# A Survey of incidence and severity of pests and diseases of okra (*Abelmoschus esculentus* L. Moench) and egg plant (*Solanum melongena* L.) in Abuja, Nigeria

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**Abstract**

The incidence and severity of field pests and diseases of okra and eggplant cultivated in the Federal Capital Territory (FCT) Abuja, Nigeria farms was investigated. Questionnaires were administered to the farmers of the two crops in order to collect their biodata. It was shown that the age of the farmers were within the active workforce of 31- 40 years) and about 43% of them, either attempted or completed secondary school education. The mean incidence of grasshopper in okra and eggplant farms fall within a mean of 13% and 24.1% respectively and were significantly ($p<0.05$) higher than other pests in the surveyed Area. Leaf spot disease of okra and eggplant had the highest mean incidence of 23.8% and 21.5% respectively. Yellow mosaic disease showed the highest severity level of infection in both crops. The present study provides an indication of incidence and severity of pests and diseases of okra and eggplant on which strategies could be derived to ameliorate them in the FCT, Abuja, Nigeria.

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## 1. Introduction

Okra (*Abelmoschus esculentus* [L. Moench]) is an important fruit vegetable in the tropics including Nigeria. Young fruits are consumed fresh or cooked. Okra is a good source of Vitamin A, B, C and protein, carbohydrate, fats, minerals, iron and iodine (Jha and Dubey, 1998). The mucilage from okra is suitable for industrial and medicinal application (Akinyele and Yemikotan, 2007) and could be applied as plasma replacement or blood volume expander (Arapitsas, 2008). The leaf buds and flowers are also edible (Doijode, 2001). The seed when roasted and ground can be used as coffee additive or substitute (Moekchantuk and Kumar, 2004).

Eggplant (*Solanum melongena*) (L) also known as garden egg is one the most important fruit vegetable crops in West Africa (Owusu-Ansah *et al.*, 2001; Norman *et al.*, 1992; Hanson *et al.*, 2006). Eggplant contains nutrients such as dietary fiber, folate, ascorbic acid, vitamin K, niacin, vitamin B6, pantothenic acid, potassium, iron, magnesium, manganese, phosphorus, and copper (USDA, 2009).

Pests and diseases such as flea beetle, cotton stainer, aphids, thrips, grasshopper, and diseases include leaf spot, bacterial wilt, root-knot nematode, powdery mildew and early blight are associated with okra (Kucharek, 2004). Shivalingaswamy and Satpathy (2007) reported that in the tropics, eggplant production is severely constrained by several insect pests such as shoot borer, flea beetle, leaf hopper, whitefly, thrips, aphids, spotted beetles, leaf roller, cotton stainer, blister beetle and spider mite. Usman (2004) reported that if the pests and diseases of fruit vegetables are not properly managed, it could have an economic impact on the level of production by reducing crop yield, quality and subsequently low return. The objective of this research was to identify the common pests and diseases found on eggplant and okra and also to assess the incidence and severity of pests and diseases of okra and eggplant in Abuja, Nigeria.

## 2. Materials and Methods

### 2.1 Study Location

The research work was carried out in the Federal Capital Territory (FCT) Abuja, Nigeria with a total land Area of 713km$^2$ situated between Lat. 9$^o$ 4'N and Long. 7$^o$ 29'E Abuja is made up of six Area Councils is as shown in Fig. 1. The survey was however restricted to five Area Councils namely: Abuja Municipal, Bwari, Gwagwalada, Kuje and Kwali. The primary occupation of the inhabitants was mostly farming except in Abuja Municipal.

