EC034264, EC087896, EC087071, EC080850, EC000372 (>2.62)	HPU-51 (2.62)
7	Plant height (cm)	63.87	110.55	EC034264, EC059489, EC087815, EC340245, IC030270, EC018257, EC340288 (>90.08)	Totru Local (88.58)
8	Seed yield per plant (g)	65.60	226.77	EC340286, EC018257, EC015257, EC087815 (>196.01)	HPU-51 (154.68)
9	100 Seed weight (g)	5.61	13.38	EC000248, EC281186, EC087896, EC008707, EC340254, EC000249 (>10.40)	HPU-51 (9.66)

**Table 15: Multilocation evaluation of germplasm lines in adzuki bean at different locations: Kharif 2015 (Hills)**

S.No.	Accession No.	Days to 50% Flowering			Days to 80% Maturity			Number of Clusters per plant			No. of pod per plant			Number of Seeds per pod		
		Shimla	Palampur	Mean	Shimla	Palampur	Mean	Shimla	Palampur	Mean	Shimla	Palampur	Mean	Shimla	Palampur	Mean
1	EC000248	74.00	66.33	<b>70.17</b>	113.00	128.67	<b>120.83</b>	15.50	12.53	<b>14.02</b>	55.50	25.13	<b>40.32</b>	5.50	9.13	<b>7.32</b>
2	EC000249	75.00	67.00	<b>71.00</b>	115.00	125.33	<b>120.17</b>	9.50	11.73	<b>10.62</b>	32.50	26.00	<b>29.25</b>	5.50	8.93	<b>7.22</b>
3	EC000372	65.00	66.00	<b>65.50</b>	109.00	125.67	<b>117.33</b>	10.50	11.53	<b>11.02</b>	35.50	29.47	<b>32.48</b>	8.50	9.87	<b>9.18</b>
4	EC008707	66.00	65.67	<b>65.83</b>	113.00	126.00	<b>119.50</b>	9.50	10.53	<b>10.02</b>	27.50	26.53	<b>27.02</b>	7.50	9.20	<b>8.35</b>
5	EC015257	72.00	56.67	<b>64.33</b>	120.00	126.67	<b>123.33</b>	14.50	14.80	<b>14.65</b>	35.50	28.60	<b>32.05</b>	6.50	8.53	<b>7.52</b>
6	EC018257	89.00	76.00	<b>82.50</b>	124.00	126.00	<b>125.00</b>	15.50	14.80	<b>15.15</b>	49.50	27.07	<b>38.28</b>	8.50	8.20	<b>8.35</b>
7	EC034264	74.00	63.67	<b>68.83</b>	115.00	125.67	<b>120.33</b>	14.50	15.80	<b>15.15</b>	47.50	27.13	<b>37.32</b>	7.50	7.60	<b>7.55</b>
8	EC036070	69.00	56.67	<b>62.83</b>	108.00	128.00	<b>118.00</b>	11.50	13.60	<b>12.55</b>	39.50	25.87	<b>32.68</b>	8.50	9.60	<b>9.05</b>
9	EC059489	72.00	55.67	<b>63.83</b>	113.00	128.67	<b>120.83</b>	13.50	14.60	<b>14.05</b>	51.00	28.47	<b>39.73</b>	8.50	8.67	<b>8.58</b>
10	EC080850	66.00	55.67	<b>60.83</b>	107.00	127.33	<b>117.17</b>	14.50	13.33	<b>13.92</b>	52.50	34.00	<b>43.25</b>	8.00	9.33	<b>8.67</b>
11	EC087071	73.00	63.33	<b>68.17</b>	110.00	129.67	<b>119.83</b>	16.50	11.47	<b>13.98</b>	45.50	29.33	<b>37.42</b>	7.50	9.40	<b>8.45</b>
12	EC087815	76.00	67.33	<b>71.67</b>	113.00	128.67	<b>120.83</b>	17.50	12.40	<b>14.95</b>	56.50	31.07	<b>43.78</b>	10.50	7.20	<b>8.85</b>
13	EC087896	64.00	57.00	<b>60.50</b>	106.00	125.00	<b>115.50</b>	20.50	11.53	<b>16.02</b>	66.50	35.43	<b>50.97</b>	5.50	8.30	<b>6.90</b>
14	EC281186	75.00	67.33	<b>71.17</b>	120.00	125.67	<b>122.83</b>	15.50	10.60	<b>13.05</b>	39.50	25.80	<b>32.65</b>	5.50	8.87	<b>7.18</b>
15	EC340245	81.00	66.67	<b>73.83</b>	118.00	124.67	<b>121.33</b>	16.50	14.33	<b>15.42</b>	56.50	31.07	<b>43.78</b>	6.30	8.93	<b>7.62</b>
16	EC340254	73.00	67.00	<b>70.00</b>	113.00	123.67	<b>118.33</b>	13.50	14.33	<b>13.92</b>	62.50	30.47	<b>46.48</b>	8.50	9.67	<b>9.08</b>
17	EC340286	65.00	62.33	<b>63.67</b>	106.00	125.67	<b>115.83</b>	16.50	14.60	<b>15.55</b>	53.50	31.20	<b>42.35</b>	8.50	9.47	<b>8.98</b>
18	EC340287	72.00	62.00	<b>67.00</b>	116.00	123.67	<b>119.83</b>	12.50	10.67	<b>11.58</b>	46.50	24.53	<b>35.52</b>	9.00	9.20	<b>9.10</b>
19	EC340288	71.00	66.67	<b>68.83</b>	115.00	126.67	<b>120.83</b>	15.50	10.07	<b>12.78</b>	52.50	20.60	<b>36.55</b>	8.00	9.67	<b>8.83</b>
20	IC024522	68.00	63.33	<b>65.67</b>	109.00	125.67	<b>117.33</b>	16.50	14.93	<b>15.72</b>	55.50	26.60	<b>41.05</b>	10.50	8.60	<b>9.55</b>
21	IC030270	78.00	62.33	<b>70.17</b>	120.00	123.67	<b>121.83</b>	16.50	15.40	<b>15.95</b>	61.00	34.33	<b>47.67</b>	6.50	8.13	<b>7.32</b>
22	IC108854	67.00	63.33	<b>65.17</b>	109.00	129.33	<b>119.17</b>	15.50	15.73	<b>15.62</b>	70.50	31.40	<b>50.95</b>	6.50	8.87	<b>7.68</b>

S.No.	Accession No.	Number of primary branches per plant			Plant height (cm)			Seed yield per plant (g)			100 Seed weight (g)			Shimla	Palampur	
		Palampur	Shimla	Mean	Palampur	Shimla	Mean	Palampur	Shimla	Mean	Palampur	Shimla	Mean	No. of Pod/Cluster	Pod length (cm)	Pod width (cm)
1	EC000248	2.07	3.50	<b>2.78</b>	87.33	62.50	<b>74.92</b>	276.67	48.84	<b>162.75</b>	10.76	16.00	<b>13.38</b>	3.50	9.37	0.40
2	EC000249	1.80	3.50	<b>2.65</b>	86.33	61.50	<b>73.92</b>	346.00	17.87	<b>181.94</b>	10.87	10.00	<b>10.44</b>	3.50	9.17	0.40
3	EC000372	2.40	3.50	<b>2.95</b>	78.00	75.10	<b>76.55</b>	320.00	13.10	<b>166.55</b>	8.59	6.15	<b>7.37</b>	3.50	8.97	0.33
4	EC008707	1.67	3.50	<b>2.58</b>	84.00	58.70	<b>71.35</b>	336.67	26.42	<b>181.54</b>	9.46	12.80	<b>11.13</b>	2.50	9.63	0.33
5	EC015257	1.53	3.50	<b>2.52</b>	106.67	70.10	<b>88.38</b>	386.67	20.76	<b>203.71</b>	7.54	9.13	<b>8.34</b>	2.50	8.10	1.60
6	EC018257	2.53	6.00	<b>4.27</b>	101.00	84.40	<b>92.70</b>	410.00	37.86	<b>223.93</b>	11.71	9.10	<b>10.40</b>	3.50	8.43	0.40
7	EC034264	2.53	5.50	<b>4.02</b>	101.00	120.10	<b>110.55</b>	348.33	32.09	<b>190.21</b>	9.04	9.07	<b>9.06</b>	4.00	9.77	1.60
8	EC036070	2.00	3.50	<b>2.75</b>	97.67	60.60	<b>79.13</b>	346.67	26.86	<b>186.76</b>	9.29	8.03	<b>8.66</b>	3.50	9.53	0.37
9	EC059489	1.73	3.50	<b>2.62</b>	86.67	111.40	<b>99.03</b>	236.67	26.01	<b>131.34</b>	7.87	6.08	<b>6.98</b>	4.50	9.47	0.37
10	EC080850	1.80	4.50	<b>3.15</b>	95.67	84.50	<b>90.08</b>	343.33	44.62	<b>193.98</b>	8.44	10.71	<b>9.58</b>	3.50	9.60	1.93
11	EC087071	1.93	4.50	<b>3.22</b>	88.33	84.90	<b>86.62</b>	347.67	37.53	<b>192.60</b>	9.73	11.08	<b>10.40</b>	4.00	9.47	0.50
12	EC087815	1.93	3.50	<b>2.72</b>	103.33	90.30	<b>96.82</b>	346.67	59.32	<b>202.99</b>	9.52	10.63	<b>10.07</b>	2.50	8.37	0.40
13	EC087896	1.87	5.50	<b>3.68</b>	76.93	50.80	<b>63.87</b>	80.00	51.20	<b>65.60</b>	8.22	14.31	<b>11.27</b>	3.50	8.77	0.40
14	EC281186	1.73	3.50	<b>2.62</b>	95.00	76.40	<b>85.70</b>	256.67	34.76	<b>145.71</b>	10.56	16.07	<b>13.31</b>	2.50	9.13	0.40
15	EC340245	2.13	3.50	<b>2.82</b>	94.33	95.50	<b>94.92</b>	336.67	32.03	<b>184.35</b>	7.91	9.05	<b>8.48</b>	3.50	9.07	0.43
16	EC340254	2.20	3.50	<b>2.85</b>	92.00	67.80	<b>79.90</b>	226.67	63.75	<b>145.21</b>	9.02	12.02	<b>10.52</b>	6.00	9.03	0.40
17	EC340286	2.33	2.50	<b>2.42</b>	90.67	65.80	<b>78.23</b>	403.33	50.20	<b>226.77</b>	9.46	11.00	<b>10.23</b>	3.50	8.87	0.37
18	EC340287	1.60	3.50	<b>2.55</b>	72.67	70.50	<b>71.58</b>	303.33	41.85	<b>172.59</b>	9.09	10.37	<b>9.73</b>	3.50	8.53	0.43
19	EC340288	1.80	3.50	<b>2.65</b>	94.33	86.40	<b>90.37</b>	306.67	30.15	<b>168.41</b>	10.81	7.18	<b>9.00</b>	3.50	9.53	1.23
20	IC024522	1.80	4.00	<b>2.90</b>	79.00	72.30	<b>75.65</b>	276.67	66.43	<b>171.55</b>	9.67	11.04	<b>10.36</b>	3.50	9.53	0.43
21	IC030270	1.80	3.50	<b>2.65</b>	96.00	92.70	<b>94.35</b>	210.00	31.72	<b>120.86</b>	8.25	8.14	<b>8.20</b>	3.50	8.17	0.40
22	IC108854	1.47	3.50	<b>2.48</b>	82.00	90.80	<b>86.40</b>	310.00	41.24	<b>175.62</b>	9.42	9.03	<b>9.22</b>	4.00	9.07	0.47

S.No.	Accession No.	Days to 50% Flowering			Days to 80% Maturity			Number of Clusters per plant			No. of pod per plant			Number of Seeds per pod		
		Shimla	Palampur	Mean	Shimla	Palampur	Mean	Shimla	Palampur	Mean	Shimla	Palampur	Mean	Shimla	Palampur	Mean
23	IC108857	66.00	61.67	<b>63.83</b>	106.00	128.00	<b>117.00</b>	13.50	13.13	<b>13.32</b>	57.50	26.40	<b>41.95</b>	8.50	8.67	<b>8.58</b>
24	IC341941	73.00	62.33	<b>67.67</b>	115.00	125.67	<b>120.33</b>	12.50	14.87	<b>13.68</b>	42.50	28.80	<b>35.65</b>	7.50	7.87	<b>7.68</b>
25	IC341944	66.00	62.00	<b>64.00</b>	105.00	124.33	<b>114.67</b>	15.50	11.07	<b>13.28</b>	67.00	26.47	<b>46.73</b>	8.50	9.73	<b>9.12</b>
<b>Mean for check variety</b>																
1	<b>HPU-51</b>	69.50	66.33	<b>67.92</b>	110.50	125.67	<b>118.08</b>	19.50	15.13	<b>17.32</b>	59.00	30.40	<b>44.70</b>	7.25	8.00	<b>7.63</b>
2	<b>Totru Local</b>	70.00	69.00	<b>69.50</b>	115.00	124.33	<b>119.67</b>	20.50	12.87	<b>16.68</b>	67.50	25.93	<b>46.72</b>	8.25	8.40	<b>8.33</b>
	<b>Minimum</b>	<b>64.00</b>	<b>55.67</b>	<b>60.50</b>	<b>105.00</b>	<b>123.67</b>	<b>114.67</b>	<b>9.50</b>	<b>10.07</b>	<b>10.02</b>	<b>27.50</b>	<b>20.60</b>	<b>27.02</b>	<b>5.50</b>	<b>7.20</b>	<b>6.90</b>
	<b>Maximum</b>	<b>89.00</b>	<b>76.00</b>	<b>82.50</b>	<b>124.00</b>	<b>129.67</b>	<b>125.00</b>	<b>20.50</b>	<b>15.80</b>	<b>17.32</b>	<b>70.50</b>	<b>35.43</b>	<b>50.97</b>	<b>10.50</b>	<b>9.87</b>	<b>9.55</b>
	<b>Mean</b>	<b>71.46</b>	<b>63.68</b>	<b>67.57</b>	<b>112.72</b>	<b>126.22</b>	<b>119.47</b>	<b>14.94</b>	<b>13.20</b>	<b>14.07</b>	<b>51.35</b>	<b>28.45</b>	<b>39.90</b>	<b>7.68</b>	<b>8.82</b>	<b>8.25</b>
	<b>CD (0.05)</b>	-	-	<b>0.89</b>	-	-	<b>0.72</b>	-	-	-	<b>7.16</b>	-	-	<b>0.44</b>	-	-
	<b>CV (%) Error</b>	-	-	<b>0.88</b>	-	-	<b>0.36</b>	-	-	-	<b>4.13</b>	-	-	<b>14.19</b>	-	-
	<b>CV (%) Phen.</b>	<b>7.81</b>	<b>7.27</b>	<b>6.69</b>	<b>4.45</b>	<b>1.40</b>	<b>2.03</b>	<b>19.14</b>	<b>13.77</b>	<b>13.04</b>	<b>22.18</b>	<b>11.68</b>	<b>16.17</b>	<b>17.87</b>	<b>7.89</b>	<b>9.30</b>

S.No.	Accession No.	Number of primary branches per plant			Plant height (cm)			Seed yield per plant (g)			100 Seed weight (g)			Shimla	Palampur	
		Palampur	Shimla	Mean	Palampur	Shimla	Mean	Palampur	Shimla	Mean	Palampur	Shimla	Mean	No. of Pod/Cluster	Pod length (cm)	Pod width (cm)
23	IC108857	1.27	3.50	<b>2.38</b>	74.67	68.30	<b>71.48</b>	290.00	53.76	<b>171.88</b>	9.69	11.08	<b>10.39</b>	2.40	9.47	0.43
24	IC341941	2.20	3.50	<b>2.85</b>	90.33	74.50	<b>82.42</b>	363.33	28.68	<b>196.01</b>	8.93	9.13	<b>9.03</b>	2.40	8.03	0.37
25	IC341944	1.53	3.50	<b>2.52</b>	71.67	100.30	<b>85.98</b>	336.67	51.25	<b>193.96</b>	8.80	9.07	<b>8.94</b>	3.45	9.03	0.33
<b>Mean for check variety</b>																
1	<b>HPU-51</b>	1.73	3.50	<b>2.62</b>	90.67	82.25	<b>86.46</b>	266.67	42.69	<b>154.68</b>	9.09	10.22	<b>9.66</b>	2.98	9.00	0.30
2	<b>Totru Local</b>	1.80	3.00	<b>2.40</b>	85.67	91.50	<b>88.58</b>	250.00	27.36	<b>138.68</b>	6.65	4.56	<b>5.61</b>	3.48	9.20	0.43
	<b>Minimum</b>	<b>1.27</b>	<b>2.50</b>	<b>2.38</b>	<b>71.67</b>	<b>50.80</b>	<b>63.87</b>	<b>80.00</b>	<b>13.10</b>	<b>65.60</b>	<b>6.65</b>	<b>4.56</b>	<b>5.61</b>	<b>2.40</b>	<b>8.03</b>	<b>0.30</b>
	<b>Maximum</b>	<b>2.53</b>	<b>6.00</b>	<b>4.27</b>	<b>106.67</b>	<b>120.10</b>	<b>110.55</b>	<b>410.00</b>	<b>66.43</b>	<b>226.77</b>	<b>11.71</b>	<b>16.07</b>	<b>13.38</b>	<b>6.00</b>	<b>9.77</b>	<b>1.93</b>
	<b>Mean</b>	<b>1.90</b>	<b>3.78</b>	<b>2.84</b>	<b>88.96</b>	<b>79.63</b>	<b>84.29</b>	<b>306.00</b>	<b>38.46</b>	<b>172.23</b>	<b>9.20</b>	<b>10.04</b>	<b>9.62</b>	<b>3.43</b>	<b>9.05</b>	<b>0.57</b>
	<b>CD (0.05)</b>	<b>1.36</b>	-	-	-	<b>2.43</b>	-	-	-	<b>3.16</b>	-	-	-	<b>1.71</b>	-	<b>25.90</b>
	<b>CV (%) Error</b>	<b>9.83</b>	-	-	-	<b>14.47</b>	-	-	-	<b>8.28</b>	-	-	-	<b>15.16</b>	-	<b>19.73</b>
	<b>CV (%) Phen.</b>	<b>16.87</b>	<b>20.55</b>	<b>16.56</b>	<b>10.63</b>	<b>20.61</b>	<b>12.31</b>	<b>22.52</b>	<b>36.00</b>	<b>19.41</b>	<b>12.20</b>	<b>26.91</b>	<b>17.41</b>	<b>21.81</b>	<b>5.52</b>	<b>77.82</b>

**Table 16: Characterization of germplasm lines in adzuki bean at Shimla: Kharif 2015 (Hills)**

S.No.	Accession No.	Early Plant Vigour	Plant Habit	Plant Growth Habit	Leaf Colour	Leaf Surface	Leaflet Shape	Flower Colour	Stem Colour	Stem Surface	Pod Angle	Pod Surface	Seed Coat Colour
1	EC000248	3	2	1	2	2	1	2	3	2	1	1	3
2	EC000249	2	2	1	2	2	1	2	3	2	1	1	3
3	EC000372	3	2	1	2	2	1	2	3	2	1	1	4
4	EC008707	3	2	1	2	2	1	2	3	2	1	1	4
5	EC015257	2	2	1	2	2	1	2	3	2	1	1	3
6	EC018257	3	2	1	2	2	1	2	3	2	1	1	4
7	EC034264	2	2	1	2	2	1	2	3	2	1	1	2
8	EC036070	1	2	1	2	2	1	2	3	2	1	1	4
9	EC059489	3	2	1	2	2	1	2	3	2	1	1	99
10	EC080850	2	2	1	2	2	1	2	3	2	1	1	4
11	EC087071	3	2	1	2	2	1	2	3	2	1	1	4
12	EC087815	3	2	1	2	2	1	2	3	2	1	1	2
13	EC087896	2	2	1	2	2	1	2	3	2	1	1	99
14	EC281186	2	2	1	2	2	1	2	3	2	1	1	4
15	EC340245	2	2	1	2	2	1	2	3	2	1	1	2
16	EC340254	2	2	1	2	2	1	2	3	2	1	1	4
17	EC340286	2	2	1	2	2	1	2	3	2	1	1	4
18	EC340287	2	2	1	2	2	1	2	3	2	1	1	4
19	EC340288	2	2	1	2	2	1	2	3	2	1	1	4

S.No.	Accession No.	Early Plant Vigour	Plant Habit	Plant Growth Habit	Leaf Colour	Leaf Surface	Leaflet Shape	Flower Colour	Stem Colour	Stem Surface	Pod Angle	Pod Surface	Seed Coat Colour
20	IC024522	2	2	1	2	2	1	2	3	2	1	1	4
21	IC030270	2	2	1	2	2	1	2	3	2	1	1	99
22	IC108854	2	2	1	2	2	1	2	3	2	1	1	4
23	IC108857	3	2	1	2	2	1	2	3	2	1	1	4
24	IC341941	3	2	1	2	2	1	2	3	2	1	1	3
25	IC341944	3	2	1	2	2	1	2	3	2	1	1	4
<b>Mean for check variety</b>													
1	<b>HPU-51 (C)</b>	3	2	1	2	2	1	2	3	2	1	1	4
2	<b>Totru local (C)</b>	2	2	1	2	2	1	2	3	2	1	1	99
	<b>Minmum</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>
	<b>Maximum</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>99</b>
	<b>Mode</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>4</b>

**Qualitative Descriptors:** **Early plant vigour:** 1-poor, 2-good, 3-very good; **Plant habit:** 1-determinate, 2-indeterminate, 99-others; **Plant growth habit:** 1-erect, 2-spreading, 99-others; **Leaf colour:** 1-yellowish green, 2-green, 3-dark green, 99-others; **Leaf surface:** 1-glabrous, 2-pubescent, 99-others; **Leaflet shape:** 1-entire, 2-lobed, 99-others; **Flower colour:** 1-light yellow, 2-yellow, 3-orange, 99-others; **Stem colour:** 1-light yellow, 2-purple, 3-green, 99-others; **Stem surface:** 1-glabrous, 2-pubescent, 99-others; **Pod angle:** 1-erect, 2-pendent, 99-others; **Pod surface:** 1-glabrous, 2-pubescent, 99-others; **Seed coat colour:** 1-green, 2-brown, 3-maroon, 4-red, 99-others.

**Table 17: Promising lines in job's tear (coix) germplasm for various characters at Ranichuari: Kharif 2015 (Hills)**

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
UUHF, Ranichauri (Accessions 25)					
1	Days to 50% flowering	105.00	110.00	IC022280, IC374506, IC416831, IC416884, IC416971 (<107.00)	Mayeun (108.00)
2	Days to 50% maturity	195.00	201.00	IC029280, IC374506, IC416831, IC416971, IC416884 (<197.00)	Pollin (198.33)
3	Plant height (cm)	89.20	302.20	IC089389, IC089390, IC540267, IC089393 (>255.20)	Pollin (204.00)
4	No. of productive tillers/plant	1.60	4.40	IC089393, IC029280, IC077150, IC089390 (>3.60)	Mayeur (2.73)
5	Seed yield per plant(g)	16.67	50.33	IC029280, IC089390, IC089389, IC540267, IC089393 (>41.33)	Mayeur (25.55)

**Table 18: Evaluation of germplasm lines in job's tear (coix) at Ranichauri: Kharif 2015 (Hills)**

S. No	Accesssions	Days to 50% flowering	Days to 50% maturity	Plant height (cm)	No. of productive tillers/plant	Seed yield per plant(g)
1	IC001274	109.00	200.00	117.00	1.80	25.22
2	IC022280	105.00	195.00	249.00	4.00	50.33
3	IC036667	107.00	197.00	118.00	2.40	16.67
4	IC077150	107.00	197.00	248.50	3.80	41.33
5	IC089389	110.00	201.00	302.20	3.60	50.10
6	IC089390	108.00	197.00	293.60	3.80	50.12
7	IC089393	109.00	200.00	261.60	4.40	41.67
8	IC203034	110.00	201.00	99.60	3.00	24.21
9	IC203983	110.00	201.00	100.60	2.40	30.10
10	IC334314	107.00	197.00	139.40	2.20	32.10
11	IC360791	109.00	200.00	119.00	2.00	29.12
12	IC374506	105.00	195.00	89.20	2.40	26.22
13	IC416727	107.00	197.00	124.00	3.60	36.12
14	IC416824	108.00	198.00	219.00	2.40	23.17
15	IC416831	105.00	195.00	180.40	3.40	20.15
16	IC416868	107.00	197.00	167.60	2.00	22.12
17	IC416884	105.00	196.00	129.40	3.40	28.12
18	IC416971	105.00	195.00	107.00	2.00	26.20
19	IC417053	109.00	200.00	124.60	3.40	33.18
20	IC419448	109.00	200.00	214.80	2.20	20.33

S. No	Accessions	Days to 50% flowering	Days to 50% maturity	Plant height (cm)	No. of productive tillers/plant	Seed yield per plant(g)
21	IC419466	108.00	198.00	184.60	2.80	33.16
22	IC521340	110.00	200.00	192.00	2.00	21.16
23	IC524631	109.00	200.00	165.00	3.60	39.67
24	IC540236	107.00	197.00	255.20	1.60	33.33
25	IC540267	107.00	197.00	277.00	3.00	46.16
<b>Mean for check variety</b>						
<b>1</b>	<b>Mayeun (C)</b>	108.00	198.67	157.60	2.73	25.55
<b>2</b>	<b>Pollin (C)</b>	108.00	198.33	204.00	2.67	24.31
	<b>Minimum</b>	<b>105.00</b>	<b>195.00</b>	<b>89.20</b>	<b>1.60</b>	<b>16.67</b>
	<b>Maximum</b>	<b>110.00</b>	<b>201.00</b>	<b>302.20</b>	<b>4.40</b>	<b>50.33</b>
	<b>Mean</b>	<b>107.70</b>	<b>198.07</b>	<b>179.26</b>	<b>2.84</b>	<b>31.48</b>
	<b>CV(%) Phenotypic</b>	<b>1.54</b>	<b>1.01</b>	<b>36.56</b>	<b>27.15</b>	<b>31.47</b>

**Table 19: Promising lines in Perilla germplasm for various characters at Ranichuari: Kharif 2015(Hills)**

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
UUHF, Ranichauri (Accessions 25)					
1	Days to 50% flowering	107.00	116.00	IC374593, IC526701, IC52660 (<109.33)	Jyantia-(109.33)
2	Days to maturity	117.00	174.00	IC521284 (<160.00)	Jyantia-(163.67)
3	Plant height (cm)	36.40	116.20	IC526701, IC006447, IC003942 (>97.80)	Shilong-(69.53)
4	100 seeds weight (g)	0.18	0.24		Shilong-(0.24)
5	Inflorescence length (cm)	3.00	8.40	IC526701, IC003942 (>6.60)	Shilong-(6.33)
6	No. of primary Branches/plant	2.60	16.20	IC006447, IC211608, IC526701, IC52660(>11.60)	Shilong-(9.13)
7	No of leaves/plant	5.40	43.80	IC006447, IC211608, IC526701, IC571286, IC374494 (>20.00)	Jyantia-(10.67)
8	Seed yield per plant (g)	2.46	4.63	IC526701 (>4.59)	Jyantia-(4.40)

**Table 20: Evaluation of germplasm lines in Perilla at Ranichauri: Kharif 2015 (Hills)**

S.No.	Accession No.	Days to 50% flowering	Days to maturity	Plant height (cm)	100 seeds weight (g)	Inflorescence length (cm)	No. of primary Branches/plant	No of leaves/plant	Seed yield per plant (g)
1	IC003942	112.00	167.00	101.40	0.18	7.20	9.20	12.40	3.32
2	IC003955	116.00	173.00	44.60	0.23	3.40	5.40	6.00	2.63
3	IC006447	116.00	173.00	110.00	0.24	6.20	16.20	43.80	3.35
4	IC010240	113.00	169.00	66.60	0.24	5.80	9.60	11.00	2.52
5	IC033413								
6	IC033508	114.00	170.00	77.00	0.21	5.80	10.80	18.60	2.80
7	IC052660	109.00	163.00	61.60	0.23	5.80	12.60	17.00	4.32
8	IC204185	113.00	170.00	46.20	0.23	3.80	7.40	11.00	3.67
9	IC211608	115.00	171.00	96.40	0.21	4.80	14.40	39.00	3.16
10	IC216268								
11	IC334813	110.00	164.00	97.80	0.24	5.40	11.60	15.40	4.59
12	IC369449	115.00	171.00	36.40	0.21	3.00	2.60	5.40	3.22
13	IC374494	114.00	170.00	85.20	0.19	6.60	8.00	22.00	3.63
14	IC374593	110.00	165.00	65.00	0.24	6.20	11.20	8.00	3.28
15	IC374609	116.00	174.00	84.00	0.23	6.40	11.20	13.40	2.46
16	IC409475	107.00	160.00	72.60	0.21	6.00	9.40	8.80	3.44
17	IC416861	116.00	174.00	68.40	0.22	6.00	10.00	8.40	3.52
18	IC419477	116.00	173.00	75.20	0.22	6.40	9.20	20.00	2.95
19	IC419706	112.00	167.00	86.60	0.23	4.80	7.70	12.40	3.73
20	IC459598	110.00	164.00	97.00	0.19	6.20	8.00	11.80	3.55
21	IC521284	114.00	117.00	48.60	0.24	5.20	6.40	7.80	3.32
22	IC521286	112.00	167.00	78.60	0.21	5.80	7.40	25.40	3.49
23	IC521291	113.00	169.00	88.40	0.23	6.00	12.80	37.40	4.63
24	IC521292	114.00	171.00	60.60	0.23	6.60	10.40	13.80	3.32
25	IC526701	108.00	162.00	116.20	0.21	8.40	11.40	12.60	2.46
<b>Mean for check varieties</b>									
	<b>Jaintia (C)</b>	109.33	163.67	61.50	0.22	4.67	8.60	10.67	4.40
	<b>Shillong (C)</b>	111.67	167.00	69.53	0.24	6.33	9.13	9.00	4.37
	<b>Minimum</b>	<b>107.00</b>	<b>117.00</b>	<b>36.40</b>	<b>0.18</b>	<b>3.00</b>	<b>2.60</b>	<b>5.40</b>	<b>2.46</b>
	<b>Maximum</b>	<b>116.00</b>	<b>174.00</b>	<b>116.20</b>	<b>0.24</b>	<b>8.40</b>	<b>16.20</b>	<b>43.80</b>	<b>4.63</b>
	<b>Mean</b>	<b>112.64</b>	<b>166.19</b>	<b>75.82</b>	<b>0.22</b>	<b>5.71</b>	<b>9.63</b>	<b>16.04</b>	<b>3.45</b>
	<b>CV(%) Phenotypic</b>	<b>2.40</b>	<b>6.61</b>	<b>27.38</b>	<b>7.77</b>	<b>20.47</b>	<b>29.79</b>	<b>64.32</b>	<b>18.53</b>

### 2.3.2 Plains

A total of (220) germplasm accessions comprising grain amaranth (90), winged bean (45), kankoda (59), pillipesara (26) were evaluated during Kharif 2014. The germplasm evaluation experiments were conducted in augmented design with standard check cultivars.

#### 2.3.2.1 Grain Amaranth (*Amaranthus* spp.)

Germplasm screening nursery consisting of 100 lines was planned to be evaluated at two locations namely, UAS, Bengaluru and TNAU, Mettupalayam. The results were received from both the centres. The list of promising accessions for all characters has been presented in Table 21 and statistical parameters for all the characters of different locations have been presented in Table 22.

A set of 90 accessions along with three checks were evaluated for four quantitative and nine qualitative characters (Table 23) at UAS, Bengaluru. Accession IC095371 (48.40 g/plant) was observed highest yielder. The maximum plant height (201.33 cm) was observed in the genotype IC095371. Accession SKGPA-062 (37.00 days) was earliest in flowering and SKGPA-082 in maturity (73.00 days).

A total of 90 accessions with four checks were also evaluated at TNAU, Mettupalayam for six quantitative characters. Accession SKGPA-079 (39.00 days) was earliest in flowering while SKGPA-62 was earliest in maturity (52.00 days). The entry SKGPA-086 (204.00 cm) had the highest plant height. The highest grain yield per plant was observed in SKGPA-74 (16.40 g).

The performance of entries based on adjusted value and average over the locations has been summarized in the following paragraphs:

Significant differences were observed among the accessions for seed yield per plant at two centres. Seed yield per plant (g) was low at Mettupalayam (9.66 g) and high at Bengaluru (12.64 g). The genotype IC095371 (28.80 g) was the highest seed yielder followed by genotype IC035642 (20.15 g).

Plant height was the highest at Mettupalayam (160.98 cm) and lowest at Bengaluru (149.56 cm) on the basis of average over the two locations. The genotype SKGPA-092 had the highest plant height (182.83 cm).

The mean flowering time was the almost same (47.31 days) at Bengaluru (49.01 days) at Mettupalayam. The germplasm line SKGPA-079 showed consistency for early flowering over the locations and ranked first (39.50 days) based on the mean values.

Maturity period was the less at Bengaluru (87.95 days) followed by Mettupalayam (92.31 days). The entry SKGPA-079 (80.50 days) was the earliest maturing line based on two locations.

### **2.3.2.2 Winged bean (*Psophocarpus tetragonlogus*)**

Germplasm screening nursery was evaluated at two locations at IGKV, Ambikapur and BAU, Ranchi. List of promising genotypes of the centres has been presented in Table 24.

At IGKV, Ambikapur, a set of 6 accessions was evaluated for 6 quantitative and statistical parameters for all the characters have been presented in Table 25. The genotype EC178337 was observed superior for flowering (72.00 days). Maximum pod length (17.20 cm) was observed in the genotype EC38955, while the genotype EC178292 (35.81 g) had the highest seed weight.

A set of 39 genotype along with two check were evaluated at BAU, Ranchi for thirteen characters and statistical parameters for all the characters have been presented in Table 26. Early flowering (58.00 days) was observed in genotype Ambika-13 while EC178295 was early maturing (146.00 days). The maximum plant height (248.70 cm) was recorded in the genotype EC038821-2 while entry RWB-15 (58.70 g) was superior to check variety for seed yield per plant (g).

### **2.3.2.3 Kankoda**

At MPKV, Rahuri, a set of 30 genotypes without check were evaluated for seven characters. The promising genotypes and statistical parameters for all the

characters have been presented in Tables 27 and 28, respectively. The earliness in first picking was observed in the genotype RKG-09-30 (65.00 days). The genotype RKG-09-33 had the highest fruit weight (23.00 g).

At IGKV, Ambikapur, a set of 29 genotypes without check were evaluated for 9 characters. The promising genotypes and statistical parameters for all the characters have been presented in Tables 27 and 29, respectively. The earliness in first picking was observed in the genotype PK-28 (26.00 days). The genotype PRATAPPURPKA-49 had the highest fruit weight (133.00 q/ha).

#### **2.3.2.5 Pillipesara (*Vigna trilobata*)**

Germplasm screening nursery was evaluated at two locations at OUA&T, Bhubaneswar and FCRI Mettupalayam. List of promising genotypes of the centres has been presented in Table 30.

At OUA&T, Bhubaneswar, a set of 26 accessions was evaluated for 12 quantitative and statistical parameters for all the characters have been presented in Table 31. The genotype IC553517 was observed superior for flowering (28.00 days). Maximum pod length (5.80 cm) was observed in the genotype IC550532, while the genotype IC553505 (1.32 g) had the highest seed weight.

A set of 26 genotype along with two check were evaluated at TNAU, Mettupalayam for 8 characters and statistical parameters for all the characters have been presented in Table 31. Early flowering (42.00 days) was observed in genotype IC261321 while IC524667 was early maturing (67.00 days). The maximum plant height (82.00 cm) was recorded in the genotype IC261321 while entry IC550532 (4.47 q/ha) was superior.

