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The Role of Sylepta Derogata[Lepidoptera: Pyralidae] In The Abscission And Defoliation of Okra Flowers, Seeds And Pods In Monocrop Gardens In Port Harcourt, Nigeria.

[1]Ogbalu, O. K., [2]Bob Manuel, R. B. And [3]Gbarakoro, T.
[1.] Entomology Unit, Department of Applied and Environmental Biology,Rivers State University of Science and Technology, P. M. B. 5080, Port Harcourt, Nigeria.
[2.] Ignatius Ajuru University of Education, Rumuoluemeni, Port Harcourt, Nigeria.
[3.] Department of Animal and Environmental Biology, University of Port Harcourt, Nigeria.

Abstract*:* *Syleptaderogata*, a prominent pest of Okra in the Niger Delta of Nigeria causes both defoliation of Okra leaves and abscission of pods and seeds during the rainy seasons. Okra pods were eaten up by the Pyralid leaving the pods on the soil along with the seeds. Abscission was up to 92.4% under heavy infestation of the rainy season of 2013. The feeding activities of S. derogate affected the viability of okra seeds as 64.5% of okra seeds did not germinate. Data on the effects of their feeding activities on flowers, pods, leaf abscission are presented.
Keywords: *Syleptaderogata*, abscission, defoliation okra pods, seeds, flowers, seed viability.

I. Introduction

Okra is attacked by quite an array of insects prominent among them are*Sylepta derogata*, *Dysdercus superstitiosus*, *Podagrica uniforma* and *P. sjostedti*, others include*Anomis flava*,*Earias biplaga*, *Aphis gossypii*, *A. craccivora* and others.Attacks on okra leaves starts as early as the germination stage by termites [*Macrotermes*spp]and*Podagrica* species that create circular, irregular and spherical holes on okra leaves of all ages apart from punctures they make on pods. *D. superstitiosus*causes punctures on okra fruits especially during the dry seasons in Niger Delta of Nigeria. Some hemipterans including *Acanthocoris*spp, *Leptoglossus australis* infest okra attacking its pods. Reports on the biology of *S. derogata*in the eastern states of Nigeria had been provided [1]. He reported that *S. derogata* is a defoliator but the present work assesses the role of the Pyralid as a defoliator, a leaf roller and itsposition in the abscission of pods, flowers, seeds and leaves of okra. Other authors listed species of okra pests within the tropics and temperate zones [2, 3].The object of this study is to investigate whether the feeding activities of*Sylepta derogata*are associated with the abscission of flowers, leaves and pods of okra.

II. Materials And Methods

Field trials were conducted during the rainy season and of 2013in the Research Farm of the Department of Applied and Environmental Biology of the Rivers State University of Science and Technology, Port Harcourt. We used early-maturing variety of okra;chuku-chuku obtained from the Ministry of Agriculture Port Harcourt was used. The variety is the okra commonly grown and eaten throughout Rivers State and Niger Delta as a whole. Okra seeds were sown on ridges constructed on a sandy loam soil in a landscape of 20.4 by 5 metres with 14 rows at plant spacing of 62 x 48cm. After germination, thinning was allowed to establish only one plant per stand making up to 20 plants per row and there were ten rows per plot. There were ten plots altogether and the soil around each plant was fertilized with 15g of N P K [15: 15 :15] compound fertilizer applied to each plant as a side dressing two weeks after germination [4]. Each plot was screened with a mosquito cotton mesh.

Each plot was replicated four times, and therewas also one unscreened [control] plot for each of the replicated four plots.

