

IMPROVED VARIETIES AND CULTIVATION PRACTICES OF RICE BEAN

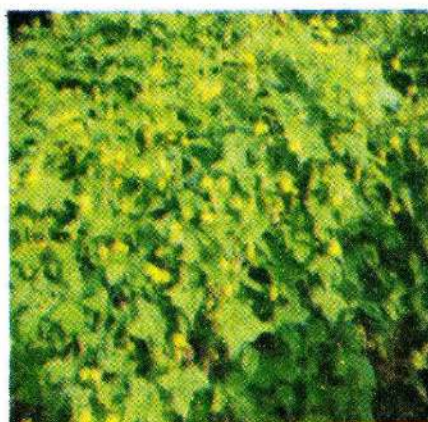
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Rice bean, also known as Climbing bean, Mountain bean, Mambi bean, Oriental bean, Haricot bean, Red bean and Jerusalem pea, is a highly branched annual with erect or semi-erect stem tending to be viny. In India, it is known by different local names such as moth, rajmoong and satrangi mash. It has axillary raceme inflorescence with bright yellow flowers occurring in clusters. Pods are slender and somewhat curved. Seeds are oblong with varying seed coat as smooth, dark wine, green, yellow, brown, black, speckled or mottled. Wild forms are perennial, very viny, thin stemmed with tuberous root system. Five distinct botanical varieties of rice bean viz., *major*, *glabra*, *rumbaiya*, *gracillis* and *macrocarpa* have been identified. Rice bean is largely a self-pollinated diploid crop but some natural cross-pollination has

also been reported. Originally the rice bean was described as *Phaseolus calcaratus* Roxb but recent taxonomy retains this species under *Vigna*.

DISTRIBUTION AND ADAPTATION

Rice bean is a native of South and South East Asia. As a cultigen, rice bean occurs in India, Myanmar, Malaysia, China, Korea, Indonesia and Philippines. It is also cultivated to a limited extent in West Indies, USA, Australia and East Africa, Java, Fiji, Bangladesh, Srilanka and Nepal. The cultivars are well adapted to sub-tropical dry to moist climate.



The best performance is obtained under 24–28°C temperature with 1500–2000 mm rainfall.

In India, its distribution is mainly confined to the tribal regions of north eastern hills and hilly tracts of Western and Eastern Ghats. In North Eastern states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura it is predominantly grown as rainfed in mixed farming system under shifting cultivation or in kitchen gardens and backyards. It is grown only on a limited scale in eastern peninsular tracts (parts of Orissa and Chhotanagpur) and western peninsular tracts of southern hills. Sporadic cultivation of rice bean is also done in sub-temperate Western Himalaya in Kumaon hills of Uttarakhand and Chamba region of Himachal Pradesh. Though no information is available about exact area under this crop in India, but roughly it is estimated

to be grown in around 15000 ha. Rice bean is also reported to grow wild in the Himalayas and in central China. Its adaptive polymorphism is indicated from its wider distribution with climatic variation ranging from humid sub-tropical to warm and cool temperate climate and growing up to an elevation of 1500 m.

USES

Rice bean is a promising multipurpose crop with a good potential to be used as food, fodder, green manure and cover crop. The dried seeds are usually eaten boiled or as pulse. Young immature pods are used as vegetable. Immature pods and bean sprouts are highly recommended in the nutritional diet of the Philippines. Its seeds are also good for broiler ration.

Whole plant can be used as forage for livestock. The foliage, green pods, immature seeds and flowers are readily eaten by animals. Due to its luxuriant growth, it can be grown as mixed crop with millets, minor millets, cereals as well as grasses.

It is also grown as a green manure and also as an excellent cover crop.

In China, Japan and Korea, the beans are generally ground into flour and meal;

beans are often boiled and eaten as soup.

It is immune to Yellow Mosaic Virus (YMV), a prominent disease in green gram and black gram and thus can easily re-

place green gram in plains if short duration varieties are developed. The crop can also be used as a donor parent for incorporating disease resistance in other *Vigna* species.

The nutritional quality of rice bean has been reported to be the best among all the traditional pulses on account of its high protein and appreciable quantities of two limiting amino acids : methionine and tryptophan (Table 1). It contains high quality of vitamins: thiamine, niacin and riboflavin. Calcium and iron contents are also appreciably high. Phytin-phosphorus which generally inhibits the phosphorus availability and lowers the protein digestibility in most of the Asian pulses is low in this bean.

