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Effect of Sowing Dates and Varieties on the Incidence of Insect Pests on Mungbean in Myanmar

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ABSTRACT

Experiments were carried out in farmer's field of Latpankone village in Nyaunglebin Township, Bago Region in Myanmar, during winter seasons in 2017 - 2018 and 2018 - 2019. A field trial was arranged in a split plot design with three replications. Five sowing dates as main plot factor and three mungbean varieties as subplot factor were set up. The maximum percentage of bean fly infested plants was (50%) and (70.44%) in S5 (16th Dec) during the first experiment and the second experiment, respectively. The highest mean number of thrips per flower (3.72) and (4.69) were found in S4 (9th Dec) in first experiment and second experiment, respectively. The maximum percentage of aphid infested plants (13.22%) and (28.27%) was found in S1(18th Nov) in the first and in the second experiment, respectively. All sowing dates had significant effect on insect pests in both years except thrips in 2018 - 2019.The varieties were found to have significant effect on aphid in 2017 - 2018. The varieties were also found to have significant effect on bean fly infested plant sand thrips in 2018 - 2019. The pod borer larvae were only observed in 2018 - 2019 and lowest number in S1 (18th Nov). It is inferred that early sowing resulted in lower incidence of bean fly and thrips except aphid. The results suggest that for ensuring reduced infestation of majority of insect pests, mungbean in winter season should be sown in mid-November, in the study area.

Keywords: *sowing dates, varietal effect, insect pest infestation, mungbean*

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INTRODUCTION

Mungbean is an important crop of Asia and a major component of many cropping systems. Mungbean seeds are rich in protein and amino acids, thus serve as valuable protein source for human consumption. Pods and sprouts of mungbean are also eaten as a vegetable and are a source of vitamins and minerals [20]. Mungbean is a flexible crop which can be grown in diverse cropping systems and seasons subjected to a wide range of cultural management techniques and more or less well supported by technological inputs [16].

Among the ASEAN countries, Myanmar is the leading pulse and bean producer, the third largest producer of pulses after India and Canada. Globally, About 18 types of pulses are produced in Myanmar led by black gram and followed by green gram, pigeonpeas, and chickpeas, and including a number of "other pulses." Myanmar exports about 23% of pulse and bean production; in 2016/17 it exported 1.42 million tons of pulses valued at US$1.40 billion. Green gram in second place accounted for 25% of the value and 29% of the volume [1].In Myanmar, the total sown area of mungbean is 1.24 million ha and the total production is 1.578 million metric tons and average yield was 1.27 tons per hectare [14].

Pulses are mostly produced in the Dry Zone, Bago, Sagaing and Ayeyarwaddy Region. They can be grown in a wide range of climatic conditions [14]. Literally, it can be sown at any date of the years. However, in Myanmar, normal sowing dates are pre-monsoon season (May - June), post - monsoon season (September - October) and at the onset of winter (November - December) [22]. In general, mungbean is mostly grown in two season: (i) monsoon season (May - July), and (ii) post-monsoon season after harvest of rice (October - December) in Myanmar. Moreover, mungbean is also grown in summer season (February - May) with irrigation. Mungbean is usually grown from November to December after rice harvest in Nyaunglebin Township.

However, mungbean is extensively cultivated in Asia; their yield potentials are not being realized. There are several constraints including climatic conditions, adaptation of varieties, disease and insect pest problems and poor crop management practices [10].

Several insect pests have been reported to infest mungbean damaging the crops during seedlings, leaves, stems, flowers, buds and pods causing considerable losses ([5]; [8]; [11]; [17]; [19]). Pest management is one of the major constraints to increase the total production of yield per unit area in mungbean([6]; [12]; [18]). It is generally accepted that a range of Heteroptera, Homoptera, Lepidoptera and Coleoptera constitute the most widely distributed and serious group of insect pests of grain legumes in the world [15].

The economically important insect pests in mungbean are the bean fly (*Ophiomyiaphaseoli*), aphids (*Aphis fabae*), flower thrips (*Taeniothripssjostedti*), pod borers

(*Marucatestularis*) and (*Helicoverpaarmigera*), bruchids (*Acanthosalidesobtectus*) [7].

