



First Report: Pathological Potential of Fungi on *Moringa Oleifera* Lam in Egypt

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Abstract : During 2013 and 2014 *Moringa oleifera* Lam wilt syndromes were observed on shoot system before flowering stage. The objective of this study was to isolate and identification of pathogens responsible for root-rot observed on *Moringa oleifera* in Egypt. Two isolates of *Fusarium semitectum* Berk. & Ravenel were isolated from diseased tissue on potato dextrose agar (PDA). Fungal isolates were purified and identification according to morphological, cultural and microscopic characters. Chlorosis, yellowish, curls, wilt and dryness symptoms were developed on flowering stage. Dried leaves were dropped which led to stripping appearance. Main stem and branches became leaves-free within 5 days after initial symptoms were observed. Soften-rot of stem base and main root were also observed as soaking tissue with brown discoloration. Heavy white mycelial growth was showed on diseased tissue 3 days after incubation in damping chamber at 25°C under highly relative humidity condition. Pathogenicity test on *Moringa oleifera* trees revealed that one isolate was highly causing wilt syndromes on shoot system and soften rot-root. Pathogenic isolate was re-isolated from diseased soften roots.

Conclusion: This is first record of root-rot on *Moringa oleifera* in Egypt.

Keyword: *Fusarium semitectum*, *Moringa oleifera*, rot-root.

Introduction

The Moringaceae (Horseradish tree family), contains 13 species from tropical and subtropical climates that range in size from tiny herbs to massive trees. The most widely cultivated species is *Moringa oleifera*, which growing in India, Pakistan, Bangladesh and Afghanistan. All parts of the plant can be used for medicine, biofuel, industrial product food and animal feed¹. In addition, *Moringa oleifera* plant extracts have been reported to be safe, non-toxic to man, and effective against plant pathogens of cowpea *i.e.*, damping-off and stem-rot diseases caused by *Scolorotium rolfsi*² and wet rot disease on sweet potato caused by *Rhizopus stolonifer*³. In addition, ⁴mentioned that *Moringa oleifera* a good candidate for bio prospecting fungicide against *Gibberella xylarioides* causing wilt of coffee. Moringa is fairly pest and disease resistant, particularly since its fast growth allows it to regenerate quickly. The most serious foliar diseases in Moringa are leaf spot disease caused by *Cercospora moringae*⁵, *Cercospora apii* a new host of *Moringa oleifera*⁶, brown spots caused by *Cercospora* spp., *Septoria lycopersici* and *Alternaria solani*⁷, Powdery mildew caused by *Levellula taurica*⁸. In addition, soil borne diseases were recorded, such as wilt disease of Moringa seedlings caused by *Fusarium*

oxsporium f. sp. *Moringae*⁹, *Diplodia* spp. caused root-rot, severe wilt and death of plants in water logged soils^{8,10}. *Fusarium semitectum* Berk & Rav causing wilting of young shoots and branches dieback was recorded in China¹¹. The objective of this study was to isolate and identification of pathogens responsible for root-rot observed on *Moringa oleifera* in Egypt.

Materials and Methods

Isolation and identification of causal pathogens

During 2013 and 2014 at Kafer El-Abida village, El-Mehalla El-Kobra District, Gharbeia Governorate, Egypt, *Moringa* plants suffer from diseases symptoms. The plants have chlorosis, yellowish, and wilt syndromes on leaves and branches. Also, soften rot of main root and stem base with brown discoloration as well as mycelium of fungal growth were observed (Figures 1 and 2). Soften tissues samples were obtained from stem base and roots and then cut into small square parts (0.5 cm). Samples were surface sterilized for 1min using 5% sodium hypochlorite solution, rinsed in sterile distilled water several times and then plated on PDA at 25-28°C for 5 days. Fungal isolates were purified using single spore culture technique and identified according to information from^{12,13}.

Pathogenicity test

Pathogenic potential of fungal isolates on *Moringa oleifera* was carried out on 2015 growing season at National Research Centre (NRC), Egypt. Plastic pots 25 cm-diameter containing sterilized loamy-sand soil inoculated with each fungal inocula 5% (w/w) were used. Fungal inocula was prepared on sterilized sand corn medium (SCM) according to¹⁴. Fifteen pots were used as a replicates for each isolate and 5 ones were served as a control. Each pot was seeding with five seeds. Wilt on shoot system and root-rot plants were observed 30 after sowing.

