



Iron Cowpea

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Table 1. Summary of Iron Cowpea

Target Micronutrient	Iron	
Target Countries	India	
Baseline (<i>parts per million, ppm; dry weight, DW</i>)	30 ppm	
Target Increment	+33 ppm	
Target Level in Crop	63 ppm	
Nutrition Factors	Original Assumption	Measured/Revised*
Cowpea Consumption, <i>grams/day (fresh weight)</i>	Women	200 g/d
	Children	100 g/d
Iron Retention (%)	85%	
Iron Absorption (%)	5%	
Absorbed Iron as % of EAR	30%	
Releases		
Pant Lobia-1	India, 2008	82 ppm Fe, 40 ppm Zn
Pant Lobia-2	India, 2010	100 ppm Fe, 37 ppm Zn
Pant Lobia-3	India, 2013	67 ppm Fe, 38 ppm Zn
Pant Lobia-4	India, 2014	51 ppm Fe, 36 ppm Zn

*Original assumptions have not yet been measured and revised.

Breeding to Date

During HarvestPlus Phase I (Discovery, 2003-2008), the International Institute of Tropical Agriculture (IITA) screened and assessed more than 2,000 cowpea lines in replicated screening in Nigeria. Screening activities identified minerals and agronomic traits, and assayed subsets of materials for protein and total carotenoids, finding iron content ranging from 27-97 ppm and zinc content from 23-62 ppm. Genetic variation for minerals suggests that target increments are feasible. A cowpea sampling protocol to reduce iron contamination from dust was developed and implemented.

Germplasm lines (1,541) of different origins were obtained from the genetic resources unit at IITA and sown in the experimental field in Minjibir, Kano State, Nigeria. The grain was analyzed for protein and nine mineral contents, then researchers used cluster analysis to group the cowpea germplasm accessions based on their levels of protein and mineral concentrations to identify promising parent lines. A significant and positive relationship between protein and iron concentration in grain was demonstrated (1).

In HarvestPlus Phase II, cowpea research shifted to G.B. Pant University of Agriculture and Technology, Pantnagar, India. It focused on the introduction and further improvement of recently developed photo-insensitive and heat-tolerant “60-day cowpea” varieties by IITA. Two early-maturing high-iron and zinc cowpea varieties, Pant Lobia-1 and Pant Lobia-2, were released by the Uttarakhand Government in 2008 and 2010, respectively. They were subsequently notified in 2009 and 2011 by the national Central Sub-Committee on Standards, Notification and Release of Varieties. Pant Lobia-3 was released in 2013. These varieties have now entered the national seed multiplication system and seed is available to farmers.

The National Meeting on Arid Zone Legumes in June 2014 identified another variety, Pant Lobia-4, for release in 2014.

Future Releases

Several varieties with high iron and zinc are in advanced variety trials at state and national levels. More than 100 new breeding lines with 60-65 day maturity, combining high yield and resistance to cowpea yellow mosaic, have been developed and are being tested in multi-location trials in eastern and southern India. The best varieties in advanced trials have up to 66 ppm iron and 60 ppm zinc.

Highlights

- Three iron cowpea varieties have been released in India, and a fourth identified for release in 2014.

Challenges

- As Green Revolution-led 'wheat-rice' and 'rice-rice' cropping systems have become more popular, legume production has been pushed to marginal lands, resulting in stagnant production of pulses and high prices.
- Introducing short duration cowpea varieties as a niche crop in the 'wheat-rice' and 'rice-rice' cropping systems has potential, but it is not well known to farmers.
- In addition to the current work on wheat-rice-cowpea system in northern India and as a multiple crop throughout India, a collaborative project with the International Rice Research Institute (IRRI) has also been initiated to demonstrate these new varieties in rice-rice cropping systems in mid and south India.
- The new cowpea varieties are also being introduced as a niche crop for the late *Kharif* (rainy) season planting after the harvest of fodders and maize crop for green cobs. The potential area under "wheat-cowpea-rice" system in northern India is about 10 million hectares; a similar potential area exists for the "rice-cowpea-rice" system. Even a partial success in introducing short duration cowpea varieties in these systems would bring India close to meeting its pulses requirement in the near future.

Table 2. Released Varieties of Iron Cowpea

Variety Name	Release Year	Iron Content	Zinc Content	Av. Yield	Comments on Agronomic properties
Pant Lobia-1	2008	82 ppm Fe	40 ppm Zn	1500kg/ha	Early erect plants, multiple disease res., white seeds
Pant Lobia-2	2010	100 ppm Fe	37 ppm Zn	1500Kg/ha	Early erect plants, multiple disease res., red seeds
Pant Lobia-3	2013	67 ppm Fe	38 ppm Zn	1500Kg/ha	Early semi erect, multiple disease res., brown seeds
Pant Lobia-4	2014	51 ppm Fe	36 ppm Zn	1700kg/ha	Early semi erect, multiple disease res., brown seeds
Buksora local	-	26 ppm Fe	30 ppm Zn	800Kg/ha	Medium semi-erect , virus susc., red specs on seeds

Notes: Data from 3-4 years of multi-locational testing at 8-10 sites

Figure 1. Pant Lobia-2 (top with red seeds) and Pant Lobia-1 (bottom with white seeds)



1. Boukar, O; Massawe, F; Muranaka, S; Franco, J; Maziya-Dixon, B; Singh, B; Fatokun, C. 2011. Evaluation of cowpea germplasm lines for protein and mineral concentrations in grains. *Plant Genetic Resources*. 9(4): 515-522.