**Table 21: Promising lines in grain amaranth germplasm for various characters at different locations: Kharif 2015 (Plains)**

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
UAS, Bengaluru (Accession 90)					
1	Days to 50 % flowering	37.00	52.00	SKGPA-062, IC035404, IC035642, SKGPA-061, SKGPA-065, SKGPA-089 (<40.00)	BGA 2 (47.17)
2	Days to 80% maturity	73.00	98.00	SKGPA-082SKGPA-102SKGPA-079, SKGPA-083, IC035635, SKGPA-072, SKGPA-081 (<80.00)	BGA 2 (84.00)
3	Plant height (cm)	98.33	201.33	IC095371, IC120621SKGPA-092, IC120668, IC035719, IC095430, IC035735 (>182.33)	BGA 2 (155.89)
4	Seed yield per plant(g)	2.60	48.40	IC095371, IC035642, IC120621, SKGPA-066 (>22.80)	BGA 2 (19.93)
TNAU, Mettupalayam (Accession 90)					
1	Days to 50 % flowering	39.00	58.00	SKGPA-079SKGPA-082SKGPA-093, SKGPA-094, SKGPA-095-0, SKGPA-100, SKGPA-102 (<42.00)	GA 2 (49.00)
2	Days to 80% maturity	82.00	97.00	SKGPA-062, IC035404, IC035642, SKGPA-061, SKGPA-065, SKGPA-089 (<85.00)	BGA 2 (92.17)
3	Plant height (cm)	105.00	204.00	SKGPA-086SKGPA-071SKGPA-077, SKGPA-087 (>197.00)	Suvarna (180.00)
4	Seed yield per plant(g)	5.30	16.40	SKGPA-074SKGPA-071, IC035642 (>14.30)	Suvarna (12.40)
5	Ear head height (cm)	36.00	73.00	SKGPA-075SKGPA-086, IC035661, SKGPA-085 (>68.00)	Suvarna (52.00)
6	100 seed weight (g)	1.40	7.60		Suvarna (7.60)
Best entries over locations (Accession 90)					
1	Days to 50 % flowering	39.50	54.50	SKGPA-079SKGPA-089 (<44.00)	GA 2 (48.67)
2	Days to 80% maturity	80.50	96.50	SKGPA-079SKGPA-102, IC035642 (<84.00)	BGA 2 (88.08)
3	Plant height (cm)	121.84	182.83	SKGPA-092, IC035651, IC032186, SKGPA-091, IC035642 (>175.67)	Suvarna (166.44)
4	Seed yield per plant(g)	4.90	28.80	IC095371, IC035642 (>17.75)	BGA 2 (15.17)

**Table 22: Multilocation evaluation of germplasm lines in grain amaranth at different locations: Kharif 2015(Plains)**

S.No	Accession No.	Days to 50 % flowering			Days to 80% maturity			Plant height (cm)			Seed yield per plant(g)			Mettupalayam	
		Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Ear head height (cm)	100 seed weight (g)
1	IC021803-A	51.00	57.00	<b>54.00</b>	93.00	96.00	<b>94.50</b>	151.67	141.00	<b>146.33</b>	14.40	7.50	<b>10.95</b>	62.00	7.20
2	IC021938	51.00	51.00	<b>51.00</b>	82.00	96.00	<b>89.00</b>	156.33	152.00	<b>154.17</b>	15.40	7.60	<b>11.50</b>	61.00	7.00
3	IC032186	47.00	50.00	<b>48.50</b>	83.00	92.00	<b>87.50</b>	170.00	188.00	<b>179.00</b>	13.00	14.20	<b>13.60</b>	50.00	6.90
4	IC032190	50.00	49.00	<b>49.50</b>	84.00	95.00	<b>89.50</b>	143.33	191.00	<b>167.17</b>	13.00	7.50	<b>10.25</b>	48.00	7.10
5	IC032193	47.00	56.00	<b>51.50</b>	89.00	92.00	<b>90.50</b>	133.33	178.00	<b>155.67</b>	15.20	11.60	<b>13.40</b>	54.00	7.20
6	IC032195	49.00	52.00	<b>50.50</b>	85.00	94.00	<b>89.50</b>	154.67	151.00	<b>152.83</b>	21.40	13.20	<b>17.30</b>	67.00	6.90
7	IC035404	39.00	50.00	<b>44.50</b>	88.00	84.00	<b>86.00</b>	150.00	162.00	<b>156.00</b>	12.00	9.40	<b>10.70</b>	68.00	6.90
8	IC035415	47.00	53.00	<b>50.00</b>	91.00	92.00	<b>91.50</b>	133.33	150.00	<b>141.67</b>	14.00	8.20	<b>11.10</b>	38.00	7.00
9	IC035615	51.00	52.00	<b>51.50</b>	95.00	96.00	<b>95.50</b>	121.33	175.00	<b>148.17</b>	13.60	6.50	<b>10.05</b>	36.00	6.90
10	IC035633	51.00	46.00	<b>48.50</b>	96.00	96.00	<b>96.00</b>	122.60	180.00	<b>151.30</b>	8.80	6.30	<b>7.55</b>	48.00	7.20
11	IC035635	47.00	48.00	<b>47.50</b>	78.00	92.00	<b>85.00</b>	179.33	149.00	<b>164.17</b>	7.20	11.20	<b>9.20</b>	49.00	7.10
12	IC035638	50.00	49.00	<b>49.50</b>	88.00	95.00	<b>91.50</b>	146.00	135.00	<b>140.50</b>	13.20	9.40	<b>11.30</b>	54.00	7.00
13	IC035642	39.00	51.00	<b>45.00</b>	83.00	84.00	<b>83.50</b>	182.33	171.00	<b>176.67</b>	25.20	15.10	<b>20.15</b>	47.00	7.20
14	IC035651	41.00	48.00	<b>44.50</b>	85.00	86.00	<b>85.50</b>	170.33	192.00	<b>181.17</b>	12.20	12.30	<b>12.25</b>	61.00	7.00
15	IC035661	50.00	49.00	<b>49.50</b>	91.00	95.00	<b>93.00</b>	181.33	170.00	<b>175.67</b>	8.60	10.10	<b>9.35</b>	70.00	7.10
16	IC035665	49.00	51.00	<b>50.00</b>	89.00	94.00	<b>91.50</b>	132.67	141.00	<b>136.83</b>	19.00	7.60	<b>13.30</b>	47.00	7.00
17	IC035701	50.00	48.00	<b>49.00</b>	85.00	95.00	<b>90.00</b>	158.00	165.00	<b>161.50</b>	17.60	7.20	<b>12.40</b>	66.00	7.30
18	IC035702	47.00	49.00	<b>48.00</b>	90.00	92.00	<b>91.00</b>	168.33	170.00	<b>169.17</b>	22.80	7.40	<b>15.10</b>	44.00	7.10
19	IC035711	50.00	50.00	<b>50.00</b>	98.00	95.00	<b>96.50</b>	157.67	151.00	<b>154.33</b>	11.40	5.30	<b>8.35</b>	42.00	7.20

S.No	Accession No.	Days to 50 % flowering			Days to 80% maturity			Plant height (cm)			Seed yield per plant(g)			Mettupalayam	
		Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Ear head height (cm)	100 seed weight (g)
20	IC035713	50.00	49.00	<b>49.50</b>	92.00	95.00	<b>93.50</b>	98.33	157.00	<b>127.67</b>	12.40	6.80	<b>9.60</b>	68.00	7.10
21	IC035716	47.00	51.00	<b>49.00</b>	85.00	92.00	<b>88.50</b>	174.33	111.00	<b>142.67</b>	6.60	6.60	<b>6.60</b>	51.00	7.30
22	IC035717	47.00	50.00	<b>48.50</b>	89.00	92.00	<b>90.50</b>	182.33	158.00	<b>170.17</b>	4.00	8.30	<b>6.15</b>	46.00	7.20
23	IC035719	50.00	51.00	<b>50.50</b>	86.00	95.00	<b>90.50</b>	188.67	161.00	<b>174.83</b>	22.40	6.70	<b>14.55</b>	50.00	7.10
24	IC035735	46.00	44.00	<b>45.00</b>	91.00	91.00	<b>91.00</b>	183.00	123.00	<b>153.00</b>	13.40	6.50	<b>9.95</b>	46.00	7.00
25	IC035742	47.00	57.00	<b>52.00</b>	97.00	92.00	<b>94.50</b>	160.00	135.00	<b>147.50</b>	10.00	7.30	<b>8.65</b>	37.00	7.10
26	IC081698-B	49.00	53.00	<b>51.00</b>	94.00	94.00	<b>94.00</b>	171.00	158.00	<b>164.50</b>	14.00	7.20	<b>10.60</b>	46.00	7.10
27	IC094654	48.00	51.00	<b>49.50</b>	91.00	93.00	<b>92.00</b>	166.00	156.00	<b>161.00</b>	8.00	8.10	<b>8.05</b>	45.00	7.20
28	IC094661	51.00	52.00	<b>51.50</b>	93.00	96.00	<b>94.50</b>	117.00	128.00	<b>122.50</b>	9.80	7.20	<b>8.50</b>	40.00	7.10
29	IC095204	51.00	44.00	<b>47.50</b>	88.00	96.00	<b>92.00</b>	164.33	123.00	<b>143.67</b>	22.00	8.10	<b>15.05</b>	37.00	7.30
30	IC095244	49.00	45.00	<b>47.00</b>	92.00	94.00	<b>93.00</b>	168.33	131.00	<b>149.67</b>	8.40	7.20	<b>7.80</b>	40.00	6.90
31	IC095248	44.00	51.00	<b>47.50</b>	91.00	89.00	<b>90.00</b>	171.00	133.00	<b>152.00</b>	11.60	8.50	<b>10.05</b>	43.00	6.80
32	IC095251	42.00	50.00	<b>46.00</b>	93.00	87.00	<b>90.00</b>	149.33	105.00	<b>127.17</b>	13.20	9.20	<b>11.20</b>	40.00	7.10
33	IC095371	51.00	51.00	<b>51.00</b>	95.00	96.00	<b>95.50</b>	201.33	124.00	<b>162.67</b>	48.40	9.20	<b>28.80</b>	48.00	7.20
34	IC095383	48.00	51.00	<b>49.50</b>	81.00	93.00	<b>87.00</b>	171.33	143.00	<b>157.17</b>	17.20	6.30	<b>11.75</b>	46.00	7.00
35	IC095389	50.00	51.00	<b>50.50</b>	85.00	95.00	<b>90.00</b>	171.67	160.00	<b>165.83</b>	15.20	9.10	<b>12.15</b>	43.00	7.10
36	IC095391	51.00	49.00	<b>50.00</b>	90.00	96.00	<b>93.00</b>	170.00	159.00	<b>164.50</b>	10.40	9.50	<b>9.95</b>	40.00	7.20
37	IC095406	49.00	45.00	<b>47.00</b>	86.00	94.00	<b>90.00</b>	174.33	154.00	<b>164.17</b>	12.60	7.50	<b>10.05</b>	39.00	7.10
38	IC095430	50.00	44.00	<b>47.00</b>	92.00	95.00	<b>93.50</b>	185.67	158.00	<b>171.83</b>	20.60	7.40	<b>14.00</b>	48.00	7.10
39	IC095498	48.00	52.00	<b>50.00</b>	91.00	93.00	<b>92.00</b>	167.33	144.00	<b>155.67</b>	9.60	7.30	<b>8.45</b>	42.00	7.20
40	IC095510	46.00	48.00	<b>47.00</b>	92.00	91.00	<b>91.50</b>	178.33	131.00	<b>154.67</b>	10.20	6.10	<b>8.15</b>	40.00	7.30
41	IC095516	46.00	44.00	<b>45.00</b>	89.00	91.00	<b>90.00</b>	171.67	156.00	<b>163.83</b>	2.60	7.20	<b>4.90</b>	39.00	6.90

S.No	Accession No.	Days to 50 % flowering			Days to 80% maturity			Plant height (cm)			Seed yield per plant(g)			Mettupalayam	
		Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Ear head height (cm)	100 seed weight (g)
42	IC095556	49.00	46.00	<b>47.50</b>	91.00	94.00	<b>92.50</b>	176.00	145.00	<b>160.50</b>	10.40	6.80	<b>8.60</b>	38.00	7.00
43	IC120621	45.00	48.00	<b>46.50</b>	92.00	90.00	<b>91.00</b>	192.33	158.00	<b>175.17</b>	24.00	8.10	<b>16.05</b>	58.00	7.10
44	IC120649	47.00	49.00	<b>48.00</b>	84.00	92.00	<b>88.00</b>	173.67	155.00	<b>164.33</b>	19.00	8.20	<b>13.60</b>	44.00	6.90
45	IC120668	50.00	51.00	<b>50.50</b>	92.00	95.00	<b>93.50</b>	190.33	140.00	<b>165.17</b>	13.60	8.50	<b>11.05</b>	46.00	7.00
46	IC120670	46.00	47.00	<b>46.50</b>	91.00	91.00	<b>91.00</b>	174.33	154.00	<b>164.17</b>	11.34	6.40	<b>8.87</b>	52.00	7.10
47	IC120689	49.00	50.00	<b>49.50</b>	90.00	94.00	<b>92.00</b>	158.00	160.00	<b>159.00</b>	8.20	6.30	<b>7.25</b>	49.00	7.20
48	SKGPA-061	39.00	56.00	<b>47.50</b>	90.00	84.00	<b>87.00</b>	135.00	145.00	<b>140.00</b>	5.40	9.50	<b>7.45</b>	41.00	7.40
49	SKGPA-062	37.00	54.00	<b>45.50</b>	92.00	82.00	<b>87.00</b>	102.67	141.00	<b>121.84</b>	10.40	12.30	<b>11.35</b>	37.00	7.30
50	SKGPA-063	49.00	48.00	<b>48.50</b>	91.00	94.00	<b>92.50</b>	102.00	165.00	<b>133.50</b>	9.20	12.60	<b>10.90</b>	47.00	7.20
51	SKGPA-065	39.00	54.00	<b>46.50</b>	89.00	84.00	<b>86.50</b>	115.33	181.00	<b>148.17</b>	6.60	14.30	<b>10.45</b>	61.00	7.20
52	SKGPA-066	50.00	50.00	<b>50.00</b>	90.00	95.00	<b>92.50</b>	135.55	179.00	<b>157.28</b>	23.40	12.10	<b>17.75</b>	63.00	7.10
53	SKGPA-067	47.00	53.00	<b>50.00</b>	89.00	92.00	<b>90.50</b>	137.00	154.00	<b>145.50</b>	7.60	8.90	<b>8.25</b>	59.00	6.90
54	SKGPA-068	49.00	54.00	<b>51.50</b>	88.00	94.00	<b>91.00</b>	137.00	181.00	<b>159.00</b>	14.00	11.40	<b>12.70</b>	60.00	7.10
55	SKGPA-070	44.00	52.00	<b>48.00</b>	87.00	89.00	<b>88.00</b>	135.67	165.00	<b>150.34</b>	10.60	9.50	<b>10.05</b>	59.00	7.30
56	SKGPA-071	46.00	52.00	<b>49.00</b>	81.00	91.00	<b>86.00</b>	121.00	201.00	<b>161.00</b>	9.80	15.20	<b>12.50</b>	57.00	7.20
57	SKGPA-072	44.00	51.00	<b>47.50</b>	79.00	89.00	<b>84.00</b>	124.67	159.00	<b>141.84</b>	4.40	9.40	<b>6.90</b>	61.00	7.30
58	SKGPA-073	42.00	52.00	<b>47.00</b>	84.00	87.00	<b>85.50</b>	121.63	197.00	<b>159.32</b>	5.00	12.10	<b>8.55</b>	63.00	7.20
59	SKGPA-074	41.00	50.00	<b>45.50</b>	87.00	86.00	<b>86.50</b>	122.67	193.00	<b>157.84</b>	13.00	16.40	<b>14.70</b>	55.00	7.40
60	SKGPA-075	46.00	49.00	<b>47.50</b>	81.00	91.00	<b>86.00</b>	121.67	190.00	<b>155.84</b>	13.20	7.30	<b>10.25</b>	73.00	7.20
61	SKGPA-076	44.00	49.00	<b>46.50</b>	94.00	89.00	<b>91.50</b>	116.67	165.00	<b>140.84</b>	8.60	11.20	<b>9.90</b>	59.00	7.10
62	SKGPA-077	44.00	51.00	<b>47.50</b>	83.00	89.00	<b>86.00</b>	128.52	201.00	<b>164.76</b>	15.20	12.10	<b>13.65</b>	62.00	7.30
63	SKGPA-078	42.00	50.00	<b>46.00</b>	84.00	87.00	<b>85.50</b>	101.67	159.00	<b>130.34</b>	10.40	10.30	<b>10.35</b>	63.00	7.40

S.No	Accession No.	Days to 50 % flowering			Days to 80% maturity			Plant height (cm)			Seed yield per plant(g)			Mettupalayam	
		Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Ear head height (cm)	100 seed weight (g)
64	SKGPA-079	40.00	39.00	<b>39.50</b>	76.00	85.00	<b>80.50</b>	105.00	197.00	<b>151.00</b>	13.20	8.60	<b>10.90</b>	64.00	7.30
65	SKGPA-080	51.00	52.00	<b>51.50</b>	87.00	96.00	<b>91.50</b>	102.00	193.00	<b>147.50</b>	10.80	14.00	<b>12.40</b>	49.00	7.10
66	SKGPA-081	51.00	46.00	<b>48.50</b>	79.00	96.00	<b>87.50</b>	128.00	190.00	<b>159.00</b>	11.60	9.10	<b>10.35</b>	46.00	7.50
67	SKGPA-082	51.00	40.00	<b>45.50</b>	73.00	96.00	<b>84.50</b>	119.67	165.00	<b>142.34</b>	9.00	11.00	<b>10.00</b>	62.00	7.10
68	SKGPA-083	47.00	51.00	<b>49.00</b>	76.00	92.00	<b>84.00</b>	105.53	191.00	<b>148.27</b>	8.60	9.40	<b>9.00</b>	61.00	6.90
69	SKGPA-085	52.00	52.00	<b>52.00</b>	80.00	97.00	<b>88.50</b>	119.33	174.00	<b>146.67</b>	6.80	7.40	<b>7.10</b>	70.00	7.10
70	SKGPA-086	52.00	49.00	<b>50.50</b>	81.00	97.00	<b>89.00</b>	136.00	204.00	<b>170.00</b>	9.40	6.50	<b>7.95</b>	71.00	6.80
71	SKGPA-087	49.00	52.00	<b>50.50</b>	89.00	94.00	<b>91.50</b>	128.67	201.00	<b>164.83</b>	9.00	9.40	<b>9.20</b>	62.00	6.90
72	SKGPA-088	49.00	54.00	<b>51.50</b>	86.00	94.00	<b>90.00</b>	158.67	160.00	<b>159.33</b>	14.20	8.20	<b>11.20</b>	61.00	7.20
73	SKGPA-089	39.00	46.00	<b>42.50</b>	88.00	84.00	<b>86.00</b>	154.33	162.00	<b>158.17</b>	10.80	7.40	<b>9.10</b>	53.00	7.10
74	SKGPA-090	40.00	48.00	<b>44.00</b>	89.00	85.00	<b>87.00</b>	134.67	195.00	<b>164.83</b>	11.20	7.10	<b>9.15</b>	42.00	7.30
75	SKGPA-091	51.00	58.00	<b>54.50</b>	91.00	96.00	<b>93.50</b>	158.33	197.00	<b>177.67</b>	19.00	7.80	<b>13.40</b>	60.00	7.20
76	SKGPA-092	51.00	49.00	<b>50.00</b>	92.00	96.00	<b>94.00</b>	190.67	175.00	<b>182.83</b>	11.00	9.40	<b>10.20</b>	54.00	7.10
77	SKGPA-093	49.00	40.00	<b>44.50</b>	92.00	94.00	<b>93.00</b>	175.00	167.00	<b>171.00</b>	14.80	8.40	<b>11.60</b>	54.00	7.30
78	SKGPA-094	47.00	41.00	<b>44.00</b>	91.00	92.00	<b>91.50</b>	143.00	176.00	<b>159.50</b>	15.20	11.40	<b>13.30</b>	52.00	7.20
79	SKGPA-095-0	51.00	41.00	<b>46.00</b>	92.00	96.00	<b>94.00</b>	170.00	155.00	<b>162.50</b>	7.60	9.10	<b>8.35</b>	51.00	7.10
80	SKGPA-096	51.00	42.00	<b>46.50</b>	90.00	96.00	<b>93.00</b>	169.33	158.00	<b>163.67</b>	18.60	5.80	<b>12.20</b>	52.00	7.20
81	SKGPA-097	48.00	47.00	<b>47.50</b>	91.00	93.00	<b>92.00</b>	150.00	168.00	<b>159.00</b>	11.80	6.90	<b>9.35</b>	44.00	7.00
82	SKGPA-098	49.00	51.00	<b>50.00</b>	93.00	94.00	<b>93.50</b>	140.33	147.00	<b>143.67</b>	11.80	7.80	<b>9.80</b>	65.00	7.20
83	SKGPA-099	48.00	42.00	<b>45.00</b>	94.00	93.00	<b>93.50</b>	116.00	146.00	<b>131.00</b>	4.00	9.50	<b>6.75</b>	62.00	6.90
84	SKGPA-100	49.00	41.00	<b>45.00</b>	84.00	94.00	<b>89.00</b>		129.00	<b>129.00</b>	6.60	11.40	<b>9.00</b>	40.00	7.00
85	SKGPA-102	47.00	41.00	<b>44.00</b>	73.00	92.00	<b>82.50</b>	119.67	170.00	<b>144.83</b>	6.20	7.50	<b>6.85</b>	53.00	7.20

S.No	Accession No.	Days to 50 % flowering			Days to 80% maturity			Plant height (cm)			Seed yield per plant(g)			Mettupalayam	
		Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Bengaluru	Mettupalayam	Mean	Ear head height (cm)	100 seed weight (g)
86	SKGPA-104	52.00	44.00	<b>48.00</b>	81.00	97.00	<b>89.00</b>	155.33	193.00	<b>174.17</b>	4.40	7.30	<b>5.85</b>	46.00	7.00
87	SKGPA-106	50.00	45.00	<b>47.50</b>	85.00	95.00	<b>90.00</b>	164.67	150.00	<b>157.33</b>	6.40	12.20	<b>9.30</b>	52.00	6.90
88	SKGPA-108	44.00	46.00	<b>45.00</b>	84.00	89.00	<b>86.50</b>	152.67	166.00	<b>159.33</b>	22.80	8.40	<b>15.60</b>	49.00	1.40
89	SKGPA-109	44.00	45.00	<b>44.50</b>	91.00	89.00	<b>90.00</b>	133.67	131.00	<b>132.33</b>	17.20	8.10	<b>12.65</b>	60.00	6.90
90	SKGPA-110	49.00	46.00	<b>47.50</b>	92.00	94.00	<b>93.00</b>	162.67	138.00	<b>150.33</b>	8.00	9.30	<b>8.65</b>	45.00	7.00
<b>Mean for check variety</b>															
	<b>BGA 2 ©</b>	47.17	51.00	<b>49.08</b>	84.00	92.17	<b>88.08</b>	155.89	135.00	<b>145.44</b>	19.93	10.40	<b>15.17</b>	50.00	7.50
	<b>GA 2 ©</b>	48.33	49.00	<b>48.67</b>	96.00	93.33	<b>94.67</b>	136.01	150.00	<b>143.01</b>	12.37	7.50	<b>9.93</b>	50.00	7.30
	<b>Suvarna ©</b>	48.33	52.00	<b>50.17</b>	94.00	93.33	<b>93.67</b>	152.89	180.00	<b>166.44</b>	8.97	12.40	<b>10.68</b>	52.00	7.60
	<b>Minimum</b>	<b>37.00</b>	<b>39.00</b>	<b>39.50</b>	<b>73.00</b>	<b>82.00</b>	<b>80.50</b>	<b>98.33</b>	<b>105.00</b>	<b>121.84</b>	<b>2.60</b>	<b>5.30</b>	<b>4.90</b>	<b>36.00</b>	<b>1.40</b>
	<b>Maximum</b>	<b>52.00</b>	<b>58.00</b>	<b>54.50</b>	<b>98.00</b>	<b>97.00</b>	<b>96.50</b>	<b>201.33</b>	<b>204.00</b>	<b>182.83</b>	<b>48.40</b>	<b>16.40</b>	<b>28.80</b>	<b>73.00</b>	<b>7.60</b>
	<b>Mean</b>	<b>47.31</b>	<b>49.01</b>	<b>48.16</b>	<b>87.95</b>	<b>92.31</b>	<b>90.13</b>	<b>149.56</b>	<b>160.98</b>	<b>155.16</b>	<b>12.64</b>	<b>9.06</b>	<b>10.85</b>	<b>51.88</b>	<b>7.06</b>
	<b>CD(0.05)</b>	<b>2.94</b>	-	-	<b>4.38</b>	-	-	<b>40.55</b>	-	-	<b>49.95</b>	-	-	-	-
	<b>CV(%) Error</b>	<b>2.34</b>	-	-	<b>1.92</b>	-	-	<b>9.36</b>	-	-	<b>43.97</b>	-	-	-	-
	<b>CV(%) Pheno.</b>	<b>7.70</b>	<b>8.24</b>	<b>5.36</b>	<b>6.02</b>	<b>3.95</b>	<b>3.72</b>	<b>17.10</b>	<b>13.85</b>	<b>8.77</b>	<b>49.71</b>	<b>26.48</b>	<b>30.88</b>	<b>18.32</b>	<b>8.70</b>

**Table 23: Characterization of germplasm lines in grain amaranth at Bengaluru: Kharif 2015 (Plains)**

S.No.	Accession No.	Early plant vigour	Plant growth habit	Leaf colour	Inflorescence colour	Inflorescence compactness	Stem colour	Stem surface	Inflorescence shape	Inflorescence spininess
1	IC021803-A	3	3	5	11	5	2	1	2	4
2	IC021938	3	3	5	11	5	2	1	2	4
3	IC031404	2	1	5	2	5	2	1	1	4
4	IC032186	2	99	5	11	5	6	2	4	4
5	IC032190	2	3	3	11	3	2	1	4	4
6	IC032193	2	1	3	11	7	2	2	4	1
7	IC032195	2	3	3	11	3	2	1	4	4
8	IC035404	2	1	3	6	5	6	2	4	3
9	IC035415	3	2	3	7	5	2	1	1	1
10	IC035615	1	1	10	10	5	6	1	4	3
11	IC035633	3	1	2	2	5	5	1	4	1
12	IC035635	1	1	10	10	5	6	1	4	3
13	IC035638	1	1	10	10	5	6	1	4	3
14	IC035642	2	2	6	10	7	6	1	2	4
15	IC035651	3	1	2	2	5	5	1	4	1
16	IC035661	1	1	10	10	5	6	1	4	3
17	IC035665	3	1	2	2	5	5	1	4	1
18	IC035701	2	1	10	10	5	6	2	4	1
19	IC035702	2	1	3	10	7	6	2	1	4
20	IC035711	2	1	5	10	5	6	1	4	1
21	IC035713	3	3	5	10	7	6	2	1	3
22	IC035716	2	1	5	9	5	6	2	4	3
23	IC035717	3	1	5	10	5	6	2	4	3
24	IC035719	3	1	2	2	5	5	1	4	1
25	IC035735	2	3	5	9	5	6	1	2	3
26	IC035742	2	2	5	8	5	6	1	4	1
27	IC081698-B	2	1	10	8	5	6	2	5	3
28	IC094654	3	1	10	8	5	6	2	4	4
29	IC094661	2	1	5	9	5	6	2	4	3
30	IC095204	2	99	5	11	5	6	2	4	4
31	IC095244	3	1	3	8	5	6	2	4	3
32	IC095248	3	1	10	8	7	6	2	4	4
33	IC095251	3	2	5	10	7	99	2	1	3
34	IC095371	1	1	10	8	7	6	1	4	3
35	IC095383	1	1	10	10	5	6	1	4	3
36	IC095389	3	2	1	1	5	1	1	4	1

S.No.	Accession No.	Early plant vigour	Plant growth habit	Leaf colour	Inflorescence colour	Inflorescence compactness	Stem colour	Stem surface	Inflorescence shape	Inflorescence spininess
37	IC095391	3	2	5	10	5	6	2	4	1
38	IC095406	3	2	5	8	5	6	2	7	3
39	IC095430	3	1	2	2	5	1	1	3	1
40	IC095498	2	2	5	7	5	2	1	4	3
41	IC095510	3	1	5	10	5	5	2	4	1
42	IC095516	2	3	2	1	5	1	2	4	1
43	IC095556	3	1	5	2	5	2	2	4	1
44	IC120621	1	1	5	1	5	2	1	4	1
45	IC120649	2	1	5	2	7	2	1	4	1
46	IC120668	2	1	5	3	5	2	1	4	4
47	IC120670	2	1	5	2	5	2	1	4	1
48	IC120689	2	1	5	2	5	2	2	4	4
49	SKGPA-061	2	3	3	11	3	2	1	4	4
50	SKGPA-062	3	3	5	11	5	2	1	2	4
51	SKGPA-063	2	1	10	8	12	2	1	4	1
52	SKGPA-065	2	2	3	8	7	2	2	4	1
53	SKGPA-066	3	1	3	1	5	2	2	4	4
54	SKGPA-067	3	3	5	11	5	2	1	2	4
55	SKGPA-068	3	1	3	11	5	2	1	4	3
56	SKGPA-070	3	1	5	4	3	2	1	4	3
57	SKGPA-071	2	2	3	8	7	2	2	4	1
58	SKGPA-072	3	1	5	4	3	2	1	4	3
59	SKGPA-073	2	1	3	4	3	2	1	1	1
60	SKGPA-074	2	1	3	4	3	2	1	1	1
61	SKGPA-075	2	1	3	4	3	2	1	1	1
62	SKGPA-076	2	2	3	8	7	2	2	4	1
63	SKGPA-077	2	2	3	8	7	2	2	4	1
64	SKGPA-078	2	1	10	8	12	2	1	4	1
65	SKGPA-079	2	3	3	11	3	2	1	4	4
66	SKGPA-080	3	1	8	8	5	6	1	4	3
67	SKGPA-081	2	1	10	8	12	2	1	4	1
68	SKGPA-082	3	1	8	8	5	6	1	4	3
69	SKGPA-083	2	2	3	8	7	2	2	4	1
70	SKGPA-085	3	1	7	8	5	5	2	4	3
71	SKGPA-086	2	2	3	8	7	2	2	4	1
72	SKGPA-087	3	3	5	11	5	2	1	2	4
73	SKGPA-088	3	1	8	8	5	6	1	4	3
74	SKGPA-089	3	3	5	11	5	2	1	2	4

S.No.	Accession No.	Early plant vigour	Plant growth habit	Leaf colour	Inflorescence colour	Inflorescence compactness	Stem colour	Stem surface	Inflorescence shape	Inflorescence spininess
75	SKGPA-090	3	1	5	8	5	2	2	4	2
76	SKGPA-091	3	1	8	8	5	6	1	4	3
77	SKGPA-092	2	1	3	4	5	1	2	4	4
78	SKGPA-093	2	2	3	8	7	2	2	4	1
79	SKGPA-094	3	1	8	8	5	6	1	4	3
80	SKGPA-095	2	3	3	11	3	2	1	4	4
81	SKGPA-096	2	1	3	6	5	5	2	4	3
82	SKGPA-097	3	3	5	11	5	2	1	2	4
83	SKGPA-098	2	1	6	8	5	6	2	4	3
84	SKGPA-099	2	1	3	4	3	2	1	1	1
85	SKGPA-100	2	2	3	8	7	2	2	4	1
86	SKGPA-102	2	1	3	11	7	2	2	4	1
87	SKGPA-104	2	1	3	11	7	2	2	4	1
88	SKGPA-106	2	1	3	4	3	2	1	1	1
89	SKGPA-108	3	3	5	11	5	2	1	2	4
90	SKGPA-109	2	1	3	11	7	2	2	4	1
<b>Mean for check variety</b>										
	<b>BGA-2 (CH-2)</b>	3	1	3	11	5	2	1	1	1
	<b>GA-2 (CH-3)</b>	2	1	3	8	5	2	1	4	1
	<b>Suvarna (CH-</b>	2	3	5	11	7	2	1	4	1
	<b>Minimum</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
	<b>Maximum</b>	<b>3</b>	<b>99</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>99</b>	<b>2</b>	<b>7</b>	<b>4</b>
	<b>Mode</b>	<b>2</b>	<b>1</b>	<b>5</b>	<b>8</b>	<b>5</b>	<b>2</b>	<b>1</b>	<b>4</b>	<b>1</b>
<b>Qualitative characters :</b> <b>Early plant vigour</b> : 1-Poor, 2-Good, 3-Very good; <b>Plant growth habit</b> : 1-Erect, 2-Spreading, 3-Drooping, 99-Others; <b>Leaf colour</b> : 1-Yellow, 2-Yellowish orange, 3-Yellowish green, 4-Orange, 5-Green, 6-Greenish orange, 7-Pink, 8-Pinkish green, 9-Reddish yellow, 10-Redish green, 11-Red, 12-Dark red, 99-Others; <b>Inflorescence colour</b> : 1-Light yellow, 2-Yellow, 3-Yellowish orange, 4-Yellowish green, 5-Orange, 6-Pink, 7-Pinkish green, 8-Purple, 9-Red, 10-Reddish green, 11-Green, 99-Others; <b>Inflorescence compactness</b> : 3-Lax, 5-Intermediate, 7-Dense, 99-Others; <b>Stem colour</b> : 1-Yellow, 2-Yellowish green, 3-Orange, 4-Pink, 5-Red, 6-Reddish green, 7-Reddish orange, 99-Others; <b>Stem surface</b> : 1-Smooth, 2-Ridged, 99-Others; <b>Inflorescence shape</b> : 1-Globose, 2-Semi drooping, 3-Completely drooping, 4-Straight, 99-Others; <b>Inflorescence spininess</b> : 1-Smooth, 2-Glabrous, 3-Prickly, 4-Spiny, 99-Others; <b>Seed shattering</b> : 3-Low (%), 5-Intermediate (10-50%), 7-High (50%), 99-Others; <b>Seed colour</b> : 1-White, 2-Creamish, 3-Pale yellow, 4-Pink, 5-Red, 6-Brown, 7-Black, 8-Golden, 99-Others; <b>Popping ability of seed</b> : 3-Poor, 5-Medium, 7-Good, 99-Others										

**Table 24: Promising lines in winged bean germplasm for various characters at different locations: Kharif 2015(Plains)**

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
IGKV, Ambikapur (Accession 6)					
1	Days to 50% flowering	72.00	77.00	EC178337, EC142661, EC38955-13 (<76.00)	
2	Days to 80% maturity	205.00	209.00	IC095229, EC038821-1, EC38955-13 (<207.00)	
3	Pods/Plant	38.00	225.00	EC38955-13 (>216.00)	
4	Pod length (cm)	14.40	17.20	EC38955-13 (>16.20)	
5	Number of seeds per Pod	9.00	10.80	EC38955-13 (>10.60)	
6	100 seed weight (g)	26.91	35.81	EC178292, EC178337 (>31.02)	
BAU, Ranchi (Accession 39)					
1	Plant height (cm)	128.30	248.70	EC038821-2, RWB-15, EC178309, EC142600 (>220.00)	AKWB1 (195.24)
2	Number of branches per plant	1.50	4.50	IC026904, RWB-15, EC003600RMDWB-1 (>4.00)	BHW-1 (3.50)
3	Number of pods/plant	2.00	8.50	IC026945, IC026904, Ambika 11-2, EC178314, EC018302(>7.00)	AKWB1 (5.82)
4	Number of Seeds per pod	3.50	11.20	EC003600, Ambika 13-5, EC178314, RWB-13, Ambika 13-4(>9.00)	AKWB1 (7.52)
5	Pod length (cm)	9.00	14.70	EC038821-2, Ambika 13-5, IC026904, EC003600(>13.00)	AKWB1 (12.20)
6	Leaf length (cm)	4.50	8.20	RWB-11, Ambika 11-2, EC018302 (>7.00)	AKWB1 (5.76)
7	Leaf breadth (cm)	3.50	7.00	EC018302, Ambika 11-2, EC014267, EC027884 (>5.50)	AKWB1 (5.14)
8	Peduncle length (cm)	2.20	3.50	EC018302, Ambika 11-2 (>3.20)	AKWB1 (2.56)
9	Plant stand at harvest	2.00	3.00	EC038821-2 (>2.00)	BHW-1 (2.00)
10	Days to 50% flowering	58.00	77.00	Ambika 13-5AKW-11-3, RWB-11(>61.00)	AKWB1 (63.40)
11	Days to 80% maturity	146.00	155.00	EC178295, IC026945, EC178289, EC178292, IC026170, RWB-16 (<148.00)	BHW-1 (151.00)
12	100 seed weight (g)	21.90	43.20	EC038821-2, EC142600, RWB-15, Ambika 13-4, RWB-11 (>36.20)	AKWB1 (31.62)
13	Seed yield/plant (g)	4.50	58.70	RWB-15, EC178292, IC026949-1, EC178279, Ambika 11-2 (>32.90)	AKWB1 (13.72)

**Table 25: Evaluation of germplasm lines in winged bean at IGKV, Ambikapur: Kharif 2015 (Plains)**

<b>S.No.</b>	<b>Accession No.</b>	<b>Days to 50% flowering</b>	<b>Days to 80% maturity</b>	<b>Pods/Plant</b>	<b>Pod length (cm)</b>	<b>Number of seeds per Pod</b>	<b>100 seed weight (g)</b>
1	EC178337	72.00	209.00	137.00	16.20	10.60	35.78
2	IC095229	76.00	205.00	106.00	16.00	10.60	30.06
3	EC178292	77.00	207.00	216.00	15.60	9.00	35.81
4	EC038821-1	77.00	205.00	123.00	16.20	10.60	26.91
5	EC142661	72.00	209.00	38.00	14.40	9.60	31.02
6	EC38955-13	72.00	205.00	225.00	17.20	10.80	30.80
	<b>Minimum</b>	<b>72.00</b>	<b>205.00</b>	<b>38.00</b>	<b>14.40</b>	<b>9.00</b>	<b>26.91</b>
	<b>Maximum</b>	<b>77.00</b>	<b>209.00</b>	<b>225.00</b>	<b>17.20</b>	<b>10.80</b>	<b>35.81</b>
	<b>Mean</b>	<b>74.33</b>	<b>206.67</b>	<b>140.83</b>	<b>15.93</b>	<b>10.20</b>	<b>31.73</b>
	<b>CV(%) Phenotypic</b>	<b>3.47</b>	<b>0.95</b>	<b>50.06</b>	<b>5.76</b>	<b>7.12</b>	<b>10.95</b>

