



RESEARCH PAPER

## Natural Association of Egusi Melon (*Citrullus lanatus*) Diseases and Their Distribution, Incidence and Severity in Lapai Southern Guinea Savannah

<sup>1</sup>Kumar N., <sup>2</sup>Musa A. and <sup>1</sup>David I.

<sup>1</sup>Department of Crop Production, Ibrahim Badamasi Babangida University, Lapai, Nigeria

<sup>2</sup>Department of Biochemistry, Ibrahim Badamasi Babangida University, Lapai, Nigeria

### ABSTRACT

These studies were carried out to know the various diseases naturally associated with egusi melon, their distribution, incidence and severity in Lapai Local Government Area, Niger State, Nigeria. The plant samples were collected from ten (10) villages and all together fifty (50) farmers' fields were visited in Lapai Local Government Area. It was clear from the data collected on egusi melon diseases in this Local Government Area. Seventeen (17) different kinds of diseases were collected and identified, twelve (12) fungal, three (3) bacterial and two (2) viral diseases were recorded during the farmers' fields visit. The village with the highest number (15) of diseases was Cece closely followed by Lapai (14) and Saminaka (9) whereas, village with least number (5) of diseases was Ganamadi. The highest incidence (11.0%) was recorded in Cercospora leaf spot disease followed by Anthracnose (9.1%), and Alternaria leaf spot (8.4%), While, the least (2.1%) incidence was recorded in bacterial vine necrosis followed by bacterial leaf blotch (2.5%) and Cucumber mosaic virus disease (2.8%). This study has given the information about the natural association of egusi melon diseases in different villages of Lapai Local Government Area and management practices should be adopted to sustain the production of melon.

**Keywords:** Distribution, Incidence, Severity, Egusi melon, Diseases

### INTRODUCTION

Egusi melon (*Citrullus lanatus*) is commonly and annually cultivated in West Africa as a cash vegetable crop with other arable crops in the rainy and dry seasons (Tindal, 1983; Asoegwu, 1987; Oyolu, 1997; Adewusi *et al.*, 2000; Denton and Olufolaji, 2000; Todd and Wehner, 2010). Melon plays vital roles as a source of soil fertility leaving high residual nitrogen in soil, energy and also weed suppressant (Asoegwu, 1987; Park *et al.*, 1996; Adewusi *et al.*, 2000). Moreover, the crop also plays important roles in cropping system and also prevents dislodge soil granules, hence, the problem of sheet and rill erosion are prevented. (Todd and Wehner, 2010; Park *et al.*, 1996). Melon is generally grown before the main crops viz., yam, maize, sorghum and cassava in traditional mixed cropping system in rainy and dry season in Nigeria (Oyolu, 1997; Adewusi *et al.*, 2000). The crop is considered as a minor crop, however, it plays vital role in socio-economic system of rural dwellers in Nigeria (Denton and Olufolaji, 2000). The crop thrives in harsh climates and high yields are attainable in barren landscapes. Pests and disease are rarely a problem for farmers of this crop. Further benefits include

increased soil quality through ground cover and suppression of weeds. This crop also holds significant nutritional value. Oil makes up 44% of the seed, where 30% is protein rich in essential amino acids. The seed is an excellent vegetable protein, and is ideal for battling nutritional debilitations. High in essential vitamins and minerals, egusi melon also compliments the starch and grain diet of most Africans. Despite the crops obvious advantages, *C. lanatus* remains an underutilized tool for nutritional intervention in Africa.

The incidence and severity of melon diseases have been reported by the research workers (Tmechenko, 1977; Rego, 1994; Hill and Waller, 1999; Ferrin, 2008; Miller *et al.*, 2009; Anjoria and Mohammed, 2009; Kehinde, 2011). However, as with other most minor crops in mixed cropping, incidence and severity of their diseases are not properly documented from

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Address Correspondence to:

[niranjanibbu@gmail.com](mailto:niranjanibbu@gmail.com)

different Local Government Areas of Niger State. Moreover, such minor crops act as reservoir of pathogens and eventually these pathogens cause significant damages to main crops (Weber, 1973; Chienjina, 2006; Anjoria and Mohammed, 2009; Kehinde, 2011). Among the several kinds of pathogens of egusi melon, fungal pathogens were reported by Kehinde (2011). In other hand, melon seeds are sources of protein and oil and consumed in various forms by Nigerians (Oyolu, 1997). *C. lanatus* propagated entirely by seed. In the transitional zone of West Africa this crop is sown during the major rainy season between March and May. Here the soils are rich in organic matter with a high rainfall of 1,400 mm distributed April-October. Although seeds have been reported as important disease reservoirs (Neergaard, 1977; Anjoria and Mohammed, 2009) and many fungal pathogens are associated with these seeds. The associated pathogens cause serious damages to the crop qualitatively and quantitatively (Oyolu, 1997; Chienjina, 2006 Choi *et al.*, 2010). These seed-borne pathogens can remain viable for longer period of time if the seeds are kept under good storage conditions until planting time. These pathogens may cause failure of the seeds to germinate or may infect the germinating seedlings and the mature plants, resulting in poor performance. Due to the fact that egusi melon crop is highly responsive to production inputs: its food and industrial uses are many. It is therefore, definitely a solution to hunger, which can salvage the famine population. Diseases of egusi melon can cause considerable economic losses due to direct damage to the crop, discoloration of leaves branches, off odours, taints, off flavours, reduced yield and loss of nutritive values. Some of the pathogens associated with diseases may produce toxin substances, which have toxic effect on both human and animals. Since diseases of egusi-melon crop cause mild to severe crop losses, therefore, there is an urgent need to identify the diseases and also find out associated causal organisms. Moreover, to know the incidence and severity of diseases of the crop, these are necessary for economical, eco-friendly and effective management of plant diseases. In view of the above facts the objectives of the present research work are find out the natural association of egusi melon diseases, their distribution, and (%) incidence and severity of egusi melon in ten (10) different

villages of Lapai Local Government Area of Niger State.

## METHODOLOGY

### Experimental Site

Fifty (50) egusi melon farmers' fields in ten (10) villages of Lapai Local Government Area (Lapai, Mawogi, Cece, Barugu, Saminaka, Takalafiya, Maraba, Birninmaza, Ganamadi and Takuti) were surveyed for the diseases associated with the crop, their distribution, incidence and severity. This lies at longitude 9<sup>0</sup>-02N and latitude 6<sup>0</sup>-34E of the equator. The area is located in the vegetative zone of Guinea Savannah middle belt of Nigeria. It has an average temperature of 23<sup>0</sup>C-34.4<sup>0</sup>C, minimum rainfall of 1073mm. The main occupation there is farming with much abundant land, only minority group go into trading.

### Natural Association of Diseases and Distribution

From Lapai Local Government Area, ten (10) villages were selected for the studies. From each village five farmers' field were selected for the sampling of plant materials. For the data and sample collection, plants were observed randomly and zig-zag manner throughout the fields. In each field, 150 egusi-melon plants were taken into examine to find out their natural association of melon diseases, their distribution, incidence and severity. A total of 1699 infected plant were taken into consideration and parts of infected materials were collected in separate polythene bags and brought to the laboratory, Department of Crop production, Ibrahim Badamasi Babangida University, Lapai. However, for the proper identification of the causal agents of diseases culture media were prepared. Observations were made since the date of germination of egusi melon seed in farmers' fields and visits were made quarterly till harvesting of the egusi melon crops. With the help of several illustrated books on Method of Identifying Vegetable Diseases were taken into consideration for egusi melon diseases identification (Barnett and Hunter, 1988; Snowdon, 1990; Lucas, 1992; Rego, 1994; Buzi *et al.*, 2002; Alexopolus *et al.*, 2002; Agrios, 2005; Ferrin, 2008). For the identification of fungal species, culture growth, colony patterns, colony colour, hyphae, shape, size of spore and conidiophores were taken into consideration under the stereo-research microscope (Agrios,

2005). Isolation of plant pathogenic fungi from different parts of infected plants of egusi melon were done in potato dextrose agar (PDA) medium and also maintained by regular sub-culturing at interval of 10 days on PDA medium in Petri plates and in slant test tubes at low temperature (4-5°C). All media were sterilized in autoclaved at 15 lbs/inch<sup>2</sup> pressure for 20 minutes. Each medium melted but cooled to 50<sup>0</sup>C were poured into several sterilized Petri-plates. When media in the Petri-plates were solidifying the fungal disc of 5mm diameters taken from edge of the fungus culture was transferred in the center of each Petri-plate. The Petri-plates were incubated at 28±10<sup>0</sup>C and observations were recorded on culture growth, colony patterns, colony colour, hyphae, shape, size of spore and conidiophores for proper identification of fungal species.

