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# Fusarium Wilt of Garden Egg (*Solanum Melongena*) At Imawa Village of Kura Local Government of Kano State, Nigeria

Authors

**Bello Hassan Jakada[1]*, Sauban Musa Jibril[2]**

[1]Graduate of Botany from Bayero University, Kano and currently pursuing M sc. Botany at Jodhpur National University, India

[2]Graduated from Bayero University, Kano and presently studying M sc. Botany at Jodhpur National University, Rajasthan India

Corresponding Author

**Bello Hassan Jakada**

Faculty of Applied Sciences, Jodhpur National University, India

Email: *bellojakada@gmail.com, +919680037634*

**ABSTRACT**

*This was a Survey of fusarium wilt of Solanum melongena at Imawa village of Kura Local Government area located on N11°47'56.8" and 008°27'33.7". During the survey, Four (4) plots were visited weekly for 8 weeks. Symptoms of disease were carefully observed from 35 egg plants (Solanum melongena) selected at random. 10-20g of soil from the depth of 2-4cm near the roots of both healthy and infected egg plants was collected using spatula, Composite mixture of the soil sample was made for isolation and identification of the wilt pathogen. Isolation of the pathogen was done using serial dilution technique where 1g of the soil was mixed with 9ml of distilled water to obtain $10^{-1}$ up to $10^{-4}$ and then 1ml was poured directly in to prepared P.D.A and stored at room temperature for 5-7 days after which the dominant pathogen was identified. The dominant species identified are fusarium oxysporum (4 isolate with 50%) abundance followed by Rhizophus stolonifer (2 isolate with 25%) and Aspergillus niger (2 isolate with 25%). The incidence was calculated and plot B was found to have the highest incidence. The data obtained was subjected to chi square statistical analysis and the data showed significant difference in terms of infection between the plots.*

**Key words:** *Fusarium Wilt, Solanum melongena, Identification, Isolation, Wilt Pathogen.*

## INTRODUCTION

Brinjal (*Solanum melongena* L.) is the important vegetable crop of India due to its cheaper rate and easy availability. It belongs to family Solanaceae and is native of southern and eastern Asia including north India, where it has been cultivated since remote antiquity for its fleshy fruits. The fully developed plants are often 2' to 3' in height. Flowers are of violet colour. Fruit is of fleshly berry type. The color of fruit varies from dark purple to yellowish white or sometime striped and has a shining surface. Fruits are used as vegetables and cooked in combination with Tomato, Potato etc. or as meshed form like Bhurta or sometime it is preserved as pickles. The average rainfall is about 60-100 cm/year while the average temperature varies from 6.9°C to 37.3°C. Generally the climate is moderate and humid. The winter season of this region is specified by thick covering of fogs over the crops which even persist for weeks together. The fruit is botanically classified as a berry and contains numerous small,

soft seeds which are edible, but have a bitter taste because they contain nicotinoid alkaloids; this is unsurprising as it is a close relative of tobacco. Because of the plant's relationship with the Solanaceae (nightshade) family, the fruit was at one time believed to be extremely poisonous. The flowers and leaves can be poisonous if consumed in large quantities due to the presence of solanine (Mishra and Kumar, 2012).

*Fusarium oxysporum* is a common soil pathogen of garden egg (*Solanum melongena*) and saprophyte that feeds on dead and decaying organic matter. It survives in the soil debris as a mycelium and all spore types, but is most commonly recovered from the soil as chlamydospores. This pathogen spread in two basic ways: it spreads short distance by water splash, and by planting equipment, and long distances by infected transplants and seeds. *F. oxysporum* infects a healthy plant by means of mycelia or by germinating spores penetrating the plant's root tips, root wounds, or lateral root. The mycelium advances intracellularly through the root cortex and into the xylem. Once in the xylem, the mycelium remains exclusively in the xylem vessels and produce microconidia (asexual spores). The microconidia are able to enter into the sap stream and are transported upward. Wherever the flow of the sap stops the microconidia germinate. Eventually the spores and the mycelia plug the vascular vessels which prevent the plant from up-taking and translocating nutrients. In the end the plant transpires more than it can transport, the stomata close, the leaves wilt, and the plant dies. After the plant dies the fungus invades all tissues, sporulates, and continue to infect neighboring plants (Mishra and Kumar 2012).

**HOSTS AND SYMPTOMS**

The fungal pathogen *Fusarium oxysporum* affects a wide variety of hosts of any age. Tomato, Egg plant, tobacco, legumes, cucurbits, sweet potatoes and banana are a few of the most susceptible plants, but it will also infect other herbaceous plants (Mishra and Kumar 2012). *Fusarium oxysporum* generally produces symptoms such as wilting, chlorosis, necrosis, premature leaf drop, browning of the vascular system, stunting, and damping-off. The most important of these is vascular wilt. Fusarium wilt starts out looking like vein clearing on the younger leaves and drooping of the older lower leaves, followed by stunting of the plant, yellowing of the lower leaves, defoliation, marginal necrosis and death of the plant. On older plants, symptoms are more distinct between the blossoming and fruit maturation stages (Nelson, *et al*; 1994).

