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INFLUENCE OF PLANT DENSITIES AND PLANTING DATES ON THE POPULATION OF PIGEONPEA FLOWER BLISTER BEETLES IN OWERRI, IMO STATE, NIGERIA

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ABSTRACT
The early maturing pigeonpea cultivar (ICPL 84023) was evaluated to ascertain the extent of protection to which plant densities and dates of planting will have on the population of blister beetles (*Mylabris pustulata* Thunberg (Coleoptera: Meloidae). Field trial was carried out at the Postgraduate Teaching and Research Farm, Department of Crop Science and Technology, Federal University of Technology, Owerri Imo State in April, July and October 2009 and repeated in 2010. Experiment was laid out in a 3 x 4 factorial and treatments consisted of four plant populations namely: 190,474 plants ha^{-1}, 125,000 plants ha^{-1}, and 80,000 plants ha^{-1}, 55,556 plants ha^{-1} with three planting dates, April, July, and October. The result showed high population of *M. pustulata* on higher plant densities than at lower plant densities. Also April planting season recorded very high population of the *M. pustulata* on the pigeonpea while there was absence of the blister beetles during July and October planting seasons. Appropriate plant density and time of sowing may be an important integrated management of *M. pustulata* population in this locality.

INTRODUCTION

Pigeonpea (*Cajanus cajan* (Linnaeus) Millspaugh is an important grain legume which belongs to fabaceae family, and widely cultivated pulse crop in India. Pigeonpea have deep roots that enable them to tap soil moisture at greater depth than other crops. It is a highly nutritious food legume that is grown in many tropical countries (Acland, 1971, Nene *et al*., 1990, Singh, 1991). Its seeds are rich in protein (Amarteifio *et al*., 1986, Duke, 1981) and are used in the preparation of many dishes in India and parts of Africa. In India, sprouted seeds are cooked to make thick soup primarily for mixing with rice. In Nigeria, the leaves serve as foliage for small ruminants such as goats, sheep, rabbits etc, while the dry seeds can be cooked and consumed in mixture with maize flour, cocoyam chips (Achicha).

Insects feed on all parts of the pigeonpea plant. The most serious pest and the primary focus of pigeonpea pest management research are those that attack reproductive structures, including buds, flowers and pods. Among the beetles that attack pigeonpea, the blister beetles to which *Mylabris pustulata*, Thunberg (Coleoptera: Meloidae) belongs is very important pests of pigeonpea. They feed on the flowers of pigeonpea and thus cause poor pod setting which can reduce the pigeonpea yield potentials. *M. pustulata* has been notorious for causing severe blister due to the presence of a chemical cantharidin in their body fluids (Kazmi, and Ramamurthy, 2004). Adult blister beetle has been reported to be one of the major insect pests damaging pigeonpea (Singh and Singh, 1978). In several pigeonpea pest researches in Nigeria, documented records of *M. pustulata* population at varying improved pigeonpea plant density in rainforest agro-ecological region of Southeastern, Nigeria is lacking. Also scarce in documentation, is the optimum planting time during which the population of *M. pustulata is* minimal. Hence the objective of this study is to explore the population of the *M. pustulata* in Owerri agro-ecological zone in relation to (i) plant densities and (ii) planting dates.

MATERIALS AND METHODS

Field research was carried out in the Postgraduate Teaching and Research Farms, Department of Crop Science and Technology, Federal University of Technology, Owerri, Imo State Nigeria, in the months of April, July, and October, 2009 and repeated in 2010. The research field is located in the rain forest belt, longitude 7° 122 E and latitude 5° 272 N of equator. The mean annual temperature (33.55°C), rainfall (281.72 mm), and relative humidity (81.33%) of the study area were prevalent in year 2009 and in 2010 planting season temperature (34.03°C), rainfall (301.45 mm), and relative humidity (85.91%) were obtained from Federal Ministry of Aviation Owerri Meteorological Station, Imo State. An area of land measuring 11.0 m × 10.0 m (110 m^2) was mapped out at Postgraduate and Research Farms, Department of Crop Science and Technology, Federal University of Technology,

