IMPACT OF SPACING AND ORGANIC FERTILIZERS ON INCIDENCE OF POD BORERS INFESTING COWPEA

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ABSTRACT

The present investigation was carried out to study the "Impact of spacing and organic fertilizer on incidence of pod borer infesting cowpea" under field condition at College Farm, Navsari Agricultural University, Navsari during summer 2016. Among the four spacing (S_1: 45 cm x 20 cm, S_2: 60 cm x 20 cm, S_3: 45 cm x 30 cm and S_4: 60 cm x 30 cm), crop sown at wider spacing 60 cm x 30 cm (S_4) recorded significantly the lowest pod borer larval population as compared to crop sown at spacing 45 cm x 20 cm (S_1) and 60 cm x 20 cm (S_2). Per cent flower damage was significantly the lowest on crop sown at 60 cm x 30 cm (S_4) (20.65 %). The per cent pod damage recorded significantly the lowest (23.24 %) in crop sown at wider spacing 60 cm x 30 cm (S_4) as compared to 45 cm x 20 cm (S_1). Impact of organic fertilizers on pod borer larvae per plant, per cent flower damage and per cent pod damage was non-significant. So far as seed yield is concerned, significantly the highest cowpea seed yield (11.46 q/ha) was obtained under 60 cm x 30 cm (S_4) spacing, which was followed by 45 cm x 30 cm (S_3), 60 cm x 20 cm (S_2) and 45 cm x 20 cm (S_1). The impact of organic fertilizers on cowpea seed yield was non-significant.

KEY WORDS: Cowpea, Larval population, Organic fertilizers, Pod borer, Spacing

INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp.) is originated in the savannah region of west and central Africa and mainly grown in warm climates. In India, it is a mainly grown as a sole crop throughout the year in *kharif*, *rabi* as well in summer season. Among the different constraints responsible for lower yield and poor quality of grains, the losses due to insect pests are considered to be an important one. The crop is damaged extensively by a number of insect pests. The attack by insect attributed the losses in yield up to 90 per cent (Raheja, 1976).

As many as 21 insect pests of different groups were reported on cowpea during summer and *kharif* season (Sardana and Verma, 1986). The major pests of cowpea are aphid, jassid, whitefly, thrips, leaf miner, spotted pod borer, pod borer and semi looper. Of these, pod borers (*H. Armigera* and *M. Vitrata*) are one of the common and most damaging pests in cowpea.

The young larvae of *M. vitrata* attack the terminal shoot and flower buds, whereas older larvae damage the open flowers and the pods. The larvae web the flower or inflorescences with the adjacent leaves

flowers as well as pods and feed from inside the webbed mass. About 21.30 and 17.37 per cent pod damage was estimated due to *H. armigera* and *M. Vitrata*, respectively (Anonymous, 1989). In early stage, larvae of *H. Armigera* feed on the leaves and in later stage larvae feed on buds, flowers and pods of cowpea by thrusting its head into the pod and keeping remaining buds cut. It feeds on the pods by making circular holes.

Spacing modified the micro environment of the crop, duration of crop growth and development that influence the pest population. Fertilizer provides plants with more nutrient as a result the plant not only gat lush green colour, but also enhance the accumulation of nutrient in plant which attracts phytophagus insect (Natarajan, 1986). Presently, more emphasis is being given to development of suitable strategies based on ecological principle. Hence, the present investigation was carried out to study the impact of spacing and organic fertilizer on incidence of pod borer infesting cowpea.

