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IMPACT OF CROP DURATION AND INTERCROPPING ON THE INCIDENCE OF *CLAVIGRALLA GIBBOSA* AND *MYLABRIS* SPP. ON PIGEONPEA

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ABSTRACT

The experiments were conducted to study the effect of intercropping on various insect pests with differently maturing cultivars of pigeonpea in rainy seasons of 2000 and 2001. Among three cultivars of pigeon pea, the infestation of both the insect pests *Clavigralla gibbosa* and *Mylabris* spp. varied significantly. The sole crop of pigeonpea carried less infestation of *C. gibbosa* suggesting that pigeonpea with intercrops (sorghum and castor) harboured higher pest population. The same intercrops reduced the beetle population and short duration pigeonpea with castor and sorghum had less infestation of the pests.

INTRODUCTION

Use of plant species diversity in agro ecosystems is a fairly old method of reducing crop losses due to pests (Theunissen and Den Ouden, 1980). Any deterrence of colonization is probably one of the promising means of controlling the insect pests through intra field diversity because only a little additional diversity in the crop field may have a profound effect on colonization by insects. This was well documented in case of intercropping (Risch, 1981). Pigeonpea of different maturity groups are to be tested since the spatially fluid nature of arthropod population and the intercrop interaction present some real challenges (Kennedy and Margolies, 1985). With this background information, differently maturing three cultivars of pigeonpea were intercropped with three dryland crops - cereal (sorghum) pulse (greengram) and oilseed (castor) to determine the impact of intercropping on pod bug, *Clavigralla gibbosa* and blister beetles *Mylabris* spp. which are major yield reducers on pigeonpea. The experiments were conducted during rainy seasons 1999 and 2000 and reasons for the differences if any were explored.

MATERIAL AND METHODS

The field experiments were conducted during rainy season of 1999 and 2000.The experimental design used was a factorial randomised block design with pigeonpea cultivars of three duration (short, medium and long) and 4 treatments (sole crop, sorghum, castor and greengram as intercrops) and replicated three times. Three different cultivars of pigeonpea *viz.*, ICPL 84031 (Durga) for short duration (SD), PRO 100 for medium duration (MD) and LRG -30 for long duration (LD) category were selected These were cultivated mainly under rainfed conditions and the duration of pigeonpea was 120,150 and 180 days, respectively. The ratios of rows of pigeonpea to rows of intercrop were 1:2 for sorghum and greengram and 1:1 for castor.

Weekly insect counts were recorded from ten randomly labeled pigeonpea plants in each plot at various stages of crop growth. Three terminals per plant were selected. Field observations of insect pest and predator (coccinellids and spiders) population were recorded during cool hours of the day (7 to 9.30 am and 4 to 6 pm). The number of pod bugs as absolute population per plant (Pradhan, 1964) and number of beetles per m row of plants were recorded. The weekly pest counts were summed to obtain cumulative pest units (CPU), meant to serve as an index of pest

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load experienced by the crop. The mean of weekly pest counts was also calculated.

RESULTS AND DISCUSSION

Effect of crop duration on insect pests of pigeonpea

The incidence of insect pests varied significantly among three cultivars of pigeonpea and the findings are discussed pest wise.

C. gibbosa: The infestation of pod bug was noticed for a short period i.e., 6 weeks in SD pigeonpea than the other two cultivars of pigeonpea. Peak infestation was observed at pod formation stage and was in tune with the findings of Kashyap *et al.* (1990). The infestation varied significantly among three cultivars of pigeonpea and it was higher in MD pigeonpea (19.30 CPU) than LD pigeonpea (15.58) and SD pigeonpea (12.58) in *kharif* season (Table 1). But Yadav *et al.* (1988) found no difference in the incidence of this pest on both early and late maturing cultivars of pigeonpea.

Mylabris spp.: Blister beetle population was associated with the flowering of the crop and varied significantly among cultivars of pigeonpea and was more in MD pigeonpea (54.29 CPU), moderate in LD pigeonpea (39.96) and less in SD pigeonpea (24.29) (Table2). Yadava *et al.* (1988) reported that occurrence of *Mylabris* spp was common to early varieties of pigeonpea. In the present study its infestation was more in MD pigeonpea probably due to synchrony between flowering to early pod formation and pest's peak activity.

