



**EVALUATION OF IMIDACLOPRID (210 G/KG) + BETA-CYFLUTHRIN (90 G/KG)
AGAINST TWO KEY INSECT PESTS OF WET AND DRY SEASONS EGGPLANT
(*SOLANUM MELONGENA* L.) AT TUDUN GANGAMA, YOBE STATE**

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ABSTRACT

A field study was carried out during the 2018 and 2019, wet and dry seasons, respectively, at Tudun Gangama in Bursari Local Government Area of Yobe State, Nigeria. The aim was for the reduction of infestation by the shoot and fruit borer - *Leucinodes orbonalis* Guéne, and *Thrips* spp. on sweet white and bitter green eggplant cultivars using a multi-purpose synthetic insecticide containing a mixture of Imidacloprid (210 g/kg) and Beta-cyfluthrin (90 g/kg) [30% WP], with a Pre-harvest Interval of 15 days. From the results, the pre-treatment counts of both the borer and *Thrips* spp., were statistically similar with and without insecticide application and as well as that between the two different eggplant cultivars under wet and dry season productions. Although there were significantly lower mean number of each of these two insect pests of eggplant between the treated and untreated plots at all days after spray applications during both wet and dry season productions. However, such mean number of the borer and *Thrips* between the two eggplant cultivars were statistically similar to each other under the two different seasons. Irrespective of the season, eggplant fruits production was significantly higher with three sprays of the Imidacloprid 210g/kg + Beta-cyfluthrin 90 g/kg than the untreated. Thus, an appreciable level of protection of eggplant against the shoot/fruit borer and *Thrips* spp., with an accompanying increase in productivity could be achieved with a minimum of three spray of the treatment combination at the study area.

Keywords: Eggplant, *Leucinodes orbonalis*, *Thrips* spp., Imidacloprid and Beta-cyfluthrin.

INTRODUCTION

Eggplant, *Solanum* species, which is also popularly known as garden egg, belongs to the family: Solanaceae. The cultivated eggplant remains a very popular vegetable crop worldwide, especially in Asia and Africa (Collonnier, *et al.*, 2001). Nutritionally, eggplant fruit is rich in essential nutrients as it is composed of 92% water, 6% carbohydrate, 1% protein and negligible fat (San Jose, *et al.*, 2014). Countries known to have high production capacity of the crop are China, India, Egypt, Turkey, Algeria, Iran, Indonesia (FAOSTAT, 2018). In Nigeria, the higher yield and longer fruiting period were observed to have attracted many local farmers to eggplant production (Folorunso, *et al.*, 2020). However, the production of the crop is severely constrained by several insect and mite pests attack and the major pests include eggplant fruit fly, shoot and fruit borer, leafhopper, whitefly, thrips, aphid, spotted beetles, leaf roller, stem borer, blister beetle, red spider mite, and little leaf disease. (Gapud and Canapi, 1994; Orden, *et al.*, 1994; Fairuz, *et al.*, 2026). A similar report was made in Nigeria where insect pest infestation has become a major threat to the cultivation of the crop (Ghimire and Khatiwada, 2001), a factor that has resulted in a considerable reduction and low fruit yield of eggplant across the country.

Among other insect pests, the shoot and fruit borer (*Leucinodes orbonalis* Guéne) remains one of the most destructive insects attacking eggplants in Nigeria (Olaniran, *et al.*, 2016), with an estimated yield loss varying from one region to another. The larvae of this insect pest bore into the tender shoots of seedling and other plants which inadvertently leads to wiping and death of the tips (Olaniran, *et al.*, 2016; Fairuz *et al.*, 2026), while *Thrips* spp., affect the flowers and the fruits of the eggplant, resulting largely due to its anthocyanin content, the smooth surface of the leaves and fruit and the aroma that is attractive to this pest, causing losses to farmers and reducing yields by up to 23%. At present, rural growers mostly rely on the use of different types of synthetic insecticides that are available to manage



the adverse effect of the activities of these two key pests on eggplant. Thereby leading to an increasing amount of pesticide sprays in the cultivation of eggplant due to an increasing damage by arthropod pests (Alam *et al.*, 2003). Nonetheless, such wanton usage of the pesticides was reported to have raised many problems such as increased resistance, resurgence of pests, detection of residues above safe level, and environmental hazards (Chawla, *et al.*, 2018). Consequently, there is a need for an investigation in to the use of some new pesticide combinations that could help in decreasing environmental load, so that there could be a substantial delay in the development of resistance to these chemicals in pests.