MATERIALS AND METHODS

In order to study the impact of spacing and organic fertilizer on incidence of pod borer infesting cowpea, a field experiment was conducted at College Farm, Navsari Agricultural University, Navsari during summer 2016. The cowpea variety GC-4 was sown during 3rd week of February in 2.25 m x 2.0 m plot size replicated thrice and all the recommended agricultural practices were adopted for raising the crop. Different four spacing (S_1: 45 cm x 20 cm, S_2: 60 cm x 20 cm, S_3: 45 cm x 30 cm and S_4: 60 cm x 30 cm), and three levels of organic fertilizers (F_1: Jeevamrut @ 3000l/ha, F_2: Nadep @ 2500 kg/ha, F_3: Jeevamrut + Nadep) were evaluated based on pod borer larval population, pod borer damage to flowers and pods as well as seed yield data. The fertilizers were applied at basal as well as 30 and 45 days after sowing. For recording observations, five plants were randomly selected from each plot. Population of pod borer (*M. vitrata*) was recorded by examining the same selected five plants from each plot and the larval population was counted from whole plant. For recording observations on flower damage by pod borer, healthy and damaged flowers as well as pods were counted from same selected five plants from each plot. The observations were recorded at weekly interval starting from one week after sowing and continued till the harvest of crop. The seed yield was recorded from each plot as the crop matured. The whole experiment plot was kept free from any insecticide application. The periodical data of larval populations were subjected to analysis of variance (ANOVA) after suitable transformation by following standard statistical procedure (Steel and Torrie, 1980). The seed yield data were analysed without any transformation.

RESULTS AND DISCUSSION

The data on pooled over periods are presented in Table 1, 2, 3 and 4 and also depicted in Figure 1, 2 and 3.

The data on pod borer larval population (Table 1) revealed that the crop sown at wider spacing S_4 (60 cm x 30 cm) recorded significantly the lowest pod borer (0.99 pod borer larvae/plant) population as compared to crop sown at 45 cm x 20 cm (S_1) and 60 cm x 20 cm (S_2), whereas it was at par with 45 cm x 30 cm (S_3). Crop sown at S_1 and S_2 did not significantly differ from each other.

Cowpea seed sown at wider spacing S_4 (60 cm x 30 cm) recorded significantly the lowest flower damage (20.65%) as compared to crop sown at 45 cm x 20 cm (S_1), 60 cm x 20 cm (S_2) and 45 cm x 30 cm (S_3) (Table 2). Crop sown at S_3 and S_2 recorded significantly the lower per cent flower damage than S_1 and both were at par with each other.

The data on per cent pod damage (Table 3) revealed that the crop sown at wider spacing S_4 (60 cm x 30 cm) recorded significantly the lowest pod damage (23.24 %) as compared to 45 cm x 20 cm (S_1), but was at par with 60 cm x 20 cm (S_2) and 45 cm x 30 cm (S_3). The crop sown at S_2 and S_3 also exhibited significantly the lower pod damage than S_1.

The data on impact of organic fertilizers on pod borer larvae per plant, per cent flower damage and per cent pod damage was non-significant. It indicated that the tested organic fertilizers had no influence on the pod borer population. The interaction effect of spacing (S) and organic fertilizers (F) was also non-significant for pod borer population, flower as well as pod damage.

So far as seed yield is concerned, impact of spacing on seed yield was significant. Among the different spacing, significantly highest cowpea seed yield (11.46 q/ha) was obtained under S_4 (60 cm x 30 cm) which was followed by S_3 (10.41 q/ha), S_2 (9.80 q/ha) and S_1 (9.27 q/ha) spacing. Crop sown at 45 cm x 30 cm (S_3) yielded significantly the higher than S_1, but it was at par with S_2. Crop sown at S_1 and S_2 did not significantly differ from each other. The impact of organic fertilizers on cowpea seed yield was non-significant.

Overall, the cowpea crop sown at wider spacing exhibited the lower pod borer infestation and yielded higher, whereas the crop sown at closer spacing recorded the higher pod borer larval population as well as higher flower and pod damage and exhibited lower yield. The results obtained under present investigation are in accordance with the results of Karel *et al*. (1980), Adipala *et al.* (2000) and Asiwe *et al.* (2005), who reported that the infestation of pod borer was lower in wider spacing, whereas it was higher in close or dense spacing.

CONCLUSION

The crop sown at wider spacing S_4 (60 cm x 30 cm) recorded significantly the lowest pod borer larval population (0.99 per plant), lowest flower (20.65%) and pod damage (23.24 %) as well as higher cowpea seed yield (11.46 q/ha). The impact of organic fertilizers on pod borer larvae per plant, per cent flower damage and per cent pod damage along with seed yield was non-significant.

