respectively, of "the Identification Service, CABI International Institute of Entomology" for authoritative identifications of the pod fly and the parasite.

References

Lateef, S.S. 1991. Insect pests of pigeonpea and their management. Pages 53-59 *in* the Proceedings of the first Eastern and Southern Africa Legumes (Pigeonpea) Workshop, 25-27 June 1990, Nairobi, Kenya (Laxman Singh, Ariyanayagam, R.P., Silim, S.N. and Reddy, M.V., eds.). Nairobi, Kenya: East African Cereals and Legumes [EARCAL] Program, International Crops Research Institute for the Semi-Arid Tropics.

Le Pelley, R.H. 1959. Agricultural insects of East Africa. East African High Commission, Nairobi, Kenya.

Minja, E. M. 1997. Insect pests of pigeonpea in Kenya, Malawi, Tanzania and Uganda and grain yield losses in Kenya. A consultant's report. Submitted to the African Development Bank. Improvement of Pigeonpea in Eastern and Southern Africa, Nairobi, Kenya: International Crops Research Institute for the Semi-Arid Tropics, 98 pp.

Reed, W., Lateef, S.S., Sithanantham, S., and **Pawar, C.S. 1989.** Pigeonpea and chickpea insect identification handbook. Information Bulletin no. 26. Patancheru, India: International Crops Research Institute for the Semi-Arid Tropics.

Sithanantham, S., and **Reddy, Y.V.R. 1990.** Arthropods associated with pigeonpea in Kenya, Malawi and Zambia. International Pigeonpea Newsletter 11, 17-18.

Adjusting Pigeonpea Sowing Time to Manage Pod Borer Infestation

S S Dahiya[1], Y S Chauhan[2], C Johansen[2], and **T G Shanower[2]** (1. Chaudhury Charan Singh Haryana Agricultural University (CCS HAU), Krishi Vigyan Kendra, Sonipat, Haryana, India; and 2. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru 502 324, Andhra Pradesh, India (Present address: United States Department of Agriculture, Agricultural Research Station, 1500 N Central Avenue, Sidney-MT 59270, USA)

In India, pigeonpea [*Cajanus cajan* (L.) Millsp.] accounts for about 16% of the area and 19% of the production of all pulse crops. Pigeonpea is a comparatively recent introduction in Haryana, India. It has become the second most important pulse crop in the state after chickpea as evidenced by increase in area, from 2200 ha in 1976/77 to around 50 000 ha in 1993/94. It is used for both grain and fuel wood.

The grain yield of pigeonpea is considerably reduced by pod borer (*Helicoverpa armigera)* infestation. Chemical control of pod borer is not popular among farmers due to the difficulties of spraying or dusting (plants >2 m in height) and economic costs. Therefore, there is a need to exploit agronomic practices which can reduce the infestation of pod borer. Data from several experiments suggested that early sowing was critical to obtaining higher yields and good economic returns, but it was not clear if it was due to a lower level of pod borer infestation. Therefore, the susceptibility of the short-duration pigeonpea variety Manak to pod borer in relation to different sowing times was studied on farmers' fields in Sonipat District, Haryana, during the 1995 and 1996 rainy seasons.

During the 1995 and 1996 rainy seasons, 15 on-farm trials of > 1000 m^2 area, five each for different sowing times, i.e., first week of May (early sown), mid-May (15th-25th), and mid-June (15th-25th), were conducted. The level of pod damage was recorded on 10 randomly selected plants in each sowing, and yield was recorded from the entire area. The crop was not sprayed with any insecticide.

The early-sown crop had less than 10% pod borer damage (Table I). In contrast, pod damage to pigeonpea sown in mid-May and mid-June was 20-40%. The year x sowing date interaction was not significant. Grain yield decreased with a delay in sowing (Table 1).

Grain yield was negatively correlated with both sowing time (r = -0.98) and pod borer damage (r = -0.93). Pod borer damage was also associated with sowing time (r = 0.99). In the past, the advantage of early sowing had

Table 1. Effect of sowing time on pod damage by *Helicoverpa armigera* and yield of pigeonpea, Sonipat, Haryana, India, 1995 and 1996 rainy seasons.

