Global Scientific JOURNALS

GSJ: Volume 14, Issue 3, March 2026, Online: ISSN 2320-9186

www.globalscientificjournal.com

CONTROL OF LEAF ROLLER (*Sylepta derogata*) IN COTTON USING MORINGA SEED OIL IN HONG LOCAL GOVERNMENT AREA, ADAMAWA STATE, NIGERIA

[1]TOROMA LAWRENCE, [2]DANIEL KEVIN WAMDUDA, [1]JEREMIAH TIZHE SAMAILA AND [1]AHMED USMAN

[1] Department of Agricultural Education, Adamawa State College of Education, Hong

[2] Department of Early Childhood Education, School of PED, ECCE, Adamawa State College of Education, Hong

Corresponding Author:

Lawrence Toroma

Email: toromalawrence@gmail.com

Phone: +2348138779790

ABSTRACT

The study was carried out on Control of Leaf Roller (*Sylepta derogata*) in Cotton using Moringa Seed oil in Hong, Adamawa State of Nigeria in 2025 Cropping Season. The objectives were to assess the effect of Moringa seed oil on number of leaves damaged, boll damaged and percentage reduction on different cotton varieties and cultivar on sprayed and unsprayed cotton plants. The research was carried out on split plot design with fifteen (15) treatments replicated three (3) times. The main plots were the different treatments while the sub plots were the five (5) varieties and cultivar of cotton (SAMCOT 8, 9, 10, 11 and EX Ngurore). Data were collected on growth, damaged leaves and bolls, yield and percentage reduction in yield and were taken and subjected to analysis of variance (ANOVA) using SAS software and means were separated using Students Newman- Keuls (NSK) test for variables of 0.05. level of significance. The number of leaves damaged was high on untreated plants at 12 WAS (20.17) and low on treated plots with Sherpa plus and Moringa Seed oil (2.45 and 10.51) respectively. Cotton bolls infested were high on

untreated plots (2.13) and less on Moringa seed oil (0.78) and Sherpa plus (0.67) treated plots per plants. The yields obtained in each variety and cultivar showed that, SAMCOT 9 had the highest yield (1445.3kg/ha) followed by SAMCOT 8 (1160.1kg/ha), SAMCOT 10 (910.9kg/ha), EX Ngurore (864 6kg/ha) and least SAMCOT 11 (125.0kg/ha). The percentage reduction in yields showed that SAMCOT 11 had the lower percentage reduction in yield compared with other varieties and cultivar and the highest was SAMCOT 10 on untreated plants. The percentage reduction in Moringa seed oil treated plants, showed that SAMCOT 11 (5.26%) displayed low reduction and the highest yield reduction was SAMCOT 9 (26.26%). The results showed that Moringa seed oil treated plots has less percentage reduction in yield than untreated plots. Therefore, it is recommended that use of insecticides can be replaced with Moringa seed oil as insect pests control since it compete favorably in suppressing the leaf roller on cotton varieties and cultivar and also environmentally friendly.

Keywords: Control, Leaf Roller, Cotton, Moringa and Seed Oil

1.0 INTRODUCTION

Cotton (*Gossypium* spp.) belongs to the family Malvaceae and is a plant crop which produces a fruit or a green capsule known as boll and is one of the most important fiber crops commercially grown worldwide used as textile materials, oil cake and edible oil. It is the main and the most important raw material for textile industries Worldwide that enters into the daily life of the world's population more than any other fiber sources (Majeed *et al.*, 2021). Cotton is cultivated in a total land area of about 36 million hectares in over 100 countries which account for 117 million bales of lint and it is estimated to increase by 18.4million bales or 16% above 2023 reported (GCO, 2024). According to USDA-WAP,(2024), India, China, 2USA,Pakistan and Brazil accounts for 77% of the world cotton production. In Nigeria's cotton production volume for the year 2023/2024 was 350000480 Ib bales cultivated under 270000 hectares and Adamawa and Yobe States produces 12% and 3% respectively of the total volume (USDA-FAS, 2024). Cotton is adapted to most ecological zones and is being cultivated in the northern zone (Kano, Zamfara, Katsina, Sokoto, Kebbi States) and North eastern zone (Borno, Adamawa, Bauchi, Taraba, Gombe, Yobe states) and some parts of the other zone (Kwara, Niger, Oyo, Benue, Ondo, and Edo states).

USDA (2025), statistic shows that the total amount of cotton produced World wide in 2016 amounted to 120million bales. Cotton plays an important role in the economic and social affairs of the world, employing about 69 million people in its cultivation, trade or processing (Dunuwel *et al.*, 2024). India is the only country in the world where all the four cultivated species of cotton, namely; *Gossypium arboretum, G. hirsitum, G. herbaceum*, and G. *barbadenses* along with intra-and inter-specific hybrids are cultivated along diverse agro climatic

conditions. The Asiatic or diploid cottons, *G. arboretum* and *G. barbadenses* (Egyptian cotton) were introduced in India by the East India companies during the nineteenth century (Rajendran and Jain, 2004). Cotton fiber has exercised a profound influence on humans from time immemorial. With a history going back to antiquity, the fiber has maintained its pristine purity and importance to this day. In Indian cotton crop has had the prides of place among cash crops from the earliest time. It finds mention in the Rig-veda, the oldest scripture of Hindus. Cotton fabrics were found in the Mohen-jo-daro relics the ancient Indus valley civilizations which flourished in Indian about five thousand years ago (Malgwi, 2007).

Cotton production worldwide has been constrained by the prevalence of pests (insects) and diseases which affects the yield and fiber quality (Malgwi, 2007). Dunuwel *et al.,* (2024) and Shehu *et al.,* (2024) reported that, yield losses have been recorded to be generally between 10 and 30% and may reach 50% or more in Africa or Asia. Important insect pests of cotton include; leaf roller, boll worms, bollweevils jassids, cotton stainers, while diseases of cotton include; bacteria blight, leaf spot, wilt and leaf curl (Malgwi, 2011). The attempt by the researchers to improve crop yield in the face of the increasing population is a decision in the right direction although, it is being hampered by many limitations. The most important and interesting problem encountered by researchers is how to drastically reduced or wholly prevent the insect pests, especially the cotton leaf roller, *S. derogata* (F.).