Owerri during each sowing time (first week of April, July, October 2009 and 2010 sowing seasons.. The area was cleared of grasses, tilled manually, and divided into 3 replications with 1m pathways between replications. Each replication comprised of 4 plots of uniform sizes 3.0 m × 3.6 m (10.8 m^2), with different plant densities of 55,556 plants ha^{-1}, 80,000 plants ha^{-1}, 125,000 plants ha^{-1}, 190,474 plants ha^{-1} and separated by 1 m pathway between plots. Each plot contained 5 ridges with 12 rows of pigeonpea per plot to give a total of 60 plants per plot. Planting was done using 3 seeds per hole at each sowing time and later thinned down two weeks after planting (WAP) to one stand per hole to give the plant population per hectare for different crop arrangement as shown below.

The population of flower blister beetles (*Mylabris pustulata*) was assessed from four plants per row selected randomly from the three middle ridges giving a total of 12 sampled plants per plot. *M. pustulata counts* were expressed as the number of pest per one metre row per plot. The collection and counting was done at weekly intervals each time between 7.00 a.m to 8.00 am when the insects were less mobile. Weeding was done manually with the use of hoe at two weeks and six weeks after planting. There was no application of either organic or inorganic fertilizers to the pigeonpea plots in the experiment as the area was left fallow for over 5 years.

Statistical analysis

All data collected were subjected to analysis of variance using Genstat Discovery Edition 3 (2009). Data on *Mylabris* and *Aulacophora* counts were subjected to square root transformation before analysis of variance was carried out, while treatment means was separated by the use of Least Significant Difference at 5 % level of significance.

RESULTS AND DISCUSSION

The result of the weather conditions during the planting seasons 2009 and 2010 is presented in table 1. July planting season recorded higher amount of rainfall in 2009 (394.10 mm) and 2010 (511.13 mm) compared with the average rainfall received in April and October planting seasons. . In earlier studies on pigeonpea, Srilaxml and Ravindra, (2010) reported that, appearance of pests in the field in various months of the year is a factor that can determine the population of insect pests on crops.

Thus, there was higher population of *M. pustulata* in April and this could be due to micro and macro climatic environment which favoured the proliferation of the pests to populous level.

The population trend of flower blister beetles, *Mylabris pustulata* as influenced by plant density and planting date in 2009 is presented in figure 1 (a and b). Significant population ($p < 0.05$) of the blister beetles was noticed on plants at higher plant density while low population occurred on plant at lower plant density. At 63 days after planting (DAP), population of *M. pustulata* increased with successive increase in plant densities and decreased on plants at lower densities. In April at 49 DAP, population of blister beetles was significant ($p > 0.05$) and subsequently increased significantly ($p < 0.05$) at 56 DAP with peak population at 63 DAP. In the earlier research work on pigeonpea by Dialoke and Ezueh (2003), in derived savannah zone of Nsukka, higher population of variegated grasshopper nymphs (*Zonocerus variegatus* Fab.) was observed in April with of absence of the pest in June and August cropping seasons.

The absence of *M. pustulata* on pigeonpea flowers during July and October planting seasons indicated that sowing time is an important factor influencing the population of *M. pustulata*. This condition could have been related to cool weather resulting from heavy rainfall during JULY and sudden cessation of rainfall prevalent during October planting season.

Figure 2 (a and b) presents the response of blister beetles (*M. pustulata*) population to plant density and planting date during 2010 planting season. Peak population of *M. pustulata* was observed on higher pigeonpea plant density (190,474 $plants^{-1}$) at 56 DAP, while low population was noticed on lower pigeonpea plant density (55,556 $plants^{-1}$) at 56 DAP compared with other pigeonpea plant densities but decreased at 63 DAP. This finding agreed with Srilaxml and Ravindra, (2010), who observed abundant population of *M. pustulata* on pigeonpea flower at high density. The blister beetles, *M. pustulata* were found ravaging the pigeonpea flowers at higher plant densities compared with plants at low densities, during 2009 planting season. The blister beetles, *M. pustulata* being flower eaters decreased in population as flowering stage gave way to podding stage, indicating that availability and quantity of flowers produced could be among the factors determining the population of *M. pustulata*.