A laboratory culture of fifty paired adults of *Sylepta derogata*collected from traditional okra plots within the University campus, were maintained [for rainy seasons cultures]in ten sleeve wooden cages [80x80x50 cm] gauzed with transparent mosquito net on a diet of 20% honey solution [1] absorbed in cotton wools hanged at different angles of the sleeve cages. Also cotton wools absorbed in a diet mixture of dry baker's yeast, sugar and water were hung in the same cage in order to enhance egg production in the moths [4, 5].Ten cotton wool balls absorbed in 20ml of water were hung in each of the ten cages. After 48hours of mating and feeding, twenty paired adults were released into each of the screened ten plots at eight weeks after planting. The control plots were exposed to natural infestation by *S. derogata*.A damage assessment on okra by *S. derogata* was recorded 14 days from the introduction of the moths.We also sampled from four adjoining traditional farms during the rainy of the same year to assess some of the factors already listed above.

Observations commenced 24 hours after the release of the mated adults. Counts and measurements were made of daily eggs laid, number of larvae and number of pupae. Observations also commenced as early as 10 weeks after planting to assess for number of leaves rolled per plant as well as leaf, flower and pod abscissions. Records were taken of the losses of the aforementioned parts. At harvest, dry pods with dry mature seeds which were deseeded and sown for germination tests both in the laboratory and in the field [n=20-50]; depending on the number of seeds per pod]. Records were also made of the number of okra seeds that dropped from the podsand recovery of seeds was made on the soil. Marketable pods were harvested from each of the 30 plants per row/plot every 7 days. Mature green pods that are without blemish were regarded as marketable.

Statistical Analysis. The experimental Design was a Randomized Complete Block Design [RCBD]. Most of the data were analyzed using analysis of variance [ANOVA] and t-test analysis was used at 5% level of significance to establish significant difference in marketable or unmarketable pods.

III. Results And Discussion

Records and data from the present study confirmed*S.derogata* as a defoliator, a leaf roller and a skeletonizer. These roles as well as abscission are caused by the larval stages of S. derogata. They leaf roll prior to pupation and this factor causes a reduction in the photosynthetic sites of the okra leaves.Most punctures they make on okra leaves are of different shapes. Earlier, many workers established that theokra flea beetles [*Podagrica* species] made circular holes on okra leaves, however in a more recent study, Ogbalu and Sigalo [2015] showed that shapes of punctures made on okra leaves by *S. derogata*were ellipsoidal, irregular and spherical punctures. Punctures or feeding punctures made by*Podagrica* species are circular, ellipsoidal and spherical in shapes. Most of the leaf punctures are subjected to wear and tear under heavy winds and they further cause reduction in photosynthetic activities in okra.There was a significant difference between marketable and unmarketable pods; the number of punctures and blemishes on unmarketable was significantly higher than those on marketable pods [t-test,$_{0.95}$].

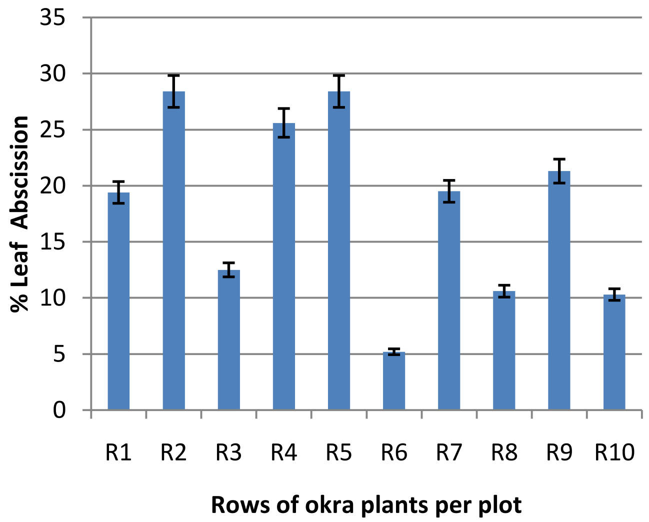
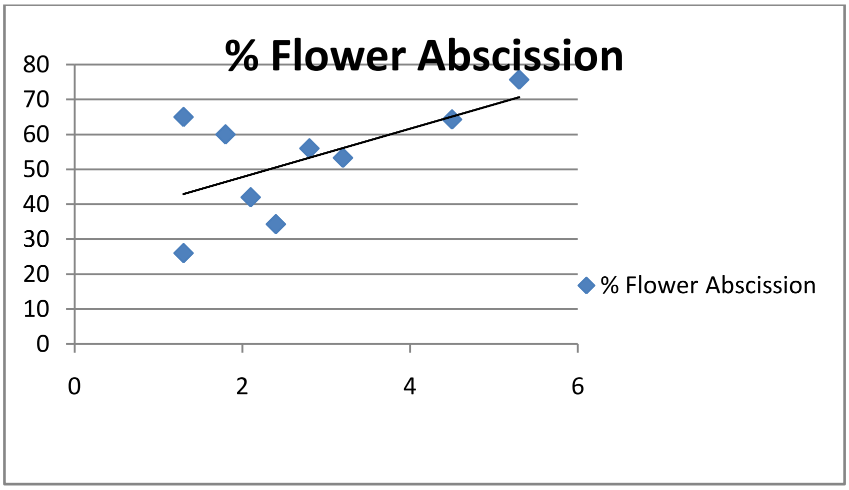