**Table 26: Evaluation of germplasm lines in winged bean at BAU, Ranchi: Kharif 2015 (Plain)**

S.No.	Accession No.	Plant height (cm)	Number of branches per plant	Number of pods/plant	Number of Seeds per pod	Pod length (cm)	Leaf length (cm)	Leaf breadth (cm)	Peduncle length (cm)	Plant stand at harvest	Days to 50% flowering	Days to 80% maturity	100 seed weight (g)	Seed yield/plant (g)
1	AKW-11-3	163.00	2.70	3.20	6.20	13.00	6.20	5.20	2.70	2.00	60.00	153.00	32.90	21.90
2	Ambika 11-1	182.50	2.00	4.00	5.00	11.00	5.50	5.00	2.50	2.00	65.00	148.00	31.60	8.90
3	Ambika 11-2	195.60	3.60	8.00	8.30	13.00	7.60	6.60	3.30	2.00	66.00	149.00	33.20	39.50
4	Ambika 13-4	163.40	3.00	3.40	6.80	11.20	5.00	3.80	2.40	2.00	63.00	150.00	28.80	30.90
5	Ambika 13-4	128.30	2.60	3.60	9.30	11.60	4.60	3.60	3.00	2.00	66.00	150.00	38.20	11.70
6	Ambika 13-5	196.50	4.00	5.00	10.00	13.70	6.00	5.30	2.90	2.00	58.00	150.00	30.30	26.40
7	AWB-13-1	178.00	1.50	2.00	8.00	13.00	4.50	3.50	2.20	2.00	66.00	148.00	30.70	17.30
8	EC003600	184.20	4.20	4.20	11.20	13.20	6.20	5.00	2.70	2.00	68.00	152.00	30.40	16.00
9	EC013084	183.00	3.50	4.50	6.50	10.50	6.50	5.50	3.00	2.00	68.00	150.00	28.40	10.20
10	EC014267	142.00	3.00	5.00	6.00	12.00	7.00	6.00	3.00	2.00	67.00	155.00	22.70	4.50
11	EC017002	199.70	3.00	4.70	6.70	12.00	5.70	5.00	2.70	2.00	61.00	154.00	24.90	17.60
12	EC018302	186.00	3.00	7.50	7.00	12.50	7.50	7.00	3.50	2.00	75.00	148.00	26.40	9.30
13	EC027884	211.30	2.60	6.00	5.60	11.30	6.60	5.60	3.00	2.00	68.00	155.00	25.40	14.60
14	EC038821-2	248.70	3.00	5.50	8.00	14.70	6.70	5.50	2.70	3.00	66.00	154.00	43.20	28.70
15	EC038824-1	165.30	2.30	2.60	5.30	11.00	4.60	3.60	2.60	2.00	67.00	151.00	32.40	9.30
16	EC142600	225.00	2.30	3.00	7.60	12.30	6.00	4.60	3.00	2.00	74.00	154.00	39.30	7.90
17	EC150118	158.50	2.00	2.50	4.50	9.50	5.50	4.50	2.20	2.00	74.00	152.00	36.20	9.40
18	EC178279	184.40	2.80	5.20	6.80	11.00	5.80	4.60	3.20	2.00	67.00	153.00	29.10	39.90
19	EC178286	220.00	4.00	2.00	9.00	12.00	5.00	5.00	3.00	2.00	69.00	149.00	30.50	16.30
20	EC178289	195.20	2.70	4.50	5.70	11.00	6.00	5.20	3.00	2.00	65.00	147.00	32.20	18.90
21	EC178292	218.40	3.40	5.00	8.20	12.40	5.60	4.60	2.60	2.00	66.00	147.00	22.20	53.60
22	EC178295	133.00	2.00	3.50	3.50	9.00	5.00	4.00	2.50	2.00	77.00	146.00	27.60	10.20

S.No.	Accession No.	Plant height (cm)	Number of branches per plant	Number of pods/plant	Number of Seeds per pod	Pod length (cm)	Leaf length (cm)	Leaf breadth (cm)	Peduncle length (cm)	Plant stand at harvest	Days to 50% flowering	Days to 80% maturity	100 seed weight (g)	Seed yield/plant (g)
23	EC178309	230.00	3.20	4.70	7.50	11.20	6.20	4.70	2.50	2.00	64.00	150.00	21.90	18.30
24	EC178314	193.20	3.50	8.00	10.00	13.00	5.30	4.60	2.70	2.00	66.00	151.00	31.80	28.80
25	EC388257	208.50	2.50	2.50	5.00	11.00	6.00	4.50	3.00	2.00	66.00	152.00	28.50	8.00
26	IC026170	131.60	2.60	2.30	5.00	10.00	5.00	4.00	2.60	2.00	66.00	147.00	27.40	15.10
27	IC026904	168.20	4.50	8.20	9.00	13.50	6.00	4.50	3.00	2.00	63.00	151.00	28.40	25.30
28	IC026945	158.20	4.00	8.50	7.20	12.00	5.50	4.50	2.60	2.00	62.00	146.00	25.50	22.70
29	IC026949-1	195.00	3.20	5.50	8.50	12.50	5.20	4.20	2.60	2.00	61.00	153.00	31.20	48.20
30	IC038683	194.30	3.30	5.60	8.00	11.30	5.60	4.60	3.00	2.00	67.00	148.00	34.40	9.60
31	PWB11-1	172.20	2.70	2.70	6.50	11.50	6.20	5.00	3.00	2.00	71.00	148.00	29.80	20.90
32	PWB11-2	177.00	3.00	3.00	4.00	10.50	6.00	4.50	3.00	2.00	65.00	152.00	28.40	10.60
33	RMDWB-1	176.00	4.20	6.40	7.80	13.00	6.00	4.80	2.50	2.00	68.00	149.00	32.20	10.70
34	RWB-02	170.00	3.00	2.00	4.00	10.50	5.00	4.00	2.50	2.00	69.00	149.00	35.60	8.70
35	RWB-05	156.60	2.60	2.60	5.00	10.00	6.30	5.00	3.00	2.00	64.00	150.00	30.60	12.80
36	RWB-11	182.70	3.50	5.50	8.00	13.00	8.20	4.50	2.50	2.00	60.00	150.00	37.80	32.90
37	RWB-13	176.00	3.40	7.00	9.40	13.00	6.60	5.40	2.60	2.00	64.00	154.00	30.20	29.70
38	RWB-15	233.70	4.50	6.70	7.00	12.20	7.00	5.20	3.20	2.00	66.00	155.00	38.80	58.70
39	RWB-16	139.50	2.50	3.00	8.50	12.00	6.50	5.00	2.70	2.00	67.00	147.00	32.20	6.20
<b>Mean for check variety</b>														
	<b>BHW-1</b>	174.50	3.50	3.50	4.50	9.50	5.50	4.00	2.50	2.00	67.00	151.00	29.50	8.40
	<b>AKWB1 (Ch)</b>	195.24	3.42	5.82	7.52	12.20	5.76	5.14	2.56	2.00	63.40	152.00	31.62	13.72
	<b>Minimum</b>	<b>128.30</b>	<b>1.50</b>	<b>2.00</b>	<b>3.50</b>	<b>9.00</b>	<b>4.50</b>	<b>3.50</b>	<b>2.20</b>	<b>2.00</b>	<b>58.00</b>	<b>146.00</b>	<b>21.90</b>	<b>4.50</b>
	<b>Maximum</b>	<b>248.70</b>	<b>4.50</b>	<b>8.50</b>	<b>11.20</b>	<b>14.70</b>	<b>8.20</b>	<b>7.00</b>	<b>3.50</b>	<b>3.00</b>	<b>77.00</b>	<b>155.00</b>	<b>43.20</b>	<b>58.70</b>
	<b>Mean</b>	<b>182.79</b>	<b>3.08</b>	<b>4.60</b>	<b>7.02</b>	<b>11.78</b>	<b>5.93</b>	<b>4.80</b>	<b>2.77</b>	<b>2.02</b>	<b>66.23</b>	<b>150.49</b>	<b>30.79</b>	<b>19.81</b>
	<b>CV(%) Pheno.</b>	<b>15.40</b>	<b>22.85</b>	<b>40.98</b>	<b>26.23</b>	<b>10.70</b>	<b>13.91</b>	<b>15.40</b>	<b>10.56</b>	<b>7.71</b>	<b>6.01</b>	<b>1.73</b>	<b>15.10</b>	<b>66.74</b>

**Table 27: Promising lines in Kankoda germplasm for various characters at MPKV, Rahuri: Kharif 2015 (Plains)**

S.No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
IGKV, Ambikapur (Accession 6)					
1	Days to flowering	26.00	52.00	PK-28, BESRAGUDA, PK-46, PK-9 (<33.00)	Indra Kankoda-1 (38.00)
2	Days to maturity	120.00	145.00	PK-5PREMNAGAR , PK-8WADRAFNAGAR (<127.00)	Indra Kankoda-1 (137.00)
3	Plant height (cm)	131.80	316.40	PHULE-MD-05-2RMF-7-P-1PRATAPPUR (>275.20)	Indra Kankoda-1 (227.80)
4	No. of branches	1.60	5.40	PK-49, KRISHNAPUR, PK-46, PK-5 (>4.80)	Indra Kankoda-1 (4.00)
5	Fruits per plant	5.00	146.00	PRATAPPURPK-9 (>113.00)	Indra Kankoda-1 (100.00)
6	Seeds per fruit	12.40	26.40	PHULE-MD-05-1, KRISHNAPUR, RAIGARH, BESRAGUDAPK-34 (>21.00)	Indra Kankoda-1 (15.40)
7	10 fruits weight	9.10	99.00		Indra Kankoda-1 (99.00)
8	Fruit weight (q/ha)	1.25	133.00	PRATAPPURPK-49, PK-9 (>116.50)	Indra Kankoda-1 (102.37)
9	100 Seed weight	6.05	11.95	RMF-1, NDM-1, NDM-1 (>11.45)	Indra Kankoda-1 (9.20)
MPKV, Rahuri (Accession 30)					
1	Fruits yield per plant (kg)	0.12	0.34	RKG-09-29, RKG-09-33, RKG-09-45, RKG-09-10, RKG-09-6, RKG-09-49 (>0.25)	
2	Days to picking first	65.00	102.00	RKG-09-30, RKG-09-43, RKG-09-20, RKG-09-8 (<70.00)	
3	Days to picking last	96.00	136.00	RKG-09-43, RKG-09-8, RKG-09-21, RKG-09-13, RKG-09-6, RKG-09-10 (<113.00)	
4	Fruit weight(g)	9.00	23.00	RKG-09-33, RKG-09-49, RKG-09-6, RKG-09-29, RKG-09-37, RKG-09-45 (>18.00)	
5	Number of fruits per Vine	12.10	20.20	RKG-09-20, RKG-09-34, RKG-09-29, RKG-09-45, RKG-09-10 (>16.40)	
6	Fruit girth (cm)	7.30	12.20	RKG-09-44, RKG-09-14, RKG-09-34, RKG-09-23, RKG-09-9 (>11.00)	
7	Fruit length (cm)	3.40	6.80	RKG-09-3, RKG-09-29, RKG-09-26, RKG-09-50 (>6.30)	

**Table 28: Evaluation of germplasm lines in Kankoda at MPKV, Rahuri: Kharif 2015 (Plain)**

S.No.	Accession No.	Fruits yield per plant (kg)	Days to picking first	Days to picking last	Fruit weight(g)	Number of fruits per Vine	Fruit girth (cm)	Fruit length (cm)
1	RKG-09-3	0.14	70.00	116.00	11.00	13.80	9.50	6.80
2	RKG-09-4	0.13	82.00	122.00	14.00	12.10	9.30	4.70
3	RKG-09-5	0.12	79.00	123.00	9.00	16.40	9.30	3.40
4	RKG-09-6	0.26	80.00	105.00	20.00	15.90	10.30	4.80
5	RKG-09-8	0.14	69.00	102.00	11.00	15.20	9.40	6.00
6	RKG-09-9	0.12	82.00	127.00	12.00	14.70	11.20	5.00
7	RKG-09-10	0.28	71.00	110.00	17.00	17.60	9.60	4.90
8	RKG-09-11	0.18	87.00	130.00	13.00	13.90	9.00	5.30
9	RKG-09-13	0.25	71.00	104.00	16.00	16.30	9.40	5.00
10	RKG-09-14	0.21	72.00	113.00	14.00	13.60	12.00	4.90
11	RKG-09-20	0.25	66.00	117.00	13.00	20.20	10.70	6.30
12	RKG-09-21	0.14	70.00	103.00	12.00	15.40	9.00	5.30
13	RKG-09-23	0.23	85.00	119.00	16.00	16.30	11.30	6.20
14	RKG-09-25	0.25	88.00	117.00	17.00	16.30	9.00	5.30
15	RKG-09-26	0.19	93.00	129.00	15.00	15.00	11.00	6.40
16	RKG-09-27	0.25	70.00	116.00	18.00	14.70	8.30	4.50
17	RKG-09-29	0.34	74.00	124.00	20.00	19.40	10.00	6.70
18	RKG-09-30	0.19	65.00	120.00	15.00	16.40	9.70	4.30
19	RKG-09-33	0.30	73.00	126.00	23.00	12.90	9.90	4.90
20	RKG-09-34	0.15	82.00	128.00	15.00	20.20	11.40	5.90
21	RKG-09-37	0.18	93.00	129.00	19.00	14.30	7.30	4.00
22	RKG-09-38	0.12	102.00	136.00	12.00	16.40	8.00	5.00
23	RKG-09-41	0.19	73.00	119.00	15.00	15.20	8.90	4.80
24	RKG-09-43	0.13	65.00	96.00	14.00	14.70	7.90	5.40
25	RKG-09-44	0.17	84.00	127.00	13.00	16.40	12.20	5.30
26	RKG-09-45	0.30	79.00	125.00	19.00	19.30	11.00	5.90
27	RKG-09-47	0.21	78.00	120.00	15.00	15.40	9.60	5.00
28	RKG-09-48	0.12	82.00	115.00	14.00	13.40	7.30	5.30
29	RKG-09-49	0.26	70.00	119.00	21.00	15.40	11.00	5.00
30	RKG-09-50	0.12	73.00	118.00	13.00	13.20	9.40	6.40
<b>Minimum</b>		<b>0.12</b>	<b>65.00</b>	<b>96.00</b>	<b>9.00</b>	<b>12.10</b>	<b>7.30</b>	<b>3.40</b>
<b>Maximum</b>		<b>0.34</b>	<b>102.00</b>	<b>136.00</b>	<b>23.00</b>	<b>20.20</b>	<b>12.20</b>	<b>6.80</b>
<b>Mean</b>		<b>0.20</b>	<b>77.60</b>	<b>118.50</b>	<b>15.20</b>	<b>15.67</b>	<b>9.73</b>	<b>5.29</b>
<b>CV(%) Pheno.</b>		<b>32.70</b>	<b>11.73</b>	<b>8.00</b>	<b>21.68</b>	<b>13.18</b>	<b>13.24</b>	<b>15.05</b>

**Table 29: Evaluation of germplasm lines in Kankoda at IGKV, Ambikapur: Kharif 2015 (Plain)**

S.No.	Accession No.	Days to flowering	Days to maturity	Plant height (cm)	No. of branches	Fruits per plant	Seeds per fruit	10 fruits weight	Fruit weight (q/ha)	100 Seed weight
1	BESRAGUDA	31.00	130.00	236.00	4.20	27.00	23.60	10.00	32.37	7.50
2	INDIRA KANKODA-1	38.00	137.00	227.80	4.00	100.00	15.40	99.00	102.37	9.20
3	JAGDALPUR	46.00	130.00	184.00	3.20	64.00	17.20	13.60	38.75	11.45
4	KRISHNAPUR	44.00	127.00	216.00	5.00	93.00	25.20	15.40	108.50	9.15
5	NDM-1	39.00	139.00	246.60	2.60	22.00	21.00	14.00	19.05	11.50
6	NDM-1	50.00	139.00	269.00	4.60	69.00	13.80	15.20	61.62	11.85
7	PHULE-MD-05-1	41.00	136.00	275.00	2.60	40.00	26.40	14.90	59.62	9.30
8	PHULE-MD-05-2	42.00	136.00	316.40	3.20	5.00	12.40	17.00	1.25	11.15
9	PK-13	46.00	136.00	131.80	2.60	45.00	20.20	11.40	32.00	11.15
10	PK-27	33.00	139.00	178.40	1.60	85.00	21.00	12.00	68.00	9.95
11	PK-28	26.00	136.00	213.60	3.60	86.00	17.00	15.90	44.87	9.80
12	PK-33	46.00	135.00	170.00	2.20	74.00	16.40	12.00	8.50	11.05
13	PK-34	41.00	129.00	184.60	2.80	13.00	21.80	11.00	15.22	9.20
14	PK-35	39.00	139.00	154.20	2.80	44.00	12.60	10.50	42.25	9.50
15	PK-46	32.00	133.00	252.60	5.00	108.00	19.40	19.60	107.25	9.50
16	PK-49	52.00	140.00	249.60	5.40	100.00	15.00	17.20	122.12	9.05
17	PK-5	38.00	120.00	198.80	5.00	45.00	16.40	12.40	53.00	9.75
18	PK-8	48.00	122.00	150.40	3.00	9.00	15.00	10.00	2.80	9.95
19	PK-9	32.00	129.00	212.20	3.20	131.00	17.40	13.60	118.37	10.85
20	PRATAPPUR	49.00	129.00	294.00	3.60	146.00	19.40	15.00	133.00	10.05
21	PREMNAGAR	41.00	121.00	245.80	3.40	70.00	13.00	13.90	56.10	9.85
22	RAIGARH	34.00	129.00	263.60	4.80	62.00	23.80	16.00	57.75	10.05
23	RMF-1	38.00	145.00	208.20	4.00	25.00	20.40	12.00	14.37	11.95
24	RMF-17	41.00	136.00	275.20	4.20	113.00	15.00	9.60	116.50	6.75
25	RMF-27	48.00	140.00	263.80	4.20	21.00	15.60	13.00	19.00	7.55
26	RMF-7-P-1	42.00	145.00	303.60	4.20	24.00	18.40	99.00	8.82	7.70
27	RMF-P-4	44.00	142.00	215.40	4.40	53.00	18.80	9.10	40.75	6.05
28	SKNKK-501	35.00	139.00	247.00	4.40	62.00	19.40	15.60	33.25	9.50
29	WADRAFNAGAR	40.00	126.00	219.40	3.80	39.00	19.80	11.00	25.00	8.25
<b>Minimum</b>		<b>26.00</b>	<b>120.00</b>	<b>131.80</b>	<b>1.60</b>	<b>5.00</b>	<b>12.40</b>	<b>9.10</b>	<b>1.25</b>	<b>6.05</b>
<b>Maximum</b>		<b>52.00</b>	<b>145.00</b>	<b>316.40</b>	<b>5.40</b>	<b>146.00</b>	<b>26.40</b>	<b>99.00</b>	<b>133.00</b>	<b>11.95</b>
<b>Mean</b>		<b>40.55</b>	<b>133.93</b>	<b>227.69</b>	<b>3.71</b>	<b>61.21</b>	<b>18.30</b>	<b>19.27</b>	<b>53.19</b>	<b>9.61</b>
<b>CV(%) Pheno.</b>		<b>15.63</b>	<b>5.06</b>	<b>20.53</b>	<b>25.67</b>	<b>61.37</b>	<b>20.32</b>	<b>115.35</b>	<b>75.58</b>	<b>15.56</b>

**Table 30: Promising lines in *Vigna trilobata* germplasm for various characters at two locations: Kharif 2014 (Plains)**

S.No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
OUA&T, Bhubanewar (Accession 26)					
1	Days to 50% flowering	28.00	38.00	IC553517, IC553524, IC553525 (<31.00)	-
2	Days to maturity	65.00	71.00	IC550529, IC553505, IC553512, IC553547 (<66.00)	-
3	No. of Branches	1.00	2.50	IC550538, IC553555(>2.00)	-
4	No. of pods per plant	2.40	8.40	IC553518, IC553555 (>6.60)	-
5	Plant height (cm)	28.20	49.00	IC524639, IC553547, IC553518, IC553525 (>43.60)	-
6	Seed yield (q/ha)	0.00	0.96	IC553555, IC553518, IC553525 (>0.77)	-
7	Seed yield per plant (g)	0.02	0.20	IC553555, IC553518, IC553505, IC524667 (>0.10)	-
8	100-seed weight (g)	0.70	1.32	IC553505, IC553502, IC524667, IC553525 (>1.08)	-
9	No. of seeds per pod	8.20	13.20	IC553530, IC550540, IC553544 (>12.20)	-
10	No. of cluster per plant	1.20	3.20	IC553518, IC553555, IC524639, IC553517 (>2.40)	-
11	No. of pods per cluster	1.50	2.60	IC524667, IC553517, IC553555 (>2.20)	-
12	Pod length of (cm)	4.00	5.80	IC550532, IC553518, IC553530 (>5.50)	-
TNAU, Mettupalayam (Accession 26)					
1	Days to 50% Flowering	42.00	49.00	IC261321, IC553530 (<43.00)	-
2	Days to maturity	67.00	82.00	IC524667, IC550557, IC553494 (<69.00)	-
3	No. of branches	5.00	10.00	IC261321, IC550532 (>9.00)	-
4	No. of pods per plants	76.00	112.00	IC550541, IC550532, IC550529, IC550543 (>102.00)	-
5	Plant height (cm)	74.00	82.00	IC261321, IC550537, IC550536 (>80.00)	-
6	Seed yield (q/ha)	3.53	4.47	IC550532, IC550529, IC550531, IC550543 (>4.25)	-
7	Dry matter (q/ha)	0.83	5.50	IC550537, IC553518, IC553517 (>3.58)	-
8	Green pod yield (q/ha)	4.17	34.42	IC550537, IC553518, IC553517, IC550536 (>17.50)	-
Best entries over locations (Accession 26)					
1	Days to 50% Flowering	35.50	49.00	IC553524, IC553517 (<37.00)	-
2	Days to maturity	68.00	78.00	IC524667, IC261321, IC550529, IC550557, IC553517 (<69.00)	-
3	No. of branches	3.30	9.00	IC550531, IC550536, IC550543 (>7.00)	-
4	No. of pods per plants	40.30	104.00	IC550543, IC550531, IC550536 (>96.00)	-
5	Plant height (cm)	53.10	82.00	IC550537, IC550536, IC550531 (>79.00)	-
6	Seed yield (q/ha)	2.10	4.33	IC550531, IC550543, IC550537, IC550536, IC550529 (>2.50)	-

**Table 31: Evaluation of germplasm lines in *Vigna trilobata* at various locations: Kharif 2015 (Plain)**

S.No.	Accession No.	Days to 50% flowering			Days to maturity			No. of Branches			No. of pods per plant			Plant height (cm)		
		Bhubaneswar	Mettupalaya m	Mean	Bhubaneswar	Mettupalaya m	Mean	Bhubaneswar	Mettupalaya m	Mean	Bhubaneswar	Mettupalaya m	Mean	Bhubaneswar	Mettupalaya m	Mean
1	RKG-09-3	32.00	42.00	<b>37.00</b>	67.00	70.00	<b>68.50</b>	2.00	10.00	<b>6.00</b>	5.00	80.00	<b>42.50</b>	38.40	82.00	<b>60.20</b>
2	RKG-09-4	31.00	43.00	<b>37.00</b>	68.00	75.00	<b>71.50</b>	1.60	8.00	<b>4.80</b>	3.40	85.00	<b>44.20</b>	49.00	75.00	<b>62.00</b>
3	RKG-09-5	36.00	45.00	<b>40.50</b>	69.00	67.00	<b>68.00</b>	1.20	9.00	<b>5.10</b>	6.60	76.00	<b>41.30</b>	43.60	80.00	<b>61.80</b>
4	RKG-09-6	35.00	45.00	<b>40.00</b>	65.00	72.00	<b>68.50</b>	1.40	8.00	<b>4.70</b>	3.20	105.00	<b>54.10</b>	33.00	75.00	<b>54.00</b>
5	RKG-09-8		44.00	<b>44.00</b>		73.00	<b>73.00</b>		9.00	<b>9.00</b>		102.00	<b>102.00</b>		80.00	<b>80.00</b>
6	RKG-09-9	34.00	48.00	<b>41.00</b>	66.00	74.00	<b>70.00</b>	2.00	10.00	<b>6.00</b>	3.80	110.00	<b>56.90</b>	30.00	77.00	<b>53.50</b>
7	RKG-09-10		49.00	<b>49.00</b>		75.00	<b>75.00</b>		8.00	<b>8.00</b>		98.00	<b>98.00</b>		81.00	<b>81.00</b>
8	RKG-09-11		46.00	<b>46.00</b>		78.00	<b>78.00</b>		7.00	<b>7.00</b>		96.00	<b>96.00</b>		82.00	<b>82.00</b>
9	RKG-09-13	38.00	48.00	<b>43.00</b>	69.00	76.00	<b>72.50</b>	2.50	9.00	<b>5.75</b>	3.50	93.00	<b>48.25</b>	31.00	76.00	<b>53.50</b>
10	RKG-09-14	34.00	45.00	<b>39.50</b>	71.00	77.00	<b>74.00</b>	1.80	8.00	<b>4.90</b>	3.60	88.00	<b>45.80</b>	28.20	78.00	<b>53.10</b>
11	RKG-09-20	35.00	47.00	<b>41.00</b>	69.00	78.00	<b>73.50</b>	1.00	8.00	<b>4.50</b>	2.40	112.00	<b>57.20</b>	35.60	75.00	<b>55.30</b>
12	RKG-09-21		46.00	<b>46.00</b>		74.00	<b>74.00</b>		8.00	<b>8.00</b>		104.00	<b>104.00</b>		79.00	<b>79.00</b>
13	RKG-09-23	31.00	45.00	<b>38.00</b>	69.00	68.00	<b>68.50</b>	1.60	9.00	<b>5.30</b>	3.40	96.00	<b>49.70</b>	39.20	74.00	<b>56.60</b>
14	RKG-09-25	34.00	43.00	<b>38.50</b>	71.00	68.00	<b>69.50</b>	1.40	7.00	<b>4.20</b>	2.60	78.00	<b>40.30</b>	33.20	76.00	<b>54.60</b>
15	RKG-09-26	31.00	46.00	<b>38.50</b>	70.00	69.00	<b>69.50</b>	1.40	7.00	<b>4.20</b>	4.80	93.00	<b>48.90</b>	39.80	76.00	<b>57.90</b>
16	RKG-09-27	34.00	47.00	<b>40.50</b>	65.00	76.00	<b>70.50</b>	1.80	7.00	<b>4.40</b>	5.00	84.00	<b>44.50</b>	36.40	77.00	<b>56.70</b>
17	RKG-09-29	32.00	44.00	<b>38.00</b>	65.00	73.00	<b>69.00</b>	1.20	6.00	<b>3.60</b>	4.20	92.00	<b>48.10</b>	37.40	75.00	<b>56.20</b>
18	RKG-09-30	28.00	45.00	<b>36.50</b>	67.00	70.00	<b>68.50</b>	1.60	8.00	<b>4.80</b>	6.60	88.00	<b>47.30</b>	42.40	78.00	<b>60.20</b>
19	RKG-09-33	31.00	44.00	<b>37.50</b>	70.00	69.00	<b>69.50</b>	1.60	5.00	<b>3.30</b>	8.40	97.00	<b>52.70</b>	44.60	76.00	<b>60.30</b>
20	RKG-09-34	28.00	43.00	<b>35.50</b>	69.00	81.00	<b>75.00</b>	1.40	9.00	<b>5.20</b>	5.40	93.00	<b>49.20</b>	42.00	75.00	<b>58.50</b>

S.No.	Accession No.	Seed yield (q/ha)			Bhubaneswar						Mettupalayam	
		Mettupalaya m	Bhubaneswar	Mean	Seed yield per plant (g)	100-seed weight (g)	No. of seeds per pod	No. of cluster per plant	No. of pods per cluster	Pod length of (cm)	Dry matter (q/ha)	Green pod yield (q/ha)
1	RKG-09-3	4.00	0.70	<b>2.35</b>	0.07	1.02	12.20	2.00	2.00	5.20	1.17	6.33
2	RKG-09-4	3.92	0.66	<b>2.29</b>	0.06	0.96	11.80	2.60	1.80	5.10	1.58	8.25
3	RKG-09-5	4.25	0.76	<b>2.50</b>	0.10	1.14	9.90	2.20	2.60	5.10	1.92	10.42
4	RKG-09-6	4.42	0.67	<b>2.54</b>	0.04	1.00	10.80	1.60	2.20	4.90	1.58	8.00
5	RKG-09-8	4.33		<b>4.33</b>							1.08	6.17
6	RKG-09-9	4.47	0.00	<b>2.23</b>	0.03	0.96	9.30	1.70	1.50	5.80	3.08	17.50
7	RKG-09-10	3.92		<b>3.92</b>							3.58	17.58
8	RKG-09-11	4.00		<b>4.00</b>							5.50	34.42
9	RKG-09-13	3.83	0.64	<b>2.24</b>	0.02	0.86	8.60	1.50	1.50	4.00	2.08	10.83
10	RKG-09-14	3.80	0.67	<b>2.24</b>	0.07	0.98	13.00	2.00	1.60	5.40	2.83	14.92
11	RKG-09-20	3.87	0.64	<b>2.25</b>	0.02	0.70	8.20	1.60	1.60	4.80	2.92	15.92
12	RKG-09-21	4.27		<b>4.27</b>							0.83	4.33
13	RKG-09-23	4.13	0.70	<b>2.42</b>	0.08	1.00	11.20	2.40	1.80	5.20	1.50	7.42
14	RKG-09-25	4.13	0.65	<b>2.39</b>	0.03	0.91	9.20	1.60	1.60	4.80	1.83	10.25
15	RKG-09-26	4.05	0.67	<b>2.36</b>	0.05	1.26	10.60	2.00	2.20	5.50	1.92	9.25
16	RKG-09-27	3.65	0.77	<b>2.21</b>	0.12	1.32	11.40	2.40	2.00	5.10	1.92	10.42
17	RKG-09-29	3.98	0.68	<b>2.33</b>	0.05	1.01	11.40	1.80	2.20	5.20	1.08	6.25
18	RKG-09-30	3.73	0.75	<b>2.24</b>	0.10	0.75	10.40	2.60	2.60	4.80	4.00	21.50
19	RKG-09-33	4.02	0.88	<b>2.45</b>	0.18	1.08	8.20	3.20	2.20	5.60	4.25	22.67
20	RKG-09-34	4.07	0.73	<b>2.40</b>	0.07	0.86	8.30	2.40	2.20	5.20	2.58	10.08

S.No.	Accession No.	Days to 50% flowering			Days to maturity			No. of Branches			No. of pods per plant			Plant height (cm)		
		Bhubaneswar	Mettupalaya m	Mean	Bhubaneswar	Mettupalaya m	Mean	Bhubaneswar	Mettupalaya m	Mean	Bhubaneswar	Mettupalaya m	Mean	Bhubaneswar	Mettupalaya m	Mean
21	RKG-09-37	30.00	44.00	<b>37.00</b>	70.00	82.00	<b>76.00</b>	1.00	8.00	<b>4.50</b>	4.80	90.00	<b>47.40</b>	43.80	74.00	<b>58.90</b>
22	RKG-09-38	31.00	43.00	<b>37.00</b>	70.00	78.00	<b>74.00</b>	1.00	7.00	<b>4.00</b>	3.60	85.00	<b>44.30</b>	42.20	78.00	<b>60.10</b>
23	RKG-09-41	34.00	42.00	<b>38.00</b>	71.00	75.00	<b>73.00</b>	1.20	8.00	<b>4.60</b>	3.20	82.00	<b>42.60</b>	32.40	75.00	<b>53.70</b>
24	RKG-09-43	33.00	44.00	<b>38.50</b>	69.00	78.00	<b>73.50</b>	1.20	7.00	<b>4.10</b>	3.40	93.00	<b>48.20</b>	42.00	76.00	<b>59.00</b>
25	RKG-09-44	31.00	45.00	<b>38.00</b>	65.00	73.00	<b>69.00</b>	1.00	6.00	<b>3.50</b>	3.20	96.00	<b>49.60</b>	46.80	78.00	<b>62.40</b>
26	RKG-09-45	36.00	46.00	<b>41.00</b>	67.00	78.00	<b>72.50</b>	2.20	8.00	<b>5.10</b>	8.00	97.00	<b>52.50</b>	39.00	80.00	<b>59.50</b>
<b>Minimum</b>		<b>28.00</b>	<b>42.00</b>	<b>35.50</b>	<b>65.00</b>	<b>67.00</b>	<b>68.00</b>	<b>1.00</b>	<b>5.00</b>	<b>3.30</b>	<b>2.40</b>	<b>76.00</b>	<b>40.30</b>	<b>28.20</b>	<b>74.00</b>	<b>53.10</b>
<b>Maximum</b>		<b>38.00</b>	<b>49.00</b>	<b>49.00</b>	<b>71.00</b>	<b>82.00</b>	<b>78.00</b>	<b>2.50</b>	<b>10.00</b>	<b>9.00</b>	<b>8.40</b>	<b>112.00</b>	<b>104.00</b>	<b>49.00</b>	<b>82.00</b>	<b>82.00</b>
<b>Mean</b>		<b>32.68</b>	<b>44.96</b>	<b>39.87</b>	<b>68.27</b>	<b>74.12</b>	<b>71.71</b>	<b>1.50</b>	<b>7.85</b>	<b>5.18</b>	<b>4.46</b>	<b>92.81</b>	<b>55.98</b>	<b>38.64</b>	<b>77.23</b>	<b>61.15</b>
<b>CV(%) Pheno.</b>		<b>7.87</b>	<b>4.10</b>	<b>8.38</b>	<b>3.04</b>	<b>5.55</b>	<b>3.90</b>	<b>27.56</b>	<b>15.16</b>	<b>27.68</b>	<b>37.16</b>	<b>10.00</b>	<b>35.11</b>	<b>14.62</b>	<b>3.14</b>	<b>14.51</b>

S.No.	Accession No.	Seed yield (q/ha)			Bhubaneswar						Mettupalayam	
		Mettupalaya m	Bhubaneswar	Mean	Seed yield per plant (g)	100-seed weight (g)	No. of seeds per pod	No. of cluster per plant	No. of pods per cluster	Pod length of (cm)	Dry matter (q/ha)	Green pod yield (q/ha)
21	RKG-09-37	4.08	0.82	<b>2.45</b>	0.09	1.10	12.20	2.20	2.00	5.40	3.08	16.75
22	RKG-09-38	4.02	0.75	<b>2.39</b>	0.06	1.08	11.00	1.80	1.80	5.00	1.33	6.33
23	RKG-09-41	3.53	0.66	<b>2.10</b>	0.06	1.08	13.20	1.60	2.00	5.60	1.75	10.67
24	RKG-09-43	3.58	0.65	<b>2.12</b>	0.03	0.82	12.60	1.80	1.60	5.40	2.17	9.08
25	RKG-09-44	3.60	0.69	<b>2.14</b>	0.06	0.92	9.20	1.20	2.20	4.60	0.92	4.17
26	RKG-09-45	3.92	0.96	<b>2.44</b>	0.20	0.89	10.10	2.80	2.40	5.10	1.75	7.50
<b>Minimum</b>		<b>3.53</b>	<b>0.00</b>	<b>2.10</b>	<b>0.02</b>	<b>0.70</b>	<b>8.20</b>	<b>1.20</b>	<b>1.50</b>	<b>4.00</b>	<b>0.83</b>	<b>4.17</b>
<b>Maximum</b>		<b>4.47</b>	<b>0.96</b>	<b>4.33</b>	<b>0.20</b>	<b>1.32</b>	<b>13.20</b>	<b>3.20</b>	<b>2.60</b>	<b>5.80</b>	<b>5.50</b>	<b>34.42</b>
<b>Mean</b>		<b>3.98</b>	<b>0.69</b>	<b>2.60</b>	<b>0.07</b>	<b>0.99</b>	<b>10.58</b>	<b>2.05</b>	<b>1.98</b>	<b>5.13</b>	<b>2.24</b>	<b>11.81</b>
<b>CV(%) Pheno.</b>		<b>6.21</b>	<b>25.32</b>	<b>26.10</b>	<b>64.77</b>	<b>15.16</b>	<b>14.89</b>	<b>23.99</b>	<b>16.96</b>	<b>7.64</b>	<b>51.05</b>	<b>57.87</b>

## 2.4 GERMPLASM CONSERVATION

A total of 219 accessions were added to the National Gene Bank at NBPGR during 2015-16. Crop wise details are given below in table 32.

**Table 32: Crop wise details of germplasm stored in the National Gene Bank during 2015-16.**

Crop	Botanical name	No. of accessions
Amaranth (100)	<i>Amaranthus blitum</i>	5
	<i>Amaranthus caudatus</i>	2
	<i>Amaranthus dubius</i>	1
	<i>Amaranthus graecizans</i>	24
	<i>Amaranthus hybridus</i>	6
	<i>Amaranthus hypocondriacus</i>	10
	<i>Amaranthus sp.</i>	1
	<i>Amaranthus spinosus</i>	16
	<i>Amaranthus tristis</i>	2
	<i>Amaranthus tricolor</i>	33
Buckwheat (47)	<i>Fagopyrum esculentum</i>	15
	<i>Fagopyrum tataricum</i>	32
Job`s Tears(6)	<i>Coix lacryma-jobi</i>	6
Chenopod(4)	<i>Chenopodium murale</i>	3
	<i>Chenopodium album</i>	1
Perilla (61)	<i>Perilla frutescens</i>	61
Colocynth (1)	<i>Citrullus colocynthis</i>	1
Watermelon (1)	<i>Citrullus vulgaris</i>	1

## 2.5 SEED SUPPLY

The seed and planting material of 218 accessions belonging to different crops were supplied to ICAR institutes/coordinated projects, agricultural universities and other users in India. Based on specific requests received samples were supplied as per details given below under the Material Transfer Agreement (MTA) and GEX 01 Forms.

