

Highlights of AICRP on Groundnut- 2018

I. Crop Improvement

1. Maintenance, multiplication and characterization of groundnut germplasm

- 60 wild *Arachis* accessions representing six sections of the genus *Arachis*: section *Arachis* (40 accessions); *Erectoides* (12 accessions); *Caulorhizae* (2 accessions); *Rhizomatosae* (2 accessions); *Extranervosae* (2 accessions); and *Heteranthae* (2 accessions) are being maintained in the field gene bank at Vriddhachalam.
- In the same centre, a field gene bank comprising four allotriploids {(*A. hypogaea* cv. VRI 4 x (*A. correntina* X *A. helodes*); *A. hypogaea* cv. VRI 2 x *A. correntina*; *A. hypogaea* cv. VRI 2 x *A. kempff-mercadoi* and *A. hypogaea* cv. VRI 2 x *A. cardenasii*}; three auto-tetraploids developed from two diploid species of the section *Arachis* (*A. villosa* and *A. stenosperma* and one species from the section *Erectoides* viz. *A. rigonii*); 11 amphidiploids (2n=4x=40) obtained through direct hybridisation between diploid wild species and tetraploid cultivated species were also being field maintained were being field maintained.
- From fourteen interspecific crosses effected in kharif 2017, 64 true F₁ hybrids were identified; to recover the genome of recurrent parents, 272 BC₁F₁ plants were recovered from nine interspecific cross-combinations in rabi-summer 2017-18. In kharif 2018, 18 interspecific crosses have been made introgressing the alien genes through triploid and tetraploid pathways.
- Four thousand one hundred and forty-six (4146) germplasm accessions are being maintained at 11 centres. This included 60 wild accessions; 19 interspecific derivatives; exotic collection; 2834 Spanish bunch accessions; 53 Valencia accessions; 810 Virginia Bunch accessions; 374 Virginia Runner accessions; and four other germplasm accessions.
- Few promising genotypes, soil borne (stem rot and collar rot) diseases (K 1812, JL 1176, CS-319, JL-977, JL-977, HNG-10, HNG-10, ICGV-86325, CS-19, GG-16) and earliness with fresh seed dormancy (TCGS 1157, TCGS 1694, VG 13127, VG 13149, VRI 8).

2. Hybridization programme

- For developing high-yielding groundnut cultivars possessing resistance to various biotic and biotic stresses which limit yield in season, 98 single-

crosses during rabi-summer and 189 in crosses in *kharif* 2018 were made different AICRP-G centers

- During *rabi*-summer progenies of 362 crosses were advanced to their respective next filial generation from which a very large number (10646) of selections were made
- During *rabi*-summer, progenies of 312 crosses were advanced to their respective next filial generation and in *kharif* season; progenies of 1513 crosses were advanced to their respective next filial generation from which very large number of objective specific selections was made. Of the total crosses, which were advanced to different filial generations, in *rabi*-summer, 136 crosses were in early generations (F_1 - F_3) and in *kharif* progenies of 1154 crosses were in early generations (F_1 - F_4) and the rest were in advanced generations (F_5 onwards).

3. Varietal evaluation at multi-location

- A three tier system of evaluation of groundnut entries under the nomenclature of Initial Varietal Trial, Stage I (**IVT I**); Initial Varietal Trial, Stage II (**IVT II**) and Advanced Varietal Trial (**AVT**) was adopted and the trials were allotted to 25 centers located in five agro-ecological zones of groundnut both in *kharif* and *rabi*-summer
- During *kharif*, 16 entries of Spanish Bunch; 10 entries of Virginia in IVT-I; 19 SB entries, 12 genotypes of Virginia and 6 large seeded genotypes in IVT-II were tested across the five zones with appropriate checks. Entries of IVT-I will be evaluated for one more year in IVT-II.
- In IVT-II, during *kharif*, the genotype Dh 257 (Proposed by UAS, Dharwad) promoted to AVT in Zone II (Gujarat and southern Rajasthan) with a high pod (3161 kg/ha) and kernel (2304 kg/ha) yield (10% higher over the best check, GG 7) and K 1812 with high pod (3385 kg/ha) and kernel (2346 kg/ha) yield (13% higher kernel yield) over the best check, R 2001-2 was promoted to AVT in Zone V (Tamil Nadu, Andhra Pradesh, Karnataka).
- At LSVT (Large Seeded Varietal Trial) out of seven test genotypes, two genotypes viz. **K 1574** (2825 kg/ha of pod and 1994 kg/ha of kernel yield) followed by **ICGV 06189** (2768kg/ha of pod and 1960 kg/ha of kernel yield) respectively. Both these genotypes recorded 10% higher kernel yield over the best check BAU 13 and hence promoted to ALSVT.
- In *kharif* 2018, at AVT, the genotype **Dh 256** was found superior over the best check R 2001-2 in Zone V (Tamil Nadu, Andhra Pradesh, Karnataka). Across different stages of testing from 2016 to 2018, the genotype, **Dh 256** (Proposed by UAS Dharwad), recorded a high pod

(3258 kg/ha) and kernel yield (2183 kg/ha) against the best zonal check variety, R 2001-2 with 2837 kg/ha of pod and 1882 kg/ha of kernel yield. Over different check varieties, the increase in pod yield of **Dh 256** was 61.2% over GPBD 4; 29.9% over GJG 32; and 20.1% over R 2001-3 and 14.8% over the best check of this zone R 2001-2 respectively. Increase in kernel yield of **Dh 256** over these check varieties was 59.3% over GPBD 4; 36.6% over GJG 32; 20.2% over GJG 32 and 16.0% over the best check of this zone R 2001-2 respectively. Oil content of Dh 256 is 50%. Hence proposed for identification.

4. High oleic Acid Varietal Trial (AVT-I; HOVT SB & VG)

- A special trial on High oleic Acid Varietal Trial (HOVT) was constituted in kharif 2018 (first year) with eight elite Spanish Bunch and six elite Virginia genotypes developed by ICAR-DGR Junagadh (6 VG entries), JAU Junagadh (5 SB entries) and UAS Raichur (3 SB entries). The check varieties used were TG 37A, GPBD 4 and GJG 32 (ICGV 03043) in Spanish Bunch trial and GG 20, KDG 128 (Phule Warna) and KDG 123 (Phule Morna) in Virginia trial. The trial was conducted at six locations, Tindivanam (Tamil Nadu), Palem (Telengana), Tirupati (Andhra Pradesh), Dharwad (Karnataka), Junagadh (Gujarat), and Durgapura (Rajasthan). The mean yield levels of the Spanish Bunch test materials including those of check varieties were 2746 kg of pod and 1806 kg per ha of kernel.

