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Characterization of *Fusarium Oxysporum* Associated with Tomato Infection

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Abstract: *Tomatoes are still susceptible to Fusariun wilt diseases caused by Fusarium oxysporum f. sp. lycopersici. The disease is the responsible for great losses in tomato production across the globe, more especially during Warmer climates, as such a study was conducted to asses the prevalence of Fusarium oxysporum Associated with Tomato Infection in some farms within Maiduguri to ascertain it involvement in tomato spoilage, samples were collected from farms and were analysed the results showed the most in vitro radial growth after incubation. A total of 5 storage fungi were recovered from tomato. The result indicates, Aspergillus niger, Penicillium species, Aspergilus flavus, and Alternaria alternata, Fusarium oxysporum has the highest frequency. Out of the total of 9 equivalents to 47% were Fusarium oxysporum while 10 equivalents to 53% were other fungi, this showed that Fusarium oxysporum is most prevalent in tomato infection within the studied sample.*

Keywords: *Fusarium oxysporum, Tomato, Fungi, Infection*

Introduction

Fusarium oxysporum has a wide-reaching distribution in soil and are found in rhizosphere of many plant species. It is an anamorphic species that cause several diseases such as vascular wilt, yellows, corm rot, root rot and damping-off (Gordon and Martyn, 1997). Despite various genetic modifications in advancement of deferent varieties of *F. oxysporum,* that are resistant to tomato, the tomatos are still susceptible to Fusariun wilt diseases caused by *Fusarium oxysporum f. sp. lycopersici.* The disease is the responsible for great losses in tomato production across the globe, more especially during Warmer climates (Onyekachukwu and Adefoyeke, 2017). Some strains that induce root rots or vascular wilts are accountable for enormous yield losses on crops of economical importance including tomato, chickpea, wheat, beans, cucumber etc. Higher incidence of the wilt may inflict a yield decline of up to 5q/h in chickpea. Fusarium wilt is also a major limiting factor in tomato production which adversely affect yield by causing damage of up to 15% annual loss to canning tomatoes in advanced countries like USA, but exact amount of loss in India and other developing countries are not known (Peter and Rai, 1976). The life cycle

of *F. oxysporum* begins in the soil where the spore germ tube, or mycelium enters through a wounds or passes the root tips of susceptible hosts. The developing mycelium enters the xylem vessels all the way through their pits after traversing the root cortex and travels upwards via the plant towards the stem and crown(Abu Bakar, et al,2013)

Tomato (*Lycopersicon esculentum*)

Tomato (*Lycopersicon esculentum*) is one of the world's most widely cultivated vegetable crops for consumption as fresh fruits and various types of processed products (Hariprasad et al.,2009). Tomato is a highly required because of its nutritive value generally and specific paramount in vegetarian diets globally. It also serves as good source of vitamins C, A and minerals such as Fe and Cu (Sandani and Weerahewa., 2018)

The proper management and control of the causative agent of fusarium wilt, the Fusarium oxysporum with soil origin has not been successful as the fungus lives particularly in or near the dynamic environment of the rhizosphere and can frequently survive long periods in soil with the help of resistant structures. It has been recorded that the commonly applied control measures against this pathogen infection are pre plant fumigation and fungicide application. Other biological mode of control was also adopted. Several different methods have been attempted to manage the Fusarium wilt disease. Induction of host resistance and biological control has been prominent among other approaches. The defence mechanisms of a tomato plant have been activated through the induction of the expression of β-fructosidase, by a combination of chitosan and endophytic bacterial strain.

Comprehensive understanding of pathogen populations and diversity at the species level is important, as high genetic diversity indicates a rapid change in genetic structures. This, in turn, shows the development of more virulent species and strains in response to management practices, changed environments, and increased biological fitness of these species. Screening the pathogen population, therefore, helps us in studies aimed at reliably detecting variations in the population structure of the pathogen, which in turn enable us to understand population biology of the pathogen (Akbar eta al, 2018). Many studies reported that molecular techniques using different markers could detect genetic diversity within and among populations to a certain extent, including pathogenicity variation, geographical, and host differences (Li et al 2012).