The Leaf roller, (S. *derogata*) is widely distributed insect pest in the Orient and Africa. In India, it occurs in all the cotton growing tracks and is an important sporadic pest in the north zone and beside cotton it has been recorded on various other Malvaceous plants including okra and jute (Atwal and Dhaliwal, 2001*).* The Leaf roller *(S. derogata (F.)* rolls cotton leaves into conical structures and feeds on the edges of the rolled leaf, resulting to serious defoliation. The larvae use silk to stabilize their leaf cones and to balloon to other leaves and high pest populations significantly decrease cotton production (Di *et al*., 2007). This insect has received very little attention world wide and not much work has been done on it in Nigeria. Although, damage caused by *S. derogata* is very visible. To increase cotton lint yields by suppressing S. derogata infestation on cotton using Moringa seed oil. Therefore, the objectives of the research were;

i. to determine the effect of Moringa seed oil on the leaves damaged on cotton by the cotton leaf roller, *S. derogata*, and.,

ii. to determine the effect of Moringa seed oil on percentage reduction in lint yield of cotton caused by *S. derogata*.

MATERIALS AND METHODS

2.1 Experimental Site

The experiment was conducted in Adamawa State College of Education, Hong Department of Agricultural Education Research Farm, Adamawa State, Nigeria. Hong is located in Central part of Adamawa State, it lies between latitude7^{o}-11^{o}N and longitude 11^{o}-14^{o}E

2.2 Planting Materials (Seed) Varieties and Source.

Five varieties of cottons were sown. The four improved varieties were obtained from the Institute for Agricultural Research (IAR) Ahmadu Bello University (ABU), Samaru, Zaria as described by Malgwi (2007) that is SAMCOT 8, SAMCOT 9, SAMCOT 10and SAMCOT 11and one local cultivar was obtained at AFCOTT Processing unit at Ngurore, Yola South Local Government Area, Adamawa State. The improved varieties and local cultivar include;

SAMCOT- 8: This is a medium staple variety belonging to *G. hirsutum* which has maturing period of 120-130 days and potentials yield of 1500-2000kg/ha

SAMCOT- 9: A recommended medium stable variety of *G. hirsitum* which mature at 120 days and has potential yield of 2500-3000kg/ha

SAMCOT-10: This is a medium stable variety belonging to *G. hirsitum* that mature at 120 days and the potentials yield ranging from 2500-3000kg/ha

SAMCOT- 11: Developed at IAR, Samaru, introduced from Sudan. This is a long stable variety of cotton and it is a long duration cotton.

EX-Ngurore A cultivar cultivated in central and southern part of Adamawa State with an average yield of 1500-2000kg/ha.

2.3 Cultural Practices

The selected fields were ploughed with tractor after clearing of plant debris when the rainfall was established in May/June. The essence of ploughing was to destroy the weeds and break down the soil clods for proper aeration and ease percolation of moisture/water in the soil. The fields were later be made into ridges to create suitable beds as plots for proper and adequate

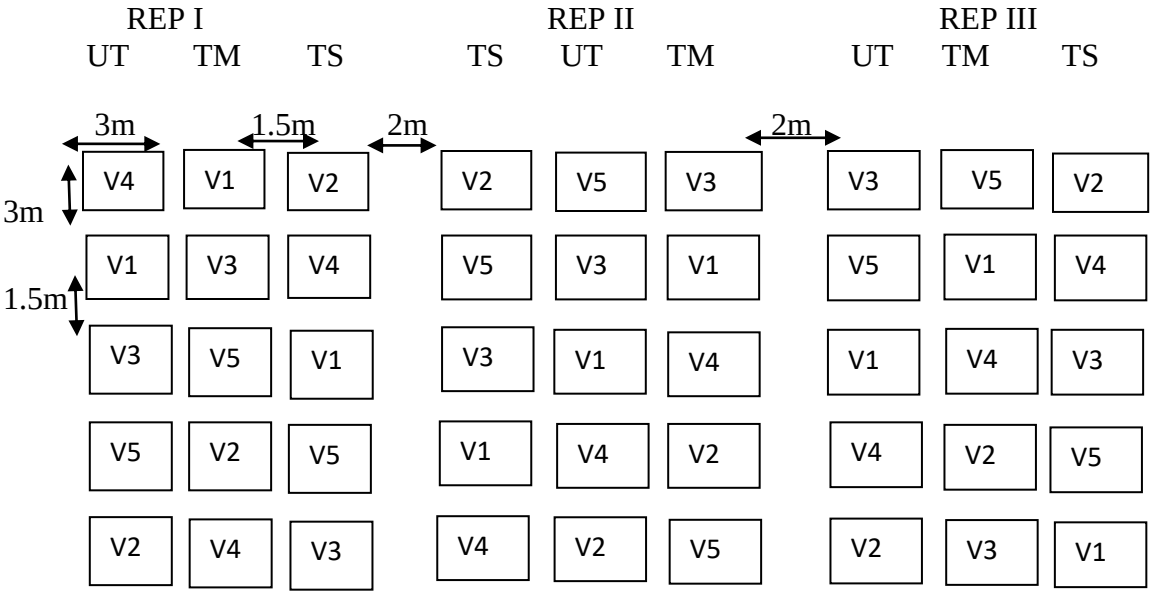
germination and deep extension of roots. The fields were then marked out and demarcated into plots measuring 3x3m using measuring tape, rope and pegs.

As recommended by Institute for Agricultural Research (IAR), cotton seeds were dressed with Bronocot at the rate of 12kg of cotton seed or mixture of Bronocot and Apron Star 50Ds (10% + carboxine 6% + furathiocarb 34%) at 2.5 + 5.0g for 1kg of cotton seed before planting in order to ensure good germination and protect against soil borne and seed borne pests and other predators.

The seeds were sown as soon as the rainfall established which was15^{h} of July, 2025 in Hong research farm. The seeds were sown at rate of 4-5 per hole to ensure 100% establishment. The intra- row spacing was 50cm while inter- row spacing was 75cm and the sowing depth was 2.5-3cm. Weeding was carried out using hoe and was done thrice at 4th, 8th and 12th weeks after sowing and regular hand pulling was done to keep the farm clean and also prevent excessive competition for space. Early weeding is extremely important in cotton as weeds reduces yield by 50% (Jakusko, 2017). Fertilizer containing Nitrogen, Phosphorus and Potassium (NPK) was applied twice at 4 WAS and 8WAS at the rate of 60kgha^{-1}, 30kgha^{-1} and 30kgha^{-1} respectively and was applied in furrows 10cm away from plants and was covered with soil immediately as recommended (Suleiman and Ahmad, 2022).

2.4 Treatments and Experimental Design.

The experimental design used was split plot with fifteen treatments replicated three times as shown in figure1. The main plots were the different treatments which were; untreated plots, Moringa seed oil treated plots and Sherpa Plus treated plots, while the sub plots were the four varieties and one local cultivar of cotton. Each sub plot was 3x3m separated by 1.5m and 2m wide pathways between the replications. The experimental field size was 21 x 40m (840m^{2}).