Results

Root rot incidence on *Moringa oleifera* plants

During 2013 and 2014, leaves wilting, root softening and root brown discoloration syndromes have been observed on 4-8 months old *Moringa* plants at Kafer El-Abida village, El-Mehalla El-Kobra District, Gharbeia Governorate, Egypt. The symptoms began as a chlorosis on lower leaves, which turned to yellowish and extended to upper leaves. At final stage, brown discoloration of root tissues and stem base was observed (Figures 1 and 2).

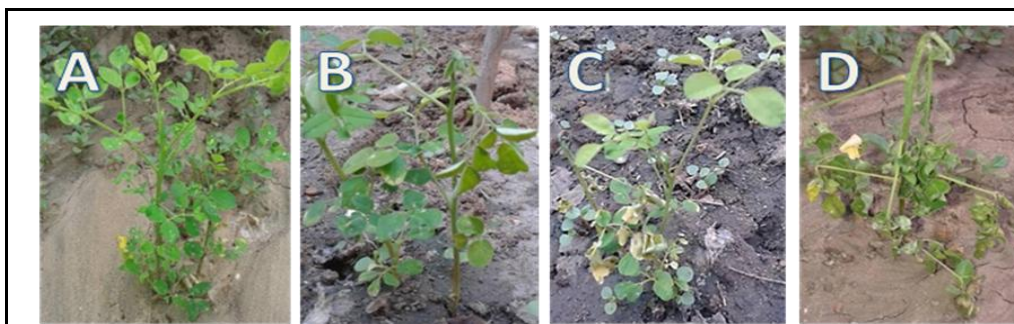


Fig. 1: Different wilt syndromes of shoot system on *Moringa* plants at vegetative stage (4 months), (A) healthy, (B) chlorosis, (C) yellowish and wilt and (D) dead plant.

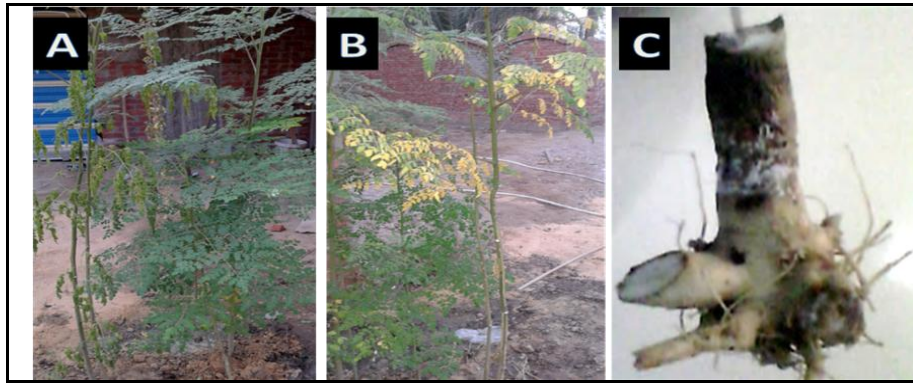


Fig. 2: Syndromes of shoot system and stem base on *Moringa* plants at flowering stage (8 months) showing, (A) typical wilt compared to healthy plant, (B) clear yellowish of leaves and (C), soften rot, brown discoloration on stem base and roots of diseased plant, and white mycelia growth.

Isolation and identification of causal pathogens

Routine isolation from diseased roots and softens tissues on PDA medium yielded two isolates of *Fusarium semitectum* as shown in Figure (3). Heavy white mycelial growth and pigment were observed on PDA medium 5 days after incubation at 25 °C.

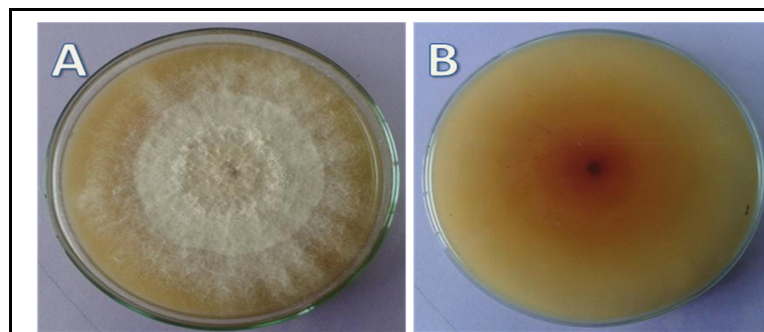


Fig. 3: Culture of *Fusarium semitectum* isolate on PDA medium. (A), mycelia growth and (B), fungal pigment.

