

Fungal diseases of watermelon in Morogoro urban, Tanzania

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Abstract

A study to examine fungal diseases infecting watermelon (*Citrullus lanatus* Thunb.) plants in Morogoro urban, Tanzania was conducted in November, 2011. Forty eight watermelon samples with necrotic symptoms collected from randomly selected home gardens were tested for infection using the Blotter method. Identification of the detected fungi was done based on morphological characters of the mycelia and conidia Observed under the stereo and compound microscopes. The results indicated that, watermelon samples were infected by *Alternaria alternata* (96.7%), *Cercospora citrullina* (93.3%), *Fusarium oxysporum* (40%), *Microphomina phaseolina* (38.3%) and *Cladosporium cucumeticum* (14.2%). Such results implied that, a number of fungal pathogens infect watermelon in Morogoro urban district. This is the first report of these fungal pathogens in Tanzania. More work is therefore, needed to study the incidence, distribution and economical impact of diseases of watermelon caused by these fungal pathogens in different locations in the country.

Keywords: *Citrullus lanatus*, incidence, disease, blotter method, fungi

INTRODUCTION

Watermelon (*Citrullus lanatus* Thunb.) is a flowering vine-like plant of the family Cucurbitaceae [1]. The center of origin of watermelon is believed to be the Kalahari dessert region, Africa where different species can be found in various forms in the wild [2-3]. Watermelon is currently produced in warm climates all over the world and utilized for the production of fruit cocktails, juices and nectars [4]. The fruit of watermelon is composed of 93% water, small amount of minerals, proteins, fats, carbohydrates, lycopenes and vitamins [5-6]. Its flesh is rich in citrulline; a source of arginine amino acid, which is a substrate for the synthesis of nitric oxide and is associated with cardiovascular and immune roles in humans [7]. Watermelon like other fruits is an important crop which, generates income and improves nutrition and food security especially to the small-holder farmers in Tanzania [8]. The demand for fruits in the country is increasing due to a rapid population growth in the urban areas such as Dar Es Salaam, Arusha, Tanga and Morogoro regions, where fruits are sold in open air markets and by street vendors located in residential streets of these towns [9]. In 2010, the estimated production quantity of watermelon in the country was

7,500 tones which, was three-fold higher compared with 2,500 tones produced in 1990 [10]. Like other fruit crops, watermelon requires proper disease management. However, with exception of gummy stem blight caused by *Didymella bryoniae* [11], no further information is available concerning other diseases that infect this crop in Tanzania. Therefore, the objective of this work was to detect and document important fungal pathogens infecting watermelon plants growing in Morogoro urban district, Tanzania. Morogoro region was selected among other regions in the country due to its climate which, is suitable for production of watermelon and other crops and its status as the national food reserve region.

MATERIAL AND METHODS

Survey and collection of samples

Forty eight infected leaf samples of watermelon were collected from twelve locations (home gardens) in Morogoro urban district in November, 2011. From each location, four leaf samples with lesions (representing four replications) were randomly collected and were packed in sterilised transparent polyethylene bags, labelled and transported to the African Seed Health Centre laboratory, Morogoro, Tanzania for analysis.

Isolation and identification of fungal pathogens from infected plants

The Blotter method described by Mathur and Kongsdal [12] was used to test watermelon leaf samples for infection by fungal pathogens. Leaf samples of about 1 cm x 2 cm taken from the margins of the lesions were placed on well water-soaked three-layer blotters in Petri-

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dishes (eight pieces per leaf sample x four leaves or replications per location) and, were incubated at 22-25 °C for seven days in alternating cycles of 12 h darkness and light. Identification of the fungi was done based on the morphology of the mycelia and conidia observed under the stereo and compound microscopes [12].

Determination of disease incidence

The incidence of the detected fungi was calculated by counting the number of samples infected by each fungus over total number of samples tested per location x 100%. The mean incidence for each fungus was calculated by dividing the sum of values (incidence) recorded from all

RESULTS

Results (Table 1) showed that *Alternaria alternata* (Fr.) Keissler f. sp. cucurbitae was isolated at the highest incidence (96.7%) followed by *Cercospora citrullina* Cooke (93.3%). The incidence of *Fusarium oxysporum* Schlechtend (Fr.) f. sp. *niveum* was 40%, while that of *Macrophomina phaseolina* (Tassi) Goidanich and *Cladosporium cucumerinum* Ellis & Arth were 38.3% and 14.2%, respectively. The highest incidence (100%) of *C. citrullina* was recorded in eight out of twelve locations (Table 1). The lowest incidence (70%) of *C. citrullina* was recorded in watermelon samples collected

Table 1. Incidence of fungal pathogens isolated from watermelon plants in Morogoro urban, Tanzania in 2011

locations by the total number of locations.

from location No. 4 obtained from Tubuyu (Table 1).