The compositions of media were as follows:  
Composition of Potato Dextrose Agar (PDA) Medium:

Peeled potato	= 200.0 g
Dextrose	= 20.0 g
Agar-Agar	= 20.0 g
Distilled water	= 1000 ml

Composition of Selective medium:

MgSO <sub>4</sub> .7H <sub>2</sub> O	= 0.20 g
K <sub>2</sub> HPO <sub>4</sub>	= 0.90 g
KCl	= 0.15 g
Glucose	= 1.0 g
Chloramphenicol	= 0.25 g

Data collected during farmers' fields visit from different villages were calculated using percentage incidence and severity index. Incidence of egusi melon diseases was calculated using the formula:

(%) Incidence =

$$\frac{\text{Number of infected plants by particular diseases}}{\text{Total number of plants sampled}} \times 100$$

Severity index was used based on following index:

- 0 = No infection (all leaf areas were spotless);
- 1 = very slight infection (20% leaf areas were covered with spots)
- 2 = Light infection (40% leaf areas were covered with spots)
- 3 = Moderate infection (60% leaf areas were covered with spots)
- 4 = Heavy infection (80% leaf areas were covered with spots)

5 = Very Heavy Infection (100% leaf areas were covered with spots)

## RESULTS

The studies on natural occurrence of egusi melon diseases in ten (10) different villages of Lapai Local Government Area during 2014-2015 are presented in Table (1) and Table (2) respectively. It was clearly shown from the data collected during survey of farmers' fields showed natural associated of pathogen in egusi melon and occurrence of diseases and their distribution in different villages of Lapai Local Government Area. A total of 1699 egusi melon plants were infected with different kinds of pathogens. Seventeen (17) different kinds of diseases were identified, twelve (12) fungal, viz., three (3) bacterial and two (2) viral diseases were observed from the farmers' fields. (Table 1).

The distributions of egusi melon diseases from ten (10) villages in Lapai Local Government Area are presented in (Table 2). Among all the ten villages of Lapai Government Area visited the maximum diseases were found in Cece (15), closely followed by Lapai (14), Saminaka (9), whereas, the minimum (5) diseases were found in Ganamadi and followed by Maraba (6), Takuti (8) shown in (Table 2). In all the villages, it was observed that *Cercospora citrullina*, *Colletotrichum lagenarium* and *Alternaria cucumerina* were the most prominent and commonly found diseases, whereas *Cucumber mosaic virus*, *Acidovoraxarene subsp. citrulli* and *Erwinia spp.* were the least occurrence diseases found on the field as shown in (Table 2).

Estimation of (%) incidence and severity index of egusi melon diseases in ten villages of Lapai Local Government Area are presented in (Table 3). The maximum incidence (11.0%) was observed in *Cercospora* leaf spot followed by *Anthraco*se (9.1%), *Alternaria* leaf spot (8.4%) and leaf blight (8.2), whereas, the minimal incidence (2.1%) were observed in Bacterial vines necrosis closely followed by (2.5%) Bacterial fruit blotch and (2.8%), *Cucumber mosaic virus* disease (Table3). Moreover, the maximum severity of egusi melon was in *Cercospora* leaf spot diseases (3-5), followed by leaf blight, *Anthraco*se disease, vine wilt, damping off, Bacterial vines necrosis and yellow vine disease which scored (2-5), whereas,

minimum severity was in seed borne rot (1-2) and wet rot flower and fruit (1-3) (Table 3).

Table 1: Natural association of diseases on egusi-melon and their causal organisms in ten (10) different village of Lapai Local Government Area.

S/N	Diseases	Causal Organism
1	Leaf blight	<i>Didymella bryoniae</i>
2	Anthraco disease	<i>Colletotrichum lagenarium</i>
3	Powdery mildew	<i>Erysiphe cucurbitarum</i>
4	Vine wilts	<i>Fusarium oxysporum</i>
5	Fruit rot	<i>Didymella bryoniae</i>
6	Alternaria leaf spot	<i>Alternaria cucumerina</i>
7	Cercospora leaf spot	<i>Cercospora citrullina</i>
8	Wet rot of flower and fruit	<i>Choanephora cucurbitarum</i>
9	Stem blight	<i>Didymella bryoniae</i>
10	Downy mildew	<i>Peronospora cucurbitarum</i>
11	Damping off	<i>Macrophomina phaseolina</i>
12	Cucumber mosaic virus Disease	<i>Cucumber mosaic virus</i>
13	Melon mosaic virus Disease	<i>Mosaic virus</i>
14	Seed-borne rot	<i>Aspergillus niger</i>
15	Bacterial fruit blotch	<i>Acidovorax arene subsp. citrulli</i>
16	Bacterial vines necrosis	<i>Erwinia spp.</i>
17	Yellow vine disease	<i>Phloem limited bacterium</i>