In the study area, most of the farmers usually sow the mungbean just after the rice harvesting without considering the optimum sowing dates. As a result of the crop growth affected by unfavorable prevailing climatic condition and the higher pest infestation, the high yield become uncertain. Nowadays, farmers use various chemical insecticides to control the insect pests. Despite the second most important legumes for local consumption and export, the information regarding the mungbean's insect pest appearance and level of damage in relation to sowing dates, is not much available in Myanmar. In these regards, experiments were carried out to determine the natural insect pest infestation level in different sowing dates and on varieties of mungbean.

MATERIALS AND METHODS

The experiments were carried out at the farmer's field of Latpankon Village in Nyaunglebin Township, during the winter season (November to March) of 2017 - 2018 and 2018 - 2019. The climate in general is wet monsoon climate. The total annual rain fall of the region is 3,484 mm and 3,416 mm in 2017 - 2018 and2018 - 2019, respectively [13].

The experiment was arranged in split plot design with five sowing dates as main plot treatment and three mungbean varieties as subplot treatment with three replications. The treatments were randomly allotted in each block. The main plot factor (sowing date) consisted of five levels. They were:
S1: Sowing on 18th November
S2: Sowing on 25th November
S3: Sowing on 2nd December (normal sowing date)
S4: Sowing on 9th December
S5: Sowing on 16th December

There were three tested varieties as sub plots. They were Y-1(Yezin-1), Y-11 (Yezin-11), and Y-14 (Yezin-14). The crop maturity is Yezin-1 (70-75 days), Yezin-11 (60-65 days) and Yezin-14 (60-65 days) (Department of Agricultural Research [DAR], 2019).

The final land preparation was done on15 November 2017, 2018 in both growing seasons. Compound fertilizer (15: 15: 15) 150 Kg per hectare and cow dung manure 5 tons per hectare were applied as basal fertilizer to the experimental plots. The plots were prepared one day before seed sowing. The agricultural practices such as irrigation and weeding, applied in this experiment were similar to those commonly adopted by local farmers. The seeds were sown in rows in the furrows having a depth of 3-4 cm. Row spacing was 30 cm and plant spacing was15cm. The experimental plots were maintained the margins at a large distance from the surrounding fields to make sure that the insecticides sprayed to other fields do not affect the study plots.

The data were collected by weekly schedule for the natural incidence based on the number of insects and the percentage of infected plants mainly for bean fly, aphids, thrips and pod borers. The outermost two rows were left as border rows and excluded from sampling.

For bean fly, 10 sample plants were randomly uprooted and checked from each sub plot until 42 days after sowing. The number of mungbean plants showing symptoms such as poor plant growth, leaf chlorosis, premature defoliation and death: stems thicker than normal with crack above soil, were recorded as infested plants. Even though the number of larvae and pupae found in the stem of the infested plants has been counted, it wouldn't be mentioned and discussed in this paper. Thrips population was collected from random20 opened flowers from each sub plot. The collected flowers were immediately put in plastic boxes containing alcohol soaked cotton balls to kill the thrips for easy counting of their population. Sampling was started from 49 DAS until harvest. For aphids, the number of aphid infested plants (more than 20 aphids per plant) was randomly counted on 10 sample plants to record the infested plants throughout the growing season until harvest. The number of spotted pod borer larva was collected on shoot tips, flower buds, flowers and pods by collecting all available stages of 10 random plants.

The collected data were analyzed by using Statistix (version 8.0) and means were separated by using least significant difference (LSD) test at 5% level.

RESULTS AND DISCUSSION

Bean Fly Infestation Percentage

Bean fly infested plants on ten sample plants was presented with different sowing dates and different varieties in both growing seasons (Table 1). In 2017-2018, there were highly significantly different among the different sowing dates. The highest percentage of bean fly infested plants (50%) was observed in sowing date S5 followed by sowing date S4 (26.67%) and significant difference was found between S5 and S4 sowing dates. The lowest infestation percentage (2.44%) was observed in sowing date S1 followed by sowing date S2 (5.11%) and normal sowing date S3 (5.56%). It was observed that the mean value of bean fly infested plant (%) was gradually increased from sowing date S1 to S5. No significant varietal effect was observed in this experiment. The tested varieties result very similar percentages of bean fly infestation (Table 1). The percentage of bean fly infested plants was higher on Yezin-1 (18.27%) followed by Yezin-11 (18.13%) and Yezin-14 (17.46%). It was recorded that Yezin-1 and sowing date S5 was the highest bean fly infested plants.