**Table 33: Seed Supply of Potential Crops during 2015-16.**

Crop	Accn.	Supplied to	Source
Amaranth	120	Dr. BSKK Vidyapeeth, Maharashtra; CHES -IIHR, Bhubaneswar	NBPGR RS, Shimla; NBPGR RS Hyderabad
Chenopodium	16	SLIET, Sangrur; COH, Bidar,	NBPGR RS, Shimla
<i>Coix lacryma-jobi</i>	42	ICAR RC for NEH Umiam	GCD, NBPGR, New Delhi
Pillipesara bean	30	OUAT, Bhubaneswar and TNAU, Mettupalayam	NBPGR RS Hyderabad

*Jatropha curcas* (79 accessions) and *Simarouba glauca* (1 accession) are maintained in the field gene bank of RS Hyderabad.

**CROP IMPROVEMENT**

---

### III. CROP IMPROVEMENT

Based on the regional economic importance, area covered by the crop, specific adaptive advantage and future potential, the work on Potential crops have been prioritized for hill as well as for the plain areas of the country. These include food and fodder crops, energy and industrial plants and crop species suitable for problematic areas. Among the economically important indigenous as well as introduced plant species, the promising lines are included in the coordinated testing programme. Apart from Initial Varietal Trial (IVT) and Advanced Varietal Trials (AVT-I & II) were carried out in important Kharif crops like grain amaranth, buckwheat, and rice bean. The results of the experiments conducted during *Kharif* 2015 in the hills as well as plains are enumerated below:

#### 3.1 HILLS

The crops included in the hill areas are the pseudocereals (grain amaranth and buckwheat). These crops were grown during kharif season in hills of North-Western and North-Eastern Himalayas. Replicated data were received from the centres. Statistical analysis was carried out to estimate mean, CD (at 5% level) and CV (%). For overall comparison, mean over locations has been calculated. For the varieties qualifying for consideration of identification on the basis of three years performance, the weighted means in respect of grain yield and maturity have been given in the Annexures.

##### 3.1.1 Grain Amaranth (*Amaranthus* spp.)

Grain amaranth is an important crop in mid and high altitude regions of North-Western Himalaya. It is a dual purpose crop grown for its green foliage and grain. Its seeds being rich in protein and essential amino acids (lysine), are used for various confectionary items and other nutritious food products.

An IVT on grain amaranth were conducted during kharif, 2015. Although many species of grain amaranth are economically important, but three species, namely, *A. hypochondriacus*, *A. caudatus* and *A. edulis*, being the important grain yielding types, are included in the testing programme.

### **3.1.1.1 Initial Varietal Trial (IVT)**

In this trial, six entries in IVT along with three checks were tested at four locations. The data were received from all centres. The performance of the entries as compared to the checks has been given in Table 34. Based on the overall mean performance in respect of grain yield over four locations, entry IC - 361853 (24.56 q/ha) showed yield superiority over the check variety, Durga (20.90 q/ha).

Significant differences were observed among the entries for seed yield at two locations (Table 35). Seed yield level was high at Shimla (40.94 q/ha) and, moderate at Ranichauri (15.02 q/ha) and very low at Sangla (5.23 q/ha). Based on the average performance over locations, entry IC361853 was the highest yielder (24.56 q/ha) followed by IC362199 (23.02 q/ha).

Average plant height of the entries (Table 36) was the highest at Shimla (286.54 cm) followed by at Almora (170.30 cm). It was the lowest at Sangla (136.13 cm) centre. The plant height at Shimla ranged from 261.93 cm to 306.40 cm and at Almora from 145.33 cm to 205.33 cm. Based on average performance over four locations the entry KBGA-7 had highest plant height (186.99 cm).

Flowering time showed considerable variation among locations as well as the entries. The mean flowering time was shortest (53.30 days) at Almora while it was longest (88.38 days) at Shimla (Table 37). The variation in flowering time among the entries was wider at Shimla (67.00–105.00 days). The entry check variety Durga showed consistency for early flowering over the locations and ranked first (62.25 days) based on the overall performance.

The average maturity period of the entries over the locations was 135.62 days (Table 38). The check, Durga was the earliest in maturity (123.50 days). The average maturity period was the minimum at Almora (98.26 days) while, it was the longest at Shimla (153.04 days).

The length of inflorescence (Table 39) of the entries was the highest at Shimla (66.25 cm) followed by at Almora (50.87 cm). Inflorescence length was

lowest (29.16 cm) at Sangla. Based on the average over four locations, the entry, IC313250 had the longest inflorescence (48.64 cm).

Test weight (Table 40) expressed in terms of weight of 10 ml seed recorded at four centres showed that it was the highest at Ranichauri (11.45 g) and very low at Sangla (6.56 g). The variation among the entries was relatively low. Based on the average over four locations the entry, KBGA-6 (9.13 g) showed the highest test weight.

### **3.1.2 Buckwheat (*Fagopyrum* spp.)**

Buckwheat is a multi-utility pseudocereal crop grown extensively in the higher hills and is a catch crop in the foot hills. In addition to its foliage and grain, it produces a glucoside called *rutin* that has important medicinal value against cardio-vascular ailments.

#### **3.1.2.1 Initial Varietal Trial and Advanced Varietal Trial (IVT, AVT-I)**

A combined trial of Initial Varietal Trial (5 entries) and Advanced Varietal Trial-I (3 entries) with four checks was conducted at four locations viz. Shimla, Ranichauri, Almora and Sangla, data were received from all locations. The summary performance of various entries in respect of grain yield and other important traits as compared to the checks has been given in Table 41. The check Shimla-B-1 was found superior in yield (5.98 q/ha).

Data on grain yield have been presented in Table 42. Significant differences were observed among the entries with respect to grain yield at one location. Seed yields at Ranichauri (2.24 q/ha) was comparatively very low. Highest seed yield was recorded at Almora (9.40 q/ha).

Average plant height (Table 43) was recorded to be the highest at Shimla (138.53 cm) followed by at Almora (109.25 cm). The check, PRB-1 was the tallest (132.85 cm) entry.

Flowering time varied from 34.00 to 70.33 days at Shimla, 34.00 to 51.33 days at Ranichauri and 51.33 to 66.67 days at Sangla centre (Table 44). Mean flowering time was the earliest at Almora (34.42 days) followed by at Shimla

(44.86 days). On the basis of average over four locations the check variety VL-7 was earliest in flowering (35.08 days).

Maturity period (Table 45) also showed similar trend as that of flowering time. Average maturity period was the earliest at Almora (66.73 days) followed by at Sangla (98.97 days). On the basis of average over four locations the check variety Shimla-B-1 was earliest in maturity (81.79 days).

The average test weight was recorded to be higher at Sangla (2.72 g) than at other centres (Table 46). On the basis of average over three locations VL-7 possessed the highest (2.50 g) test weight.

**Table 34: Performance of grain amaranth entries in Initial Varietal Trials (IVT ) during Kharif 2015 (Hills)**

S. No.	Genotypes	Mean maturity duration (days)	Mean weight of 10ml seed (g)	Mean seed yield over locations (q/ha)			Percent increase/decrease over check		
				Mean	Location	Rank	Annapurna	Durga	PRA 3
1	IC313250	130.83	8.52	16.54	4	6	18.12	-20.84	-7.31
2	IC341505	132.67	8.94	17.96	4	4	28.26	-14.04	0.65
3	IC361853	137.50	8.69	24.56	4	1	75.37	17.53	37.62
4	IC362199	135.58	8.84	23.02	4	2	64.33	10.13	28.95
5	KBGA-6	140.22	9.13	5.99	3	9	-57.22	-71.33	-66.43
6	KBGA-7	149.92	8.55	6.83	4	8	-51.21	-67.30	-61.71
7	Annapurna (C)	137.08	8.78	14.01	4	7	-	-32.98	-21.53
8	Durga (C)	123.50	8.69	20.90	4	3	49.21	-	17.09
9	PRA 3 (C)	133.25	8.77	17.85	4	5	27.43	-14.60	-
<b>Mean</b>		<b>135.62</b>	<b>8.77</b>	<b>16.41</b>					

**Table 35: Grain yield (q/ha) in Initial Varietal Trials (IVT ) on grain amaranth: Kharif 2015(Hills)**

S. No.	Genotypes	Almora	Ranichauri	Sangla	Shimla *	Mean	Rank	Location	Frequency
1	IC313250	6.13	13.81	5.19	41.05	16.54	6	4	0/4
2	IC341505	7.04	15.22	5.15	44.45	17.96	4	4	0/4
3	IC361853	8.00	16.63	7.22	66.40	24.56	1	4	0/4
4	IC362199	9.04	12.64	6.33	64.05	23.02	2	4	1/4
5	KBGA-6	3.21	11.27	3.50	-	5.99	9	3	0/3
6	KBGA-7	3.67	15.72	3.78	4.17	6.83	8	4	0/4
7	Annapurna (C)	7.63	16.77	5.41	26.22	14.01	7	4	-
8	Durga (C)	22.83	14.58	5.35	40.83	20.90	3	4	-
9	PRA 3 (C)	7.42	18.50	5.17	40.31	17.85	5	4	-
<b>Mean</b>		<b>8.33</b>	<b>15.02</b>	<b>5.23</b>	<b>40.94</b>	<b>16.41</b>	-	-	-
<b>CD (0.05)</b>		<b>1.95</b>	<b>0.11</b>	<b>0.57</b>	<b>3.35</b>	-	-	-	-
<b>CV (%) Error</b>		<b>13.54</b>	<b>0.41</b>	<b>6.28</b>	<b>4.71</b>	-	-	-	-

\* The grain yield very high at Shimla centre

**Table 36: Plant height(cm) in Initial Varietal Trials (IVT) on grain amaranth:Kharif 2015(Hills)**

S. No.	Genotypes	Almora	Ranichauri	Sangla	Shimla	Mean	Rank
<b>IVT</b>							
1	IC313250	145.33	147.67	138.27	290.10	180.34	5
2	IC341505	159.33	132.73	133.13	292.50	179.42	6
3	IC361853	173.00	123.73	143.97	306.40	186.77	2
4	IC362199	155.67	105.67	121.87	289.80	168.25	8
5	KBGA-6	205.33	141.97	155.43	-	167.58	9
6	KBGA-7	181.67	143.07	141.33	281.90	186.99	1
7	Annapurna (C)	152.67	155.33	147.77	278.50	183.57	4
8	Durga (C)	200.67	152.93	128.80	261.93	186.08	3
9	PRA 3 (C)	159.00	130.33	114.60	291.20	173.78	7
<b>Mean</b>		<b>170.30</b>	<b>137.05</b>	<b>136.13</b>	<b>286.54</b>	<b>179.20</b>	-
<b>CD (0.05)</b>		<b>23.38</b>	-	<b>7.53</b>	<b>21.62</b>	-	-
<b>CV (%) Error</b>		<b>7.93</b>	-	<b>3.19</b>	<b>4.34</b>	-	-

**Table 37: Days to flowering in Initial Varietal Trials (IVT ) on grain amaranth: Kharif 2015 (Hills)**

S. No.	Genotypes	Almora	Ranichauri	Sangla	Shimla	Mean	Rank
<b>IVT</b>							
1	IC313250	42.00	72.67	72.33	86.00	68.25	2
2	IC341505	47.00	75.67	77.00	85.33	71.25	4
3	IC361853	53.67	77.33	73.33	89.00	73.33	6
4	IC362199	46.67	75.67	68.67	89.00	70.00	3
5	KBGA-6	69.00	87.67	75.33	-	77.33	8
6	KBGA-7	69.33	89.67	75.67	105.00	84.92	9
7	Annapurna (C)	54.33	80.67	70.33	93.00	74.58	7
8	Durga (C)	51.33	68.33	62.33	67.00	62.25	1
9	PRA 3 (C)	46.33	78.33	69.33	92.67	71.67	5
<b>Mean</b>		<b>53.30</b>	<b>78.45</b>	<b>71.59</b>	<b>88.38</b>	<b>72.62</b>	-
<b>CD (0.05)</b>		<b>2.46</b>	-	<b>2.95</b>	<b>7.39</b>	-	-
<b>CV (%) Error</b>		<b>2.67</b>	-	<b>2.38</b>	<b>4.81</b>	-	-

**Table 38: Days to maturity in Initial Varietal Trials (IVT ) on grain amaranth: Kharif 2015 (Hills)**

S. No.	Genotypes	Almora	Ranichauri	Sangla	Shimla	Mean	Rank	Location	Frequency
1	IC313250	84.33	135.67	151.33	152.00	130.83	2	4	0/4
2	IC341505	90.00	138.67	153.00	149.00	132.67	3	4	0/4
3	IC361853	99.00	140.33	157.00	153.67	137.50	7	4	0/4
4	IC362199	95.00	138.67	154.33	154.33	135.58	5	4	1/4
5	KBGA-6	117.00	150.67	153.00	-	140.22	8	3	0/3
6	KBGA-7	117.00	152.67	150.67	179.33	149.92	9	4	0/4
7	Annapurna (C)	100.33	143.67	151.00	153.33	137.08	6	4	-
8	Durga (C)	86.33	131.33	148.33	128.00	123.50	1	4	-
9	PRA 3 (C)	95.33	132.67	150.33	154.67	133.25	4	4	-
<b>Mean</b>		<b>98.26</b>	<b>140.48</b>	<b>152.11</b>	<b>153.04</b>	<b>135.62</b>	-	-	-
<b>CD (0.05)</b>		<b>2.03</b>	-	<b>1.89</b>	<b>3.16</b>	-	-	-	-
<b>CV (%) Error</b>		<b>1.19</b>	-	<b>0.72</b>	<b>1.19</b>	-	-	-	-

**Table 39: Inflorescence length (cm) in Initial Varietal Trials (IVT ) on grain amaranth: Kharif 2015 (Hills)**

S. No.	Genotypes	Almora	Ranichauri	Sangla	Shimla	Mean	Rank
1	IC313250	48.77	46.13	31.90	67.77	48.64	1
2	IC341505	47.10	40.27	28.87	72.33	47.14	5
3	IC361853	53.77	35.87	29.83	71.03	47.63	3
4	IC362199	54.23	34.07	29.80	67.40	46.38	6
5	KBGA-6	63.47	31.87	23.83	-	39.72	9
6	KBGA-7	45.90	33.27	30.93	59.97	42.52	8
7	Annapurna (C)	44.33	50.47	33.30	61.87	47.49	4
8	Durga (C)	46.80	37.27	27.27	64.93	44.07	7
9	PRA 3 (C)	53.43	49.53	26.70	64.73	48.60	2
	<b>Mean</b>	<b>50.87</b>	<b>39.86</b>	<b>29.16</b>	<b>66.25</b>	<b>45.80</b>	-
	<b>CD (0.05)</b>	<b>15.65</b>	-	<b>5.08</b>	<b>7.98</b>	-	-
	<b>CV (%) Error</b>	<b>17.78</b>	-	<b>10.07</b>	<b>6.93</b>	-	-

**Table 40: Seed volume (g/10ml) in Initial Varietal Trials (IVT ) on grain amaranth: Kharif 2015 (Hills)**

S. No.	Genotypes	Almora	Ranichauri	Sangla	Shimla	Mean	Rank
1	IC313250	9.07	11.06	6.67	7.27	8.52	9
2	IC341505	9.61	11.76	7.33	7.05	8.94	2
3	IC361853	9.06	11.75	6.67	7.27	8.69	7
4	IC362199	9.80	11.47	6.33	7.75	8.84	3
5	KBGA-6	9.92	11.47	6.00	-	9.13	1
6	KBGA-7	9.34	11.09	6.67	7.09	8.55	8
7	Annapurna (C)	9.68	11.76	6.33	7.34	8.78	4
8	Durga (C)	9.96	11.63	6.33	6.83	8.69	6
9	PRA 3 (C)	9.76	11.05	6.67	7.59	8.77	5
<b>Mean</b>		<b>9.58</b>	<b>11.45</b>	<b>6.56</b>	<b>7.27</b>	<b>8.77</b>	-
<b>CD (0.05)</b>		<b>0.83</b>	-	<b>0.98</b>	<b>0.26</b>	-	-
<b>CV (%) Error</b>		<b>5.00</b>	-	<b>8.62</b>	<b>2.07</b>	-	-

**Table 41: Performance of buckwheat entries in Initial and Advanced Varietal Trials ( IVT & AVT) during Kharif 2015 (Hills)**

S. No.	Genotypes	Mean maturity duration (days)	Mean weight of 100 seed (g)	Mean seed yield over locations (q/ha)			Percent increase/decrease over check			
				Mean	Location	Rank	Himpriya	PRB-1	Shimla-B-1	VL-7
IVT										
1	IC329201	115.00	2.30	2.74	3	12	-53.37	-46.32	-54.28	-52.16
2	IC339688	93.17	1.97	3.35	4	11	-42.97	-34.35	-44.09	-41.49
3	IC341588	99.33	2.35	5.52	4	5	-5.97	8.24	-7.82	-3.53
4	IC341589	99.50	2.32	5.04	4	7	-14.17	-1.20	-15.85	-11.94
5	Sangla-B-400	96.17	2.26	5.57	4	4	-5.06	9.28	-6.93	-2.60
AVT-I										
6	IC013510	95.75	1.88	3.68	4	10	-37.20	-27.71	-38.43	-35.57
7	IC013533	94.56	2.01	4.26	4	9	-27.38	-16.41	-28.81	-25.50
8	IC412733	95.50	2.33	4.50	4	8	-23.35	-11.77	-24.86	-21.36
9	Himpriya (C)	111.96	1.86	5.87	4	2	-	15.11	-1.96	2.59
10	PRB-1 (C)	99.46	1.99	5.10	4	6	-13.12	-	-14.83	-10.87
11	Shimla-B-1 (C)	81.79	2.00	5.98	4	1	2.00	17.41	-	4.65
12	VL-7 (C)	85.54	2.50	5.72	4	3	-2.53	12.20	-4.44	-
Mean		97.31	2.15	4.78						

**Table 42: Grain yield (q/ha) in Initial and Advanced Varietal Trials (IVT & AVT) on buckwheat: Kharif 2015(Hills)**

S. No.	Genotypes	Almora	Ranichauri *	Sangla	Shimla	Mean	Rank	Location	Frequency
<b>IVT</b>									
1	IC329201		1.99	5.55	0.67	2.74	12	3	0/3
2	IC339688	5.51	1.57	5.37	0.94	3.35	11	4	0/4
3	IC341588	7.87	2.42	6.66	5.11	5.52	5	4	0/4
4	IC341589	9.17	2.48	4.72	3.78	5.04	7	4	0/4
5	Sangla-B-400	9.21	1.86	7.31	3.89	5.57	4	4	0/4
<b>AVT-I</b>									
6	IC013510	5.05	1.78	<b>6.85</b>	1.06	3.68	10	4	1/4
7	IC013533	10.51	1.87	3.52	1.15	4.26	9	4	0/4
8	IC412733	11.44	1.61	2.96	1.98	4.50	8	4	0/4
9	Himpriya (C)	9.86	2.57	5.83	5.21	5.87	2	4	-
10	PRB-1 (C)	7.73	3.32	4.61	4.73	5.10	6	4	-
11	Shimla-B-1 (C)	12.18	3.01	5.88	2.87	<b>5.98</b>	1	4	-
12	VL-7 (C)	14.86	2.38	3.22	2.41	5.72	3	4	-
<b>Mean</b>		<b>9.40</b>	<b>2.24</b>	<b>5.21</b>	<b>2.81</b>	<b>4.78</b>	-	-	-
<b>CD(0.05)</b>		<b>1.49</b>	<b>0.25</b>	<b>0.52</b>	<b>1.21</b>	-	-	-	-
<b>CV(%) Error</b>		<b>9.38</b>	<b>6.66</b>	<b>5.94</b>	<b>25.36</b>	-	-	-	-

\* Seed yield very low due to high rainfall

**Table 43: Plant height (cm) in Initial and Advanced Varietal Trials (IVT & AVT) on buckwheat: Kharif 2015 (Hills)**

S. No.	Genotypes	Almora	Ranichauri	Sangla	Shimla	Mean	Rank
<b>IVT</b>							
1	IC329201	58.00	95.47	101.00	228.27	120.68	4
2	IC339688	93.00	76.67	106.87	87.80	91.08	12
3	IC341588	104.00	97.47	109.40	129.03	109.98	5
4	IC341589	107.00	94.27	105.67	122.90	107.46	7
5	Sangla-B-400	107.00	84.13	99.47	110.73	100.33	10
<b>AVT-I</b>							
6	IC013510	101.00	92.80	108.83	106.37	102.25	9
7	IC013533	115.00	68.47	105.93	102.67	98.02	11
8	IC412733	131.00	125.47	108.13	148.90	128.38	2
9	Himpriya (C)	97.00	84.97	105.00	148.13	108.77	6
10	PRB-1 (C)	143.00	136.83	101.00	150.57	132.85	1
11	Shimla-B-1 (C)	148.00	94.85	71.33	168.90	120.77	3
12	VL-7 (C)	107.00	73.47	73.73	158.10	103.08	8
<b>Mean</b>		<b>109.25</b>	<b>93.74</b>	<b>99.70</b>	<b>138.53</b>	<b>110.30</b>	-
<b>CD(0.05)</b>		<b>21.74</b>		<b>6.10</b>	<b>33.51</b>	-	-
<b>CV(%) Error</b>		<b>11.77</b>		<b>3.62</b>	<b>14.31</b>	-	-

**Table 44: Days to 50% flowering in Initial and Advanced Varietal Trials (IVT & AVT) on buckwheat:Kharif 2015(Hills)**

S. No.	Genotypes	Almora	Ranichauri	Sangla	Shimla	Mean	Rank
<b>IVT</b>							
1	IC329201	79.00	43.67	66.67	58.00	61.83	12
2	IC339688	28.00	45.67	63.33	38.00	43.75	4
3	IC341588	34.00	42.67	64.33	42.00	45.75	5
4	IC341589	35.00	44.33	66.33	44.33	47.50	9
5	Sangla-B-400	38.00	44.67	57.67	51.33	47.92	10
<b>AVT-I</b>							
6	IC013510	32.00	51.33	62.00	40.33	46.42	7
7	IC013533	33.00	49.00	63.33	39.67	46.25	6
8	IC412733	24.00	38.33	63.33	37.67	40.83	3
9	Himpriya (C)	37.00	54.83	66.67	70.33	57.21	11
10	PRB-1 (C)	26.00	50.50	65.67	43.67	46.46	8
11	Shimla-B-1 (C)	26.00	41.67	51.33	39.00	39.50	2
12	VL-7 (C)	21.00	34.00	51.33	34.00	35.08	1
<b>Mean</b>		<b>34.42</b>	<b>45.06</b>	<b>61.83</b>	<b>44.86</b>	<b>46.54</b>	-
<b>CD(0.05)</b>		<b>3.71</b>	-	<b>1.68</b>	<b>4.96</b>	-	-
<b>CV(%) Error</b>		<b>6.37</b>	-	<b>1.61</b>	<b>6.55</b>	-	-

**Table 45: Days to maturity in Initial and Advanced Varietal Trials (IVT & AVT) on buckwheat: Kharif 2015 (Hills)**

S. No.	Genotypes	Almora	Ranichauri	Sangla	Shimla	Mean	Rank	Location	Frequency
<b>IVT</b>									
1	IC329201		103.67	100.67	140.67	115.00	12	3	0/3
2	IC339688	63.00	100.67	100.67	108.33	93.17	3	4	0/4
3	IC341588	71.00	102.67	99.67	124.00	99.33	8	4	0/4
4	IC341589	70.00	104.67	101.33	122.00	99.50	10	4	0/4
5	Sangla-B-400	76.00	98.67	86.00	124.00	96.17	7	4	0/4
<b>AVT-I</b>									
6	IC013510	71.00	104.67	101.67	105.67	95.75	6	4	0/4
7	IC013533	68.00	102.23	102.33	105.67	94.56	4	4	0/4
8	IC412733	61.00	100.67	104.67	115.67	95.50	5	4	0/4
9	Himpriya (C)	78.00	113.50	118.67	137.67	111.96	11	4	-
10	PRB-1 (C)	64.00	104.17	103.00	126.67	99.46	9	4	-
11	Shimla-B-1 (C)	58.00	88.17	84.67	96.33	81.79	1	4	-
12	VL-7 (C)	54.00	79.50	84.33	124.33	85.54	2	4	-
<b>Mean</b>		<b>66.73</b>	<b>100.27</b>	<b>98.97</b>	<b>119.25</b>	<b>97.31</b>	-	-	-
<b>CD(0.05)</b>		<b>1.31</b>	-	<b>1.48</b>	<b>5.76</b>	-	-	-	-
<b>CV(%) Error</b>		<b>1.16</b>	-	<b>0.89</b>	<b>2.86</b>	-	-	-	-

**Table 46: 100 seed weight (g) in Initial and Advanced Varietal Trials (IVT & AVT) on buckwheat: Kharif 2015 (Hills)**

S. No.	Genotypes	Ranichauri	Sangla	Shimla	Mean	Rank
<b>IVT</b>						
1	IC329201	1.74	3.03	2.13	2.30	5
2	IC339688	1.87	2.38	1.65	1.97	10
3	IC341588	1.90	3.02	2.14	2.35	2
4	IC341589	1.88	2.76	2.32	2.32	4
5	Sangla-B-400	1.54	3.10	2.14	2.26	6
<b>AVT-I</b>						
6	IC013510	1.67	2.59	1.38	1.88	11
7	IC013533	1.87	2.80	1.36	2.01	7
8	IC412733	1.55	3.08	2.34	2.33	3
9	Himpriya (C)	1.70	2.03	1.84	1.86	12
10	PRB-1 (C)	1.55	2.20	2.22	1.99	9
11	Shimla-B-1 (C)	1.34	3.03	1.64	2.00	8
12	VL-7 (C)	1.95	2.63	2.93	2.50	1
<b>Mean</b>		<b>1.71</b>	<b>2.72</b>	<b>2.01</b>	<b>2.15</b>	-
<b>CD(0.05)</b>		-	<b>0.19</b>	<b>0.03</b>	-	-
<b>CV(%) Error</b>		-	<b>4.23</b>	<b>0.95</b>	-	-

## 3.2 PLAINS

The Varietal Trials were constituted in grain amaranth, Winged bean, kalingada, Kankoda and Tumba and conducted during the Kharif 2015 season.

### 3.2.1 Grain Amaranth (*Amaranthus* spp.)

In grain amaranth the Initial Varietal Trial and the Advanced Varietal Trials were conducted during *Kharif* 2015 at two locations.

#### 3.2.1.1 Initial Varietal Trial (IVT): Kharif - 2014

In this trial 16 entries, including four checks, were tested at two locations and data were received from both the locations (Bengaluru and Mettupalayam). The performance of the entries as compared to the checks has been summarized in Table 47.

Significant differences were observed among the entries for grain yield at both the centres Bengaluru (13.09 q/ha) and Mettupalayam (8.75 q/ha) (Table 48). The entry RGA-1 (15.80 q/ha) was the highest yielding entry based on single location.

Average plant height of the entries differed significantly at both the locations (Table 49). Based on two locations check RMA-7 had the highest plant height (185.62 cm).

Flowering time showed no variation between two locations (Table 50). The entry RGA-10 (48.3 days) showed early flowering consistently at single location.

Maturity period also showed same trend as that of flowering time. The average maturity period of the entries over two locations was 92.13 days (Table 51). The entry SKGPA-72 was the earliest in maturity (88.30 days). The average maturity period was higher at Bengaluru (94.08 days) as compared to that observed at Mettupalayam (89.47 days).

The length of inflorescence (Table 52) of the entries was the highest at Mettupalayam (58.08 cm) followed by at Bengaluru (46.55 cm). Based on the average over two locations, the entry, SKGPA-72 had the longest inflorescence (57.80 cm).

Test weight (Table 53) as measured by the weight of 10 ml seed was highest at Bengaluru (8.31 g) and Mettupalayam (7.26 g). Based on two locations the entry SKNA-908 had the highest seed weight (7.97 g).

### **3.2.1.2 Advanced Varietal Trial-1 (AVT-I): Kharif - 2015**

The trial comprising 13 entries including four checks was proposed to be conducted at two locations and data have been received from both the centres. The summary of performance of the entries has been presented in Table 54.

No significant differences were observed among the entries for grain yield at both the centres (Table 55). Seed yield levels was low at Mettupalayam (9.76 q/ha) and high at Bengaluru (12.79 q/ha). The check variety, Suvarna (14.37 q/ha) was the highest yielder based on two locations.

Plant height was the highest at Mettupalayam (202.30 cm) and lowest at Bengaluru (156.44 cm) centre (Table 56). On the basis of average over the locations RMA-7 (193.62 cm) had the highest plant height whereas GA-2 had the lowest (168.63 cm).

Flowering time was the earliest at Bengaluru (50.62 days) and delayed at Mettupalayam (55.46 days) centre (Table 57). On the basis of average over the locations the entry KBGA-4 (48.50 days) was earliest in flowering.

Maturity period was the earliest at Mettupalayam (90.85 days) and delayed at Bengaluru (92.54 days) centre (Table 58). The entry KBGA-4 (89.20 days) was the earliest maturing line based on two locations.

The length of inflorescence (Table 59) of the entries was the highest at Mettupalayam (53.27 cm) followed by at Bengaluru (51.01 cm). Based on the average over two locations, the check, RMA-7 had the longest inflorescence (59.50 cm).

Test weight (Table 60) as measured by the weight of 10 ml seed was highest at Bengaluru (8.27 g) and Mettupalayam (7.31 g). Based on two locations the entry KBGA-3 had the highest seed weight (8.07 g).

### **3.2.1.3 Advanced Varietal Trial-I1 (AVT-II): Kharif - 2015**

The trial comprising 12 entries including four checks was proposed to be conducted at two locations and data have been received from both the centres. The summary of performance of the entries has been presented in Table 61.

No significant differences were observed among the entries for grain yield at both the centres (Table 62). Seed yield levels was low at Mettupalayam (9.06 q/ha) and high at Bengaluru (13.86 q/ha). The check variety, Suvarna (14.35 q/ha) was the highest yielder based on two locations.

Plant height was the highest at Mettupalayam (208.17 cm) and lowest at Bengaluru (155.87 cm) centre (Table 63). On the basis of average over the locations BGA-43 (232.60 cm) had the highest plant height whereas BGA-11 had the lowest (163.58 cm).

Flowering time was the earliest at Bengaluru (50.80 days) and delayed at Mettupalayam (55.46 days) centre (Table 64). On the basis of average over the locations the check BGA-2 (48.20 days) was earliest in flowering.

Maturity period was the earliest at Mettupalayam (93.08 days) and delayed at Bengaluru (94.20 days) centre (Table 65). The entry KBGA-1 (90.30 days) was the earliest maturing line based on two locations.

The length of inflorescence (Table 66) of the entries was the highest at Mettupalayam (64.60 cm) followed by at Bengaluru (50.11 cm). Based on the average over two locations, the entry, BGA-43 had the longest inflorescence (83.87 cm).

Test weight (Table 67) as measured by the weight of 10 ml seed was highest at Mettupalayam (8.14 g) and Bengaluru (7.18 g). Based on two locations the entry BGA-21 had the highest seed weight (8.12 g).

### **3.2.2 Winged Bean (*Psophocarpus tetragonolobus*)**

#### **3.2.2.1 Initial and Advanced Varietal Trials (IVT, AVT-I & AVT-II)**

The IVT, AVT-I and AVT-II comprising of five entries and one check was conducted at four locations. The results have been received from three locations. The summary of performance of the entries has been given in Table 68.

Significant variation was observed for seed yield at three locations. Seed yield (Table 69) was the highest at Ambikapur (15.66 q/ha) followed by Rahuri (12.66 q/ha). The entry AWB-13-4 yielded the highest (14.43 q/ha).

Average flowering time at three centres ranged between 59.83 and 100.04 days (Table 70). Based on three locations data the entry AWB-13-5 flowered the earliest (73.25 days).

Maturity period of the entries was recorded at three centres (Table 71). The average maturity period was the lowest at Ranchi (166.08 days) and highest at Rahuri (196.25 days). Based on all locations data the check variety, AKWB-1 matured the earliest (173.00 days) whereas, the entry, RMD-WB-1 had the longest maturity period (178.93 days).

The mean 100-seed weight was the highest at Ambikapur (33.75 g) and the lowest at Rahuri (28.65 g) centre (Table 72). On the basis of average over three locations Ambika RMD-WB-1 had the largest seed (32.47 g).

### **3.2.3 Kalingada (*Citrullus lanatus*)**

Kalingada is primarily a vegetable crop grown for its unripe fruits which are used as vegetable. However, its seed yields useful oil. In Kalingada, Initial and Advanced Varietal Trials were proposed to be conducted during Kharif 2015 at four locations. Data have been received from three locations only.

### **3.2.3.1 Initial Varietal Trial (IVT) and Advanced Varietal Trial (AVI-I & II)**

The Initial Varietal Trial (IVT) and Advanced Varietal Trial (AVT-I & II) consisting of 10 entries including check was planned to be conducted at four locations. Results have been received from two centres. The summary of performance of the entries has been given in Table 73.

Seed yield levels were highest at Jodhpur (6.02 q/ha) and very low at Jaisalmer (1.14 q/ha). Based on three locations data the entry, SKNK-13-01 was the highest yielder (4.70 q/ha). Fruit yield was the highest at Jodhpur (169.10 q/ha) and lowest at Jaisalmer (34.19 q/ha) centre. Based on the average SKNK-13-1 (132.82 q/ha) was the highest fruit yielder (Table 74).

The average days to fruit setting period of the entries over all the locations was 37.73 days. The entry, CAZJK-13-1 was the earliest in fruit setting (39.00 days). No variation in average fruit setting period among the locations (Table 75). Test weight recorded at two centres showed that it was the highest at Jodhpur (7.07 g) and low at S.K. Nagar (6.75 g). Based on the average over two locations, the entry SKNK-11-02 (7.21 g) showed the highest test weight (Table 75).

### **3.2.4 Kankoda (*Momordica dioica*)**

Kankoda is an important vegetable crop grown throughout the country. It's green immature fruits are preferred for their delicacy. In Kankoda one Advanced Varietal Trial was proposed to be conducted.

#### **3.2.4.1 Advanced Varietal Trial (AVT-I-II)**

The Advanced Varietal Trial on five Kankoda entries was planned to be conducted at three locations. The results have been received from only Ambikapur and Faizabad centres. The performance of the entries has been presented in Table 76.

The entry RMDFG-3 (33.10 q/ha) was the highest yielder and earliest in days taken to first picking (57.15 days).

### **3.2.5 Tumba (*Citrullus colocynthis*)**

Tumba is an important crop of the desert region having wide medicinal value. Its seed is used for extracting oil which is used for industrial purposes. In tumba an Initial Varietal Trial was formulated.

#### **3.2.5.1 Initial Varietal Trial (IVT)**

In this trial 10 entries including a check was conducted at three locations but no result has been received from any centre.