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Table 1: Impact of spacing and organic fertilizer on incidence of pod borer in cowpea (Pooled over periods)

Treatments Main/Sub	Number of Pod Borer Larvae / Plant			Mean
	F_1	F_2	F_3	
S_1	1.52 (1.81)	1.53 (1.84)	1.33 (1.27)	1.46[b] (1.63)
S_2	1.39 (1.43)	1.49 (1.72)	1.36 (1.35)	1.41[b] (1.49)
S_3	1.25 (1.06)	1.39 (1.43)	1.21 (0.96)	1.28[a] (1.14)
S_4	1.16 (0.85)	1.30 (1.19)	1.20 (0.94)	1.22[a] (0.99)
Mean	1.32[a] (1.24)	1.43[a] (1.54)	1.28[a] (1.14)	
ANOVA				
S. Em ± S	0.03			
F	0.02			
P	-			
S x F	0.05			
S x P	0.05			
F x P	0.05			
S x F x P	0.11			
C. D. at 5 % S	0.09			
F	NS			
P	NS			
S x F	NS			
S x P	NS			
F x P	NS			
S x F x P				
C. V. %	12.91			

Note: 1. Figures in the parentheses are retransformed values, while those outside are $\sqrt{X + 0.5}$ transformed values
2. Treatment means with letter(s) in common are not significant at 5% level of significance in respective columns

Table 2: Impact of spacing and organic fertilizer on incidence of flower damage due to pod borer in cowpea (pooled over periods)

Treatments Main/Sub	Flower Damage (%)			Mean
	F_1	F_2	F_3	
S_1	30.05 (25.08)	29.98 (24.97)	28.64 (22.97)	29.56[c] (24.34)
S_2	28.44 (22.68)	28.39 (22.61)	28.62 (22.94)	28.48[b] (22.74)
S_3	27.79 (21.74)	28.75 (23.14)	28.34 (22.53)	28.29[b] (22.46)
S_4	26.23 (19.53)	27.88 (21.87)	26.98 (20.58)	27.03[a] (20.65)
Mean	28.13[a] (22.23)	28.75[a] (23.14)	28.15[a] (22.26)	
ANOVA				
S. Em ± S	0.26			
F	0.41			
P	-			
S x F	0.54			
S x P	0.43			
F x P	0.43			
S x F x P	0.86			
C. D. at 5 % S	0.76			
F	NS			
P	NS			
S x F	NS			
S x P	NS			
F x P	1.22			
S x F x P	NS			
C. V. %	4.56			

Note: ***1. Figures in the parentheses are retransformed values, while those outside are $\sqrt{X + 0.5}$ transformed values***
2. Treatment means with letter(s) in common are not significant at 5% level of significance in respective columns

Table 3: Impact of spacing and organic fertilizer on incidence of pod damage due to pod borer in cowpea