Effect of intercropping on insect pests of pigeonpea

C. gibbosa: The infestation of pod bug varied significantly across intercropped pigeonpea systems. The sole crop of pigeonpea carried less infestation both in terms of CPU and mean population per plant also suggesting that intercrops harbored higher pest population (Fig. 1). The pod bug population was more in pigeonpea with sorghum (26.11) and castor (26.68) as intercrops but, the Pigeonpea with greengram (21.92) as intercrop recorded less number of pod bugs (Table 1). The similar trend was reflected when mean population per plant was also considered and were higher in pigeonpea with sorghum and castor as intercrops. This was evident significantly in MD Pigeonpea intercropped systems (> 5-7/plant) than other duration cultivars with intercropping systems in both the years (Fig. 1).

In present study intercropped systems had more population and in agreement with Gethi and Khaemba (1991) who reported higher populations of the *Clavigralla* spp. in the intercropped plots with maize rather than on sole cowpea crop. The several biotic and abiotic factors are known to be responsible for pest fluctuation in several intercropping situations and was well documented. High relative humidity was reported in intercropping system (Baldy and Stigter, 1997) because of transpiring leaves. Gethi and Khaemba (1991) observed more number of pod bugs in intercropped cowpea plots and attributed to the fact that cooler conditions favoured the bugs. In present study also, more activity of *Clavigralla* was noticed in intercropped systems with sorghum and castor as intercrops than sole crop of pigeonpea recorded higher relative humidity in crop canopy. Baliddawa (1985) found that factors responsible for pest depression were natural enemies, camouflage and unfavourable microclimate in intercrop systems.

But, Alghali (1993) observed that reduction of *Clavigralla* sp. on cowpea intercropped with sorghum. High relative humidity recorded in present experiments possibly enhanced the oviposition and colonization process of the pest resulting in the significantly higher activity within sorghum and castor intercropped plots.

