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Performance of ICRISAT Pigeonpeas in China

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Introduction of pigeonpea (*Cajanus cajan*) materials from ICRISAT, Patancheru, India into China began in 1985 when a Pigeonpea Observation Nursery (PON) was grown at Guangzhou. This nursery consisted of a range of materials and its major objective was to obtain primary information about some basic adaptation parameters such as maturity and plant type. This information helps in decision-making in introducing more germplasm within the adapted plant types and maturity groups for more refined evaluation and selection. The PON, sown at the onset of the rainy season on 9 March revealed that the short-duration pigeonpeas were relatively better adapted than medium- and long-duration types. Yield of the short-duration lines was 1.0–1.2 t ha^{-1} while that of the medium-duration types was 0.3–0.9 t ha^{-1}. The local control (Fongsoon) flowered in 180 days and produced 0.65 t ha^{-1} yield. ICRISAT's long-duration lines were found to be extremely photoperiod sensitive and took more than 200 days to flower; they failed to produce grains.

As a follow-up, a set of 16 short-duration determinate lines were evaluated in 1988 in a replicated trial at Guangzhou. The trial was sown on 27 April at spacing of 65 × 33 cm. The 50% flowering in the test lines ranged between 54 days and 86 days. ICPLs 85033 recorded the highest seed yield of 2.03 t ha^{-1}, followed by ICPLs 86010, 86005, 87, 84037, and 83024 (Table 1). The local check took 115 days to flower and produced significantly low yield (0.37 t ha^{-1}).

In spite of demonstrating high yield potential and good adaptability in Guangzhou, the follow-up research and development activities on short-duration pigeonpeas could not be continued due to various unavoidable reasons. After a gap of 10 years the interest in ICRISAT's pigeonpea was revived but this time it was in Guangxi and Yunnan provinces. At the Guangxi Academy of Agricultural Sciences, Nanning in Guangxi Province the main research emphasis was on fodder production, grazing, and soil conservation while at the Institute of Insect Resources, Chinese Academy of Forestry, Kunming the prime aim was to exploit the potential of pigeonpea for soil conservation.

In 1998, 18 advanced pigeonpea breeding lines were evaluated in rainy season at Nanning in Guangxi province. The unreplicated trial was sown on 22 April in four-row plots. The spacing between and within rows was kept at 100 cm and 50 cm respectively. ICPL 90011 did not germinate. Data on various plant and seed characters were recorded on plot basis. Based on maturity the genotypes were classified into three groups: short duration (130 days), medium duration (180–250 days), and long duration (>250 days). In general short- and medium-duration lines were compact, short in height, and uniform in flowering and podding. The long-duration types were tall and spreading. All the lines were susceptible to *Helicoverpa* and *Maruca* pod borers and blister beetles. The local check was very late and spreading and produced a lot of biomass but low seed yield. Based on their performance ICPLs 90008, 93012, 93047, 93081, 93092, 87091, 87119, and ICP 7035 were selected for further testing.

Evaluation for Biomass Production

In parts of southern China, characterized by high rainfall of about 1000 mm, pod borer damage to pigeonpea is extensive due to high temperature and high humidity. Even 3–4 sprays of Chloropyriphos 20 EC at 300 ml ha^{-1} are not effective. In such areas, however, pigeonpea not only

Figure 1. Seed production of ICRISAT pigeonpea line ICPL 87091 in Guangxi province, China.

Figure 2. A short-duration pigeonpea variety intercropped with soybean in Guangxi province, China.

Table 1. Performance of short-duration determinate ICRISAT pigeonpea lines tested in Guangzhou, China during 1988.