In 2010, April planting again had the highest population of blister beetles at 56 DAP which decreased at 63 DAP while

Table 1: Summary of average monthly rainfall, temperature, relative humidity, number of rain days, from a maximum of three months (from planting to harvest)

Cropping season	Rainfall (mm)	Maximum Temp. (°C)	Minimum Temp.(°C)	Relative Humidity (%)	No. of Rain days(day)
2009					
Early cropping April	232.30	34.67	15.33	79.67	11.33
Mid-cropping July	394.10	34.33	19.00	86.33	18.33
Late-cropping October	218.83	31.64	18.67	78.00	7.67
Mean	281.74	33.55	17.67	81.33	12.44
2010					
Early cropping April	237.90	33.17	22.47	87.09	10.67
Mid-cropping July	511.13	33.60	21.03	89.67	14.00
Late-cropping October	155.33	35.33	19.33	81.00	7.33
Mean	301.45	34.03	20.94	85.92	10.67

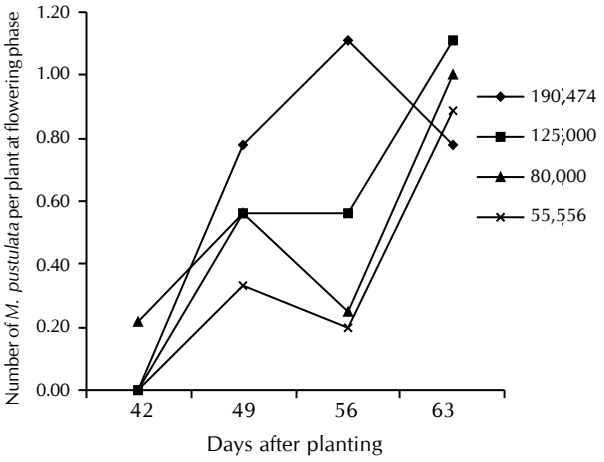

Figure 1(a): Effect of plant density on number of blister beetles *M. pustulata* per plant at pigeonpea flowering phase during 2009 season.

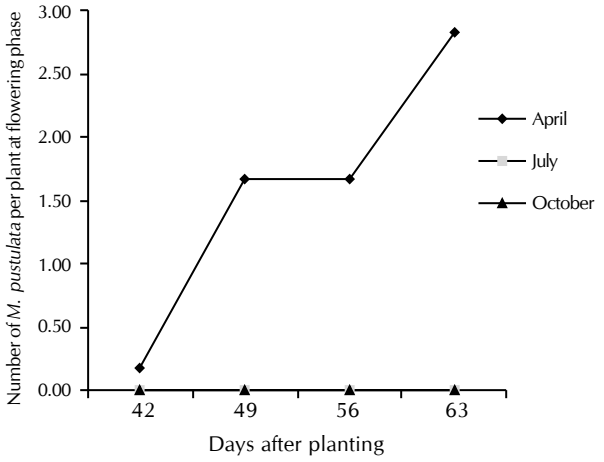

Figure 1 (b): Effect of planting date on number of blister beetles *M. pustulata* per plant at pigeonpea flowering phase during 2009 season.

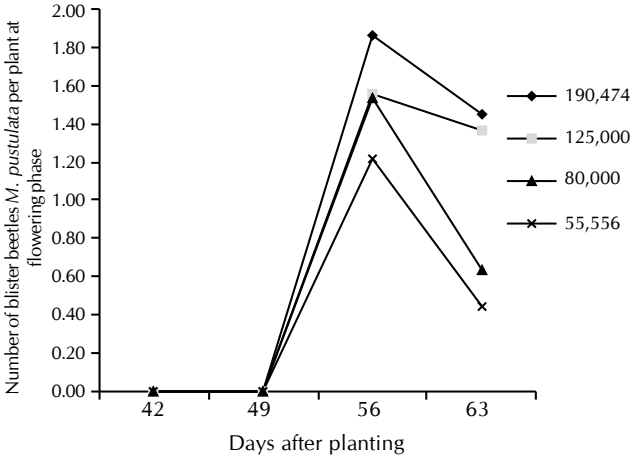

Figure 2 (a): Effect of plant density on the number of blister beetles, *M. pustulata* per plant at pigeonpea flowering phase during 2010 planting season.