*Fusarium oxysporum* split into divisions called *formae speciales* (singular *forma specialis*, abbreviated *f.sp.*). There are over 100 formae speciales divisions, each with one or two different races. Each forma specialis within the species are host-specific (i.e. specific to a certain plant) and produce different symptoms (Nelson, *et al*; 1994).

**DISEASE CYCLE**

*Fusarium oxysporum* is the most widely dispersed of the *Fusarium* species and is found worldwide, *F. oxysporum* has no known sexual stage, but produces three types of asexual spores: microconidia, macroconidia, and chlamydospores. The microconidia are the most abundantly produced spores. They are oval, elliptical or kidney shaped and produced on aerial mycelia. Macroconidia, which have three to five cells and have gradually pointed or curved edges, are found on sporodochia on the surface of diseased plant (in culture the sporodochia may be sparse or nonexistent). Chlamydospores are usually formed singly or in pairs, but can sometimes be found in clusters or in short chains. They are round thick walled spores produced within or terminally on an older mycelium or in macroconidia. Chlamydospores unlike the other spores can survive in the soil for a long period of time (Agrios, G. N., 2005).

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chlamydospores. This pathogen spreads in two basic ways: it spreads short distances by water splash, and by planting equipment, and long distances by infected transplants and seeds. *F. oxysporum* infects a healthy plant by means of mycelia or by germinating spores penetrating the plant's root tips, root wounds, or lateral roots. The mycelium advances intracellularly through the rootcortex and into the xylem. Once in the xylem, the mycelium remains exclusively in the xylem vessels and produce microconidia (asexual spores). The microconidia are able to enter into the sap stream and are transported upward. Where the flow of the sap stops the microconidia germinate. Eventually the spores and the mycelia clog the vascular vessels, which prevent the plant from up-taking and translocating nutrients. In the end the plant transpires more than it can transport, the stomata close, the leaves wilt, and the plant dies. After the plant dies the fungus invades all tissues, sporulates, and continues to infect neighboring plants (Agrios, G. N., 2005).

## MATERIALS AND METHODS

### Study Area

This survey was carried out at Imawa village of Kura Local Government Area, located in the south eastern part of Kano state and lies on N 11°47'56.8" and E 008°27'33.7". People in this area are Hausa and Fulani and most of them are irrigation farmers mostly cultivating Cucumber, Water melon, Sugar cane, and Garden egg, Tomato, Pepper and Spinach.

### The survey

The survey was carried out from December, 2012 to February, 2013. During the surveys, farmers fields were visited on weekly basis, at each location four fields were surveyed at random each field serving as replicate (Aneja K. R. 1993). Symptoms of diseases were carefully observed from 35 egg plants (*solanum melongena*). Sample collection was done in an X pattern across each farm until the plants were collected and diseases were identified using text book by (Agrios, G., 1997).

The disease incidence was calculated using the formula below;

$$D.I\ (\%) = \frac{\text{Number of diseased plants}}{\text{Total Number of plants consulted}} \times 100$$

### ISOLATION AND IDENTIFICATION OF THE WILT PATHOGEN

For this purpose, 10-20g of soil from the depth of 2-4cm near the roots of both healthy and infected egg plants was collected using sterile spoon or spatula and stored in a sterile polythene bag. A composite mixture was made by mixing the soil samples from the fields, 1g of the soil sample was mixed with 9ml of distilled water and shaken vigorously for 15mins, 1ml of the mixture was transferred to 9ml of distilled water to make $10^{-2}$, and it was repeated until $10^{-4}$ was made and 1ml was poured in to a prepared media of P.D.A and incubated for 7 days (Ainsworth G. C. 1976).

For the identification of the unknown species of fungi, cotton blue in lactopenol stain was used, the identification was achieved by placing a drop of the stain on a clean slide with the aid of a mountain needle where a small portion of the mycelium from the fungal culture was removed and placed in a drop of the lactopenol James and Natalie (2001). The mycelium was spread very well on the slide with the help of the needle. A cover slip was gently applied with little pressure to remove air bubble. The slide was then mounted and observed, under ×40 objective lens, (Kutama, *et al*, 2010).

**RESULTS**

**Table1**. Number of diseased plants per plot from week 1 to 8 of the Survey.

| Plot | Number of weeks of the survey | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| A | 34 | 29 | 28 | 33 | 0 | 0 | 0 | 0 |
| B | 24 | 20 | 23 | 35 | 31 | 28 | 31 | 33 |
| C | 0 | 7 | 6 | 7 | 3 | 3 | 3 | 5 |
| D | 2 | 11 | 29 | 20 | 22 | 20 | 20 | 29 |
| Mean | 15 | 16.75 | 24 | 23.75 | 14 | 12.75 | 13.5 | 16.75 |

The disease incidence of fusarium wilt was obtained by using the formula:

$$D.I\ (\%) = \frac{\text{Number of diseased plants}}{\text{Total Number of plants consulted.}} \times 100$$