Entry	Days to flower	Plant height (cm)	100-seed mass (g)	Grain yield (t ha^{-1})
ICPL 85033	75	143	10.5	2.03
ICPL 86010	73	152	10.3	1.98
ICPL 86005	73	130	11.2	1.95
ICPL 87	75	147	9.6	1.81
ICPL 84037	74	140	10.5	1.80
ICPL 83024	81	158	12.5	1.79
ICPL 85021	86	139	10.7	1.54
ICPL 83009	73	136	8.6	1.48
ICPL 87046	83	166	10.6	1.47
ICPL 151	73	134	8.4	1.46
ICPL 86003	65	116	8.7	1.37
ICPL 86012	73	136	9.4	1.23
ICPL 85016	73	130	5.6	0.95
ICPL 83004	54	107	6.4	0.82
ICPL 87047	80	157	7.9	0.73
ICPL 4	73	132	4.4	0.73
Local check	115	213	7.8	0.37
SE ±	0.6	6.8	0.64	0.17
CV (%)	1.5	8.2	12.32	21.6

grows at a faster rate but also produces large biomass of fresh leaves and tender branches. Hence, pigeonpea can be used as a fodder and pasture crop for goat and buffalo. In 1999 cropping season short- and medium-duration pigeonpea lines and a local check were evaluated for biomass production in Nanning in unreplicated plots. Sowing was done on 20 April. Inter-row spacing was 100 cm while plants within the row were spaced at 40 cm. ICPL 88009 was the earliest (100 days to flower). The local check took about 8 months to flower. ICPL 85010, ICPL 93047, ICPL 87119, ICP 7035, and local check produced more than 50 t ha^{-1} fresh biomass and about 25–30 t ha^{-1} of dry biomass. The data also indicated that in comparison to local check, ICRISAT lines were more efficient in dry and fresh mass accumulation rates. The promising lines from this material will be selected for more detailed studies in agronomy, feeding, and multiple cutting trials in the next season.

During 1999 cropping season, two ICRISAT pigeonpea lines ICPL 90008 and ICPL 87091 were evaluated for fodder and seed yield in Duan county in Guangxi Province (Figs. 1 and 2). The plantings were done at two locations, one representing high mountain slope and another flat lowland. These lines were sown at the beginning of rainy season on 20 April and towards the end of rainy season on 10 July. The lines took more time to flower and the plants were more vigorous in early sown (April) than late sown (July) crops. In lowland, ICPL 87091 took more time to flower and mature and produced more biomass than ICPL 90008.

Soil Conservation

The Institute of Insect Resources of the Chinese Academy of Forestry, Kunming tested a number of ICRISAT germplasm lines for soil conservation in Yunnan Province. From these, six lines were identified for large-scale field evaluation in agroforestry, intercropping, and coverage of slopy lands.

The newly developed ICRISAT pigeonpea lines have shown great promise for monocropping and intercropping systems in China. At present Guangxi and Yunnan provincial governments have developed elaborate plans to multiply seed of the promising lines and conduct a series of on-farm trials in the counties where high levels of soil erosion and drought do not permit the cultivation of other food legumes economically.

Wild Relatives of Pigeonpea in China

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Wild relatives play an important role in the genetic improvement of cultivated crops. Breeders turn their attention to the wild relatives of crops after unsuccessful search for some unique trait in the cultivated germplasm. According to van der Maesen (1986) the genus *Cajanus* has 32 species. Of these, the Indian subcontinent harbors 18 species. ICRISAT has the global responsibility of collection, maintenance, and evaluation of germplasm of the wild relatives of pigeonpea. At present a total of 213 accessions, representing 20 *Cajanus* species are conserved for use in the breeding programs.

China is known for maintaining high level of biodiversity of different crop species. But the collection and evaluation of pigeonpea and its wild relatives has been rather limited. In ICRISAT's global germplasm collection of wild species none is of Chinese origin. van der Maesen (1986), while reviewing the taxa that are closely related to pigeonpea, listed six species which were found earlier by various researchers in China. The detailed description of these species with respect to their distribution and morphology is given by van der Maesen (1986) in his monograph. For quick reference a brief description of these species is given below and the key for indentification is given in Table 1.

Cajanus crassus (Prain ex King) van der Maesen

Cajanus crassus is distributed in India, Myanmar, Thailand, China, Vietnam, Philippines, Java, and Malaysia peninsula. In Myanmar, it is locally called Pe yaing or Taw pe. In China it has been reported to be found in Yunnan Province in Manhao prefecture, Tonkinensis, Manpau, Red River Valley, middle part of E Mount Poo Peng, and on Babien-Ho between Talang and Puorl.