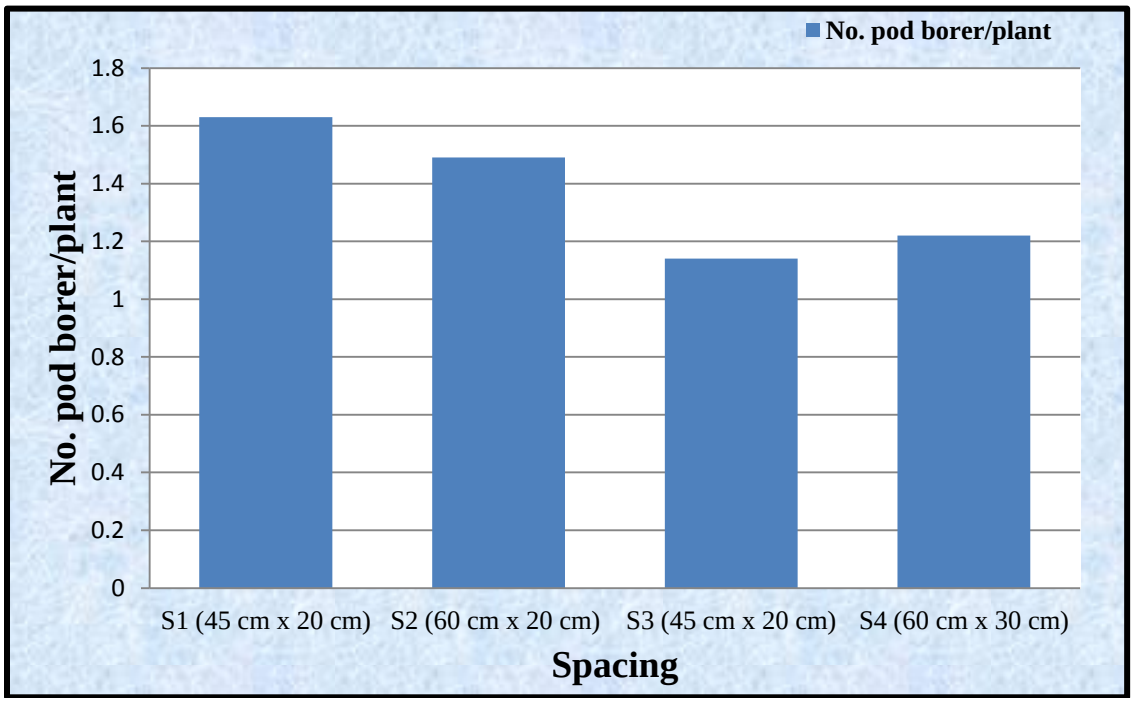
Treatments Main/Sub	Pod Damage (%)			Mean
	F_1	F_2	F_3	
S_1	32.03 (28.13)	33.53 (30.51)	32.42 (28.74)	32.66^{b}(29.12)
S_2	30.86 (26.31)	31.56 (27.39)	28.99 (23.49)	30.47^{a}(25.71)
S_3	28.38 (22.59)	32.57 (28.98)	28.47 (22.72)	29.81^{a}(24.71)
S_4	25.85 (19.01)	31.97 (28.03)	28.63 (22.96)	28.82^{a}(23.24)
Mean	29.28^{a} (23.92)	32.41^{a} (28.73)	29.63^{a} (24.44)	
ANOVA				
S. Em ± S	0.61			
F	0.74			
S x F	1.48			
C. D. at 5 % S	2.11			
F	NS			
S x F	NS			
C. V. %	6.00			

Note: ***1. Figures in the parentheses are retransformed values, while those outside are $\sqrt{X + 0.5}$ transformed values***
2. Treatment means with letter(s) in common are not significant at 5% level of significance in respective columns

Table 4: Impact of spacing and organic fertilizer on cowpea seed yield

Treatments Main/Sub	Seed Yield (q/ha)			Mean
	F_1	F_2	F_3	
S_1	9.65	8.77	9.38	9.27^{c}
S_2	10.23	10.42	8.75	9.80^{bc}
S_3	11.31	9.67	10.25	10.41^{b}
S_4	11.71	11.95	10.73	11.46^{a}
Mean	10.72^{a}	10.20^{a}	9.78^{a}	
ANOVA				
S. Em ± S	0.30			
F	0.35			
S x F	0.70			
C. D. at 5 % S	1.04			
F	NS			
S x F	NS			
C. V. %	8.85			

Note: Treatment means with letter(s) in common are not significant at 5% level of significance in respective columns



