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Survey of the Seasonal Distribution of *Spodoptera frugiperda* Smith (Lepidoptera: Noctuidae) in Some Selected Parts of Local Governments of Kano State, Nigeria

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Abstract

The Spodoptera frugiperda Smith (Lepidoptera: Noctuidae), commonly referred to as fall armyworm (FAW), is causing significant losses to maize production in African continent since its detection in 2016. The primary goal was to survey seasonal distribution of FAW in some selected local governments of Kano states, Nigeria. Major maize growing areas in Kura, Garun Malam and Bunkure Local Governments were selected in Kano state. The results show that Kura recorded the highest percentage distribution of egg masses (60%), (50%), (40%) and (40%) in the months of January, February, March and October, 2024, compared to G/malam and Bunkure Local Governments throughout the periods of dry and rainy seasons. Kura also recorded the highest percentage distribution of S. frugiperda larvae (90%), (80%), (60%) and (40%) in the months of January, February, March and June, 2024, compared to Bunkure and G/ malam Local Governments. Therefore, it is clearly concluded that Kura Local Government recorded the highest number of FAW egg masses and larvae throughout the periods of dry and rainy seasons.

Key Words: Fall armyworm, Dry season, Rainy season, Egg mass, Larvae

INTRODUCTION

Maize (*Zea mays* L.) is an important cereal crop cultivated worldwide. It is also one of the most important cultivated crops in Nigeria. Maize forms a major component in the diet of the majority of people and is also a source of raw material for agro-based industries like animal feed production (Iken and Amusa, 2004; Abdulraham and Kolawole, 2006). Maize cultivation in Nigeria cuts across different agro-ecologies including; the forest ecology, derived savannah and the guinea savannah (Olaniyan, 2015). Maize is raw material used in the production of alcohol, starch, oil in the pharmaceutics and recently for fuel production (Ellis *et al*., 1998; Acharya and Young, 2008; Ranum *et al.,* 2014).

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Despite maize being a promising crop that could ameliorate hunger and help to attain food security, there are factors militating against its production, one of which is the problem of insect pests (Sanchez *et al*., 1997).

The *S. frugiperda* is the most important pest worldwide, resulting in considerable yield losses in maize (Abbas *et al*., 2022). In West Africa, it was first detected in Nigeria (Nboyine *et al*., 2020) in early 2016 and then spread throughout sub-Saharan Africa and Southeast Asia. Now, this pest has been spread in more than 109 countries (Abbas *et al*., 2022). The *S. frugiperda* is a devastating pest that damages 186 plant species belonging to 42 families (Abbas *et al*., 2022). Without proper understanding of its distribution pattern and effective control methods, the yields losses are expected to reach 8.3 – 20.6 million tons in 12 main African corn – producing countries including Nigeria (Day *et al*., 2017). Therefore, the present study was conducted to survey the seasonal distribution of fall armyworm in some selected parts of Local Governments of Kano state. This will serve as baseline for the small scale farmers to develop an effective control strategy against fall armyworm especially in a period of higher infestation and damages.

MATERIALS AND METHODS

Study Site

A field study was conducted in some maize field of Kura, G/malam and Bunkure Local Governments of Kano state, in dry and rainy seasons.