	Pod damage (%)			Yield (t ha^{-1})		
Sowing time	1995	1996	Mean	1995	1996	Mean
1st week of May (1-7 May)	5	8	6.5	1.70	1.50	1.60
Mid-May (15-25 May)	28	25	26.5	1.10	1.20	1.15
Mid-June (15-25 June)	40	38	39.0	1.00	1.00	1.00
SE	±0.86				±0.061	
SE (interaction)	±1.1				±0.079	

often been attributed to better growth. However, studies conducted by Chauhan et al. (1994) under protected conditions revealed that dry-matter production is not a limiting factor for yield in short-duration pigeonpea in northern India. This study suggests that early-sown (early May) pigeonpea may yield better on account of low pod borer damage. Thus, this could be one of the important components of a pest management strategy to control pod borer in pigeonpea. More such studies need to be conducted in the Indo-Gangetic Plains, to determine how widely such a strategy could effectively control pod borer infestation.

Reference

Chauhan, Y.S., Johansen, C., and Saxena, K.B. 1994. Physiological basis of yield variation in short-duration pigeonpea grown in different environments of the semi-arid tropics. Journal of Agronomy and Crop Science 174:163-171.

An Outbreak of Mealy Bug, *Ceroplastodes cajani* (Maskell) in the Nimar Region of Madhya Pradesh, India

S S Shaw[1], O P Veda[2], A K Badaya[3], and **S K Parsai[4]**
(1. Indira Gandhi Krishi Vishwavidyalaya, Zonal Agricultural Research Station, Post Box no. 03, Ambikapur 497 001, Madhya Pradesh, India; 2. Krishi Vigyan Kendra, Khandwa, Madhya Pradesh, India; 3. Krishi Vigyan Kendra, Jhabua, Madhya Pradesh, India; and 4. B M College of Agriculture, Khandwa, Madhya Pradesh, India)

Pigeonpea is an important intercrop with cotton in the Nimar region of Madhya Pradesh, India. The crop is attacked by a complex of pod borers: podfly [*Melanagromyza ohtusua* (Malloch)], pod borer [*Helicoverpa armigera* (Hubner)], and plum moth [*Exelastis atomosa* (Walkr)] (Bindra and Jakhmola 1967, Odak et al. 1976). There is no report on the incidence of mealy bug [*Ceroplastodes cajani* (Maskell)] (Hemiptera: Coccidae) in Madhya Pradesh. Bhatnagar et al. (1984) reported the occurrence of the bug on pigeonpea in other states. The mealy bug was noticed for the first time on 2- to 3-year-old pigeonpea plants (single plant selection from Seoni-7) grown at the research farm of Jawaharlal Nehru Krishi Vishwavidyalaya Campus, Khandwa. The incidence of the pest was noticed from the first week of September 1992 till the last week of December 1992, peaking in the last week of Oct to mid-Dec 1992. The sudden outbreak of the mealy bug might be due to the long dry spell, from September to December, and the high temperature. Patel et al. (1991) and Ganapathy et al. (1994) reported the severe incidence of this pest during November and December in Gujarat and from March to June in Tamil Nadu.

In Madhya Pradesh, the mealy bug infested the main stem rather than branches and leaves. The main stem of the plant was fully covered with the bug's eggshells. The number of eggshells varied from 14 to 52 with an average of 29 per 3 cm. The number of eggs in eachshell varied from 125 to 215 with an average of 181. The freshly laid egg shells were light, greenish black, and covered with a milky powder. The eggs (separated from the eggshell) when kept in the laboratory at room temperature (26 to 28°C), hatched in about 9 days. The eggs were oval, yellowish, and measured 0.341 mm in length and 0.174 mm in width.

The losses caused by the mealy bugs were estimated by recording the number of completely dead and partially dead plants. Mealy bug infested 13.7% of the crop. Six percent of the plants showed complete mortality and 7.7% showed partial mortality. The completely dried plants did not revive after irrigation but partially dried plants revived after proper pruning and irrigation. Two applications of monocrotophos (0.05%) spray and one of diamethoate (0.05%) did not control the mealy bug. Such observations have also been reported by Patel et al. (1971). Since this is the first report of the occurrence of mealy bug on pigeonpea in the Nimar region of Madhya Pradesh, further study is necessary to determine the extent of its incidence in farmers' fields so that losses from pest damage may be minimized through appropriate control measures.

Acknowledgments. The authors are thankful to Dr T G Shanower, Senior Scientist (CPD), ICRISAT, Patancheru for his help in identifying the pest. The facilities provided by the Dean, College of Agriculture, Khandwa are also acknowledged.

References

Bhatnagar, V.S., Jadhav, D.P., and Pawar, C.S. 1984. Parasites of pigeonpea mealy bug, *Ceroplastodes cajani* Mask. International Pigeonpea Newsletter 3:45.

Bindra, O.S., and Jakhmola, S.S. 1967. Incidence and losses cuased by some pod infesting insects in different