Keys

V1 = SAMCOT-8

V2 = SAMCOT -9

V3 = SAMCOT- 10

V4= SAMCOT- 11

V5 = EX-Ngurore

TM = Treated with Moringa

TS= Treated With Sherpa Plus

UT=Untreated

Figure 1: Experimental Design and Field Layout

2.5 Experimental Procedures

2.5.1 *Control with Sherpa Plus* (Cypermethrin12g + Dimethoate100g)

Spraying was carried out at 8, 10 and 12 weeks after sowing (WAS) using hand sprayer at the rate of 800ml/ha according to the recommended dose from the manufacturer. Spraying was done very early in the morning. Sherpa Plus was applied to treat the infestation by *S. derogata*. At growth, five (5) plants were randomly selected and tagged per plot chosen from both untreated plots and treated plots. The treated and untreated plants were handpicked to determine percentage yield loss or percentage reduction in yield by *S. derogata* using the formula;

$$\text{Yield loss \%} = \frac{a-b}{a} * \frac{100}{1}$$

Where a = weight of yield oftreated plants (Sherpa plus)

b = weight of yield of untreated plant

2.5.2 *Extraction of Moringa seed oil*

The dried Moringa seeds were dehulled using hands and kernels and were milled using hammer mill. The powder obtained was used for oil extraction. The oil was extracted manually by turning the moringa paste with pistil and occasional adding of cold water. The oil extracted was then sieved using a fine sieve mesh to remove impurities and was finally packaged in a plastic bottle of 750 ml ready for use (Malgwi, *et al*., 2016).

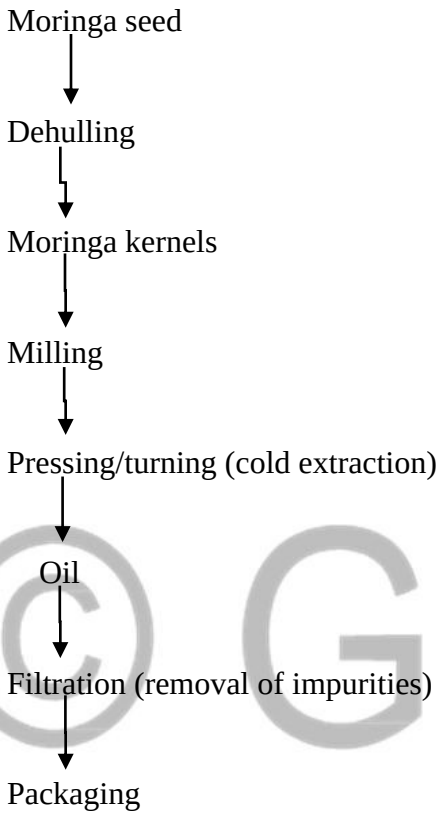


Figure 2. Flow chat for the extraction of Moringa seed oil.

Source; Malgwi, *et al*. 2016

2.5.3 *Control with Moringa Seed Oil*

Moringa Seed oil was sprayed accordingly on the plants at 8, 10 and 12 Weeks after sowing (WAS) using micro sprayer at the rate of 900ml/ha per plot. The Moringa seed oil was sprayed on the three varieties and two cultivars of cotton. The Moringa seed oil extracted was to control the infestation by *S. derogata.* During data collection, five plants per plot were chosen from Moringa seed oil treated plots and the untreated plots at random and the plants were handpicked to determine percentage yield loss caused by *S. derogata* using the formula;

% reduction in yield= $\frac{a-b}{a} * \frac{100}{1}$

Where a=weight of yields of plants treated (Moringa seed oil)

b=weight of yields of plants untreated

2.5.4 *Harvesting.*

Harvesting of cotton was carried out by hand picking the lint when the weather was dry and 50% of the matured bolls were fully opened as reported by C D C (2007). The harvested cotton varieties and cultivar was packaged according to treatments per plot and weighed.

2.6 Data Collection.

2.6.1 *Growth and Yield Parameter.*

2.6.1.1*Plants establishment*

Plant establishment was taken by counting emerged plant stands at two WAS and 50% flowering and later expressed as a percentage of total plant stands per plot and recorded.

2.6.1.2 *Yield of cotton.*

The yield of cotton was determined by harvesting all the opened bolls of the ten (10) plants in the middle of each plot which was weighed separately and the averagedetermined the yield per plot expressed in kilogram per hectare (kg/ha)

2.6.2 *Parameter on Insect Population.*

i. Number of larvae (*S. derogata*) on cotton plants was counted around 6am to 7am on the randomly selected five (5) plants per plot before spraying.
ii. Number of perforated and scold leaves on randomly selected five (5) plants per plot were counted and recorded.

2.5 Data Analysis

The data collected were subjected to analysis of variance (ANOVA) using SAS (2012) Software version 8 (2) and means were separated using Student Newman-Keuls (SNK) test for variables at P = 0.05 level of significance.

RESULTS AND DISCUSSION

3.1. RESULTS

3.1.1 Establishment Counts of Cotton at Two Weeks after Sowing, 50% Flowering and Number of Leaves in Hong during 2025 Cropping Season.

The results on establishment counts of varieties and cultivar and treatments on cotton at 2WAS, 50% flowering and number of leaves are presented in Table 1.At 2WAS,the establishment counts on cotton varieties and cultivar were encouraging. The varieties and cultivar sown were not significantly different from each other varieties, SAMCOT 8, SAMCOT 9, SAMCOT 10 and SAMCOT 11 and EX- Ngurore as local cultivar exhibited the highest establishment as shown in Table 1. The highest cotton stand percentage establishment counts was EX-Ngurore(72.11%) and the lowest was SAMCOT 11 (65.37%).At 50% flowering there was no significant difference among varieties and cultivar as shown in Table 1.

Also, the treatments showed that, there were no significant difference in the establishment counts at 2WAS and 50% flowering(65.40%, 69.26%,65.10%) for untreated, Moringa seed oil treated plots and Sherpa Plus treated plots respectively.

There were no significant different at 2WAS and 50% flowering between varieties and cultivar and between the treatments (untreated, Moringa seed oil treated plots and Sherpa Plus treated plots) on establishment counts at 2WAS and 50% flowering were not significant as shown in Table 1. Number of leaves per plant are shown in Table 1 indicated that the variety (SAMCOT 9) and cultivar (EX-Ngurore) had more leaves.

The three varieties and cultivar recorded similar number of leaves per plant which was not significantly different ($P>0.05$) and variety SAMCOT 11 showed significant different from other as exhibit few number of leaves. However, EX-Ngurore exhibited significantly higher mean number of leaves per plant (61.59) than other varieties as shown in the Table 1.

