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PEST ALERT: OUTBREAK OF *ANOPLOCNEMIS CURVIPES* IN RSU CITRUS ORCHARD

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ABSTRACT: *The outbreak of a notorious insect pest Anoplocnemis curvipes was observed on citrus orchard in Rivers State University Teaching and Research farm. This piercing and sucking insect ravage fruits, young/succulent stems, delay normal seed formation and cause premature droppings and drying of fruits was observed for the first time in Rivers State University Citrus Orchard. Lambda-cyhalothrin insecticide was applied on the infested trees using a mist blower at a standard dosage to manage the insect pest. A total of 15,795 nymph/adult A. curvipes was counted at the base of five severely infested citrus trees after insecticide application. Due to the severity of the pest attack 100% yield loss was recorded. Therefore, this survey is reporting its damage as a pest alert and also to create awareness of the presence of this notorious polyphagous pest A. curvipes as a potential insect pest in our agro-ecological environment.*

KEYWORDS: *Anoplocnemis curvipes*, citrus orchard, Lambda-cyhalothrin insecticide, damage

INTRODUCTION

Anoplocnemis curvipes is a species of sap-sucking insect in the Family: Coreidea and Order: Hemiptera. The Coreidae are a cosmopolitan family found in all zoogeographic regions but native to Sub-Saharan Africa where they are considered phytophagous insects and major pest of many types of agricultural plants such as trees and shrubs, including legumes. This has earned them the name leaf-wilter (Schabel, 2006).

The pest mechanically caused damage on all parts of the plants particularly the growing succulent region of the shrubs, stems, fruits, flowers etc by piercing and sucking and in the process transmit toxic and infectious diseases (Pathogens) by their bites such as fungi, bacteria and viruses, which cause sometimes wide-spread epidemic (Appert and Deuce, 1988). They also prevent normal seed formation and cause premature drying. *A. curvipes* lay 10-40 dark grey eggs and the eggs hatch between 7-11 days while there five nymphal instars last 30-60 days (NRI, 1996).

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In West Africa, several species of Coreidae (*Anoplocnemis spp., Leptoglossus membranaceus, Homoeocerus pallens, Clavigralla tomentosicollis* STÅL, *Mirperus jaculus* THUNB, *Riptortus sp.*) has been reported by Seri-Kouassi (2004) to attack plants' pods and seeds there by significantly reducing the yield from 10 to 80%. The damage caused by *Pseudotheraptus devastans* (coconut devastating bug) may decrease production between 50 to 80 % in West Africa (Mariau *et al.*, 1981). In America, Dupont and Dennill (1996) estimate the losses due to *Pseudotheraptus wayi* BROWN at about 400, 000 to 600,000 $.

All the reported coreinae species are known to be polyphagous feeding on both food crops and wild plants but *Anoplocnemis curvipes* has the highest number of host plants. Yeboue *et al.* (2015) surveyed over 72 plants in Côte d'Ivoire and found 90% *A. Curvipes* infestation on about 65 of the plants which include *Anacardium occidentalis, Mangifera indica* (Anacardiaceae); *Cocos nucifera, Elaeis guineensis* (Arecaceae); *Ipomoea batatas* (Convolvulaceae); *Cucumus sativus, Cucurbita maxima, Langenaria vulgaris* (Cucurbitaceae); *Hevea brasiliensis, Manihot esculenta* (Euphorbiaceae); *Arachis hypogea, Glycine max, Phaseolus lunatus, Vigna unguiculata* (Fabaceae); *Persea africana* (Lauraceae); *Abelmoschus esculentus, Gossypium barbadense* (Malvaceae); *Musa paradisiaca* (Musaceae); *Psidium guajava* (Myrtaceae); *Passiflora edulis* (Passifloraceae), *Oryza glabberima, Zea mays* (Poaceae); *Coffea arabica* (Rubiaceae); *Citrus limosus, C. maxima, C. sinensis* (Rutaceae); *Lycopersicon esculentum, Solanum nodiflorum, S. melongena* (Solanaceae), *Theobroma cacao* (Sterculiaceae) and *Coffea arabica.*

These insects were more found on Citrus plants, the legumes and Cucurbitaceae. The most affected plants are cowpeas, coconut, cucumber, cassava and Malvaceae. The damage observed are multiple and according to their abundance on these plants. Thus intensity of damage caused by these insects is linked to their number on the field making its management in the field difficult (Abdoul *et al.*, 2014; Tano, 2007).

