International Journal of Agriculture Innovations and Research
Volume 3, Issue 4, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy) :
Received : 25/12/2014 | Accepted on : 02/01/2015 | Published : 15/01/2015

Insect Pest and Fungi Responsible for the Deterioration of Eggplant (*solanumspp*) in Abia State

Okwulehie, I. C.
Department of Plant Science and Biotechnlogy, College of Natural Sciences, Micheal Okpara University of Agriculture, Umudike. P.M.B 7267. Umuahia, Abia State.

Okon, E.U.
Department of Plant Science and Biotechnlogy, College of Natural Sciences, Micheal Okpara University of Agriculture, Umudike. P.M.B 7267. Umuahia, Abia State.

Abstract: **Insect pests and fungi responsible for the deterioration of eggplant (*Solanumspp*) in Abia state were investigated. Infected fruits eggplant were bought from the markets, and were cut into small pieces of about 3mm-4mm sizes, surfaced sterilized with 70% ethanol for 1 minute and later washed twice in distilled water, the washed pieces of eggplant were dried with sterile filter paper to remove water droplets and then plated on potato dextrose agar (PDA) media. The plates were replicated and incubated at 25^0c for 3-5 days. *Trichodermaviride, Botryodiplodiatheobromae, Geotrichumcandidum, Rhizopusstolonifera* were isolated from the diseased plants. *Rhizopusstolonifera* was the most frequently isolated organism from the infected fruit (41.7%) being glaringly higher frequency of occurrence than *Botryodiplodia*(33.3%). The pathogenecity tests on susceptible fruits of the eggplant species using all the fungi isolated, showed that *Rhizopusstolonifera* was pathogenic on the test crop(eggplant) with the diameter of 5.0mm, from the result of this study it is shown that *Rhizopusstolonifera* was the most occurrence and infective followed by other organism. Insect pests identified in this study is the larva and pupa of *Leucinodesarbonalis* which bore, feed and cause damage on eggplant fruits. The results of the investigation were discussed in relation to the need for the establishment of the cause(s) of the deterioration of the fruits of eggplants and the need of proffering solution to the problem.**

Keywords: **Eggplants, Insect Pests, Fungi, Deterioration.**

1. INTRODUCTION

Eggplant is an important Solanaceous crop of subtropics and tropics (Daunay*et al*; 2001). The name brinjal is another common name of the plant and is derived from Arabic and sanskrit whereas the name eggplant was derived from the shape of the fruit of some varieties, which are white and resemble the shape of chicken egg (Kallo 1993). It is also called aubergine (French word) in Europe (Gerras*et al;* 1987).

Eggplant is an agronomically important non-tuberous crop of solanaceae family, native to southern India and widely grown in Africa, Americas, Europe and Asia. It is a leading vegetable crop in tropical Africa mostly grown in Nigeria, Ghana, and Senegal, in South America, and the Caribbean countries (Grubben and Denton 2004). It is popularly referred to as Anara (Igbo) in south Eastern Nigeria (Nworie and Agbaraevoh 2002). Other local names like Ikan,Igba, Arungu, Efo and Ijesu have been used to describe the plant (Toluodugbemi, 2010). Eggplant is of nutritional and medicinal value. It is low in calories and fats, but contains water, protein, fiber and carbohydrate. It can be used in the preparation of sauce, while the leaves and fruits of some varieties can be eaten raw and fresh as desserts, and can be used in the treatment of different diseases and health problems (Burkill, 1985).

In spite of the numerous uses of the plant and its products, eggplant fruits are susceptible to a wide range of pests and pathogens which causes severe loss in all stages of growth and development. The most significant and wide spread diseases are leaf blight and fruit rot (*Phomopsisvexans*), leaf spots (*Alternariamelongenae* and *Cercosporamelongenae*) damping off (*Phythiumaphandermatum*),wilt (*Verticuliumdahliae*), bacterial wilt (*Pseudomonas solanacearum* and *Ralstoniasolanacearum*) little leaf (*Mycoplasmacandidatus*) and root knot of brinjal (*Meloidogyne incognita).* (Rangaswamy and Mahadevan 2002).