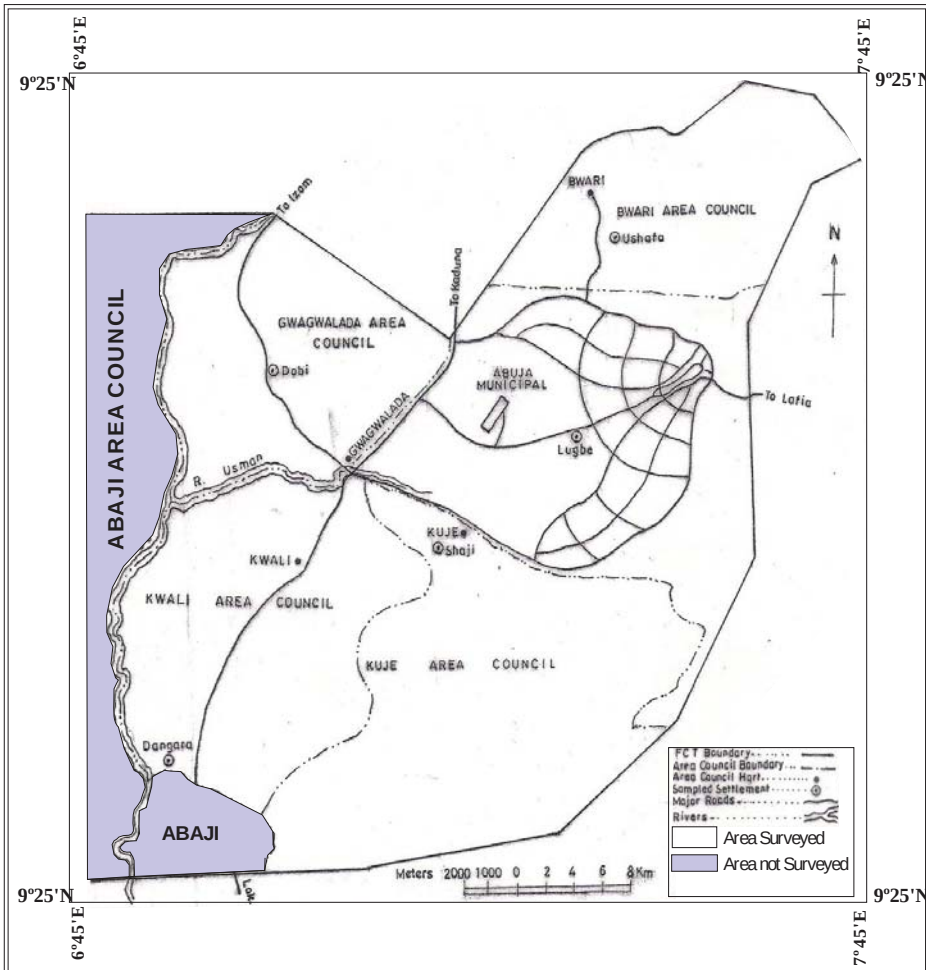


**Fig. 1 Map of the surveyed Area.**

**(**Source: Dept. of Planning & Survey, FCDA, Abuja)

### 2.2 Data collection

In the months of June to November 2012, a total of 120 farms of okra and eggplant in four villages each from the five Area Councils of the FCT, Abuja were visited for this study. Pest and disease incidence and severity were visually- rated on their farms. From each farm visited, incidence of a pest or disease observed was assessed from three locations each involving five stands of okra and eggplant excluding those plants in the border lines (Enikuomehin and Peter, 2002).

The formulae shown as follows were used for estimations:

$$disease\ incidence = \frac{number\ of\ diseased\ plant\ x\ 100}{total\ number\ of\ samped\ plant}$$

$$disease\ severity = \frac{area\ of\ tissue\ affected}{total\ area\ of\ tissue}$$

(Berger, 1980)

A total of 120 questionnaires were also administered to the farmers in order to obtain details concerning their bio data such as age, sex, educational background and the extent of their knowledge of pests and diseases of okra and eggplant. Five farmers each out of the respondents from each Area Council were personally interviewed and sometimes with the help of an interpreter.

The respondents were served with pictorial print out of pests and diseases of vegetable to acquaint them with pests and/or disease that could be observed on their farms.

**Grasshopper and flea beetle damage rating/visual severity score**

Grasshopper and flea beetle severity was estimated using the visual rating scale of 1 – 5 per individual plant; where 1 = 0 – 20% of foliage consumed, 2 = 21 – 40% of foliage consumed, 3 = 41 – 60% of foliage consumed, 4 = 61 – 80% of foliage consumed and 5 = 81 – 100% of foliage consumed.

**Aphids and whitefly damage rating**

The assessment of severity by these insect pests was done as per the 1-4 scale by Nagrare *et al.*, (2011) as follows: Grade 1: Scattered appearance of few aphids/ whitefly on the plant; Grade 2: Severe infestation of aphids on any one branch of the plant; Grade 3: Severe infestation of aphids on more than one branch or half portion of the plant; and Grade 4: Severe infestation of aphids on the whole plant.

**Stray animal damage rating**

The severity of stray animal was estimated using the visual rating scale of 1 – 4 per individual plant as follows: Grade 1: Few damage on the leaf of the plant by stray animal; Grade 2: Moderate damage on a branch of the plant; Grade 3: Severe damage on more than one branch of the plant. and Grade 4: Severe damage on the whole plant (Stray animal guide, 2010).

**Cercospora leaf spot blight and anthracnose disease**

The modified rating of Enikuomehin *et al.* (2002) of these two diseases was adopted as follows: 1 = No disease (No trace of infection) 2 = Trace infection (small lesions on upper and lower leaves); 3 = Slight infection (small lesions on upper and lower leaves); 4 = Moderate infection (Advanced lesions on upper and or lower leaves, with or without new infections on petiole); and 5 = Very severe infection (Advanced lesions on upper and lower leaves, buds and petioles characterized by a dark to dark-brown spot with a whitish to straw-coloured or perforated centre).

