Diseases Caused by Nematodes

First Report of *Meloidogyne graminicola* on Rice in Anhui Province, China

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Meloidogyne graminicola, a devastating plant pathogen of rice (*Oryza sativa*), is considered to be a severe constraint to productivity in rice-growing areas (Zhan et al. 2018). In April 2020, irrigated paddy rice field in Qianshan City, Anhui Province, China, showed symptoms with stunting, thinning, chlorosis, and typical hook-shaped root tips. Females and egg masses of *Meloidogyne* sp. were found inside the cortex of the root galls, and males were found in soil and roots. The morphological characteristics of females, males, and second-stage juveniles (J2s) were identified as described previously (Tian et al. 2017; Wang et al. 2017). The perineal pattern of the females ($n = 12$) was dorsoventrally oval with low and round dorsal arches, with lateral fields obscure or absent. Most of the striae were smooth, and occasionally broken by short and irregular striae. Morphological measurements (mean $\pm$ SD, range) of female nematodes ($n = 20$) were body length ($543.0 \pm 66.0 \mu\text{m}$, 448.0 to 629.0 μm), stylet ($11.6 \pm 1.9 \mu\text{m}$, 7.9 to 14.2 μm), dorsal pharyngeal gland orifice to stylet base (DGO) ($4.0 \pm 0.4 \mu\text{m}$, 3.4 to 4.7 μm), vulval slit length ($24.1 \pm 4.9 \mu\text{m}$, 14.8 to 32.8 μm), and vulval slit to anus distance ($16.1 \pm 3.0 \mu\text{m}$, 8.4 to 20.2 μm). The male nematodes were cylindroid, vermiform, and rounded

tail, with the measurements ($n = 20$) body length ($1,673.0 \pm 125 \mu\text{m}$, 1,346.0 to 1,822.0 μm), stylet ($15.5 \pm 0.8 \mu\text{m}$, 14.0 to 17.1 μm), DGO ($3.7 \pm 0.5 \mu\text{m}$, 2.9 to 5.5 μm), and spicule ($30.7 \pm 2.5 \mu\text{m}$, 23.4 to 34.6 μm). The J2s were vermiform with a gradually tapering hyaline, and its measurements ($n = 20$) were body length ($452.0 \pm 33.0 \mu\text{m}$, 391.0 to 511.0 μm), stylet ($13.4 \pm 0.8 \mu\text{m}$, 12.0 to 15.2 μm), DGO ($3.6 \pm 0.6 \mu\text{m}$, 2.5 to 4.7 μm), tail length ($72.1 \pm 5.2 \mu\text{m}$, 59.8 to 84.8 μm), and hyaline tail terminus ($21.7 \pm 2.5 \mu\text{m}$, 18.0 to 29.7 μm). DNA extracted from individual females ($n = 10$) was used for molecular identification. The D2/D3 region of 28S rRNA was amplified with D2A (5'-ACAAGTACCGTGAGGGAAAGTTG-3') and D3B (5'-TCGGAAGGAACCAGCTACTA-3') (De Ley et al. 1999). The internal transcribed spacer (ITS) region was amplified with AB28 (5'-ATATGCTTAAGTTCAGCGGGT-3') and TW81 (5'-GTTTCCGTAGG TGAACCTGC-3') (Curran et al. 1994). The fragments of D2/D3 region (GenBank accession no. MT576694) and ITS region (GenBank accession no. MT573412) were 766 and 579 bp, respectively; they all exhibited 99 to 100% similarity with those of *Meloidogyne graminicola* isolates available in the GenBank. Therefore, both morphological and molecular characterization confirmed the status of this nematode as *M. graminicola*. In a greenhouse test, 20 rice seedlings (2 weeks old, cv. Longliangyou) were individually maintained in pots with sterilized sand and soil (3:1) and inoculated with 300 J2s; another 10 noninoculated rice seedlings were used as a negative control. Rice seedlings were grown in a greenhouse at 28°C/25°C with a 16-h/8-h light/dark photoperiod. After 30 days, all inoculated rice seedlings showed symptoms with stunting, chlorosis, and typical hook-shaped root tips, which were similar with those in the fields. The nematode reproduction index (final population density/initial population density) was 7.86 to 10.32. No symptoms were observed on noninoculated rice seedlings. These results confirmed the pathogenicity of *M. graminicola* on rice. To our knowledge, this is the first report of *M. graminicola* in Anhui Province, China.

References:

- Curran, J., et al. 1994. Mycol. Res. 98:547.
- De Ley, P., et al. 1999. Nematology 1:591.
- Tian, Z., et al. 2017. Plant Dis. 101:2152.
- Wang, G., et al. 2017. Plant Dis. 101:1056.
- Zhan, L., et al. 2018. BMC Plant Biol. 18:50.

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