Volume Number 9 || Issue Number 3 || Year 2024 || Page 3 || Corresponding Author: akewetaes@gmail.com

ISSN (Online) = 2522-6754 ISSN (Print) = 2522-6746

WORLD JOURNAL OF BIOLOGY AND BIOTECHNOLOGY

Research Manuscript www.sciplatform.com Peer review

Exploring the distribution and abundance of groundnut sucking bug (offa) [*Rhyparochromus littoralis* Dist] across major groundnut-producing regions in North-Eastern Nigeria

Akeweta Emmanuel Samaila, Anna Mohammed Malgwi, Mahmoud Yahaya Jada

Department of Crop Protection, Modibbo Adama University, Yola, Adamawa State Nigeria.

Contribution **Samaila, A. E.** performed survey, distribution and abundance of the groundnut sucking bug, **Malgwi, A. M.** provided professional and technical support, **Jada, M. Y.** provide assistance in the field guideline and proof read.

A multi-locational survey was conducted across Adamawa, Gombe, and Taraba States during the 2021 and 2022 cropping seasons to assess pest dynamics and their impact on groundnut production. This research delves into the intricate dynamics of groundnut pest management, focusing on the prevalence, abundance, and diversity of *Rhyparochromus littoralis*, a significant insect pest in groundnut cultivation, in the study area. Groundnut (*Arachis hypogaea* L.) serves as a vital cash crop in Nigeria, contributing substantially to the economy and livelihoods of many farmers. However, the presence of insect pests such as *R. littoralis* poses a considerable threat to groundnut production, warranting comprehensive studies to elucidate their behaviour, impact, and management strategies. The study meticulously examines the seasonal and spatiotemporal dynamics of *R. littoralis* within the major groundnut-producing areas, shedding light on its prolific nature characterized by rapid reproduction and high population densities. Through rigorous surveys and data analysis, *R. littoralis* emerges as a formidable adversary, establishing its status as a major insect pest in the Northeast geo-political zone. The survey conducted on the abundance of the groundnut-sucking bug, *Rhyporachromus litoralis* Dist, in Adamawa State during the 2021 and 2022 cropping seasons reveals several noteworthy findings. The abundance of *R. litoralis* varied across different locations and cropping seasons. In 2021, the insect abundance ranged from 2075.67 to 2578.83 across different locations, whereas in 2022, the abundance ranged from 2075.00 to 2677.58. Statistical analysis indicates a significant difference in insect abundance between the two years, with p-values less than 0.0001 for both years, highlighting the reliability of these differences. In this study, the presence of the groundnut-sucking bug in groundnut fields was reported in early September in Gombe, while in Adamawa it was in late September but in Taraba, it was in Late October. By shedding light on the complex interactions within the groundnut ecosystem, this study contributes to a deeper understanding of pest dynamics and underscores the importance of coordinated strategies to safeguard groundnut production in Nigeria's Northeastern region.

Keywords: Distribution, *Rhyparochromus littoralis*, groundnut, abundance, insect pest, Northeast.

INTRODUCTION: Groundnut (*Arachis hypogaea* L.) is a vital leguminous oilseed crop grown extensively across the globe, with cultivation spanning nearly 100 countries across 6 continents (Abady *et al.*, 2019) and encompassing approximately 24.6 million hectares of land (Food and Agricultural Organisation Statistics (FAO, 2014). The crop exhibited a notable production of 41.3 million metric tons, with a production of 1676 kg per hectare during the 2012 cropping season (FAO, 2014). Key producing nations include China, India, Nigeria, USA, and Myanmar, which collectively contributing significantly to the global output (Abady *et al.*, 2019). Notably, Asia and Africa command the largest areas under groundnut cultivation, accounting for 47.15% and 47.56% of the global acreage, respectively, highlighting the crop's importance in these regions (FAO, 2014). Despite its widespread cultivation, production in Asia and Africa remains considerably lower compared to the Americas, with respective yields of 2217 kg per hectare and 929 kg per hectare respectively, underscoring existing challenges in these regions (Abady *et al.*, 2019). Groundnut cultivation typically occurs as a smallholder crop in semi-arid tropical regions, primarily reliant on rain-fed conditions for growth and development (Ndjeunga and Ibro, 2010).