5. High oleic Acid Varietal Trial (AVT-I; HOVT SB & VG)

- A special trial on High oleic Acid Varietal Trial (HOVT) has been constituted during *kharif* 2017 with 18 genotypes. The check varieties used were TG 37A, GPBD 4 and GJG 32 (ICGV 03043). There were six locations Tindivanam (Tamil Nadu), Palem (Telengana), Tirupati (Andhra Pradesh), Dharwad (Karnataka), Junagadh (Gujarat), and Durgapura (Rajasthan).
- Across different locations and over two years, the check variety ICGV 00343 recorded 52.58% oleic acid. Whereas two genotypes **ICGV 15083 and ICGV 15090** 78.2% oleic acid which fulfills the bench mark (78%±2) set for high Oleate lines.
- Over different check varieties, the increase in pod yield of **ICGV 15083** was 57.3% over GPBD 4; and 41.4% over TG 37A, but fell short by just by 2.9% over ICGV 00343 (GJG 32). Whereas increase in kernel yield of this genotype **ICGV 15083** over these check varieties was 56.4% over GPBD 4; and 36.0% over TG 37A, but was less by 3.8% over ICGV 00343 (GJG 32) respectively. The genotype **ICGV 15083** matured in 112d with 67% of shelling; 43 g as Hundred Seed Mass, which was

comparatively higher over all the check varieties and with high oil, content (53%) which is 1-2% higher over all the checks. Protein content of this genotype was 27% and comparable with that of other check varieties.

- Over different check varieties, the increase in pod yield of the other entry **ICGV 15090** was 52.7% over GPBD 4; and 37.3% over TG 37A, but fell short by 5.7% over ICGV 00343 (GJG 32) respectively. Whereas increase in kernel yield of this genotype over these check varieties was 54.0% over GPBD 4; and 33.9% over TG 37A, but was less by 5.3% over ICGV 00343 (GJG 32) respectively. The genotype **ICGV 15090** matured in 113d with 67% of shelling; 41 g as Hundred Seed Mass, which was comparatively higher over all the check varieties and with a high oil content (53%) over all the checks. Protein content of this genotype was 26% and comparable with that of other check varieties. Hence these two high Oleate lines are proposed for identification.
- **In rabi-summer 2017-18**, one genotype, **J 95** (with 4558 kg/ha of pod and 3367 kg/ha kernel yields in **Zone I (Punjab and UP)**); two genotypes, **Dh 257** (with 3854 and 2788 kg/ha of pod and kernel yield) and **K 1812** (with 3854 and 2788 kg/ha of pod and kernel yield) in **zone IIIa** (Maharashtra, Karnataka); and **J 94** (with 3293 kg/ha of pod and 2283 kg/ha kernel yield in **Zone IIIb** (Tamil Nadu, Telengana, Andhra Pradesh) and **KGL 1322** (with 3047 kg/ha of pod and 2182 kg/ha of kernel yield) for Zone IIIb and Zone IV (Odisha, West Bengal, Manipur) were promoted to AVT based on their superiority over the best check of their respective zone and are currently in verge of their evaluation.

6. Breeder Seed Production

- During *kharif* 2018, DAC indents to the tune of 10458.91q of breeder seeds were received for 48 groundnut varieties. Based on the availability of nucleus/breeder seed stage I, a production target of 10167.23q was assigned for 46 groundnut varieties to 21 centres. During *kharif* 2018, a total quantity of 2940.55q breeder seed could be produced. To mitigate the short fall, a compensatory programme was undertaken during *rabi*-summer 2018-19 and the anticipated production is about 6382.50q. Thus, the total expected production of groundnut breeder seeds during 2018-19 would be 9323.05q.

HIGHLIGHTS

AICRPG (CROP PRODUCTION)

Kharif, 2018

1. Effect of paclobutrazol on growth and productivity on rain fed groundnut

The experiment was conducted at Bhubaneswar and Shirgaon during kharif, 2018. At Bhubaneswar single spraying at 30 DAE of Paclobutrazol @100ppm gave significantly higher dry pod yield. While at Shirgaon double spray of paclobutrazol @ 100 ppm at 30 and 50 DAE gave significantly higher pod yields (2619 kg/ha)

2. Evaluation of DAPG-producing fluorescent pseudomonads for enhancing nutrient use efficiency, bio- control of soil-borne diseases and yield of groundnut

The experiment was conducted at Raigarh during kharif, 2018. Application of DAPG 1 gave the highest dry pod yield but was found to be non-significant.

3. Studies on tank mix application of post-emergence herbicides for efficient weed control in groundnut

The experiment was conducted at Mohanpur during kharif, 2018. Significantly highest pod yield was found with weed free check followed by farmers practice (Hand weeding at 15 and 30 DAS), which was at par with the application of pendimethalin as pre-emergence along with tank mix of imazethapyr and quizalofop ethyl either 50: 50 or 60:40. Weed control efficiency was found maximum with tank mix application of Imazethapyr (60%) + Quizalofop ethyl (40%)

4. Identification of rainfed groundnut+millet intercropping system for red soils of Karnataka

The trial was conducted at Dharwad and Hiriyur during kharif, 2018. At Dharwad significantly higher groundnut pod equivalent yield was obtained with groundnut + little millet (4:2) while at Hiriyur sole groundnut gave significantly higher groundnut pod equivalent yield.

5. Response of *kharif* groundnut to plant geometry and fertility levels

The trial was allotted at Bawal, Gwalior, Raigarh and Jodhpur during *kharif*, 2018. Bawal centre did not report any result. At Gwalior 75% RDF gave significantly higher pod yield with plant population @ 3.33 lakh ha⁻¹ (30 x 10 cm) but plant population did not have any significant effect on pod yield. At Raigarh 125 % RDF and Plant population @ 3.33 lakh ha⁻¹ recorded the highest pod yield but found to be non-significant. At Jodhpur significantly higher pod yield was observed with 125 % RDF while plant population @ 4 lakh ha⁻¹ gave highest pod yield without having significant effect on pod yield.

6. Alleviation of moisture-deficit stress in groundnut by application of endophytic bacteria

The experiment was conducted at Akola, Durgapura, Hiriyur, Kadiri and Tirupati during *kharif*, 2018. At Akola significantly higher dry pod yield was recorded with DGREB culture with normal inter-culturing while at Durgapura DGREB-1 with suggested inter-culture operations gave the highest dry pod yield but did not have any significant effect. At Hiriyur, DGREB-3 (i/c 15 days interval) obtained significantly higher pod yield. At Kadiri significantly higher yield was gained with DGREB-2 and at Tirupati DGREB 1 with normal inter cultural operations provided highest pod yield without having significant effect.