This notorious insect pest *A. curvipes* has been observed in large numbers ravaging citrus fruits and succulent stems for the first time in Rivers State University Orchard. Thus this paper is reporting its damage as a pest alert and means of management.

MATERIALS AND METHODS

Study Area

The outbreak of *A. curvipes* was observed on citrus orchard (Plate 1a & 1b) located at the Rivers State University Teaching and Research farm. The farm is located at latitude $04^0$8"59"N and longitude $06^0$10"90"E of the equator; the farm lies in the humid tropical zone. The annual rainfall ranges from average of 2000mm to 4500mm, relative humidity in the area is high ranging from

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75-90%, while the monthly temperature ranges from 28ºC and 33ºC (RISADEP, 1995). The orchard is made up of 400 orange trees.

Plate 1a: Citrus orchard

Plate 1b: Citrus plant and fruits severely infested by *A. curvipes*

Survey

Few insects were observed on the citrus orchard by the farm workers during routine farm checkup and were reported to the farm manager. With keen interest on the attack of *A. curvipes*, surveys were made on weekly interval (Plate 2a & b) and the insects were counted on each infested plant and fruit. In four weeks intervals, the number of *A. curvipes* increased drastically to twenty (20) on each fruit (Plate 2 c & d). These *A. curvipes* cause lesion on the surface of the fruit after piercing and sucking the juice of the orange fruit (Plate 2e & 2f). This observation on this high number of growth and multiplication was rare and was taken in serious account.

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Plate 2 a & b: 2nd week infestation of *A. curvipes*

Plate 2 c & d: Fourth week survey with severe infestation of *A. curvipes*

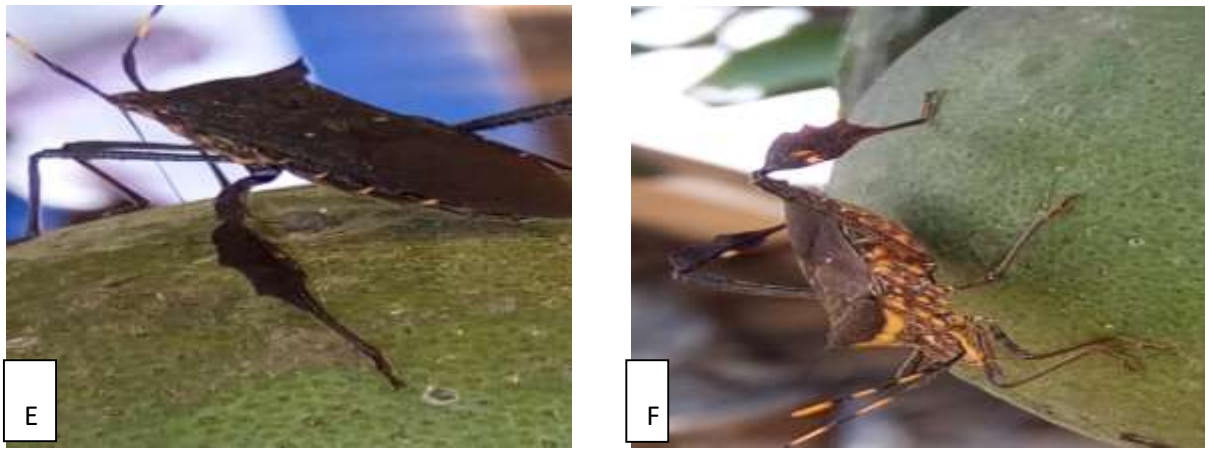

Plate 2e: Sucking of the citrus juice by *A. curvipes* Plate 2f: Lesion on the citrus fruit

Management

Several insect pest management methods have been recorded in the management of *A. curvipes* in other parts of the world, these management practices includes cultural method, host plant suitability and resistance, chemical control (NRI, 1996). Although, chemical management is hazardous to the environment but it is only the recommended measure for this severe level of attack. Lambda-cyhalothrin was applied on the infested trees using a mist blower at a standard dosage of 1ml to a liter of water (Plate 3a). Five citrus trees which were severely infested with the insect were randomly selected for insect count after the application. The insects that were dead were collected and counted at the base of the trees (3b, c & d). Also recorded were the infested premature citrus fruits that fell to the ground (Plate 3e).