Along this line, Acharya *et al.* (2002) studied the efficacy of some new insecticide combinations, such as imidacloprid/abamectin and reported the new molecules evaluated were safer to lady bird beetles. Giraddi *et al.* (2017) added that, one major advantage of combi insecticides is that they result in reduced number of insecticide application, since they target more than one type of insect pest at a given time. In recent years, the use of combi insecticides has been on the increase and the products with neonicotinoid and pyrethroid have become very popular in pest management (Giraddi, *et al.*, 2017), as these products successfully target different groups of insects, resulting in optimum control of insect populations due to their varied mode of action. For instance, imidacloprid (neonicotinoid) and beta-cyfluthrin (pyrethroid) have been reported to be among the most commonly used insecticides (Agrofit, 2022), with a key benefit that includes versatile pest control, reduced treatment frequency, resistance management and improved crop protection.

Keeping this in view, the present investigation was designed to evaluate the potential of minimum sprays of a single multi-purpose synthetic insecticide consisting of Imidacloprid (210 g/kg) and Beta-cyfluthrin (90 g/kg) in reducing infestation by shoot/fruit borer and *Thrips* spp. in wet and dry seasons eggplant at the study location.

MATERIALS AND METHODS

The field experiment was conducted during the wet and dry seasons of 2018 and 2019, respectively, at Tudun Gangama in Bursari Local government area of Yobe State. The geographical location of the research farm was read as 12. 87649⁰N and 11. 031582 ⁰E of Latitude and Longitude, respectively.

Treatments and Experimental Design

The treatment consisted of two different synthetic insecticides treatment combination [Imidacloprid (22 g/kg) + Beta-cyfluthrin (90 g/kg)] 30% WP, which has a Pre-harvest Interval of 15 days was obtained from the Yobe State Agricultural Development Programme (YOSADP), while the sweet white (SW) and bitter green (BG) eggplant cultivars were obtained from the North East Arid Zone Development Programme (NEAZDP). These treatments were combined and laid out in a Split-plot design, with each treatment replicated three times. With and without insecticide application was placed in the main plot, while the SW and BG eggplant cultivars occupied the sub-plots.

The synthetic insecticide was first sprayed on the eggplant crop soon after initiation of flowers, then with an interval of fourteen days a second and third sprays were applied as described Saimandir and Gopal (2009) and Agrofit (2022). All the three sprays of the synthetic chemical were only applied to the treated plots of each of the two eggplant cultivars during both wet and dry season productions at the study location. Additionally, all recommended package of agronomic practices that involved land preparation, nurse practices, weed control and fertilization application were followed to raise a good and healthy crop (Suganthi and Sakthivel, 2013).

Data Collection and Analysis

Data collection commenced at two (2) weeks after transplanting, with a pre-treatment count (PTC) on the population of the two different pests made before spraying and thereafter, treatment counts made at 1, 3, 5, 7 and 14 days after insecticide spraying as described by Suganthi and Sakthivel (2013). Sampling for the shoot and fruit borer was done twice throughout each of the two different seasons, carried out a day before the 2nd and 3rd spray application, by randomly selecting and uprooting three eggplants from each of the treated and untreated plots. These were then taken to the laboratory for dissection and infestation and/or damage of the borer recorded. The population of the *Thrips* spp., was assessed by the sampling of six (6) flowers at random from 3 tagged plants in each of the treated and



untreated plots, then placed in a bottle containing 50% ethanol and taken to the laboratory where adult and nymphs were counted under a microscope.

Data collected for the two different insect pests and seasons were subjected to analysis of variance (ANOVA), using GENSTAT Discovery Statistical package (17th Edition) and differences between significant treatment means were separated using Student Newman Keuls (SNK) test at 5% level of probability.

RESULTS AND DISCUSSION

The results as presented in Table 1 revealed that, the fruit shoot borer was among the most prevalent insect pests observed attacking both the sweet white (SW) and bitter green (BG) eggplant cultivars during both wet and dry season productions at the study location. Several workers have stated that the shoot and fruit borer has remained a major constraint to the production of eggplant all over the world (Dhankar, 1988). Pre-treatment Count (PTC) of the shoot and fruit borer larvae ranged from 12 to 15/plot (Table 1), with a non-significant difference observed between the Imidacloprid 210g/kg + Beta-cyfluthrin 90 g/kg treated and untreated eggplant plots during both wet and dry seasons. However, a significantly lower number of the shoot and fruit borer was recorded in the insecticide treated plots than that of the untreated, at all days after spray application (Table 1). With and without insecticide treatment, the mean number of the shoot and fruit borer recorded increased gradually from first to the fourteenth day after spray application under each of the two different seasons (Suganthi and Sakthivel, 2013), a situation that indicates a probable gradual reduction in the potency of mixed formulation against the shoot and fruit borer from the first to the fourteenth day after spray application. Similarly, a bio-efficacy study using combination of β -cyfluthrin and imidacloprid has been found effective for the control of *Amrasca biguttla* and *Leucinales orbonali* (Bhargava *et al.*, 2003).