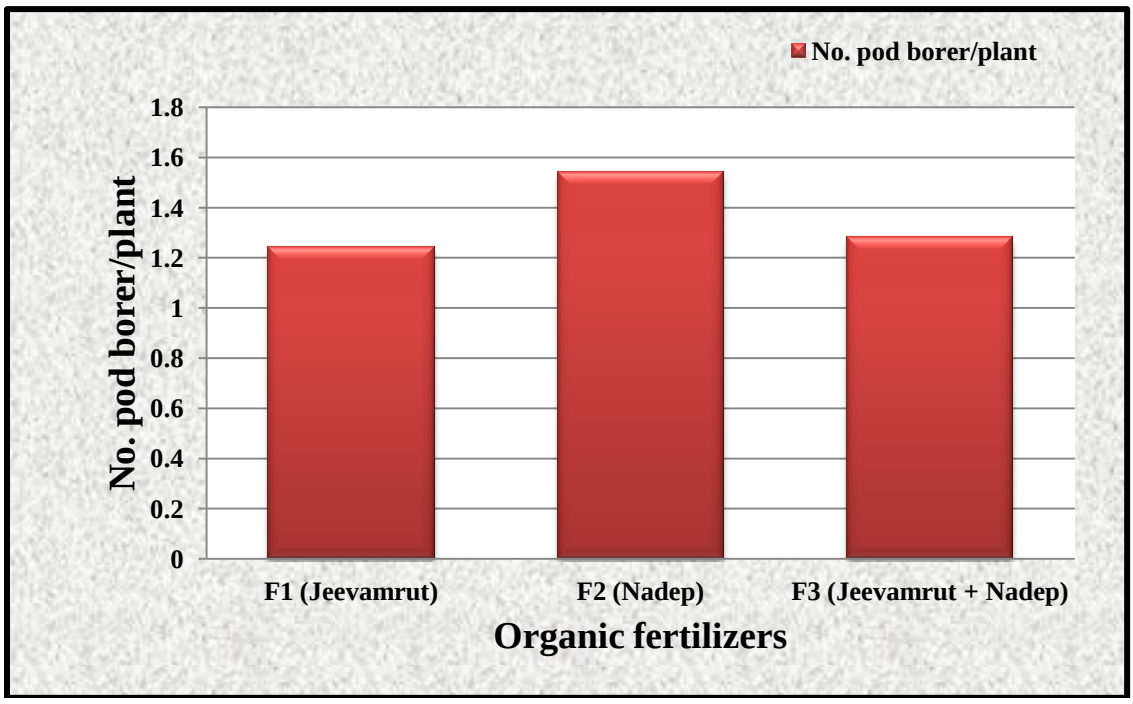


Figure 1: Impact of spacing and organic fertilizer on incidence of pod borer larval population in cowpea