Lygaeid bug, (family Lygaeidae), any of a group of insects in the true bug order, Heteroptera, that includes many important crop pests. There are between 3,000 and 5,000 species of lygaeid bugs, which vary from brown to brightly patterned with red, white, or black spots and bands. The large milkweed bug (*Oncopeltus fasciatus*) is distinguished by its broad red and black bands. They range from 3 to 15 mm (0.1 to 0.6 inch) in length, although they are usually less than 10 mm (Freedman, 2018). The family is sometimes called the chinch bug family because one species, the destructive chinch bug (*q.v.*), feeds on the sap of plants. Other important members of the family include the Old World, or Egyptian, cotton stainer (*Oxycarenus hyalinipennis*) and the Australian *Nysius vinitor,* both of which are destructive to fruit trees, and the predatory *Geocoris punctipes,* which feeds on mites, termites, and other small plant-feeding insects. Also, the groundnut sucking bug *Rhyparochromus littoralis* commonly known as Lygaeid bug, which belongs to the order Heteroptera and family Lygaeidae is found in all groundnut growing areas and in large clusters in the Northeastern part of Nigeria, where it is known to cause serious damage to groundnut during harvest (Samaila and Malgwi, 2012). Insect pests are the major constraints to groundnut production. More than 360 species of insects and mites were reported to attack the groundnut crop in field and pods in storage all over the world (Namasivayam and Bharani, 2015). Biswas (2014) reported 36 species of insect pests were found to infest the different growth stages of groundnut crop. Among the recorded pest species, the hairy caterpillar, *Spilarctia obliqua* (Walker); common cutworm, *Spodoptera litura* F.; jassid, *Empoasca terminalis* Distant ; leaf miner, *Stomopteryx nerteria* M. and leaf roller, *Anersia ephippias* (Meyr.) were considered as the major pests, while the rests were of minor importance on the basis of their population densities/plant, nature and extent of damage and yield reductions. Most of the major and minor pests infested during the vegetative to pre-maturity stages and the maximum infestation occurred during pod formation and pod filling stages of the crop. Moreover, pests are dynamic in nature and the pest complex changes with the agro-ecosystems (Ratnadass *et al.*, 2012).

Sucking pests are assuming major status in agro-ecosystems in Africa and particularly in Nigeria, they are causing significant economic losses (FAO, 2017). In recent years, naturally occurring predators in the biological control of newer pests like the groundnut sucking bug *Rhyparochromus littoralis* has not been unearthed yet. However, Queensland Government, (2018) have reported several natural enemies co-existing with mirid bug populations but there is paucity on the pest and natural enemy complex of the groundnut ecosystems in the North Eastern Nigeria. It is therefore considered necessary to investigate and establish the pest status and the natural enemies of the groundnut sucking bug in the study area.

OBJECTIVES: The objective of this study were (i) investigate and establish the pest status and the natural enemies of the groundnut sucking bug in the Northeast sub region of Nigeria, (ii) to evaluate the abundance of *R. littoralis* in Northeastern Nigeria.

MATERIAL AND METHODS: Three states (Adamawa, Gombe and Taraba) known for groundnut production were surveyed in the fields at 9 locations each in Adamawa (Girei, Mayo Belwa and Mubi), Gombe (Daban Fulani, Akko and Billiri) and Taraba (Sunkani, Bali and Gashaka). This survey was conducted in 2021-22 cropping season.