Further from the result, infestation by the shoot and fruit borer was not significantly influenced by any of the two different eggplant cultivars at all days after treatment application during both wet and dry season productions (Table 1). Elsewhere, a relative to intermediate resistance and susceptible responses were observed in some eggplant varieties towards the population of jassids (Ali *et al.*, 2014). Similarly, a recent screening of eggplant varieties for pest load revealed significant differences in their susceptibility to various insect pests (Ogbinaka, *et al.*, 2025).

Table 1: Mean Number of Fruit Shoot Borer on Two Eggplant Cultivars, during 2018 Wet and 2019 Dry Seasons, with and without Insecticide Application at Tudun Gangama

Treatments	Number of shoot and fruit borer/three eggplants/plot				
	PTC	1 DAT	3 DAT	7 DAT	14 DAT
Wet season					
Control					
-Treated	15.5	3.11 ^a	4.90 ^a	6.80 ^a	9.90 ^a
-Untreated	14.8	17.56 ^b	20.20 ^b	22.30 ^b	25.40 ^b
L.S.	ns	**	**	**	*
LSD ($P<0.05$)	-	2.28	3.22	5.34	7.59
Cultivars					
-Sweet White	15.0	10.44	12.6	14.4	17.8
-Bitter Green	14.6	10.22	12.5	14.7	17.5
L.S.	ns	ns	ns	ns	ns
LSD ($P<0.05$)	-	-	-	-	-
Dry season					
Control					
-Treated	12.80	0.61 ^a	2.40 ^a	4.90 ^a	8.70 ^a
-Untreated	12.90	16.39 ^b	19.90 ^b	23.00 ^b	25.90 ^b
L.S.	Ns	**	**	**	**
LSD ($P<0.05$)	-	3.32	1.21	1.06	8.29
Cultivars					
-Sweet White	13.30	8.78	11.50	14.70	17.60
-Bitter Green	12.90	8.22	10.80	13.20	16.10
L.S.	ns	ns	ns	ns	ns
LSD ($P<0.05$)	-	-	-	-	-

Means in a column within a subset followed by same letters are not significantly different from each other using LSD at 5% level of probability. PTC = Pre-treatment count, DAT = Days after treatment, L.S. = Level of significance, LSD = Least Significant Difference and ns = Not significant.

As presented by other related investigations, *Thrips* spp. remains among the number of the very serious arthropod pests attacking a number of arable crops, amongst which are eggplant and other related crops (Seal *et al.*, 2006; Fairuz *et al.*, 2026), as observed in this study with the prevalence and infestation of eggplants by *Thrips* spp. during both wet and dry season productions at the study area. Pre-treatment count of the *Thrips* spp. ranged from 16.0 to 28.2/plot (Table 2), with a non-significant difference observed between the Imidacloprid 210 g/kg + Beta-cyfluthrin 90g/kg treated and untreated eggplant plots under the wet and dry season productions. Comparatively, there was a significant reduction in the population of *Thrips* spp. in the insecticide treated eggplants, with higher mean number of infestations recorded in the untreated plots at all days after spray application under each of the two different seasons. With and without insecticide treatment, the mean number of *Thrips* spp. recorded in the eggplant increased gradually from the first to the fourteenth day after spray application under each of the two different seasons as reported by Suganthi and Sakthivel (2013). Similar to the findings of this investigation, previous study has showed the effectiveness of imidacloprid against thrips in onion (Srinivas *et al.*, 2012) and as well as thrips and lace bugs in avocado (Byrne *et al.*, 2010). That aside, there was a non-significant difference in infestation by *Thrips* spp. between the SW and BG eggplant cultivars at all days after spray application during both wet and dry season cultivations (Table 2). In a contrasting study, a significant difference in pest load was observed between different eggplant varieties (Ogbinaka, *et al.*, 2025).

