

DISEASE NOTE

First Record of Carrot Leaf Blight Caused by *Alternaria alternata* in Egypt

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Carrot (*Daucus carota* L.) is a member of family Apiaceae and is an important vegetable crop. Interestingly, a severe infection of leaf blight was detected on carrot cultivars in Qalubiya governorate, Egypt during the growing season in November 2019. Leaf blight was widely spread in the cultivated area. Initial symptoms were observed on the smaller leaflets such as a- water-soaked lesions, irregularly shaped and sized, dark brown to black numerous lesions without yellow halos, then with disease progress, the lesions expanded to involve entire leaves, causing the leaves to turn a brown color and ultimately collapsed, decayed and died (Figs. 1 & 2). Although, all carrot leaves can be attacked, however, older leaves are the most susceptible to infection. Disease incidence of 20–30% was observed in the affected carrot fields. It seems that the occurrence of the disease on carrot plants was generally related to high levels of soil moisture which was predominantly conformable to the tacky drainage systems of soil. Intense foliar infections resulted in decreasing productivity and reducing the effectiveness of manual harvesting.

Therefore, the associated fungus was isolated from the margins of carrot leaves and roots using potato dextrose agar (PDA) amended with ampicillin and the plates were incubated at 26°C for one week. Subsequently, pure cultures were maintained using the single spore and/or the hyphal tip technique and preserved at 25°C for further studies. Characterization of the isolated fungus was carried out according to its cultural and morphological characteristics. Microscopic examinations demonstrated that conidia are dark olivaceous brown (Fig. 3). The conidia measured $20.3 - 32.6 \times 6.9 - 12.4 \mu\text{m}$, including a filamentous beak ($7.8 - 13.7 \times 2 - 3.9 \mu\text{m}$) as well as the conidiophore was $30.2 - 50.7 \times 7.2 - 9.3 \mu\text{m}$. Accordingly, the isolated fungus was identified as *Alternaria alternata* (Fr.) Keissler. Moreover, pathogenicity tests were performed where leaf blight symptoms on inoculated healthy carrot plants were displayed again and *Alternaria alternata* was re-isolated and reidentified. Pathogenicity tests were performed in growth chambers under laboratory conditions using carrot root (Fig. 4 a and b) and under greenhouse conditions, using carrot seedlings at the five-leaf stage, by spraying healthy leaves with a conidial suspension 1×10^4 conidia /ml. Subsequently, inoculated plants were covered with polyethylene bags and incubated at 26°C with a 16 h photoperiod. Disease symptoms on carrot leaf were observed within 10 days post inoculation (Fig. 4C). The obtained symptoms were similar to those observed under natural infection conditions. Based on these results, *Alternaria alternata* (Fr.) Keissler is considered the causal agent of carrot leaf blight in Egypt.

As the authors are far aware the current study is considered the first record of *Alternaria* leaf blight on carrot caused by *Alternaria alternata* (Fr.) Keissler under Egyptian conditions.

The genomic DNA of the targeted fungus was isolated, and the amplified DNA was sequenced using the internal transcribed spacer regions (ITS1 and ITS4) by GATC Biotech Company using ABI 3730xl DNA sequencer throughout the traditional Sanger method and the new 454 technology. Thereafter, the obtained data were analyzed and deposited on the National Center for Biotechnology Information (NCBI) with accession number MZ434944.

Keywords: Carrot, *Daucus carota*, leaf blight, *Alternaria alternata*.

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Fig. (1): Symptoms of *Alternaria* leaf blight on carrot plants under open field conditions on carrot cultivars in Qalubiya governorate, Egypt during November 2019.

