Indian Journal of Agricultural Sciences 71 (7) : 499–501, July 2001

Management of pod-borers in short-duration pigeonpea (*Cajanus cajan*) by shift in sowing time

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Received : 15 December 1999

Key words: Time of sowing, Short-duration pigeonpea, IPM, Pod-borer complex

Approximately 90% of the world's pigeonpea [*Cajanus cajan* (L.) Millsp.] production is from Asia, of which India, Myanmar and Nepal are the largest producers (Nene and Sheila 1990). In India mostly long-duration pigeonpea cultivars are being grown under rainfed conditions. In order to increase the pigeonpea production, more recently short and extra-short duration genotypes have been developed that mature in as few as 90 days. In Tamil Nadu after the introduction of short-duration pigeonpea genotype ('Vamban 1'), the area under short-duration pigeonpea is on the increase. Pigeonpea crop is highly susceptible to a large number of insect pests and the pests that are occurring during the reproductive phase are of greater economic importance. The most important pests are the gram pod-borer, *Helicoverpa armigera* Hijbn., spotted pod-borer *Maruca vitrata* Geyer, pod fly, *Melanagromyza obtusa* Mall. and blister beetles *Mylabris* spp.

In India the pod-borer complex damage is around 50% and varies with intensity of damage and the type of pests (Lateef and Reed 1984).

In Tamil Nadu also *H. armigera, M. vitrata, M. obtusa* and *Mylabris* sp assumed a major pest status, especially in short-duration pigeonpea (Durairaj *et al.* 1997, Durairaj and Venugopal 1996, Durairaj and Ganapathy 1996). In Tamil Nadu the pod-borer complex damage was as high as 60% (AICPIP, 1995). Hence a field study was undertaken during 1995–98 to study the effect of time of sowing on the damage of pod-borer complex in pigeonpea and to be used as one of the integrated pest management (IPM) tools for pod-borer management in short-duration pigeonpea.

The short-duration pigeonpea genotype 'Vamban 1' with a duration of 90–100 days was sown in an area of 2 000 m^2 during the third week of March 1995 and 1996 as summer sowing. Similarly, another sowing with the same variety was taken up during July as rainy (*kharif*) season sowing. Another short-duration genoype 'ICPL 86012' was sown in the same periods and in the same area as that of 'Vamban 1' during the 1997 and 1998. Normal agronomic practices were followed as recommended for Tamil Nadu. In the summer sowing at the time of flowering a spray with dichlorvos @ 500 ml/ha was given against the blister beetle *(Mylabris* sp) damage on the genoype 'Vamban 1' as well as on 'ICPL 86012'. In the rainy season sowing the insecticidal spray of monocrotophos 0.04% was given during flowering and early pod-formation stage, followed by neem-seed-kernel extract spray 5% at 10-day interval. At the time of harvest a sample of 500 pods was collected in each genotype from the pool of pods collected from 50 plants selected at random and the pod-borer complex damage (%) was assessed. Similarly, the pod-fly seed damage (%) was assessed from the seeds thrashed out from the pods collected for pod-borer complex damage assessment. This methodology was uniformly adopted in all seasons. The data on the weather parameters, viz mean maximum and minimum temperature, relative humidity, total rainfall and number of rainy days were recorded during the crop period for the purpose of analysis (Table 1).

There was greater variation between the genotypes, year and seasons on lepidopteran pod-borer complex damage, pod fly seed damage and on the seed yield (Table 2). In all the 4 years of experimentation, the lepidopteran pod-borer complex damage was very high during the rainy season than summer seasons. In both the genotypes, the pod damage ranged from 65.0% in 'ICPL 86012' during 1997 to 85% in 'Vamban 1' during 1995 in the rainy season compared with 17.5–23.0% during the summer season in 1995 and 1998 respectively. Similarly, the pod-fly seed damage was high (20.0–27.0%) in the rainy seasons, while it was low (10.0–18%) in the summer season during the period of investigation. During summer season only 1 insecticidal spray was given against blister beetles. But during the rainy season despite 2 rounds of insecticidal spray application, pod-borer control was not satisfactory and pod-borer damage remained high compared to that in summer season. The rains during rainy seasons might have reduced the insecticidal effect. Hence more damage was recorded during the rainy season. Higher grain yields were obtained in