Among the treatments (Untreated, Moringa seed oil treated plots and Sherpa Plus treated plots), there were no significant difference among the treatments on number of leaves produced. Though, Sherpa plus (TS) exhibited highest mean number (57.47) of leaves and untreated (UT) displayed less mean number (52.40) of leaves as shown in Table 1. Generally, in analysis of treatments, there were no significant difference among, but only other treatments produced more number of leaves than others such as; Sherpa Plus treated plots gave more leaves than Moringa seed oil treated plots and Moringa seed oil treated plots gave more leaves than untreated plots as presented (Table 1).Based on the analysis, treatments had no significant difference on number of leaves per plant despite Sherpa Plus treated plots gave more number of leaves than other treatments.

Table 1: Establishment counts of cotton at two weeks after sowing, 50% flowering and number of leaves in Hong in 2025 cropping season.

Variety	2WAS	50% flowering	Number of Leaves
SAMCOT 8	65.56[a]	62.67[a]	54.33[a]
SAMCOT 9	67.00[a]	65.00[a]	58.33[a]
SAMCOT 10	69.00[a]	66.44[a]	55.56[a]
SAMCOT 11	65.37[a]	64.00[a]	40.22[b]
EX-Ngurore	72.11[a]	70.56[a]	61.59[a]
P α F	0.9079	0.8836	0.0001
	N.S	N.S	*
S.E	2.55	4.63	4.38
C.V (%)	7.92	10.93	13.64
Treatments			
Untreated	65.40[a]	62.20[a]	52.40[a]
Moringa seed oil	69.26[a]	63.27[a]	52.92[a]
Sherpa plus	65.10[a]	67.33[a]	57.47[a]
P α F	0.5857	0.4556	0.0943
	N.S	N.S	N.S
S.E	2.79	3.40	2.34
C.V(%)	7.92	10.93	13.64

Mean values followed by the same letter(s) in the same column are not significantly different at P=0.05 using Student Newman Keuls (SNK) mean separation.

3.1.2 Effect of *Sylepta derogata* on Boll Formation and infested bolls on Cotton in Hong in 2025Cropping Season.

The effect of *S. derogata* on number of bolls formation on cotton is presented in Table 2. The results showed that the number of bolls formations were significantly different among SAMCOT 8, SAMCOT 9, SAMCOT 10, SAMCOT 11and EX-Ngurore. SAMCOT 9 and EX-Ngurore gave similar number of bolls (12.56 and 12.11) and SAMCOT 11 was highly significantly different among other varieties and cultivar as it gave few numbers of bolls (4.89) as revealed in Table 2.

The results on boll formation among the treatments showed significant difference, though; there were slight difference among the treatments on number of boll formation. Moringa seed oil (TM) treated plots gave more boll formations than other treatments and Sherpa plus (TS) treated plots revealed higher than untreated plots as showed in Table 2. Based on the results obtained, there was effect of *S. derogata* on number of boll formations on cotton as the results of treatments revealed that the treated ones gave more bolls than untreated (Table 2). The number of infested bolls showed highly significant difference among the varieties and cultivar. The results showed no significant difference among SAMCOT 8, SAMCOT 9, SAMCOT 10, and EX-Ngurore, but significantly different compared with SAMCOT 11 (1.22, 1.44, 1.63, 1.69, and 0.67 respectively) as shown in table 2. It showed that SAMCOT 11 had less infested bolls and EX-Ngurore had the highest number of cotton bolls damaged.

. It also revealed that, among the SAMCOTs varieties, SAMCOT 10 had the highest infested bolls among the four varieties as displayed in Table 2. The effect of treatments on cotton bolls damaged based on the results obtained showed high significant difference among the treatments. It revealed that Sherpa plus treated plots (TS) exhibited the lowest cotton bolls damaged (0.67), followed by Moringa seed oil treated plots (TM) (0.78) and Untreated plots (UT) recorded the highest infestation of bolls as indicated in Table 2 and the result (2.13) was highly significant. In conclusion, it showed that varieties and treatments had an effect on cotton bolls damaged based on the results obtained during 2025 cropping season as presented.

Table 2. Effect of *Sylepta derogata* on numbers of boll formation on cotton in Hong in 2025 cropping season

Variety	No. of bolls	No. of Infested bolls
SAMCOT 8	11.44[a]	1.22 [a]
SAMCOT 9	12.56[a]	1.44 [a]
SAMCOT10	12.00[a]	1.63 [a]
SAMCOT 11	4.89[b]	0.67[b]
EX- Ngurore	12.11[a]	1.69 [a]
P α F	0.0001 **	0.0001 **
S.E	0.701	0.141
C.V (%)	22.56	23.68
Treatments		
Untreated	8.40[b]	2.13 [a]
Moringa seed oil	11.73[a]	0.78[b]
Sherpa plus	11.67[a]	0.67[b]
P α F	0.0007 **	0.0001 **
S.E	0.974	0.818
C.V(%)	22.56	23.68

Mean values followed by the same letter(s) in the same column are not significantly different at P=0.05 using Student Newman Keuls (SNK) mean separation.

3.1.3 The Mean Abundance of Larvae of *Sylepta derogata* on Cotton at different Weeks in Hong in 2025Cropping Season.

During the cropping season, the result obtained at 8 WAS showed that SAMCOT 9 had the highest number of larvae (3.60) and lowest number of larvae was recorded in SAMCOT 11 (0.73).The result revealed high significant difference on abundance of larvae as presented in Table 3. SAMCOT 11 exhibited low number of larvae. At 10WAS, the results presented in Table

3 revealed that, SAMCOT 9 had highest number of larvae (5.36) followed by SAMCOT 8 (3.89), EX-Ngurore (3.27) and SAMCOT 10 (3.00). SAMCOT 11 had lowest number of larvae (0.60).

At 12 WAS, EX Ngurore had the highest number of larvae (11.51) per plant followed by SAMCOT 9 (10.87) and SAMCOT 11that had the lowest abundance of larvae among the varieties and cultivar (Table 3).The results revealed that EX Ngurore had highest abundance of larvae while SAMCOT 8, SAMCOT 9 and SAMCOT 10 revealed similar abundance of larvae on leaves. SAMCOT 11 showed the lowest abundance of larvae at 12 WAS. The results presented revealed that the mean abundance of larvae in SAMCOT 8, SAMCOT 9, SAMCOT 10 and EX-Ngurore were not significantly different but EX-Ngurore and SAMCOT 9 exhibited highest abundance of larvae per plant (11.51 and 10.87) among the varieties and cultivar, meanwhile, SAMCOT 11 revealed the lowest abundance of larvae compared with other varieties and cultivar as presented. The abundance of larvae of *S. derogata* on treatments at 8, 10, and 12WAS revealed the following results; at 8WAS, the results showed no significant difference among the treatments. At 10WAS, showed significant difference among the treatments, where Sherpa plus treated plots (TS) showed low abundance of larvae (1.19) than the other treatments and also, showed highly significant difference among the treatments. Sherpa plus (TS) had the lowest abundance of larvae (1.19) and the Moringa seed oil treated plots and Untreated plots showed no significant difference as presented (Table 3). At 12WAS, the results indicated that there were significant difference among the treatments, which showed that Sherpa plus treated plots showed lower abundance of larvae and followed by Moringa seed oil treated plots and highest abundance revealed in table 3.The Untreated plot gave the highest abundance of larvae (14.37) as indicated in figure 1.