S/No.	Location	Incidence of fungal pathogens (%)*				
		Cer. ci	A.alt	M. ph	F.oxy	Cl.cuc
1	Tubuyu	100	100	60	20	20
2	Tubuyu	100	100	50	40	0
3	Tubuyu	80	100	40	20	20
4	Tubuyu	70	100	30	40	30
5	Tungi	100	90	60	20	30
6	Tungi	100	100	50	30	0
7	Tungi	100	100	20	60	10
8	Kingolwira	90	100	40	50	0
9	Kingolwira	100	100	20	60	20
10	Kichangani	80	80	10	60	30
11	Kichangani	100	90	30	30	0
12	Kichangani	100	100	50	40	10
Mean		93.3	96.7	38.3	40	14.2

* Each value is a mean of eight water melon leaf pieces per sample of 1 cm x 2 cm in four replications. Fungal pathogens were detected using blotter method described by Mathur and Kongsdal, (2003) with some modifications. S/No.= sample number, Cer. ci = *Cercospora citrullina* Cooke, A. alt = *Alternaria alternata* (Fr.) Keissler f. sp. cucurbitae, M. ph = *Macrophomina phaseolina* (Tassi) Goidanich, F.oxy = *Fusarium oxysporum* Schlechtend (Fr.) f. sp. *niveum* and Cl.cuc = *Cladosporium cucumerinum* Ellis & Arth.

Table 2. Diseases and symptoms caused by fungi isolated from watermelon plants in Morogoro urban, Tanzania in 2011

No	Disease name	Fungus name	Symptoms on plant	References
1	Alternaria leaf spot	<i>Alternaria alternata</i> (Fr.) Keissler f. sp. cucurbitae	Dark brown, circular lesions on watermelon leaves	[14]
2	Cercospora leaf spot	<i>Cercospora citrullina</i> Cooke	Small, circular to irregular circular spots with tan or light brown centers surrounded by dark purple or black margins on young leaves	[1]
3	Scab disease	<i>Cladosporium cucumerinum</i> Ellis & Arth	Sunken and dark green spots developing into large lesions softened with gummy substances	[13]
4	Fusarium wilt	<i>Fusarium oxysporum</i> Schlechtend (Fr.) f. sp. <i>niveum</i>	Dull, grey green appearance followed by yellowing of older leaves near the crown advancing outwards. The leaves then quickly wilts	[1]
5	Charcoal rot	<i>Macrophomina phaseolina</i> (Tassi) Goidanich	Water-soaked lesions, yellowing and death of crown leaves	[1]

The highest incidence (100%) of *A. alternata* f. sp. *cucurbitae* was recorded in samples collected from nine out of twelve locations, whereas, that of *M. phaseolina* (60%) was recorded in two out of twelve locations (Table 1). *Alternaria alternata* f. sp. *Cucurbitae* fungus had the lowest incidence (80%) in location No. 10 (Kichangani), while the lowest incidence of *M. phaseolina* was 10% (Table 1). The highest incidence (60%) of *F. oxysporum* was recorded in three out of twelve locations and the lowest incidence (20%) was recorded in two out of twelve locations (Table 1). The highest incidence (30%) due to *C. cucumerinum* was recorded in three out of twelve locations and the pathogen was not detected in four out of twelve locations (Table 1).

DISCUSSION

Several fungal pathogens infect watermelon worldwide [1]. In this study, five fungal species namely *A. alternata*, *C. citrullina*, *F. oxysporum*, *M. phaseolina* and *C. cucumerinum* were isolated from infected watermelon plants collected from Morogoro urban district.

These organisms have been reported to be pathogenic on watermelon and cause diseases (Table 2) of economic importance in watermelon production in many parts of the world [1, 13-14]. In the current study the mean incidence of 96.7%, 93.3%, 40% and 38.3% were recorded for *A. alternata*, *C. citrullina*, *F. oxysporum* and *M. phaseolina*, respectively. Such results implied that watermelon plants in Morogoro urban district are infected by a number of fungal pathogens. Such findings indicate that these fungi are widely distributed among watermelon fields in Morogoro urban district. Diseases caused by fungi are among the serious constraints causing low watermelon productivity [15]. This is the first report of *A. alternata*, *F. oxysporum* and *M. phaseolina* on watermelon plants in Tanzania. More work is needed on the distribution and economical impact of diseases caused by such fungi in Morogoro and other regions where watermelon is grown in Tanzania.

ACKNOWLEDGEMENTS

This work was supported by the African Seed Health Centre, Sokoine University of Agriculture, Morogoro, Tanzania.

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