7. Standardization of sowing depth of groundnut crop in light soils of hyper arid regions

The trial was conducted at Bikaner during *kharif*, 2018. Significantly higher pod yield was obtained with 7 cm depth of sowing.

8. Identification of remunerative groundnut based cropping systems

The experiment was conducted at Dharwad, Jalgaon, Junagadh and Vridhachalam. Significantly higher groundnut pod equivalent yield was obtained with Groundnut+Cotton (4:2), Groundnut+Pigeonpea (4:2), Groundnut-coriander and groundnut-groundnut cropping sequence at Dharwad, Jalgaon, Junagadh and Vridhachalam, respectively.

9. Application of bio-formulations in *kharif* groundnut production

The experiment was conducted at Dharwad, Durgapura, Gwalior, Jalgaon, Junagadh, Kadiri, Jhargram, Shirgaon and Tirupati. At Dharwad, Durgapura and Jalgaon, Junagadh, Kadiri, Jhargram, Shirgaon and Tirupati significantly high dry pod weight was found with the application of 100 % RDF and at Gwalior highest pod yield was found with 75% RDF but was non-significant. At Durgapura, Jalgaon, Kadiri and Tirupati significantly high dry pod weight was obtained with Bio-Grow bio-formulation. At Dharwad, Gwalior, Junagadh, Jhargram and Shirgaon significantly high dry pod weight was found with application of NPK liquid formulation+Zn solubilizing bacterial bio-formulation.

10. Integrated water management in rainfed groundnut

The experiment was conducted at Bhubaneswar, Gwalior, Jalgaon, Kadiri and Palem. At Bhubaneswar and Gwalior application of hydrogel @ 2.5 kg/ha along with mulching of agrowaste/weed biomass @ 5 t/ha recorded significantly higher pod yield. At Jalgaon, Kadiri and Palem application of hydrogel 2.5kg/ha + mulching 5 t/ha + use of endophytic bacteria recorded higher dry pod yield which was at par with the application of hydrogel @ 2.5 kg/ha along with mulching of agrowaste/weed biomass @ 5 t/ha.

11. Identifying suitable crop geometries for mechanical intercropping in Spanish bunch type groundnut

The trial was conducted at Jalgaon, Junagadh and Bikaner. At Jalgaon, intercropping of groundnut + pigeon pea (3:1 row proportion) (60/30/30 cm) recorded significantly higher groundnut pod equivalent yield which was at par with intercropping of groundnut pigeon pea (2:1 row proportion) (60/30 cm). At Junagadh, groundnut-pigeonpea intercropping (2:1) (60/30 cm) recorded significantly higher groundnut pod equivalent yield. At Bikaner different crop geometries did not have any significant effect on groundnut pod yield. Bhubaneswar and Hiriya did not report any data.

12 Developing Conservation Agriculture practices in groundnut-wheat cropping system

The trial is in progress at Bikaner, Durgapura, Jalgaon and Ludhiana

13 Improving phosphorus use efficiency in kharif groundnut with microbial cultures

The trial was conducted at Bikaner, Hiriya, Junagadh, Ludhiana, Jhargram, Puducherry, Tindivanam and Vridhachalam. At Bikaner significantly highest pod yield was recorded with application of 60 kg P₂O₅ with or without DGRC culture. At Hiriya, application of 40 kg/ha of P + DGRC culture recorded significantly higher dry pod. At Junagadh, different phosphorus doses alone and in combination with DGRC culture did not have any significant effect on pod yield. At Ludhiana, application of FYM @ 2.5 t/ha+ DGRC culture recorded significantly higher pod yield. At Jhargram, Puducherry and Vridhachalam application of 60 kg P₂O₅/ha+ DGRC recorded significantly higher pod. At Tindivanam significantly higher pod yield was recorded with application of application of 60 kg/ha of P, which was at par with application of 40 kg/ha of P+ DGRC culture.

14 Identification of most profitable groundnut based intercropping systems under rain fed situation

The experiment was conducted at Tindivanam Centre. Groundnut + cotton intercropping system reported significantly higher groundnut pod equivalent yield and BCR of 3.2.

15 Integrated weed management in kharif groundnut

The experiment was conducted at Dharwad, Durgapura, Gwalior, Hiriya, Jodhpur, Puducherry, Raigarh, Tindivanam, Tirupati and Vridhachalam. At Dharwad, Hiriya, Raigarh and Vridhachalam, significantly higher dry pod yield obtained with treatment pendimethalin 30EC + Imazethapyr 2 EC @ 1.0 kg/ha PE (ready mix) + manual weeding at 25-30 DAS. At Durgapura, Jodhpur and Tirupati, two manual weedings at 25 and 40 DAS recorded significantly higher dry pod yield. At Gwalior

and Puducherry application of pendimethalin 30EC + Imazethapyr 2 EC @ 1.0 kg/ha PE (ready mix) as pre-emergence followed by quizafop – p-ethyl @ 50 g/ha at 15-20 DAS recorded significantly highest pod yield. At Tindivanam, significantly higher dry pod yield was recorded with application of Pendimethalin@ 0.75 or 1.0 kg/ha as PE + Imazethapyr@ 75 or 100 g/ha at 15-20 DAS.

16 Optimization of seed rate for groundnut cultivars having differential seed sizes

The experiment was conducted at Bikaner, Bhubaneswar, Jalgaon and Junagadh. At Bikaner significantly higher pod yield was obtained with HNG-10 @ 210 kg ha⁻¹ and Mallika @ 240 kg ha⁻¹. At Bhubaneswar, significantly higher pod yield was obtained with Dharani (seed rate as calculated by considering HKW and recommended plant population) followed by ICGV 00351. At Jalgaon, significantly higher pod yield was recorded by Phule Morna (2538kg/ ha) which remained at par with Phule Warna and JL-776 (seed rate as calculated by considering HKW and recommended plant population). At Junagadh significantly higher pod yield was recorded by GJG 32 (Bunch type, 45cm x 10cm) (seed rate as calculated by considering HKW and recommended plant population).

17 Agronomic management of AVT

The experiment was conducted at Bhubaneswar and Tirupati. At Bhubaneswar variety GNH 804 recorded significantly higher pod yield with RDF (25-50-50) N, P₂O₅, K₂O/ha (N in 2 splits, 80% basal, 20% TD) at 25DAS.