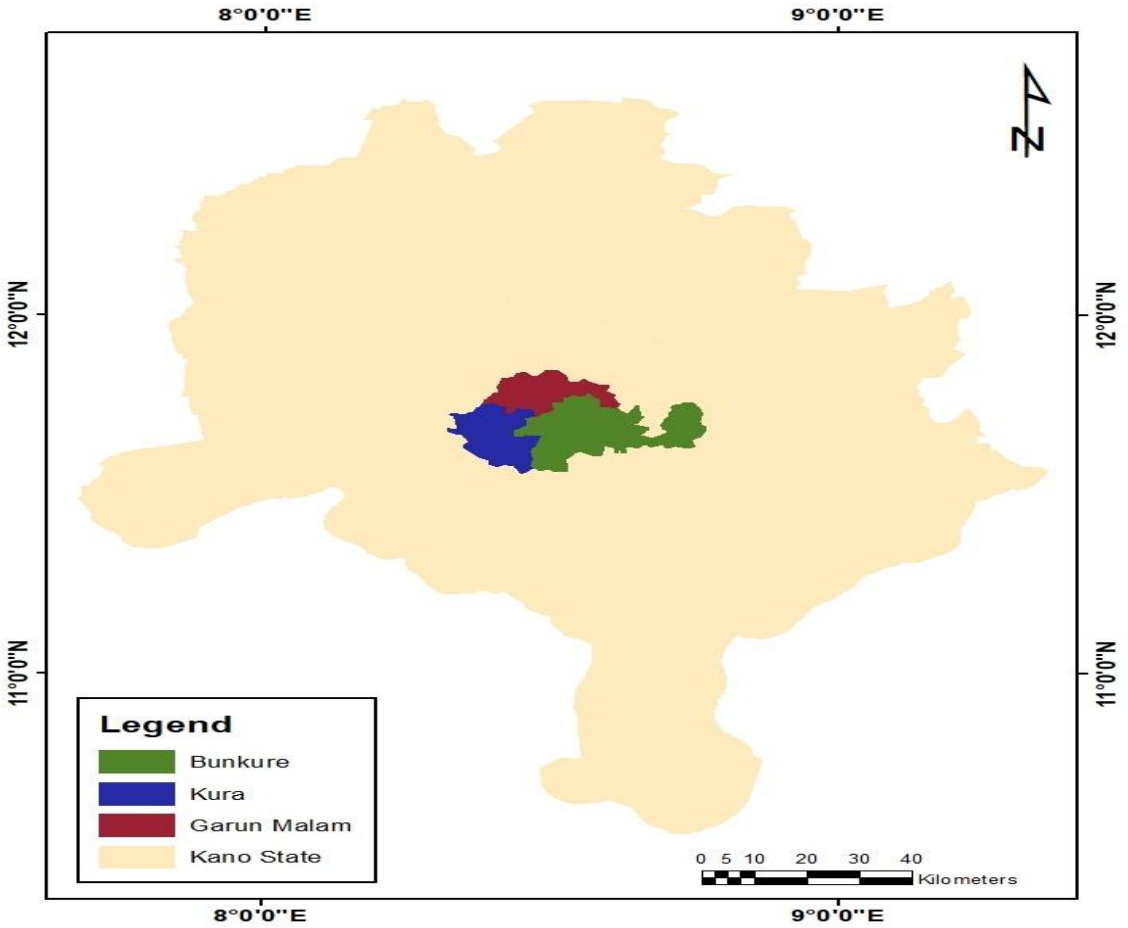

Fig. 1: Map of Kano state showing study sites of Kura, G/malam and Bunkure Local Governments.

Collection, Identification and Rearing of Fall Armyworm (Larvae)
The larvae used for the present study were collected by handpicking and beat sampling techniques (Sule *et al*., 2020) in some maize farms of Kura LGA of Kano state, and these were transported to the Laboratory for rearing and identification. The collected larvae were reared to the adult stage following the procedure described by Kliter **et *al***, (2000). The fall armyworm was identified using taxonomic guide provided by Kiran and Kamana, (2019).

Survey of the Seasonal Distribution of fall armyworm in Some Major Maize Growing Areas of Kura, G/malam and Bunkure Local Governments of Kano State
The field survey of the distribution of fall armyworm was carried out from January to May (dry season), and in June to October (rainy season), 2024. Major maize growing areas in Bunkure, Kura and G/malam were selected in Kano state. Maize fields from these places were visited and surveyed twice monthly in both dry and rainy seasons respectively. Maize fields were selected using referral method (Albasini *et al*., 2020). Only fields with at least 100 plants were selected and in each field, 10 plants were randomly selected in "W" pattern to check for the presence of *S. frugiperda* egg masses and larvae (Albasini *et al*., 2020). Maize leaves both at upper and lower surfaces were carefully inspected. The number of egg masses and larvae present in each field was assessed, counted and recorded. The insecticide-sprayed fields were excluded from the survey.

Data Analysis
All data obtained was subjected to descriptive statistics by percentages and analysis of variance.

RESULTS
The monthly distribution of *S. frugiperda* egg masses in Kura, G/malam and Bunkure Local Governments of Kano State, during dry and rainy seasons is presented in Figure 1. The result shows that highest percentage distribution of egg masses (60%), (50%), (40%) and (40%) were recorded in Kura in the months of January, February, March and October, 2024, compared to G/malam and Bunkure Local Governments which recorded lower percentage distribution of egg masses throughout the period of dry and rainy seasons.