Fusarium oxysporum

Fungal soil-borne pathogens such as *Fusarium oxysporum f. sp*. radicis-lycopersici, first observed in 1969 in Japan (Sato and Araki, 1974), and *Fusarium oxysporum* f. sp. lycopersici, described over 100 years ago in the UK causes tomato wilting (Inami et al., 2014), *Fusarium oxysporum* is an anamorphic species that includes both pathogenic and nonpathogenic strains. Plant pathogenic forms cause a wilt disease and are grouped into formae speciales based on their host range; some are further subdivided into pathogenic races. Many formae speciales are comprised of multiple clonal lineages and, in some cases, a pathogenic race is associated with more than one clonal lineage, suggesting independent origins. Although some evidence suggests one pathogenic race may give rise to another, recent derivation of a pathogen from a non pathogen has not been documented. Most new occurrences of Fusarium wilt appear to be the result of a recent introduction rather than an independent local origin of the pathotype. Asexual

propagation is the dominant influence on population structure in *F. oxysporum* and the absence of sexual reproduction is not likely to prevent this pathogen from continuing to inflict significant damage on susceptible crop hosts (Gordon, 1997)

Methodology

Study Area and sample collection

The study was conducted in Maiduguri Metropolis, Borno State, Nigeria. The State is located in the north-eastern geopolitical zones of the country, lies in latitude 10^0N and 13^0E. It shares international boundaries with the Republic of Niger to the north, Chad to the North east and Cameroon to the east. It also shares national boundaries with Adamawa to the south, Yobe to the west and Gombe to the west. The State has an area of 69,435sq kilometres (NPC).
The samples were collected from different tomato farm, alone custom irrigation farm area.

Procedure

Twenty eight gram of commercially prepared PDA (Potato dextrose agar) was transferred into a conical flask. One litre of distilled water was added and boiled to dissolve and later sterilized by autoclave at 121^0C for 15 minutes. It was allowed to cool before being poured into plates (petri dishes).

Isolation and Identification of Associated Fungi

The unhealthy sample were cut through by means of placing the infected site on prepared Potato dextrose agar (PDA) with sterile distilled water and plated on Saboroud dextrose agar (PDA) and incubated at room temperature for 24 to 48 hours. Representative colony types were purified by sub culturing on fresh PDA plates. Pure cultures were transferred to slants of PDA for future use. The isolated fungi were identified based on the isolates colonial characteristics on culture plates and microscopic features in slide cultures. A sterile inoculating needle were used to fetch a portion of each mycelia colony and aseptically placed on a clean microscope slide and observed under the microscope.

Result and discussion

Table 1: showing characterised *Fusarium oxysporum* and other fungi form tomato rot

s/no	*Fusarium oxysporum* isolates	Other Fungal isolates
1	-	+
2	+	-
3	+	-
4	+	-
5	+	-
6	-	+
7	-	+
8	+	-
9	-	+
10	-	+
11	-	+
12	+	-
13	-	+
14	-	+
15	+	-

16	+	-
17	+	-
18	-	+
19	-	+

Isolates showed the most in vitro radial growth after incubation. A total of 5 storage fungi were recovered from tomato. The result indicates, *Aspergillus niger, Penicillium* species, *Aspergilus flavus,* and *Alternaria alternata*, *Fusarium oxysporum* has the highest frequency
Out of the total number 9 equivalents to 47% were *Fusarium oxysporum* while 10 equivalents to 53% were other fungi, This showed that *Fusarium oxysporum* is most prevalent in tomato infection within the studied sample. Although the pathogenic isolate caused the most severe root rot at pH 6 and 30°C, in this case the pH and temperature were not assed this is in conformity with the work of Gordon and Martyn, (1997) Who says *Fusarium oxysporum* has a wide-reaching distribution in soil and are found in rhizosphere of many plant species. It is an anamorphic species that cause several diseases such as vascular wilt, yellows, corm rot, root rot and damping-off. This phenomenon was observed in most of the samples analysed and the scenario is most prominent in *Fusarium oxysporum* dedicated affected tomato.

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