VARIETIES FOR HILLS

1. PRR-1 (PRR 8801): The variety released in 1997 for hill region of Uttarakhand was developed at G.B. Pant University of Agricultural & Technology, Hill Campus, Ranichauri, Tehri

Table 1. Quality traits of released varieties of rice bean

Varieties	Quality parameters (%)		
	Protein	Methionine	Phenol
PRR-1	19.50	0.89	0.19
PRR-2	20.03	0.95	0.23
RBL-1	19.33	0.90	0.20
RBL-6	20.43	0.90	0.18
RBL-50	19.27	0.84	0.19
RBL-35	19.83	0.87	0.19

Garhwal as a pure line selection from Jagdhar (Tehri) collections. It gives an average grain yield of 15.0 q/ha and matures, on an average, in 141 days (111-165 days). Growth habit is trailing and indeterminate with average plant height of 90 cm. Foliage colour is dark green and seed colour is bluish black. The seed weight is around 7.0 g. The variety is recommended for low input and rainfed conditions.

2. PRR-2 (PRR 8901): The variety released in 1997 for hill region of UP, HP and North Eastern states, particularly mid and high altitude areas was developed at G.B. Pant University of Agriculture & Technology, through pure line selection from the Dargi collections in district Tehri Garhwal. The variety has bold, attractive and light yellow coloured seeds having field tolerance to *Ascochyta* and is resistant to yellow mosaic disease. The plants are medium tall (av. 83.7 cm ht.), indeterminate

and less branched. Stem is light purple coloured and bears dark green leaves. It is suitable for timely sown and low input conditions. It gives good nodulation even under acid soil conditions. Protein content in grains (20.0%) is slightly higher than that of the local material (19.2%) and PRR-1 (19.4%). Mean seed yield in advanced varietal testing under All India Coordinated Trials over five years was 8.85q/ha. The seeds are bolder (10 g/100 seeds) than PRR-1. The maturity period of PRR-1 and PRR-2 is almost the same.

VARIETIES FOR PLAINS

1. **RBL-1**: The variety released in 1986 for Punjab was developed at PAU, Ludhiana as a pure line selection from the material collected from Rajasthan. Plants are semi erect, 30-50 cm tall, producing 50-150 cm long twining branches. Stem is light green, grooved, covered with short fine white hair. Leaves are trifoliolate with 6-9 cm long leaflets. Seeds are light green with smooth seed coat. The variety gives an average seed yield of 16.0 q/ha. It matures in about 130 days and is resistant to diseases and stored grain pests.

2. **RBL-6**: The variety released in 2000 for plains at national level was developed at PAU, Ludhiana as a pure line

selection from germplasm collections of district Nagaur, Rajasthan. Like RBL 1, the variety is medium tall, spreading and has intertwining branches. However, RBL 6 has wider adaptability than RBL 1. The average plant height is 92 cm. Seed colour is light green. The average maturity period is 116 days ranging from 106 to 122 days. The variety when tested across the country in plains gave an average seed yield of 13.33 q/ha. Like other rice bean varieties, RBL 6 is also resistant to yellow mosaic virus and most of the other foliar diseases under field conditions. Sometimes sporadic incidence of *Macrophomina*, root rot, blight, *Cercospora* leaf spot and root knot nematodes is observed in sandy and loamy sand soils. Whitefly and jassids are the major insect-pests of ricebean. Some damage is also done by galerucid beetle (flower/blister beetle), hairy caterpillar and stemfly. RBL 6 takes about 28 minutes for softening of grains in cooking as against 23 minutes taken by mung bean variety ML131.

3. **RBL-35**: This variety, released in 2003 for plains, was developed at PAU, Ludhiana as a pure line selection from germplasm collections of district

Nagaur, Rajasthan. In coordinated trials it gave an average seed yield of 11.65 q/ha and matured in 92 days, 10 days earlier than RBL 1 and RBL6. Growth habit is semispreading, viny and semi inter-twining. Internodes are short. Pods are glabrous and slightly curved. Seeds are oblong, greenish brown with 6.2 g test weight.

4. **RBL-50**: Released in 2003 for plains, this variety was developed at PAU, Ludhiana as a pure line selection from germplasm collections of district Nagaur, Rajasthan. In coordinated trials it gave an average seed yield of 10.97 q/ha and matured in about 101 days. Pods at maturity are dark brown. Foliage is dark green. The seeds are oblong and green with 6.0 g test weight.

PROMISING GENOTYPES / LAND RACES AVAILABLE

1. **BRS 1**: The variety, identified in 2003 for north-





west hills, was developed at NBPGR regional station Bhowali as a pure line selection from local material. In coordinated trials it gave an average seed yield of 14.50 q/ha. Colour of its seed resembles with that of mash (urd).

2. Naini: The genotype, suited to Central Himalayas, was developed from IC 26973-A, a collection made from Imphal (Manipur). The genotype is viny and tall of about 160 cm. It has about three main branches. The genotype flowers in about 80 days and matures in 150 days bearing about 75 pods per plant with average pod length of 10 cm. Each pod possesses about 10 seeds, green in colour with test weight of 10.3 g/ 100 seeds. The average seed yield of this genotype is around 8.0 q/ha.

3. Megha Rumbaija 1 (RCRB 1-6): A selection from Meghalaya local germplasm, this variety is suited to Meghalaya. It gives an average seed yield of 18 q/ha and

is tolerant to diseases.