**Mosaic disease rating**

Disease severity on plants was assessed by rating the symptoms expressed on six top most leaves of one shoot per plant. The rating method was based on a score of 1 - 5 where: 1 = No symptoms observed; 2 = Mild chlorotic pattern over entire leaflets or mild distortion only at base of leaflets with the rest of the leaflets appearing green and healthy; 3 = Conspicuous mosaic pattern throughout leaf, narrowing and distortion of two thirds of leaflets and general reduction of leaf size; and 5 = Severe mosaic, distortion of four-fifth of leaves, twisted and malformed leaves (Hahn *et al*., 1980).

**Powdery mildew rating**

The percentage of each foliar disease severity was recorded by employing disease severity scale from 0 to 4 according to Cohen *et al.,* (2009) was followed, whereas: 0 = No leaf lesions; 1 = 25% or less; 2 = 26 – 50%; 3 = 51 – 75% and 4 = 76 – 100% infected Area of plant leaf.

**Wilt disease rating**

A scale of 1 to 5 was used to assess disease severity in which: 1 = Leaf of healthy plants inspected; 2 = Epinasty or wilted leaf without chlorosis; 3 = One or several slightly chlorotic bands on the leaf; 4 = Chlorotic bands over the entire surface of the leaf or chlorotic bands with a necrotic centre and 5 = Complete necrosis or death of the leaf (Beye and Lafay, 1985).

## 2.3 Statistical Analysis

The data collected were described by frequency tables, percentages and graphs. They were also subjected to ANOVA and separation of treatment means was computed with Duncan Multiple Range Test (DMRT) using SPSS package version 16.

## 3. Results

### 3.1 Age of farmers of okra and eggplant in Abuja, Nigeria

The highest percentage age group of the farmers (43.0%) was between 31 and 40 years and the least (7.80%) was between 51 and above (Fig. 2).

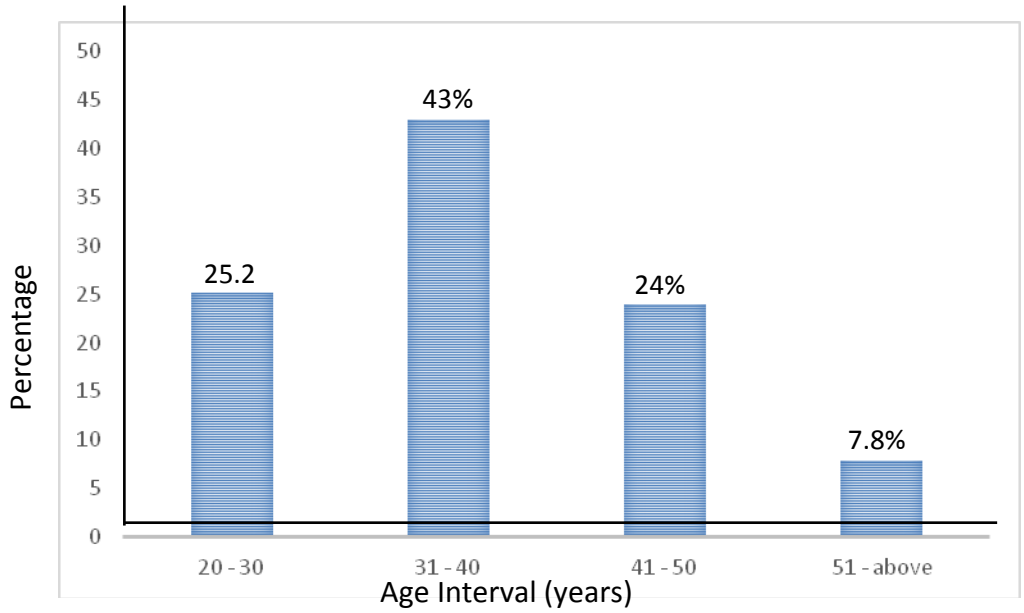


**Fig 2: Age group of okra and eggplant farmers in Abuja.**

### 3.2 Sex Distribution of Okra and Eggplant Farmers in Abuja

Fig. 3 showed that 71.3% of the okra and eggplant farmers in the five Area Council of Abuja were males and most of them were married. Most of the women worked with their husbands on the family farms.