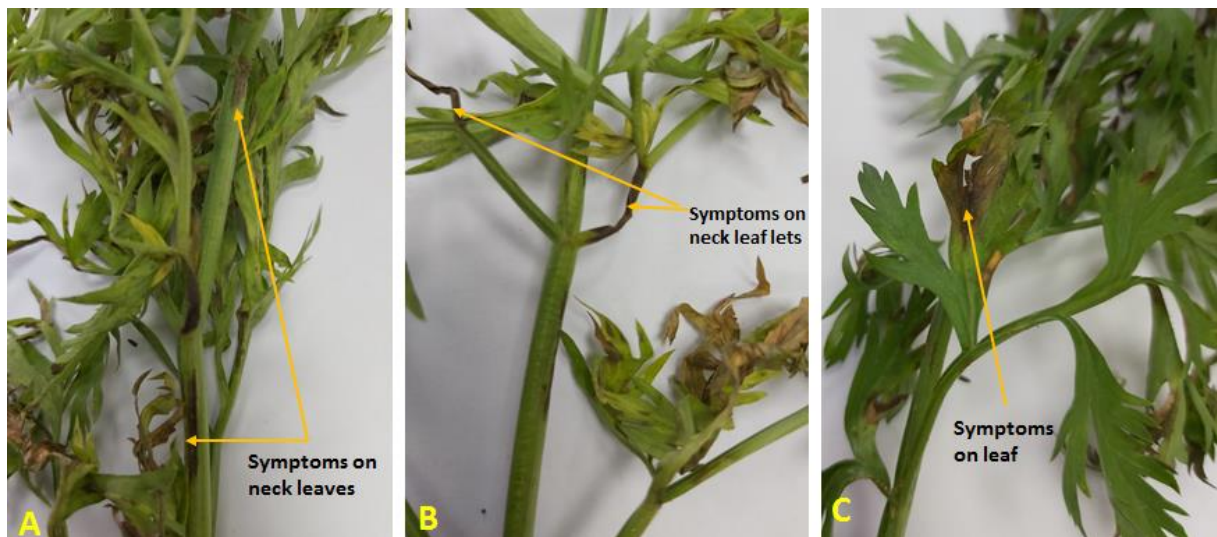


Fig. (2): Symptoms of *Alternaria* leaf blight on different parts of carrot plants. A: neck leaves, B: neck leaflets and C: on the leaf.

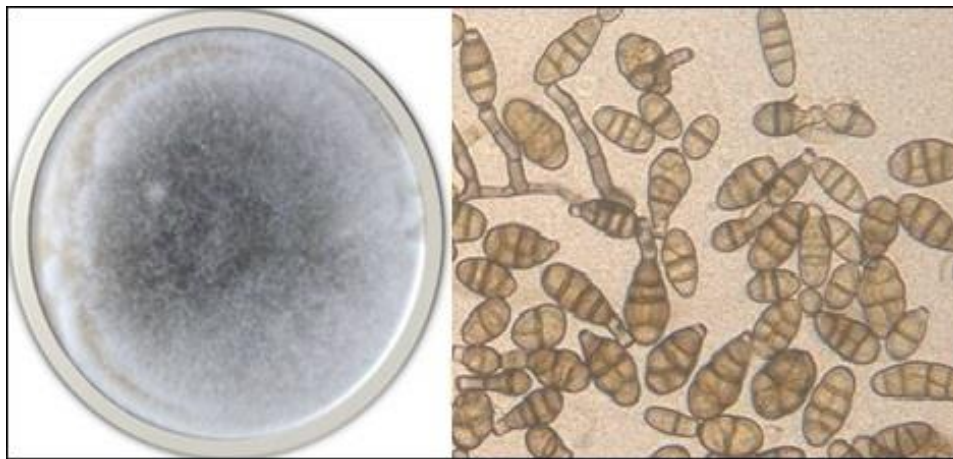


Fig. (3) Conidia and filamentous beak of *Alternaria alternata* the causal of leaf blight on carrot.



Fig. (4): Pathogenicity tests of *Alternaria alternata* on carrot roots under laboratory conditions. A: zero-time post inoculation, B: 10 days post inoculation and C: symptoms on leaves.