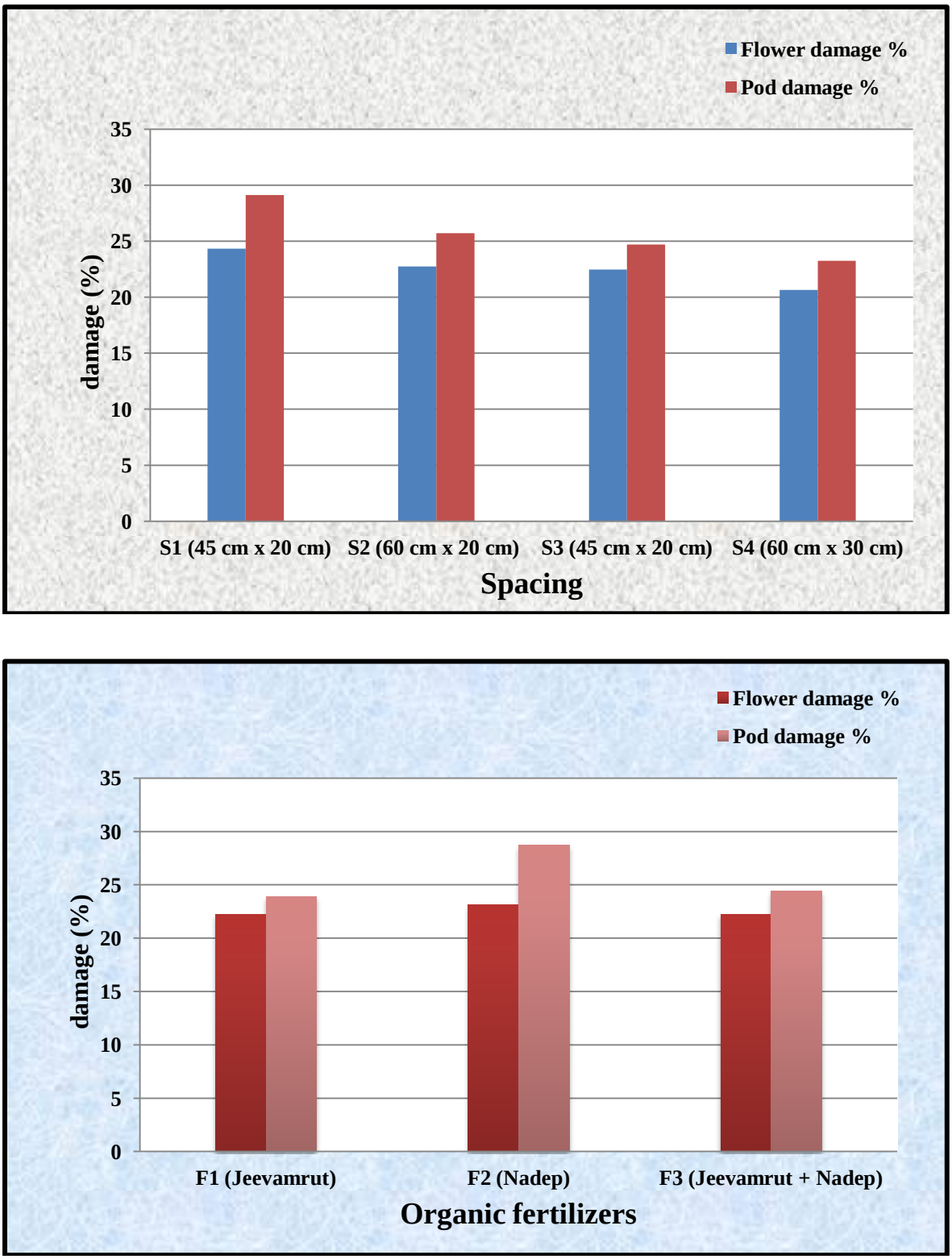
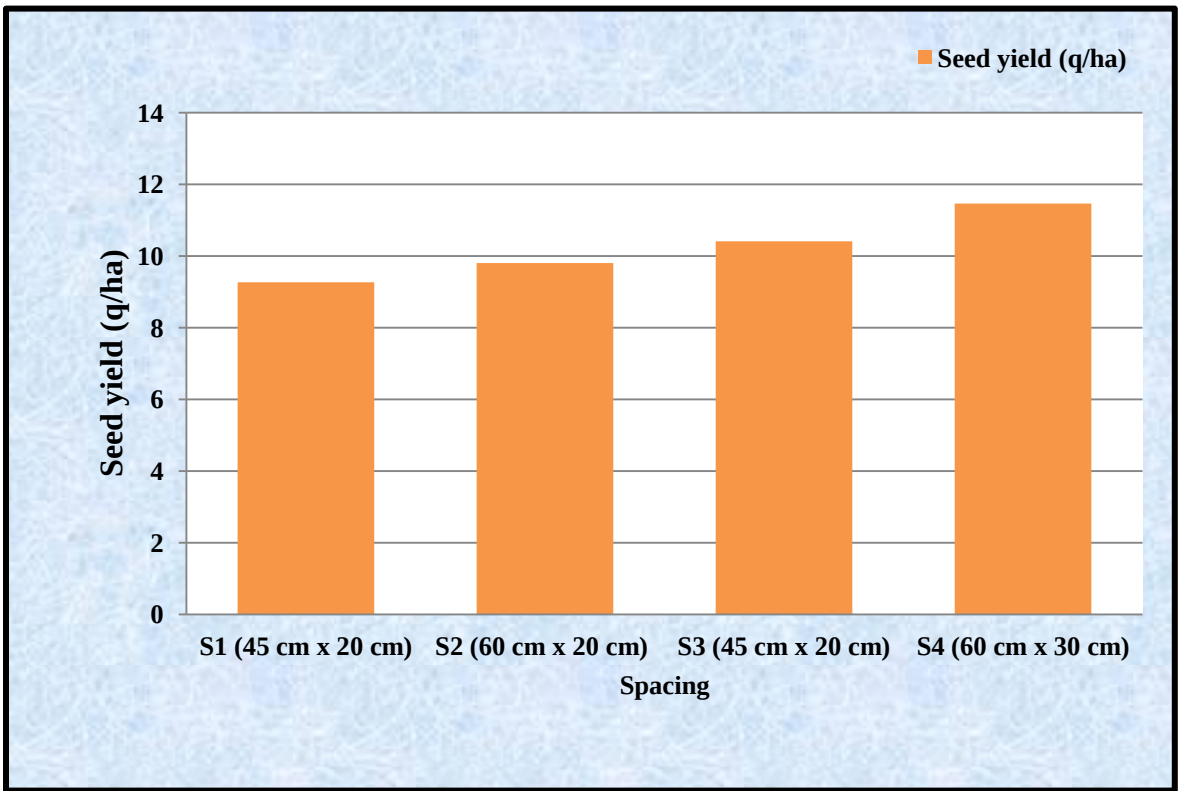