The plant is grown extensively as warm humid summer vegetable crop and this growing season coincides with the rainy season especially the fruit bearing stage and therefore subjects the crop to many pest, nematode, bacterial, viral and fungal diseases. Foliar and fruit disease caused by fungi and pest have emerged as major constraint in economic production of the crop. Fruit rot or deterioration caused by fungal pathogens act as foci for secondary spread of infection, thereby reducing the market value of fruits, and sometimes even leading to complete loss of crop under favourable weather conditions.

In view the deterioration of eggplant and lack of enough information on its associated pests and pathogens in Abia and the surrounding States hence the need for this work.

The work therefore is aimed at Isolating and identifying the insect pests and fungi which causes damages in the fruits of eggplant.

2. MATERIALS AND METHODS

Sample Collection:

Different species of eggplants were bought from Umuahia main market, Ini-Oru market and Umuariaga market. Spoilt and clean eggplants were separately packed into two different polyethylene bags and taken to the plant pathology of the National Root Crops Research Institute Umudike, Abia state.

The spoilt eggplants were rinsed in sterile distilled water, surface sterilized with 70% ethanol for one (1) minute (Fawole and Oso, 1998). This was done by cutting the spoilt eggplant to small pieces of about (3mm- 4mm) sizes, dropping into 70% ethanol in a sterile beaker and washed for 1 minute. It was later washed twice in sterile distilled water. The washed pieces of eggplant were dried

with sterile filter paper to remove water droplets. A flamed forceps was used in picking five pieces of sterilized eggplant and dropped (inoculate) into the already prepared solidify potato Dextrose Agar Media. All plates were triplicated and aseptic conditions were observed throughout the experiment. All inoculated plates were incubated at 25°c for 3-5 days and were observed daily for mycelia growth.

After incubation, purification of isolates was done by sub-culturing different mycelia colony from the inoculated plates to obtain pure culture. Sterilized surgical blade was use to cut different colonies of mycelial growth and transferred into newly prepared potato Dextrose Agar media (PDA). The plates were incubated at 25°c for 3-5days, for characterization and pathogenicity test.

Characterization of purified cultures:

Macroscopic examination was done using physical characteristics of the mycelia like colour and structure of the mycelia growth, microscopic characterization was done through the morphological structures according to (Banette and Hunter; 1987). Some of the morphological features used for characterization were fruiting bodies, septate or non–septate mycelia, presence or absence of sporangiophores, present of special organ like rhizoids.

Pathogenicity test:

Clean healthy eggplants were washed with sterile distilled water twice and sterilized with 70% ethanol and it was then washed with sterile water. The eggplants were air dried in a laminar air flow. A flamed 5mm corn borer was used to bore holes into the healthy egg plants. Disc of five day culture of isolates were used to plug the holes created in the clean egg plants and the disc of eggplant in the cork borer was replaced to cover the bored hole, then blue seal Vaseline was used to seal the surface of the eggplant (Okigbo and Ikediugwu 2000). The setup was incubated in a humid chamber at 25°c for 7days. After the incubation period, a plain rules was used in measuring the infected parts after being cut into two (2) halves.

Confirmation of isolates used for pathogenicity test:

After the cutting of the inoculated eggplant into two (2) halves, the rotten ones (disintegrated tissues) were cut into pieces (3mm), surface sterilized in 70% ethanol, washed twice in sterile distilled water, blot with filter paper and later plate on solidified Potato Dextrose Agar. The inoculated plates were incubated at 25°c for 3-5days. Growth colonies were sub cultured, purified and characterized. The identified cultures were compared to the initial inoculated fungi.

Determination of percentage of fungal occurrence:

This was done to determine the frequency of occurrence of the different fungal isolates. Isolation was made from ten different spoilt eggplant and were cultured differently. The number of occurrence for each isolates in the ten(10) different samples were recorded and calculated as a ratio of the total number of occurrence and was then expressed as a percentage, using the formula is given below:

$$\text{Percentage Occurrence} = \frac{x}{N} \times 100$$

x = Total number of each organism in all the samples.

N = Total number of the entire organism in the entire sample screened.