In 2018-2019, there were also highly significant differences among the different sowing dates. The maximum number of bean fly infestation percentage (70.44%) was observed in sowing date S5 followed by S4 (59.77%) and S3 (57.55%) and the infestation percentage was significantly different among the three sowing dates. The minimum affected percentage (17.77%) was observed in sowing date S1 followed by S2 (30.22%) and there were significantly different between the sowing dates S1 and S2. The population was gradually increased from sowing date S1 to S5, as in 2017-2018. The effect of varieties was observed significant difference on bean fly infestation. The highest percentage (50.26%) was found on Yezin-1 variety and the lowest percentage (43.06%) on Yezin-14 variety. There is no interaction between the sowing dates and varieties in 2018 - 2019. It was recorded that sowing date S5 and Yezin-1 variety were the highest bean fly infestation.

The present result was similar to findings of [4] who reported that the infestation of bean fly varied significantly from 50% to 100% depending on the sowing dates.

Population fluctuation of *O. phaseoli* varies depending on location, varieties and growing season, age and growth stages of mungbean[2].

In this research, the bean fly incidence was observed within November and mid-January, and the highest infestation was found to be as severe as (70%) in the late sown crops. Moreover, the highest bean fly infestation was found because the effect of different growth stages and drought soil condition are greater indicated than the effect of air temperature changes for each sowing date. It has been reported that the infestation percentage of bean fly are influenced markedly by the different growth stages [21].

Thrips population

Natural incidence of thrips, based on the number of thrips per flower was presented with different sowing dates and different varieties (Figure1). In 2017-2018, the different sowing dates were found to have the significant effect on the number of thrips. The highest mean number of thrips (3.72) was observed in sowing date S4 and the minimum mean number (1.96) was observed sowing date S2 followed by (1.97) in sowing date S1. The population was gradually increased from sowing dates S1 to S4 and decrease at sowing date S5.

In 2018-2019, there were no significant differences among the different sowing dates but it was found that the minimum mean number (2.86) was observed sowing date S1. The highest number of thrips (4.69) was observed in sowing date S4. The population was gradually increased from sowing dates S1 to S4 and decrease at sowing date S5. The varietal effect was found on the number of thrips in both growing seasons. In the study site, rice season is followed by the dry weather. The mungbean is sown by using the residual moisture in the soil. According to [9], the number of thrips on a crop can increase rapidly in dry weather and decrease rapidly after rain. Therefore, similar findings were observed obviously in both seasons, particularly in the second season experiment.

Incidence of Aphid

The percentage of infested plants by aphid was presented with different sowing dates on different varieties in (Table 2). In 2017-2018, the different sowing dates were found significant effect on the aphid infestation percentage. The maximum number of aphid infested plants (13.22%) was observed in sowing date S1 followed by sowing date S2 (11.00%). The minimum mean number (0.33) was observed sowing date S5. The infested plant population was gradually decreased from sowing dates S1 to S5.

In 2018-2019, the different sowing dates were found similar effect on the aphid infestation percentage. But the infestation level was higher in 2018-2019 than that in 2017-2018. The infestations were significantly different among the sowing dates. The maximum number of aphid infested plants (28.27%) was observed in sowing date S1 and the minimum number (2.35%) was observed in sowing date S5. Like in 2017-2018 growing season, the infested plant population was gradually decreased from sowing dates S1 to S5.

Effect on Spotted Pod Borer in 2018 - 2019

Pod borer infestation was occurred only in 2018 - 2019 growing season. The different sowing dates were found to have significant effect on the number of pod borers per ten plants (Figure 2). The maximum mean number of pod borers was observed in sowing date S4 and the minimum number in S1. The population of pod borer was gradually increased from sowing dates S1 to S4 and decreased at S5. The present study revealed the similar results with [3] where sowing dates showed significant influence in pod damage.