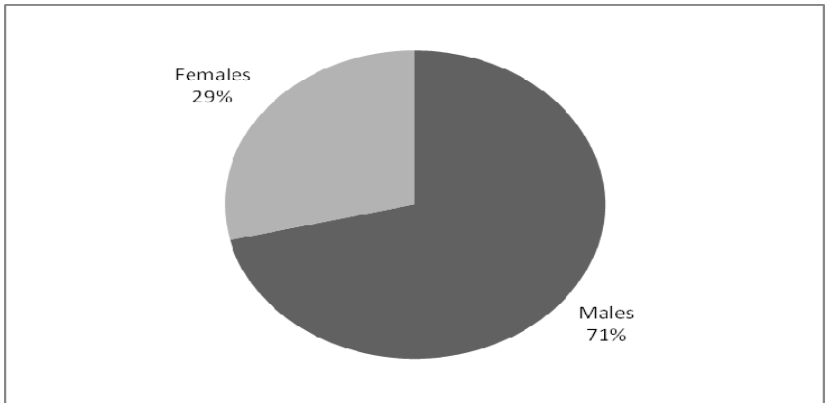


**Fig. 3: Educational Distribution of Okra and Eggplant Farmers in Abuja.**

Fig. 4 shows that, 23.5% of the okra and eggplant farmers did not have formal education, 43.5% had secondary school education while only 7.8% had tertiary level of education.

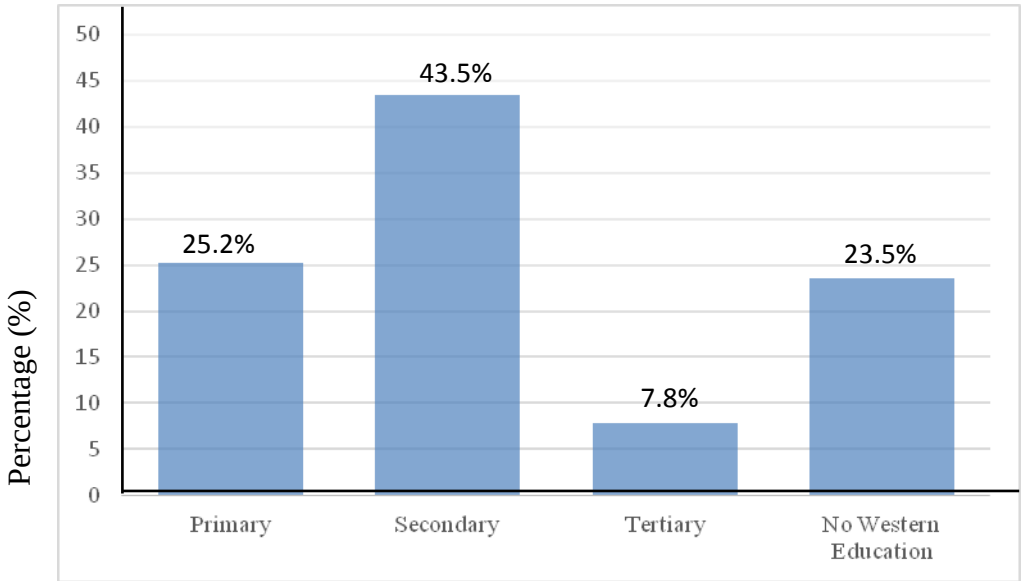


**Fig. 4: Educational Level of Abuja Okra and Eggplant Farmers.**

### 3.3 Incidence and Severity of Pests of Okra and Eggplants

#### a. Incidence and severity of Flea beetle

The incidence of flea beetle on okra in Kuje Area Council was significantly ($p$<0.05) higher than in other Area Councils with the least incidence recorded in Kwali Area Council (Table 1). However, severity of damage was slight throughout the Area Councils except in Bwari where it was moderate. The incidence of the pest on eggplant was significantly (p<0.05) higher in AMAC and with a slight damage recorded throughout the Area Councils surveyed.

**Table 1: Incidence and severity of flea beetle in okra and eggplant farms in the FCT, Abuja, Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| Bwari | 15.0c | 3 | 7.5d | 2 |
| AMAC | 28.0b | 2 | 26.7a | 2 |
| Gwagwalada | 27.3b | 2 | 12.5b | 2 |
| Kuje | 30.9a | 2 | 12.5b | 2 |
| Kwali | 13.0d | 2 | 10.5c | 2 |
| Mean (FCT) | 22.8 | | 13.9 | |

2 = Slight damage 3 = Moderate damage . Means with the same letters along the column are not significantly different ($p>0.05$) as analyzed by Duncan Multiple Range Test (DMRT).

### b. Incidence and severity of Aphids

As shown in Table 2, there was no significant difference ($p>0.05$) between the incidence of aphids on okra in Gwagwalada and Kwali Area Council. There was also no significant ($p<0.05$) difference in incidence of aphids incidence on eggplant farm in AMAC and Bwari. Generally, the least incidence was recorded in Kuje on both okra and eggplant. Severity of damage was slight in all the surveyed Area Councils.