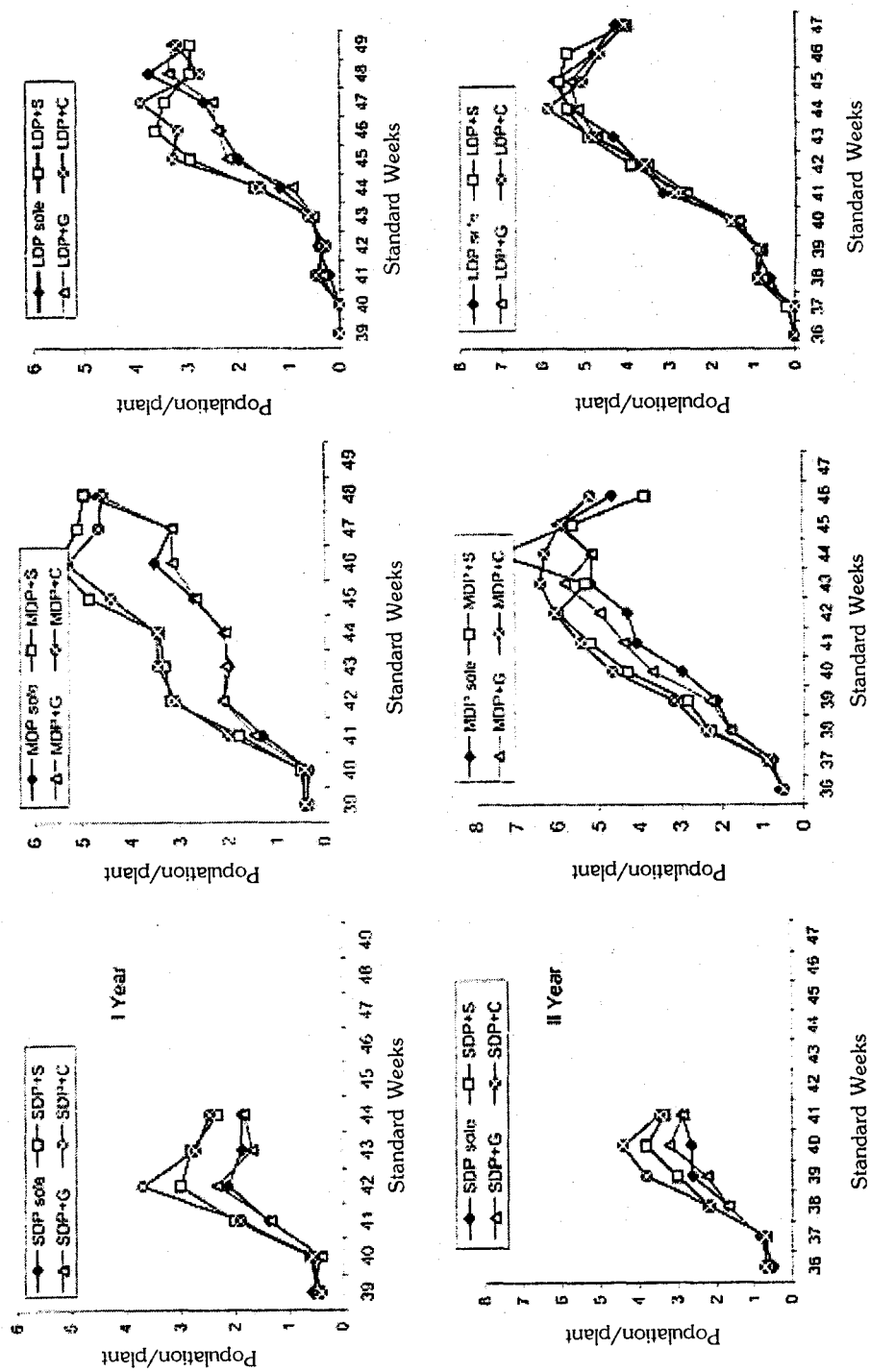

Fig. 1. Impact of intercropping on *Clavigralla gibbosa* in pigeonpea

Table 1. Effect of intercropping on CPU and mean population of *C. gibbosa* on pigeonpea cultivars of different duration, *Kharif* season

Cropping systems	1999		2000		Mean	
	CPU	Mean pop.	CPU	Mean pop.	CPU	Mean pop.
SDP sole	8.21	1.37	11.10	1.85	9.65	1.61
SDP + sorghum	11.20	1.87	13.57	2.26	12.4	2.07
SDP + green gram	8.06	1.15	11.39	1.90	9.73	1.62
SDP + castor	11.77	1.97	15.27	2.55	13.55	2.26
MDP sole	22.56	2.26	37.77	3.43	30.15	2.84
MDP + sorghum	33.16	3.32	44.46	4.04	38.80	3.35
MDP + greengram	22.16	2.22	40.93	3.72	31.52	2.97
MDP + castor	31.96	3.20	47.22	4.29	39.62	3.75
LDP sole	15.99	1.78	34.33	3.12	25.17	2.45
LDP + sorghum	18.76	2.08	35.45	3.22	27.12	2.66
LDP + green gram	15.86	1.76	33.14	3.01	24.52	2.39
LDP + castor	19.21	2.13	34.44	3.13	26.87	2.64
SEm±	1.018	0.188	1.156	0.147	2.557	0.285
LSD at 0.05	2.118	0.388	2.404	0.306	5.305	0.591
Factor 1						
SDP	9.81	1.59	12.83	2.14	11.33	1.89
MDP	27.46	2.75	42.60	3.87	35.02	3.23
LDP	17.46	1.94	34.34	3.12	25.92	2.53
SEm±	0.509	0.093	0.578	0.073	1.279	0.142
LSD at 0.05	1.059	0.195	1.202	0.153	2.661	0.297
Factor 2						
Sole	15.59	1.80	27.73	2.80	21.66	2.30
Sorghum	21.04	2.42	31.16	3.17	26.11	2.69
Green gram	15.36	1.71	28.49	2.88	21.92	2.33
Castor	20.98	2.43	32.31	3.32	26.68	2.88
SEm±	0.588	0.109	0.667	0.085	1.478	0.165
LSD at 0.05	1.223	0.225	1.388	0.177	3.072	0.343
CV (%)	6.85	10.92	4.75	5.94	13.05	13.75

SDP: Short duration pigeonpea;
MDP: Medium duration pigeonpea;
LDP: Long duration pigeonpea;
NS: Not-significant.

