



Effect of Planting Dates on Incidence of Legume Pod Borer (*Maruca vitrata* Geyer) on Cowpea (*Vigna unguiculata* (L.) Walp.) Varieties in Samaru Kataf, Kaduna State

Musa, N.,¹ Utono, I. M.,² Adamu, A. I.³ and Nwoye, Z. I.⁴

¹Department of Crop Production Technology, Nuhu Bamalli Polytechnic, Samaru Kataf Campus

²Department of Crop Protection, Institute for Agricultural Research, Ahmadu Bello University, Zaria

³Department of Agronomy, Federal University, Kashere, Gombe State

⁴Shehu Idris College of Health Sciences and Technology, Makarfi, Kaduna State

Abstract

Field experiment was carried out during 2018 cropping season to evaluate the effect of planting dates on incidence of legume pod borer *Maruca vitrata* on cowpea (*Vigna unguiculata*) varieties. The treatments consist of five varieties of cowpea (local variety, SAMPEA 6, SAMPEA 7, SAMPEA 8 and SAMPEA 10) which were sown at three different dates, 7th (early), 24th (Mid) August and 7th (early) September, 2018. The experiment was laid out in a Randomized Complete Block Design (RCBD) replicated three times. The number of *M. vitrata* larva on flowers, damaged pods and weight of grains were determined. The result showed that first sowing nearly August had less infestation by *M. vitrata* than those in mid August and differs significantly ($P \leq 0.05$) from those sown in September. All varieties sown in early and mid August had less *M. vitrata* infestation and produced higher grain yield of 533.33kg and 395.06 kg on SAMPEA 7 and SAMPEA 8, respectively compared to those sown in early September: 256.79 and 197.53 on SAMPEA 7 and SAMPEA 10, respectively. Local variety and SAMPEA 6 were the varieties with higher mean number of *M. vitrata*, higher pod damage and low grain yield. Therefore, SAMPEA 7 can be utilized in breeding program for the management of pod borer.

Keywords: Planting date, *Maruca*, Cowpea.

INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp.) is an important grain legume in the tropics. Cowpea is mainly grown in tropical and subtropical regions of the world for vegetable and grain and to a lesser extent as fodder crop (Anonymous, 2009). Nigeria produces

the most quantity of cowpea grains annually at approximately 2.14 million metric tonnes (FAOSTAT, 2017). More than 11 million hectares are cultivated worldwide 97% of which is in Africa, Nigeria alone cultivates 4.5 million hectares annually representing over 60% of total production (FAOSTAT, 2015). Cowpea is eaten in the form of grain,

*Correspondence email:
musanuradeen@gmail.com

green pods, and leaves (Olakoja *et al.*, 2007). It is known as vegetable meat due to high amount of protein in the grain with better biological value on dry weight basis (Owolabi, *et al.*, 2012). Cowpea grain depending on varieties, for instance, IAR (SAMPEA 7) contain 26.61% protein, 3.99% lipid, 8.60% moisture 1.51%, gross energy, and 54.85% nitrogen free extract (Owolabi *et al.*, 2012). The crop is usually preferred by farmers because of its role in increasing soil fertility through nitrogen fixation and production of nutritious fodder for livestock (Blade, *et al.*, 1997; Asiwe, *et al.*, 2009).

However, in spite of the high nutritional values and usefulness of cowpea, the plant is attacked by a wide range of insect pests, which significantly reduce the yield. The major insect pests which severely damage cowpea at all growth stages are the cowpea aphid (*Aphis craccivora* Koch), foliage beetle (*Ootheca mutabilis* Sahlb), the flower bud thrips (*Megalurothrips sjostedti* Trybom), the legume pod borer (*Maruca vitrata* Fabricius) and the sucking bug complex, of which *Clavigralla tomentosicollis* Stal is major. The cowpea bruchid (*Callosobruchus maculatus*) whose larvae bore into seed and feed on seed content of store grains is the major to store pest.

