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Evaluation of some Fungal Pathogens associated with Tomato plant in Mbaise Southeast Nigeria

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ABSTRACT

A great yield of tomato is lost to disease of varied causes annually. This underscores the need for continuous study of factors affecting the epidemiology and prevalence of these diseases for effective management. This study was conducted in two environments of Aboh and Ahiazu Mbaise local Government Areas of Imo State Southeast, Nigeria. The aim was to investigate the fungal pathogens associated with tomato plants. The plant leaf samples were cultured on Saboraud Dextrose Agar (SDA) and Brain Heart Infusion Agar (BHIA) and incubated at room temperature for 3-5 days. Result revealed that the most prevalent species were *Fusarium* (75%) and *Curvularia* (55%) while *Alternaria* (15 %) was least .The pathogenecity test carried out showed that *F*usarium species were the most pathogenic ; followed by the *Aspergillus and Curvularia* Species . The data generated from this study will help local farmers in Mbaise in minimizing yield losses.

Introduction

Tomato (*Lycopersicum esculentum*) is the second most popular and widely grown vegetables in the world after potato(Panthee and Chen 2010).Nigeria ranked 18th in global production of tomato with 896,000 tones (FAO 2006).In addition to being consumed as a fresh vegetable, it is also used as a salad, as a puree and in many other forms depending on the growing area. Tomato constitutes an important component of the daily diet of many and contains carotenoids and flavonoids that prevents prevent cancer.It is estimated that 4.6 million ha of tomatoes are grown annually worldwide producing 126million Mt.The average tomato yield in Nigeria is 7 Mt ha^{-1} (Fajinmi and Fajinmi 2010).Diseases are one of the major factors that militate the pro function of tomato. A great yield of tomato is lost to diseases of varied causes annually. Among these are diseases caused by fungi, bacteria, and viruses. In order to improve the yield of tomato, diverse resistant species, and attentive disease management and control strategies have been employed (Awad *et al.*, 1993).Awurum and Okorie (2011) reported that the cultivation and productivity of vegetable were affected by diseases co- related with the amount and duration of rain and other enviromental factors like; air, temperature, relative humility, dew period, solar ,topography (Awad *et al*,. 1993). Diseases can be transmitted by unhealthy plants to healthy ones by various means which includes flies (vectors), soil, water and poor handling.

Aref and Dougdoug (1996) recommended that smokers should wash their hands before handling tomato plants since the viral diseases that affect tobacco plants are readily spread to tomato. This leads to low income generation and poverty among tomato farmers and shortage in tomato supply. Although, some studies have been carried out on fungi pathogen associated with tomato plants (Aref and Dougdoug, 1996; Cal and Camero, 1997),this study is intended to provide additional information mainly for local farmers in Mbaise community of Imo state Nigeria by identifying some fungi pathogens associated with tomato plant, especially those in the endemic area.

Materials and Method

The study area

The study was conducted in Aboh and Ahiazu local Government areas of Imo state, Nigeria. Both towns are located in Mbaise and lie between rain forest belts of Nigeria.

Collection of materials

The infected branches of the tomato plants were cut from the two study sites and immediately transported in air tight polythene bags for laboratory analysis.

Preparation of media

The media used were Saboraud Dextrose Agar (SDA) and Brain Heart Infusion Agar (BHIA). 52g of agar were dissolved in Liter of distilled water.

Inoculation of the samples

One gram me of the mashed portion of the tomato was inoculated on the prepared media (SDA and BHIA).Prior to inoculation, the infected portions were scraped and dipped into 70% ethanol and flamed to burn off the ethanol before being used. The cut out leaf portions were washed in 0.1% mercury chloride for 10 seconds and rinsed in distilled water for 10 seconds. It was then mashed on a mortar, sieved, poured into prepared media and inoculated at room temperature for 3-7 days. The incubated plates were observed daily for fungal growth. Any observed fungal growth was subcultured into a freshly prepared SDA.

Purification of isolates

The observed fungal colonies were sub cultured to obtain pure isolates. The isolates obtained were preserved in slants as stock culture and subjected to microscopic and macroscopic

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observations for characterization and identification. The following characteristics were considered; textile, pigmentation, and nature of growth on the reverse side of the plate.

Identification of fungal isolates

The procedure used for identification was the lacto phenol techniques. It involves applying 1-2 drops of lacto phenol on clean grease – free slide with the aid of a sterile inoculation loop. The inoculation of the mould samples was made on the lacto phenol using tease mount method. This was covered with a cover slip and examined under a microscope using X 40 to identify the nature of hyphae with the aid of identification manual by Barnet and Hunter(1987).