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4	Vine wilts	<i>Fusarium oxysporum</i>
5	Fruit rot	<i>Didymella bryoniae</i>
6	Alternaria leaf spot	<i>Alternaria cucumerina</i>
7	Cercospora leaf spot	<i>Cercospora citrullina</i>
8	Wet rot of flower and fruit	<i>Choanephora cucurbitarum</i>
9	Stem blight	<i>Didymella bryoniae</i>
10	Downy mildew	<i>Peronospora cucurbitarum</i>
11	Damping off	<i>Macrophomina phaseolina</i>
12	Cucumber mosaic virus Disease	<i>Cucumber mosaic virus</i>
13	Melon mosaic virus Disease	<i>Mosaic virus</i>
14	Seed-borne rot	<i>Aspergillus niger</i>
15	Bacterial fruit blotch	<i>Acidovorax arene subsp. citrulli</i>
16	Bacterial vines necrosis	<i>Erwinia spp.</i>
17	Yellow vine disease	<i>Phloem limited bacterium</i>

Table 3: Estimation of incidence and severity of egusi-melon diseases from ten (10) different villages of Lapai Local Government Area.

S/N	Diseases	No. of infected plants	Incidence (%)	Severity (0-5)
1	Leaf blight	141	8.2	02-May
2	Anthracnose disease	156	9.1	02-May
3	Powdery mildew	108	6.3	01-Apr
4	Vine wilts	118	6.9	02-May
5	Fruit rot	127	7.4	01-May
6	Alternaria leaf spot	144	8.4	02-May
7	Cercospora leaf spot	188	11	03-May
8	Wet rot of flower and fruit	101	5.9	01-Mar
9	Stem blight	79	4.6	02-Apr
10	Downy mildew	83	4.8	01-Apr
11	Damping off	65	3.8	02-May
12	Cucumber mosaic virus Disease	49	2.8	02-Mar
13	Melon mosaic virus Disease	92	5.4	02-Apr
14	Seed-borne rot	74	4.3	01-Feb
15	Bacterial fruit blotch	43	2.5	02-Mar
16	Bacterial vines necrosis	37	2.1	02-May
17	Yellow vine disease	94	5.5	02-May
	Total	1699		

## DISCUSSION

The observations on the distribution, (%) incidence and severity of egusi melon diseases in different villages of Lapai Local Government Area showed the occurrence of egusi melon diseases. Some of the diseases were fungal, bacterial and viral diseases. The present work was similar to the work reported by (Kehinde *et al.*, 2011; Anjori and Mohammed, 2009). Kehinde *et al.* (2011) reported that fungal, bacterial and viral diseases were recorded in egusi melon farms from the five states Oyo, Osun, Ondo and Ogun which support the present work. From fungal diseases *Cercospora citrullina*, *Colletotrichum lagenarium* and *Alternaria cucumerina* were prominent on farmers' egusi melon field.

The distribution and occurrence of egusi melon diseases were high in five villages; Cece, Lapai, Saminaka, Takalafiya and Mawogi, Although, Cece had the highest infection, and it might be due to the poor management of the egusi melon crops by the farmers. However, the incidence of diseases was least in village Ganamadi, which

may be due to the proper management of cropping system in the village. It was apparent from the observations that the incidences of some of egusi melon diseases such *Cercospora* leaf spot (11.0%), *Anthracnose* (9.1%), *Alternaria* leaf spot (8.4%) and leaf blight (8.2%) were high as compare to other diseases.

Similarly, the severity of some of diseases such as *Cercospora* leaf spot, *Anthracnose* disease, *Alternaria* leaf spot and leaf blight of egusi melon disease was maximum. It may be due to climatic factors especially temperature which prevailed at Lapai Local Government Area during the present studies. Temperature and humidity are the most important factors, which affect the occurrence, incidence and development of many diseases (Agrios, 2005; Adewusi *et al.*, 2006). It was observed that the severity of fungal diseases were more severe on farmers field visits. This finding supports the results of Kehinde (2011) that reported in Sub-Saharan African country like Nigeria there are high incidence of fungal diseases.

## Conclusion

The present research shows clearly that substantial numbers of egusi melon diseases in different villages of Lapai Local Government Area were recorded. Some of these diseases were common in the villages of Lapai Local Government Area. Egusi melon plants were prone to diseases which can lead to crop loss. However, since this is preliminary research work, further studies are needed so that the diseases can be properly managed.

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