***Mylabris* spp.:** The castor and sorghum intercrops reduced the infestation of blister beetle in pigeonpea significantly recording 29.83 and 35.56 CPU than sole pigeonpea (50.44). SD pigeonpea + castor and SD pigeonpea + sorghum had less infestation of the pest (Table 2).

The presence of castor as intercrop attracted less number of beetles and in case of sorghum these coleopterans preferred sorghum spikelets to pigeonpea flowers. Emeasor and Ezuech (1997) found reduction of *Mylabris* population on cowpea intercropped with maize and cassava plants. The sole crop of pigeonpea and pigeonpea with greengram attracted more beetles. Decoy effects based on the special attractiveness of a certain phonological stage of intercrop might be the reason in altering of pest population. If these flowering stages do not coincide pest often builds upon intercrop and may lead to destructive infestation of main crop (Bhatnagar and Davies, 1981).

The castor and sorghum intercrops reduced the infestation of blister beetle in pigeonpea significantly recording 29.83 and

Table 2. Effect of intercropping on CPU and mean population of *M. pustulata* on pigeonpea cultivars of different duration, *kharif* season

Cropping systems	1999		2000		Mean	
	CPU	Mean pop.	CPU	Mean pop.	CPU	Mean pop.
SDP sole	34.00	4.86	31.94	4.52	32.83	4.69
SDP + sorghum	18.67	2.67	20.00	2.86	19.33	2.76
SDP + green gram	22.00	3.14	31.36	4.48	26.67	3.81
SDP + castor	14.33	2.05	22.34	3.19	18.33	2.62
MDP sole	70.62	6.43	66.95	6.70	68.33	6.51
MDP + sorghum	48.00	4.36	50.00	5.00	48.83	4.66
MDP + greengram	47.33	4.31	69.00	6.90	58.17	5.60
MDP + castor	34.67	3.15	49.00	4.90	41.83	4.04
LDP sole	60.99	5.55	39.33	3.93	50.17	4.74
LDP + sorghum	39.67	3.61	37.33	2.73	38.50	3.67
LDP + green gram	45.67	4.14	38.00	3.80	41.83	3.98
LDP + castor	30.00	2.72	28.67	2.87	29.33	2.80
SEm±	2.809	0.261	3.264	0.357	3.810	0.388
LSD at 0.05	5.843	NS	6.788	0.743	7.902	NS
Factor 1						
SDP	22.25	3.18	26.33	3.76	24.29	3.47
MDP	50.20	4.56	58.42	5.84	54.29	5.20
LDP	44.11	4.00	35.83	3.58	39.96	3.80
SEm±	1.404	0.130	1.631	0.179	1.905	0.193
LSD at 0.05	2.921	0.271	3.394	0.371	3.962	0.403
Factor 2						
Sole	55.22	5.62	44.74	5.02	50.44	5.31
Sorghum	35.44	3.55	35.22	3.85	35.56	3.70
Green gram	38.33	3.86	45.01	5.06	42.22	4.46
Castor	26.33	2.64	35.22	3.65	29.83	3.15
SEm±	1.622	0.151	1.884	0.206	2.20	0.224
LSD at 0.05	3.731	0.312	3.919	0.429	4.575	0.465
CV (%)	8.89	8.17	9.97	9.98	11.84	11.44

SDP: Short duration pigeonpea;
MDP: Medium duration pigeonpea;
LDP: Long duration pigeonpea;
NS: Not-significant.

35.56 CPU than sole pigeonpea (50.44). SD pigeonpea + castor and SD pigeonpea + sorghum had less infestation of the pest. Castor and sorghum as intercrops reduced the infestation on medium and long duration pigeonpea also.

CONCLUSIONS

The results of the present investigation indicated that duration of pigeonpea and intercropping altered the C. *gibbosa* and *Mylabris* spp. population. Short duration pigeonpea recorded low level of pest population than other two cultivars of pigeonpea. Sorghum and castor as intercrops harbored more population of C. *gibbosa* . The sole crop of pigeonpea and greengram as intercrop recorded low level of C. *gibbosa*. In contrary intercrops reduced the *Mylabris* population. The choice of duration of pigeonpea and intercrop has vital role to regulate the above pest population and it can be a effective component of IPM in pigeonpea.

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