At Tirupati, among the entries, Dh-256 has recorded significantly higher per hectare pod (2872 kg), kernel (1703 kg), haulm yield (5087 kg) over local check Dharani which recorded 1493 kg, 1035 kg and 4968 kg pod, kernel and haulm yield per hectare, respectively.

Rabi/Summer, 2017-18

1. Evaluation of DAPG-producing fluorescent pseudomonads for enhancing nutrient use efficiency, bio-control of soil-borne diseases and yield of groundnut.

The experiment was conducted at Puducherry, Rahuri, Tindivanam, and Tirupati during *rabi*-summer, 2017-18. At Pudducherry and Rahuri DAPG-producing fluorescent pseudomonads FP 86 and at Tindivanam and Tirupati DAPG 4 was found to give significantly higher pod yield.

2. Standardization of potash levels and apportioning time in summer groundnut under drip irrigation.

The experiment was conducted at Rahuri and Junagadh during *rabi*-summer, 2017-18. At Rahuri application of 30 kg/ha K₂O in 10 equal

splits while at Junagadh application of 50 kg/ha K₂O in 8 equal splits produced significantly highest pod yield.

3. Economizing phosphorus use in groundnut production by exploiting phosphorus build up in soil.

The experiment was conducted at Bhubaneswar, Dharwad, Jagtial, Jalgaon, Junagadh, Kadiri, Mohanpur, Puducherry, Rahuri, Raigarh, Shirgaon, Tindivanam, Tirupati, Vridhachalam during *rabi*-summer, 2017-18. Application of FYM @ 5t/ha +100 % RDP+DGRC 2 was found to give significantly higher pod yield at Jalgaon, Kadiri, Mohanpur, Puducherry, Shirgaon, Tindivanam, Tirupati, and Vridhachalam while application of FYM @ 5t/ha +100 % RDP+DGRC 1 gave significantly higher pod yield at Dharwad. At Bhubaneswar application of FYM @ 5t/ha +50 or 100 % RDP+DGRC 2; at Junagadh FYM @ 5t/ha +50 % RDP+DGRC 2; and at Rahuri FYM @ 5t/ha +100 % P were found superior.

4. Fertilizer recommendation based on targeted yield concept for groundnut under alluvial zone of West Bengal

The trial was allotted at Mohanpur center for *rabi*/summer 2017-18 but the centre has not reported results.

5. Studies on tank mix application of early post emergence herbicide for efficient weed control in groundnut

At Pudducherry the highest pod yield (4735 Kg/ha) was observed with application of Pendimethalin @1.5 kg ai/ha (PE) followed by tank mix application of Imazethpyr (50%) + Quizalofop ethyl (50%) at 20- 30 DAS. While at Tindivanam, pre-emergence application of Pendimethalin @ 1.5 kg a.i/ha (PE) followed by tank mix application of 50 % of each of Imazethapyr @ 37.5 g a.i/ha + Quizalopfop ethyl @ 25 g a.i/ha at 20-30 DAS as early post-emergence was found effective for weed management and higher yield (2244 kg/ha) of groundnut.

6. Evaluation of suitable varieties with nutrient levels for potato-groundnut system.

The trial was allotted at Deesa, Mohanpur and Mainpuri centers for *rabi*/summer 2017-18 but only centre has reported the results.

7. Irrigation Management in Potato- Groundnut Systems in light soils.

The trial was allotted at Deesa, Mohanpur and Mainpuri centers for *rabi*/summer 2017-18 but none of the centres have reported results.

8. Efficacy of herbicide application on groundnut under rice-fallow.

The trial was allotted at Akola, Bhubanswar, Dharwad (Kumta), Kadiri(Vijayanagaram), Mohanpur, Raigarh, Tindivanam, Vridhachalam for *rabi*-summer 2017-18 and all the centres except Kadiri

(Vijayanagaram) and Raigarh have reported the results. At Akola among the herbicidal treatments application of Pendimethalin 30 % E.C @ 1.5 kg a.i. ha⁻¹ (Pre E) + Imazethapyr 10 % S.L @ 75 g a.i. ha⁻¹ (Post E) at 20-30 DAS recorded superior dry pod yield (1724 kg ha⁻¹). At Bhubaneswar Pendimethalin 30% EC@1.5 kg/ha+ 1 HW (25 DAS) as well as with 2 HW (20 and 40 DAS) were found superior. At Dharwad, significantly higher dry pod yield obtained with weed free treatment (2603 kg ha⁻¹) which was at par with pendimethalin 30% E.C. @ 1.5 kg a.i./ha + One hand weeding at 25 DAS (2457 kg ha⁻¹). At Mohanpur, pendimethalin 30% E.C. @ 1.5 kg a.i./ha + Imazethapyr 10% S.L. @ 75 g a.i./ha at 20-30 DAS was best among the chemical treatments. At Tindivanam application of Pendimethalin @ 1.5 kg a.i/ha (PE) + Tank mix Imazethpyr (50%) + Quizalopfop ethyl 50 (50%) at 20-30 DAS resulted in higher groundnut pod yield. At Vridhachalam application of Pendimethalin 30% EC @ 1.50 kg a.i/ha + one hand weeding at 25 DAS recorded higher pod yield (2785 kg/ha).

9. Agronomic practices for Rice-fallow groundnut.

The trial was conducted at Dharwad (Kumta), Kadiri (Vizianagaram), Mohanpur, Puducherry, Raigarh, Shirgaon, Tindivanam, Vridhachalam during rabi-summer 2017-18 and all the centres except Kadiri (Vijayanagaram) and Raigarh have reported the results. At Dharwad groundnut variety Dh-101 recorded higher dry pod yield (2592 kg ha⁻¹) and haulm(2638 kg ha⁻¹) yield than Dh-86 (2412 kg ha⁻¹ and 2563 kg ha⁻¹), respectively. At Mohanpur, TAG24 and TG51 remained at par with respect to pod yield. The groundnut variety TKG Bold recorded significantly higher pod, kernel and haulm yield (2599, 1897 and 2714 kg ha⁻¹, respectively) over groundnut variety Konkan Gaurav (2269, 1674 and 2401 kg ha⁻¹, respectively). At Tindivanam, higher growth and yield parameters were observed with TMV 13 under rice fallow groundnut system over TMV 7. At Vridhachalam, VRI 8 produced higher pod yield over VRI 7. At Dharwad (Kumta), Mohanpur, Shirgaon, and Vridhachalam application of 125 % RDF + Rhizobium gave significantly higher pod yield while at Tindivanam application of 100 % RDF + Rhizobium gave significantly higher pod yield.