The monthly distribution of *S. frugiperda* larvae in Kura, G/malam and Bunkure Local Governments of Kano State, during dry and rainy seasons is presented in Figure 2 below. The result shows that highest percentage distribution of larvae (90%), (80%), (60%) and (50%) were recorded in Kura in the months of January, February, March and April, 2024, compared to G/malam and Bunkure Local Governments which recorded lower percentage distribution of larvae throughout the period of dry and rainy seasons.

The distribution of fall armyworm egg masses between dry and rainy seasons in Kano state is presented in Table 1. The result reveals that significant mean number of egg masses (3.47) was recorded during dry season compared to rainy season which recorded lower mean number of egg masses (1.73).

The distribution of fall armyworm larvae between dry and rainy seasons in Kano state is presented in Table 2. The result reveals that significant mean number of larvae (4.93) was recorded during dry season compared to rainy season which recorded lower mean number of larvae (2.27).

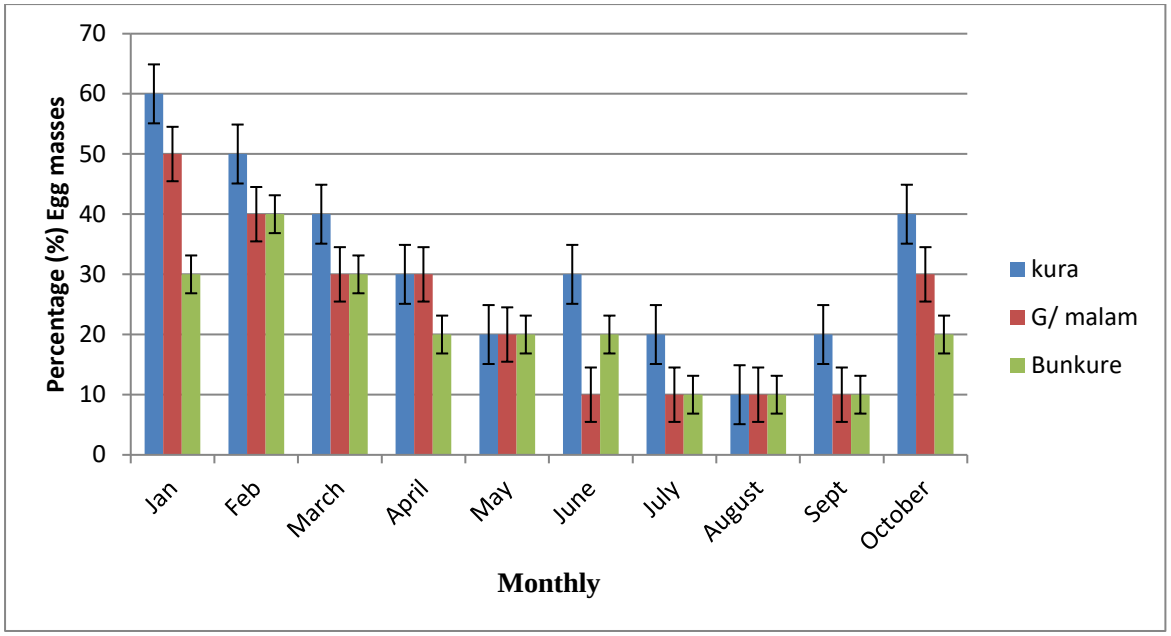

Fig 1: Monthly Distribution of fall armyworm egg masses in Kura, G/malam and Bunkure Local Government of Kano state during Dry and Rainy Season.