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Table 1 Data on the weather parameters recorded during the growth period of short-duration pigeonpea

	1995		1996		1997		1998	
	Summer season*	Rainy season**	Summer season*	Rainy season**	Summer season*	Rainy season**	Summer season*	Rainy season**
Temperature (°C)								
Mean maximum	36.0	37.8	36.5	34.0	36.3	35.1	37.3	33.6
Mean minimum	25.8	25.3	25.9	24.5	25.4	25.0	26.7	25.0
Mean relative humidity (%)	79.2	80.2	77.0	82.2	80.6	81.8	78.2	83.4
Total ranfall (mm)	222.6	360.8	130.3	515.0	300.7	461.9	277.4	522.6
Total rainy days	16	24	15	41	14	29	21	35

*Weather data recorded during April–July
**Weather data recorded during July–October

'Vamban 1' and 'ICPL 86012' (765–850 kg/ha) in the summer-sown crops than the rainy-season crops (405–525 kg/ha). There was no much variation between the genotypes in their performance between the years (Table 2). As the summer-season crop escaped from lepidopteran pod-borer damage as well as pod-fly damage, the role of host evasion/ pseudo-resistance was well evident. Similar phenomenon was observed by Lal and Sachan (1989), who suggested that host avoidance may be highly useful for the management of *H. armigera* in pigeonpea, gram and *M. obtusa* in pigeonpea. Our findings confirm those of Lal (1983), who found that the greengram crop sown during summer recorded low pest damage with increased grain yield. Singh *et al.* (1984) found summer season-sown crop suitable to escape the Indian senna from attack of larve of white butterfly (*Catopsilia pyranth*).

The reasons for the variation in the pod-borer complex damage and pod-fly seed damage between the season and years were analysed with the help of weather parameters recorded during the crop period of the respective season and years. It was observed that the variation between the maximum, minimum temperatures and relative humidity between the seasons was a meagre when compared to the quantum of rainfall received and number of rainy days between the seasons. Obviously, there was excess rainfall (53–295%) with more number of rainy days during the rainy season than the summer. This would have favoured the pest population build up which in turn inflicted more damage on pods. Thus pod damage (%) had inverse relationship with yield. Hence it is evident that short-duration pigeonpea genotypes raised during summer season under irrigated condition escaped from pod-borer complex damage and gave better yield with less plant-protection measures.

Table 2 Performance of short-duration pigeonpea during rainy and summer seasons against pod-borer complex damage

Cultivar	Rainy season			Summer season			Yield increase over rainy season (%)
	Pod-borer damage (%)	Pod-fly damage (%)	Seed yield (kg/ha)	Pod-borer damage (%)	Pod-fly damage (%)	Seed yield (kg/ha)	
'Vamban 1'							
1995	85.0	27.0	405.0	17.5	10.0	765.0	88.0
1996	76.0	23.0	430.0	20.0	12.0	790.0	83.7
Mean	80.5	25.0	417.5	18.7	11.0	777.5	86.2
'ICPL 86012'							
1997	65.0	25.0	525.0	18.0	15.0	850.0	61.9
1998	72.0	20.0	500.0	23.0	18.0	835.0	67.0
Mean	68.5	22.5	512.5	20.5	16.5	842.5	64.4

Summer season, April–July; rainy season, July–October

SUMMARY

A study was carried out during 1995–98 to find out the effect of change in sowing time on management of pod-borer *Helcoverpa armigera* Hübner give damage in short-duration pigeonpea [*Cajanus cajan* (L.) Millsp.]. Excess rainfall (53–295%) with more number of rainy days during the rainy season than the summer favoured the pest-population build up which in turn inflicted more damage on pods of pigeonpea. The pod damage had inverse relationship with yield. The genotype raised during summer under irrigated condition escaped from damage of pod-borer complex and provided better yield with less plant-protection measure.

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