10. Application of bio-formulations in rabi-summer groundnut production.

The trial was conducted at Akola, Dharwad, Jalgaon, Junagadh, Kadiri, Mohanpur, Rahuri, Tirupati for rabi-summer 2017-18 and all the centres except Akola have reported the results. Application of 100 percent RDF was found to produce significantly higher yield over rest of the treatments at all the centres. At Tirupati, yield levels were comparable with the application of 100 percent and 75 percent RDF. At Dharwad and

Mohanpur, application of NPK liquid formulation + Zn solubilizing bacteria produced significantly higher pod yield over biogrow and control. At Jalgaon and Rahuri, significantly higher pod yield was obtained with the application of biogrow. While at Junagadh, the yield levels were at par with the application of NPK liquid formulation + Zn solubilizing bacteria and biogrow. However, at Tirupati no significant effect of application of bio-formulations was observed on pod yield of groundnut.

11. Effect of foliar application of water soluble fertilizer on growth, yield and nutrient uptake of summer groundnut.

The trial was conducted at Jalgaon, Junagadh, Pudducherry and Rahuri centres during rabi/summer 2017-18. At Jalgaon and Rahuri, application of 75% RDF+2% WSF at 45,60,75 DAS while at Junagadh and Pudducherry application of 75% RDF+1.5% WSF at 45,60,75 DAS produced significantly higher pod yield over control.

12. Agronomic management of AVT

No AVTs were conducted by any center during *rabi*/summer 2017-18.

CROP PROTECTION (AICRP-G)

RESEARCH HIGHLIGHTS

(2018)

Altogether 21 trials, 9 during *rabi*-summer 2017-18, 12 during *kharif* 2018 from entomology and pathology were conducted. The highlights with five recommendations from the research of selected centres are presented:

ENTOMOLOGY (*Kharif*)

- ❖ **Insect-pests' situation:** Incidence of sucking pest and defoliators was recorded throughout the centres. *Spilarctia ablique* was observed during the entire cropping season with defoliation per cent of 2.5 to 5.5. at Dharwad. The maximum damage by *Spodoptera litura* Fab. and leaf miner was noticed during 45-75 days of crop growth wherein, *Spodoptera* damage ranged from 15-35 percent at Raichur. Latur recorded highest population of leaf hopper ranging from 5 to 25 leaf hoppers/3 leaves with damage of 25 per cent. Whereas, the population of thrips ranged from 5 to 22 leaf hoppers/3 leaves damage 16.8 thrips/3 leaves. *Helicoverpa* and leaf miner ranged between 20 and 15 per cent in farmers field respectively.
- ❖ **Occurrence of natural enemies:** Natural enemies observed during *kharif* season were predatory Coccinellids, spiders and green lace wings from Latur, Pavagada, Raichur, Vridhachalam and being maximum at Dharwad. *Nomuraea rileyi* was recorded at Dharwad causing mortality of *Spodoptera* larvae being peak during September (6.5-17%). The birds observed were mina, black dungro and cattle egret, and the major parasitoids recorded were *Apanteles sp.* and *Campoletis chloridae*.
- ❖ **Monitoring of *Spodoptera*, *Helicoverpa*, leaf miner and sucking pest of groundnut:** Peak *Spodoptera* moths of 182 during 32nd standard week at Dharwad while in Latur it was 38th standard week, in Raichur 45th standard week (84.2 moths/trap), and Vridhachalam observed three peak catches on 27 SMW, 28 SMW and 32 SMW. The highest (26 adults) numbers of *Helicoverpa* were caught during 39th SMW at Latur and Raichur. However, leaf miners noticed were more (4.8/trap) during 38th standard week at Raichur. Leafhoppers, in yellow sticky trap were maximum on 33 and 34 SMW (16.4 and 15.4 hoppers/trap/day/acre) and there after declined to 8.6 hoppers/trap/day/acre on 39 SMW at Vridhachalam.
- ❖ **Screening for resistance to insect pests:** ISK-I-2018-18 and ISK-I-2018-29 was found promising against defoliators and sucking pests at Dharwad; leaf hopper, *Spodoptera* and leaf miner in Latur, and for leaf

miner at Vridhachalam. ISK-I-2017-09 was effective against thrips at Dharwad, leaf hopper, *Spodoptera* at Latur. ISK-I-2017-20 had recorded lower damage score against Thrips at Dharwad, leaf hopper and *Spodoptera* at Latur.

❖ **Management of root-feeders in groundnut:**

- *Seed treatment with Chlorpyrifos@12ml/kg or Imidacloprid 600FS@2ml/kg were found effective in managing white grub species.*

PATHOLOGY (Kharif)

- ❖ **Diseases situation:** Monitoring of major diseases at farmers' field and research stations was reported. Maximum Late leaf spot (LLS) was reported from Aliyarnagar (7 scale) followed by Dharwad (7-9 scale), Junagadh (4-6) Ludhiana and Vridhachalam (5-7). Early leaf spot (ELS) was moderate at Dharwad (2-5 scale) and low in other research stations. Rust was maximum at Aliyarnagar (7 scale) followed by Dharwad and Vridhachalam (5-7). Maximum Alternaria leaf blight (ALB) was reported from Vridhachalam (5 scale), Junagadh and Pavagada (3-4 scale). Collar rot from Vridhachalam (15-20%), Bikaner and Junagadh (10-14%). Dharwad and Vridachalam reported stem rot incidence of 30%. PBNB was reported from Raichur (32-82%) and Pavagada (13%). Dry root rot was recorded high at Raichur (12-29%) and Kadiri (24-36%). PSND was reported from Kadiri (16-36%). Collar rot was maximum at Vridhachalam (21%).
- ❖ **Screening of IVT-I & AVT and other coordinated trial material for resistance / tolerance to major diseases:** Among genotypes screened, ISK-I-2018-18 was promising to rust and LLS at Aliyarnagar, Jalgaon and LLS at Junagadh and Vridhachalam. ISK-I-2018-29 showed resistance to rust and LLS at Aliyarnagar; LLS, stem rot and dry rot in Junagadh. IVK-I-2018-9 showed resistance to rust and LLS at Aliyarnagar and collar rot incidence in Bikaner. ISK-I-2018-10 (rust and LLS) Aliyarnagar and LLS at Vridhachalam. ASK-2018-7 showed resistance to rust and LLS at Aliyarnagar and stem rot (Junagadh) and collar rot (Kadiri). LSVT-II-2017-9 showed resistance to rust and LLS at Aliyarnagar and to collar rot and stem rot at Jalgaon. IVK-I-2018-6 was resistant against LLS at Dharwad; collar rot, stem rot, LLS and rust at Junagadh and LLS at Kadiri, and ELS, LLS, soil borne and PBNB at Raichur. ISK-I-2017-30 was resistant to LLS at Dharwad; dry root rot (DRR) at Kadiri. IVK-I-2017-3 had resistance to LLS at Dharwad and DRR at Kadiri. IVK-I-2017-27 showed resistance to LLS at Dharwad and was free from collar rot at Junagadh and Kadiri. ISK-I-2018-3 was found to be resistant against collar rot, stem rot, leaf spots and rust at Jalgaon, and collar rot at Kadiri. ISK-I-2018-4 was found resistant to