Fig.1. Assessment of Leaf Abscission in okra plots containing Sylepta derogata adults and its developmental stages.



Abscission of okra leaves occurred in all plots [Figs.1-2]. Mean percentage abscission was significantly high in rows 2 and 5 although there was no significant difference in leaf abscission between the aforementioned rows [DMRT; $P < 0.05$]. Apparently,the voracious feeding activities of the Pyralid moth caused abscission since as many as 28-131 larvae of different ages were recovered on plants per row during rainy season. Releases made into okra screened plots caused the gravid females having located suitable oviposition sites on both the abaxial and adaxial sides to deposit their eggs; most females preferred the adaxial sides of the okra leaves to lay their eggs. The gregarious populations of early instars feeding activities caused irregular and ellipsoidal holes on okra leaves and later larval instars initiated total skeletonization of okra leaves so that any slightest force such as wind will aid the already-torn leaves to drop. The older instars are also involved in leaf consumption and in the destruction of leaf veins and petioles. *S. derogata* caused up to 28.4 % abscission of okra leaves in screened plots.The relationship between percentage leaf rolls and number of larvae was shown in Fig. 4, a positive linear relationship that signified larval feeding affected leaf rolling. In the unscreened plots, infestation was unrestricted and other phytophagous pests of okra might have aided leaf abscission due to their added feeding activities. Other destructive pests of okra leaves in the Niger Delta included the okra flea beetles [*Podagrica uniforma* and *P. sjostedti*], *Aspidomorpha* species [tortoise beetles], *Aphis gossypii*, *A.craccivora* and *Anomis flava* apart from *D. superstitiosus*, the cotton stainer that cause blemishes on okra pods along with its multi-coloured nymphs especially during the dry seasons.