Table 3. The Mean Abundance of Larvae of Sylepta derogata on cotton at different weeks in Hong in 2025 cropping season

Variety	8WAS	10WAS	12WAS
SAMCOT 8	2.98[a]	3.89[b]	7.33 [a]
SAMCOT 9	3.60[a]	3.27[a]	10.87 [a]
SAMCOT10	2.82[a]	3.00[b]	9.91[a]
SAMCOT 11	0.73[b]	1.00[c]	1.21[b]

EX- Ngurore	3.20[a]	5.36[b]	11.51 [a]
P α F	0.0001 **	0.0001 **	0.0001 **
S.E	9,362	0.762	0.141
C.V (%)	20.78	22.82	23.72
Treatments			
Untreated	2.60[a]	3.84[a]	14.37[a]
Moringa seed oil	2.83[a]	4.46[a]	8.60[b]
Sherpa plus	2.57[a]	1.19[b]	1.08[c]
P α F	0.6354 N.S	0.0001 **	0.0001 **
S.E	0.294	0.428	1.539
C.V(%)	20.78	22.82	23.72

Mean values followed by the same letter(s) in the same column are not significantly different at P=0.05 using Student Newman Keuls (SNK) mean separation.

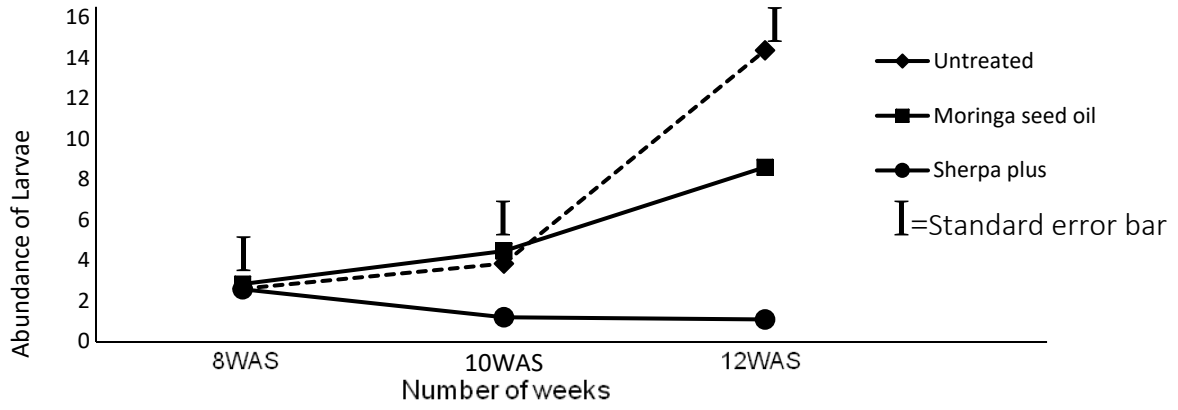


Figure 1: Effect of Treatments on the abundance of larvae of *Sylepta derogata* on cotton at different weeks in Hong in 2025 cropping season

3.1.4 Number of Leaves Damaged on Cotton by *Sylepta derogata* at 2 Weeks Interval in Hong in 2025Cropping Season.

The results on number of leaves damaged on cotton by *Sylepta derogata* at 2 weeks interval was presented in Table 4. At 8 WAS, the results showed significant difference among varieties and cultivar. There were highly significant difference among the varieties and cultivar

at 8WAS. SAMCOT 8, SAMCOT 9, SAMCOT 10 and EX-Ngurore were not significantly different but it was shown that number of curled and perforated leaves were high in SAMCOT 9 (3.49) and EX-Ngurore (3.16) and lowest was recorded on SAMCOT 11 (0.69) as presented in Table 4. At 10WAS, result showed high significance among the varieties and cultivar, which EX Ngurore revealed the highest curled and perforated leaves (5.00) and less in SAMCOT 11(1.20) while not significant among SAMCOT 8, SAMCOT 9, SAMCOT 10 and EX-Ngurore as indicated in table 4.At 12 WAS, the results revealed significant among the varieties and cultivar as presented in table 4. SAMCOT 11 had less number of curled and perforated leaves and EX Ngurore exhibited the highest number of leaves damaged (17.60).Therefore, the results revealed that estimation of curled and perforated leaves were highly significant which showed less in SAMCOT 11and highest in EX Ngurore.

The results on treatments on damaged leaves of cotton caused by *Sylepta derogata* at different week's interval shows as follows; At 8 WAS, the results revealed that, the treatments showed no significance among the treatments. At 10 WAS, results revealed that there were high significant difference among the treatments where Sherpa plus treated plots (TS) gave the lowest number of curled and perforated leaves (1.04) than other treatments. At 12 WAS, results indicates that Sherpa plus treated plots (TS) showed less curled and perforated leaves (2.45) and followed by Moringa seed oil treated plots (10.51) and finally, the untreated revealed more number of curled and perforated leaves (20.17) on cotton plants as presented (Table 4).

Table 4. The number of leaves damaged on cotton by Sylepta derogata at 2weeks interval in Hong in 2025 cropping season.

Variety	8WAS	10WAS	12WAS
SAMCOT 8	2.80[a]	3.51[a]	10.04 [a]
SAMCOT 9	3.49[a]	3.29[a]	12.96 [a]
SAMCOT10	2.69[a]	3.24[a]	13.91[a]
SAMCOT 11	0.69[b]	1.20[b]	0.71[b]
EX- Ngurore	3.16[a]	5.00[a]	17.60 [a]
P α F	0.0001 **	0.0001 **	0.0002 **
S.E	0.316	0.791	4.081
C.V (%)	20.03	23.31	24.59

Treatments			
Untreated	2.53[a]	3.96[a]	20.17[a]
Moringa seed oil	2.67[a]	4.75[a]	10.51[b]
Sherpa plus	2.49[a]	1.04[b]	2.45[c]
P α F	0.7751 N.S	/0.0001 **	/0.0001 **
S.E	0.256	0.468	1.762
C.V(%)	20.03	23.31	24.59

Mean values followed by the same letter(s) in the same column are not significantly different at P=0.05 using Student Newman Keuls (SNK) mean separation.