collar and stem rot at Jalgaon and ELS, LLS and PBNB at Raichur. ISK-I-2018-18 was resistant to LLS and rust at Jalgaon and stem rot at Vridhachalam. IVK-I-2018-13 exhibited resistance to collar rot, stem rot, LLS and rust at Jalgaon, collar rot and stem rot at Junagadh and ELS, LLS, soil borne diseases and PBNB in Raichur. ISK-2018-1 was resistant to collar rot and LLS at Junagadh. ASK-2018-9 was free from stem rot in Vridhachalam and ELS, ALB and soil borne diseases in Raichur.

❖ **Validation of Management Modules for soil borne diseases:** The module T₄ was used as check and next best performing module was T₆ at Kadiri, Dharwad, Raichur, and Vridhachalam. {T₆: *Deep summer ploughing with mould board plough + Soil application of Trichoderma @ 4 kg/ ha enriched in 250 kg FYM/ha + Seed treatment with Tebuconazole 2DS @ 1.5 g/kg of seeds + Soil application of Trichoderma @ 4 kg/ ha enriched in 250 kg FYM/ha at 35 and 70 DAS*}. At Aliyarnagar, T₂ {*Deep summer ploughing with mold board plough+ Soil application of Trichoderma @ 4 kg/ ha enriched in FYM+ Seed treatment with Trichoderma @ 10g/kg of seed+ Soil application of Trichoderma @ 4 kg/ ha enriched in FYM at 35 days after sowing (DAS)*}.

❖ **Management of major foliar diseases:**

➤ (T₄) *Seed treatment with Tebuconazole 2DS @ 1.5 g/kg seeds followed by Tebuconazole 50% + Trifloxystobin 25% WG @ 1.32 g/L (0.035%) at 40 and 65 DAS or (T₂), Seed treatment with Tebuconazole 2DS @ 1.5 g/kg seeds followed by Tebuconazole @ 1 mL/L (0.0259%) at 40 and 65 DAS*

❖ **Management of different insect pests and diseases through integration of different IPM modules:**

➤ (Module 2) *Border crop with bajra (4 rows) + Seed treatment with Imidacloprid 600 FS @ 1 mL/Kg seeds + Foliar sprays using Thiocloprid 480 SC @ 0.3 mL/L at 20-25 DAS followed by Fipronil 5SC @ 1 mL/L @ 40DAS and Acetamaprid 20 SP @ 0.2 g/L at 60 DAS.*

ENTOMOLOGY (Rabi-Summer)

❖ **Insect – pests' situation:** Sucking pests were observed in all the centres while leaf miner, *Spodoptera* were observed at Kadiri. Moderate to high incidence of thrips was recorded at Dharwad, Junagadh, Kadiri (1-7 scale), Raichur (4.6/terminal bud) and Vridhachalam (6/leaflet). *Spodoptera litura* damage was severe (6-8) in farmers' field of Vridhachalam Leafhopper and leaf miner infestation was recorded at Kadiri (1-8). *Helicoverpa armigera* incidence was high at Vridhachalam and moderate at Dharwad and Kadiri.

❖ **Occurrence of natural enemies:** The predatory insects such as Coccinellids and spiders were observed at Dharwad, Vridhachalam (1/plant) and Kadiri @ 1-4/4 sqm area. *Apanteles* and *Compoletis chlorideae* (2-10%) was observed at Kadiri parasitizing on *Spodoptera*, *Helicoverpa* and leafminer. In Raichur *Chelonus* sp. was noticed in the 9th standard week parasitizing leaf miner.

- ❖ **Monitoring of *Spodoptera*, *Helicoverpa*, Leaf miner and sucking pests of groundnut using traps (pheromone or sticky traps):** The highest *Spodoptera* was recorded (103/ trap) at 51st standard week in Raichur, and (6.6/day) trap at 3rd standard week in Junagadh. The peak incidence of leaf hopper was recorded (80.2/trap/week) at 52th week at Kadiri, which also recorded Leaf miner (15.6/trap) at 12th standard week.
- ❖ **Screening for resistance to insect pests:** INS-I-2016-07 and INS-I-2016-08 recorded lower damage of thrips and leaf hopper at Dharwad, Leafhopper and *Spodoptera* at Kadiri. INS-I-2016-01 was found effective for *Spodoptera* at Dharwad, for thrips at Junagadh and for Leafhopper at Kadiri. RSWUE- 2016-2 was efficient against leaf hopper (Dharwad) and Leafhopper & *Spodoptera* (Kadiri). INS-I-2016-6 and INS –I-2016-26 had lowest thrips damage at Junagadh and Leafhopper and *Spodoptera* damage at Kadiri. INS-I-2016-5 was resistant to thrips in Junagadh, Leafhopper and leaf miner at Kadiri. INS-I-2016-11 was resistant to thrips in Junagadh and leaf miner at Kadiri. INS-I-15 and INS-I-2016-23 was resistant to thrips ad Leafhopper at Junagadh and Kadiri. INS-I-2016-8, 23, 27, 28, 29 were resistant to Leafhopper and *Spodoptera* at Kadiri. INS-I-2016-2, 6, 9, 10, 21, 23, 26, 27, 28, 29 were resistant to Leafhopper and leaf miner at Kadiri.
- ❖ **Management of groundnut defoliator pests using botanicals:**
 - *Pongamia oil @ 3 ml/l or Azadirachtin 3% @ 3 ml/lit or Neem oil @ 3.0 ml/lit or Pongamia oil 50% plus Neem oil 50% @ 3 ml/l were found effective in managing defoliators.*

PATHOLOGY (*Rabi-Summer*)