**Table 47: Performance of grain amaranth entries in Initial Varietal Trial (IVT) during Kharif (2015) - Plains**

S. No.	Genotypes	Mean maturity duration (days)	Overall mean seed weight (g/10ml)	Mean seed yield over locations (q/ha)			Percent increase/decrease over check			
				Mean	Location	Rank	BGA-2	GA-2	RMA-7	Suvarna
1	BGA-4-9	94.17	7.63	10.60	2	10	-28.19	-1.03	20.70	-31.25
2	BGA-8-5	93.33	7.65	10.00	2	14	-32.21	-6.57	13.93	-35.10
3	KBGA-5	90.83	7.97	13.43	2	5	-8.99	25.43	52.96	-12.87
4	RGA-10	93.33	7.83	10.40	2	12	-29.54	-2.90	18.41	-32.55
5	RGA-11	96.33	8.67	15.80	2	1	7.05	47.53	79.91	2.49
6	RGA-12	93.00	8.50	12.76	2	6	-13.54	19.15	45.30	-17.23
7	RMA-57	92.83	7.78	6.89	2	20	-53.34	-35.70	-21.58	-55.33
8	RMA-58	93.17	7.72	10.01	2	13	-32.16	-6.51	14.01	-35.05
9	RMA-59	92.33	7.87	9.00	2	17	-38.98	-15.90	2.55	-41.58
10	SKGPA-68	91.50	7.75	9.61	2	15	-34.89	-10.26	9.44	-37.66
11	SKGPA-72	88.33	7.80	11.24	2	7	-23.82	4.98	28.02	-27.07
12	SKGPA-74	89.83	7.83	15.34	2	3	3.92	43.22	74.65	-0.51
13	SKGPA-86	89.33	7.77	8.83	2	18	-40.18	-17.56	0.54	-42.73
14	SKGPA-91	92.83	7.75	9.57	2	16	-35.17	-10.66	8.95	-37.94
15	SKNA-1003	90.83	7.75	10.44	2	11	-29.26	-2.51	18.88	-32.28
16	SKNA-1008	92.50	7.73	11.16	2	8	-24.34	4.27	27.15	-27.57
17	BGA-2 (C)	90.00	7.90	14.76	2	4	-	37.82	68.07	-4.26
18	GA-2 (C)	91.00	7.70	10.71	2	9	-27.44	-	21.95	-30.53
19	RMA-7 (C)	95.50	7.92	8.78	2	19			-	
20	Suvarna (C)	91.67	7.83	15.41	2	2	4.45	43.96	75.55	-
<b>Mean</b>		<b>92.13</b>	<b>7.87</b>	<b>11.24</b>						

**Table 48: Grain yield (q/ha) in Initial Varietal Trial (IVT) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank	Location	Frequency
1	BGA-4-9	11.63	9.57	10.60	10	2	0/2
2	BGA-8-5	10.67	9.33	10.00	14	2	0/2
3	KBGA-5	18.03	8.83	13.43	5	2	0/2
4	RGA-10	10.40	-	10.40	12	1	0/1
5	RGA-11	15.80	-	15.80	1	1	0/1
6	RGA-12	12.76	-	12.76	6	1	0/1
7	RMA-57	7.24	6.53	6.89	20	2	0/2
8	RMA-58	12.59	7.43	10.01	13	2	0/2
9	RMA-59	10.74	7.27	9.00	17	2	0/2
10	SKGPA-68	9.58	9.63	9.61	15	2	0/2
11	SKGPA-72	13.08	9.40	11.24	7	2	0/2
12	SKGPA-74	<b>21.30</b>	9.37	15.34	3	2	1/2
13	SKGPA-86	8.82	8.83	8.83	18	2	0/2
14	SKGPA-91	10.87	8.27	9.57	16	2	0/2
15	SKNA-1003	12.14	8.73	10.44	11	2	0/2
16	SKNA-1008	13.33	9.00	11.16	8	2	0/2
17	BGA-2 (C)	18.28	11.23	14.76	4	2	-
18	GA-2 (C)	14.32	7.10	10.71	9	2	-
19	RMA-7 (C)	11.66	5.90	8.78	19	2	-
20	Suvarna (C)	18.56	12.27	15.41	2	2	-
	<b>Mean</b>	<b>13.09</b>	<b>8.75</b>	<b>11.24</b>	-	-	-
	<b>CD (0.05)</b>	<b>2.49</b>	<b>0.41</b>	-	-	-	-
	<b>CV (%) Error</b>	<b>11.89</b>	<b>2.90</b>	-	-	-	-

**Table 49: Plant height (cm) in Initial Varietal Trial (IVT) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-4-9	144.00	174.30	159.15	13
2	BGA-8-5	146.67	171.13	158.90	14
3	KBGA-5	127.80	218.53	173.17	6
4	RGA-10	126.80	-	126.80	20
5	RGA-11	132.60	-	132.60	19
6	RGA-12	164.67	-	164.67	8
7	RMA-57	137.60	191.00	164.30	10
8	RMA-58	160.53	187.53	174.03	5
9	RMA-59	140.80	181.37	161.08	11
10	SKGPA-68	121.87	177.07	149.47	17
11	SKGPA-72	153.67	192.33	173.00	7
12	SKGPA-74	167.33	195.87	181.60	2
13	SKGPA-86	141.00	187.87	164.43	9
14	SKGPA-91	139.33	180.63	159.98	12
15	SKNA-1003	126.60	185.97	156.28	15
16	SKNA-1008	135.33	173.00	154.17	16
17	BGA-2 (C)	144.20	215.87	180.03	3
18	GA-2 (C)	115.00	182.63	148.82	18
19	RMA-7 (C)	152.00	219.23	185.62	1
20	Suvarna (C)	164.60	188.80	176.70	4
	<b>Mean</b>	<b>142.12</b>	<b>189.60</b>	<b>162.24</b>	-
	<b>CD (0.05)</b>	<b>10.86</b>	<b>13.33</b>	-	-
	<b>CV (%) Error</b>	<b>4.77</b>	<b>4.39</b>	-	-

**Table 50: Days to flowering in Initial Varietal Trial (IVT) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-4-9	51.67	61.00	56.3	14
2	BGA-8-5	50.33	54.67	52.5	11
3	KBGA-5	48.67	54.67	51.7	9
4	RGA-10	48.33	-	48.3	1
5	RGA-11	51.33	-	51.3	8
6	RGA-12	48.67	-	48.7	2
7	RMA-57	50.67	63.00	56.8	17
8	RMA-58	51.67	61.00	56.3	14
9	RMA-59	47.67	51.67	49.7	6
10	SKGPA-68	52.00	51.67	51.8	10
11	SKGPA-72	48.00	57.67	52.8	12
12	SKGPA-74	47.33	50.67	49.0	4
13	SKGPA-86	49.00	63.00	56.0	13
14	SKGPA-91	51.00	63.33	57.2	18
15	SKNA-1003	47.00	52.00	49.5	5
16	SKNA-1008	49.00	64.33	56.7	16
17	BGA-2 (C)	52.00	<b>49.00</b>	50.5	7
18	GA-2 (C)	52.33	<b>63.67</b>	58.0	19
19	RMA-7 (C)	53.00	<b>64.33</b>	58.7	20
20	Suvarna (C)	46.67	<b>51.00</b>	48.8	3
	<b>Mean</b>	<b>49.82</b>	<b>57.45</b>	<b>53.03</b>	-
	<b>CD (0.05)</b>	<b>3.51</b>	<b>1.01</b>	-	-
	<b>CV (%) Error</b>	<b>4.40</b>	<b>1.09</b>	-	-

**Table 51: Days to maturity in Initial Varietal Trial (IVT) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank	Location	Frequency
1	BGA-4-9	95.33	93.00	94.2	18	2	0/2
2	BGA-8-5	95.33	91.33	93.3	16	2	0/2
3	KBGA-5	93.67	88.00	90.8	5	2	0/2
4	RGA-10	93.33	-	93.3	16	1	0/1
5	RGA-11	96.33	-	96.3	20	1	0/1
6	RGA-12	93.00	-	93.0	14	1	0/1
7	RMA-57	95.67	90.00	92.8	12	2	0/2
8	RMA-58	96.67	89.67	93.2	15	2	0/2
9	RMA-59	92.67	92.00	92.3	10	2	0/2
10	SKGPA-68	95.67	87.33	91.5	8	2	0/2
11	SKGPA-72	93.00	<b>83.67</b>	88.3	1	2	1/2
12	SKGPA-74	93.00	86.67	89.8	3	2	0/2
13	SKGPA-86	94.00	84.67	89.3	2	2	0/2
14	SKGPA-91	96.00	89.67	92.8	12	2	0/2
15	SKNA-1003	92.00	89.67	90.8	5	2	0/2
16	SKNA-1008	94.00	91.00	92.5	11	2	0/2
17	BGA-2 (C)	93.00	87.00	90.0	4	2	-
18	GA-2 (C)	89.33	92.67	91.0	7	2	-
19	RMA-7 (C)	98.00	93.00	95.5	19	2	-
20	Suvarna (C)	91.67	91.67	91.7	9	2	-
<b>Mean</b>		<b>94.08</b>	<b>89.47</b>	<b>92.13</b>	-	-	-
<b>CD (0.05)</b>		<b>2.87</b>	<b>0.90</b>	-	-	-	-
<b>CV (%) Error</b>		<b>1.91</b>	<b>0.63</b>	-	-	-	-

**Table 52: Inflorescence length (cm) in Initial Varietal Trial (IVT) on grain amaranth: Kharif 2015 (Plains)**

S.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-4-9	43.67	61.43	52.55	9
2	BGA-8-5	48.53	57.50	53.02	7
3	KBGA-5	41.33	61.80	51.57	12
4	RGA-10	46.33	-	46.33	18
5	RGA-11	42.73	-	42.73	20
6	RGA-12	57.33	-	57.33	3
7	RMA-57	41.67	53.87	47.77	17
8	RMA-58	56.93	58.33	57.63	2
9	RMA-59	49.93	48.70	49.32	15
10	SKGPA-68	37.00	67.30	52.15	10
11	SKGPA-72	52.00	63.60	57.80	1
12	SKGPA-74	55.00	54.87	54.93	5
13	SKGPA-86	46.33	68.03	57.18	4
14	SKGPA-91	47.73	58.20	52.97	8
15	SKNA-1003	43.33	55.57	49.45	14
16	SKNA-1008	45.00	58.27	51.63	11
17	BGA-2 (C)	37.93	60.07	49.00	16
18	GA-2 (C)	40.73	49.20	44.97	19
19	RMA-7 (C)	45.73	62.38	54.06	6
20	Suvarna (C)	51.73	48.30	50.02	13
<b>Mean</b>		<b>46.55</b>	<b>58.08</b>	<b>51.62</b>	-
<b>CD (0.05)</b>		<b>7.76</b>	<b>5.14</b>	-	-
<b>CV (%) Error</b>		<b>10.42</b>	<b>5.53</b>	-	-

**Table 53: Seed volume (g/10ml) in Initial Varietal Trial (IVT) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-4-9	8.00	7.27	7.63	20
2	BGA-8-5	8.00	7.30	7.65	19
3	KBGA-5	8.50	7.43	7.97	3
4	RGA-10	7.83	-	7.83	9
5	RGA-11	8.67	-	8.67	1
6	RGA-12	8.50	-	8.50	2
7	RMA-57	8.50	7.07	7.78	11
8	RMA-58	8.33	7.10	7.72	17
9	RMA-59	8.67	7.07	7.87	6
10	SKGPA-68	8.33	7.17	7.75	13
11	SKGPA-72	8.33	7.27	7.80	10
12	SKGPA-74	8.50	7.17	7.83	7
13	SKGPA-86	8.33	7.20	7.77	12
14	SKGPA-91	8.17	7.33	7.75	13
15	SKNA-1003	8.33	7.17	7.75	13
16	SKNA-1008	8.33	7.13	7.73	16
17	BGA-2 (C)	8.33	7.47	7.90	5
18	GA-2 (C)	8.10	7.30	7.70	18
19	RMA-7 (C)	8.50	7.33	7.92	4
20	Suvarna (C)	8.00	7.67	7.83	7
<b>Mean</b>		<b>8.31</b>	<b>7.26</b>	<b>7.87</b>	-
<b>CD (0.05)</b>		<b>0.59</b>	<b>0.22</b>	-	-
<b>CV (%) Error</b>		<b>4.47</b>	<b>1.86</b>	-	-

**Table 54: Performance of grain amaranth entries in Advanced Varietal Trial-I (AVT-I) during Kharif (2015) - Plains**

S. No.	Genotypes	Mean maturity duration (days)	Overall mean seed weight (g/10ml)	Mean seed yield over locations (q/ha)			Percent increase/decrease over check			
				Mean	Location	Rank	BGA-2	GA-2	RMA-7	Suvarna
1	BGA-07-1	92.00	8.00	10.09	2	9	-26.34	-2.17	22.80	-29.77
2	BGA-10-2	91.00	7.78	10.15	2	8	-25.88	-1.56	23.56	-29.34
3	BGA-11-1	92.50	7.83	9.59	2	12	-29.98	-7.00	16.73	-33.24
4	KBGA-3	90.67	8.07	11.94	2	5	-12.81	15.80	45.35	-16.88
5	KBGA-4	89.17	7.60	14.30	2	2	4.40	38.66	74.04	-0.47
6	MGA-15	92.00	7.90	13.22	2	4	-3.52	28.14	60.84	-8.02
7	SKNA-401	91.00	7.95	10.00	2	10	-26.98	-3.01	21.74	-30.38
8	SKNA-403	91.50	7.72	9.73	2	11	-28.98	-5.67	18.40	-32.29
9	SKNA-908	91.00	7.52	10.94	2	6	-20.11	6.11	33.19	-23.83
10	BGA-2 (C)	89.67	7.73	13.70	2	3	-	32.82	66.71	-4.66
11	GA-2 (C)	93.50	7.75	10.31	2	7	-24.71	-	25.52	-28.22
12	RMA-7 (C)	97.67	7.78	8.22	2	13	-40.02	-20.33	-	-42.81
13	Suvarna (C)	90.33	7.67	14.37	2	1	4.89	39.31	74.86	-
<b>Mean</b>		<b>91.69</b>	<b>7.79</b>	<b>11.27</b>						

**Table 55: Grain yield (q/ha) in Advanced Varietal Trial-I (AVT-I) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank	Location	Frequency
1	BGA-07-1	9.48	10.70	10.09	9	2	0/2
2	BGA-10-2	10.07	10.23	10.15	8	2	0/2
3	BGA-11-1	9.72	9.47	9.59	12	2	0/2
4	KBGA-3	14.22	9.67	11.94	5	2	0/2
5	KBGA-4	18.70	9.90	14.30	2	2	0/2
6	MGA-15	16.10	10.33	13.22	4	2	0/2
7	SKNA-401	10.07	9.93	10.00	10	2	0/2
8	SKNA-403	10.19	9.27	9.73	11	2	0/2
9	SKNA-908	11.45	10.43	10.94	6	2	0/2
10	BGA-2 (C)	15.99	11.40	13.70	3	2	-
11	GA-2 (C)	13.63	7.00	10.31	7	2	-
12	RMA-7 (C)	10.47	5.97	8.22	13	2	-
13	Suvarna (C)	16.20	12.53	14.37	1	2	-
<b>Mean</b>		<b>12.79</b>	<b>9.76</b>	<b>11.27</b>	-	-	-
<b>CD (0.05)</b>		<b>2.35</b>	<b>0.69</b>	-	-	-	-
<b>CV (%) Error</b>		<b>10.93</b>	<b>4.19</b>	-	-	-	-

**Table 56: Plant height (cm) in Advanced Varietal Trial-I (AVT-I) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-07-1	153.67	195.87	174.77	11
2	BGA-10-2	171.67	193.50	182.58	4
3	BGA-11-1	155.67	194.60	175.13	10
4	KBGA-3	134.40	195.50	164.95	13
5	KBGA-4	141.33	221.67	181.50	6
6	MGA-15	161.67	204.13	182.90	3
7	SKNA-401	157.67	195.17	176.42	9
8	SKNA-403	156.20	208.83	182.52	5
9	SKNA-908	146.33	210.07	178.20	7
10	BGA-2 (C)	176.07	211.17	193.62	1
11	GA-2 (C)	145.87	191.40	168.63	12
12	RMA-7 (C)	177.67	209.57	193.62	1
13	Suvarna (C)	155.53	198.43	176.98	8
<b>Mean</b>		<b>156.44</b>	<b>202.30</b>	<b>179.37</b>	-
<b>CD (0.05)</b>		<b>18.04</b>	<b>9.75</b>	-	-
<b>CV (%) Error</b>		<b>6.86</b>	<b>2.87</b>	-	-

**Table 57: Days to flowering in Advanced Varietal Trial-I (AVT-I) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-07-1	51.67	48.33	50.0	3
2	BGA-10-2	50.33	52.67	51.5	6
3	BGA-11-1	53.00	49.67	51.3	5
4	KBGA-3	48.33	57.00	52.7	8
5	KBGA-4	49.67	47.33	48.5	1
6	MGA-15	51.00	52.33	51.7	7
7	SKNA-401	50.33	60.67	55.5	9
8	SKNA-403	50.67	62.67	56.7	11
9	SKNA-908	49.67	61.67	55.7	10
10	BGA-2 (C)	49.00	48.33	48.7	2
11	GA-2 (C)	50.00	64.67	57.3	12
12	RMA-7 (C)	55.00	64.67	59.8	13
13	Suvarna (C)	49.33	51.00	50.2	4
<b>Mean</b>		<b>50.62</b>	<b>55.46</b>	<b>53.04</b>	-
<b>CD (0.05)</b>		<b>4.20</b>	<b>0.94</b>	-	-
<b>CV (%) Error</b>		<b>4.93</b>	<b>1.01</b>	-	-

**Table 58: Days to maturity in Advanced Varietal Trial-I (AVT-I) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank	Location	Frequency
1	BGA-07-1	93.67	90.33	92.0	9	2	0/2
2	BGA-10-2	92.33	89.67	91.0	5	2	0/2
3	BGA-11-1	95.00	90.00	92.5	11	2	0/2
4	KBGA-3	90.33	91.00	90.7	4	2	0/2
5	KBGA-4	91.67	<b>86.67</b>	89.2	1	2	1/2
6	MGA-15	93.00	91.00	92.0	9	2	0/2
7	SKNA-401	92.33	89.67	91.0	5	2	0/2
8	SKNA-403	92.67	90.33	91.5	8	2	0/2
9	SKNA-908	91.67	90.33	91.0	5	2	0/2
10	BGA-2 (C)	91.00	88.33	89.7	2	2	-
11	GA-2 (C)	92.00	95.00	93.5	12	2	-
12	RMA-7 (C)	97.00	98.33	97.7	13	2	-
13	Suvarna (C)	90.33	90.33	90.3	3	2	-
<b>Mean</b>		<b>92.54</b>	<b>90.85</b>	<b>91.69</b>	-	-	-
<b>CD (0.05)</b>		<b>4.13</b>	<b>1.28</b>	-	-	-	-
<b>CV (%) Error</b>		<b>2.65</b>	<b>0.84</b>	-	-	-	-

**Table 59: Inflorescence length (cm) in Advanced Varietal Trial-I (AVT-I) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-07-1	53.60	54.30	53.95	5
2	BGA-10-2	57.13	51.97	54.55	3
3	BGA-11-1	59.33	50.43	54.88	2
4	KBGA-3	41.13	55.20	48.17	13
5	KBGA-4	45.40	57.00	51.20	8
6	MGA-15	49.20	55.03	52.12	6
7	SKNA-401	50.07	48.33	49.20	12
8	SKNA-403	54.47	54.20	54.33	4
9	SKNA-908	47.27	51.97	49.62	9
10	BGA-2 (C)	51.00	47.93	49.47	11
11	GA-2 (C)	48.00	51.00	49.50	10
12	RMA-7 (C)	58.33	60.67	59.50	1
13	Suvarna (C)	48.13	54.43	51.28	7
<b>Mean</b>		<b>51.01</b>	<b>53.27</b>	<b>52.14</b>	-
<b>CD (0.05)</b>		<b>6.17</b>	<b>4.61</b>	-	-
<b>CV (%) Error</b>		<b>7.19</b>	<b>5.14</b>	-	-

**Table 60: Seed volume (g/10ml) in Advanced Varietal Trial-I (AVT-I) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-07-1	8.63	7.37	8.00	2
2	BGA-10-2	8.27	7.30	7.78	6
3	BGA-11-1	8.23	7.43	7.83	5
4	KBGA-3	8.83	7.30	8.07	1
5	KBGA-4	8.00	7.20	7.60	12
6	MGA-15	8.40	7.40	7.90	4
7	SKNA-401	8.73	7.17	7.95	3
8	SKNA-403	8.17	7.27	7.72	10
9	SKNA-908	7.83	7.20	7.52	13
10	BGA-2 (C)	8.13	7.33	7.73	9
11	GA-2 (C)	8.17	7.33	7.75	8
12	RMA-7 (C)	8.33	7.23	7.78	6
13	Suvarna (C)	7.83	7.50	7.67	11
<b>Mean</b>		<b>8.27</b>	<b>7.31</b>	<b>7.79</b>	-
<b>CD (0.05)</b>		<b>0.73</b>	<b>0.18</b>	-	-
<b>CV (%) Error</b>		<b>5.28</b>	<b>1.43</b>	-	-

**Table 61: Performance of grain amaranth entries in Advanced Varietal Trial-II (AVT-II) during Kharif (2015) - Plains**

S. No.	Genotypes	Mean maturity duration (days)	Overall mean seed weight (g/10ml)	Mean seed yield over locations (q/ha)			Percent increase/decrease over check			
				Mean	Location	Rank	BGA-2	GA-2	RMA-7	Suvarna
1	BGA-04	93.17	7.77	10.95	2	7	-21.58	-4.22	-2.81	-23.67
2	BGA-11	92.17	7.75	11.12	2	6	-20.36	-2.73	-1.30	-22.48
3	BGA-12	94.50	8.12	10.81	2	8	-22.64	-5.51	-4.11	-24.69
4	BGA-21	92.67	7.20	9.53	2	10	-31.78	-16.68	-15.45	-33.60
5	BGA-38	91.33	7.40	9.40	2	11	-32.70	-17.79	-16.58	-34.49
6	BGA-43	94.67	7.20	10.77	2	9	-22.91	-5.84	-4.46	-24.96
7	KBGA-1	90.33	7.53	12.36	2	3	-11.53	8.06	9.65	-13.88
8	RMA-45	97.50	7.43	7.76	2	12	-44.46	-32.16	-31.16	-45.94
9	BGA-2 (C)	90.50	7.88	13.97	2	2	-	22.14	23.94	-2.66
10	GA-2 (C)	95.33	7.68	11.43	2	4	-18.13	-	1.47	-20.31
11	RMA-7 (C)	98.17	7.62	11.27	2	5	-19.32	-1.45	-	-21.46
12	Suvarna (C)	92.17	7.48	14.35	2	1	2.73	25.48	27.33	-
<b>Mean</b>		<b>93.54</b>	<b>7.59</b>	<b>11.14</b>						

**Table 62: Grain yield (q/ha) in Advanced Varietal Trial-II (AVT-II) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank	Location	Frequency
1	BGA-04	13.54	8.37	10.95	7	2	0/2
2	BGA-11	12.91	9.33	11.12	6	2	0/2
3	BGA-12	12.41	9.20	10.81	8	2	0/2
4	BGA-21	10.66	8.40	9.53	10	2	0/2
5	BGA-38	-	9.40	9.40	11	1	0/1
6	BGA-43	-	10.77	10.77	9	1	0/1
7	KBGA-1	16.05	8.67	12.36	3	2	0/2
8	RMA-45	8.15	7.37	7.76	12	2	0/2
9	BGA-2 (C)	16.63	11.30	13.97	2	2	-
10	GA-2 (C)	15.67	7.20	11.43	4	2	-
11	RMA-7 (C)	16.17	6.37	11.27	5	2	-
12	Suvarna (C)	16.40	12.30	14.35	1	2	-
<b>Mean</b>		<b>13.86</b>	<b>9.06</b>	<b>11.14</b>	-	-	-
<b>CD (0.05)</b>		<b>2.73</b>	<b>0.45</b>	-	-	-	-
<b>CV (%) Error</b>		<b>11.37</b>	<b>2.95</b>	-	-	-	-

**Table 63: Plant height (cm) in Advanced Varietal Trial-II (AVT-II) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-04	151.33	184.33	167.83	9
2	BGA-11	134.93	192.23	163.58	12
3	BGA-12	140.00	193.30	166.65	10
4	BGA-21	147.13	193.33	170.23	8
5	BGA-38	-	219.20	219.20	2
6	BGA-43	-	232.60	232.60	1
7	KBGA-1	147.00	231.00	189.00	5
8	RMA-45	164.33	187.63	175.98	7
9	BGA-2 (C)	181.67	230.53	206.10	4
10	GA-2 (C)	141.70	186.20	163.95	11
11	RMA-7 (C)	170.27	204.53	187.40	6
12	Suvarna (C)	180.33	243.13	211.73	3
<b>Mean</b>		<b>155.87</b>	<b>208.17</b>	<b>187.86</b>	-
<b>CD (0.05)</b>		<b>13.55</b>	<b>10.25</b>	-	-
<b>CV (%) Error</b>		<b>5.02</b>	<b>2.91</b>	-	-

**Table 64: Days to flowering in Advanced Varietal Trial-II (AVT-II) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-04	50.67	54.33	52.5	6
2	BGA-11	50.00	54.33	52.2	5
3	BGA-12	53.00	47.33	50.2	3
4	BGA-21	50.67	60.67	55.7	9
5	BGA-38	-	59.67	59.7	12
6	BGA-43	-	53.00	53.0	7
7	KBGA-1	48.00	51.67	49.8	2
8	RMA-45	50.00	58.67	54.3	8
9	BGA-2 (C)	48.00	48.33	48.2	1
10	GA-2 (C)	52.67	64.67	58.7	10
11	RMA-7 (C)	53.67	63.67	58.7	10
12	Suvarna (C)	51.33	50.67	51.0	4
<b>Mean</b>		<b>50.80</b>	<b>55.58</b>	<b>53.65</b>	-
<b>CD (0.05)</b>		<b>1.73</b>	<b>0.96</b>	-	-
<b>CV (%) Error</b>		<b>1.80</b>	<b>1.03</b>	-	-

**Table 65: Days to maturity in Advanced Varietal Trial-II (AVT-II) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank	Location	Frequency
1	BGA-04	94.67	91.67	93.2	7	2	0/2
2	BGA-11	94.00	90.33	92.2	4	2	0/2
3	BGA-12	97.00	92.00	94.5	8	2	0/2
4	BGA-21	94.67	90.67	92.7	6	2	0/2
5	BGA-38	-	91.33	91.3	3	1	0/1
6	BGA-43	-	94.67	94.7	9	1	0/1
7	KBGA-1	88.00	92.67	90.3	1	2	0/2
8	RMA-45	94.00	101.00	97.5	11	2	0/2
9	BGA-2 (C)	92.00	89.00	90.5	2	2	-
10	GA-2 (C)	96.67	94.00	95.3	10	2	-
11	RMA-7 (C)	97.67	98.67	98.2	12	2	-
12	Suvarna (C)	93.33	91.00	92.2	4	2	-
<b>Mean</b>		<b>94.20</b>	<b>93.08</b>	<b>93.54</b>	-	-	-
<b>CD (0.05)</b>		<b>3.24</b>	<b>1.28</b>	-	-	-	-
<b>CV (%) Error</b>		<b>1.98</b>	<b>0.82</b>	-	-	-	-

**Table 66: Inflorescence length (cm) in Advanced Varietal Trial-II (AVT-II) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-04	47.80	63.63	55.72	6
2	BGA-11	50.87	65.37	58.12	5
3	BGA-12	46.00	59.90	52.95	10
4	BGA-21	44.53	63.53	54.03	8
5	BGA-38	-	63.10	63.10	3
6	BGA-43	-	83.87	83.87	1
7	KBGA-1	48.73	58.67	53.70	9
8	RMA-45	54.40	77.60	66.00	2
9	BGA-2 (C)	47.87	57.53	52.70	11
10	GA-2 (C)	58.67	61.13	59.90	4
11	RMA-7 (C)	49.27		49.27	12
12	Suvarna (C)	53.00	56.23	54.62	7
<b>Mean</b>		<b>50.11</b>	<b>64.60</b>	<b>58.66</b>	-
<b>CD (0.05)</b>		<b>7.34</b>	<b>4.56</b>	-	-
<b>CV (%) Error</b>		<b>8.46</b>	<b>4.18</b>	-	-

**Table 67: Seed volume (g/10ml) in Advanced Varietal Trial-II (AVT-II) on grain amaranth: Kharif 2015 (Plains)**

S. No.	Genotypes	Bengaluru	Mettupalayam	Mean	Rank
1	BGA-04	7.37	8.17	7.77	3
2	BGA-11	7.20	8.30	7.75	4
3	BGA-12	7.17	9.07	8.12	1
4	BGA-21	6.67	7.73	7.20	11
5	BGA-38	7.40	-	7.40	10
6	BGA-43	7.20	-	7.20	11
7	KBGA-1	7.23	7.83	7.53	7
8	RMA-45	6.57	8.30	7.43	9
9	BGA-2 (C)	7.37	8.40	7.88	2
10	GA-2 (C)	7.37	8.00	7.68	5
11	RMA-7 (C)	7.23	8.00	7.62	6
12	Suvarna (C)	7.37	7.60	7.48	8
<b>Mean</b>		<b>7.18</b>	<b>8.14</b>	<b>7.59</b>	-
<b>CD (0.05)</b>		<b>0.26</b>	<b>0.30</b>	-	-
<b>CV (%) Error</b>		<b>2.17</b>	<b>6.74</b>	-	-

**Table 68: Performance of winged bean entries in Initial & Advanced Varietal Trial (IVT & AVT) during Kharif 2015 (Plains)**

S. No.	Genotypes	Mean maturity duration (days)	Mean 100 seed weight (g)	Mean seed yield over locations (q/ha)			Percent increase/decrease over check
				Mean	Location	Rank	AKWB 1
IVT							
1	PWB 11-1	182.31	29.38	12.10	3	5	10.64
2	PWB 11-2	179.78	31.03	13.06	3	2	19.41
AVT-I							
3	RMD- WB-1	181.72	32.47	12.18	3	4	11.30
AVT-II							
4	AWB-13-4	177.58	31.94	13.27	3	1	21.31
5	AWB -13-5	178.67	30.89	12.68	3	3	15.91
6	AKWB 1 (C)	180.53	32.21	10.94	3	6	-
Mean		180.10	31.32	12.37			

**Table 69: Seed yield (q/ha) in Initial & Advanced Varietal Trial (IVT & AVT) on winged bean: Kharif 2015 (Plains)**

<b>S. No.</b>	<b>Genotypes</b>	<b>Ambikapur</b>	<b>Rahuri</b>	<b>Ranchi</b>	<b>Mean</b>	<b>Rank</b>	<b>Location</b>	<b>Frequency</b>
<b>IVT</b>								
1	PWB 11-1	17.47	9.00	9.85	12.10	5	3	0/3
2	PWB 11-2	17.57	11.30	10.31	13.06	2	3	0/3
<b>AVT-I</b>								
3	RMD- WB-1	13.23	11.30	12.00	12.18	4	3	1/3
<b>AVT-II</b>								
4	AWB-13-4	16.83	11.00	11.98	13.27	1	3	0/3
5	AWB -13-5	16.63	8.45	12.96	12.68	3	3	0/3
6	AKWB 1 (C)	12.22	8.50	12.10	10.94	6	3	-
	<b>Mean</b>	<b>15.66</b>	<b>9.93</b>	<b>11.53</b>	<b>12.37</b>	-	-	-
	<b>CD (0.05)</b>	<b>7.42</b>	<b>2.48</b>	<b>1.18</b>	-	-	-	-
	<b>CV (%) Error</b>	<b>31.45</b>	<b>11.49</b>	<b>5.59</b>	-	-	-	-

**Table 70: Days to 50% flowering in Initial & Advanced Varietal Trial (IVT & AVT) on winged bean: Kharif 2015 (Plains)**

S. No.	Genotypes	Ambikapur	Rahuri	Ranchi	Mean	Rank
<b>IVT</b>						
1	PWB 11-1	100.75	60.00	75.33	78.69	6
2	PWB 11-2	100.00	62.00	72.67	78.22	5
<b>AVT-I</b>						
3	RMD- WB-1	100.25	62.00	67.00	76.42	3
<b>AVT-II</b>						
4	AWB-13-4	99.50	58.50	76.00	78.00	4
5	AWB -13-5	99.25	54.50	66.00	73.25	1
6	AKWB 1 (C)	100.50	62.00	64.67	75.72	2
	<b>Mean</b>	<b>100.04</b>	<b>59.83</b>	<b>70.28</b>	<b>76.72</b>	-
	<b>CD (0.05)</b>	<b>2.39</b>		<b>2.80</b>	-	-
	<b>CV (%) Error</b>	<b>1.59</b>		<b>2.17</b>	-	-

**Table 71: Days to maturity in Initial & Advanced Varietal Trial (IVT & AVT) on winged bean: Kharif 2015 (Plains)**

S. No.	Genotypes	Ambikapur	Rahuri	Ranchi	Mean	Rank	Location	Frequency
<b>IVT</b>								
1	PWB 11-1	210.25	174.00	162.67	182.31	6	3	0/3
2	PWB 11-2	210.00	167.00	162.33	179.78	3	3	0/3
<b>AVT-I</b>								
3	RMD- WB-1	211.50	172.00	161.67	181.72	5	3	0/3
<b>AVT-II</b>								
4	AWB-13-4	211.25	162.50	159.00	177.58	1	3	0/3
5	AWB -13-5	211.00	163.00	162.00	178.67	2	3	0/3
6	AKWB 1 (C)	211.25	171.00	159.33	180.53	4	3	-
<b>Mean</b>		<b>210.88</b>		<b>161.17</b>	<b>180.10</b>	-	-	-
<b>CD (0.05)</b>		<b>1.61</b>		<b>1.81</b>	-	-	-	-
<b>CV (%) Error</b>		<b>0.51</b>		<b>0.61</b>	-	-	-	-

**Table 72: 100-seed weight (g) in Initial & Advanced Varietal Trial (IVT & AVT) on winged bean: Kharif 2015 (Plains)**

S. No.	Genotypes	Ambikapur	Rahuri	Ranchi	Mean	Rank
<b>IVT</b>						
1	PWB 11-1	32.25	27.20	28.70	29.38	6
2	PWB 11-2	37.39	24.55	31.15	31.03	4
<b>AVT-I</b>						
3	RMD- WB-1	33.55	30.45	33.40	32.47	1
<b>AVT-II</b>						
4	AWB-13-4	34.97	29.28	31.58	31.94	3
5	AWB -13-5	30.54	30.94	31.20	30.89	5
6	AKWB 1 (C)	33.79	29.46	33.38	32.21	2
<b>Mean</b>		<b>33.75</b>	<b>28.65</b>	<b>31.57</b>	<b>31.32</b>	-
<b>CD (0.05)</b>		<b>6.33</b>		<b>2.16</b>	-	-
<b>CV (%) Error</b>		<b>12.46</b>		<b>3.72</b>	-	-

**Table 73: Performance of kalingada entries in Initial & Advanced Varietal Trial (IVT & AVT) during Kharif 2015 (Plains)**

S. No.	Genotypes	Days to fruit setting	Mean seed yield over locations (q/ha)			Per cent increase/decrease over
			Mean	Location	Rank	GK-1 ( C )
IVT						
1	CAZJK-14-01	38.00	2.26	3	9	-24.74
2	CAZJK-14-02	39.00	1.96	3	10	-34.66
3	SKNK-13-01	36.83	4.70	3	1	56.85
4	SKNK-13-02	36.67	3.22	3	7	7.59
AVT-I						-100.00
5	CAZJK-13-1	39.00	3.93	3	5	31.20
6	CAZJK-13-2	36.83	4.64	3	2	54.73
AVT-II						-100.00
7	SKNK-11-01	37.83	3.57	3	6	19.25
8	SKNK-11-02	37.00	4.42	3	3	47.61
9	SKNK-11-03	38.50	4.29	3	4	42.99
10	GK-1 ( C )	37.67	3.00	3	8	-
Mean		37.73	3.60			

**Table 74: Different characters of kalingada entries in Initial & Advanced Varietal Trial (IVT & AVT) at various locations during Kharif 2015 (Plains)**

S. No.	Genotypes	Fruit yield (q/ha)							Seed yield (q/ha)						
		Jaisalmer	Jodhpur	S.K. Nagar	Mean	Rank	Location	Frequency	Jaisalmer	Jodhpur	S.K. Nagar	Mean	Rank	Location	Frequency
IVT															
1	CAZJK-14-01	28.38	120.43	110.37	86.39	8	3	0/3	0.98	3.60	2.18	2.26	9	3	0/3
2	CAZJK-14-02	30.46	65.87	123.70	73.34	10	3	0/3	1.24	2.55	2.09	1.96	10	3	0/3
3	SKNK-13-01	29.46	243.07	125.92	132.82	1	3	1/3	0.81	8.28	5.02	4.70	1	3	2/3
4	SKNK-13-02	18.39	152.19	105.18	91.92	7	3	0/3	1.16	4.44	4.07	3.22	7	3	0/3
AVT-I															
5	CAZJK-13-1	46.65	161.68	97.04	101.79	6	3	0/3	1.51	7.17	3.11	3.93	5	3	1/3
6	CAZJK-13-2	27.16	201.42	128.15	118.91	5	3	2/3	0.98	9.48	3.45	4.64	2	3	1/3
AVT-II															
7	SKNK-11-01	43.63	198.28	125.92	122.61	4	3	0/3	1.56	5.26	3.90	3.57	6	3	0/3
8	SKNK-11-02	64.12	205.56	104.44	124.71	2	3	2/3	1.24	7.50	4.53	4.42	3	3	2/3
9	SKNK-11-03	23.74	220.04	126.67	123.48	3	3	2/3	0.80	7.62	4.44	4.29	4	3	1/3
10	GK-1 ( C )	29.96	122.48	99.26	83.90	9	3	-	1.09	4.28	3.62	3.00	8	3	-
	Mean	34.19	169.10	114.67	105.99	-	-	-	1.14	6.02	3.64	3.60	-	-	-
	CD (0.05)	28.12	44.96	26.88	-	-	-	-	0.74	1.64	0.83	-	-	-	-
	CV (%) Error	47.95	15.51	13.67	-	-	-	-	37.79	15.86	13.26	-	-	-	-

**Table 75: Different characters of kalingada entries in Initial & Advanced Varietal Trial (IVT & AVT) at various locations during Kharif 2015 (Plains)**

S. No.	Genotypes	Days to fruit setting				100-seed weight (g)			
		Jodhpur	S.K. Nagar	Mean	Rank	Jodhpur	S.K. Nagar	Mean	Rank
IVT									
1	CAZJK-14-01	37.00	39.00	38.00	4	6.72	7.17	6.95	6
2	CAZJK-14-02	42.00	36.00	39.00	1	6.56	6.86	6.71	9
3	SKNK-13-01	38.67	35.00	36.83	9	7.29	6.83	7.06	2
4	SKNK-13-02	38.33	35.00	36.67	10	6.88	7.07	6.98	4
AVT-I									
5	CAZJK-13-1	41.00	37.00	39.00	1	7.50	6.44	6.97	5
6	CAZJK-13-2	40.33	33.33	36.83	8	7.25	6.29	6.77	8
AVT-II									
7	SKNK-11-01	40.33	35.33	37.83	5	6.77	6.28	6.52	10
8	SKNK-11-02	40.67	33.33	37.00	7	7.44	6.98	7.21	1
9	SKNK-11-03	42.33	34.67	38.50	3	7.16	6.67	6.92	7
10	GK-1 (C )	39.67	35.67	37.67	6	7.09	6.88	6.99	3
Mean		40.03	35.43	37.73	-	7.07	6.75	6.91	-
CD (0.05)		1.69	1.18	-	-		0.78	-	-
CV (%) Error		2.46	1.94	-	-		6.75	-	-

**Table 76: Performance of kankoda entries in Advanced Varietal Trial (AVT) during Kharif 2015 (Plains)**

S. No.	Genotypes	Days to first picking			Days to last picking			Fruit yield over locations (q/ha)					Percent increase /decrease over check	
		Ambikapur	Faizabad	Mean	Ambikapur	Faizabad	Mean	Ambikapur	Faizabad	Mean	Location	Rank		
AVT-I														
1	RMDFG-2	66.60	57.00	61.80	116.75	112.60	114.68	54.06	8.54	31.30	2	2	14.92	
2	RMDFG-3	62.30	52.00	57.15	109.50	115.30	112.40	59.32	6.88	33.10	2	1	21.51	
AVT-II														
3	Ambika K 13-5	64.60	52.75	58.68	112.75	115.30	114.03	37.46	6.67	22.06	2	5	-18.99	
4	Ambika K 13-6	66.00	52.00	59.00	113.00	115.30	114.15	40.15	8.54	24.35	2	4	-10.62	
5	Indira Kankoda	66.00	57.75	61.88	113.13	113.30	113.21	43.64	10.83	27.24	2	3	-	
	Mean	65.10	54.30	59.70	113.03	114.36	113.69	46.93	8.29	27.61	-	-	-	
	CD(0.05)	9.39	5.73	-	9.60	3.90	-	10.11	1.87	-	-	-	-	
	CV(%) Error	7.65	6.92	-	5.80	1.81	-	16.22	11.96	-	-	-	-	

# **CROP PRODUCTION AND PROTECTION**

---

## IV. CROP PRODUCTION AND PROTECTION

### 4.1 CROP PRODUCTION

A total of fifteen agronomic experiments were formulated to be conducted at fourteen locations in 31 trials. These comprised of two studies each on amaranth and buckwheat, eight on rice bean, and one each on adzuki bean, kalingada, job's tear and perilla. The results of trials on rice bean were passed on to IIPR, Kanpur. Out of the remaining results of two experiments were received from two locations in 2 trials. Centre-wise details of experiments are presented in Table 77 and the findings are as follows:

#### **Experiment 1: Response of promising genotypes (AVT-II entries of Kalingada to different level of management**

Year of start	:	Kharif 2015
Objective	:	To evaluate promising genotypes (AVT-II entries of Kalingada to different level of management
Locations	:	S.K. Nagar
Treatments	:	a) Varieties : V1-SKNK-1102, V2-SKNK-1103, V3-GK-1 b) Fertilizer doses: F1:NPK:20:40:00 F2:NPK:10:20:00 F3: control c) Spacing:S1:3x0.75 m, S2:3x1.00 m, 3x1.5 m
Design	:	Factorial RBD
Replications	:	3
Date of sowing	:	01.08.2015

**Results:** At S.K. Nagar the application of recommended Fertilizer Dose (F3) recorded significantly maximum fruit yield among all genotypes. Maximum fruit yield of 119.07 q/ha was recorded with SKNK-1103 variety with application of F3 followed by genotype SKNK-1102 (107.96 q/ha) with the same treatment.