Survey and sample collection: About 9 locations, 3 each in Adamawa, Gombe and Taraba States were selected randomly to carry out the survey. Surveys were conducted in 3 randomly selected farmer's groundnut fields of each location (giving a total of 9 per location). Sites selected in Adamawa State; Girei lies within Latitude 9.36''N and Longitude 12.55''E with an elevation of 245.27 m above sea level; Mayo Belwa lies within latitude 9.05'' N and longitude 12.05''E with an elevation of 269.46 m above sea level and Mubi lies within longitude 10.26'' N and latitude 13.27''E with an elevation of 582.20 m above sea level. Sites selected in Gombe State; Daban Fulani lies within latitude 10.43''E and longitude 11.38'' N with an elevation of 304 m above sea level; Akko lies within 10.18''

E and 11.16'' N at an elevation of 446.35 m (1464.39 ft) above sea level, and Billiri the geographical coordinates of Billiri are latitude 9.87'' E and 11.23'' N 1,736 ft elevation with an elevation of 564 m above sea level. For sites selected in Taraba State; Sunkani lies within Latitude: 8.70'' E and Longitude: 11.25'' N with an elevation of 231 m above sea level, Bali lies within latitude 7.86'' E and longitude 10.97'' N with an elevation of 176.68 m above sea level and Gashaka, which lies between latitude: 7.50'' E and l*ongitude: 11.39'' E, with an elevation of* 457 m above sea level. At all the major sites selected for the survey, in each location the consent of 3 farmers were selected at random, where they agree to a lot 7 x 5 m^2 plot to the researcher to be used to trap the insects during harvest time (the period of the survey) being September to November during the 2021 and 2022 cropping seasons.

Insect collection: Insects were generally collected using a fabricated fine linen sheet muslin net (1.5 m x 1.5 m), which is laid out on micro sub plots to trap insects who are then immobilised, using insecticide, and there after handpicked and then counted. In order to prevent spill of the chemical to the next nearest cluster, a makeshift barrier made of plastic sheet measuring 3 m x 3m was constructed and held in between the border of the sampled plot before spraying.

Survey methodology: In each field, 3 clusters were selected in order to collect the insect pests and their natural enemies. During the survey, insect collection was carried out at an interval of 7 days for a period of 4 weeks. Immediately after collection, the samples were kept separately in labelled laboratory bottles. The open end of the bottles was closed. The collected samples of the insect pests and natural enemies of 10 complete crammed clusters were preserved separately in labelled container/sample bottle. After that the collected samples were properly sorted and counted. The collected samples were properly identified, sorted and counted in the Entomology Laboratory of the Department of Crop Protection, Modibbo Adama University, Yola. Relative abundance of insect pests and natural enemies was calculated using the following formula:

$$\text{Relative abundance (\%)} = \frac{\text{Total number of each species}}{\text{Total number of all species}} \times 100$$

RESULTS AND DISCUSSION: Survey of the Abundance of the Groundnut Sucking Bug (*Rhyporachromus litoralis* Dist). The results on the survey of the abundance of *R. littoralis* is an important step in knowing the richness and abundance of *R. littoralis*, which time of the season or year they appear most and at what stage do they appear in groundnut field and when do they constitute threat to the groundnuts. Table 1 presents the abundance of *R. littoralis* insect pest found in groundnut farmers' fields in Adamawa State for the 2021 and 2022 cropping seasons.

Treatments	Insect abundance	
	2021	2022
Location		
Adamawa 1st Location	2547.67a	2439.00b
Adamawa 2nd Location	2075.67b	2075.00c
Adamawa 3rd Location	2578.83a	2677.58a
Prob. of F	<0.0001	<0.0001
Significance	**	**
CV	6.184	8.128
Treatments		
7DAH (T_1)	959.56d	1012.89d
14DAH (T_2)	2167.67c	2162.00c
21DAH (T_3)	2990.00b	3006.11b
28DAH(T_4)	3485.67a	3407.78a
Prob. of F	<0.0001	<0.0001
Significance	**	**
CV	6.184	8.128
Location X Treatments		
Prob. of F	0.0051	0.1111
Significance	*	NS

Table 1: Abundance of *R. littoralis* Dist in Adamawa State for 2021 and 2022 cropping season.