3.1.5 Mean of different Yields of Cotton Varieties and Treatments in Hong in 2025Cropping Season.

The results of data analysis of different yields of cotton varieties and cultivar are shown in Table 5. The result was highly significant among the varieties and cultivar. The varieties and cultivar; SAMCOT 8, SAMCOT 9, SAMCOT 10, and EX-Ngurore were not significant, but slightly differed in quantity which indicated that SAMCOT 9 gave the highest yield (1445.3kg/ha) than the other varieties and cultivar despite that it had similar level of significance. SAMCOT 11 showed to be variety that had the lower yield as presented in Table 5.The SAMCOT 8, SAMCOT 9, SAMCOT 10 and EX-Ngurore revealed not significant. SAMCOT 9produced high yield (1445.3) and SAMCOT 11 exhibited low yield (125.0.5).

The mean values of treatments on cotton yield showed highly significant difference where Sherpa plus treated plots gave the highest yield (1177.1kg/ha) than other treatments. Likewise, Moringa seed oil treated plots produced more yield (849.4kg/ha) than Untreated plots (617.9kg/ha) as presented in Table 5. Therefore, the results showed significant difference on yield obtained on untreated plots and the Treated plots as shown (Table 5).

Table 5. Effect of Varieties and Treatments on cotton in Hong in 2025 cropping season

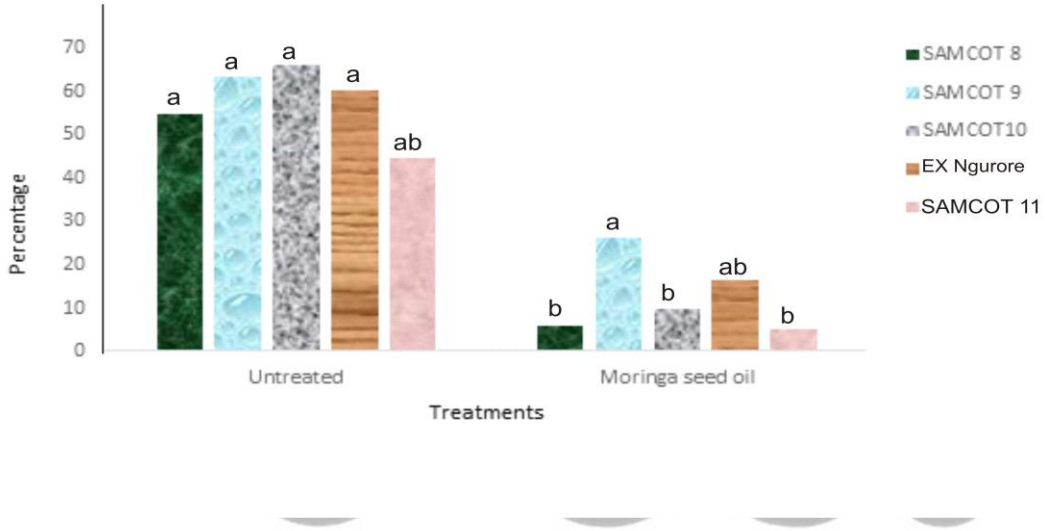
Variety	Yield/plot(g)	Yield/ha(kg)
SAMCOT 8	1044.1[a]	1160.1 [a]
SAMCOT 9	1167.6[a]	1445.3[a]
SAMCOT10	848.9[a]	910.9[a]
SAMCOT 11	113.3[b]	125.0[b]
EX- Ngurore	778.3[a]	864.9[a]
P α F	0.0004 **	0.0005 **
S.E	104.4	106.1
C.V (%)	27.26	27.52
Treatments		
Untreated	525.8[b]	617.9[b]
Moringa seed oil	785.6[ab]	849.4[ab]
Sherpa plus	1059.9[a]	1177.1[a]
P α F	0.0118 **	0.0228 *
S.E	188.8	201.6
C.V(%)	27.26	27.52

Mean values followed by the same letter(s) in the same column are not significantly different at P=0.05 using Student Newman Keuls (SNK) mean separation.

3.1.6 Percentage Reduction in Yield of Cotton as caused by *Sylepta derogata* in Hong in 2025 Cropping Season.

Results on percentage reduction in yield were presented in Figure 2, where the percentage reduction in yield of cotton varieties and cultivar were highly significant. The Untreated (UT) showed higher significant difference on SAMCOT 11 which had the lowest percentage reduction in yield compared with SAMCOT 8 (57.26%), SAMCOT 9 (75.84%) and SAMCOT 10 (76.21%) and EX Ngurore (72.20%) as shown in Fig 2. The percentage reduction in yields on Moringa seed oil treated plots (TM) was highly significant. Among the varieties, SAMCOT 11

displayed low reduction and SAMCOT 9 exhibited the high percentage of yield reduction. Though, the percentage reduction in yield of varieties and cultivar showed no significant difference. The insects caused high damaged which led to percentage reduction in yields. Moringa seed oil treated plots (TM) compared with Untreated plots (UT), showed great significant difference as indicated in the results (Figure 2). SAMCOT 11 and SAMCOT 8 had the lowest yield reduction (5.26% and 5.86%) and the highest yield reduction was SAMCOT 9 (26.26%) as shown (Figure2). Sherpa plus treated plots (TS) gave the highest cotton yield than Moringa seed oil treated plots and untreated plots as shown in results.



Means followed by the same alphabet on each bar are not significantly different at 5% using Student Newman-Keuls (SNK) mean separation.

Figure 2: Percentage reduction in yield of cotton as caused by *Sylepta derogata* in Hong

3.2 DISCUSSION

The seeds obtained were very important in ensuring good germination and plant establishment to farmers and researchers. From this result, it can be seen that EX-Ngurore was among the varieties and cultivar that establishment counts of cotton seeds at 2 weeks after sowing and 50% flowering that had the lowest establishment due to the seed was not obtained from certified seed Research Institutes. SAMCOT 8, SAMCOT 9 and SAMCOT 10 at 2 weeks and at 50% flowering ensured successful establishment. This finding agrees with recommendation made by Institute for Agricultural Research (I. A. R) as described by Malgwi, (2007 and 2011), that cotton seed have to be dressed or treated with recommended chemicals and seeds are to be obtained from certified seed Research Institutes before sowing in order to ensure

good germination and establishment and protection against soil borne and seed borne pests and other predators. This showed that, failure in germination and establishment counts can be low in uncertified seeds as the results indicated.