**Table 2: Incidence and severity of aphids in okra and eggplant farms in the FCT, Abuja, Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| AMAC | 1.7c | 2 | 15.0a | 2 |
| Bwari | 11.0b | 2 | 13.3a | 2 |
| Gwagwalada | 20.0a | 2 | 3.0c | 2 |
| Kuje | 1.0c | 2 | 2.0c | 2 |
| Kwali | 18.3a | 2 | 10.0b | 2 |
| Mean (FCT) | 10.4 | | 8.1 | |

2 = Slight Damage ; 3 = Moderate Damage. Means with the same letters along the column are not significantly different ($p>0.05$) as analyzed by DMRT.

### c. Incidence and severity of Grasshopper

Grasshopper incidence was significantly ($p<0.05$) higher in Gwagwalada than other Area Councils while the least incidence was observed in AMAC and Kwali on both their okra and eggplant farms. The mean incidence of grasshopper in okra and eggplant farms in the FCT Abuja were 13.0 and 24.1% respectively. Severity of damage varies from slight to moderate infection (Table 3).

**Table 3: Incidence and severity of grasshopper in okra and eggplant farm in the FCT, Abuja, Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| AMAC | 5.0d | 3 | 17.2d | 4 |
| Bwari | 8.3c | 3 | 32.5b | 4 |
| Gwagwalada | 33.8a | 3 | 43.3a | 3 |
| Kuje | 10.0b | 3 | 20.0c | 3 |
| Kwali | 8.0c | 3 | 7.5e | 3 |
| Mean (FCT) | 13.0 | | 24.1 | |

2 = Slight Damage ; 3 = Moderate Damage . Means with the same letters along the column are not significantly different (p>0.05) as analyzed by DMRT.

**d. Incidence and severity of Fruit worm**

The incidence of fruit worm was significantly ($p$<0.05) higher in Gwagwalada on okra and eggplant than in other Area Councils. Thus the least incidence was recorded in Bwari Area Council on both okra and eggplant farms (Table 4).

**Table 4: Incidence and severity of fruit worm in okra and eggplant farm in the FCT, Abuja Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| AMAC | 4.1b | 2 | 2.0c | 2 |
| Bwari | 1.0c | 2 | 1.7d | 2 |
| Gwagwalada | 10.0a | 2 | 7.5a | 2 |
| Kuje | 2.0c | 2 | 7.5a | 2 |
| Kwali | 1.7c | 2 | 6.3b | 2 |
| Mean (FCT) | 3.3 | | 5.0 | |

2 = Slight Damage (2); 3 = Moderate Damage . Data is a mean of three replicates. Means with the same letters along the column are not significantly different (p>0.05) as analyzed by DMRT..

**e. Incidence and severity of Whiteflies**

The incidence of whiteflies was significantly (p<0.05) higher on okra and eggplant farms in AMAC and the least incidence was observed in Gwagwalada. There was moderate severity of damage by the white flies on okra in AMAC and in Kuje on eggplant farms in Kwali Area Council. (Table 5).

**Table 5: Incidence and severity of whiteflies in okra and eggplant farms in the FCT, Abuja, Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| Kwali | 7.5c | 3 | 5.0c | 2 |
| AMAC | 20.0a | 2 | 13.8a | 2 |
| Bwari | 5.0d | 2 | 1.3d | 2 |
| Gwagwalada | 1.0e | 2 | 1.3d | 2 |
| Kuje | 10.0b | 2 | 11.7b | 2 |
| Mean (FCT) | 8.7 | | 6.6 | |

2 = Slight Damage ; 3 = Moderate Damage . Data is a mean of three replicates. Means with the same letters along the column are not significantly different ($p>0.05$) as analyzed by DMRT.

### f. Incidence and severity stray animals

In addition to the common pests of okra and eggplant in the five Area Councils surveyed, straying animals such as cattle and goat were also observed. The incidence of these straying animals on okra farms was significantly ($p<0.05$) higher in Gwagwalada and with the least incidence in AMAC. For the eggplant farms, the highest incidence was in Kwali with a moderate severity of damage (Table 6).

**Table 6: Incidence and severity of straying animal in okra and eggplant farms in the FCT, Abuja, Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| Gwagwalada | 25.0a | 2 | 5.0d | 1 |
| Kwali | 10.0b | 1 | 17.5a | 2 |
| AMAC | 2.5d | 0 | 10.c | 1 |
| Bwari | 5.0c | 1 | 15.0b | 1 |
| Kuje | 8.8b | 1 | 7.9cd | 1 |
| Mean (FCT) | 10.3 | | 10.3 | |

1 = few damage on leaf ; 2 = Moderate damage . Means with the same letters along the column are not significantly different ($p>0.05$) as analyzed by DMRT.