Pathogenecity

The Agar Block technique was adopted as described by Aref and Doughdoug (1996). The culture media containing the isolates were cut into blocks and a small hole made on the leaves of the tomato plant with the aid of a sterile scalpel. The blocks containing the culture were then placed on both side of the leaves and sealed with Vaseline. These were left till signs of infection begin to manifest. The number of days taken for the infection to manifest was recorded according to the isolate tested.

Data Analysis

Data collected were expressed as simple percentages.

Results and discussion

General distribution of fungal species

It was discovered that the prevalent fungal species average across the two sampled local government were *Fusarium (*68 %,) followed by *Aspergillus*(52%*),Curvularia*(45%) while the least was *Alternaria*(23%)

Percentage distribution of fungal species based on the two local government areas sampled

Fusarium species was the most prevalent in the two local government areas; Aboh and Ahiazu Mbaise sampled with 75% and 60% respectively (Table 1). In Ahiazu Mbaise ,*Fusarium* was closely followed by *Curvularia* species (55%) while *Alternaria* species were the least with 30% prevalent rate. In Aboh Mbaise , *Fusarium* species were high (75%) followed by *Aspergillus (55*%),*Curvularia* species (35%) while *Alternaria* species were the least with 15% prevalence rate. Averaged over the two environments, highest prevalent fungal species were *Fusarium* (68%) while the least were *Alternaria* (23%).

Occurrence of fungal species based on plant leaf discolouration

All the organisms observed have brownish discolouration. Black discolouration was only seen in *Alternaria* and *Curvularia* species. *Fusarium* and *ASpergillus* species showed yellow and cream coloured discolouration (Table 2).

Days of observable tangible fungal disorder

The test showed that *Fusarium* species caused observable infection within 5 days of inoculation and continued till the end of the experiment (Table 3). It was equally observed that *Curvularia* and *Aspergillus* specie caused infection from 6 days of inoculation till the end of the experiment. *Alternaria* specie was pathogenic to the tomato leaf as it caused tangible infection from 11th day of observation.

Discussion

Results obtained from the research showed that fungal pathogens associated with tomato plants are high in the community studied. Four fungal species were mostly prevalent; *Fusarium, Aspegillus, Curvularia, and Alternaria.* All the fungal species observed in this study were spores formers, whose spores could easily be blown about by the wind (Busscher *et al*., 1994; Guillino *et al*. 1995, and Awad *et al.,* 1997). These spores cause fungal diseases as they spraed in vegetable fields (Aref and Dougdoug, 1996). The discolouration observed on the infected tomato plants caused noticeable changes only on the 11th day. The late observation of the effects could be attributed to the slow reaction of the components or the toxins they produced. Since the toxins produced were in small quantities, it requires time to act (Guillino *et al.* , 1995). The result agrees with the works of Nowak and Pillay (1996) who observed that *Fusarium* species were most common pathogens of tomato. However, it differs slightly from that of Aref and Dougdoug (1996) who reported the presence of *Curvularia* sacotima and *Fuckelina* species. Similar fungal species were obtained in both Aboh and Ahiazu Mbaise local government areas. This could be attributed to uniformity in climatic, environmental and cultural characteristics in plants; since it has been observed that similar plants within a given environment are infected by similar pathogens (Aref and Dougdoug ,1996). This study therefore confirms *Fusarium, Aspergillus* and *Curvularia* species as the major fungal pathogens of tomato plant in the studied areas. Thus, effective control measures such as weeding and prompt harvesting and handling; as well as adequate knowledge of the epidemiology of these parasites will minimize their adverse impacts.

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Table 1: Percentage distribution of the fungal species based on the two environments sampled

	Aboh Mbaise			Ahiazu Mbaise		
Fungal Pathogens	No of plants sampled	No of plants infected	Percentage infected	No of plants sampled	No of plants infected	Percentage infected
Curvularia spp	20	7	35	20	11	55
Aspergillus spp	20	11	55	20	10	50
Alternaria spp	20	3	15	20	6	30
Fusarium spp	20	15	75	20	12	60

Table 2: Occurrence of fungal species based on the plant leaf discolouration

Fungal pathogens	Black	Brown	yellow	Cream white
Curvularia spp	+	+	_	_
Aspergillus spp	_	+	+	+
Alternaria spp	+	+	_	_
Fusarium spp	_	+	+	+

Table 3: Pathogenicity and days of tangible fungal disorder

Fungal pathogens	Number of days									
	5	6	7	8	9	10	11	12	13	14
Curvularia spp	-	+	+	+	+	+	+	+	+	+
Aspergillus spp	-	+	+	+	+	+	+	+	+	+
Alternaria spp	-	-	-	-	-	-	+	+	+	+
Fusarium spp	+	+	+	+	+	+	+	+	+	+