M. vitrata is a major pest of cowpea which causes economic damage at the lowest population density (Sharma and Lopez, 1989). Intensity of larvae is usually highest on flowers followed by flower buds, terminal shoots and pods. *M. vitrata* can be controlled primarily through the use of chemical insecticides (Akinfenwa, 1975; Dina and Medaigedu, 1988). However, continuous use of chemical insecticides may lead to problems such as development of pest resistance, outbreak of secondary insect pests and pesticide residues in the produce and environmental degradation.

The basic biology of *M. vitrata* has been studied extensively (Jackai 1982; Akinfenwa, 1975; Singh *et al.*, 1990), but there is still inadequate information on the time to apply economic control measures in Nigeria and this could hinder the development of effective integrated pest management strategies against the pest in the country. A better understanding of pest populations is needed in order to integrate these and other pest control options into an overall integrated pest management (IPM) plan to maximize cowpea production in the field. Therefore, this study was conducted to determine the effects of planting dates on the incidences of *Maruca vitrata* on some cowpea varieties.

MATERIALS AND METHOD

The research was conducted during the 2018 cropping season at the Research Farm, School of Agricultural Technology, Nuhu Bamalli Polytechnic, Samaru Kataf Campus in the southern guinea savannah, ecological zone of Nigeria. The area is located between Latitude 25⁰N and 10⁰ 20' N and Longitude 7⁰45' E and 8⁰40' E, with annual mean temperature of 25°C and average relative humidity of 80% with annual rainfall of 1250mm (Musa, 2014).

A total of five cowpea varieties were obtained from Institute for Agricultural Research, Samaru, Zaria. SAMPE 8 and 10 were early maturing varieties measuring 65-90 days. SAMPEA 6 and 7 are medium varieties that mature in 90-100 days while the local variety (*Kanannado*) is a late maturing variety 90-110 days.

The fields were disc harrowed and ridged at 75 cm apart, and single super phosphate fertilizer was applied prior to planting at the rate of 13.74 Kg P₂O₅/ha to promote proper root development. The varieties were sown at three different sowing dates on 10th, 24th, August and 7th September 2018. The

experiment was laid in Randomized Complete Block Design (RCBD) with three replications. The plots were sprayed with Glyphosate® herbicides at the rate of 3l/ha to control weeds. The varieties were sown two rows per plot each measuring 2 m in length with spacing 20 x 75 cm. Each plot of the two rows was separated by 1.5 m border margin. Similarly, the replicates were separated by 1.5 m of unplanted path. Two seeds of these cowpea varieties were sown per hill. Two hand weeding was carried out manually with hoe at three weeks interval beginning from 3 weeks after sowing (WAS). No insecticide was applied to the treatments as the studies were under natural infestation conditions (Musa, 2016).

Determination of the level of resistance of the varieties on the incidences of *M. vitrata* was based on larval population in flowers, pod damage, and grain yield at harvest. These were recorded at weekly intervals, starting from 50% flowering to pod maturity for each variety. Four plants per plot were randomly selected and tagged from each variety. From the tagged plants, the population densities of *M. vitrata* were estimated by randomly picking 4 flowers from each plot. The picked flowers were placed in glass vials containing 50% ethanol solution. Subsequently, *M. vitrata* larvae

were counted. At harvest, data were collected on total grain yield per variety from the tagged plants. Estimate of grain yield per unit area was done when the grains dried, using the tagged plants. All data collected were subjected to Analysis of Variance (ANOVA) while the treatment means were separated using Student Newman's Keuls Test ($P \leq 0.05$) (SAS, 2003).

RESULTS

Effect of *M. vitrata* larval infestation at three sowing dates of cowpea per plot

There were significant differences ($P \leq 0.05$) among the cowpea varieties (Table 1). At first sowing date, the mean number of *M. vitrata* larva was higher ($P \leq 0.05$) on local variety but statistically similar to SAMPEA 6 and 10. The least number of *M. vitrata* was recorded on SAMPEA 7 and 8. However, at the second sowing date, the local variety had significantly higher ($P \leq 0.5$) number of *M. vitrata* larvae compared to SAMPEA 6, but this was not significantly different ($P > 0.05$) from SAMPEA 7, 8 and 10. At the third sowing date no significant difference ($P > 0.05$) was recorded between local variety with regard to infestation (Table 1).