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### 3.4 Incidence and Severity of Diseases on Okra and Eggplant

#### a. Incidence and severity of Leaf spot

The incidence of leaf spot was significantly ($p< 0.05$) higher in Kwali and Gwagwalada then other Area Councils. However, moderate severity of the diseases was observed in Bwari and Kwali. The leaf disease incidence on eggplant ranged between 10.0 and 33.3% in the Area Councils with the the maximum incidence (33.3%) recorded on the farms in AMAC. Leaf spot severity was moderate on Bwari and Gwagwalada and slight symptoms were observed in other Area Councils (Table 7).

**Table 7: Incidence and severity of leaf spot in Okra and eggplant farms in the FCT, Abuja, Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| AMAC | 16.7c | 2 | 33.3a | 2 |
| Bwari | 26.0b | 3 | 16.7d | 3 |
| Gwagwalada | 29.2a | 3 | 25.0b | 2 |
| Kuje | 16.0c | 2 | 10.0e | 2 |
| Kwali | 31.3a | 3 | 22.5c | 2 |
| Mean (FCT) | 23.8 | | 21.5 | |

2 = Slight infection ; 3= Moderate infection.. Means with the same letters along the column are significantly different ($p>0.05$) as analyzed by DMRT..

#### b. Incidence and Severity of yellow mosaic disease

The average of incidence of yellow mosaic disease incidence in the FCT Abuja was relatively lower and eggplant (3.0%) than in okra (12.7%). The severity of the mosaic disease in okra farms was moderately severe in Kuje and Kwali and slight in other Area Councils. However, on the egg plant farms, mosaic disease was only slight in all the Area Councils (Table 8).

**Table 8: Incidence and severity of yellow Mosaic on okra and eggplant farms in the FCT, Abuja, Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| Kuje | 13.3b | 3 | 2.0b | 2 |
| Kwali | 18.3a | 3 | 1.0b | 2 |
| AMAC | 6.7d | 2 | 5.0a | 2 |
| Bwari | 11.7c | 2 | 5.0a | 2 |
| Gwagwalada | 13.3b | 2 | 2.0b | 2 |
| Mean (FCT) | 12.7 | | 3.0 | |

2= Slight infection ; 3 = Moderate infection . Means with the same letters along the column are not significantly different ($p>0.05$) as analyzed by DMRT..

**c. Incidence and severity of Anthracnose**

There was no significant difference ($p$>0.05) between the incidence of anthracnose in AMAC and Bwari on okra farm. In eggplant farms, incidence of anthracnose was significantly ($p$<0.05) higher in Kuje Area Council but with slight severity of infection AMAC had the highest level of severity of anthracnose on their egg plant farms (Table 9).

**Table 9: Incidence and severity of Anthracnose in okra and eggplant field in the FCT, Abuja Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| AMAC | 5.0a | 2 | 22.5c | 3 |
| Bwari | 4.0a | 2 | 25.0b | 2 |
| Gwagwalada | 1.7b | 2 | 1.7d | 2 |
| Kuje | 2.0b | 2 | 26.7a | 2 |
| Kwali | 2.0b | 3 | 2.0d | 2 |
| Mean (FCT) | 2.9 | | 15.6 | |

2 = Slight infection ; 3 = Moderate infection . Means with the same letters along the column are not significantly different (p>0.05) as analyzed by DMRT..

**d. Incidence and severity of Powdery mildew**

The incidence of powdery mildew on okra farms in Kuje and Kwali was significantly ($p$<0.05) lower than in other Area Councils with a moderate infection in Gwagwalada (Table 10). There was no significant ($p$>0.05) difference in the severity of powdery mildew on eggplant farms.

**Table 10: Incidence and severity of powdery mildew on okra and eggplant farm in the FCT, Abuja, Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| Gwagwalada | 20.0a | 3 | 7.5d | 2 |
| AMAC | 10.0b | 2 | 27.2b | 2 |
| Bwari | 8.3c | 2 | 17.2c | 2 |
| Kuje | 1.0d | 2 | 38.3a | 2 |
| Kwali | 1.0d | 2 | 36.0a | 2 |
| Mean (FCT) | 8.1 | | 27.2 | |

2 = Slight infection; 3 = Moderate infection. Means with the same letters along the column are not significantly different (p>0.05) as analyzed by DMRT.

**e. Incidence and severity of bacterial wilt disease**

The incidence and severity of bacterial wilt on okra in AMAC and Bwari Area Councils was significantly ($p$<0.05) higher than other Area Councils. Farms in Kwali Area Council had the least incidence and severity rate of the wilt infection (Table 11).

**Table 11: Incidence and severity of Bacteria wilt in okra and eggplant farm in the FCT, Abuja, Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| Kwali | 1.3c | 3 | 1.3b | 2 |
| AMAC | 20.0a | 2 | 2.3b | 2 |
| Bwari | 21.3a | 2 | 25.0a | 2 |
| Gwagwalada | 16.0b | 2 | 2.0b | 2 |
| Kuje | 2.0c | 2 | 1.3b | 2 |
| Mean (FCT) | 12.1 | | 6.2 | |

2= Slight infection; 3 = Moderate infection. Means with the same letters along the column are not significantly different (p>0.05) as analyzed by DMRT.