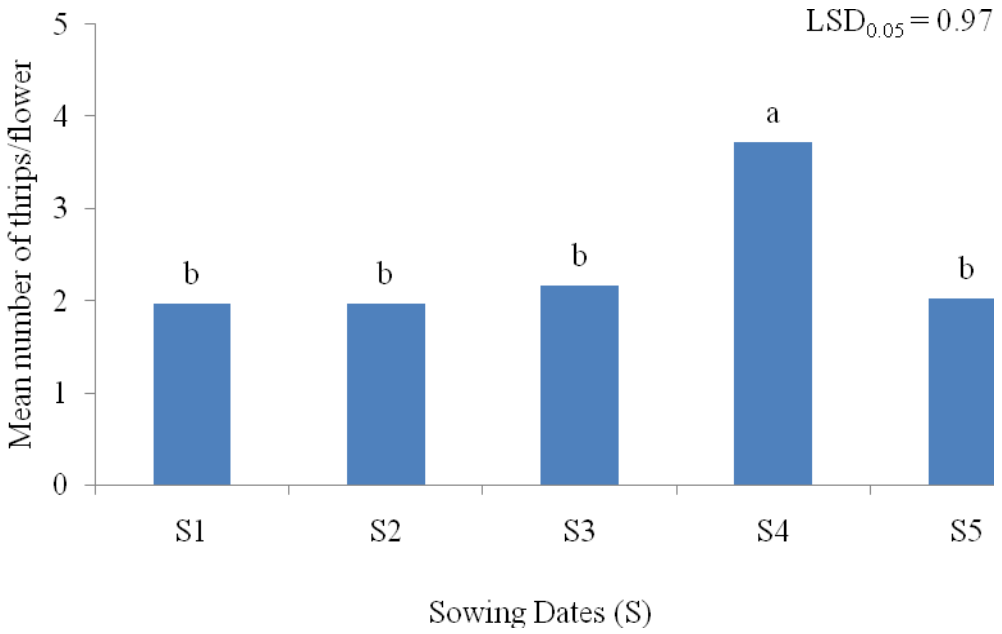
CONCLUSION

The present study in farmer's field is considered to be the first study on the effect of sowing dates and varieties on insect pests infestation in mungbean different varieties. Mungbean is the only grown crop after monsoon rice in this study area. In both experiments, although all insect pests such as bean fly, thrips and aphids were observed in both growing seasons, pod borers was only observed in 2018 - 2019. It was observed that the population of insect pest infestation in 2018 - 2019 was higher than that of 2017 - 2018. All sowing dates had significant effect on insect pests in both years except thrips in 2018 - 2019. However the varietal effect was not significantly different on the number of pests except aphid infestation in 2017 - 2018. The present findings provide information on the seasonal abundance of insect pests as well as its level of infestation on different stages of mungbean, which might be helpful to growers to escape the possible date of infestation. Hence, for ensuring the less insect pest infestation, mungbean should be sown within the period ofsecond week of November.

Table1Percentage of bean fly infested plants affected by sowing dates and varieties in 2017 - 2018 and 2018-2019

	Treatments	Bean fly infested plants (%)	
		2017 - 2018	2018 - 2019
Sowing Dates (S)	S1	2.44 c	17.77 d
	S2	5.11 c	30.22 c
	S3	5.56 c	57.55 b
	S4	26.67 b	59.77 b
	S5	50.00 a	70.44 a
	$LSD_{0.05}$	4.43	11.84
Varieties (Y)	Y-1	18.27 a	50.26 a
	Y-11	18.13 a	48.13 ab
	Y-14	17.46 a	43.06 b
	$LSD_{0.05}$	3.8	5.14
Pr>F	S	**	**
	Y	ns	*
	S x Y	ns	ns
CV%	CV% (a)	22.68	23.11
	CV% (b)	27.73	14.33