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Plate 3a: Researcher applying the insecticide using Mist blower

Plate 3b: Dead *A. curvipes* on the ground

Plate 3c: Nymph/Adult of *A. curvipes*

Plate 3d: Counted *A. curvipes* from five selected citrus trees

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Plate 3e: Infested citrus fruits

RESULTS AND DISCUSSION

The experimental result obtained after four weeks interval, revealed that *A. curvipes* has high fecundity and this is in agreement with the report by NRI in 1996 that *A. curvipes* lay 10-40 eggs and this eggs hatch between 7-11 days. This explains the reason for the drastic increase in population of the insect pest from four per fruit in two weeks to over twenty per fruit in four weeks. The sudden presence of *A. curvipes* in Rivers State may be due to industrialization/urbanization of their habitat, global warming, lack of natural enemies and alteration of the ecosystem through gas flaring, oil spillage etc (Dhaliwal *et al.,* 2013, Sharma, 2010, Dhaliwal and Kukal, 2005). This industrialization/urbanization of their preferred habitat has caused migration of the pest to the only vegetation available which is the RSU farm. Chukunda *et al.,* (2016) has reported several insect visitors to the flowers of *Moringa oleifera* at the same farm. A similar incident of pest outbreak has been reported by Ukoima *et al.* (2016) in RSU arboretum where they observed defoliation of the leaves of *Termnalia ivorensis* (black afara) by the larvae *Epicerura pulverulenta*.

A total of 15,795 nymph/adult *A. curvipes* were counted from five orange trees after insecticide application (Table 1). After piercing and sucking the juice of the orange fruit, these *A. curvipes* cause lesion on the surface of the fruit as shown in Plate 2e and 2f. This result was in conformity with the findings of Yeboue *et al.* (2015) who stated that larvae and adult of *A. curvipes* suck the water of citrus by prickling the leaves, young stem and fruits. The oranges were all bad upon maturity following the feeding lesion on the fruits by the sucking insects which changes the colour of the fruit to pale green and wither. This withered fruit turns brownish black in colour thus reducing the quality and edibility of the fruit. This confirms the report of Yeboue *et al.* (2015) who emphasized that after the attack of *A. curvipes* on young stem and fruit they become black and fall down completely; also the report of Dwomoh *et al.* (2008) who listed *Anoplocnemis curvipes* among the devastating insect pest attacking cashew field in Ghana. It is worthy of note that the experimental result reported severe damage of 100% loss to the farm confirming the findings of Seri-Kouassi (2004) who stated that *A. curvipes* significantly reduce yield from 10 to 80%. This intensity of damage caused by these insects is linked to their number on the field making its management in the field difficult (Abdoul *et al.*, 2014; Tano, 2007).

Table 1: Number of insect caught per orange trees assessed

Orange plant	Nymph/Adult
1	3500[a]
2	3350[a]
3	3055[a]
4	2985[a]
5	2905[a]
Grand Total	**15795**

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The chemical (Lambda-cyhalothrin) used in the management of the insect pest was effective as it killed the nymph and adult *A. curvipes*. The insecticide used is a mixture of isomers and pyrethroid; this chemical disrupts the functioning and nervous system of insects thereby leading to paralysis or death (Metcalf, 2002). Further work will be done on the gut and mouth parts of the insects to check for possible vectors of other transmissible pathogens by the insect as a Hemiptera.

CONCLUSION

This survey assessed the outbreak of notorious polyphagous insect pest *A. curvipes* in Rivers State University Teaching and Research farm in which its damage on the citrus orchard significantly caused yield loss of 100% on the farm. It also revealed that the chemical Lambda-cyhalothrin used in the management was effective and successfully managed the insect pest.

Author Contribution' and 'Acknowledgments
The author acknowledged the Management of the Rivers State University and the Farm staff for the management of the University Teaching and Research farm where the study was carried out.

Compliance with Ethical Standards: The study was self-funded by SON and HN. SON is the manager of the University Research Farm, while HN is the Dean of the Faculty of Agriculture and MD is an assistant research officer. In all, No conflict exists as SON conceived and conducted research and wrote the manuscript. MD analyzed data and wrote manuscript. HN designed research and reviewed the manuscript. All authors read and approved the manuscript.

Ethical approval: No animal was involved or used in the study. Humans were involved in carrying out the insecticide application and records. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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