#### **Experiment 2: Response of promising genotypes (AVT-II entries) of winged bean to different levels of management**

Year of start	:	Kharif 2015
---------------	---	-------------

Objective : To evaluate promising genotypes (AVT-II entries) of Winged bean to different levels of management

Locations : Ambikapur, Cooch Behar, Rahuri.

Treatments : a) Varieties : V1-AWB-13-4, V2-AWB-13-4  
V3-AWB-13-5  
b) Fertilizer doses: F1:NPK:00:00:00  
F2:NPK:10:20:10  
F3: 20:40:20  
c) Spacing:S1:45x30 cm, S2:16x30 cm, 45x45 cm

Design : Factorial RBD

Replications : 3

Date of sowing : 25.07.2015

**Results:** At Ambikapur the application of Fertilizer Dose (F3) recorded significantly maximum pod yield among all genotypes. Maximum pod yield of 53.94 q/ha was recorded with AWB-13-4 variety with application of F3 followed by genotype AWB-13-5 (44.61 q/ha) with the same treatment.

**Table 77: Centre-wise details of agronomic experiments allotted/conducted on different Potential crops during Kharif 2015.**

S. No.	Experiment	Ambikapur	Bangalore	Bhubneswar	Palampur	Rahuri	Ranichauri	Sk Nagar	Cooch Behar	Lamphelpat	Lembucherra	Medziphema	Shimla	Tadong	Umiam	Total
1	Organic farming in grain amaranth								1(0)							1(0)
2	Intercropping study of rice bean			1(1)					1(0)							2(1)
3	Fertilizer management in rice bean based intercrops								1(0)							1(0)
4	Effect of data of sowing and spacing for rice bean in Sikkim													1(0)		1(0)
5	Response of rice bean to sulphur fertilization		1(1)	1(0)			1(0)									3(1)
6	Nutrient management in rice bean + Maize intercropping system									1(0)	1(0)	1(0)		1(0)		4(0)
7	Nutrient management in Adzuki bean + Maize intercropping system										1(0)					1(0)
8	Reponse of promising genotypes (AVT-II entries) of Kalingada to different levels of management							1(1)								1(1)
9	Reponse of promising genotypes (AVT-II entries) of winged bean to different levels of management	1(1)				1(0)			1(0)							3(1)

S. No.	Experiment	Ambikapur	Bangalore	Bhubneswar	Palampur	Rahuri	Ranichauri	Sk Nagar	Cooch Behar	Lamphelpat	Lembucherra	Medziphema	Shimla	Tadong	Umiam	Total
10	Reponse of promising genotypes (AVT-II entries) of grain amaranth to different levels of management						1(0)						1(0)			2(0)
11	Reponse of promising genotypes (AVT-II entries) of Buckwheat to different levels of management						1(0)						1(0)			2(0)
12	Reponse of promising genotypes (AVT-II entries) of Rice bean to different levels of management				1(1)		1(0)									2(1)
13	Rice bean based cropping system in eastern zone			1(0)					1(0)							2(0)
14	Evaluation of perilla and job's tear accessions									1(0)		1(0)			1(0)	3(0)
15	Evaluation of buckwheat and rice bean in North Eastern Region									1(0)		1(0)			1(0)	3(0)
		1(1)	1(1)	3(1)	1(1)	1(0)	4(0)	1(1)	5(0)	3(0)	2(0)	3(0)	2(0)	2(0)	2(0)	31(5)

( ) = conducted; Without ( ) = allotted

**Table 78: Kalingada genotype yield (q/ha) and fruit yield during Kharif 2015 at S.K. Nagar.**

		Fruits weight q/ ha				Seed yield q/ ha			
		<b>S1</b>	<b>S2</b>	<b>S3</b>	<b>Mean</b>	<b>S1</b>	<b>S2</b>	<b>S3</b>	<b>Mean</b>
V1	F1	95.06	96.91	100.00	<b>97.33</b>	3.45	3.53	2.77	<b>3.25</b>
	F2	118.52	95.68	109.26	<b>107.82</b>	3.79	3.87	4.41	<b>4.02</b>
	F3	111.11	133.33	111.73	<b>118.72</b>	4.40	4.80	3.96	<b>4.39</b>
V2	F1	117.90	109.26	102.47	<b>109.88</b>	3.98	3.79	3.23	<b>3.66</b>
	F2	119.75	138.27	128.39	<b>128.81</b>	4.05	4.78	4.59	<b>4.47</b>
	F3	121.60	112.35	121.60	<b>118.52</b>	4.21	3.88	4.16	<b>4.08</b>
V3	F1	97.53	91.36	81.48	<b>90.12</b>	4.32	2.89	2.62	<b>3.28</b>
	F2	109.26	101.85	95.68	<b>102.26</b>	3.56	3.55	3.74	<b>3.62</b>
	F3	109.88	100.62	93.21	<b>101.23</b>	3.93	3.33	3.83	<b>3.70</b>
<b>Mean</b>		<b>111.18</b>	<b>108.85</b>	<b>104.87</b>	<b>108.30</b>	<b>3.97</b>	<b>3.97</b>	<b>3.82</b>	<b>3.70</b>
<b>CD (0.05%) genotypes</b>					<b>4.00</b>				
<b>CD (0.05%) for fertilizer</b>					<b>9.20</b>				
<b>CD (0.05%) for genotypes x fertilizer</b>					<b>30.73</b>				
<b>CV (%) genotypes</b>					<b>17.73</b>				
<b>CV (%) fertilizers</b>					<b>3.70</b>				

**Table 79: Effect of different fertilizer doses on different genotypes during Kharif 2015 at S.K. Nagar.**

<b>S. No.</b>	<b>Treatment</b>	<b>Fruits weight q/ ha</b>	<b>Seed yield q/ ha</b>
1	V1S1F1	95.06	3.45
2	V1S1F2	118.52	3.79
3	V1S1F3	111.11	4.40
4	V1S2F1	96.91	3.53
5	V1S2F2	95.68	3.87
6	V1S2F3	133.33	4.80
7	V1S3F1	100.00	2.77
8	V1S3F2	109.26	4.41
9	V1S3F3	111.73	3.96
10	V2S1F1	117.90	3.98
11	V2S1F2	119.75	4.05
12	V2S1F3	121.60	4.21
13	V2S2F1	109.26	3.79
14	V2S2F2	138.27	4.78
15	V2S2F3	112.35	3.88
16	V2S3F1	102.47	3.23
17	V2S3F2	128.39	4.59
18	V2S3F3	121.60	4.16
19	V3S1F1	97.53	4.32
20	V3S1F2	109.26	3.56
21	V3S1F3	109.88	3.93
22	V3S2F1	91.36	2.89
23	V3S2F2	101.85	3.55
24	V3S2F3	100.62	3.33
25	V3S3F1	81.48	2.62
26	V3S3F2	95.68	3.74
27	V3S3F3	93.21	3.83
<b>Mean</b>		<b>108.30</b>	<b>3.83</b>
<b>CD</b>		<b>30.73</b>	<b>1.28</b>
<b>CV Error (%)</b>		<b>17.73</b>	<b>20.85</b>

**Table 80: Winged bean genotype yield (q/ha) and fruit yield during Kharif 2015 at Ambikapur.**

		Green Pod Yield (q/ha)				Seed Yield (q/ha)			
		S1	S2	S3		S1	S2	S3	
V1	F1	10.67	17.24	19.85	<b>15.92</b>	4.70	3.52	1.75	<b>3.32</b>
	F2	27.89	17.48	22.77	<b>22.71</b>	3.08	3.08	2.11	<b>2.76</b>
	F3	116.21	92.53	119.54	<b>109.43</b>	11.97	10.86	12.80	<b>11.88</b>
V2	F1	17.00	16.47	26.97	<b>20.15</b>	3.29	1.69	3.37	<b>2.78</b>
	F2	61.22	18.18	17.39	<b>32.26</b>	2.88	2.49	2.55	<b>2.64</b>
	F3	79.12	87.23	7.76	<b>58.04</b>	10.99	11.48	3.48	<b>8.65</b>
V3	F1	18.59	19.49	20.03	<b>19.37</b>	2.53	1.29	1.58	<b>1.80</b>
	F2	63.98	86.60	18.69	<b>56.42</b>	9.46	7.71	1.71	<b>6.29</b>
	F3	10.40	125.49	106.77	<b>80.89</b>	1.46	11.45	11.23	<b>8.05</b>
<b>Mean</b>		<b>45.01</b>	<b>53.41</b>	<b>39.98</b>	<b>46.13</b>	<b>5.60</b>	<b>5.95</b>	<b>4.51</b>	<b>5.35</b>
<b>CD (0.05%) genotypes</b>					<b>13.00</b>	<b>2.00</b>			
<b>CD (0.05%) for fertilizer</b>					<b>5.00</b>	<b>75.00</b>			
<b>CD (0.05%) for genotypes x fertilizer</b>					<b>32.00</b>	<b>4.00</b>			
<b>CV (%) genotypes</b>					<b>9.00</b>	<b>19.70</b>			
<b>CV (%) fertilizers</b>					<b>4.93</b>	<b>11.00</b>			

**Table 81: Effect of different fertilizer doses on different genotypes of winged bean during Kharif 2015 at Ambikapur.**

S. No.	Treatment	Days to 50% flowering	Days to Maturity	No. of Pods/Plant	Pod Length (cm.)	No. of Seed/Pod	100 Seed Weight (g)	Days to First Picking	Days to Last Picking
1	V1S1F1	101.67	208.00	242.33	15.67	8.53	36.58	170.67	197.00
2	V1S1F2	103.00	207.67	233.67	15.47	9.00	33.09	172.67	196.00
3	V1S1F3	102.67	207.67	486.00	17.40	10.27	35.60	172.33	195.67
4	V1S2F1	102.00	208.00	172.67	15.00	10.07	41.30	172.00	196.00
5	V1S2F2	101.67	207.67	216.33	15.07	9.33	32.68	173.67	197.67
6	V1S2F3	104.00	208.00	409.67	17.33	9.87	34.65	171.00	196.33
7	V1S3F1	103.00	208.00	132.00	15.60	10.60	38.31	169.00	197.00
8	V1S3F2	103.67	207.33	168.00	15.20	9.33	32.45	170.67	196.67
9	V1S3F3	103.67	207.00	379.33	17.00	11.67	39.73	171.33	196.33
10	V2S1F1	102.67	208.00	194.00	15.13	8.60	36.41	173.00	196.67
11	V2S1F2	102.67	208.67	290.67	15.80	9.53	35.09	173.67	196.00
12	V2S1F3	102.33	207.00	523.33	17.87	11.73	36.17	172.67	196.67
13	V2S2F1	101.00	206.67	113.67	15.40	8.40	35.97	172.33	197.33
14	V2S2F2	102.00	207.00	131.33	15.07	9.53	32.80	170.67	196.67
15	V2S2F3	102.67	206.33	569.67	16.60	10.80	36.54	172.00	197.33
16	V2S3F1	101.67	207.67	192.33	15.47	9.33	38.27	172.33	196.67
17	V2S3F2	101.67	208.67	166.67	15.00	8.87	34.11	170.67	196.00

S. No.	Treatment	Days to 50% flowering	Days to Maturity	No. of Pods/Plant	Pod Length (cm.)	No. of Seed/Pod	100 Seed Weight (g)	Days to First Picking	Days to Last Picking
18	V2S3F3	102.67	207.33	194.00	14.33	8.53	34.58	171.67	197.33
19	V3S1F1	101.00	207.33	200.00	15.40	9.00	32.63	172.67	195.67
20	V3S1F2	102.67	208.33	468.00	16.47	10.93	35.26	170.33	196.67
21	V3S1F3	100.67	207.00	117.33	15.80	8.60	39.68	172.67	196.00
22	V3S2F1	104.33	206.33	117.33	14.60	9.33	35.51	173.00	198.33
23	V3S2F2	103.00	206.67	506.33	16.53	9.60	35.69	172.67	197.33
24	V3S2F3	104.67	207.00	392.33	16.33	10.40	36.87	173.67	195.67
25	V3S3F1	104.67	207.33	143.00	15.47	10.53	37.39	171.67	197.00
26	V3S3F2	102.00	208.33	139.00	14.67	8.47	31.50	171.33	196.00
27	V3S3F3	103.67	206.67	573.00	16.93	9.67	36.60	173.67	197.67
<b>Mean</b>		<b>102.64</b>	<b>207.47</b>	<b>276.74</b>	<b>15.80</b>	<b>9.65</b>	<b>35.76</b>	<b>172.00</b>	<b>196.65</b>
<b>CD(0.05)</b>		<b>2.65</b>	<b>1.87</b>	<b>173.95</b>	<b>1.75</b>	<b>1.61</b>	<b>7.60</b>	<b>3.37</b>	<b>2.12</b>
<b>CV(%)</b>		<b>1.61</b>	<b>0.56</b>	<b>39.28</b>	<b>6.93</b>	<b>10.44</b>	<b>13.27</b>	<b>1.22</b>	<b>0.67</b>
<b>Error</b>									

## 4.2 CROP PROTECTION

In crop protection, two experiments, *viz.*, screening of germplasm against major insect pests and diseases and Integrated pest management (IPM) in potential crops were formulated to be conducted at 4 locations in 9 trials during *kharif* 2015 on two crops such as grain amaranth and buck wheat. Out of these, results of two experiments was received from one location for 4 trials. Centre wise details of crop protection experiments allotted/conducted on different potential crops during *kharif* 2015 was given in table 82. The results are as follows:

### **Experiment 1: Screening of germplasm against major insect pests and diseases**

This experiment was planned in order to identify the sources of resistance in IVT, AVT entries and germplasm against major insect pests and diseases on grain amaranth and buckwheat at different locations. The results on grain amaranth of IVT, AVT entries and germplasm at Bangalore had been received. The details of results have been given below

#### **Grain amaranth**

##### ***Insect pests***

Twelve AVT I entries along with 4 checks were screened against major insect pests of grain amaranth under protected conditions. Promising entries for resistance to stem weevils were SKNA-403, BGA-11 and SKGPA-72, promising entries for resistance to sucking pests were BGA-10-2 and KBGA 2 and promising entry for resistance to defoliators is SKGPA-72. Same entries were also screened under unprotected conditions. Promising entries for resistance to stem weevils were KBGA-3 and BGA-2 (c), promising entry for resistance to sucking pests was KBGA-4 and promising entries for resistance to defoliators were KBGA-4, BGA-11-1 and RMA-7 (c).

Twelve AVT II entries along with 4 checks were screened against major insect pests of grain amaranth under protected conditions. Entries such as KBGA-1, KBGA-4 and GA-2 (C) were found to be promising against stem weevils, entries such as BGA-12 and SKGPA-95 found promising against sucking pests and one

entry IC-035719 was found promising for defoliators. Similarly, the same entries were screened under unprotected conditions. One entry IC035719 was found to be promising against stem weevils and one entry KBGA-1 was found to be promising against sucking pests and two entries IC035719 and IC03573 were found to be promising against defoliators.

Twenty IVT entries along with 4 checks were screened against major insect pests of grain amaranth under protected conditions. Entries such as KBGA-5 and BGA-4-9 were found to be promising against stem weevils, entries such as RMA-58 and BGA-8-5 were found promising against sucking pests and one entry RGA-12 was found promising for defoliators.

One Hundred and fourteen entries along with 4 checks were screened against major insect pests of grain amaranth under protected conditions. Entries such as BGA-38, SKGPA-65, SKGPA-68, SKGPA 70, SKGPA 74, SKGPA 79, SKGPA 81, BGA-13, SKGPA 86, SKGPA-89, IC021938, IC032193, IC035615 and IC035633 were found to be promising against stem weevils, entries such as SKGPA-65, SKGPA-68, SKGPA 70, IC032193 and IC035615, were found promising against sucking pests and entries such as SKGPA-108, IC035742, SKGPA-112, IC031404 and SKGPA-123 was found promising for defoliators.

### ***Diseases***

A total of 24 genotypes of grain amaranth (IVT) along with checks were screened against diseases such as leaf spot, leaf rust and phyllody. The % leaf spot ranged from 0 % to 29.91% (SKGPA-74). Three entries such as SKNA-1008, SKGPA-91 and SKNA-1003 were found promising as the incidence level was less than 1 %. The leaf rust incidence and % phyllody incidence was low in all the genotypes.

A total of 16 genotypes of grain amaranth (AVT-I) along with 4 checks were screened against diseases such as leaf spot, leaf rust and phyllody. The % leaf spot ranged from 0 to 23.84 (BGA-2 (c)). Two entries such as RMA-7 (c) and BGA-7-1 were found promising as the incidence level was less than 1 %. The leaf rust incidence and % phyllody incidence was low in all the genotypes. Similarly, 16 genotypes of grain amaranth (AVT II) along with 4 checks were screened against diseases such as leaf spot, leaf rust and phyllody. The % leaf

spot ranged from 0 to 29.57% (BGA-04). Three entries such as RMA-7 (c), RMA-45 and GA-2 (c ) were found promising as the incidence level was less than 1 %. The % phyllody ranged from 0 to 47.74% (IC033701). Two entries such as BGA-2 and BGA-04 were found promising as the incidence level was less than 1 %. The leaf rust incidence was low in all the genotypes.

A total of 101 accessions of grain amaranth along with checks were screened against diseases such as leaf spot, leaf rust and phyllody. The % leaf spot ranged from 0 % to 43.75% and % phyllody ranged from 0 % to 34%. The leaf rust incidence was nil in all the genotypes.

## **Experiment 2: Integrated pest management (IPM) in potential crops**

This experiment was planned on two crops (grain amaranth and buck wheat) in hills and plains in different locations to manage insect pests and diseases causing economic damage. The results on one crop (grain amaranth) at Bangalore had been received. The details of results have been given below

### **Grain amaranth**

Results of Integrated pest management (IPM) for the management of defoliators of grain amaranth, indicated that out of the 5 treatments, maximum yield of 1,398 kg/ha was obtained in emamectin benzoate @ 0.5ml/lit followed by Profenophos @ 0.5 ml/lit which gave a yield of 1359 kg/ha compared to control (1157 kg/ha). In case of sucking pests, out of the 7 treatments, maximum yield of 1,328 kg/ha was obtained in Imidacloprid 17.8 SL (Confidor) @ 0.08ml/lit followed by Acetamiprid @ 0.5ml/lit (1,269 kg/ha) compared to control (1,044 kg/ha).

**Table 82: Centre-wise details of crop protection experiments allotted/conducted on different potential crops during Kharif 2015.**

<b>S. No.</b>	<b>Experiments</b>	<b>Crops</b>	<b>Bengaluru</b>	<b>Bhubaneswar</b>	<b>Hisar</b>	<b>Mettupalayam</b>	<b>S.K. Nagar</b>	<b>Ranichauri</b>	<b>Sangla</b>	<b>Total</b>
1	Screening of germplasm against major insect pests and diseases	Grain Amaranth	1(1)	-	-	1(0)	-	-	-	<b>2(1)</b>
		Buckwheat	-	-	-	-	-	1(0)	-	<b>1(0)</b>
2	Integrated pest management in potential crops	Buckwheat	1(0)	-	-	-	-	1(0)	1(0)	<b>3(0)</b>
		Grain amaranth	1(1)	-	-	-	-	-	-	<b>1(1)</b>
	<b>Total trial allotted/conducted</b>		<b>3(2)</b>	<b>-</b>	<b>-</b>	<b>1(0)</b>	<b>-</b>	<b>2(0)</b>	<b>1(0)</b>	<b>7(2)</b>

# QUALITY ANALYSIS

---

## **V. QUALITY ANALYSIS**

The seed of promising genotypes evaluated in IVT, AVT and germplasm evaluation of the four potential crops were planned for quality analysis at three centres viz. MPKV, Rahuri, CSKHPKV, Palampur and CCSHAU, Hisar, Quality analysis was done at three centres and seed was supplied by Shimla, Rahuri, S.K. Nagar, and Hisar centres. The crop-wise details of quality traits are given below:

### **5.1 GRAIN AMARANTH**

#### **5.1.1 IVT and Germplasm Kharif 2015: Hill**

A combined quality trial of IVT (4 entries) and germplasm kharif 2015 (51 entries) with three checks were analysed at Hisar. The summary performance of various entries in respect of different quality parameters as compared to check varieties has been given in Table 83.

The entry of germplasm IC035393 had highest protein content (14.20%) followed by entry IC035375 (14.00%). The genotype EC322051 had highest fat content (8.20%). The entry EC338767 had highest Zn content (6.10 mg/100g). The entry of germplasm EC328873 was superior to check variety Annapurna (9.20 mg/100g) in Fe content. The entry IC035463 had the highest Ca content (325.00 mg/100g). The entry IC035371 (0.045%) showed the lowest phenol content (Table 84).

#### **5.1.2 AVT-I and AVT-II Kharif 2015: Plain**

A combined quality trial of AVT-I (9 entries) and AVT-II (4 entries) kharif 2015 with four checks were analysed at Hisar centre and seed supply by Bangalore centre. The summary performance of various entries in respect of different quality parameters as compared to check varieties has been given in Table 83.

The entry SKNA-40 had highest protein content (13.90%) followed by entry SKNA-908 (13.80%). The genotype BGA-4 had highest fat content (8.10%). The entry SKNA-403 had highest Zn content (5.80 mg/100g). The entry was superior to check variety BGA-11-1 (15.30 mg/100g) in Fe content

based on the overall performance. The entry SKNA-403 had the highest Ca content (334.00 mg/100g) (Table 85).

## **5.4 BUCKWHEAT**

### **5.4.1 IVT and AVT-I Kharif 2015: Hill**

In this trial IVT (5 entries) and AVT-I (3 entries) along with four checks were analysed at CSK, Palampur centre. Seed was supplied by NBPGR, RS, Shimla centre. The summary performance of various entries in respect of different quality parameters as compared to check varieties has been given in Table 86.

The entry IC341588 had highest protein content (13.40%). The check Himpriya had highest Fe content (8.20 mg/100g). The entry IC412733 had the highest Ca content (98.50 mg/100g). The check Himpriya (3.80 mg/100g) showed the highest sodium content and the entry Sangla B-400 had the highest K content (584.00 mg/100g) (Table 87).

## **5.5 CHENOPODIUM**

### **5.5.1 Germplasm Kharif 2015: Hill**

Thirteen genotypes were analysed at Palampur centre and seed supply by NBPGR, RS, Shimla centre for protein and mineral content analysis (Table 86). Entry EC507741 had highest protein content (16.50%) followed by EC507742 (15.80%). Entry IC411825 had highest Fe content (14.00 mg/100g). The entry EC507749 ranked first (3.60 mg/100g) for sodium content. The entry EC507738 had the highest Ca content (470.00 mg/100g). The entry EC507742 (7.80 mg/100g) showed the highest Potassium content (Table 88).

## **5.7 KALINGADA**

### **5.7.1 IVT, AVT-I and AVT-II Kharif 2015: Plain**

Seeds of eleven genotypes along with one check of Kalingada supplied by S.K. Nagar were analysed at MPKV, Rahuri centre for oil, protein (in the whole seed), Ca, Fe, Mg and Su content (Table 86). The SKNA-1102 had the highest oil content (29.87 g/kg), SKNA-1101 had highest protein (23.16 g/kg), MGPK-10-2 had highest Cu content (3.39 g/kg). The entry SKNK-1302 (21.60 g/kg) was

superior to check variety GA-1 (14.75 g/kg) in Ca content. The entry SKNK-1301 had the highest Fe content (17.31 g/kg) (Table 89).

**Table 83: Promising genotypes in Grain Amaranth Kharif 15 (Hill & Plain).**

S. No.	Character	range		Promising genotype	Best check value
		Min.	Max.		
A. Coordinated Trials of Grain Amaranth at Shimla Kharif 2015: Hill					
1	Protein %	10.00	14.20	IC035393 (14.2), IC035375 (14), EC328891 (13.8), IC035307 (13.8), IC035366 (13.8)	Durga (12.4)
2	Oil (%)	5.20	8.20	EC322051 (8.2), EC289390 (8.1), IC035441 (8.1), IC361853 (7.8)	Durga (7.1)
3	Phenol (%)	0.05	0.07	IC035371 (0.045), IC035366 (0.048), IC035393 (0.048), EC289391 (0.051)	PRA-3 (0.058)
4	Ca (mg/ 100g)	285.00	325.00	IC035463 (325), IC035389 (321), IC035393 (318), IC035436 (318)	Annapurna (311)
5	Fe (mg/ 100g)	5.80	9.20	EC328873 (9.2), EC322997 (9.1), EC289391 (8.9), EC328874 (8.7)	Annapurna (8.2)
6	Zn (mg/ 100g)	3.60	6.10	EC338767 (6.1)	Durga (5.8)
B. Coordinated Trials of Grain Amaranth at Bangalore Kharif 2015: Plain					
1	Protein (%)	9.70	13.90	SKNA-401 (13.9)SKNA-908 (13.8)KBGA-3 (13.6)BGA-10-2 (13.4)KBGA-4 (13.1)SKNA-403 (12.9)BGA-7-1 (12.8)	Suvarna (C) (12.8)
2	Oil (%)	5.80	8.10	BGA-4 (8.1)	GA-2 (C) (7.9)
3	Phenol (%)	0.05	0.06		Suvarna (C) (0.047)
4	Ca (mg/ 100g)	308.00	334.00	SKNA-403 (334)BGA-10-2 (333)KBGA-4 (327)BGA-12 (327)	RMA -7(C) (323)
5	Fe (mg/ 100g)	9.30	15.30	BGA-11-1 (15.3)	RMA -7(C) (13.3)
6	Zn (mg/ 100g)	4.20	5.80	SKNA-403 (5.8)BGA-12 (5.6)	Suvarna (C) (5.6)

**Table 84: IVT and Germplasm of Grain Amaranth Kharif 2015 (Hill).**

S. No.	Genotypes	Protein %	Oil (%)	Phenol (%)	Ca (mg/100g)	Fe (mg/100g)	Zn (mg/100g)
<b>IVT</b>							
1	IC313250	11.60	7.40	0.06	308.00	7.80	5.20
2	IC341505	11.50	6.80	0.07	285.00	6.30	4.70
3	IC361853	11.70	7.80	0.07	291.00	8.20	4.90
4	IC362199	11.20	7.40	0.07	304.00	8.40	5.10
<b>Germplasm</b>							
1	EC277972	11.40	5.70	0.07	304.00	8.50	4.50
2	EC289367	12.30	6.10	0.07	309.00	8.10	5.10
3	EC289376	11.40	7.30	0.07	298.00	7.30	4.20
4	EC289381	11.70	6.40	0.07	292.00	7.20	4.30
5	EC289390	11.50	8.10	0.06	291.00	8.50	3.80
6	EC289391	11.60	7.20	0.05	307.00	8.90	3.70
7	EC289393	13.20	5.80	0.05	309.00	6.80	4.70
8	EC289395	11.80	6.70	0.07	291.00	6.30	5.10
9	EC289400	12.40	6.10	0.06	304.00	8.20	5.20
10	EC322033	10.70	7.80	0.07	298.00	8.10	4.30
11	EC322043	12.90	5.40	0.07	309.00	7.40	4.60
12	EC322044	10.00	7.80	0.07	311.00	6.30	4.20
13	EC322045	11.10	5.90	0.07	310.00	7.30	3.80
14	EC322051	10.80	8.20	0.07	299.00	8.40	3.70
15	EC322997	10.20	7.80	0.07	295.00	9.10	3.60
16	EC323003	11.20	6.50	0.06	307.00	8.30	3.80
17	EC328873	10.60	7.30	0.07	304.00	9.20	4.20
18	EC328874	10.30	7.10	0.07	302.00	8.70	4.10
19	EC328875	11.50	6.40	0.07	308.00	7.70	4.60
20	EC328891	13.80	6.20	0.06	295.00	7.20	5.40
21	EC338767	12.00	5.30	0.05	289.00	7.70	6.10
22	EC341797	10.10	6.40	0.07	301.00	8.10	5.10
23	EC351944	11.10	7.30	0.05	307.00	7.50	5.20
24	EC354980	12.70	6.80	0.05	312.00	6.50	4.70
25	EC5195491	12.80	5.70	0.06	311.00	6.30	4.80
26	IC035307	13.80	6.20	0.05	307.00	7.80	4.80
27	IC035363	11.30	6.80	0.06	302.00	8.30	4.50

S. No.	Genotypes	Protein %	Oil (%)	Phenol (%)	Ca (mg/ 100g)	Fe (mg/ 100g)	Zn (mg/ 100g)
28	IC035366	13.80	5.40	0.05	311.00	6.70	4.50
29	IC035367	12.20	5.70	0.06	317.00	7.30	5.10
30	IC035371	13.20	6.10	0.05	312.00	7.10	5.30
31	IC035375	14.00	5.80	0.05	314.00	6.20	5.20
32	IC035377	13.10	5.70	0.06	308.00	6.50	4.80
33	IC035389	13.20	5.70	0.05	321.00	6.10	4.30
34	IC035393	14.20	5.20	0.05	318.00	6.20	5.30
35	IC035398	12.70	6.50	0.06	304.00	5.80	4.10
36	IC035410	13.10	5.80	0.06	307.00	7.10	4.70
37	IC035428	11.90	7.40	0.07	298.00	7.50	4.20
38	IC035430	13.60	6.30	0.05	310.00	6.30	5.30
39	IC035434	11.10	7.50	0.06	309.00	7.30	3.80
40	IC035436	13.30	5.40	0.05	318.00	6.30	4.80
41	IC035437	12.00	6.20	0.05	312.00	6.80	4.60
42	IC035441	11.90	8.10	0.06	302.00	7.90	4.20
43	IC035443	12.70	7.40	0.06	317.00	8.10	4.70
44	IC035444	12.90	6.30	0.07	298.00	8.20	4.30
45	IC035445	12.90	6.10	0.07	295.00	7.20	4.50
46	IC035446	11.50	7.70	0.06	291.00	6.80	4.20
47	IC035459	11.30	7.20	0.07	307.00	6.20	3.80
48	IC035463	13.00	5.30	0.05	325.00	7.40	5.20
49	IC423551	10.60	7.20	0.06	307.00	6.30	4.10
50	IC467911	11.20	5.60	0.07	311.00	7.40	4.40
51	KBGA-7	12.50	5.80	0.06	302.00	6.70	5.20
1	DURGA (C)	12.40	7.10	0.07	298.00	7.20	5.80
2	ANNAPURNA (C)	12.10	6.70	0.06	311.00	8.20	4.80
3	PRA-3 (C)	12.20	7.10	0.06	294.00	6.80	5.40
<b>Minimum</b>		<b>10.00</b>	<b>5.20</b>	<b>0.05</b>	<b>285.00</b>	<b>5.80</b>	<b>3.60</b>
<b>Maximum</b>		<b>14.20</b>	<b>8.20</b>	<b>0.07</b>	<b>325.00</b>	<b>9.20</b>	<b>6.10</b>
<b>Mean</b>		<b>12.05</b>	<b>6.59</b>	<b>0.06</b>	<b>304.78</b>	<b>7.38</b>	<b>4.63</b>

**Table 85: AVT-I and AVT-II of Grain Amaranth Kharif 2015 (Plain).**

<b>Sr. No.</b>	<b>Genotypes</b>	<b>Protein (%)</b>	<b>Oil (%)</b>	<b>Phenol (%)</b>	<b>Ca (mg/ 100g)</b>	<b>Fe (mg/ 100g)</b>	<b>Zn (mg/ 100g)</b>
<b>AVT-I</b>							
1	KBGA-4	13.10	6.70	0.05	327.00	10.80	4.20
2	SKNA-908	13.80	6.40	0.05	318.00	9.50	5.30
3	KBGA-3	13.60	6.80	0.05	312.00	10.30	5.10
4	SKNA-401	13.90	7.10	0.05	321.00	10.80	5.20
5	SKNA-403	12.90	7.30	0.05	334.00	11.40	5.80
6	BGA-7-1	12.80	6.50	0.06	317.00	12.50	4.60
7	BGA-11-1	9.70	7.70	0.06	308.00	15.30	4.40
8	MGA-15	11.50	6.80	0.06	311.00	12.20	4.60
9	BGA-10-2	13.40	5.80	0.05	333.00	11.10	5.40
<b>AVT-II</b>							
1	KBGA-1	12.10	7.20	0.05	322.00	10.60	4.80
2	BGA-4	11.80	8.10	0.06	312.00	11.50	4.70
3	BGA-11	12.20	6.30	0.05	321.00	9.30	5.30
4	BGA-12	12.30	6.40	0.05	327.00	10.70	5.60
5	BGA-21	11.80	7.50	0.05	308.00	11.20	4.60
6	RMA-45	12.50	6.80	0.06	315.00	10.40	5.20
	BGA-2(C)	11.70	7.70	0.05	315.00	12.20	5.50
	GA-2 (C)	11.90	7.90	0.06	312.00	10.40	5.50
	RMA -7(C)	11.90	7.70	0.05	323.00	13.30	5.40
	Suvarna (C)	12.80	7.80	0.05	319.00	12.10	5.60
	<b>Minimum</b>	<b>9.70</b>	<b>5.80</b>	<b>0.05</b>	<b>308.00</b>	<b>9.30</b>	<b>4.20</b>
	<b>Maximum</b>	<b>13.90</b>	<b>8.10</b>	<b>0.06</b>	<b>334.00</b>	<b>15.30</b>	<b>5.80</b>
	<b>Mean</b>	<b>12.41</b>	<b>7.08</b>	<b>0.05</b>	<b>318.68</b>	<b>11.35</b>	<b>5.09</b>

**Table 86: Promising genotype of Buckwheat, Chenopod and Kalingada**

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
Buckwheat					
1	Crude protein (%)	12.01	13.40		VL-7 (12.00)
2	Total Phenols (mg/100g)	216.58	263.00	IC412733 (263.00), IC329201 (260.00)	Shimla B-1 (257.00)
3	Tryptophan(g/100g Protein)	0.77	0.93		Himpriya (0.93)
4	Methionine(g/100g Protein)	1.28	1.62		PRB-1 (1.62)
5	Sodium(mg/100 g)	3.05	3.80		Himpriya (3.80)
6	Potassium (mg/100 g)	434.25	584.00	Sangla B-400* (584.00), IC339688 (576.00)	Himpriya (525.00)
7	Calcium(mg/100 g)	84.50	98.50	IC412733 (98.50)	Himpriya (98.30)
8	Iron(mg/100 g)	5.76	8.20		Himpriya (8.20)
Chenopod					
1	Crude protein (%)	14.77	16.50	EC507741 (16.5), EC507742 (15.8), EC507749 (15.8), EC507739 (15.4)	
2	Saponins(%)	9.55	11.40	EC507741 (11.4), EC507748 (10.9), EC507738 (10.8), EC507740 (10.3)	
3	Calcium(mg/100 g)	332.46	470.00	EC507738 (470), EC507747 (438), EC507749 (434)IC411824 (426)	
4	Iron(mg/100 g)	10.66	14.00	IC411825 (14), EC507740 (12.5), EC507748 (12.5), EC507743 (12)	
5	Sodium(mg/100 g)	2.78	3.60	EC507749 (3.6), EC507740 (3.2), EC507741 (3.2), EC507738 (3.1)	
6	Potassium(mg/100 g)	4.64	7.80	EC507742 (7.8), EC507739 (6.4), EC507740 (6.2), EC507744 (5.6)	