**f. Incidence and severity of Early blight disease**

The incidence of early blight on okra in Kwali was significantly (p<0.05) higher than other Area Councils surveyed. There was no significant ($p$>0.05) difference in the incidence of early blight in AMAC and Kuje Area Councils (Table 12). On eggplant, the incidence in Kuje was significantly ($p$<0.05) higher than other Area Councils. The highest severity rate of infection (moderate infection) was recorded in Kuje Area Council on both okra and eggplant.

**Table 12: Incidence and severity of early blight in okra and eggplant field in the FCT, Abuja, Nigeria**

| | Okra | | Eggplant | |
|---|---|---|---|---|
| **Area Council** | **Incidence (%)** | **Severity** | **Incidence (%)** | **Severity** |
| AMAC | 10.0b | 3 | 15.0b | 3 |
| Bwari | 1.3d | 3 | 2.0c | 3 |
| Gwagwalada | 5.0c | 3 | 1.3c | 3 |
| Kwali | 15.0a | 3 | 15.0b | 3 |
| Kuje | 10.0b | 4 | 20.0a | 4 |
| Mean (FCT) | 8.3 | | 10.7 | |

2 = Slight infection; 3 = Moderate infection. Means with the same letters along the column are not significantly different (p>0.05) as analyzed by DMRT.

**4. Discussion**

Over 60% of the farmers in Abuja are ignorant of the presence of pests and diseases on their farms, hence there is need for proper education in order to assist the farmers to take preventive steps. Anjorin and Salako (2010) reported that the introduction of effective agricultural extension agents and Crop Diseases Clinics (CDC) the FCT Abuja and other States by the Government will go along way in solving crop pests and diseases among the farmers.

The incidence and severity of insect pests on okra and eggplant farms in the FCT Abuja ranged from being moderate to none. Berry (1998), observed that the two crops are tolerant to most insect pest especially during wet season because of the profuse growth of foliage. The high incidence of flea beetle on okra farms in Kuje Area Council agreed with the report of Ogbalu and Ekweozor, (2002) that flea beetle is the major insect pests of okra with similar numbers of insects per plant in South South zone of Nigeria

Aldyhim and Khalil (1993) reported that the season and temperature variation have major effects in the abundance of aphid population because they play a major role in reproductive ability and mortality of aphids. The presence of many alternative hosts for breeding of aphids may have affected the low aphid populations in most of the surveyed Area Councils. The survey revealed that grasshopper incidence was high in Bwari Area Council. Kemp and Berry (2001) observed that high temperature and population dynamics affect the level of infestation.

The most likely cause of the observed damage by stray animals could be due to lack of hedges or fencing of close farms and gardens to farmers homes. Kitts (2009) said that increasing incidence of stray animals has could become a major problem for crop farmers often resulting in significant losses in Saskatchewan.

Powdery mildew occurred in all the surveyed Area Councils in both okra and eggplant farms but with low severity of infection. Singh (2005) reported that the fungus that causes the disease can sporulate and cause infection in a very dry as well as wet atmosphere but infection increases with increase in atmospheric humidity. Bacterial wilt occurred in FCT Abuja with relatively low incidence rates in both okra and eggplant field. Kumar and Sood (2001) reported that application of super phosphate fertilizer increases the disease while nitrogen fertilizer suppresses it. Farmers in the FCT-Abuja experienced wide spread of early blight disease in Okra and eggplant fields. Singh (2005) reported that early blight caused by *Alternaria solani* is free from inhibitions caused by weather conditions and occurs in cool as well as warm Areas.

**Conclusion**

The outcome of this study will serve as a guide to the farmers when planning for their fruit vegetable production and protection strategies. It should be noted that the pests and diseases observed in this study may prompt immediate control but should be noted that only those that cause severe or moderate damage or infection to the crop that are to be controlled while those with slight damages should be well managed. The cost of controlling the pests and diseases should not be more than the economic benefit to be derived from such control. The vegetable farmers should be educated on integrated pests and diseases management approaches that can incorporate all known measures comprising of cultural practices, biological measures and the use of approved chemicals with little or no residual effects on the crop and consumers of the crops.

**References**


1. Anjorin, S.T. and E.A. Salako (2010). Necessity and Challenges of Plant Disease Clinics in Niger State, Nigeria. *International Journal of Agricultural and Rural Development 1*(1):84-92

2. Arapitsas, P. (2008). Identification and Quantification of polyphenolic Compounds from okra seeds and skin. *Food Chemical* 110:pp1041-1045.