Moringa seed oil treated plots (TM) and Sherpa Plus treated plots (TS) on mean percentage establishment counts showed no effect. Meaning that, the plant materials had insecticidal potentials that could compete with synthetic insecticides. This finding agrees with Okereke (2007)and Aboubakary *et al*. (2008) who reported that, plants have been tested as interesting botanical pesticides in Sub-Sahara Africa and that they are suitable, biodegradable and eco-friendly and could compete favorably with synthetic pesticides. The results obtained, showed that most of the cotton varieties and cultivars performed better when sprayed. Therefore, Sherpa plus treated plots (TS) revealed high mean number of leaves in 2025 cropping season followed by plants treated with Moringa seed oil (TM) and mean number of leaves per plant decreased on untreated (UT) plants. The result is in corroboration with Oparaeke *et al*. (2004), which stated that the use of insecticides proved to be more reliable and effective in insect pest control. Therefore, insecticides used as treatment gave more number of leaves than other treatments, which means that, insecticides are still the most reliable remedy in an emergency situation such as an outbreak of insect pests. The effect of varieties showed no effect on cotton branches, which reveals that SAMCOT-11 that had fewer branches and significantly different among other varieties and cultivar. The results of SAMCOT 8, SAMCOT 9, SAMCOT 10 and EX-Ngurore showed no significant difference on mean number of branches which agrees with some researchers that vegetative branches are similar on number of branches.

Therefore, insecticides used as treatment are still seen as the most effective insect pests control method. This agrees with the work by Oaya (2016) who reported that the use of synthetic insecticides is seen as the most effective and efficient method of insect pests control .The infestation by *S. derogata* affects the number of boll formation on different varieties and cultivar of cotton. SAMCOT 8, SAMCOT 9, SAMCOT 10 and EX-Ngurore were not significant compared with SAMCOT-11. This means that, performance of varieties and EX-Ngurore was similar in boll formations. The mean performance of varieties and cultivar at Hong showed that, SAMCOT-11 had less in terms of boll formation compared with other varieties and cultivar. Thus, SAMCOT-11 performed less boll formations.

Moreover, Sherpa Plus (TS) treated plots showed more number of boll formation compared to other treatments. It also showed that there was no significant difference between Sherpa Plus (TS) and Moringa seed oil (TM). On the other hand, there washighly significant difference in number of boll formations between the treated and untreated plots. The result of the study showed that, the botanical pesticides and synthetic chemical have proved to be very reliable and effective in terms of pest attack. This collaborates with Fasunwon and Banjo,(2010) and Oparaeke *et al*.(2004) who reported that insecticidal constituents in some plant materials, remained correctly the main way of insect pests control.

The abundance of larvae of S. *derogata* on varieties and cultivar at several weeks after sowing revealed that, it was SAMCOT-11 that showed relative resistance to S. *derogata* which harbored only few larvae compared to other varieties(SAMCOT 8, SAMCOT 9, SAMCOT 10 and Ex- Ngurore cultivar). Also, the highest mean of abundance larvae was recorded on EX Ngurore, which showed that, the cultivar was relatively susceptible to S. *derogata*, compared to others varieties which had few number of larvae. The abundance of larvae on leaves of cotton caused the leaves to drop and spins web around curled leaves and the number of rolled leaves which would not enable photosynthesis to occur and result into lower yield as described by Dunuwel *et al.* (2024) and Malgwi (2011).

The number of leaves damaged on cotton plant by *S. derogata* revealed the level of resistance and susceptibility of varieties and cultivar of the cotton. The highest mean number of leaves damaged was recorded on EX Ngurore which showed that, the cultivar was relatively susceptible to S. *derogata* while SAMCOT-11 had the lower mean number of leaves damaged which indicated that, the variety was relatively resistance to *S. derogata* compared to other varieties (SAMCOT 8, SAMCOT 9 SAMCOT 10) and EX Ngurore as shown by the results.

The degree of leaves damaged was significant lower on treated plots (TS and TM) compared to untreated plots. This agrees with work by Atwal and Dhaliwal (2001) who stated that, the untreated plants carries high infestation which several rolled and curled leaves were found dropping. On the other hand, treated with Sherpa Plus (TS) suppressed leaves curled and other damages caused by *S. derogata* compared to plots treated with Moringa seed oil (TM) which was significant. This observations support the earlier work by Malgwi and Onu (2011) who reported that, Sherpa plus reduces the population of S. *derogata* 93-95%. Therefore, the

result of treatment treated with Sherpa plus (TS) considered as effective method to control *S .derogata* compared to other treatments. However, the high mean number of leaves damaged resulting in huge loses in cotton yield as described by different researchers as stated earlier.

Cotton varieties and cultivar have different number of days with regards to maturing and this depends on climatic conditions and edaphic factors. The maturity can exceed the number of days stipulated. The results obtained, showed that most of the cotton varieties, particularly SAMCOTs performed better when sprayed and the right variety of cotton was planted and the farm was managed well. The highest mean yields of cotton was recorded in SAMCOT 9 in 2025 cropping season and the lowest mean yields was recorded in SAMCOT-11 as the work revealed. Though, there was no significant difference among varieties and cultivar with regard to yields obtained. Moreover, the results showed significant difference among the varieties and cultivar, but it also suggested, the three varieties had the highest yields production in Hong, Adamawa state of Nigeria. However, SAMCOT-11 variety recorded the lowest mean yield as the result of few numbers of leaves, branches, flowers and bolls formations as the results revealed.

The results of the Sherpa plus (TS) treated plots had the highest mean yields of cotton followed by the plots treated with Moringa seed oil (TM) and the least was Untreated (UT) plots as the result has shown. The result corroborated with report in the Oparaeke *et al*. (2004), Malgwi (2007) and Malgwi and Onu (2011) who reported that, the use of insecticides are still the remedy for insect pests control for higher yield and good quality products. This observation suggested that, both the synthetic insecticides and the plant materials were effective in controlling *S. derogata* on cotton plant. Sherpa plus gave relatively complete control and more yields were obtained. Similarly, Moringa seed oil was effective in suppressing *S. derogata* on the various cotton varieties and cultivar and could therefore be used as alternative to synthetic insecticides.

The mean percentage reduction in yield of cotton as caused by *S. derogata* in2025 cropping season using different treatments revealed different percentage reduction on cotton yields. The results obtained showed that, cotton varieties (SAMCOT 8, SAMCOT 9 SAMCOT 10 and EX Ngurore) performed better than (SAMCOT-11) after spraying with Sherpa plus and Moringa seed oil on treated plots. The Untreated (UT) showed higher mean percentage reduction in yields and this agrees with findings by Thaxton and El-zik, (2001) who reported that, yield losses due

to insect pests attack has been recorded to be in general 10-30% and may reach 50% or more in Africa or Asia which this work has affirmed. Despite that, the preference by worms and sucking insect pests on cotton plants gives more yield reduction was obtained on infested than uninfected cotton plants. Therefore, the high percentage reduction in yields as damaged caused by S. *derogata* to cotton resulting in huge loses in cotton yield and evolved into serious and true pest of cotton plant.