- ❖ **Monitoring of major diseases of groundnut:** The experiment was conducted at Aliyarnagar, Dharwad, Jalgaon, Junagadh, Kadiri, Raichur, Pavagada and Vridhachalam. ELS, LLS and ALB had moderate infection and ranged between 2 -7 across all the centres. Stem rot and root rot ranged between 10-22% at Aliyarnagar (22%). PBNB was highest at Raichur (16-32%).
- ❖ **Screening of IVT-I & II, AVT and other coordinated trial material for resistance/ tolerance to major diseases:** INS-I-2017-11 showed resistance to both rust and LLS at Aliyarnagar, stem rot at Dharwad, DRR at Kadiri. INS-I-2017-27 showed resistance to rust and LLS at Aliyarnagar, collar rot at Jalgaon. INS-I-2016-12 showed resistance to rust and LLS at Aliyarnagar, stem rot at Dharwad and Kadiri. INS-I-2016-13 showed resistant to rust and LLS at Aliyarnagar, collar rot at Junagadh. INS-I-2016-18 was resistant to rust and LLS at Aliyarnagar, stem rot at Dharwad. INS-I-2016-20 was resistant to rust and LLS at Aliyarnagar and stem rot at Junagadh. INS-I-2016-23 was resistant to

rust and LLS at Aliyarnagar, stem rot at Juangadh. AVT-II-2016-6 was resistant to rust and LLS at Aliyarnagar and collar rot at Jalgaon. INS-I-2017-3 recorded less incidence of stem rot in Dharwad and ALB at Kadiri. INS-I-2017-7 showed resistance to stem rot at Jalgaon, DRR and ALB at Kadiri. RSWUE-II-2016-6 and RSWUE-2016-7 were found promising against collar rot (Jalgaon) and stem rot (Kadiri). RSWUE-2016-8 was free from stem rot at Jalgaon and PBNB at Kadiri. INS-I-2017-10 was found free from collar rot at Jalgaon and ALB at Kadiri. INS-I-2017-21 was free from stem rot at Junagadh and ALB at Kadiri. INS-I-2017-6, 16, 21 shown resistances to ALB at Kadiri and collar rot at Raichur. INS-I-2017-26 had low incidence of ALB and DRR at Kadiri. INS-I-2017-12 was free from stem rot and PBNB at Kadiri. INS-I-2016-16 was free from stem rot and DRR at Kadiri. INS-I-2016-26 and RSWUE 2016-7 were free from DRR and PBNB at Kadiri.

❖ **Management of PBNB through integration of different modules:**

- (Module II) *Border crop with bajra (4 rows) + Seed treatment with Imidacloprid 600 FS @1 mL/Kg seeds + Foliar sprays using Thiocloprid 480 SC @ 0.3 mL/L at 20-25 DAS followed by Fipronil 5SC @ 1 mL/L @ 40DAS and Acetamaprid 20 SP @ 0.2 g/L at 60 DAS)*

FIELD LEVEL DEMONSTRATIONS

Summary points for Kharif 2018:

- During *Kharif*- 2018 FLDs were allotted in 8 states having 13 groundnut research FLD centers. The states in which FLDs conducted were Gujarat, Karnataka, Maharashtra, Rajasthan, Manipur and West Bengal. The FLDs were allotted on Whole Package (WP). Among the 550 FLDs allotted, results were received for 342 FLDs from 8 centers, which indicated 62 per cent of implementation.
- There were 10 new varieties' production potential and profitability were compared with 8 old ruling varieties which are cultivated with farmers' traditional cultivation practices.
- The average pod yield achieved was 2032 kg/ha under improved whole package of practices, in which mainly, new varieties were demonstrated. The old varieties performance observed was 1667 kg/ha with farmer's traditional practices. The yield increase observed was 23.9 per cent. The minimum yield difference observed was 11.9 percent and the maximum was 37.0 per cent.
- The average cost of cultivation with improved practice was Rs.58897kg/ha in comparison with 54198kg/ha with farmer's practice. The maximum observed was 129922 kg/ha in improved practice and 104082 kg/ha with farmer's traditional practice.
- The average Gross Marginal Returns with improved practice was Rs.98036/ha and Rs.78461/ha with respect to traditional practices. Net returns observed was Rs.59985/ha and Rs.44177/ha for improved practice and farmer's practices respectively. The average B: C was 2.1 and 1.7 for improved practice and farmer's practices respectively.

Summary points for Rabi-Summer 2017-18:

- The *Rabi*-Summer 2017-18 FLDs were allotted in 9 states having 18 groundnut research FLD centers. The states in which FLDs conducted were Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. The FLDs were allotted on Whole Package (WP) component. Among 300 FLDs allotted, from 13 centers results were received for 215 FLDs, which indicated 71 per cent of implementation.

- There were 11 new varieties' production potential and profitability were compared with 12 old ruling varieties which are cultivated with farmers' traditional cultivation practices.
- The average pod yield achieved was 2749kg/ha under improved whole package of practices, in which mainly, new varieties were demonstrated. The old varieties performance observed was 2219kg/ha with farmer's traditional practices. The yield increase observed was 25 per cent. The minimum yield difference observed was 12.4 percent and the maximum was 44.0 per cent.
- The average cost of cultivation with improved practice was Rs.45682/ha in comparison with Rs.43197/ha with farmer's practice. The maximum observed was Rs.86581/ha in improved practice and Rs.99228/ha with farmer's traditional practice.
- The average Gross Marginal Returns with improved practice was Rs.116948/ha and Rs.931138/ha with respect to traditional practices. Net returns observed was Rs.63612/ha and Rs.45585/ha for improved practice and farmer's practices respectively. The average B: C was 2.5 and 2.1 for improved practice and farmer's practices respectively.

