Agric. Sci. Digest., 37(3) 2017: 232-236
Print ISSN:0253-150X / Online ISSN:0976-547

AGRICULTURAL RESEARCH COMMUNICATION CENTRE
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Short durartion cowpea varieties for cultivation as a niche crop in various cropping systems for enhanced pulse production

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Received: 10-12-2016 Accepted: 29-05-2017 DOI:10.18805/asd.v37i03.8996

ABSTRACT

Agriculture must become nutrition-smart. Food security without nutrition security is not enough. Our basic food systems have to be optimized to provide the greatest amount of nutrients per square meter per unit time, especially in the face of climate change. Majority of the Indian people are vegetarian and they depend primarily upon grain legumes for dietary protein. Unfortunately the production of grain legumes in India has remained stagnant since 1950 causing declining per capita availability and widespread malnutrition. This is because most of the good lands have gone to the green revolution led 'wheat-rice' and 'rice-rice' cropping systems and food legumes have been pushed to marginal lands. Also, the traditional food legume varieties are late in maturity with low yield potential. This has led to inadequate protein and minerals in the diets of rural and urban masses on one hand and imbalanced soil fertility due to cereal-cereal rotation on the other hand. Therefore, increased cultivation of pulses is urgently needed. How can this be achieved with the limited land is one of the major challenges of agricultural research. The only answer is to breed and cultivate short duration food legumes in the existing niches between cereal-cereal systems. Wheat is harvested in March–April and rice is transplanted in July leaving about 80-90 days gap in which a short duration food legume can be grown. A number of photo-insensitive and heat tolerant '60-day cowpea' varieties have been recently developed by Pantnagar University which were tested under farmer participatory on-farm trials and All India Multi-location Coordinated Trials with the support from Harvest Plus Project of CGIAR. These varieties can be grown as a niche crop in the wheat-rice cropping system of northern India which has a potential area of over 10 million ha. and also fit well in rice fellows in southern India.

Key words: Cowpea varieties, Improved, local, Nutrients.

Mature dry cowpeas (*Vigna unguiculata* L.Walp) are important in the diets of many population groups around the world. Africa alone accounts for 7.5 million hectares of the estimated world total area, of about 10 million hectares under cowpeas. Of the 7.5 million hectares, about 70% lies in West and Central Africa (Singh *et al*., 1996). This food legume is readily available, inexpensive and a popular part of the traditional food system. Cowpeas (*Vigna unguiculata* L.Walp) along with other legumes are recognized as important sources of protein (Agazounon *et al*., 2004). However, their contribution to the overall diet and dietary mineral needs is less known. Nutritional deficiencies of iron and zinc are often widespread in developing countries, where staple diets are frequently plant-based and consumption of meat and other animal-based food products is low due to high price, which most farmers cannot afford (Speedy, 2003). Cowpea can be consumed as dried, fresh grain, and long stored dried grain, which is cooked; they are also dehulled to remove the seed testa, then ground to obtain flour. The flour obtained can be used to make various dishes or as an ingredient in recipes (FAO, 1997). The young and tender cowpea leaves are picked and eaten as relish along with the main staples. The grains and leaves are the source of carbohydrates, proteins, fats, ßcarotene, and vitamins B and C, which are necessary for maintaining good health (Enwere, *et al*., 1998). Young cowpea leaves are consumed in at least 18 countries in Africa, and seven countries in Asia and the Pacific Ahenkora *et al*., 1998). Cowpea leaves are among the top three or four leafy vegetables marketed and consumed in Africa (Imungi and Potter, 1983; Barret, 1998). The other vegetative parts of the cowpea plant after removal of the grain, are used as feed, forage, hay and silage for livestock. Although cowpea was reported to contain appreciable amount of minerals, most analyses concentrated on a few varieties and on raw samples, hence little information is available on nutrients of some varieties and of cowpea recipes (Sinha and Kawatra, 2005). Cowpeas are prepared and consumed in a number of ways, including as a relish for stiff porridge and rice, mixed and boiled with maize and cowpea buns. In both regions, the cowpea buns were important as a source of income in a number of households. Analysis of the improved cowpea varieties showed relatively higher protein content ranging from 24- 30% and 8-11% for fat content.