3. Akinyele, B.O and T. Yemikotan (2007).Effect of Variation in soil texture on the vegetable and pod characteristics of okra. Interm. *J. Agric. Res.* 2: pp. 165-169.

4. Berger, R. D. (1980). Measuring disease intensity. - In: Teng, P. S., S. V. Krupa (eds.): Crop loss assessment, Proc. E. C. Stakman Commem. Symp. *Misc. Publ. 7, Agric. Exp. Stn*., pp.28-31.

5. Berry, R.E. (1998). Insect and mites of economic importance in the pacific Northwest. 2nd (ed). Osu Bookstore Inc. Corvailis., USA, pp. 221.

6. Beye I. and J. F. Lafay (1985). Etude des criteres de selection pour une resistance generale a la Verticilliose chez la tomate. *Agronome* 5, 305-311.

7. Cohen, Y., U. Gisi and E. Mosinger. (2009). Systemic resistance of potato plants against *Phytophthora infestans* induced by unsaturated fatty acids. *Physiol. Mol. Plant Pathol.,* 38: 255-263 pp.

8. Doijode, S. D. (2001). Seed Storage of Horticultural Crops: Food products Press, New York. USA. Pp. 342-347.

9. Hahn S.K., Terry E.R. and I. Leuschner (1980). Breeding cassava for resistance to cassava mosaic disease. *Euphytica* 29, 673-683.

10. Hanson P.M, Yang R. Y, Tsou S.C.S, Ledesma D, Engle L, T. and C. Lee (2006). Diversity in Eggplant Superoxide Scarverging Actively. *Journal of Food Composition and Analysis*. 594 – 600 pp.

11. Jha A. K. and S.C Dubey (1998). Effect of Plant age and weather parameters on collar rot of okra caused by Macrophomina phaseolina. *L. Mycol. Plant Pathol.* 351–353 pp.

12. Kemp, W. P., and J.S. Berry, (2001). A population dynamics model for Rangeland grasshoppers: Model Development and Structure: Rangeland Insect Laboratory. Pp. 111 – 122.

13. Kitts, S. T. (2009). Strategic Plane. *Department of Agriculture*. Saskatchewan Association of Rural Municipalities (SARM) Pp. 31 – 38.

14. Kucharek, T. (2004). Florida plant disease management guide: Okra. Plant Pathology Department document *PDMA*-Vol. 13 – 141 pp.

15. Kumar, P. and A. K. Sood (2002). Management of Bacterial wilt of tomato with I/AM and bacterial antagonists. *Indian Phytopath*. 55: (4): 513.

16. Moekchantuk, T. and P. Kumar, (2004). Export okra production in Thailand Inter-country Programme for vegetable IPM in South and SE Asia Phase II. Pp. 111 – 128.

17. Nagrare, V.S., Kranthi, S., Biradar, V.K., Zade, N.N., Sangode, V., Kakde, G., Shukla, R.M., Shivare, D., Khadi, B.M. and K.R. Kranthi, (2011). Widespread infestation of the exotic mealybug species *Phenacoccus solenopsis* (Tinsley) (Hemiptera: Pseudococcidae) on cotton in India. Bull. *Entomol. Res*., 99:537-541.

18. Norman M.J.T, Pearson C.J. and P.G.E Searle (1995). Tropical food crops in environment 2nd edition. Cambridge University Press, U.K pp 305 – 316.

19. Ogbalu O.K., and Ekweozor Ike (2002). The Distribution of Okra Flea beetles on three varieites of okra in traditional farms of the Niger Delta *Trop. Sci.* 42: 52 – 56 pp.

20. Owusu-Ansah F. K., Afreh-Nuamah D, Obeng-Ofori, and K. G. Ofosu-Budu (2001). Managing Infestation Level of major insect pests of garden eggs. *J. Chana Sci. Assoc*. 3, 70 – 84 pp.

21. Shivalingaswamy T. M. and S. Satpathy, (2007). Integrated pest management in vegetable crops. In: Jain PC, Bhargava M.C. Entomology: Novel Approaches, New India Publishing Agency, New Delhi, India. P. 353 – 375.

22. Singh, R. S. (2005). Plants Diseases. 8th Ed. Oxford and IBH Publishing Co. PVT Ltd, New Delhi, pp. 257.
23. Stray Animal Guide (2010). Saskatchewan Ministry of Government Relations pp.1-36.

24. Usman, I. (2004). Prospect and Problems of Vegetable Production under the Fadama Areas of Bauchi State, Nigeria. *Nigeria Journal of Horticulture Science*. Vol. 9, No1. 1118- 2733pp.

25. USDA - United States Department of Agriculture (2009). Eggplant Nutrient Values and Weights for edible portion. 114 – 130 pp.