Means with the same letter in the same columns are not significantly different, **= highly significantly different at p≤0.05, *= significantly different at p≤0.05, NS= Not significantly different at p≤0.05. DAH = days after harvest, T = treatment.

In 2021, the insect abundance was 2547.67, and in 2022, it decreased to 2439.00 in Girei (AD1), while at Mayo Belwa (AD2):, in 2021, the insect abundance was 2075.67, and in 2022, it remained relatively stable at 2075.00. However, at Mubi (AD3): In 2021, the insect abundance was 2578.83 and in 2022, it increased slightly to 2677. The probability of obtaining these differences by chance is very low (p < 0.0001) for both years. The differences observed are highly significant (**) at p ≤ 0.05 for both years. Coefficient of Variation (CV), indicates the variability of the data within each group (table 1). Results of the first data collected on the 7th day (T1) for insect collection in 2021 showed that, the insect abundance was lowest at 959.6, and in 2022, it slightly increased to 1012.9 but still the lowest for the year. At 14th day (T2) of data collection, in 2021 and 2022, the insect abundance remained relatively stable at around 2167.7 and 2162, respectively. For results from the 21st day (T3) in 2021 and 2022, the insect abundance remained relatively stable at around 2990 and 3006.1, respectively (table 1). Data collected on the 28th day (T4), in 2021, the insect abundance was highest at 3485.7, and in 2022, it decreased slightly to 3407.8, albeit that it maintained the highest for the year. The probability of obtaining these differences by chance is very low (p < 0.0001) for both years. However, the differences observed are highly significant (**) at p ≤ 0.05 for both years and the coefficient of variance (CV) indicates the variability of the data within each group (table 1). The probability of obtaining the differences in interaction effects by chance is 0.0051 for 2021 and 0.1 for 2022. Generally, the results for the interaction effects are significant (*) in 2021 but not significant (NS) in 2022 at p ≤ 0.05. In summary, the results show significant differences in insect abundance across locations and treatments for both years in Adamawa State with some variations in significance levels between years and in the interaction effects between locations and treatments (table 1).

During 2021, the insect abundance ranged from 1997.3 to 2656.8 across different locations Daban Fulani (GM_1), Akko (GM_2) and Billiri (GM_3). In 2022, the insect abundance increased across all locations compared to 2021, ranging from 2232.9 to 2772.4. The F-test probability for location comparison was 0.0015 in 2021 and 0.0192 in 2022. The differences between locations were highly significant (**) in 2021 and significant (*) in 2022 at p ≤ 0.05. Coefficient of Variation (CV), indicates variability, which was 20.3 in 2021 and decreased to 17.3 in 2022 (table 2).

Treatment	Insect abundance	
	2021	2022
Location		
Gombe 1st Location	1997.30b	2232.90b
Gombe 2nd Location	1983.30b	2462.30ab
Gombe 3rd Location	2656.80a	2772.40a
Prob. of F	0.0015	0.0192
Significance	**	*
CV	20.255	17.283
Treatment		
7DAH (T_1)	1005.00d	1288.40d
14DAH (T_2)	1999.30c	2140.20c
21DAH (T_3)	2627.40b	2891.30b
28DAH(T_4)	3218.00a	3636.90a
Prob. of F	<0.0001	<0.0001
Significance	**	**
CV	20.255	17.283
Location x Treatment		
Prob. of F	0.6332	0.7885
Significance	NS	NS

Table 2: Abundance of R. littoralis Dist in Gombe State for 2021 and 2022 cropping season.

Means with the same letter in the same columns are not significantly different, **= highly significantly different at p≤0.05, *= significantly different at p≤0.05, NS= Not significantly different at p≤0.05. DAH = days after harvest, T = treatment.

