

Original Research Article

Leaf Blight: A new Disease of *Xanthium strumarium* L. caused by *Curvularia lunata* and *Drechslera spicifera* in Sudan

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ABSTRACT

Keywords

Weed management, Beneficial agent, Leaf blight disease, Bio-control, Pathogen

Ramtouk (*Xanthium strumarium* L.) known in Sudan as a very common weed of many row crops in the temperate and subtropical regions and is widely spread in irrigated schemes in Khartoum, Blue Nile State and Gash Delta (Eastern Sudan) competing with different economic crops and causing a great losses in their yields. In this study two fungi namely, *Curvularia lunata* & *Drechslera spicifera* were isolated from necrotic spots and blight of *Xanthium strumarium* leaves in different locations in Khartoum State. Their identification based in accordance to microscopic and macroscopic characters. Pathogenicity of these pathogens studied in the Laboratory of the Department of Crop Protection, Faculty of Agriculture University of Khartoum, Sudan. Inoculation was done by using a pressurized hand sprayer. This research work was the first discovery of the incidence of the leaf blight disease in Sudan caused by *Curvularia lunata* & *Drechslera spicifera*. Therefore, those two pathogens could be considered as beneficial agents for the bio-control and to establish weed management program of this noxious weed. The plant host ranges of the two pathogens were determined in glasshouse. Host plant representing 8 families and 10 genera and the result shows that the pathogen *Drechslera spicifera* caused a miner spots on the graminaceous hosts.

Introduction

Ramtouk (*Xanthium strumarium* L.) is a very common weed of many row crops in the temperate and subtropical regions in the world and it can invade cultivated fields, along beaches, coastal dunes, watercourses, railway embankments, roadsides, field edges and waste places.

The weed prefers open communities with expectation of the mountains region (Kaul, 1971). The geographical distribution of *X. strumarium* extends from latitude 53°N to 33°S (Holm *et al.*, 1977). According to Love and Dansereau (1959) it's of Central and South America origin. In Sudan *Xanthium*

strumarium L. was reported by Braun *et al.* (1991) for the first time, with the Arabic name Kharag El Bahar and they emphasized the dispersal of this weed in Khartoum and Blue Nile provinces, While Andrews (1956) reported the presence of this weed in Gash Delta Eastern of Sudan and also the weed was reported by Braun *et al.* (1991) as widely spread in Nile Banks, Rahad and rarely in the Gezira Scheme. Currently this weed is locally known as Ramtouk (i.e. take me with you) given by the Hadandawa Tribe in the Sudan (Morgan, 1991). *X. strumarium* is a broad-leaved plant and it belongs to the family Asteraceae and due to its morphological characters, it serves as a reservoir and alternative host for a number of pathogens attacking a wide range of cultivated crops.

Materials and Methods

Survey: Surveys were made in Khartoum State at month intervals starting in January 2009 and extending through February 2011. Samples were collected from different locations selected to represent major infestation regions.

Sampling: Various foliar symptoms were observed on *Xanthium strumarium* and the plants were sampled according to:

1. Dead plants: Some of these plants were infested with *Cuscuta spp.*(Figure 1)
2. Discrete brown oval lesions.
3. Small scattered brown spots on the leaf, later these spots increase in size and coalesce covering larger leaf area with dark brown margin and yellow halo.
4. During these surveys all the plants infected with powdery mildew,

caused by *Sphaerotheca fuliginea* (Gamiel *et al.*, 2002). Either whole plants or excised leaves were collected, specimens were air dried and kept in herbarium for further investigations.

Identification of Fungi

Pathogens isolated were

1- *Curvularia lunata* from the leaves of the weed (*Xanthium strumarium* L.) with brown spots and yellow halo (Figure 2).

2-*Drechslera spicifera* isolated from the leaves with deep brown color (Figure 3).

Pathogenicity test

Xanthium strumarium L. seeds were surface sterilized and sown in pots containing sterilized soil. They were allowed to grow for 4 weeks. Prior to inoculation, the plants were predisposed to 95 percent humidity for 24 hour. Thereafter, they were inoculated with spore suspension diluted to approximately 6.0×10^5 spores/ml. The spore suspensions were sprayed using a pressurized sprayer. After inoculation the plants were exposed in the same conditions for 24 hours. Suitable control plants were maintained by spraying of sterile distilled water. Symptoms appeared after five days, the organism was re-isolated from these artificially infected leaves and the culture obtained was compared with original culture for confirmation. The host ranges of the selected pathogen (*Curvularia lunata* and *Drechslera spicifera* were determined in glasshouse by using plants representing 8 families and 10 genera grown in clay pots containing silt (Table 1) three plants were allowed per pot. All plants were inoculated 3 to 5 weeks after germination. The plants were collected in vegetative stage and each plant has leaves from a few weeks old to

months. Three plants were tested and four leaves of each plant were inoculated by placing two 5 mm diameter agar discs. The plants were then covered with plastic bags for 48 hours. The plastic covers were then removed and the plants were incubated in glasshouse for two weeks.