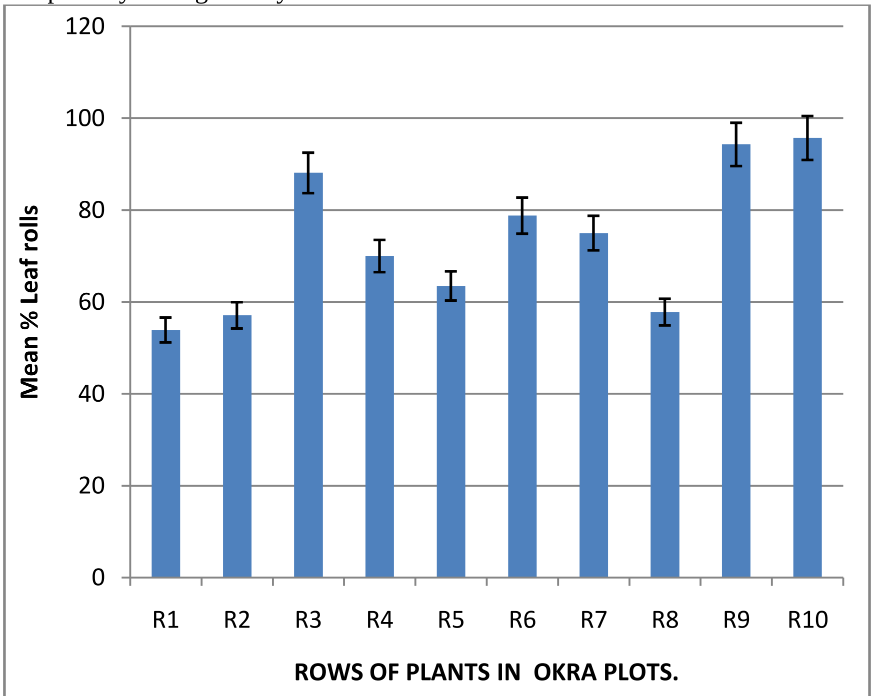


Fig. 2. Assessment of leaf rolls in screened okra plots with *S. derogata*.

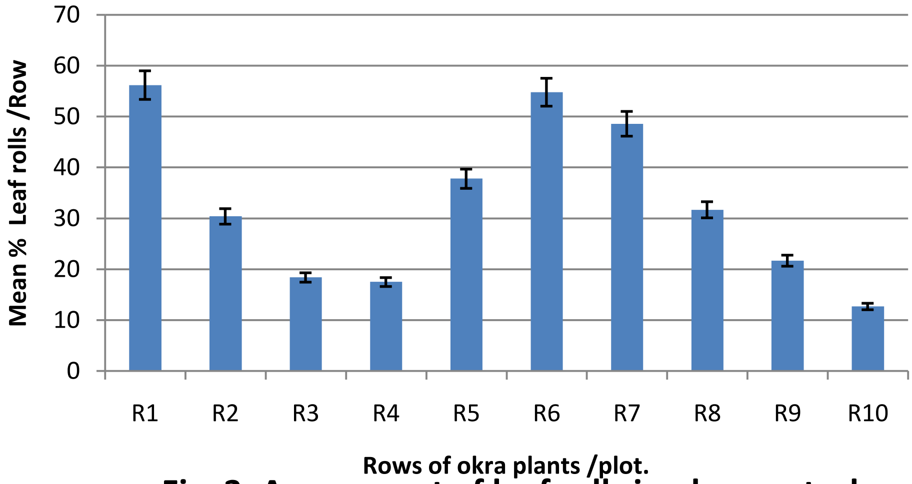


Fig. 3. Assessment of leaf rolls in okra control plot.

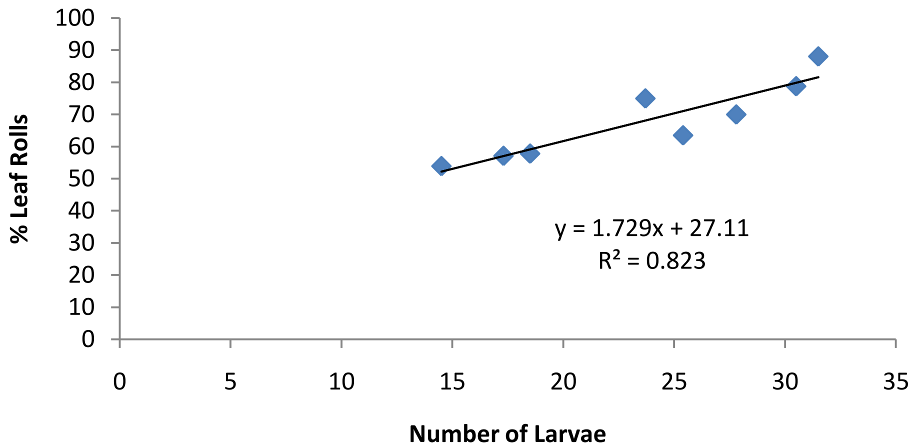


Fig. 4. Relationship between percentage leaf rolls and Number of Larvae on okra plants.