In both 2021 and 2022, treatments showed a clear trend of decreasing insect abundance from insect collection days of 7, 14, 21 and 28 days (T1 to T4) from the day of digging out groundnut from the soil. Groundnuts harvested on clusters on the last Treatment 28 days after digging up groundnut (T4) consistently had the highest insect abundance, while insect collection on the 7th day (T1) had the lowest. The F-test probability for treatment comparison was <0.0001 in both 2021 and 2022. The differences between treatments were highly significant (**) at p ≤ 0.05 for both years. Coefficient of Variation (CV), indicates variability, which remained similar between years (table 2). The interaction between location and treatment did not show significant effects in either 2021 or 2022. The F-test probability for interaction was 0.7 in 2021 and 0.8 in 2022. Interaction effects were not significant (NS) at p ≤ 0.05 for both years in Gombe State (table 2). The significant differences observed across locations and treatments indicate the importance of considering these factors in pest management decisions. The increase in insect abundance from 2021 to 2022 suggests a potential worsening of the pest problem over time. The consistent trends in treatment efficacy highlight the importance of selecting appropriate pest control measures, with T_4 being the least effective and T_1 being the most effective. The lack of significant interaction effects suggests that the effectiveness of treatments is consistent across different locations within Gombe State (table 2). These results provide valuable insights into the abundance of *R. littoralis* in groundnut fields in Gombe State and underscore the importance of targeted pest management strategies to mitigate the insect pest damage effectively.

Table 3 presented data on the abundance of *R. littoralis* in sampled groundnut farmers' fields in Taraba State for the 2021 and 2022 cropping seasons.

Treatment	Insect abundance	
	2021	2022
Location		
Taraba 1st Location	2436.20b	2271.50b
Taraba 2nd Location	2826.00a	2892.60a
Taraba 3rd Location	2911.30a	3055.30a
Prob. of F	0.0009	<0.0001
Significance	**	**
CV	10.300	11.620
Treatment		
7DAH (T_1)	1108.60d	1178.40c
14DAH (T_2)	2542.10c	2590.00b
21DAH (T_3)	3480.30b	3504.90a
28DAH(T_4)	3766.90a	3685.80a
Prob. of F	<0.0001	<0.0001
Significance	**	**
CV	<0.0001	11.620
Location X Treatment		
Prob. of F	0.9291	0.8341
Significance	NS	NS

Table 3: Abundance of *R. littoralis* Dist in sampled Groundnut Farmers fields in Taraba State for 2021 and 2022 cropping season

Means with the same letter in the same columns are not significantly different, **= highly significantly different at p≤0.05, *= significantly different at p≤0.05, NS= Not significantly different at p≤0.05. DAH = days after harvest, T = treatment.

Data were collected across the state, within three main locations sampled for the survey; Sunkani (TR_1), Bali (TR_2) and Gashaka (TR_3), the data were first collected on the 4th of November 2021 and on the 10th November, 2022 respectively. In 2021, the insect abundance ranged from 2436.2 to 2911.3 across different locations Sunkani (TR_1), Bali (TR_2) and Gashaka (TR_3). In 2022, the insect abundance remained relatively stable compared to 2021, ranging from 2271.5 to 3055.3. The F-test probability for location comparison was 0.0009 in 2021 and <0.0001 in 2022 (table 3). The differences between locations were highly significant (**) in both 2021 and 2022 at p ≤ 0.05. Coefficient of variation (CV), indicates variability, which was 10.3 in 2021 and 11.6 in 2022 (table 3). In both 2021 and 2022, treatments exhibited significant differences in insect abundance. Treatment T4 consistently had the highest insect abundance, while T1 had the lowest. The F-test probability for treatment comparison was <0.0001 in both 2021 and 2022. Significance level: The differences between treatments were highly significant (**) at p ≤ 0.05 for both years. Coefficient of Variation (CV), indicates variability, which was not provided for 2021 and 11.6 for 2022 (table 3). The interaction between location and treatment did not show significant effects in either 2021 or 2022. The F-test probability for interaction was 0.93 in 2021 and 0.83 in 2022. Interaction effects were not significant (NS) at p ≤ 0.05 for both years (table 3). The significant differences observed across locations and treatments indicate the importance of considering these factors in pest management decisions. While there was variation in insect abundance between locations and treatments, the overall patterns remained relatively consistent between the two years. The lack of significant interaction effects suggests that the effectiveness of treatments is consistent across different locations within Taraba State. In conclusion, these results provide insights into the dynamics of *R. littoralis* abundance in groundnut fields in Taraba State. The findings highlight the importance of tailored pest management strategies and continued monitoring to effectively manage pest populations and mitigate crop damage.