A. 2017 - 2018



B. 2018 - 2019

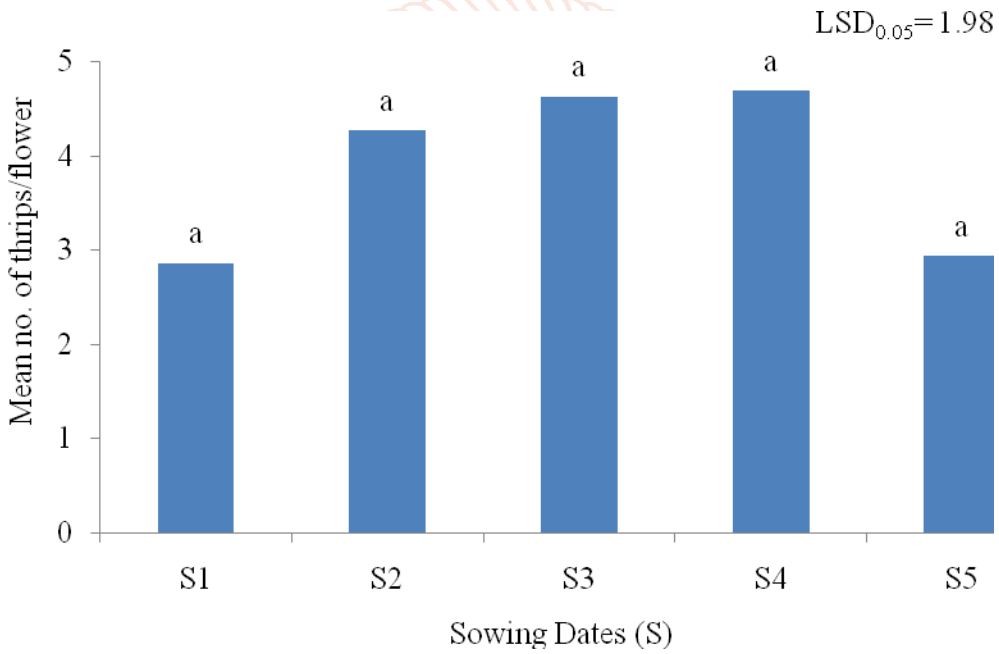


Figure 1 Season long mean number of thrips at different sowing dates in2017 - 2018 and 2018 – 2019

Table 2 Percentage of aphid infested plants affected by sowing dates and varieties in 2017 - 2018 and 2018 - 2019

	Treatments	Aphid infested plants (%)	
		2017 - 2018	2018 - 2019
Sowing Dates (S)	S1	13.22 a	28.27 a
	S2	11.00 ab	22.59 ab
	S3	5.00 bc	13.33 bc
	S4	3.56 c	12.47 bc
	S5	0.33 c	2.35 c
	$LSD_{0.05}$	6.79	12.83
Varieties (Y)	Y-1	8.20 a	16.74 a
	Y-11	8.33 a	18.67 a
	Y-14	3.33 b	12.00 a
	$LSD_{0.05}$	4.15	6.75
Pr>F	S	**	*
	Y	*	ns
	S x Y	ns	ns
CV%	CV% (a)	94.34	74.71
	CV% (b)	82.31	56.12

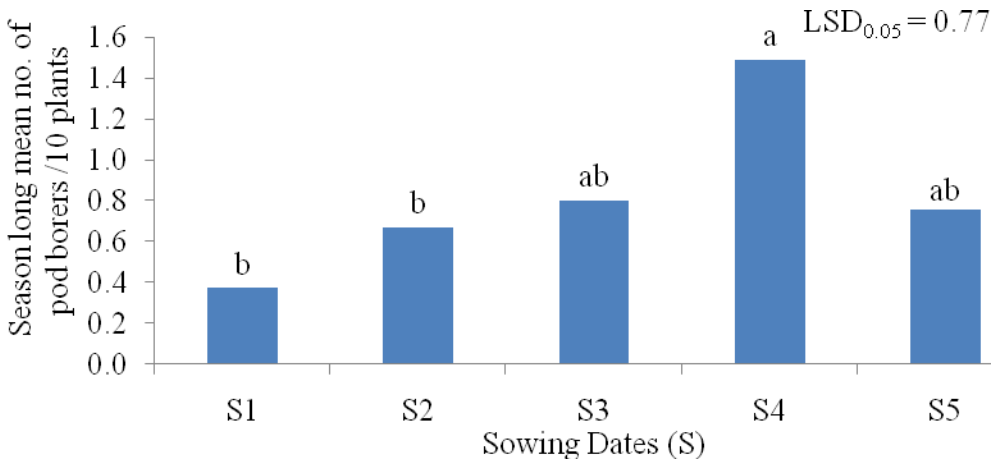


Figure 2 Season long mean number pod borers in 2018 – 2019

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