Table 1: Effect of sowing dates on field infestation of Cowpea by *Maruca vitrata* in Samaru Kataf; 2018 cropping season

Treatment	Mean number of <i>M. vitrata</i> larva Count per plot		
	1st Sowing	2nd Sowing	3rd Sowing
SAMPEA 6	3.443ab	11.733ab	13.613
SAMPEA 7	1.767c	10.890b	14.167
SAMPEA 8	2.333bc	10.777b	14.433
SAMPEA 10	3.110ab	11.003b	13.110
Local variety	4.157a	13.057a	12.780
SE ±	0.292	0.427	0.978
Mean	2.9620	11.4920	13.6187

Mean within the same column followed by different letter are significantly different using Student Newman's Keuls (SNK) at 5% probability level.

Effect of planting dates on pod damage by *M. vitrata*

At first sowing date, there was significant difference ($P \leq 0.05$) in the infestation by *M. vitrata* between local variety and improved varieties of cowpea on the number of pod damaged. Local variety had significantly higher ($P \leq 0.05$) number of pod damaged compared to SAMPEA 6, 8, 10. The least number of pods damaged was recorded from SAMPEA 7 variety. On the second sowing date, there was significant difference ($P \leq 0.05$) in level of infestation between local and the improved varieties. The difference in the infestation among the improved cowpea varieties, SAMPEA 6-8; were not significant (Table 2). However, at third

sowing date, local variety and SAMPEA 8 had significantly higher ($P \leq 0.05$) pod damage when compared with SAMPEA 6 but no significant difference between SAMPEA 6 and 10. The least number of pods damaged was recorded from SAMPEA 7.

Effect of *M. vitrata* infestation on total grain yield kg/ha of cowpea

At both sowing dates, there was no significant difference on the grain yield among the improved cowpea varieties and between the improved cowpea varieties and local variety as shown in (Table 3).

Table 2: Effect of *M. vitrata* infestation on number of cowpea pods damaged in Samaru Kataf, 2018 cropping season

Mean number of Damaged Pods per plot			
Treatment	1st Sowing	2nd Sowing	3rd Sowing
SAMPEA 6	6.223 ^b	6.280 ^a	15.947 ^b
SAMPEA 7	4.167 ^c	3.777 ^b	13.723 ^c
SAMPEA 8	7.110 ^b	6.167 ^a	19.177 ^a
SAMPEA 10	6.663 ^b	6.053 ^a	17.390 ^{ab}
Local variety	8.553 ^a	6.767 ^a	19.657 ^a
SE \pm	0.311	0.322	0.609
Mean	6.5433	5.8087	17.1787

Mean within the same column followed by different letter are significantly different using Student Newman's Keuls (SNK) at 5% probability level.

Table 3: Effect of infestation by *M. vitrata* on total grain yield in Samaru Kataf, 2018 cropping season

Treatments	Grain yield kg/ha		
	1st sowing	2nd sowing	3rd sowing
SAMPEA 6	316.05	296.30	217.29
SAMPEA 7	533.33	296.30	256.79
SAMPEA 8	217.29	355.56	138.27
SAMPEA 10	276.55	395.06	197.53
Local variety	217.29	313.05	118.52
SE \pm	33.639	29.957	4.484
Mean	312.100	333.853	185.681

Mean within the same column followed by different letter are significantly different using Student Newman's Keuls (SNK) at 5% probability level.

