Plant Pathol. J. 28(2) : 216 (2012)
http://dx.doi.org/10.5423/PPJ.DR.10.2010.0146
pISSN 1598-2254 eISSN 2093-9280

The Plant Pathology Journal

Disease Report Open Access

First Report of *Fusarium* Wilt of Carrot in Korea

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(Received on November 3, 2010; Revised on April 25, 2011; Accepted on April 27, 2011)

Carrot (*Daucus carota* L. subsp. *sativus*), of the Apiaceae family, is grown worldwide. Diseases affecting carrot production in Korea include black root rot, damping-off, leaf blight, powdery mildew and leaf spot (Agrios, 2005; The Korean Society of Plant Pathology, 2009).

Wilts, vascular discoloration or brown streaks in the taproot, were observed on carrots cultivated in fields in Daejeo and Busan, Korea (Fig. 1). 0.17 ha were represented by the surveyed areas. The disease incidence reached approximately 40% in the surveyed areas in July 2008. The causual fungus was isolated on potato dextrose agar (PDA) from diseased carrots. A total of 10 isolates were obtained from roots in one farmer's field. Colonies with light-purple mycelia developed after 5 days of incubation at 25°C (Fig. 2A). The optimum temperature for fungus growth ranged from 25°C to 28°C. Abundant microconidia, macroconidia, and chlamydospores developed on water agar (WA) (Fig. 2). The microconidia were small, colorless, one-celled, and oval to elliptical in shape (8.0–9.4 × 3.2–3.8 μm). The macroconidia were three-to-five-celled, and gradually pointed or curved toward the ends (28.8–44.8 × 3.7–5.2 μm) (Fig. 2B). The chlamydospores (4.79–10.88 × 4.53–10.98 μm) are formed singly when grown on water agar. The morphological characteristics of the causal fungus examined agree with records for *Fusarium oxysporum* described by Nelson et al. (1984). To confirm identification of the pathogen, the translation elongation factor 1α (EF-1) and mitochondrial small-subunit (mtSSU) ribosomal DNA (rDNA) were partially sequenced (O'Donnell K et al., 2004). Amplification of the EF-1α region generated a sequence of 651 bp; the mtSSU amplicon was 677 bp. The EF-1α sequence was 100% similar to the sequence of a *F. oxysporum* strain (GenBank Accession No. HM347117). The mtSSU sequence was 100% similar to the sequence of a *F. oxysporum* strain (GeneBank Accession No. HQ114275). To confirm the pathogenicity of the casual fungus, 30-day old carrots were artificially inoculated with a representative isolate. Two isolates were used for the pathogenicity tests to the host plants. Carrot roots were dipped into conidial suspension (10^6 conidia per ml) of the causal fungus for 15 min. Then, the inoculated plants were transplanted into plastic pots containing sterilized bed soil and maintained at 25°C and 90% relative humidity in a growth chamber with a daily 12-hr photoperiod of fluorescent light. The pathogenicity test was conducted twice. After a 30-day of incubation, all of the artificially inoculated carrot plants had wilted and the fungal symptoms were reproduced. No symptoms were observed on plants dipped in distilled water. The fungus was successfully re-isolated to prove Koch's postulates. Based on morphological and pathogenicity approaches, the isolated pathogen was identified as *Fusarium oxysporum*. Fusarium dry rot of carrot caused by *Fusarium* spp. has been previously reported in Korea, but Fusarium wilt caused by *F. oxysporum* has not been recorded yet (The Korean Society of Plant Pathology, 2009). To our knowledge, this is the first report of the occurrence of carrot *Fusarium* wilt caused by *F. oxysporum* in Korea.

Fig. 1. The diseased carrots caused by *Fusarium oxysporum* showing signs of rot (A–D). Longitudinal (A and C) or cross sections (D) of carrot taproots.

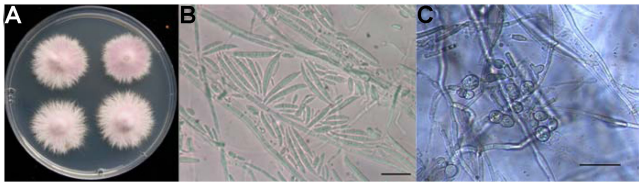

Fig. 2. Colony of *Fusarium oxysporum* on PDA after a 2-day of incubation at 25°C (A). Macroconidia (bar = 20 μm) (B). Chlamydospores (bar = 10 μm) (C).

References

Agrios, G. N. 2005. Plant Pathology, 5th. ed. Academic Press, Inc.; New York. 525 pp.

Nelson, P. E., Toussoun, T. A. and Marasas, W. O. 1983. *Fusarium* Species. An Illustrated Guide for Identification. Pennsylvania State University Press, University Park.

O'Donnell, K., Sutton, D. A., Rinaldi, M. G., Magnon, K. C., Cox, P. A., Revankar, S. G., Sanche, S., Geiser, D. M., Juba, J. H., van Burik, J. A., Padhye, A., Anaissie, E. J., Francesconi, A., Walsh, T. J. and Robinson, J. S. 2004. Genetic diversity of human pathogenic members of the Fusarium oxysporum complex inferred from multilocus DNA sequence data and amplified fragment length polymorphism analyses: evidence for the recent dispersion of a geographically widespread clonal lineage and nosocomial origin. *J. Clin. Microbiol*. 42:5109–120.

The Korean Society of Plant Pathology. 2009. List of plant diseases in Korea. 5th ed. 85 pp. (in Korean).

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