

A Newly Recorded Turfgrass Pest, Root-knot Nematode, *Meloidogyne incognita*, in Korean Golf Courses

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골프장의 신 해충, 고구마뿌리혹선충의 발견

추호렬 · 이동운 · 김형환 · 박지웅¹ · 성영탁² · 정영기³

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ABSTRACT

The root-knot nematode, *Meloidogyne incognita* (Kofold and White, 1919) Chitwood, was newly found from *Zoysia* grass during the survey of turfgrass pests in golf courses. The grass infested with *M. incognita* became yellowish and reduced growth because of lacked vitality and fasciculated roots. *Z. japonica* has higher susceptibility than *Z. matrella*. *Cynodon* sp. was also infested with this nematode. *Z. japonica* was firstly recorded host plant. Most of surveyed golf courses were damaged by root-knot nematodes even though damage degrees were different depending on golf clubs. *M. incognita* was newly recorded pest from turfgrasses in Korea.

Key words: root-knot nematode, *Zoysia japonica*, *Zoysia matrella*

INTRODUCTION

The turfgrasses with yellowish and poor growth were found during the survey of insect pests and their biological control agents in golf courses through the country. The turfgrasses were confirmed to be heavily infested with root-knot nematodes by the detail observation. The root-knot nematodes belonging to the genus *Meloidogyne* Goeldi are the

most important obligate plant parasites. They are worldwide in their distribution and species of *Meloidogyne* attack almost every type of crop, causing considerable losses of yield or affecting the quality of the product (Lamberti and Taylor 1979). The second stage larvae enter roots and move through the growing point of the root and region of cell elongation. The root system does not utilize water and nutrients by their infestation. Thus the plant growth is rapidly changed by nematode feeding. Although *M. incognita* was isolated from about 700 hundred host plants, it was not common in Zoysiagrass. Only McGlohon *et al.*(1961) recoded *M. incognita* from *Z. matrella* (see Goodey *et al.* 1965). However, nobody found root-knot nematodes from turfgrasses in Korea. Therefore, some golf clubs were investigated to confirm root-knot nematode infestation and their damage status to turfgrasses in golf courses. We present here our observations.

MATERIALS AND METHODS

The turfgrasses with yellowish and poor growth were collected with shovel from tee, fairway, rough, and green and placed in plastic bag with soil. The samples were carried back to the laboratory and washed with tap water and confirmed root-knot nematode infestation. The root galls of turfgrasses were dissected and females of root-knot nematodes were removed from root fragments. The nematodes were also extracted from soil by combined screening-funnel technique (Ayoub 1980). The characters of juveniles and males and perineal patterns of females were used for identification. The perineal pattern was prepared according to Hartman and Sasser's method (1985). Additional information on nematode outbreak and damage was obtained by questionnaire to make clear the trace of an infestation.

RESULTS AND DISCUSSION

The root-knot nematode damaging turfgrasses was the Southern root-knot nematode, *M. incognita* in all the investigated golf courses. *Cynodon* sp., *Z. japonica* and *Z. matrella* in golf courses were infested by *M. incognita*, especially, *Z. japonica* was highly susceptible to the nematodes. According to our observation, 90% of *Z. japonica* was damaged in Daegu Golf Club. Although *M. incognita* infested *Cynodon* spp. (Griffin 1984) and *Z. matrella* (see Goodey *et al.* 1965), *Z. japonica* was firstly recorded host plant. The damage was severe around green, around bunker and at the bad drainage part of fairway in Dongrae Benest Golf Club. In the Daegu Golf Club, 27 years old courses was more serious

than newly opened courses. Although *Z. japonica* was replanted at the back tee of West 9th hole, the damage was occurred within 2 or 3 years. The damaged plot showed complex disease with spring dead spot at the same tee. The damage was variable depending on turfgrass species. Only *Z. japonica* was infested at the back tee of West 7th hole when both *Z. japonica* and *Z. matrella* were planted but both *Z. japonica* and *Z. matrella* was infested at the back tee of West 8th hole. Replanted area with *Z. japonica* was damaged one year later. All the turfgrasses including bermudagrass, *Cynodon* sp. were infested with the nematode at the tee of East 1st hole. Moreover, the nematodes infested replanted turfgrasses 3 months later. At the tee of West 2nd hole bermudagrass was infested with nematodes but ryegrass was not infested. Thus, nematode infestation might depend on grass species. *Z. japonica* around green of East 1st hole was severely damaged by nematodes and complex disease was observed with large patch. Damage to grass even replanted turfgrass, occurred at the same place every year. Other plants, *Caryopteris incana*, *Solanum nigrum*, and *Viola mandshurica* in this area were also severely damaged by this nematode. Kentucky bluegrass and ryegrass were not infested at the tee of West