S. No.	Characters	Range		Promising lines	Value of best check
		Min.	Max.		
Kalingada					
1	Crude protein (%)	19.67	23.16	SKNK-1101 (23.16)	GK-1 (23.16)
2	Oil(%)	27.73	29.87	SKNK-1102 (29.87)CAZJK-14-1 (29.84)SKNK-1101 (29.32)MGPK-10-2 (29.16)SKNK-1103 (28.99)	GK-1 (27.66)
3	Crude fiber (%)	32.76	36.15	CAZJK-14-2 (36.15)CAZJK-13-2 (35.85)	GK-1 (35.85)
4	Iron(mg/100 g)	14.73	17.31	SKNK-1301 (17.31)CAZJK-13-2 (16.64)CAZJK-13-1 (15.93)SKNK-1101 (15.9)CAZJK-14-2 (15.72)SKNK-1103 (14.43)SKNK-1102 (13.57)CAZJK-14-1 (13.37)MGPK-10-2 (13.3)SKNK-1302 (12.98)	GK-1 (12.93)
5	Copper (mg/100 g)	1.32	3.39	MGPK-10-2 (3.39)	GK-1 (2.53)
6	Calcium(mg/100 g)	15.94	21.60	SKNK-1302 (21.6)SKNK-1101 (18.12)MGPK-10-2 (17.23)SKNK-1301 (17.15)CAZJK-13-2 (16.82)SKNK-1102 (16.67)SKNK-1103 (15)CAZJK-14-1 (14.9)	GK-1 (14.75)

**Table 87: IVT and AVT-I of Buckwheat Kharif 2015: Hill.**

Sl. No.	Genotypes	Crude protein (%)	Total Phenols (mg/100g)	Tryptophan(g/100g Protein)	Methionine (g/100g Protein)	Sodium(mg/100 g)	Potassium (mg/100 g)	Calcium(mg/100 g)	Iron(mg/100 g)
<b>IVT</b>									
3	IC329201	11.90	260.00	0.86	1.12	2.90	370.00	93.80	3.10
4	IC339688	10.70	200.00	0.66	0.78	3.00	576.00	97.90	5.10
5	IC341588	13.40	150.00	0.90	1.39	3.40	483.00	63.50	5.20
6	IC341589	13.10	230.00	0.78	1.43	2.70	345.00	73.50	4.20
8	Sangla B-400	11.60	208.00	0.64	1.26	3.00	584.00	89.40	8.00
<b>AVT-I</b>									
1	IC013510	12.80	129.00	0.63	1.32	3.20	255.00	96.40	6.60
2	IC013533	12.00	240.00	0.76	1.16	2.80	310.00	83.40	4.30
7	IC412733	12.00	263.00	0.87	0.85	2.50	339.00	98.50	5.00
9	<b>Himpriya ( C)</b>	11.00	237.00	0.93	1.60	3.80	525.00	98.30	8.20
10	<b>PRB-1 ( C)</b>	12.80	192.00	0.69	1.62	2.60	455.00	63.50	5.30
11	<b>Shimla B-1 ©</b>	10.80	257.00	0.80	1.52	3.30	506.00	92.80	7.20
12	<b>VL-7 ©</b>	12.00	233.00	0.72	1.30	3.40	463.00	63.00	6.90
<b>Minimum</b>		<b>12.01</b>	<b>216.58</b>	<b>0.77</b>	<b>1.28</b>	<b>3.05</b>	<b>434.25</b>	<b>84.50</b>	<b>5.76</b>
<b>Maximum</b>		<b>13.40</b>	<b>263.00</b>	<b>0.93</b>	<b>1.62</b>	<b>3.80</b>	<b>584.00</b>	<b>98.50</b>	<b>8.20</b>
<b>Mean</b>		<b>12.01</b>	<b>216.58</b>	<b>0.77</b>	<b>1.28</b>	<b>3.05</b>	<b>434.25</b>	<b>84.50</b>	<b>5.76</b>

**Table 88: Chenopodium Germplasm Kharif 2015: Hill.**

Sl. No.	Genotypes	Crude protein (%)	Saponins (%)	Calcium (mg/100 g)	Iron (mg/100 g)	Sodium (mg/100 g)	Potassium (mg/100 g)
1	EC507738	13.50	10.80	470.00	9.00	3.10	3.30
2	EC507739	15.40	8.60	232.00	7.80	2.90	6.40
3	EC507740	14.80	10.30	208.00	12.50	3.20	6.20
4	EC507741	16.50	11.40	410.00	9.50	3.20	3.30
5	EC507742	15.80	9.10	188.00	11.90	3.10	7.80
6	EC507743	14.20	9.90	314.00	12.00	2.00	3.50
7	EC507744	14.70	7.70	352.00	9.60	2.30	5.60
8	EC507746	13.70	9.40	168.00	11.00	2.40	1.60
9	EC507747	14.80	8.70	438.00	8.20	3.00	4.50
10	EC507748	14.60	10.90	352.00	12.50	2.80	3.90
11	EC507749	15.80	9.10	434.00	9.00	3.60	5.60
12	IC411824	13.40	10.30	426.00	11.60	2.40	4.60
13	IC411825	14.80	7.90	330.00	14.00	2.20	4.00
<b>Minimum</b>		<b>14.77</b>	<b>9.55</b>	<b>332.46</b>	<b>10.66</b>	<b>2.78</b>	<b>4.64</b>
<b>Maximum</b>		<b>16.50</b>	<b>11.40</b>	<b>470.00</b>	<b>14.00</b>	<b>3.60</b>	<b>7.80</b>
<b>Mean</b>		<b>14.77</b>	<b>9.55</b>	<b>332.46</b>	<b>10.66</b>	<b>2.78</b>	<b>4.64</b>

**Table 89: IVT, AVT-I and AVT-II of Kalingda Kharif 2015: Plain.**

Sr. No.	Genotypes	Crude protein (%)	Oil (%)	Crude fiber (%)	Iron (mg/100 g)	Copper (mg/100 g)	Calcium (mg/100 g)
<b>IVT</b>							
1	CAZJK-14-1	19.67	29.84	31.45	13.37	0.64	14.90
2	CAZJK-14-2	19.23	<b>24.19</b>	<b>36.15</b>	15.72	<b>0.10</b>	<b>8.67</b>
3	SKNK-1301	17.92	27.36	33.45	<b>17.31</b>	0.38	17.15
4	SKNK-1302	17.92	25.84	31.45	12.98	0.44	<b>21.60</b>
<b>AVT-I</b>							
5	CAZJK-13-1	20.54	26.62	34.60	15.93	1.16	14.40
6	CAZJK-13-2	18.35	26.21	35.85	16.64	1.91	16.82
<b>AVT-II</b>							
7	MGPK-10-2	<b>17.04</b>	29.16	32.60	13.30	<b>3.39</b>	17.23
8	SKNK-1101	<b>23.16</b>	29.32	29.80	15.90	1.47	18.12
9	SKNK-1102	18.79	<b>29.87</b>	<b>26.55</b>	13.57	1.37	16.67
10	SKNK-1103	20.54	28.99	32.65	14.43	1.16	15.00
11	GK-(Check)	23.16	27.66	35.85	<b>12.93</b>	2.53	14.75
<b>Minimum</b>		<b>19.67</b>	<b>27.73</b>	<b>32.76</b>	<b>14.73</b>	<b>1.32</b>	<b>15.94</b>
<b>Maximum</b>		<b>23.16</b>	<b>29.87</b>	<b>36.15</b>	<b>17.31</b>	<b>3.39</b>	<b>21.60</b>
<b>Mean</b>		<b>19.67</b>	<b>27.73</b>	<b>32.76</b>	<b>14.73</b>	<b>1.32</b>	<b>15.94</b>

**VALUE ADDITION**

---

## **VI. VALUE ADDITION**

### **6.1 Introduction**

The under-utilized crops viz. amaranths, buckwheat and rice bean (now potential crops) have the great significance for improvement of nutrition and food security of the region. In Himachal Pradesh and other parts of India rice bean is one of the under-utilized pulse crops have wider adaptability with high nutritional quality and consumed as such and in various foods. Similarly, buckwheat is one of the traditional crops with promising economic and medicinal value and found in high altitude regions of Himachal Pradesh and milled buckwheat can be used in preparation of speciality products. In recent years interest has been increased in amaranth grain because of its high nutritional profile and suitability for the preparation of variety of food products. Keeping the significance of these potential crops in view during this year as suggested in the last meeting the different formulations of low cost weaning foods have been standardized.

### **6.2 Technical Plan of Work**

The present study was undertaken with the broad objectives i) to evaluate amaranths, buckwheat and rice bean genotypes for product development properties ii) to standardize the food recipes for different value added products iii) documentation of traditional foods based on the crops and development of their value added products along with their nutritional evaluation and transfer of improved technologies through trainings to the farmers/ farm women/ entrepreneurs for local consumption as well as entrepreneurship development. During the year 2015-16 the work undertaken as per details below:

- Methodologies for preparation of value added products, nutraceutical properties and nutritional profile.
- Preparation and evaluation of weaning food mixes using buckwheat, amaranths and rice bean.
- Determination of shelf life of selected under-utilized based food products keeping in views the marketing potential of products.

- Hand-on-Trainings on value addition to farmers/ farm women/ self help groups for income supplementation and nutritional security in the target areas.
- Training Workshops for entrepreneurs.

The different genotypes as well as mixture of rice bean samples were procured from the Department of Organic Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur. The bulk samples of Buckwheat (*ogla and fafra*) and Amaranths were procured from University Research Station, Sangla. The seeds different crops were converted into flour and were kept in airtight containers for further use. Black gram flour, bengal gram flour, sugar, ghee, chemicals and other ingredients were procured from local market. The moisture, protein, fat, fiber, ash and minerals contents of the raw material and different products were determined using approved analytical methods. In addition to work on the different recipes based on selected potential crops the formulations of low cost weaning foods has also been carried out.

## **6.3 Product Development and Evaluation**

### **6.3.1 Rice bean Based Value Added Products**

The rice bean flour being rich in protein, fiber, ascorbic acid and minerals contents as compared to other flours have been used for preparation of different value added products. The set methodologies for different rice bean based value added products have standardized and the different formulations assessed for physico-chemical, nutritional and functional properties, storage stability and consumer's acceptability. The formulations for preparation of various value added products viz *ladoo*, *boondi*, *bhujia*, *halwa*, *sepu wadi*, *papad* and cake from the blends contained different proportions of rice bean flours have been assessed for different quality parameters.

Snack foods have long been a part of diets both in developing and developed countries. *Papad* also known as *Appalam* is a popular snack item of India. From many years Indian's always prefer traditional sweets not only on festival and occasions but also during common days. Indian sweetmeat (*Ladoo*), a sweet product made from bengal gram flour known all over India. Attempts

have been made to utilize rice bean in flour form for preparation of various traditional snacks like *ladoo* and *papad* and evaluate the nutritional and keeping quality of the prepared products. The results pertaining to nutritional profile and consumer's acceptability of *papad* and *ladoo* prepared from different formulations are summarized below:

### **Nutritional profile and consumer's acceptability of *Papad*:**

- The moisture content of the pure black gram *papad* was 3.25 per cent which increased significantly to 3.54, 3.96, 4.22 and 4.63 per cent in *papad* prepared from 75:25, 50:50, 25:75 and 00:100 blending proportions of black gram and rice bean flours, respectively. With the storage interval, the mean moisture content of *papad* ranged between 2.93 to 5.26 per cent.
- With blending, the protein content decreased significantly from 22.55 to 17.51 per cent with increased the proportion of rice bean flour in *papad*. The initial value of protein content of rice bean based *papad* was 20.18 per cent which significantly decreased to 19.96 per cent after 3 months and further 19.79 per cent after 6 months of storage intervals, respectively.
- The fat content in pure rice bean flour *papad* was (2.55%) followed by 2.35, 2.18, 1.98 and 1.83 per cent in 25, 50, 75 and 100 parts of black gram flour in *papad*, respectively. The mean value of fat content of *papad* was 2.48 per cent which decreased significantly to 2.23 and 1.83 per cent after 3 and 6 months of storage intervals, respectively.
- The maximum fiber content (4.87%) was recorded as in *papad* prepared with 100 per cent rice bean flour whereas minimum content (2.51%) was observed in pure black gram flour based *papad*. The mean fiber content of *papad* was 3.66 per cent which decreased significantly to 3.58 and 3.47 per cent with increased 3 and 6 months of storage intervals, respectively.
- With blending, the mean ash content decreased significantly from 8.96 to 8.81 per cent with increasing the proportion of rice bean flour in black gram flour proportions of *papad*. The initial mean value of ash content of *papad* was 8.91 per cent which significantly decreased to 8.88 per cent after 6 months of storage interval.

- The maximum total carbohydrates content (66.29%) was recorded in *papad* prepared from 25 per cent parts of black gram flour and 75 per cent proportion of rice bean flour whereas minimum content (64.16%) was observed in pure black gram flour *papad*. The mean total carbohydrates content of *papad* was 64.76 per cent which increased significantly to 65.40 and 66.04 per cent after 3 and 6 months of storage intervals, respectively.
- The iron content of pure black gram based *papad* was 5.12 mg/100g and 100 parts of rice bean flour based *papad* was 2.49 mg/100g. The mean values of calcium and zinc contents of rice bean based *papad* were recorded as 62.35 and 4.13 mg/100g, respectively. The maximum calcium content was observed in 100 parts of black gram flour based *papad* (68.02 mg/100g) and minimum in *papad* prepared from pure rice bean flour was 57.22 mg/100g.
- The overall acceptability of the *papad* ranged between 6.79 to 5.83 prepared from 100:00 to 00:100 proportions of black gram and rice bean flours blends. However, with storage the overall acceptability scores of the product was recorded as 6.90 which decreased to 6.28 and 5.58 after storage intervals of 3 and 6 months, respectively.

### **Nutritional profile and consumer's acceptability of *Ladoo*:**

- The addition of rice bean flour had significant effect on the moisture content of *ladoo* and the moisture content decreased with increasing proportion of rice bean flour in *ladoo*. The values of moisture content of *ladoo* were ranged from 7.06 to 6.23 per cent. The storage period of *ladoo* as had significant effect on the moisture content. The initial mean value of moisture content of *ladoo* was 6.11 per cent which increased to 6.55 per cent after 1 month of storage and further increased to 7.24 per cent after 3 months of storage, respectively.
- The protein content of *ladoo* prepared form 100 parts of bengal gram flour was 9.91 per cent which decreased significantly to 9.46, 7.86, 7.27 and 7.05 per cent of *ladoo* prepared from blends of 75:25, 50:50, 25:75 and 00:100 proportion of bengal gram and rice bean (flours), respectively. The protein content of *ladoo* slightly significantly decreased with increase in

- storage interval. The protein of fresh *ladoo* was 8.38 per cent which slightly decreased to 8.35 and 8.20 per cent of 1 and 3 months of storage.
- The fat content of rice bean based *ladoo* as affected by different blending proportions of bengal gram and rice bean (flours) in *ladoo* and storage duration. With blending, the maximum fat content was observed in *ladoo* prepared with 100 parts of rice bean flour (23.73%) and minimum in pure bengal gram flour based *ladoo* (21.01%). The fat content of *ladoo* was slightly significantly decreased with increase in storage interval. The mean values of fat content of *ladoo* were 22.68 per cent which decreased to 22.36 and 22.07 per cent after 1 and 3 months of storage.
  - The maximum fiber content (3.90%) was recorded as in *ladoo* prepared from pure rice bean flour whereas minimum content (2.68%) was observed in pure bengal gram flour *ladoo*. The addition of rice bean flour increased the fiber content of the *ladoo*. The mean value of fiber content of fresh *ladoo* was 3.38 per cent which decreased to 3.21 per cent with the increased storage interval of 3 months.
  - The ash content of the pure bengal gram *ladoo* was recorded as 2.33 per cent which increased significantly to 2.59, 2.77, 3.05 and 3.23 per cent in *ladoo* prepared from 75:25, 50:50, 25:75 and 00:100 blending proportions of bengal gram and rice bean (flours), respectively. The ash content of *ladoo* slightly decreased with increased storage and the mean ash content of fresh *ladoo* was 2.88 per cent which decreased to 2.80 and 2.70 per cent after 1 and 3 months of storage intervals, respectively.
  - With blending, the maximum carbohydrates content was observed in *ladoo* prepared from 100 parts of bengal gram flour (64.08%). The initial mean value of carbohydrates content of *ladoo* was 62.69 per cent which increased significantly to 63.16 and 63.82 per cent after 1 and 3 months of storage intervals, respectively.
  - From the results obtained it has been observed that the calcium content in pure bengal gram flour *ladoo* was 237.08 mg/100gm which followed by 304.29, 370.16, 438.42 and 507.31 mg/100gm in 75:25, 50:50, 25:75 and 00:100 proportions of bengal gram and rice bean flours, respectively. The maximum values of iron and zinc contents were recorded in pure

bengal gram flour *ladoo* (3.83 mg/100gm) and pure rice bean based *ladoo* (3.08 mg/100gm), respectively.

- The colour score of pure black gram flour based *papad* was 7.29 which significantly decreased to 6.81, 6.43, 5.90 and 5.70 after addition of 25, 50, 75 and 100 parts of rice bean flour in *papad*. In respect of storage interval, the mean colour score for all the blends was 6.96 which slightly decreased to 6.46 and 5.86 after 3 and 6 months of storage intervals, respectively.
- The mean overall acceptability scores of 7.36 declined to 6.86 and 6.37 on the basis of 9.0 after 1 and 3 months of storage intervals, respectively but the values ranged between liked moderately to liked very much.

### 6.3.2 Buckwheat, amaranths and rice bean based weaning food mixes:

The different proportions of buckwheat, amaranths and rice bean were used in preparation of weaning food mixes. The weaning foods mixes further enriched with carrot, mango, banana and apple being rich in vitamins. In one set of formulations was blended with spinach. The different formulations were prepared keeping in view the standard recommended nutritional profile of weaning food mixes. The following table indicates the formulations of weaning food mixes based on different proportions of buckwheat, amaranths and rice bean (Table 90).

**Table 90: Formulations of weaning food mixes based on buckwheat, amaranths and rice bean enriched with carrot, apple, spinach, banana and mango.**

Weaning Food Mixes	Buckwheat	Amaranths	Rice bean	Carrot	Skimmed milk powder	Sugar
WFM 1	0	100	0	10	15	15
WFM 2	25	75	0	10	15	15
WFM 3	50	50	0	10	15	15
WFM 4	0	75	25	10	15	15
WFM 5	0	50	50	10	15	15
WFM 6	25	50	25	10	15	15

<b>Weaning Food Mixes</b>	<b>Buckwheat</b>	<b>Amaranth</b>	<b>Rice bean</b>	<b>Apple</b>	<b>Skimmed milk powder</b>	<b>Sugar</b>
WFM 7	0	100	0	10	15	15
WFM 8	25	75	0	10	15	15
WFM 9	50	50	0	10	15	15
WFM 10	0	75	25	10	15	15
WFM 11	0	50	50	10	15	15
WFM 12	25	50	25	10	15	15
<b>Weaning Food Mixes</b>	<b>Buckwheat</b>	<b>Amaranth</b>	<b>Rice bean</b>	<b>Spinach</b>	<b>Skimmed milk powder</b>	<b>Sugar</b>
WFM 13	0	100	0	5	20	15
WFM 14	25	75	0	5	20	15
WFM 15	50	50	0	5	20	15
WFM 16	0	75	25	5	20	15
WFM 17	0	50	50	5	20	15
WFM 18	25	50	25	5	20	15
<b>Weaning Food Mixes</b>	<b>Buckwheat</b>	<b>Amaranth</b>	<b>Rice bean</b>	<b>Banana</b>	<b>Skimmed milk powder</b>	<b>Sugar</b>
WFM 19	0	100	0	10	15	15
WFM 20	25	75	0	10	15	15
WFM 21	50	50	0	10	15	15
WFM 22	0	75	25	10	15	15
WFM 23	0	50	50	10	15	15
WFM 24	25	50	25	10	15	15
<b>Weaning Food Mixes</b>	<b>Buckwheat</b>	<b>Amaranth</b>	<b>Rice bean</b>	<b>Mango</b>	<b>Skimmed milk powder</b>	<b>Sugar</b>
WFM 25	0	100	0	10	15	15
WFM 26	25	75	0	10	15	15
WFM 27	50	50	0	10	15	15
WFM 28	0	75	25	10	15	15
WFM 29	0	50	50	10	15	15
WFM 30	25	50	25	10	15	15

The further study on the nutritional profile of selected formulations of weaning food mixes is in progress.

## **Conclusion:**

- The rice bean based *papad* and *ladoo* prepared in the present study have improved nutritional profile and acceptable storage stability in relation to overall acceptability of the products.
- Storage studies revealed that *papad* can be stored safely for six months and *ladoo* can be stored safely for three months, at ambient temperature without much change in chemical and sensory characteristics.
- Acceptable quality weaning food mixes can be prepared from the different proportions of buckwheat, amaranths and rice bean.
- The standardized/ developed rice bean based product has great potential for household food security and add variety to diet for better nutrition.
- The improved/ developed formulations can be popularized for preparation of products with added advantages and meaningful utilization of rice bean in specialty products at cottage industry.

### **6.4 Trainings for the farmers/entrepreneurs/self help groups for income supplementation and nutritional security in the target areas**

Demonstrations on preparation of value added products (*Ladoo*, *pinni*, *papad*, cake, biscuits and extruded snacks) were given during on campus trainings organized for skill up gradation of tribal women at College of Home Science, CSKHPKV, Palampur. Links have been established with the local bakers/ entrepreneurs for commercialization of potential crops based value added products. The university has commercialized the bakery products based on buckwheat, amaranths and rice bean. Traditional tribal crops based food items were displayed and served to the participants during different exhibitions and fairs during the year 2015-16.

# **CENTRE REPORT**

---

## VII CENTRE REPORT

### 7.1 Hills

#### 7.1.1 UUHF, Ranichauri

##### No of Collections of Kharif Crops at Ranichauri

S.No.	Name of Crop	No of Collections
1.	Amaranth	42
2.	Rice Bean	25
3.	Perilla	20
4.	Faba bean	48
5.	Job's tear	20
6.	Buckwheat	50
7.	Chenopodium	36

##### Seed of Potential Crops Produced during *Kharif* 2015-16

S. No.	Name of Crop	Variety	Quantity of Seed(kg)
1.	Amaranth	PRA-1	10
		PRA-2	8
		PRA-3	6
2.	Buck Wheat	PRB-1	6

#### 7.1.2 ICAR RC AP Centre, Basar

##### 7.1.2.1 *Standardization of Job's tears (Coix lacryma -jobi) cultivation technique*

Field experiment was conducted during *kharif* 2015 under AICRN on potential crop to standardize the package of practices of Job's tears cultivation techniques. Sowing was done at 15 days interval from first fortnight of April to first fortnight of June with different spacing (30 x20 cm, 45 x 25 cm and 50 x 15cm) and nutrient management practices of different dose of NPK (0:0:0,40:30:40, 60:40:40, 80:50:40, 100:60:40, 120:80:40 Kg/ha). Different yield attribute were recorded at different stages of the crop. Highest average yield (38.2 q/ha) was recorded in sowing of first fortnight of May with a spacing 50 x 15 cm and NPK dose of 100:60:40 kg/ha followed by 32 q/ha of NPK 120:80:40 kg/ha with spacing 50 x 15 cm, sowing in first fortnight of May.

Excessive vegetative growth and prone to lodging was observed in the case of early sown in the month of March/April. Further experiment for validation of the results are undergoing.

#### **7.1.2.2      *Collection and evaluation of Perilla***

Two distinct varieties of perilla (Bold seeded with brownish color and small seed size with whitish color) which is locally known as Namdu were collected and evaluated. Experiment was conducted both in direct seeding and transplanting during kharif 2015. As per local climatic conditions, it was observed that optimal time of sowing and transplanting is in the month of April and June respectively.

## **7.2 Plains**

### **7.2.1 UAS, Bangalore**

#### **7.2.1.1 *Significant achievements:***

The variety 'KBGA-4' was accepted and approved in the ZREP meeting of UASB for Farm Trial in Zone-V.

#### **7.2.1.2 *Implementation of Technical Programme***

All the experiments allotted to the centre have been implemented in Plant Breeding, Agronomy and Plant protection. There is 100% implementation of the Technical Programme.

#### **7.2.1.3 *No. of collections of Germplasm.***

Grain Amaranth	: 5
Quinoa	: 2
Chia	: 1

#### **7.2.1.4 *Hybridization and Generation of breeding material***

##### **1. Selections:**

**Grain Amaranth:** 52 individual plant selections were made from the trial material which are being evaluated during summer 2016. The grain yield per plant in these selections ranged from 7.80 96.60 g/plant.

**Selection for MYMV resistance:** F4 seeds of five interspecific crosses of Rice bean x Mung bean are planted during summer 2016 to raise F5 to select plants resistant of MYMV with better seed yield.

##### **2. Hybridization:**

The following crosses were made in Grain Amaranth, the details of which are as follows:

S. No.	Cross combination	Total weight of the crossed seeds harvested	S. No.	Cross combination	Total weight of the crossed seeds harvested
1	KBGA -1 X GA-2	35.16	24	Durga X Suvarna	46.00
2	KBGA -1 X Durga	43.77	25	RMA-7 X VL-344	45.68
3	KBGA -1 X RMA-7	26.41	26	RMA-7 X BGA-2	40.91
4	KBGA -1 X VL-344	47.00	27	RMA-7 X PRA-3	35.60
5	KBGA -1 X BGA-2	34.40	28	RMA-7 X KBGA-4	39.04
6	KBGA -1 X PRA-3	46.90	29	RMA-7 X GA-1	28.20
7	KBGA -1 X KBGA-4	27.91	30	RMA-7 X Suvarna	26.82
8	KBGA -1 X GA-1	31.80	31	VL-344 X BGA-2	42.80
9	KBGA -1 X Suvarna	45.00	32	VL-344 X PRA-3	37.92
10	GA-2 X Durga	35.60	33	VL-344 X KBGA-4	36.54
11	GA-2 X RMA-7	57.00	34	VL-344 X GA-1	37.98
12	GA-2 X VL-344	25.41	35	VL-344 X Suvarna	50.82
13	GA-2 X BGA-2	51.96	36	BGA-2 X PRA-3	34.92
14	GA-2 X PRA-3	41.96	37	BGA-2 X KBGA-4	32.10
15	GA-2 X KBGA-4	39.00	38	BGA-2 X GA-1	49.20
16	GA-2 X GA-1	28.27	39	BGA-2 X Suvarna	43.00
17	GA-2 X Suvarna	31.62	40	KBGA-4 X GA-1	42.50
18	Durga X RMA-7	42.00	41	KBGA-4 X Suvarna	39.50
19	Durga X VL-344	43.00	42	GA-1 X Suvarna	42.12
20	Durga X BGA-2	33.00	43	PRA-3 X KBGA-4	10.20
21	Durga X PRA-3	26.91	44	PRA-3 X GA-1	39.05
22	Durga X KBGA-4	30.94	45	PRA-3 X Suvarna	32.17
23	Durga X GA-1	22.39			

### **7.2.1.5 FLDs**

There are no FLDs conducted under AICRN on Potential Crops

1. However, under TSP, ten field demonstrations (half an acre each) on Grain Amaranth variety 'Suvarna' were conducted in Bagepalli Tq of Chikkaballapur Dist.
2. Under TSP 100 tribal farmers were given 150 gms of Grain Amaranth TL seeds to grow Grain Amaranth as mixed crop in Fingemillet / Maize.

3. Under NABARD Funded project, 54 farmers were given Grain Amaranth demonstrations (half acre each) in Bagepalli Tq of Chikkaballapur Dist.

### 7.2.1.6 Seed Production

The details of TL seeds produced are as follows:

S. No.	Name of the variety	Quantity (kgs)
1	Grain Amaranth variety 'Suvarna'	215
2	Grain Amaranth variety 'KBGA -1'	65
3	Winged Bean variety 'KHWB-1	35
4	Rice Bean variety 'KBR-1'	75

### 7.2.2 BAU, Ranchi

#### 7.2.2.1 Hybridization programme on Kharif Crops

- (a) **WINGEDBEAN:** F<sub>3</sub> Genotypes have been advanced generation and observations were recorded, emphasis on short duration/ their earliness and seed yield.

Cross combinations	Number of rows sown	Selected rows for No. of pods/yield	Selected for days to maturity
Ambika-11-3 x IC 150118	26	10	6
AKWB-1 x RWB-2	19	14	5

- (b) **MUTAGEN TREATMENT IN WINGEDBEAN (M<sub>2</sub>):** M<sub>2</sub> genotypes were sown and observation and selection were done for desirable plants. All the seeds were sown on 4<sup>th</sup> August 2015 in spacing of 60cm x 30cm. Four rows of individual plant sown, observations and evaluation for as short duration and early type and bulked and three rows of individual plant sown, observations and evaluation for identified high number of pods and high yield in Ambika 11-3 and bulked their seed. ten rows of individual plant sown, observations and evaluation for earliness and high yield and bulked their seed Mysore Local.

### **7.2.2.2 Tribal Sub Plan Project on Potential Crops (TSP)**

Three training on Potential Crops were organized during kharif 2015 (17<sup>th</sup> July 2015, 4<sup>th</sup> December 2015 and 29<sup>th</sup> January 2015 at Jaria Panchayat Bhavan, Jaria, Block: Bero, District: Ranchi under heading "Chhamtavan faslo ki ek diwasia prakshishan and jagrukta karyakaram". Altogether 91 farmers of villages: Muramu, Mashu, Tingaria, Katarmali, Jaria were participated in this programme. Seeds of ricebean (20 kg) and winged bean (1.8 kg) were distributed among 21 farmers during training on 17<sup>th</sup> July 2015.

### **7.2.2.3 Extension**

During Kharif Krishi Mahotsav 169 farmers of Madhupur, Devipur, Sarvan Blocks of Deoghar were aware of potential crops and given detailed information on grain amaranth, ricebean, fababean, winged bean, chenopodium. The folders on these crops were distributed among the farmers. Some seed samples of ricebean and winged bean were distributed among farmers.

## **7.2.3 SDAU, S.K. Nagar**

### **7.2.3.1 Seed Production during Kharif-2015**

<b>S.N.</b>	<b>Crop/Variety</b>	<b>Seed production (Kg)</b>
1.	Gujarat Karingada-1	20.00

Gujarat karingada -1 variety seed distributed to farmers as a truthful seed: 10 kg

**Breeder seed availability of** Gujarat Karingada-1 : 6 kg

### **7.2.3.2 Breeding Programme in Karingada (Kharif-2015)**

(I) Karingada Germplasm Maintained : 75

(II) List of F<sub>3</sub> Evaluation in Karingada

<b>Sr. No</b>	<b>Cross</b>	<b>Sr. No</b>	<b>Cross</b>	<b>Sr. No</b>	<b>Cross</b>
1.	GK 1 × SKNK 679	11	SKNK 679 × SKNK 1004	21	SKNK 903 × CAZ JK 13-2
2.	GK 1 × SKNK 806	12	SKNK 679 × CAZJK 13-2	22	SKNK 903 × MGPK-1

Sr. No	Cross	Sr. No	Cross	Sr. No	Cross
3.	GK 1 × SKNK 903	13	SKNK 679 × MGPK-1	23	SKNK 1001 × SKNK 1004
4.	GK 1 × SKNK 1001	14	SKNK 806 × SKNK 903	24	SKNK 1001 × CAZJK 13-2
5.	GK 1 × SKNK 1004	15	SKNK 806 × SKNK 1001	25	SKNK 1001 × MGPK-1
6.	GK 1 × CAZ JK 13-2	16	SKNK 806 × SKNK 1004	26	SKNK 1004 × CAZJK 13-2
7.	GK 1 × MGPK-1	17	SKNK 806 × CAZJK 13-2	27	SKNK 1004 × MGPK-1
8.	SKNK 679 × SKNK 806	18	SKNK 806 × MGPK-1	28	CAZ JK 13-2 × MGPK-1
9.	SKNK 679 × SKNK 903	19	SKNK 903 × SKNK 1001		
10	SKNK 679 × SKNK 1001	20	SKNK 903 × SKNK 1004		

### **7.2.3.3 Seed Production (Kharif-2015)**

S.N.	Crop/Variety	Seed production (Kg)
1.	Gujarat Karingada-1	20.00

Gujarat karingada -1 variety seed distributed to farmers as a truthful seed : 10 kg

# SUMMARY

---

## VIII. SUMMARY

A total of 143 experiments were allotted during Kharif 2015 which included germplasm evaluation (53), breeding (45), agronomic (31), quality aspects (7) and crop protection (7). These were allotted at thirty one locations in different agro-climatic zones of the country. Out of these, 73 trials were carried out. A summary of research achievements is given below:

### 8.1 PLANT GENETIC RESOURCES MANAGEMENT

#### 8.1.1 Exploration and Collection of Germplasm

During the year 2015-16, a total of 43 accessions of potential crops germplasm were collected, one accession was introduced, 218 accessions were supplied, 164 accessions were evaluated, 219 accessions were conserved in the National Genebank and 80 accessions were maintained with the field genebank:

#### 8.1.2 Germplasm Introduction and Quarantine

- (1) **Import Permits Issued:** During the period under report 77 import permits were issued, details of which are presented in table 2.
- (2) **Import of Germplasm:** One accession of Amaranth was introduced from Tajikistan and sent to NBPGR RS Shimla.
- (3) **Important interceptions:** In *Jatropha*, incidence of mites and leaf webber, *Jatropha mosaic virus*, *anthracnose (Colletotrichum lindemuthianum)*, *Cercospora sp.*, *Alternaria raphani* and *Phoma sp* was noticed in many accessions. All the germplasm accessions were salvaged.

#### 8.1.3 Germplasm Evaluation (Hills and Plains)

A total of 384 accessions in different crops, some of them tested at more than one location, were evaluated at fourteen locations during Kharif 2015. Crop-wise number of accessions, locations and promising accessions have been given in Table 91.

