

Population Dynamics of Pod-sucking Bug (*Anoplocnemis curvipes* Hemiptera: coreidae) On Improved Pigeonpea Pods Under Different Plant Spacing And Time Of Sowing In Owerri, Rainforest Tropical Environment, Nigeria.

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Abstract

Field study was undertaken to determine the population of pod-sucking bugs *Anoplocnemis curvipes* Hemiptera: coreidae) and under varying plant spacing and sowing time. The study was done at the Postgraduate Teaching and Research Farm, Department of Crop Science and Technology, Federal University of Technology, Owerri Imo State. Experiment was laid out in a 3 x 4 factorial and treatments consisted of four plant spacing 15 cm x 35 cm, 20 cm x 40, 25 cm x 50 cm, 30 cm x 60 cm, with three planting dates, April (early season), July (Mid-season), and October (late season), 2009 and 2010. The results, show that significant ($p < 0.05$) population of pod sucking bugs (PSBs) such as *Anoplocnemis curvipes* on pigeonpea pods were high at close spacing of 15 cm x 35 cm. However, the population of *A. curvipes* decreases with increasing spacing of 30 cm x 60 cm. October planting seasons recorded significant ($P < 0.05$) population of *A. curvipes* while there were absence of the pest in April and July planting seasons.

Keywords: *Anoplocnemis curvipes*, population, plant spacing, planting dates.

Introduction.

Pigeonpea (*Cajanus cajan* (Linnaeus.) Millspaugh) is an important grain legume of rain fed Agriculture in the semi-arid tropics and other tropical countries use it in a variety of ways (Gopalan *et al.* 1984). The dry seed is dehulled and the split cotyledons called dhal are cooked to make thick soup primarily for mixing with rice. In India sprouted seeds are consumed and the flour or the split seeds are used for making soup. In Africa and Central America whole dry seeds without the seed coat are cooked alone or mixed with meat and used as food while in South Eastern Nigeria whole dry seeds with seed coat are cooked and mixed with yam, dry cocoyam chips (achicha) or with maize/sorghum flour. Also in Nigeria pigeonpea seed has been recommended as an alternative to maize, soybean meal or groundnut cake in the diet of broilers (Amaefule & Obioha, 2001; Onu & Okongwu 2006), pullet chicks (Amaefule & Obioha 2005; & layers (Agwunobi 2000).

In Nigeria, insect pests such as pod sucking bugs (*Anoplocnemis curvipes* Hemiptera: coreidae, *Clavigralla tomentosicollis* Stal., *C. shaddabi* Dolling, *Riptortus dentipes* Fab, *Nezara viridula* L.etc), have been reported to be the major constraints to pigeonpea production efforts (Dialoke *et al.* 2010). In Owerri Nigeria, Dialoke *et al.* (2013) reported at different pigeonpea growth stages, 65 pest species (2009), 51 pests (2010) belonging to 6 orders, feeding on early maturing pigeonpea sown in April planting season. More than 200 insect species have been reported feeding on pigeonpea at various stages of its growth in India (Lateef & Reed 1990). Theiaswi *et al.* (2008) also recorded a total of 22 species of insect pests feeding or damaging field bean (*Lablab purpureus* L.) during the experimental period of which majority were sucking pests followed by borers and defoliators. In controlling insect pest, the time of planting of a crop can have a great effect on its ability to tolerate insect pests population and damage. Careful selection of sowing dates makes it possible to ensure that the vulnerable stage in a crop does not coincide with the period of pest abundance. Also for many pest and crop systems, planting date will dictate whether or not a pest will be present in high numbers to attain pest status. For some insect pests, planting a crop early can be a practical solution to their management.

In Nigeria, with regards to planting of early maturing pigeonpea cultivar, information on the appropriate time to plant the cultivar in the rainforest zone of South Eastern Nigeria is lacking. Moreover, information on the population dynamics of pod sucking bug, (*A. curvipes*) with respect to planting dates and plant spacing of the improved pigeonpea cultivar (ICPL 84023) is scarce in Nigeria. Hence the objective of this research is to

determine the effect of plant spacing and planting dates on population of *A. curvipes* on early maturing pigeonpea cultivar (ICPL 84023) in Imo State.

Materials And Methods.

Experiment was carried out in the months of April, July, and October, 2009 and repeated in 2010 at the Postgraduate Teaching and Research Farms, Department of Crop Science and Technology, Federal University of Technology, Owerri, Imo State Nigeria. The research field is located in the rain forest belt, longitude 7° 12' E and latitude 5° 27' N of equator. The annual monthly temperature, rainfall, and relative humidity of the study area prevalent in Owerri in the year 2009 and 2010 were obtained from Federal Ministry of Aviation Owerri Meteorological Station, Imo State (Table 1).