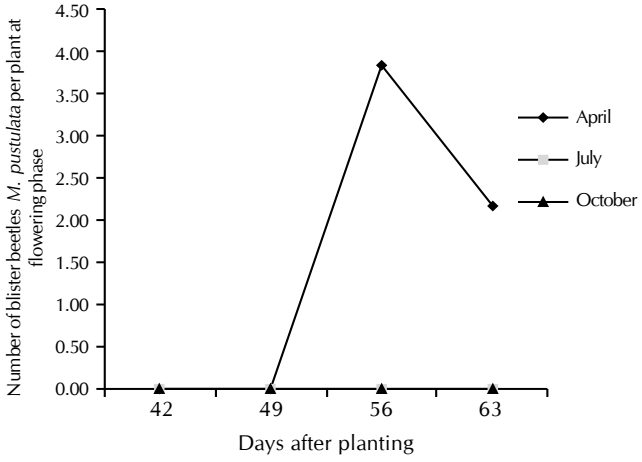

Figure 2 (b): Effect of planting date on the number of blister beetles, *M. pustulata* per plant at pigeonpea flowering phase during 2010 planting season.

there was absence of the *M. pustulata* during July and October planting. In rainforest zone of Imo State, Dialoke, (2013), also observed high population of nymphs of grasshopper (*Zonocerus variegatus*) in April with zero population in July and October planting seasons. Significant population of *M. pustulata* which occurred during April planting season, coincided with the emergence of young *M. pustulata*. Srilaxml and Ravindra, (2010) also recorded maximum population of butterflies, *Lampides boeticus, M. obtusa* in the months of April. April planting season with light rainfall of range of 237.8 mm to 250.2 mm (2009), 141.7 mm to 219 mm (2010), and a maximum temperature of 34 ^{oC} (2009), 34.5 ^{oC} (2010), created a conducive environment which supported the *M. pustulata* build up and multiplication to a high level observed in the present study. This finding is supported by Singh and Singh (1978), who reported that the population of insect pests fluctuates in relation to metereological conditions. Also, Nakamura and Numata, (2006), earlier reported that changes in temperature affect the seasonal abundance of *Dolycoris baccanum* (L.) Heteroptera: Pentatomidae). Akhilesh and Parasnath (2003), also earlier reported high population of *M. pustulata* on pigeonpea at the onset of rainy season.

The high rainfall in July and water stress in October planting seasons might have created harsh environment for the survival of the *M. pustulata* in the area, hence there was absence of *M. pustulata* in July and October planting seasons. The harsh environmental conditions must have also disrupted the adults mating and multiplication of *M. pustulata*. Zile (1973) also observed similar effect of heavy monsoon rainfall on the population of *Nezara viridula* on cowpea in India while Dialoke *et al*., (2013), observed on pigeonpea a progressive increase of *Clavigralla. tomentosicollis* and *Anoplocnemis curvipes* under low rain fall in October planting season

SUMMARY AND RECOMMENDATION

Plants at high density (194,474 plants per hectare), had higher population of blister beetles, *M. pustulata* compared with plants at lower density (55,555 plants per hectare), while April planting season recorded the greatest number of blister beetles than July and October planting seasons. In view of this, planting the improved pigeonpea cultivar at low plant density (55,555

plants per hectare), and in July season when there was absence of blister beetles are highly recommended to farmers in Owerri, ecological zone of Southeastern, Nigeria. Even though there was absence of the blister beetles in October season, planting at the season is not recommended as there would not be enough rain to sustain the life of the plants in the field, but for farmers to embark on planting, there is need for irrigation facilities.

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