**Table 91: Performance of germplasm accessions in different crops.**

<b>S. No.</b>	<b>Crop/Location</b>	<b>Seed yield per plant (g)</b>	<b>Days to 80% maturity</b>
<b>A</b>	<b>HILL</b>		
<b>1</b>	<b>Grain amaranth (25)</b>		
	VPKAS, Almora	<b>Durga (14.74)</b>	IC274471, IC278913, IC313269, IC274467 (<85.00) Durga (85.00)
	UUHF, Ranichuari	<b>PRA-2 (149.02)</b>	<b>Durga (125.00)</b>
	CSKHPKV Sangla	IC258250 ,IC278922 ,IC333108 ,IC341551 ,IC321281 ,IC278921 ,IC326896 ,IC274451 ,IC329588 ,IC313265 ,IC322201 ,IC333173 ,IC313273 (>3.00) PRA-2 (2.64)	IC313265 ,IC258250 ,IC321281 ,IC322201 ,IC278921 ,IC333108 (<147.00) <b>Durga (147.80)</b>
	NBPGR, RS, Shimla	IC274451 ,IC313265 (>137.78) <b>Durga (131.30)</b>	<b>Durga (126.50)</b>
	Best entries over locations	IC274451 (>66.54) PRA-2 (66.54)	<b>Durga (121.08)</b>
<b>2</b>	<b>Buckwheat(25)</b>		
	VPKS, Almora	IC329193 (>7.70) <b>Himpriya (7.21)</b>	<b>VL-7 (56.00)</b>
	UUHF, Ranichuari	IC313136 (>38.63) <b>PRB-1 (38.63)</b>	<b>VL-7 (86.67)</b>
	CSKHPKV, Sangla	IC313138, IC313141, IC313152, IC329202, IC313134, IC313139, IC313149 (>2.60) <b>Himpriya (2.60)</b>	IC313142 (<100.00) <b>VL-7 (100.00)</b>
	NBPGR, RS, Shimla	<b>Shimla-B-1 (3.21)</b>	<b>Shimla-B-1 (91.00)</b>
	Best entries over all locations	IC313136 (>15.25) <b>PRB-1 (11.75)</b>	<b>VL-7 (83.42)</b>
<b>3</b>	<b>Chenopodium(25)</b>		
	UUHF, Ranichauri	NIC22517, EC507730, NIC22515, EC507733, IC007961, NIC22514, IC007959, IC007957, EC507734, NIC22507, EC359445, IC007962 (>15.54) <b>PRC-9801 (14.72)</b>	EC201680, EC507733, NIC22492, EC359445, IC007958, IC007213, IC341714 (<111.00) <b>NIC-22503 (120.00)</b>
	CSKHPKV Sangla	IC007213 (>5.50) <b>PRC-9801 (5.35)</b>	NIC15022, EC322024, IC007957, IC007958, IC007960, IC341714 (<122.00) <b>NIC-22503 (123.25)</b>
	NBPGR, RS, Shimla	NIC22514, EC507733, IC415405, EC201680, IC341714, IC007961, NIC22507, NIC22492, NIC15022, IC007958 (>22.65) <b>PRC-9801 (21.86)</b>	EC-507741 (108.00)

S. No.	Crop/Location	Seed yield per plant (g)	Days to 80% maturity
	Best entries over all locations	NIC22514, EC507733, NIC22507, EC507737, IC415405, IC007961, EC201680, IC341714, NIC22517, NIC22492 (>14.29) <b>PRC-9801 (13.98)</b>	IC007958 (<121.00) EC-507741 (121.83)
<b>4</b>	<b>Quinoa (14)</b>		
	CSKHPKV, Sangla	<b>PRC-9801(5.35)</b>	EC507738, EC507739-1, IC411824 NIC-22503 (123.25)
<b>5</b>	<b>Adzuki bean (25)</b>		
	CSKHPKV, Palampur	EC018257, EC340286, EC015257, IC341941, EC034264, EC087071, EC036070, EC087815 (>346.00) <b>HPU-51 (266.67)</b>	EC340254, EC340287, IC030270 (<124.33) <b>Totru Local (124.33)</b>
	NBPGR, RS, Shimla	IC024522, EC340254, EC087815, IC108857, IC341944 (>51.25) <b>HPU-51 (42.69)</b>	IC341944, EC087896, EC340286, IC108857 (<107.00) <b>HPU-51 (110.50)</b>
	Best entries over locations	EC340286, EC018257, EC015257, EC087815 (>196.01) <b>HPU-51 (154.68)</b>	IC341944, EC087896, EC340286 (<117.00) <b>HPU-51 (118.08)</b>
<b>6</b>	<b>Job's tear (25)</b>		
	UUHF, Ranichauri	IC029280, IC089390, IC089389, IC540267, IC089393 (>41.33) <b>Mayeur (25.55)</b>	IC029280, IC374506, IC416831, IC416971, IC416884 (<197.00) <b>Pollin (198.33)</b>
<b>7</b>	<b>Perilla (25)</b>		
	UUHF, Ranichauri	IC526701 (>4.59) <b>Jyantia-(4.40)</b>	IC521284 (<160.00) <b>Jyantia-(163.67)</b>
<b>B</b>	<b>PLAIN</b>		
<b>1</b>	<b>Grain amaranth (90)</b>		
	UAS, Bengaluru	IC095371, IC035642, IC120621, SKGPA-066 (>22.80) <b>BGA 2 (19.93)</b>	SKGPA-082SKGPA-102SKGPA-079, SKGPA-083, IC035635, SKGPA-072, SKGPA-081 (<80.00) <b>BGA 2 (84.00)</b>
	TNAU, Mettupalayam	SKGPA-074SKGPA-071, IC035642 (>14.30) <b>Suvarna (12.40)</b>	SKGPA-062, IC035404, IC035642, SKGPA-061, SKGPA-065, SKGPA-089 (<85.00) <b>BGA 2 (92.17)</b>
	Best entries over locations	IC095371, IC035642 (>17.75) <b>BGA 2 (15.17)</b>	SKGPA-079SKGPA-102, IC035642 (<84.00) <b>BGA 2 (88.08)</b>

S. No.	Crop/Location	Seed yield per plant (g)	Days to 80% maturity
<b>2</b>	<b>Winged bean (45)</b>		
	IGKV, Ambikapur (6)		IC095229, EC038821-1, EC38955-13 (<207.00)
	BAU, Ranchi (39)	RWB-15, EC178292, IC026949-1, EC178279, Ambika 11-2 (>32.90) <b>AKWB1 (13.72)</b>	EC178295, IC026945, EC178289, EC178292, IC026170, RWB-16 (<148.00) <b>BHW-1 (151.00)</b>
<b>3</b>	<b>Kankoda (59)</b>		
	IGKV, Ambikapur (29)	PRATAPPURPK-49, PK-9 (>116.50) Indra Kankoda-1 (102.37)	PK-5PREMNAGAR , PK-8WADRAFNAGAR (<127.00) <b>Indra Kankoda-1 (137.00)</b>
	MPKV, Rahuri (30)	RKG-09-29, RKG-09-33, RKG-09-45, RKG-09-10, RKG-09-6, <b>RKG-09-49 (&gt;0.25)</b>	RKG-09-43, RKG-09-8, RKG-09-21, RKG-09-13, RKG-09-6, <b>RKG-09-10 (&lt;113.00)</b>
<b>4</b>	<b>Vigna trilobata (26)</b>		
	OUA&T, Bhubanewar	IC553555, IC553518, IC553505, IC524667 (>0.10) -	IC550529, IC553505, IC553512, IC553547 (<66.00) -
	TNAU, Mettupalayam	IC550532, IC550529, IC550531, IC550543 (>4.25) -	IC524667, IC550557, IC553494 (<69.00) -
	Best entries over locations	IC550531, IC550543, IC550537, IC550536, IC550529 (>2.50) -	IC524667, IC261321, IC550529, IC550557, IC553517 (<69.00) -

#### 8.1.4 Germplasm Conservation

A total of 219 accessions were added to the National Gene Bank at NBPGR during 2015-16.

#### 8.1.5 Seed Supply

The seed and planting material of 218 accessions belonging to different crops were supplied to ICAR institutes/coordinated projects, agricultural universities and other users in India. Based on specific requests received samples were supplied as per details given below under the Material Transfer Agreement (MTA) and GEX 01 Forms.

### 8.2 CROP IMPROVEMENT

Forty five varietal trials, 22 in hills and 23 in plains, were conducted on seven potential crops in order to identify improved varieties of various potential

crops. Details of trials, entries, number of locations and highest yielding entries are given below in Table 92.

**Table 92: Best genotypes in different trials conducted at multilocation during 2015.**

Crop		Entries	Locations	Top yielder	Yield (q/ha)	Best check yield (q/ha)
HILLS						
Amaranth	IVT	6	4	IC361853	24.56	Durga (20.90)
Buckwheat	IVT	5	4	Sangla-B-400	5.57	Shimla-B-1 (5.98)
	AVT-I	3	4	IC412733	4.50	
PLAINS						
Amaranth	IVT	16	2	RGA-11	15.80	Suvarna (15.41)
	AVT-I	9	2	-	-	Suvarna (14.37)
	AVT-II	8	2	-	-	Suvarna (14.35)
Winged bean	IVT	2	3	PWB-11-2	13.06	AKWB-1 (10.94)
	AVT-I	1	3	RMD-WB-1	12.18	
	AVT-II	2	3	AWB-13-4	13.27	
Kankoda*	AVT-I	2	2	RMDFG-3	33.10	Indira kankoda (27.24)
	AVT-II	2	2	Ambika-K-13-6	24.35	
Kallingda	IVT	4	3	SKNK-13-01	4.70	GK-1 (3.00)
	AVT-I	2	3	CAZJK-13-2	4.64	
	AVT-II	3	3	SKNK - 11-02	4.42	

\* Fruit yield q/ha

Based on the three years data, the best genotype in each crop with respect to yield has been identified and indicated in Table 93.

**Table 93: List of promising genotypes based on three years data.**

Crop	Variety	Seed yield (q/ha)	Maturity (days)	Increase/decrease in yield over check (%) - Best check
<b>PLAIN</b>				
Grain Amaranth	KBGA-1	12.89	91.61	-11.87
Winged bean	Ambika 13-5	13.53	173.87	5.40
Kalingda	SKNK-11-02	2.86	-	24.35
Kankoda (fruit yield)	Ambika K-13-5	52.30	-	69.96

## 8.3 CROP PRODUCTION AND PROTECTION

### 8.3.1 Crop Production

A total of fifteen agronomic experiments were formulated to be conducted at fourteen locations in 31 trials. These comprised of two studies each on amaranth and buckwheat, eight on rice bean, and one each on adzuki bean, kalingada, job's tear and perilla. The results of trials on rice bean were passed on to IIPR, Kanpur. Out of the remaining results of two experiments were received from two locations in 2 trials. Centre-wise details of experiments are presented in Table 86 and the findings are as follows:

S. No.	Experiment	Findings
1	Response of promising genotypes (AVT-II entries of Kalingada to different level of management	Application of recommended Fertilizer Dose (F3) recorded significantly maximum fruit yield among all genotypes. Maximum fruit yield of 119.07 q/ha was recorded with SKNK-1103 variety with application of F3 followed by genotype SKNK-1102 (107.96 q/ha) with the same treatment.
2	Response of promising genotypes (AVT-II entries) of winged bean to different levels of management	Application of Fertilizer Dose (F3) recorded significantly maximum pod yield among all genotypes. Maximum pod yield of 53.94 q/ha was recorded with AWB-13-4 variety with application of F3 followed by genotype AWB-13-5 (44.61 q/ha) with the same treatment

### 8.3.2 Crop Protection

In Crop protection, two experiments in potential crops were formulated to be conducted at 4 locations in 9 trials during *kharif* 2015 on two crops such as grain amaranth and buck wheat. Out of these, results of two experiments were received from one location i.e Bengaluru.

S. No.	Experiments	Crops	Results
1	Screening of germplasm against major insect pests and diseases	Grain amaranth	In IVT-I, promising entries for resistance to stem weevils were SKNA-403, BGA-11 and SKGPA-72, promising entries for resistance to sucking pests were BGA-10-2 and KBGA 2 and promising entry for resistance to defoliators is SKGPA-72. Out of 114 entries were screened against major insect pests, 14 entries were found to be promising against stem weevils, 5 entries were found promising against sucking pests and 5 entries were found promising for defoliators

S. No.	Experiments	Crops	Results
2	Integrated pest management (IPM) in potential crops	Grain amaranth	In the management of defoliators, maximum yield of 1,398 kg/ha was obtained in emamectin benzoate @ 0.5ml/lit. In case of sucking pests, maximum yield of 1,328 kg/ha was obtained in Imidacloprid 17.8 SL (Confidor) @ 0.08ml/lit

## 8.4 QUALITY ANALYSIS

The seed of promising genotypes evaluated in IVT, AVT and germplasm evaluation of the four potential crops were planned for quality analysis at three centres viz. MPKV, Rahuri, CSKHPKV, Palampur and CCSHAU, Hisar, Quality analysis was done at three centres and seed was supplied by Shimla, Rahuri, S.K. Nagar, and Hisar centres. The crop-wise details of quality traits are given below:

S. No.	Character	Range		Promising genotype	Best check value
		Min.	Max.		
A. Coordinated Trials of Grain Amaranth at Shimla Kharif 2015: Hill					
1	Protein %	10.00	14.20	IC035393 (14.2)	Durga (12.4)
2	Oil (%)	5.20	8.20	EC322051 (8.2)	Durga (7.1)
3	Phenol (%)	0.05	0.07	IC035371 (0.045)	PRA-3 (0.058)
4	Ca (mg/ 100g)	285.00	325.00	IC035463 (325)	Annapurna (311)
5	Fe (mg/ 100g)	5.80	9.20	EC328873 (9.2)	Annapurna (8.2)
6	Zn (mg/ 100g)	3.60	6.10	EC338767 (6.1)	Durga (5.8)
B. Coordinated Trials of Grain Amaranth at Bangalore Kharif 2015: Plain					
1	Protein (%)	9.70	13.90	SKNA-401 (13.9)	Suvarna (C) (12.8)
2	Oil (%)	5.80	8.10	BGA-4 (8.1)	GA-2 (C) (7.9)
3	Phenol (%)	0.05	0.06		Suvarna (C) (0.047)
4	Ca (mg/ 100g)	308.00	334.00	SKNA-403 (334)	RMA -7(C) (323)
5	Fe (mg/ 100g)	9.30	15.30	BGA-11-1 (15.3)	RMA -7(C) (13.3)
6	Zn (mg/ 100g)	4.20	5.80	SKNA-403 (5.8)	Suvarna (C) (5.6)
Buckwheat					
1	Crude protein (%)	12.01	13.40		VL-7 (12.00)
2	Total Phenols (mg/100g)	216.58	263.00	IC412733 (263.00)	Shimla B-1 (257.00)
3	Tryptophan (g/100g Protein)	0.77	0.93		Himpriya (0.93)
4	Methionine (g/100g Protein)	1.28	1.62		PRB-1 (1.62)

S. No.	Character	Range		Promising genotype	Best check value
		Min.	Max.		
5	Sodium (mg/100 g)	3.05	3.80		Himpriya (3.80)
6	Potassium (mg/100 g)	434.25	584.00	Sangla B-400* (584.00)	Himpriya (525.00)
7	Calcium (mg/100 g)	84.50	98.50	IC412733 (98.50)	Himpriya (98.30)
8	Iron(mg/100 g)	5.76	8.20		Himpriya (8.20)
<b>Chenopod</b>					
1	Crude protein (%)	14.77	16.50	EC507741 (16.5)	
2	Saponins(%)	9.55	11.40	EC507741 (11.4)	
3	Calcium(mg/100 g)	332.46	470.00	EC507738 (470)	
4	Iron(mg/100 g)	10.66	14.00	IC411825 (14)	
5	Sodium(mg/100 g)	2.78	3.60	EC507749 (3.6)	
6	Potassium(mg/100 g)	4.64	7.80	EC507742 (7.8)	
<b>Kalingada</b>					
1	Crude protein (%)	19.67	23.16	SKNK-1101 (23.16)	GK-1 (23.16)
2	Oil(%)	27.73	29.87	SKNK-1102 (29.87)	GK-1 (27.66)
3	Crude fiber (%)	32.76	36.15	CAZJK-14-2 (36.15)	GK-1 (35.85)
4	Iron(mg/100 g)	14.73	17.31	SKNK-1301 (17.31)	GK-1 (12.93)
5	Copper (mg/100 g)	1.32	3.39	MGPK-10-2 (3.39)	GK-1 (2.53)
6	Calcium(mg/100 g)	15.94	21.60	SKNK-1302 (21.6)	GK-1 (14.75)

## 8.5 VALUE ADDITION

In recent years interest has been increased in amaranth grain because of its high nutritional profile and suitability for the preparation of variety of food products. During this year, different formulations of low cost weaning foods have been standardized. Details are given below:

Rice bean Based Value Added Products	Methodologies for different rice bean based value added products viz <i>ladoo</i> , <i>boondi</i> , <i>bhujia</i> , <i>halwa</i> , <i>sepu wadi</i> , <i>papad</i> and cake have been standardized and assessed for physico-chemical, nutritional and functional properties, storage stability and consumer's acceptability.
--------------------------------------	--

Buckwheat, amaranths and rice bean based weaning food mixes	Different proportions of buckwheat, amaranths and rice bean were used in preparation of weaning food mixes. Keeping in view the standard recommended nutritional profile of weaning food mixes.
Trainings for the farmers/entrepreneurs/self help groups for income supplementation and nutritional security in the target areas	<ul style="list-style-type: none"> <li>• Demonstrations on preparation of value added products (<i>Ladoo, pinni, papad</i>, cake, biscuits and extruded snacks) were given during on campus trainings organized for skill up gradation of tribal women at College of Home Science, CSKHPKV, Palampur.</li> <li>• Links have been established with the local bakers/entrepreneurs for commercialization of potential crops based value added products.</li> <li>• The university has commercialized the bakery products based on buckwheat, amaranths and rice bean.</li> </ul>

**Annexure-I**

Mean seed yield (q/ha) of grain amaranth (Kharif 2011, 2013, 2015) varieties tested for the last three years

S. No.	Genotypes	Kharif2011			Kharif2013			Kharif2015			Weighted				Percent increase / decrease over check
		Mean	Location	Frequency	Mean	Location	Frequency	Mean	Location	Frequency	Mean	Rank	Location	Frequency	
1	BGA-04	12.65	2	0/2	9.84	2	0/2	10.92	2	0/2	11.14	I	6	0/6	-20.74
2	BGA-11	11.78	2	0/2	9.51	2	0/2	11.12	2	0/2	10.80		6	0/6	-23.11
3	BGA-12	13.00	2	0/2	10.55	2	0/2	10.81	2	0/2	11.45	II	6	0/6	-18.48
4	BGA-21	10.19	2	0/2	8.43	2	0/2	9.53	2	0/2	9.38	III	6	0/6	-33.21
5	RMA-45	8.57	1	0/1	6.04	2	0/2	7.76	2	0/2	7.46		5	0/5	-46.93
6	BGA-2 (C)	13.56	2		11.72	2		13.97	2	-	13.08		6	-	-6.88
7	GA-2 (C)	10.42	2		8.82	2		11.43	2	-	10.22		6	-	-27.24
8	RMA-7 (C)	-	0		-	0		11.27	2	-	11.27		2	-	-19.79
9	Suvarna (C)	14.60	2		13.20	2		14.35	2	-	14.05		6	-	0.00
Mean		11.85			9.76			11.24			10.98				
S. No.	Genotypes	Kharif2012			Kharif2014			Kharif2015			Weighted				Percent increase / decrease over check
		Mean	Location	Frequency	Mean	Location	Frequency	Mean	Location	Frequency	Mean	Rank	Location	Frequency	
1	BGA-38	9.91	2	0/2	12.86	2	0/2	9.40	1	0/1	10.72	II	5	0/5	-26.70
2	BGA-43	10.28	2	0/2	12.56	2	0/2	10.77	1	0/1	11.20	III	5	0/5	-23.42
3	IC035615	-	-	-	14.67	1	0/1				14.67		1	0/1	0.27
4	KBGA-1	12.25	2	0/2	14.07	2	0/2	12.36	2	0/2	12.89	I	6	0/6	-11.87
5	BGA-2 (C)	11.37	2		15.87	2		13.97	2		13.74		6		-6.11
6	GA-2 (C)	7.17	2		11.72	2		11.43	2		10.11		6		-30.92
7	RMA-7	-	0		13.88	2		11.27	2		12.58		4		-14.05
8	Suvarna (C)	12.46	2		17.08	2		14.35	2		14.63		6		0.00
Mean		12.81			13.08						11.91				

**Annexure II**

Mean maturity (days) of grain amaranth (Kharif 2011, 2013, 2015) varieties tested for the last three years

S. No.	Genotypes	Kharif 2011			Kharif 2013			Kharif 2015			Weighted				Percent increase / decrease over check
		Mean	Location	Frequency	Mean	Location	Frequency	Mean	Location	Frequency	Mean	Rank	Location	Frequency	
1	BGA-04	83.00	2	1/2	88.33	2	0/2	93.20	2	0/2	88.18	I	6	1/6	3.77
2	BGA-11	84.00	2	0/2	89.50	2	0/2	92.20	2	0/2	88.57		6	0/6	4.23
3	BGA-12	84.67	2	0/2	90.33	2	0/2	94.50	2	0/2	89.83		6	0/6	5.72
4	BGA-21	83.67	2	0/2	92.50	2	0/2	92.70	2	0/2	89.62		6	0/6	5.48
5	RMA-45	81.67	1	0/1	88.33	2	0/2	97.50	2	0/2	89.17		5	0/5	4.94
6	BGA-2 (c)	78.00	2	-	86.42	2	-	90.50	2	-	84.97	I	6	-	0.00
7	GA-2 (c)	81.00	2	-	90.00	2	-	95.30	2	-	88.77		6	-	4.47
8	RMA-7 (C)	-	-	-	-	-	-	98.20	2	-	98.20		2	-	15.57
9	Suvarna (c)	79.50	2	-	88.00	2	-	92.20	2	-	86.57		6	-	1.88
Mean		81.94			89.18			94.03			88.38				
S. No.	Genotypes	Kharif 2012			Kharif 2014			Kharif 2015			Weighted				Percent increase / decrease over check
		Mean	Location	Frequency	Mean	Location	Frequency	Mean	Location	Frequency	Mean	Rank	Location	Frequency	
1	BGA-38	89.67	2	0/2	90.50	2	0/2	91.30	2	0/1	90.49	I	6	0/6	4.05
2	BGA-43	84.17	2	0/2	88.33	2	0/2	94.70	2	0/1	89.07		6	0/6	2.41
3	IC035615	-	-	-	96.33	1	0/1	-	-	-	96.33		1	0/6	10.76
4	KBGA-1	88.00	2	0/2	89.33	2	0/2	97.50	2	0/2	91.61		6	0/6	5.34
5	BGA-2 (C)	83.83	2	-	86.58	2	-	90.50	2	-	86.97	I	6	-	0.00
6	GA-2 (C)	88.00	2	-	92.25	2	-	95.30	2	-	91.85		6	-	5.61
7	RMA-7	-	-	-	95.33	2	-	98.20	2	-	96.77		4	-	11.26
8	Suvarna (C)	83.17	2	-	92.58	2	-	98.20	2	-	91.32		6	-	5.00
Mean		86.14			91.40			95.10			90.88				

## Mean seed yield (q/ha) of Winged bean varieties tested for the last three years : Plain

S. No.	Genotypes	Kharif 2013		Kharif 2014		kharif 2015		Weighted			Percent increase / decrease over check
		Mean	Frequency	Mean	Frequency	Mean	Frequency	Mean	Frequency	Rank	AKWB-1
1	Ambika 13-4	13.11	0/3	12.46	0/3	13.27	0/3	12.95	0/9		0.83
2	Ambika 13-5	17.43	0/3	10.49	0/3	12.68	0/3	13.53	0/9	I	5.40
	AKWB-1 (C)	14.37	3	10.97	3	10.92	3	12.09			

**Mean maturity days of Winged bean varieties tested for the last three years : Plain**

S. No.	Genotypes	Kharif 2013		Kharif 2014		kharif 2015		Weighted			Percent increase / decrease over check
		Mean	Frequency	Mean	Frequency	Mean	Frequency	Mean	Frequency	Rank	AKWB-1
1	Ambika 13-4	166.69	0/3	177.71	0/3	177.58	0/3	173.99	0/9	II	7.94
2	Ambika 13-5	166.28	0/3	176.67	0/3	178.67	0/3	173.87	0/9	I	
3	AKWB-1 (C)	165.38	3	176.58	3	180.53	3	174.16	3		

## Mean seed yield (q/ha) of kalingda varieties tested for the last three years :Plain

S. No.	Genotypes	Kharif 2012		Kharif 2013		Kharif 2014		Kharif 2015		Weighted			Percent increase / decrease over check
		Mean	Frequency	Mean	Frequency	Mean	Frequency	Mean	Frequency	Mean	Frequency	Rank	GK-1
1	SKNK-11-01	1.46	0/3	3.32	0/2	1.18	0/2	3.57	0/3	2.38	0/10		3.59
2	SKNK-11-02	1.75	1/3	3.47	0/2	1.80	0/2	4.42	2/3	2.86	3/10	I	24.35
3	SKNK-11-03	1.45	1/3	3.68	0/2	1.34	0/2	4.29	1/3	2.69	2/10		16.96
4	GK-1 (C)	1.33	3	3.34	2	1.51	2	3.00	3	2.30			

## Mean fruit yield (q/ha) of kalingda varieties tested for the last three years :Plain

S. No.	Genotypes	Kharif 2012		Kharif 2013		Kharif 2014		Kharif 2015		Weighted			Percent increase / decrease over check
		Mean	Frequency	Mean	Frequency	Mean	Frequency	Mean	Frequency	Mean	Frequency	Rank	GK-1
1	SKNK-11-01	58.20	1/3	102.64	0/2	40.11	0/2	122.61	0/3	80.89	1/10		7.95
2	SKNK-11-02	63.52	1/3	88.40	0/2	46.87	0/2	124.71	2/3	80.88	3/10		7.93
3	SKNK-11-03	54.84	1/3	111.34	0/2	46.47	0/2	123.48	2/3	84.03	3/10	I	12.15
4	GK-1 (C)	54.72	3	109.10	2	51.99	2	83.90	3	74.93			

## Mean Fruit yield (q/ha) of Kankoda varieties tested for the last three years :Plain

S. No.	Genotypes	Kharif 2013		Kharif 2014		Kharif 2015		Weighted			Percent increase / decrease over check
		Mean	Frequency	Mean	Frequency	Mean	Frequency	Mean	Frequency	Rank	
1	Ambika K-13-5	92.83	0/2	42.00	0/2	22.06	0/2	52.30	0/6	I	69.96
2	Ambika K-13-6	58.17	0/2	42.17	0/2	24.35	0/2	41.56	0/6		35.08
3	Indira Kankoda	36.23	2	28.85	2	27	2	30.77			

## Annexure VIII

## Number of trials/activities allotted and conducted at various centers AICRP on Potential Crops :Kharif 2015

S. No	Name of Centre	Alloted						Conducted						
		Breeding	Germplasm	Agronomy	Crop Protection	Quality	Total	Breeding	Germplasm	Agronomy	Crop Protection	Quality	Total	Percentage
(A) Main Centres														
1	Ambikapur	3	2	1			6	3	2	1			6	100.00
2	Bangalore	2	3	1	3		9	2	1	1	2		6	66.67
3	Bhubneswar	2	1	3			6	1	2	1			4	66.67
4	Faizabad	2	1				3	2					2	66.67
5	Hisar					2	2					2	2	100.00
6	Ludhiana	1	1				2	1	1				2	100.00
7	Mandor	1					1						0	0.00
8	Mettupalayam	2	3		1		6	2	2				4	66.67
9	Palampur	1	2	1		3	7	1	2	1		2	6	85.71
10	Rahuri	3	1	1		2	7	2	1			1	4	57.14
11	Ranchi	2	1				3	2	1				3	100.00
12	Ranichauri	3	4	4	2		13	3	6				9	69.23
13	S.K. NAGAR	2		1			3	1		1			2	66.67
14	Cooch Behar	1		5			6						0	0.00
	Total (A)	25	19	17	6	7	74	20	18	5	2	5	50	67.57
(A) Cooperating and Voluntary centres														
15	Akola	1	1				2						0	0.00
16	Almora	3	3				6	3	3				6	100.00
17	Basar		3				3						0	0.00
18	Bhowali		1				1		1				1	100.00
19	Delhi	1					1						0	0.00
20	Jaisalmer	1					1	1					1	100.00
21	Jodhpur		1				1	1					1	100.00
22	Kolasib	1	3				4						0	0.00
23	Lamphelpat	2	3	3			8						0	0.00
24	Lembucherra	2	3	2			7						0	0.00
25	Medziphema	1	2	3			6						0	0.00

S. No	Name of Centre	Alloted						Conducted						
		Breeding	Germplasm	Agronomy	Crop Protection	Quality	Total	Breeding	Germplasm	Agronomy	Crop Protection	Quality	Total	Percentage
26	Pasighat		1				1						0	0.00
27	Sangla	2	3		1		6	2	3				5	83.33
28	Shillong	1	2				3	1					1	33.33
29	Shimla	3	4	2			9	3	5				8	88.89
30	Tadong	2		2			4						0	0.00
31	Umiam		4	2			6						0	0.00
	Total (B)	20	34	14	1	0	69	11	12	0	0	0	23	33.33
	Grand Total (A+B)	45	53	31	7	7	143	31	30	5	2	5	73	51.05
	% age of trials conducted							68.89	56.60	16.13	28.57	71.43	51.05	
	Rice bean Trial	18	13	13			44	13	7	3			23	52.27

**Annexure-IX**

**List of Centres and Names of Scientists working on AICRN Potential Crops**

S No	Name	Fax /E-mail	Phone (O)	Phone (R)
<b>A.</b>	<b>COORDINATING UNIT</b>			
1	<b>National Bureau of Plant Genetic Resources, Pusa, New Delhi 110 012</b>			
	Dr. B.S. Phogat, Network Coordinator	011-25841835, B.phogat@icar.gov.in	011-25841835	M-09868592706
	Dr. H.L.Raiger, Principal Scientist &PI (Documentation and Database Management)	011-25841835, drhanumanlal@yahoo.co.in hanuman.raiger@icar.gov.in	011-25841835	M-09968271997
<b>B.</b>	<b>SAU BASED MAIN CENTRES</b>			
1	<b>RMD College of Agri. &amp; Research Centre (IGKV), Ambikapur 497 001</b>			
	Dr. Jitendra Kumar Tiwari, Scientist (Plant Breeding)	07774-230986, tiwarijk5@gmail.com	07774-230815, 230986, 230056	M-07828082334
2	<b>University of Agricultural Sciences, Hebbal, Bengaluru 560 024</b>			
	Dr. Niranjana Murthy, Professor (Plant Breeding)	080-23414848. drnirananamurthy@hotmail.com, aicrnuucrops@gmail.com	080-23514353 Ext. 39, 246	M-09448680139
	Dr. B.S. Lingappa, Associate Professor (Agronomy)	080-23627265, bslingappa@gmail.com	080-23627265	M-09686939098
3	<b>Odisha University of Agriculture &amp; Technology, Bhubaneswar 751 003</b>			
	Dr. Dayanidhi Mishra, Associate Prof. (Plant Breeding)	0674-2391692/2391780, bhubaneswar.uucrops@gmail.com	0674-2391692	M-09437208099
	Dr. Mohima Prasad Behera, Associate Prof. Agronomy	0674-2561585, beheramp@gmail.com	0674-2561585	M-09437756821
4	<b>Narendra Dev University of Agriculture &amp; Technology, Faizabad 224 229</b>			
	Dr. C.B. Yadav, Associate Professor (Plant Breeding)	05270-262051, cbyadav57@yahoo.in, kamlesh_2007_2006@india.com	05270-262051	M-09616833372

5	<b>CCS Haryana Agricultural University, Hisar 125 004</b>			
	Dr. I.S. Yadav, Professor & Head, (MA & PC), Deptt. of Plant Breeding	01662-234952, 234613, mauup@hau.ernet.in, ishwar.yadav07@gmail.com	01662-289283	M-9416439265
	Dr. J.S. Hooda, Professor (Plant Breeding)	mauup@hau.ernet.in	01662-289283	M-09416590652
	Dr. M. Khabiruddin, Professor (Phytochemistry)	mauup@hau.ernet.in	01662-289283	M-09416325484
6	<b>Punjab Agricultural University, Ludhiana 141 004</b>			
	Dr. Ranjit Kaur Gill, Plant Breeder (Pulses)	0161-2459065, rkgillpbg@pau.edu	0161-2401960-70	M-9876197955
7	<b>Agriculture University Jodhpur, Mandor 342 304</b>			
	Dr. Ishwar Singh, Assistant Professor (Plant Breeding)	iskjala@gmail.com	0291-2571813	M-09413388213
8	<b>Forest College &amp; Research Institute (TNAU), Mettupalayam 641 301</b>			
	Dr. A. Balasubramanian, Associate Professor (Agronomy)	04254-225064, balayzz@yahoo.com	04254-222010	M-09443505845
9	<b>CSK Himachal Pradesh Krishi Vishwavidyalaya, Palampur 176 062</b>			
	Dr. (Mrs.) Neelam Bhardwaj, Assistant Professor (Plant Breeding) Deptt. of Organic Agriculture	01894-230402, neenabhardwaj@gmail.com	01894-230391	M-09816743729
	Dr. Y.S. Dhaliwal, Prof. & Head, Deptt. of Food Science & Nutrition	ysdhaliwal44@yahoo.co.in	01894-232444	M-09816082444
	Dr. Nageshwar Singh, Asst. Scientist & PI, Deptt. of Chem. & Biochem, COBS, CSKHPKV, Palampur	01894-230311, nageshwars@yahoo.com	01894-230311, 234079/233234	M-09418431713
10	<b>Mahatma Phule Krishi Vidyapeeth, Rahuri 413 722</b>			
	Dr. Suresh S. Dodake, Associate Professor (Plant Breeding)	02426-243223, prof_sureshdodake@rediffmail.com, banyogesh@gmail.com	02426-243249	M-09604261101

11	<b>Birsa Agricultural University, Ranchi 834 006</b>			
	Dr. Jay Lal Mehto, Assistant Professor, Deptt. of Plant Breeding & Genetics	0651-2451011, jaylalmahto@ymail.com	0651-2450561	M-09334365602
12	<b>College of Horticulture and Forestry (UHF), Ranichauri 249 199</b>			
	Dr. Arun Bhatt, Associate Professor (Plant Breeding)	01376-252606, arunbhatt@rediffmail.com	01376-252121, 252119	9634794563, 6410557319
	Dr. Ajay Kumar, JRO Agromomy, (AICRN on PC)	01376- 252606, 252138,252138,		M-08476004147
13	<b>Sardar Krushinagar Dantiwada Agri. Univ. (SDAU), Sardar Krushinagar 385 506</b>			
	Dr. Nitesh N. Prajapati, Assoc. Res. Sci. (Plant Breeding)	02748-278471, 02748-278433, Niteshpriajapati1978@gmail.com	02748-278471	M-09909900962
	Dr. B.M. Patel, Professor (Agronomy)		02748-278471	02742-251268, M-09879245373
14	<b>Uttar Banga Krishi Vishwavidyalaya, Coochbehar, West Bengal 736165</b>			
	Tarun Paul Assistant Prof. (Agronomy) & Incharge, AICRN (PC), UUC, Deptt. of Agronomy	03582-2720246, ubkvdr@gmail.com	03582-2770249, 03582-2770756	
<b>C. COOPERATING CENTRES</b>				
1	<b>NBPGR, New Delhi</b>			
	Dr. S.K. Yadav, PI (PGR Management)	011-25841835, satish.yadav1@icar.gov.in	011-25841835	M-09868573218
	Dr. S.K. Kaushik, PI (Crop Improvement)	011-25841835, surinder.kaushik1@icar.gov.in	011-25841835	M-08287286113
	Dr. M.C. Singh, PI (Crop Production)	011-25841835, molchand.singh@icar.gov.in	011-25841835	M-09958196700
	Dr. T.V. Prasad, PI (Crop Protection)	011-25841835, T.Prasad@icar.gov.in	011-25841835	M-09716859790
2	<b>NBPGR, Regional Stations</b>			

	Dr. N. Dikshit, Officer Incharge, NBPGR Regional Station Akola	0724-2258067, dikshitn@yahoo.com	0724-2258067	M-09423445981
	Dr. S.K. Verma, Officer Incharge, NBPGR Regional Station Bhowali	05942-220027, officerinchargebhowali@yahoo.com	05942-220027	M-09411162212
	Dr. Om Vir Singh, Officer Incharge, NBPGR Regional Station Jodhpur	0291-2740490, omvir_singh_ujjlain@yahoo.com	0291-2740385	M-09414030319
	Dr. A.K. Mishra, Officer Incharge, NBPGR Regional Station Shillong	0364-2570651, nbpgrshl@rediffmail.com	0364-2570193	M 09436703247
	Dr. Mohar Singh, Sr. Scientist, NBPGR Regional Station Shimla	0177-2235453, headnbpgr@dataone.in singhmohar_2003@yahoo.com	0177-2835459,	M 08894009386
	Dr. Joseph John K, Officer Incharge, NBPGR Regional Station, Vellanikkara, KAU P.O., Thrissur - 680656 (Kerala)	Joseph.k@icar.gov.in		
	Dr. V. Kamala, Pr. Scientist, NBPGR Regional Station, ARI Campus, Rajendranagar, Hyderabad - 500030 (Andhra Pradesh)	kamala.venkateshwaran@icar.gov.in		
<b>D.</b>	<b>VOLUNTARY CENTRES</b>			
<b>1</b>	<b>Vivekananda Parvatiya Krishi Anusandhan Shala, Almora</b>			
	Dr. Salej Sood, Scientist	05962-231539, salej1plp@gmail.com	05962-241003, 241005 Ext. 105	M-09411706285
<b>2</b>	<b>Central Arid Zone Research Institute (CAZRI), Jodhpur</b>			
	Dr. H.R. Mahla, Sr. Scientist, CAZRI, RRS, Jaisalmer	hrmahla@cazri.res.in		M-09413568747
<b>3</b>	<b>CSK, Himachal Pradesh Krishi Vishwavidyalaya, Sangla</b>			
	Dr. Surender Sharma, Scientist Incharge, MAREC, CSKHPKV, Sangla - 172106, Kinnaur Distt. (H.P.)	01786-242332,		M-09418043669
<b>4</b>	<b>Agricultural Research Institute P.B. 181 Port Blair - 744101 (Andaman and Nicobar Islands)</b>			
	Dr. A.K. Singh, Central Island			

Dr. Anup Das, Sr. Scientist, Division of Crop Production ICAR Res. Complex for NEH Region, Umroi Road, Umiam (Meghalaya)	<a href="mailto:anup_icar@yahoo.com">anup_icar@yahoo.com</a> <a href="mailto:anupicar@gmail.com">anupicar@gmail.com</a>	+91-3642570306	M-09436336070
Dr. L. Thouthend, Arunachal Pradesh Centre of ICAR Research Complex for NEH Region, Basar PO, West Siang - 791101 (Arunachal Pradesh)			
Dr. M.A. Ansari, Manipur Centre of ICAR Research Complex for NEH Region, Lamphelpat, Imphal - 795004 (Manipur)	<a href="mailto:merajiari@gmail.com">merajiari@gmail.com</a>		
Dr. A.K. Rattan Kumar Singh, Mizoram Centre of ICAR Research Complex for NEH Region, Kolasib - 796081, (Mizoram)	<a href="mailto:ratanplantpatho@gmail.com">ratanplantpatho@gmail.com</a>		
Dr. Rakesh Kumar, Nagaland Centre of ICAR Research Complex for NEH Region, Jharnapani, Medziphema - 797106, (Nagaland)			
Dr. Subhash Babu, Sikkim Centre of ICAR Research Complex for NEH Region, Tadong, Gangtok (Sikkim)			
Dr. S.P. Das, Tripura Centre of ICAR Research Complex for NEH Region, Lembucherra, (Tripura)			
Dr. Dinesh Sah, Department of Natural Resource Management, College of Horticulture & Forestry (CAU), Pasighat - (Arunachal Pradesh)	<a href="mailto:dr.d.sah@gmail.com">dr.d.sah@gmail.com</a> <a href="mailto:dineshsah4uall@rediffmail.com">dineshsah4uall@rediffmail.com</a>		M-09862567430, 09402909014