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Majority of Indian people are vegetarian and depend upon grain legumes for dietary protein. However, the production of grain legumes in the country is not keeping pace with the population growth and it has remained stagnant causing declining per capita availability of food legumes and high cost of pulses. Due to continuous cultivation of wheat-rice system, the food legumes have been pushed to marginal lands with little inputs. Also, the grain legumes presently grown are late maturing and have low yield potential. This has led to the lack of adequate protein and minerals in the diets of rural and urban masses on one hand and imbalanced soil fertility due to continuous cereal-cereal rotation on the other hand. How can this be achieved with the limited land is one of the major challenges of agricultural research. The only answer is to cultivate extra-early maturing food legumes in the existing niches between cereal-based systems in the plains as well as in the hills. Wheat is harvested in March–April and rice is transplanted in June-July leaving about 80-90 days gap. The extra-early cowpea varieties, which mature in 60-75 days can fit well as a niche crop in wheat-rice and other cereals based systems. So far G.B. Pant University of Agriculture & Technology has released 5 varieties *viz*. Pant Lobia-1, Pant Lobia-2, Pant Lobia-3, Pant Lobia-4 and Pant Lobia-5 which can successfully be grown in different cropping systems of India.The detailed description of these varieties is given in this research article. Short duration varieties of grain cowpea released by G.B.Pant University of Agriculture & Technology




Pant Lobia-1 was identified as a grain type, high yielder adaptable to Zaid and Kharif season and released in 2008 by SVRC Uttarakhand. It matures in 65 days in plains and 70-75 days in hills. The plant height is 40-50 cm. & pod length is 13-26 cm. The number of seeds per pod is 14 to 18, 1000-seed weight 140-150gm and seed colour is white with black eye. It has tolerance to major bacterial and viral diseases like mosaic and attack of aphids and thrips. It needs minimum irrigation and yields over 20q/ha grain and 20-25q/ha dry fodder within 65-75 days. It has 27% protein.




Pant Lobia-2 was identified as a grain type, semi spreading, high proteins, high yielder adaptable to Zaid season and released in 2010 by SVRC Uttarakhand. It matures in 70 days in plains and 75-80 days in hills. The plant height is 40-50 cm., pod length is 15-20 cm. The number of seeds per pod is 14 to 18, 1000-seed weight 130-150 gm and seed colour is red self. It has tolerance to major bacterial and viral diseases like mosaic. It needs minimum irrigation and yields over 14-18q/ha grain and 25-30q/ha dry fodder. It has 30% protein.




Pant Lobia-3 was released in 2015 by CVRC., high yielder adaptable to Zaid and Kharif season. It matures in 60-65 days in plains and 75-80 days in hills. The plant height is 55-60cm., pod length is 15-20 cm. The number of seeds per pod is 14 to 18, 1000-seed weight 110-130 gm and seed colour is brown. It has tolerance to major bacterial and viral diseases like mosaic. It needs minimum irrigation and yields over 18-20q/ha grain and 20-25/ha dry fodder. It has 27% protein. This variety has performed very well in three districts viz. Satna, Reewa and Sahdol of Madhya Pradesh during spring-summer 2014 and about 150q of seeds was produced by farmers which was sold @ Rs. 100/Kg. The variety is also popular in Karnatka and Kerala




Pant Lobia-4 was released in 2015 by CVRC. It matures in 60-65 days. The plant height is 40-45cm, pod length is 14-16 cm. The number of seeds per pod is 12 to 14, 1000-seed weight 140-160 gm and seed colour is white. It has tolerance to major bacterial and viral diseases like mosaic. It needs minimum irrigation and yields over 14-18q/ha grain and 20-25/ha dry fodder. It has 25% protein.