4. MNPL 1 and MNPL 2: These cultivars give an average seed yield of about 22 q/ha and are suited to Manipur. MNPL 1 is preferred by farmers due to its good taste and bold seeds.

The improved varieties of rice bean have better yield potential as compared to the locally available cultivars, both in humid (Imphal, Umiam) and sub-humid (Palampur, Rudraprayag) areas (Table 2).

CULTIVATION PRACTICES

➤ **Selection of site:** Rice bean can be grown on a wide range of soils, ranging from sandy loam to heavy soils with climate varying from dry to moist. However, like other pulses, saline and waterlogged soils are not suitable for this pulse also.

➤ **Sowing time:** It is sown in Kharif season with onset of rains. Therefore, the optimal sowing time for this crop in hills is the month of May and in plains first half of July.

➤ **Fertilizer application:** Application of N: P: K at 20:40:20 kg/ha at the time of sowing is recommended for better yields. Sowing of seeds at 8-10 kg/ha can be done by drilling seeds at 45-60 cm row

spacing for viny and vigorous types and at 30-40 cm for erect types. Plant to plant distance at 10-15 cm can be maintained by thinning plants at 15-20 DAS (days after sowing).

➤ **Weed management:** To keep the field free from weeds, either pre-emergent application of pendimethalin at 1 kg a.i./ha and one hand hoeing at 30-35 DAS or hand hoeing twice at 20 and 40 DAS is desirable.

➤ **Stacking:** For viny types staking the plants gives an increase in yield by more than 20-25%.

➤ **Intercropping:** Intercropping rice bean with either maize or pigeonpea in 2:1 row ratio in plains enhances rice bean equivalent yield and cost benefit ratio.

➤ **Insect-pest management:** Sometimes, the meliod beetle or the red beetle (*Mylabris* spp.) causes a serious problem at the time of flowering and its control is immediately required in consultation with an entomologist. It is desired that manual collection of adults by nets and killing them in kerosenized water may be practised. Use of endosulphan 0.05% (140 ml, Thiodon 30 EC) or carbaryl 0.1% (200g, Sevin 50 WP) at the flowering stage is also desirable.

➤ **Harvesting:** Rice bean

Table 2. Yield of rice bean trials conducted in farmer's fields (Kharif 2003).

Centre (No. of farmers)	Selected Varieties	Average Yield (q/ga)	Yield Range (q/ha)	Farmer's Preference
Palampur (8)	BRS-2	7.00	5.25-8.75	BRS-2 preferred due to high yield and seed colour but some farmers also preferred BRS-1 due to high yield and its resemblance with mash colour
	BRS-1	6.25	5.00-8.00	
	Chaukhamba	5.50	4.50-6.50	
	PRR 1	5.50	4.75-6.75	
	Naini	5.28	4.50-6.50	
	Local	3.75	2.75-5.00	
Nagrasu (3) Rudraprayag	RBL 1	14.20	13.50-14.70	RBL 1 and RBL 6, due to higher yield
	RBL 6	11.90	11.00-12.70	
	Naini	10.20	9.10-10.90	
	PRR 1	8.50	8.10-8.90	
	Local	7.20	7.00-7.70	
Raitoli (3) Rudraprayag	RBL 1	12.50	12.00-13.28	RBL 1 and RBL 6, due to higher yield
	RBL 6	11.50	11.00-12.50	
	Naini	8.40	8.10-8.90	
	PRR 1	8.10	7.50-8.30	
	Local	6.80	6.30-7.10	
Bhattgaon (3) Rudraprayag	RBL 1	12.00	11.50-12.50	RBL 1 and RBL 6, due to higher yield
	RBL 6	11.50	11.00-12.00	
	Naini	8.50	8.10-8.90	
	PRR 1	7.90	7.10-8.90	
	Local	6.80	6.30-7.10	
Umiam (10)	RCRB 1-6	12.90	10.00-15.00	RCRB 1-6 due to high yield and early maturity & MNPL 2 because of bold seed, good in taste and medium height plant
	MNPL 2	8.41	7.50-9.40	
	RBL 6	6.06	5.20-7.00	
Imphal (5)	MNPL 1	13.09	12.00-14.50	MNPL 1 - Due to higher yield, good taste and bold seed
	MNPL 2	12.79	11.00-14.00	
	PRR 1	9.61	6.50-13.25	
	RBL 1	8.72	4.80-12.65	
	SEm±	0.68		

Note: Figures in parenthesis indicate the number of farmers 1

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grown for seed is harvested when pods turn brown. The plant are cut and rolled in small bundles, as they are intertwined, in the morning/evening to avoid the shattering. The fodder crop of rice bean is har-

vested from flowering to pod initiation stage.

By adopting improved technology and varieties as described above, the yield of rice bean in hills and plains can be

substantially increased. It will not only ameliorate economic condition of the farmers dwelling in the hills and plains, but will also enhance the availability of nutritious food to check malnutrition in human beings.