3. Result and Discussion

Table 1: Showing percentage and occurrence of fungi isolated from the ten spoilt Eggplant

Garden egg	*Trichoderma*	*Botrydiplodia*	*Geotrichum*	*Rhizopus*	Total Frequency
Sample1:	-	-	+	+	
Sample 2:	-	-	+	+	
Sample 3:	+	+	-	+	
Sample 4:	+	+	-	+	
Sample 5:	+	+	-	+	
Sample 6:	-	+	-	+	
Sample 7:	+	+	-	+	
Sample 8:	-	+	-	+	
Sample 9:	-	+	-	+	
Sample 10:	-	+	-	+	
Frequency	4	8	2	10	24
Frequency %	16.7%	33.3%	8.3%	41.7%	100

Keys: (+)indicate presence of the organism, (-)indicate absence of the organism

Sample 1and 2: *Solanumaethiopicium*(gilo)

Sample 3 and 4: *Solanumaethiopicium*

Sample 5and 6: *Solanummelongena(*purple long)

Sample 7 and 8: *Solanummacrocarpon*

Sample 9 and 10: *Solanummelongena(*long white)

Table1 shows the percentage occurrence of fungi from the isolated spoilt eggplant it was summarized by showing their occurrence. The organism include *Trichodermaviride* (16.7%),*Botryodiplodiatheobromae*(33.3%),*Geotrichumcandidum*(8.3%),*Rhizopusstolonifera*(41.7%).

Table 2: Showing all the fungi isolated from all the Eggplant

No	Fungi
1	Trichodermavirida
2	Botryodiplodiatheobroma
3	Geotrichumcandidum
4	Rhizopusstolonifera

Table 3: Shows the Microscopic Characteristics of Isolated Fungi

Colour	Microscopic Description	fungi
Green	Conidiophores hyaline, much branched Not verticillatephialides single or in groups,Conidia hyaline,1-celled ovoid,borne in Small terminal clusters, usually easily Recognized by its rapid growth and green patches.	Trichoderma
Black	Pycnida black, ostiolate, erupent, stromtic, confluent; condiophores simple, short;conida dark and 2-celled at maturity ovoid toenlongate.	Botryodiplodia
White	Mycelium white, septate; conidiophores absent; conidia hyaline, 1-celled, short cylindrical, with truncate ends formed by segmentation of hyphae.	Geotrichum
Gray with white Patches	Sporangiophores long, smooth, walled non-septate, simple or branched, arising fromstolons opposite rhizoids. Sporangia areglobose, often with flattened base, grayish black, powdery in appearance.	Rhizopus

Table 4: Table showing the occurrence of insect pest isolated from the spoilt eggplant

Garden egg Leucinodesarbonalis:	Egg	Larva	pupa
Sample 1	+	+	+
Sample 2	-	-	-
Sample 3	-	+	-
Sample 4	+	+	-
Sample 5	-	+	-

Keys: (+) presence of either the egg, larva or pupa of *Leucinodesarbonalis,* (-)Absence of either the egg, larva and pupa of *Leucinodesarbonalis*

Sample 1: *Solanumaethiopicium* (gilo)
Sample 2: *Solanumaethiopicium*
Sample 3: *Solanummelongena* (long purple)
Sample 4*: Solanummacrocarpon*
Sample 5*: Solanummelongena*(White)

4. Discussion and Conclusion

The result of fungi responsible for deterioration in eggplant is summarized in Table1. The fungi isolated from the spoilt eggplant included *Trichodermaviride*(16.7%), *Botryodiplodiatheobromae* (33.3%), *Geotrichumcandidum (*8.3%), and *Rhizopusstolonifera*(41.7%).

The pathogenicity test carried out with the spores of the four fungi isolates shows that *Rhizopusspp* was more pathogenic on the eggplant followed by *Botrydiplodiatheobromae* the least was *Trichodermaviride*. From this pathogenecity test it was shown that *Rhizopusstolonifera* produces the characteristics symptom of soft rot in the entire inner tissues of the eggplant which produces a watery, dark brown colouration and also fleshy decaying rot and attracts fruit flies. Microscopic and macroscopic characteristics of isolated fungi done is shown in Table 3, the characterization was based on colour , microscopic structure (appearance under the microscope).

This observation is consistent with a previous work of Ewekeye*et al;* (2013) that reported these organisms among others that were responsible for rot of *Solanummelongena.* Table 4 shows the Insect pest isolated from the spoilt eggplant and from the result it was shown that there were presence of the egg, larva and pupa on each of the species of the eggplant, the egg and larva of the pest *Leucinodesarbonalis* occurred most in *Solanumaethiopicium* (gilo), *Solanummelongena* and non in *Solanumaethiopicum,* this observation corresponded with the work of Srinivasan (2009).