An area of land measuring 11.0 m × 10.0 m (110 m²) was mapped out Postgraduate and Research Farms, Department of Crop Science and Technology, Federal University of Technology, Owerri. The area was cleared of grasses, tilled manually, and divided into three replications. The experimental Design was a 4 × 3 factorial laid down in a Randomized Complete Block Design (RCBD) with (3) replications which was separated by 1 m pathways between replications. There was uniform plot size of 3.0 m × 3.6 m (10.8 m²). All the treatments comprising four plant spacing (15 cm x 35 cm, 20 cm x 40 cm, 25 cm x 50 cm, 30 cm x 60 cm) were randomly allocated in the plots and three planting dates (April, July and October). Each plot contained 5 ridges with 12 rows of pigeonpea per plot to give a total of 60 plants per plot. The improved pigeonpea cultivar (ICPL 84023) obtained from International Crops Research Institute for Semi-Arid Tropics (ICRISAT) used, was seed-dressed with Apron-star before sowing at the rate of 2 kg of seeds per a sachet, to control fungal diseases. Seed sample was imported through Portharcourt Quarantine Division with appropriate phytosanitary certificate. 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.

The population of *Anoplocnemis curvipes* Hemiptera: coreidae was sampled by visually counting number of PSBs from 5 plants per row randomly selected from the three middle rows following the method of Amatobi (1994) starting from 6.30 am to 8.00 am and 5.00 pm to 6.30 pm at weekly basis. Counts were expressed as the number of *A. curvipes* per 12 plants within each plot. The *A. curvipes* collected was preserved in 95 % ethyl alcohol in the Insect laboratory of the Department of Crop Science and Technology, Federal University of Technology, Owerri. The identification was carried out using preserved samples in the laboratory of the Department of Crop Science and Technology and with pigeonpea and chickpea insect identification Handbook by Reed *et al.* (1989).

Statistical Analysis.

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

Cultural Practices:

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 as the area was left fallow for over 5 years.

Result And Discussions.

Table 1, shows that in 2009, April cropping season recorded an average annual rainfall of 232.30 mm followed by October with 218.83 mm and July cropping season with 394.10 mm. In 2010 cropping season, average rainfall of 237.90 mm, was recorded in April; 511.13 mm was recorded in July, while 155.33 mm was recorded in October cropping season. Invariably, there was light rainfall in April and October with heavy rainfall in July. The Agro-climatic conditions were favourable to the development of the pest species as very light rainfall as obtained in October supported high build up of the *A. curvipes* while heavy rainfall discourages the build up in the field. Rainfall therefore, may be an important physical factor controlling the incidence and infestation of *A. curvipes*. Mandal *et al.* (2009) in his work earlier reported in region North eastern, Bihar that heavy rainfall, (1600.00 mm annual rainfall), flood, and humidity were some of the factors controlling the pests species in a natural environment.

Figure 1 (a and b) presents the effect of plant spacing and planting date on the population of *Anoplocnemis curvipes* on pigeonpea pods during 2009 planting season. The population of *A. curvipes* was significantly high

on closer plant spacing at 77 DAP, 91 DAP, 98 DAP and declined at 105 DAP. On the other hand, plants at wider spacing maintained low population of *A. curvipes* from 77 DAP to 98 DAP and slightly increased at 105 DAP. Population of *A. curvipes* was significantly high in October at 91 DAP and 98 DAP, but sharply decreased to zero at 105 DAP. There was absence of *A. curvipes* during April and July plantings.

The result which shows the occurrence of *A. curvipes* on pigeonpea under different plant spacing and planting date during 2010 sowing season is presented in figure 2 (a and b). Significant population of *A. curvipes* on closer spaced pigeonpea plants maximally occurred at 77 DAP (20 cm × 40 cm) with 125,000 plants/ha, 91 DAP (15 cm × 35 cm) and 98 DAP both with plant density of 190,474 plants/ha each while plants at wider spacing of 30 cm × 60 cm (55,556 plants/ha) maintained low population of *A. curvipes* from 70 DAP, 84 DAP, 91 DAP, 98 DAP and 105 DAP. At 84 DAP, population of *A. curvipes* on plants at wider spacing of 25 cm × 50 cm and 30 cm × 60 cm was non-significant ($p > 0.05$). The population of *A. curvipes* during October planting was highest at 91 DAP and 98 DAP. Again in 2010 planting season, there was absence of *A. curvipes* during April and July planting.

In both seasons, the population of pod sucking bug, *A. curvipes* was significantly high on plants at closer spacing with density of 190,474 plants ha⁻¹ which decreased with wider spacing which had 55,556 plants ha⁻¹. Competition for growth resources must have compelled plants at closer spacing to produce pods faster and at enough quantity than plants at wider spacing. In earlier research on cowpea in Uganda, Nabirye *et al.* (2003) reported that, close and irregularly spaced plants had significantly higher pod sucking bug populations the first and second seasons of 2000 and 2001. This variation in time and quantity of pod production probably had direct effect on the population of nymphs and adults of *A. curvipes* observed on early duration pigeonpea at different plant spacing. This finding is in agreement with Akhilesh & Parasnath (2003) and Rao *et al.* (2002) who recorded high population of pod sucking bugs on plants at close spacing than at wide spacing.