**Table2.** Weekly Disease Incidence (D.I. %) / Plot during the survey.

| PLOT | G P S | Number Of weeks | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| A | N11$^{O}$48'04.6" E008$^{O}$27'41.7" | 100.00 | 82.85 | 80.00 | 94.28 | 0 | 0 | 0 | 0 |
| B | N11$^{O}$48'14.6" E008$^{O}$27'45.4" | 70.58 | 57.14 | 91.66 | 97.22 | 88.57 | 77.77 | 86.11 | 94.29 |
| C | N11$^{O}$48'30.9" E008$^{O}$27'30.7" | 00.00 | 20.00 | 17.64 | 08.57 | 08.57 | 08.33 | 13.88 | 14.28 |
| D | N11$^{O}$48'31.4" E008$^{P}$27'31.6" | 05.88 | 31.42 | 85.29 | 85.71 | 62.85 | 55.55 | 55.55 | 92.85 |

**Table 3.** Wilt Pathogen Isolated From Composite Soil of Imawa during the Survey.

| NAME OF ISOLATE | NO. OF ISOLATE | % ABUNDANCE |
|---|---|---|
| *Fusarium oxysporum* | 4 | 50 |
| *Rhizopus stolonifer* | 2 | 25 |
| *Aspergillus niger* | 2 | 25 |
| Mean | 2.66 | 33.33 |

**Table 4.** Table of Statistical Analysis (CHI SQUARE)

| Plots | Observed | Expected | O-E | $(O-E)^2$ | $\sum(O-E)^2/E$ |
|---|---|---|---|---|---|
| A | 31.00 | 22.59 | 8.41 | 70.72 | 3.1305 |
| B | 29.38 | 22.59 | 6.79 | 46.10 | 2.0407 |
| C | 4.25 | 15.97 | -11.72 | 137.25 | 8.6005 |
| D | 19.13 | 22.59 | -3.46 | 11.97 | 0.5298 |
| Total | 83.76 | 83.56 | -0.21 | 266.04 | 14.3015 |

## DISCUSION

Table 1 of the survey result shows that the garden egg grown at Imawa shows symptoms of Fusarium wilt, the symptoms includes wilting, chlorosis, necrosis, premature leaf drop, browning of the vascular system, this is also in line with the findings of (Agrios, G. 1997).

Also in table 2, Plot B was found to have higher incidence of the disease this is due to the fact that the disease become more severe between the blossoming and fruit mature stages as stated by (Adarsh, 2010).

In table 3, the isolation result shows result of the fungal isolate from the soil sample of the plots visited, *F. oxysporum* was found to have the higher abundance with 50%, *R. stolonofer* having 25% and *A. niger* also having 25%, respectively, this confirmed that *F. oxysporum* cause fusarium wilt of garden egg ( *S. melongena*). So the Hypothesis is rejected due to the fact that *R. stolonifer* cause post harvest fruit rot (Nam, M. H. 2005and Mishra and Kumar 2012) while *A. niger* was known to cause fruit rot on certain vegetables (Nam, M. H., 2005).

Statistical analysis shows that there is no significant difference in terms of infection between the plots even though there is variation in their developmental stages; the calculated value is 14.3015 while the table value is 3.182.

## CONCLUSION

*Fusarium oxysporum* was found to be a causative agent of fusarium wilt of *Solanum melongena (*garden egg) at Imawa village of Kura Local Government Area of Kano State, Nigeria. The disease symptoms include leaf chlorosis, stunting and leaf drop. It is transmitted through the soil and vascular wounds in plant due to vein clearing on the younger leaves and dropping of the older lower leaves, followed by stunting of the plant, yellowing of the lower leaves, defoliation, marginal necrosis and death of the plant. On older plants, symptoms are more distinct between the blossoming and fruit maturation stages. The disease causes huge economic loss and death of the whole plants in severe cases.

## RECOMMENDATIONS

- Use of biological control agents against the pathogen e.g *Trichoderma harzianum.*
- Use of Biofumigant Fungus such as *Muscodor albus* in the control of such fungus is recommended.
- Use of chemicals such as nematicides, fungicides, herbicides e.t.c is not encouraged as they accumulate and cause alteration in the genetic composition in both plants and animals (mutation).
- Cultural control techniques should be employed in controlling such diseases in both tropical and temperate regions as the fungal life cycle is related to temperature and light.
- Crop rotation with non- susceptible host to starve the wilt pathogen.
- Use of sterile planting materials to avoid transmission of the pathogen through planting materials.

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**Authors Profile**

**Bello Hassan Jakada** received his B.sc in Botany at Bayero University Kano, (BUK) Nigeria in 2011 he Worked at Kano State Ministry of Environment as an industrial training student and currently studying M sc. Botany at Jodhpur National University, Rajasthan India.

**Sauban Musa Jibril** received his B.sc in Botany at Bayero University Kano, (BUK) Nigeria in 2011 he Worked at International Institute of Tropical Agriculture as an Industrial Training Student and currently studying M sc. Botany at Jodhpur National University, Rajasthan India.