Leaf rolling occurred in control plots indicating the abundance of *S. derogata*populations within the environment where trials were carried out. Farmers grow okra plants along with other crops like maize, pepper, tomatoes, yamsand other vegetables for consumption. Many okra plantations were available around the trial plots. It was not therefore surprising as leaf rolls in the adjoining farmers' plots were equally high. In some cases in those adjoining farms, leaf rolls and leaf abscission were high; they grew their okra with chicken droppings and other farm yard manure that attracted the phytophagous pests including grasshoppers, *Zonocerus variegatus*. Earlier reports [6] maintained that most vegetables grown with chicken manure attracted insect pests. In the screened plots, the pyralids kept mating and ovipositing for the period that thetrials lasted. The last instar larvae[5th or 6th instars] have the imprint behavior of leaf- rolling in order to conceal and protect themselves from predator, hot climate and extreme weather conditions prior to pupation In flower abscission, other pests such as thrips were collected. It appeared they also contributed toabscission in okra flowers. We collected up to 8-14 flower thrips per okra inflorescence identified as *Megalurothrips sjostedti*, *Haplothrips gowdeyi* and *M. ventralis*. Other authors identified more thrips in vegetables grown in the eastern states of Nigeria [7].

Aging tissues (especially senescing leaves) and nodes of stems produce ethylene. The best known effect of the hormone, however, is the promotion of fruit ripening. Ethylene stimulates the conversion of starch and acids to sugars [8]. Some people store unripe fruits, such as avocados, pawpaw, mangoes, banana and oranges in a sealed paper bag to accelerate ripening; the gas released by the first fruit to mature will speed up the maturation of the remaining fruit. Elucidating the mechanisms involved in ripening of climacteric fruit and the role that ethylene plays in the process are key to understanding fruit production and quality [9]. Ethylene also triggers leaf and fruit abscission, flower fading and dropping, and promotes germination in some cereals and sprouting. Apart from the role of ethylene in the abscission of both leaves and pods, the positive role of the feeding activities of S. derogata cannot be over emphasized. They feed on the basal portions of the okra pods causing dislodgements of tissues and regional porosity presenting a tendency to abscission. The feeding activities of other insects may also account for defoliation and abscission [e.g.*Earias*spp, *Zonocerus variegatus*] but this study examined the role of the feeding impact of *S. derogata* and that was the reason for carrying out the study in a gauzed environment. A strong correlation exists between number of larvae and number of fruits abscised [r = 0.92]. Also a high correlation exists between number of larvae and percentage of leaves rolled [r = 0.82]. Leaf rolling is usually higher in okra plantations grown near gas-flared stations in the Niger Deltaas early instar larvae protect themselves from external heat as gas flares[10] and in farms of okra grown during the dry seasons.Under heavy infestation by *S.derogata* at rainy seasons, all the aforementioned parameters of abscission of leaves and pods, defoliation of leaves, leaf rolling and skeletonization of leaf areas [are factors that cause reduction in photosynthetic activities]. Also the oviposition patterns of females*S. derogata*on okra leaves reduced photosynthetic activities as the deposited eggs cover a reasonable area of the leaf. On the effect of the larval feeding activities on seeds; 64.5% of the seeds lost their viability and could not germinate[n=200]. Under heavy infestation, larvae resort to feedingon tender fresh pods in the absence of leaves which had been defoliated by early instars. Other authors [11, 12, 13, 14,15]reported on other types of pests on okra and damage.

IV. Conclusion

It is concluded that although *S. derogata* may not be the only pest that causes defoliation on okra plants, however its feeding affect germination of seeds, causes defoliation, abscission of leaves and pods. Its presence on okra leaves even as early as after germination affects photosynthetic activities of the plant. The feeding activities affect the reproductive potentials of the seeds as most seeds they fed on lost their viability.Farmers should endeavor to plant okra early in the seasons and harvest early prior to the periods of high temperatures and when *S. derogata* populations may be high.

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