Conclusion

The results of this research showed that boll formation were high on treated plots with Sherpa Plus and Moringa seed oil compared to the Untreated plants. The work showed that, more yield were obtained on treated plants than untreated ones. Insect pest (*S. derogata*) larvae abundance and leaf damaged were very few on treated plants due to the effectiveness of the control measures and abundance of larvae were higher on untreated plots on leaves damaged also. Sherpa Plus treated plots gave more yield than those treated with Moringa seed oil and Untreated showed lowest yield production. Meanwhile, total percentage reduction in yield using Moringa seed oil was low compared to Untreated. Amongst varieties and cultivar, SAMCOT 9 gave the highest yield, followed by the other SAMCOTs; while EX-Ngurore was better than SAMCOT-11. These are the recommended cotton for the Northern Zone of Nigeria (SAMCOTS 8 and 9).

Amongst the treatments, Sherpa plus recorded best results regard to abundance of larvae, leaves damaged, boll damaged which were very low than any treatments. Furthermore, Sherpa plus exhibited highest yields followed by Moringa seed oil and Untreated gave the lowest yield. The results showed that, Sherpa plus is still the best in any emergency of pest outbreak, but Moringa seed oil is a very promising botanicals, which when alternated with an insecticides it might give a better yield in the future in order to reduce the use of the harmful effect of insecticides on the field and environments.

Recommendations

The following recommendations could be adapted for planning an effective control for future research on cotton varieties and cultivar (SAMCOT 8, SAMCOT 9, SAMCOT 10, SAMCOT 11 and EX-Ngurore).

i. The use of Moringa seed oil on insect pests control method should be harnessed since it compete favourable with Sherpa Plus in suppressing the leaf roller, *S. derogata* on all varieties and cultivar.

ii. Alternating Sherpa plus and Moringa seed oil should be tried in order to reduce the harmful effect of pesticides in the field.

iii. Certified seed should be obtained from Research Institutes to ensure good germination and establishment of the cotton plants.

Acknowledgements

We acknowledged this research work to College Management and TetFund for given us opportunity and privilege to unveiled the findings that contributes significantly to knowledge.

References

Aboubakary, A., Ratnadass, A. and Matthiew, B. (2008). Chemical and botanical Protection of transplanted sorghum from stem borer (*Sesamiaoretica*) damage in NorthernCameroun. Journal of SAT Agricultural Research, 6: 1-

Atwal, A. S. and Dhaliwal,G.S. (2001). *Agricultural pests of south Asia and their Management.*Kalyani publishers, New Delhi.

Di, J. X., Chen, X. S., Wu, Q.J., XU, N.Y., Xiao, S. H.and Liu, J. G. (2007). Preliminary study of damage caused by *Syleptaderogata* (fabricius) (Lepidoptera: Pyralidae). *JiangsuAgriculturalscience* 5:82-84

Dunuwel, D. M., Malgwi, A. M., Medugu, M. A., and Degri, M. M. (2024). Population Dynamics of Dysdercus volkeri F. (Heteroptera; Pyrrhocoridae) at different Stages of Cotton Development in Northeastern Nigeria. Nigeria Journal of Entomology 40(2) 210-218

Global Cotton Outlook (2024). International Centre for Agricultural Competitiveness Policy Modelling Group. Department of Agricultural and Applied Economics, Texas Tech University.

Jakusko , B. B. (2017). Field Crop Production for Sustainable Food Security, ISBN:978-978-8536-49-9

Majeed, S., Rana, I. A., Mubarik, M. S., Atif, R. M., Yang, S. H., Chung, G., Jia, Y., Du, X., Hinze, L. and Azhar, M T. (2021). Heat stress in Cotton: AReview on Predicted and Unpredicted Growth- Yield Anomalies and Mitigating Breeding Strategies, Agronomy, 11(1): 1-20.

Malgwi, A. M. (2007). Bioecology, damage potentials and control of *Cylas Puncticolis* Boh, (Coleoptera: Brentidae) a new pest of cotton in Nigeria. Unpublished a Ph. D thesis submitted to the postgraduate schools Amadu Bello University Zaria, 1-4pp

Malgwi, A. M. and Onu, I. (2011). The effect of Sherpa plus on the abundance of *Cylasmpuncticolis* and some major insect pest on the yield of cotton at Ngurore, Nigeria. *Nigerian Journal of Tropical Agriculture* (NJTA) 2010Management: Part IA. Worldwide perspective. A. Rev. Ent,39:527-542.

Malgwi, A.M. (2011). *Cylaspuncticolis* Boh: A *new pest of cotton*. (Bioecology, damage potential and control). LAP LAMBERT Academic GmbHand co.KG GERMANY.147Pp 1SBN 978-3-8465-0086-6

Malgwi,A. M.,Oshagbemi, E. E.and Oaya, C. S. (2016). Evaluation of seed oil of Moringa (*Moringaolefeira*) for the Management of Insect pests of Okra (*Albelmoschusesculentus (L)*). *Nigerian Journal of Plant Protection.* Volume 30 (2016), Pp134-150.

National cotton council of America (NCCA) (2025). The story of cotton. Retrieved on June, 2025 from www.cotton.org/pub/cottoncalnts/story.

Oaya, C. S. (2016). Impact of number of spray application of Chemical on the growth andof Roselle (*Hibiscus sabdariffa* L.) in Ganye Area. *International journal of Advanced Innovative Research* 5 (1): 9-12

Oparaeke, A. M., Dike, M. C, and Amatobi, C. I. (2004). Field Evaluation of Extracts of Nigeria species for control of post flowering Insect pests of cowpea Vigna unquiculata (L) Walp plant Protection Science 41;14-20

Rajendran, T. P. and Jain, K. C.(2004). *Achievements in cotton research. All India coordinated Cotton improvement project. C I C R Regional station, Coimbatore.*

SAS (2012). SAS/STAT User1`s Guide version 8(2). Statistical Analysis Systems.Institute Inc. Cary, North Carolina

Shehu, A., Malgwi, A. M., and Medugu, M. A. (2024). Persistence and Repellency Potentials of Balanites aegyptiaca and Azadirachta indica seed oils against Tropical Warehouse Moth (Ephestia cautella Walker) in stored maize. Global Journal of Agricultural Science Vol., 23 2024; 113-122.

Toroma, L., Malgwi, A. M., Dunuwel, D. M., and Medugu, M. A. (2024). Abundance and Control of Cotton leaf Roller, Sylepta derogata on some cotton varieties in Northern Guinea Savanna Zone of Nigeria, Adamawa State University Journal of Agricultural Sciences, 12(4)34-44.

United State Development of Agricultural (USDA) (2024). Nigeria and World cotton production by year. Agricultural outlook Forum, 2025,

United State Development of Agriculture –World Agricultural Production (USDA-WAP) (2024). World Cotton Productions by year.

United State Development of Agriculture-Foreign Agricultural Services (USDA-FAS) (2024). National Cotton Production Report by years.