DISCUSSION

The present study evaluated the field resistance of some cowpea varieties to *M. vitrata*. Significant differences were observed among varieties on some parameters such as the effect of different planting dates field infestation by larvae of *M. vitrata*. The results of larva population on flower and pod were a reflection of the distribution of *M. vitrata* infestation in the field. In the present study, there was significant difference in the population of *M. vitrata* at the first sowing date. Local variety was susceptible to infestation of *M. vitrata*. This could be attributed to the fact that that improved varieties have been bred with specific level of resistance to pest infestation. Infestation was generally low at the first sowing date and this could be attributed to the lower population of the *M. vitrata* in early sowing date which subsequently built-up as the season progressed. The present findings agreed with Alghali, (1993) who reported that, *M. vitrata* infestation increased on late sowing dates of cowpea. Similar report has been reported on cowpea in Uganda by Karungi *et al.* (2000) and in Nigeria by (Musa, 2016). Other studies have also shown that early planting reduced pest infestation of some crops. For example, early planted groundnut was shown to have low *A. craccivora* infestation and consequently, little or no groundnut infested (Naidu *et al.*, 1999).

Some cowpea varieties are less preferred for feeding, oviposition and damage than others (Musa, 2016). Local variety and SAMPEA 6 in the present study attracted higher number of *M. vitrata* on flowers and pods. This results corroborated the findings of Musa (2016) who reported that SAMPEA 6 and SAMPEA 7 attracted the highest *M. vitrata* larva population in his research on the determination of the economic injury level of the legume pod borer on cowpea. This could be attributed to insect pest preference or non-preference for some cowpea genotype which

may possess character that affect the behaviour and selection pressure of the insect during search for food, shelter and oviposition (Onyishi *et al.*, 2013). This finding is supported by Stadler (1977) that biochemical factors tends to a large extent affect the behavior and metabolic processes of pest, while morphological factors mostly influence the mechanisms of locomotion, feeding, oviposition, ingestion and digestion of pest. According to Onyishi *et al.* (2013), heritable characteristics of some crops, race, species clone or individual may reduce the possibility of successful utilization of the plant as a host by insect species, race and biotype.

SAMPEA 7 had the least number of *M. vitrata* among the cowpea varieties. The present study had shown that the local variety had significantly higher number of pod damage compared to improved varieties. This could be attributed to its susceptibility to the insect pest infestation.

Local variety, SAMPEA 6, 8 and 10, had high pod damage across the three sowing dates compared to other varieties except SAMPEA 7; which showed low level of pod damage. Sharma *et al.* (1999) reported that pod damage and larval infestation in flower were positively correlated with relative humidity and negatively with temperature.

The results of grain weight showed that the high grain yield was recorded from SAMPEA 7 and at the second sowing date, except the local variety and last sowing date which produced least grain weight. The variation in yield loss in the third sowing may be attributed to the fact that flowering and podding stages of cowpea planted during the third sowing date, coincided with the peak population densities of *M. vitrata* resulting in considerable reduction in grain yields. This was also in agreement with Asante *et al.* (2001) who reported that cowpea planted early escaped severe *M. vitrata* infestation, while those planted late coinciding with peak population density of the major post flowering pests resulted in

considerable reduction of grain yield. In the present study, some varieties did not produce the high grain yield in the third sowing date. This may be attributed to the genetic differences among the varieties. Low grain yield output obtained from third sowing date could be attributed to their susceptibility to insect pest infestation. However, according to Saxena *et al.* (1998) grain yield was significantly greater in *Maruca* resistant cultivars than the susceptible one. This suggests that some genotype recovered quickly following *Maruca* damage.

CONCLUSION

Planting dates have great potentials as management strategies for the control of *M. vitrata* in cowpea production and could provide suitable alternatives for pest control on field crops of small scale and low-input farmers. Early maturing cowpea varieties sown early to mid August had low *Maruca* populations per plot. These varieties are important to farmers in that the plants would have passed the vulnerable stage before the build-up of the *Maruca* larvae. Among the varieties studies local variety, SAMPEA 6 and SAMPEA 10 recorded with high grain damaged. SAMPEA 7 and SAMPEA 8 had high grain yield and low population of *Maruca* per plot and so could be considered resistant to the *Maruca* attack. Therefore, Early and late August planting of cowpea is recommended for cowpea production in the study area and SAMPEA 7 should be utilized by farmers in breeding program for resistance to legume pod borer as component of Integrated Pest Management (IPM).

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