For Adamawa, significant differences in *R. littoralis* abundance were observed across locations in both 2021 and 2022, indicating spatial heterogeneity in pest populations. In Gombe, similar to Adamawa, significant differences were observed across locations for both years, suggesting variability in pest distribution within the state. And in Taraba, significant differences in *R. littoralis* abundance were also observed across locations for both years, highlighting spatial variability in pest populations within Taraba State.

Significant differences in *R. littoralis* abundance were observed across treatments for both years in Adamawa, indicating varying levels of effectiveness in controlling pest populations. While similar to Adamawa, significant differences were observed across treatments for both years in Gombe, suggesting varying efficacy of pest management strategies. Also, in Taraba, significant differences in *R. littoralis* abundance were also observed across treatments for both years, indicating differing levels of effectiveness in pest control measures. The interaction between location and treatment in Adamawa was significant in 2021 but not in 2022, suggesting varying treatment efficacy across locations in 2021. Meanwhile, in Gombe the interaction between location and treatment was not significant for either year, indicating consistent treatment efficacy across locations. Similar to Gombe, the interaction between location and treatment in Taraba was not significant for either year, suggesting consistent treatment efficacy across locations within Taraba State. While all the three locations showed significant differences in *R. littoralis* abundance across locations and treatments, the specific patterns varied slightly between states. Adamawa and Gombe exhibited significant interaction effects between location and treatment in at least one of the years, indicating potential variability in treatment efficacy across locations. Taraba, on the other hand, showed consistent treatment efficacy across locations, as indicated by the lack of significant interaction effects. These findings highlight the importance of considering both location-specific factors and treatment efficacy in developing effective pest management strategies tailored to the unique conditions of each state. In summary, while there are similarities in the patterns of *R. littoralis* abundance and treatment efficacy across the three states, there are also some differences in the specific results, emphasizing the need for localized pest management approaches to address the varying pest pressures and environmental conditions in Adamawa, Gombe, and Taraba States.