It has been reported that eggplant is susceptible to pathogenic attack due to their low pH, high moisture content and nutrient composition. These make them rot and unfit for consumption due to production of mycotoxins (Stinson *et al*., 1984: Philips, 1984). The fungi have been documented to penetrate host tissue through natural openings such as lenticels, stomata and through the unbroken epidermis by means of aspersorium or germ tube. I is concluded that all the seed and fruit of eggplant are virulence to fungal attack and greater count of fungal propagules occur especially on seed surface (Bhajbhuje, 2013). The market value of eggplant are reduced as a result of pathogen infestation. The need for proper control and storage methods are therefore imperative to ensure that eggplant fruits are safe for consumption.

References

[1] H. L. Barnett, and B. B. Hunter,*Illustrated Genera of Imperfect Fungi*. 4th Ed Macmillan Publishing Company New York,1987, Pp 218.

[2] M. N. Bhajbhuje, "Biodiversity of mycoflora in storage of *Solanummelongena* L. seeds". *International Journal of Life Sciences,* vol. 1 (3) 2013,pp. 165-181.

[3] H. M. Burkil, *Families S-Z Croptograms addenda*. *The useful plants of West Africa*, *Royal Botanical Garden*, vol. 5.(1985).

[4] M. C. Daunay, R.N. Lester and Nao.*Cultivated eggplants in tropical plant breeding* Oxford of the University Press, Oxford.2001, Pp. 350.

[5] T. S. Ewekeye, O. A. Oke, A. I. Quadri, A. O. Isikalu, M. O. Umenwaniri, and M. L. Durosinmi, (2013) Studies on Post Harvest Deterioration of some Fruits and Vegetables in selected markets in Lagos State, Nigeria. *American Journal of Research Cmmunication,* vol. 1 (10) 2013, pp. 209-223.

[6] M. O. Fawole, and B. A. Oso.*Laboratory Manual of Microbiology.* Spectrum Books Ltd Sunshine House Ibadan Nigeria. 1988. Pp. 257

[7] C. Gerras, J. Bingham, J. Mayer, and I. Somishka,*300 of the most asked questions about organic gardening.* Rodale Press, Book Division, Emalls, 1972 109p

[8] G. J. H. Grubben, andO. A. Denton, *Plant Resources of Tropical Africa 2*. Vegetables PROTA Foundaton, Wageninger Netherlands/Backhuyo Publishers, Leiden, Netherlands/CTA, Wageninger Netherlands 2004, pp. 668pp.

[9] G. Kalloo. Eggplant, Solanummelongena L. In kalloo, G, Berg B. O. (ed) *Genetic improvement of* H. E. Nworie, and P.

C.Agbaraevoh. *Garden egg production in south Eastern Nigeria.Horticultural Society of Nigeria*2002, pp.234-238

[10] T. Odugbemi, *A textbook of medicinal plants* from Nigeria. 2010, Pp 70-80

[11] R. N. Okigbo andF. E. O. Ikediugwu"Studies in the biological control of postharvest rot of yams (*Dioscorearotundata*) with Trichodermaviride". J *Phytopathol,*vol.148, 2000, pp. 331-335.

[12] T. Odugbemi, *.Medicinal Plant Species: Family names and uses, A Textbook of Medicinal Plants from Nigeria.* University of Lagos Press.2008, Pp 601-602

[13] D. J. Philipa, *Mycotoxins as a post-harvest problem, , In Post-Harvest Pathology of fruits and vegetables: Post-Harvest losses in perishable crops* (ed) H. E. Moline, Agricultural Experimental Station, G. University of California Berkeley Publications, N. E.1984, pp. 50-54

[14] Rangaswamy, G. and A. Mahadevan, *Diseases of crop plants in India*. 4th edn. Prentice Hall of India Private Ltd. New Delhi.2002, Pp. 286-334.

[15] R. Srinivasan, Insect and mite pest on eggplant. A field Guide for identification and Management. AVRDC -The World Vegetable Centre, Shahua, Taiwan AVRDC Publication, 2002, No.09-729.640.

[16] E. E. Stinson, S. I. Osman, E. C. Heister, J. Sicaliano, andD. D. Bills,Mycotoxin production in whole Tomato, apple, mangoes and lemons, *Journal Agric. Food. Chem.*Vol. 29, 1984, pp.790-792.