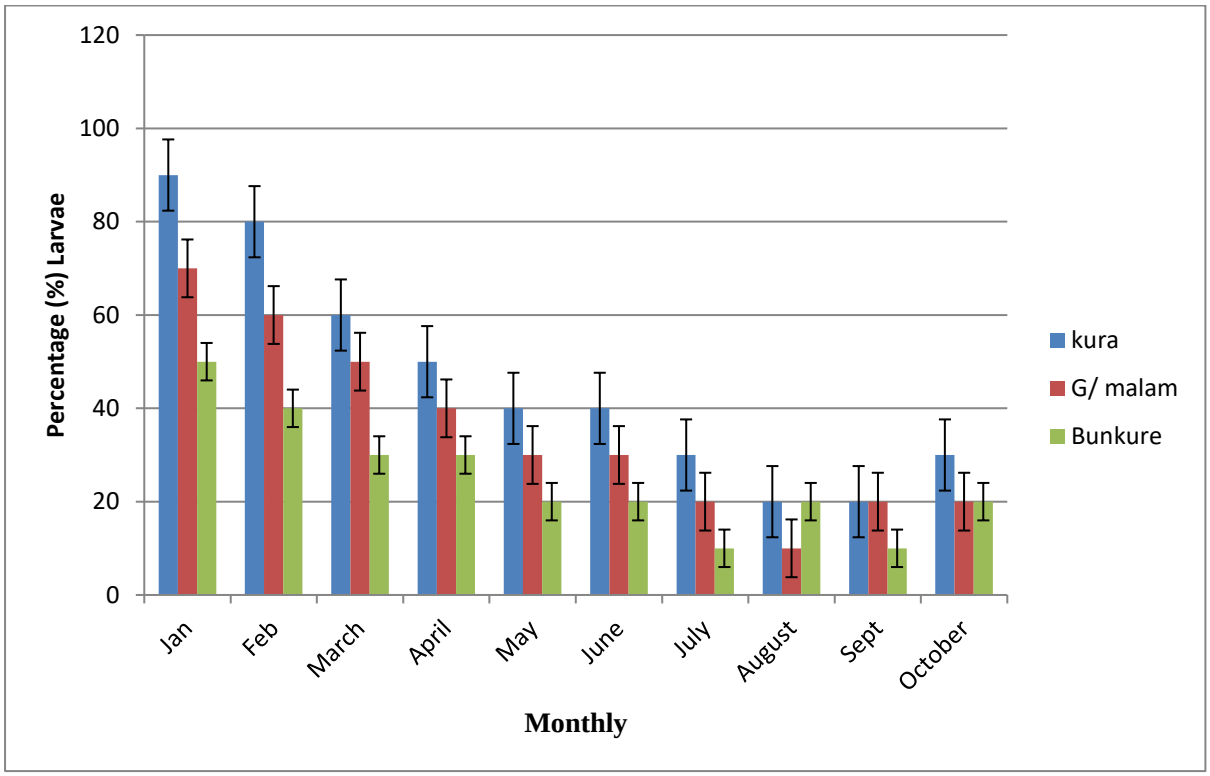

Fig 2: Monthly Distribution of fall armyworm Larvae in Kura, G/malam and Bunkure Local Government of Kano state during Dry and Rainy Season.

Table 1: Distribution of fall armyworm egg masses during dry and rainy seasons in Kano state

Seasons	Kano
Dry	3.47[b]
Rainy	1.73[a]

Mean followed by different letters in same column are significantly different at p = 0.05 level of probability according to Least Significant Difference (LSD) test.

Table 2: Distribution of fall armyworm larvae during dry and rainy seasons in Kano state

Seasons	Kano
Dry	4.93[b]
Rainy	2.27[a]

Mean followed by different letters in same column are significantly different at p = 0.05 level of probability according to Least Significant Difference (LSD) test.

DISCUSSION

The distribution of fall armyworm was found to be higher in Kura compared to G/malam and Bunkure Local Governments in both dry and rainy season respectively. Highest significant mean number of fall armyworm egg masses and larvae were recorded in dry season compared to rainy season. This could be attributed to a variety of factors, including differences in rain fall, climatic conditions, size of the farmlands, number of maize plants planted and the types of cropping system.

These findings are consistent with earlier research conducted by Albasini *et al*., (2020), who reported that rainfall was a key factor influencing the differences observed in the number of fall armyworm egg masses and larvae between the seasons.

Similarly, García, *et al*., (2017) and González-Moreno, *et al*., (2018), suggested that the population density of fall armyworm is negatively influenced by pluviometric conditions because when the maize whorl is filled up with water, the egg masses and larvae are washed off onto the ground, reducing by consequence, the pest population, which is in agreement with the present findings. Furthermore, they reported that the dynamics of fall armyworm seems to be more influenced by the prevailing climatic conditions rather than by the number of maize fields available.

CONCLUSION

In conclusion, this study has provided basic information on the distribution of fall armyworms in Kura, G/malam and Bunkure Local Governments of Kano state. The abundance of fall armyworm egg masses and larvae were found to be higher in Kura than in G/malam and Bunkure Local Governments in both dry and rainy seasons respectively. Generally, the number of fall armyworm egg masses and larvae were found to be significantly higher in dry season than in rainy season. The present research is therefore recommended that

farmers are to develop an effective control strategy especially during dry cropping season to overcome the problems of food shortage across the country.

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