ICAR Directorate of Groundnut Research Junagadh

Name of AICRP : Groundnut

S. State N.	Name of the University	Name of Centre	Detail of Sanctioned Post as per XIth Plan (2012-13 to 2016-17) EFC										Staff sanctioned for the period 2017-18 to 2019-20										
			Scientific			Tech		Field/ Admin		Total			Scientific			Tech		Field/ Admin		Total			
			PS (RPG 10000)	SS (RPG 9000)	S (RPG 6000)	Total	(GP 2800)	(GP 2000)	Field man (GP 2400)	Admin (GP 2400)	Total	PS (RPG 10000)	SS (RPG 9000)	S (RPG 6000)	Total	(GP 2800)	(GP 2000)	Field man (GP 2400)	Admin (GP 2400)				
1	Andhra Pradesh	ANGRAU, Guntur	Kadiri	1	3	1	5	5	5	2	1	13				1	2	1	4	4	1	-	9
2	Andhra Pradesh	ANGRAU, Guntur	Tirupati	-	-	2	2	3		-	-	5				-	-	2	2	2	-	-	4
3	Gujarat	JAU, Junagadh	Junagadh	1	4	-	5	5	2	1	13					1	3	-	4	4	1	-	9
4	Gujarat	NAU, Navsari	Vyara	-	-	1	1	1		-	2					-	-	-	-	-	Centre deleted		0
5	Jharkhand	BAU, Kanke	Kanke	-	-	1	1	1		-	2					-	-	-	-	-	Centre deleted		0
6	Karnataka	UAS, Dharwad	Dharwad	1	1	3	5	5	2	1	13					1	-	3	4	4	1	-	9
7	Karnataka	UAS, Raichur	Raichur	-	-	3	3	3	1	-	7					-	-	2	2	1	-	-	5
8	Karnataka	UAHS, Shivamogga	Hiriyur	-	-	2	2	2	1	-	5					-	-	2	2	1	-	-	4
9	Maharashtra	MPKV, Rahuri	Jalgaon	1	4	-	5	5	2	1	13					1	2	-	3	3	1	-	7
10	Maharashtra	MPKV, Rahuri	Rahuri	-	1	1	2	2	1	-	5					-	1	1	2	2	-	-	4
11	Maharashtra	BSKKV, Dapoli	Ratnagiri	-	-	2	2	2	1	-	5					-	-	-	-	-	Centre deleted		0
12	Madhya Pradesh	RVSUVV, Gwalior	Gwalior	-	-	2	2	2	1	-	5					-	-	2	2	2	-	-	4
13	Manipur	CAU, Imphal,	Imphal	-	-	2	2	2		-	4					-	-	1	1	1	-	-	2
14	Odisha	OUAT, Bhubaneswar	Bhubaneswar	-	-	3	3	3	1	-	7					-	-	2	2	2	-	-	4
15	Rajasthan	SKRAU, Bikaner	Bikaner	-	-	3	3	3	1	-	7					-	-	3	3	2	1	-	6
16	Rajasthan	SKNAU, Jobner	Durgapura	-	-	2	2	2	1	-	5					-	-	2	2	2	1	-	5
17	Rajasthan	MPUAT, Udaipur	Udaipur	-	-	1	1	1		-	2					-	-	1	1	1	-	-	2
18	Tamil Nadu	TNAU, Coimbatore	Vriddhachalam	1	4	-	5	5	3	1	14					1	3	-	4	4	2	-	10
19	Tamil Nadu	TNAU, Coimbatore	Aliyarnagar	-	-	1	1	2		-	3					-	-	1	1	1	-	-	2
20	Tamil Nadu	TNAU, Coimbatore	Tindivanam	-	-	2	2	1	1	-	4					-	-	2	2	1	1	-	4
21	Telangana	PJTSAU, Hyderabad	Jagtial/Palem	-	-	3	3	3	1	-	7					-	-	2	2	1	1	-	4
22	Uttar Pradesh	CSAUAT, Kanpur	Mainpuri	-	1	1	2	2	1	-	5					-	1	-	1	1	1	-	3
23	West Bengal	BCKVV, Mohanpur	Mohanpur	-	-	2	2	2	1	-	5					-	-	2	2	2	-	-	4
			Total	5	18	38	61	62	23	5	151				5	12	29	46	42	13	-	101	

ICAR Directorate of Groundnut Research Junagadh
Scientific Position (2017-18 to 2019-20) under AICRP-Groundnut

Name of AICRP : Groundnut

S. N	State	Name of the University	Name of Centre	PS (RPG 10000)	SS (RPG 9000)	S (RPG 6000)	Total
1	Andhra Pradesh	ANGRAU, Guntur	Kadiri	1=(Breeder)	2=(1 Patho+1 Agro)	1=(Jr. Breeder)	4
2	Andhra Pradesh	ANGRAU, Guntur	Tirupati	-	-	2=(1 Jr. Breeder+1 Jr.Agro.)	2
3	Gujarat	JAU, Junagadh	Junagadh	1=(Breeder)	3=(1 Patho+1 Agro+1 Breeder)	-	4
4	Gujarat	NAU, Navsari	Vyara		Centre deleted		-
5	Jharkhand	BAU, Kanke	Kanke		Centre deleted		-
6	Karnataka	UAS, Dharwad	Dharwad	1=(Breeder)	-	3=(1Jr. Patho+1 Jr. Agro+1 Jr. Ento)	4
7	Karnataka	UAS, Raichur	Raichur	-	-	2=(1 Jr. Breeder+1 Jr.Patho.)	2
8	Karnataka	UAHS, Shivamogga	Hiriyur	-	-	2=(1 Jr. Breeder+1 Jr.Agro.)	2
9	Maharashtra	MPKV, Rahuri	Jalgaon	1=(Breeder)	2=(1 Patho+1 Agro)	-	3
10	Maharashtra	MPKV, Rahuri	Rahuri	-	1=(Breeder)	1=(Jr. Agro)	2
11	Maharashtra	BSKKV, Dapoli	Ratnagiri		Centre deleted		-
12	Madhya Pradesh	RVSKVV, Gwalior	Gwalior	-	-	2=(1 Jr. Breeder+1 Jr.Agro.)	2
13	Manipur	CAU, Imphal,	Imphal	-	-	1=(Jr. Breeder)	1
14	Odisha	Ouat, Bhubaneswar	Bhubaneswar	-	-	2=(1 Jr. Breeder+1 Jr.Agro.)	2
15	Rajasthan	SKRAU, Bikaner	Bikaner	-	-	3=(1Jr. Breeder+1 Jr. Agro+1 Jr. Patho)	3
16	Rajasthan	SKNAU, Jobner	Durgapura	-	-	2=(1 Jr. Breeder+1 Agro.)	2
17	Rajasthan	MPUAT, Udaipur	Udaipur	-	-	1=(Jr. Breeder)	1
18	Tamil Nadu	TNAU, Coimbatore	Vridhachalam	1=(Breeder)	3=(1 Patho+1 Agro+1 Ento)	-	4
19	Tamil Nadu	TNAU, Coimbatore	Aliyarnagar	-	-	1=(Jr. Patho)	1
20	Tamil Nadu	TNAU, Coimbatore	Tindivanam	-	-	2=(1 Jr. Breeder+1 Jr.Agro.)	2
21	Telangana	PJTSAU, Hyderabad	Jagtial/Palem	-	-	2=(1 Jr. Breeder+1 Jr.Agro.)	2
22	Uttar Pradesh	CSAUAT, Kanpur	Mainpuri	-	1=(Breeder)	-	1
23	West Bengal	BCKVV, Mohanpur	Mohanpur	-	-	2=(1 Jr. Breeder+1 Jr.Agro.)	2
			Total	5=(Breeder)	12=(3 Breeder+4 Patho+4 Agro+1 Ento)	29=(13 Jr. Breeder+4 Patho+11 Agro+1 Ento)	46