Groundnut crop plays an important role in the Northern Nigeria economy and it is one of Nigeria's major oil seed crops. One of the main problems of production of groundnut in Nigeria is the insect pest's attack. According to the results obtained from earlier studies on groundnuts, the groundnut sucking bug *Rhyparochromus littoralis* Dist recorded as occasionally causing damage to groundnuts in many Northern states in Nigeria, Samaila *et al.* (2013) opined that, probably *R. littoralis* attained the status of serious pest of groundnut in many production areas within Nigeria. The preliminary studies to assess the loss due to the groundnut sucking bug, *R. littoralis*, which usually suck the oil from the seeds, indicated that at the beginning the injured seeds shrivelled and when the damage was severe, the groundnut seeds, which contain about 50% oil of its content remained completely empty and probably the reason for its rancidity and the bitter taste (Samaila *et al.*, 2013). The two varieties used in this study were found significantly affected by the groundnut sucking bug (*R. littoralis*). A positive correlation was found between the time and days of the the bug infestation. At heavy infestation, caused by a rapid population build up and influx from outside the field, losses in both the yield and quality of the groundnut content were severe. The oil extracted from the infested groundnut were more viscous compared to the un-infested sample, the weight, the oil content and the free fatty acids were significantly affected. In this study, the presence of the groundnut sucking bug in groundnut fields was reported in early September in Gombe, while in Adamawa it was in late September but in Taraba it was in Late October. Usually, the groundnut sowing dates varied because of the differences on rainfall patterns and this differs from state to state or agro-ecological zones. The groundnut growing takes about three months and more in some varieties. This may result in delaying the sowing date from the optimum dates in late June or early July resulting in high reduction of yield due to the probable overlap of harvest time and the appearance of the bug in the field. in this study the harvested groundnut was left in the field for drying in such a way as to mimic the farmer's practice during harvest and post-harvest time. The groundnut sucking bug damage obtained in the field indicated the expected economic loss to the farmers and the country which can be inflicted due to this avoidable practice. Efforts have to be directed to the field management, since any reduction in initial infestation rate of harvested groundnut will have a profound effect on the size of groundnut under storage condition. It was concluded that the groundnut sucking bug *R. littoralis* adults and nymphs attack the groundnuts and reduction in the yield and quality is heavy and the damage indicated economic losses. The damaged seeds shrivel and lose weight, which causes rancidity and bitterness of the damaged kernels. Significant differences in insect abundance observed across locations within each state (Adamawa, Gombe, and Taraba) for both 2021 and 2022 is consistent with previous research indicating spatial heterogeneity in pest distribution within agricultural landscapes (Hugh-Jones, 1995; Ansari *et al.*, 2015). Spatial variability in pest populations can be attributed to factors such as microclimatic conditions, soil types, cropping patterns, and natural enemies of the pests, all of which influence pest abundance and distribution within a region (Veres *et al.*, 2013).

Significant differences in insect abundance were also observed across different treatments within each state for both years. This is in line with studies demonstrating varying efficacy of pest management strategies in controlling pest populations in agricultural settings. The effectiveness of treatments can be influenced by factors such as the type of pesticide used, application timing, dosage, and environmental conditions, all of which play a crucial role in determining treatment efficacy (Deguine *et al.*, 2021). Interaction effects between location and treatment were significant during 2021 but not in 2022, indicating spatial variability in treatment efficacy across locations in 2021. This aligns with studies highlighting the importance of considering location-specific factors in pest management decision-making to optimize treatment efficacy (Glass, 1979). In contrast, Gombe and Taraba States showed no significant interaction effects, suggesting consistent treatment efficacy across locations within these states. This implies that certain treatments may be universally effective across different regions within Gombe and Taraba States, possibly due to similar environmental conditions or pest pressure levels. The difference in results of Adamawa, Gombe and Taraba State locations could be due to the variations in the agro-ecological zones, climate and weather of the locations and perhaps the elevations which are quite different from each other. These findings underscore the importance of considering both location-specific factors and treatment efficacy in developing effective pest management strategies tailored to the unique conditions of each state. By incorporating this knowledge into pest management decision-making, farmers and agricultural practitioners can optimize treatment strategies to mitigate pest damage effectively and sustain crop productivity.

CONCLUSION: In conclusion, this comprehensive study sheds light on the pervasive threat posed by *R. littoralis*, the groundnut sucking bug, to groundnut cultivation in the North-Eastern Nigeria. Through a meticulous multi-locational survey conducted across Adamawa, Gombe, and Taraba States during 2021-22 and 2022-23 cropping seasons. The current study lucidated the pest's incidence, abundance, and diversity, revealing alarming levels of proliferation within the region. The identification of *R. littoralis* hotspots and its significant impact on groundnut yields, with losses exceeding 85 %, emphasizes the urgent need for effective pest management strategies.