Table 2: Infestation by *Thrips* spp. on Two Eggplant Cultivars, during 2018 Wet and 2019 Dry seasons, with and without Insecticide Application at Tudun Gangama

Treatments	Number of <i>Thrips</i> spp./six flowers/plot				
	PTC	1 DAT	3 DAT	7 DAT	14 DAT
Wet season					
Control					
-Treated	28.20	3.67 ^a	5.11 ^a	7.72 ^a	12.67 ^a
-Untreated	26.40	28.56 ^b	30.44 ^b	33.00 ^b	36.78 ^b
L.S.	ns	**	***	***	***
LSD ($P<0.05$)	-	17.17	18.48	20.69	24.08
Cultivars					
-Sweet White	27.80	17.39	19.28	22.06	26.22
-Bitter Green	26.80	14.83	16.28	18.67	22.22
L.S.	ns	ns	ns	ns	ns
LSD ($P<0.05$)	-	-	-	-	-
Dry season					
Control					
-Treated	17.22	0.56 ^a	2.56 ^a	4.83 ^a	8.20 ^a
-Untreated	16.83	20.44 ^b	24.22 ^b	27.11 ^b	31.30 ^b
L.S.	Ns	**	***	***	**
LSD ($P<0.05$)	-	10.35	8.90	9.19	11.40
Cultivars					
-Sweet White	17.67	10.83	13.56	15.89	19.60
-Bitter Green	16.00	10.17	13.22	16.06	20.00
L.S.	ns	ns	ns	ns	ns
LSD ($P<0.05$)	-	-	-	-	-

Means in a column within a subset followed by same letters are not significantly different from each other using LSD at 5% level of probability. PTC = Pre-treatment count, DAT = Days after treatment, L.S. = Level of significance, LSD = Least Significant Difference and ns = Not significant.

Overall, the three sprays of Imidacloprid 210g/kg + Beta-cyfluthrin 90g/kg effectively reduced the mean population of the shoot and fruit borer and that of the *Thrips* infesting the two different eggplant cultivars, during both wet and dry season productions at the study area (Table 2). Much earlier, a superior bio-efficacy of neonicotinoid + pyrethroid combi product against crop pests has been reported by several workers (Jeyarani and Chandrashekar, 2006; Paramasivam *et al.*, 2017). Similarly, an effective control of bollworms of cotton using combi insecticides been observed by Supram *et al.* (2014).

As presented in Table 3, production of fruits by the SW and BG eggplants cultivars were significantly higher with the application of the synthetic insecticide treatment combination, during both wet and dry seasons. Thus, clearly indicating that the protection of wet and dry seasons eggplant against infestation and subsequent damage by the shoot and fruit borer and as well as *Thrips* spp. has become very imperative at the study area. However, irrespective of the season, the two different eggplant cultivars were statistically similar to each other in the production of fruits (Table 3).

In a study by Abati *et al.* (2023), products containing imidacloprid + beta-cyfluthrin, left a residue for approximately 10 days in canola cultures in the field. Indicating the relative safety of the harvested fruits, although these residual times may change due to adverse weather conditions, such as rainfall, higher or lower incidence of UV radiation, among others. Thus, emphasizing the need for strict adherence to the recommended pre-harvest interval period of this mixed formulation.



Table 3: Mean Number of Fruits Produced by Two Eggplant Cultivars during 2018 Wet and 2019 Dry seasons, with and without Insecticide Application at Tudun Gangama District

Treatments	Wet season	Dry season
Control		
-Treated	27.60 ^a	23.67 ^a
-Untreated	1.50 ^b	1.22 ^b
L.S.	**	**
LSD ($P<0.05$)	6.93	7.29
Cultivars		
-Sweet White	14.90	11.67
-Bitter Green	14.20	13.22
L.S.	ns	ns
LSD ($P<0.05$)	-	-

Means in a column within a subset followed by same letters are not significantly different from each other using LSD at 5% level of probability. L.S. = Level of significance, LSD = Least Significant Difference and ns = Not significant.

CONCLUSION AND RECOMMENDATION

The investigation clearly showed the prevalence of the shoot and fruit borer and the *Thrips* spp., along with their infestation on the SW and BG eggplants cultivars under both wet and dry season productions at the study area. Where the application of three sprays of the synthetic insecticide effectively brought about sharp decline in the mean number of each of these two different insect pests on the eggplant cultivars. Higher yields of both the SW and BG eggplant cultivars were also recorded under each of the two different seasons from same treatment because of better management of both devastating insect pests at the study area and is therefore recommended.

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