Pant Lobia-5: It matures in 65-70 days in plains and 75-80 days in hills. The plant height is 48-52 cm., pod length is 16-18 cm. The number of seed per pod is 12to 14 and seed colour is light brown. It has tolerance to yellow mosaic. It needs minimum irrigation and yields over 16-20q/ha grain and 15-20q/ha dry fodder. It has 25% protein. The sowing time is March to first week of September

Table 1: Description of the grain cowpea entries

	Pant Lobia-1	**Pant Lobia-2**	**Pant Lobia-3**	**Pant Lobia-4**	**Pant Lobia-5**
Year/Agency of Release	2008 (SVRC)	2010(SVRC)	2015(CVRC)	2015(CVRC)	2015(SVRC)
Growth habit	Erect plant type with early and synchronous maturity.	Semi-erect plant type with early and synchronous maturity.	Semi-erect plant type with early maturity.	Erect bush plant type with early maturity.	Erect bush plant type with early maturity.
Foliage	Moderate foliage mass	High foliage mass	Light green with higher foliage mass	Light green, less foliage	Light green, moderate foliage
Flower colour	White	Purple	Purple	White	Dark purple
Days to 50% flowering	40-45 days after planting	45-50 days after planting	40-45 days after planting	40-45 days in summer and 30-35days in rainy season crop	40-45 days in spring-summer and 30-35 days in rainy season crop
Days to maturity	60-70 days	65-75 days	65-70 days	60-65 days	65-70 days
Plant height	45-50 cm.	40-45 cm.	50-55 cm.	40-45 cm.	48-52 cm
Pod colour	Light green when immature and straw colour at maturity	White at green stage and ash colour at maturity	Dark green when immature and straw colour at maturity	Green with purple ting when immature and purple pod at maturity	Light green immature pods and straw colour at maturity
Pod length	13-16 cm.	15-20 cm.	16-18 cm.	14-16 cm.	16-18 cm.
Number of seeds per pod	10-15	14-18	14-16	12-14	12-14
1000-seed weight	140-150gm.	130-150gm.	100-110 gm.	130-140 gm.	170-180 gm.
Seed colour	White with small black hilum	Red self color	Brown	White with small black hilum	Light brown
Seed coat texture	Rough	Smooth	Smooth	Rough	Smooth
Seed shape and size	Ovoid, medium size	Medium size slightly ovoid	Kidney to oval shape,medium size	Kidney shape to oval, medium size	Oval bold
Yield potentiality	20q/ha grain & 25q/ha dry fodder under good management and favourable environment	25q/ha grain & 30 q/ha dry fodder under good management and favourable environment.	18-20 q/ha grain yield under good management and favourable environment.	14-18 q/ha grain yield under good management and favorable environment.	16-20 q/ha grain yield under good management and favorable environment.
Tolerance to major diseases and pests	High level of resistance to major fungal, bacterial & viral diseases.	High level of resistance to , major fungal bacterial & viral diseases	High level of resistance to YMV, Bacterial Blight and bruchids.	High level of resistance to CYMV and Bacterial Blight	High level of resistance to CYMV and Bacterial Blight.

Table 2: Performance of grain cowpea entries under National Summer Trials in respect of grain yield (q/ ha)

Name of the entries	**PL-1**	**PL-2**	**PL-3**	**PL-4**	**PL-5**
2008-09	-	-	11.91	-	-
2009-10	11.60	7.49	16.71	-	-
2010-11	-	-	9.83	-	11.31
2011-12	10.79	-	12.66	10.82	10.28
2012-13	8.19	-	9.97	11.11	7.90
2013-14	-	-	10.75	12.75	9.70
2014-15	-	-	8.72	-	-
2015-16	-	-	9.92	-	-

Ref: Annual Report on Arid Legumes. (2008-2016).

Table 3: Performance of grain cowpea entries under State Varietal Trials in respect of grain yield (q/ ha)

Name of the entries	**PL-1**	**PL-2**	**PL-3**	**PL-4**	**PL-5**
2008-11	12.97	11.25	-	-	19.84
2012	14.96	13.71	17.46	16.30	16.30
2013	11.35	13.95	11.35	-	16.71
2014	10.13	16.27	9.88	7.79	15.69
2015	8.12	8.55	9.87	-	10.66

Ref: Annual Report on Arid Legumes. (2008-2016).

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