The absence of *A. curvipes* during April and July planting seasons could be due to the rainfall in April and July planting season which probably discouraged mating, oviposition and multiplication of the pests. October planting coincided with the emergence of the nymphs of the bugs, hence sudden cessation of rainfall produced dry spell which probably favours feeding, mating, and multiplication of the bugs. This finding agreed with Dialoke *et al.* (2013) who reported on pigeonpea in Nigeria, that under light rainfall there was a progressive increase in the number of pod sucking bugs (*R. dentipes*, *A. curvipes* and *C. tomentosicollis*). Srilaxmi, and Ravindra (2010) equally observed high population of *Nezera viridula*, *R. dentipes*, and *A. curvipes* on pigeonpea flowering and podding stage in the months of October to December, while Foster *et al.* (1986) on rice also observed high population of stinkbug on rice planted late in a season.

Summary And Recommendation

In 2009 and 2010 sowing seasons, there was higher population of pod sucking bug represented by and *A. curvipes* at closer plant spacing compared with pigeonpea at wider plant spacing. There was high population of *A. curvipes* on pigeonpea sown in October season but was not observed on April and July sown pigeonpea. In view of the high level of *A. curvipes* on the improved cultivar (ICPL 84023) at closer spacing during October sowing time, we recommend farmers in Owerri locality to sow the improved cultivar at wider spacing of 30 cm × 60 cm within the first week of July. From this work, the plant spacing and sowing time were found to have effectively reduced the population of *A. curvipes* and so could fit into the integrated pest management programmes of pigeonpea in Owerri Rainforest zone of Southeastern, Nigeria.

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.(0 ^c) | Minimum Temp.(0 ^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 |

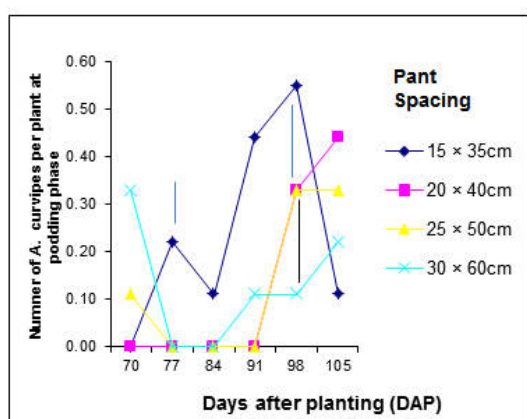


Figure 1 (a): Effect of plant spacing on the number of *A. curvipes* per plant at pigeonpea podding phase during 2009 planting season.

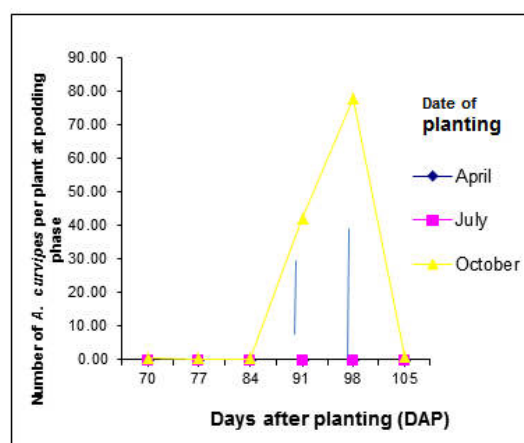


Figure 1 (b): Effect of planting date on the number of *A. curvipes* per plant at pigeonpea podding phase during 2009 planting season.

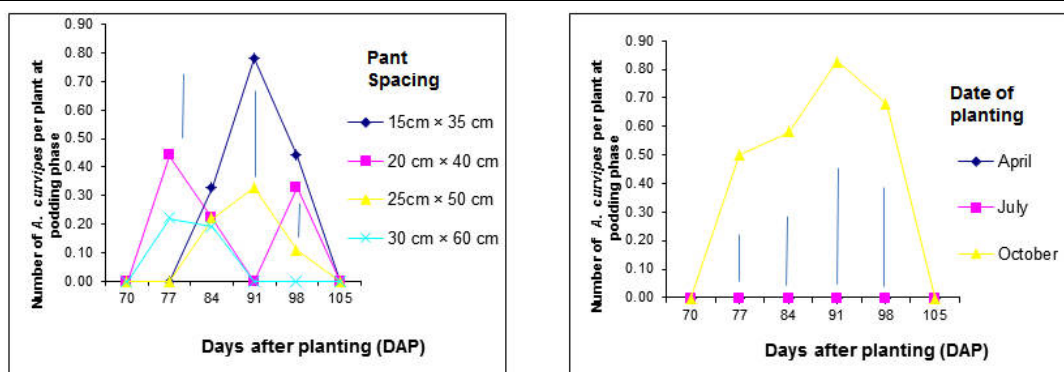


Figure 2 (a): Effect of plant spacing on the number of *A. curvipes* per plant at pigeonpea podding phase during 2010 planting season.

Figure 2 (b): Effect of planting date on the number of *A. curvipes* per plant at pigeonpea podding phase during 2010 planting season.

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