Result and Discussion

Xanthium strumarium L. is wind-pollinated, self-compatible and self-pollinated as reported by Love and Dansereau (1959). Such characteristics subject the weed plant to airborne pathogens such as *Curvularia lunata* & *Drechslera spp.* The data on survey revealed that, *Curvularia lunata* leaf symptoms and *Drechslera spicifera* symptoms incidence varied from locality to another. This is the first record of leaf blight caused by *C. lunata* and *D. spicifera* in

Sudan. Prior to 2007, the only major disease reported on this plant in Sudan was powdery mildew, caused by *Sphaerotheca fuliginea* (Gamiel *et al.*, 2002). This study provides the first detailed investigation on the possible use of fungi for the control of *Xanthium strumarium*. In Sudan, Gamiel *et al.* (2002) reported serious leaf necrosis caused by *Sphaerotheca fuliginea* in Rahad scheme and along Rahad River. Some pathogens were tested to be used as bio control agents of *X. strumarium*. Abbas *et al.* (1995) tested *Alternaria helianthi* to determine the optimum temperature for efficient production of inoculums as he considered this to be important for the development of *A. helianthi* as a mycoherbicide. Host range study was carried out to see the susceptibility of some plants due to the infection by the two pathogens as shown in (Table 1).

Table.1 Susceptibility of various plants to test pathogens associated with *Xanthium strumarium*

Family and scientific names of test plant	Pathogens	
	<i>Curvularia lunata</i>	<i>D. spicifera</i>
Graminae		
<i>Sorghum vulgare</i> (Sorghum)	-	+
<i>Triticum vulgare</i> (Wheat)	-	-
<i>Pennisetum typhoides</i> (Millet)	-	-
Cyperaceae		
<i>Cyperus rotundus</i>	+	-
Cucurbitaceae		
<i>Citrullus lanatus</i> (water melon)	-	-
Compositae		
<i>Helianthus annuus</i> (Sunflower)	-	-
Anacardiaceae		
<i>Mangifera indica</i> L. (Mango)	-	-
Amaryllidaceae		
<i>Allium cepa</i> L. (Onion)	-	-
Leguminosae		
<i>Arachis hypogea</i> L. (Groundnut)	-	-
Pedaliaceae		
<i>Sesame indicum</i>	-	-

Figure.1 *Xanthium strumarium* L.: Plant infected with *Cuscuta* spp.



Initial infection

Final infection

Figure.2 *Xanthium strumarium* L.: Symptoms of *Curvularia launata* & their spores

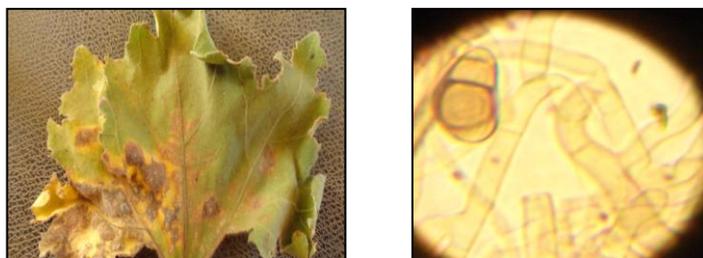


Figure.3 *Xanthium strumarium* L.: Symptoms of *Drechslera spicifera* & their spores



All selected plants were inoculated with the two pathogens in the glasshouse. However, research results showed that the fungus *Drechslera spicifera* L. was found to cause minor spots on sorghum plants leaves, so the pathogen could be used as a good potential tool for the control of the weed in sorghum plants, conditional that extra research could be carried out. On the other hand, the fungus *Curvularia lunata* could also be considered to have a promising potential as a bio-control agent. These findings are compatible with the previous reports by Abbas *et al.* (1995) *Furthermore*; results showed that the fungus *Curvularia lunata* considerably affected the noxious weed *Cyperus rotundus* L. Therefore this fungus can be used as a bio-control technique for the control of such weed which is causing a great problem in all crops in irrigated scheme in Sudan. Additional host range studies should be conducted in the field to confirm the narrow host range indicated in the greenhouse.

In conclusion, it is generally agreed that the two pathogens *Curvularia lunata* & *Drechslera spicifera* are promising beneficial agents for accomplish successful weed management program in Sudan. It also showed that the pathogen *Drechslera spicifera* have a good potential as bio control of *Xanthium strumarium* in graminaceous crops field in Sudan. There is a need for further studies relating to confirm the narrow host ranges for the two pathogens.

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