Figure 2: Impact of spacing and organic fertilizer on flower and pod damage due to pod borer in cowpea



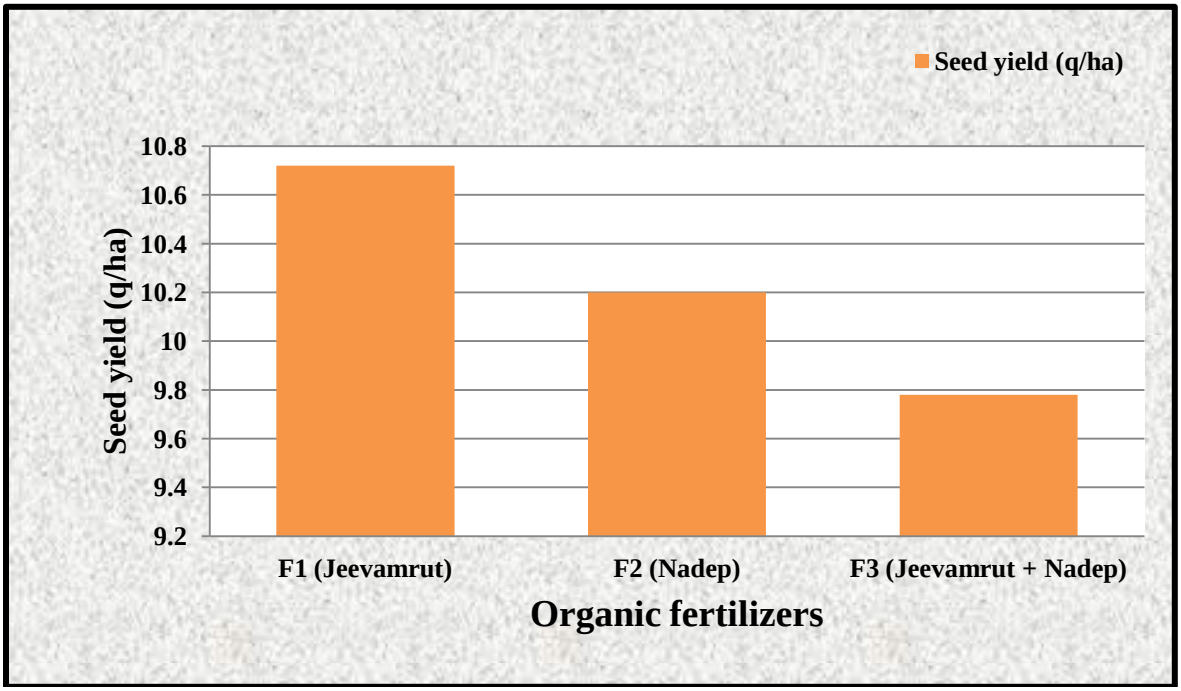


Figure 3: Impact of spacing and organic fertilizer on cowpea seed yield

[MS received : December 23, 2017] *[MS accepted : December 27, 2017]*