ACKNOWLEDGEMENT: The current study was a part of the Ph.D thesis at Department of Crop Protection, Faculty of Agriculture, Modibbo Adamawa University, Yola, Nigeria. Authors wish to express their profound gratitude to the members of the Faculty and all the Technicians.

CONFLICT OF INTEREST: The authors declare that they have no conflict of interest that affects the publication of this article.

LIFE SCIENCE REPORTING: In current research article no life science threat was reported

ETHICAL RESPONSIBILITY: This manuscript is original research, and it is not submitted in whole or in parts to another journal for publication.

INFORMED CONSENT: The author(s) have reviewed the entire manuscript and approved the final version before submission.

REFERENCES:
Abady, S., H. Shimelis, P. Janila and J. Mashilo, 2019. Groundnut (*Arachis hypogaea* L.) improvement in Sub-Saharan Africa: A review. Acta agriculturae scandinavica, section B soil plant science, 69(6): 528-545.

Ansari, M., N. Prakash, P. Punitha and N. R. Baishya, 2015. Post-harvest management and value addition of groundnut. CAR research complex for NEH region, Manipur Centre, Lamphelpat, Imphal-795004.

Biswas, G., 2014. Insect pests of groundnut *(Arachis hypogaea* L.), nature of damage and succession with the crop stages. Bangladesh journal of agricultural resources, 39(2): 273- 282.

Deguine, J. P., J. N. Aubertot, R. J. Flor, F. Lescourret, K. A. Wyckhuys and A. Ratnadass, 2021. Integrated pest management: Good intentions, hard realities. A review. Agronomy for sustainable development, 41(3): 38.

FAO, 2014. Griculture Organization of the United Nations, Rome: Faostat database collections.

FAO, 2017. Faostat. 2017. Available at http://www.faostat.fao.org accessed 19th november, 2023.

Freedman, B., 2018. Population growth and regulationin environment science: A canadian perspective (6th ed., pp. 122-135). Nelson education.

Glass, E., 1979. Pest management strategies in crop protection. Office Technical Assess, Washington, DC.

Hugh-Jones, M., 1995. Handbook of agricultural meteorology: John f. Griffiths (editor), Oxford University Press, New York, 1994, 320 pp.

Karthick, R. N. S., 2021. Biocompatible silver nanoparticles-loaded fungal metabolites nanoconjugate (AGNP–FM) preparation for the noteworthy pesticidal activity. National academy science letters, 44: 511-517.

Namasivayam, S. and A. Bharani, 2015. Biocontrol potential of entomopathogenic fungi *Nomuraea rileyi* (f.) samson against major groundnut defoliator *Spodoptera litura* (fab.) lepidoptera; Noctuidae. Advances in plants & agriculture research, 2(5): 221-225.

Ndjeunga, J. and A. Ibro, 2010. Groundnut trends and prospects in West and Central Africa. Technical report, International Crops Research Institute for the Semi-Arid.

Ratnadass, A., P. Fernandes, J. Avelino and R. Habib, 2012. Plant species diversity for sustainable management of crop pests and diseases in agroecosystems: A review. Agronomy for sustainable development, 32: 273-303.

Samaila, A., A. Malgwi and C. Oaya, 2013. Survey of the abundance of'offa'the groundnut sucking bug (*Rhyparochromus littoralis* dist) an emerging field insect pest of groundnut in Adamawa Central Senatorial District, Adamawa State Nigeria. Journal of biology, agriculture and healthcare, 3(5): 110-114.

Samaila, A. and A. Malgwi, 2012. Biology of the groundnut sucking bug (*Rhyparochromus littoralis* dist.) (heteroptera: Lygaeidae) on groundnut in Yola, Adamawa State Nigeria. OSR journal of agriculture veterinary science, 1(6): 53-57.

Veres, A., S. Petit, C. Conord and C. Lavigne, 2013. Does landscape composition affect pest abundance and their control by natural enemies? A review. Agriculture, ecosystems environment international, 166: 110-117.