Pathoenisity test

One isolate of *Fusarium semitectum* showed highly pathogenic reaction against *Moringa* plants, which causing wilt symptoms on shoot system after 30 days as shown in Figure (4). Chlorosis and yellowish were observed on lower leaves, which extended towards to upper leaves. The wilt, leaves dryness, leaves-free shoots and root-rot was appeared as shown in Figure (4). Also, reduction of root size, abnormal shape of roots and maceration root tissue as well as dryness with brown discoloration were appeared. Pathogenic isolate of *Fusarium semitectum* causing high reduction of *Moringa* plant growth and plant height as shown in Figure (4). Pathogenic isolate caused root-rot of *Moringa* plants was successfully reisolated from diseased root rotten tissue. No pathological effect was observed with second isolate of *Fusarium* sp.

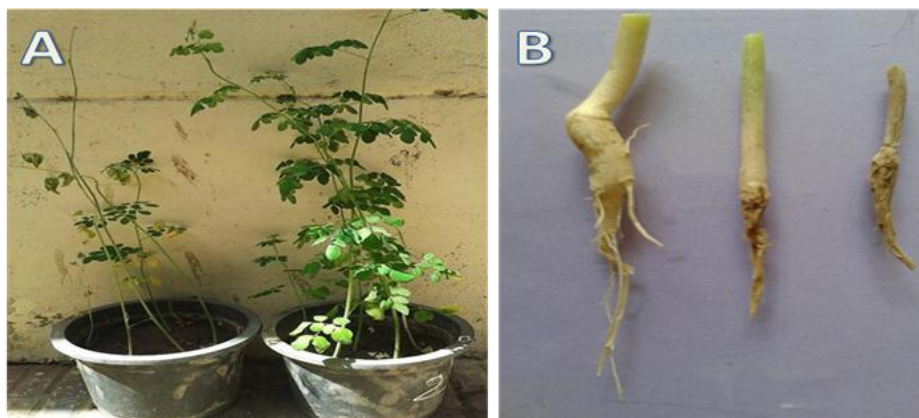


Fig. 4: Wilt and root-rot syndromes on *Moringa* plants. (A) Shoot system; shown chlorosis, yellowish and wilt induced by *Fusarium semitectum* (left pot) compared to control plants (right pot). (B) Root system; shown healthy root (left) compared to two roots having root-rot, whereas, size reduction, abnormal shape and maceration tissue as well as dryness with brown discoloration was shown on roots.

Discussion

Moringa oleifera belongs to family Moringaceae and is commonly found in India. Various parts of this plant such as the leaves, roots, seed, bark, fruit, flowers and immature pods, possess antitumor, antipyretic, antiepileptic, antiinflammatory, antiulcer, antispasmodic, diuretic, antihypertensive, cholesterol lowering, antioxidant, antidiabetic, hepatoprotective, antibacterial and antifungal activities, and are being employed for the treatment of different ailments in the indigenous system of medicine, particularly in South Asia¹⁵. Fungal diseases are the most serious on *Moringa* which cause defoliation and low levels of commercial production. Out of these, brown spots caused by *Cercospora* spp., *Septoria lycopersici*, *Alternaria solani*^{5,7}, powdery mildew caused by *Levellula taurica*⁸ and *Cercospora apii*⁶. Wilt disease of wild *Moringa* caused by *Fusarium oxysporium* f. sp. *moringae* was recorded⁹ and root rot caused by *Diplodia* sp.^{8,10}. In China, wilting of young shoots and branches dieback caused by *Fusarium semitectum*¹¹. On the other hand, no pathological potential was recorded on *Moringa oleifera* in Egypt, due to several seed borne fungal genera are associated with including *Rhizoctonia solani*, *Macrophomina phaseolina*, *Fusarium solani* and *Aspergillus* spp.¹⁶. Our observation clearly indicate that fungal isolates of *Fusarium semitectum* Berk. & Rav causing root-rot of *Moringa* plants. As far as the authors are aware and according to the available literature, this is the first record of fungal disease on *Moringa* plant in Egypt.

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