Table 1. Occurrence of root-knot nematode, *Meloidogyne incognita*, in golf courses

Golf club	Outbreak site	Host turfgrass	Damage size* (m ²)	Symptom	Turfgrass source	Purchase city
Daegu	Tee, fairway, rough	<i>Zoysia japonica</i> , <i>Z. matrella</i> , <i>Cynodon dactylon</i>	ca. 1,000,000 (Tee 10,000)	Chlorosis, wilting, fasciculation of roots, reduced growth	Purchase	?
Yongweon	Fairway	<i>Z. japonica</i> , <i>Z. matrella</i>	ca. 500	Chlorosis, wilting, reduced growth	Self-supply	-
Dongrae	Fairway, green	<i>Z. japonica</i> , <i>Z. matrella</i>	ca. 20,000	Chlorosis, wilting, reduced growth	Purchase, Self-supply	Yangsan
Pusan	Tee, fairway	<i>Z. japonica</i>	Local (hard to evaluate)	Chlorosis, wilting, reduced growth	Purchase, Self-supply	Gyeongju, Sancheong Lawn farm along to Nagdong river
Ulsan	Tee, fairway, green	<i>Z. japonica</i>	15,000	Chlorosis, wilting, reduced growth	Purchase	Pusan, Gyeongju, Chinju

*Total damaged area in golf courses.

Table 2. Topdressing source of turfgrass in golf courses

Golf club	Topdressing source	Topdressing method	Topdressing thickness (mm)
Daegu	Waegwan (Nagdong river)	With organic matter (Spring, Summer, Autumn)	2.5 ~ 4
Yongweon	Milyang (Soosan)	Full-scale a year Local in spring and autumn	5
Dongrae	Milyang (Soosan)	Full-scale in spring and autumn (Tee) Local in spring and autumn (Fairway)	2 ~ 3
Pusan	Milyang, Hapcheon	Full-scale once or twice a year	5
Ulsan	Milyang, Pusan(Nagdong river)	Full-scale a year	10

1st hole but *Z. japonica* around green was infested and wilted in the same hole within a year. The damage status was variable in symptoms and damage size (Table 1). Damage size was ranged from ca. 1,000,000 m² to ca. 500 m² depending on golf club. 90% of *Z. japonica* was damaged by nematodes in Daegu Golf Club but *Z. matrella* was not much infested. Most of turfgrasses in golf courses were purchased or self-supplied. In general, lawn farming was made along to river which contained sandy soil favourable to root-knot nematodes. Korea has four important root-knot nematodes, *M. arenaria*, *M. hapla*, *M. incognita*, but *M. javanica*. *M. incognita* is damaging economic crops the most (Choo *et al* 1987, Choi and Na 1994). Thus, the root-knot nematodes were suspected to be introduced into golf courses with turfgrasses. Otherwise, the nematodes might be introduced with topdressing sand because topdressing sand was purchased from root-knot nematode outbreak areas (Table 2). The plants cultivated along to Nagdong river was being infested with *M. incognita* in many cases (Choo unpublished data). Sometimes their damage was serious than expected and caused complex disease with plant fungal pathogens (Choo *et al.* 1987). Therefore, nematode-free turfgrasses should be purchased to keep away from root-knot nematode damage in golf courses. In addition, topdressing sand also should be checked ahead of purchasing or topdressing.

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요 약

우리나라 골프장의 잔디 가해 해충과 천적을 조사하던 중 농림작물의 중요 해충인 고구마뿌리혹선충을 *Zoysia* 잔디에서 발견하였다. 고구마뿌리혹선충에 감염된 잔디는 새 뿌리가 발육하지 못하고 몽푹하게 되어 황화현상과 함께 전반적으로 생육이 부진하였다. 감염된 잔디의 종은 들잔디 (*Zoysia japonica*)와 금잔디(*Zoysia matrella*), 벼류다글라스(*Cynodon* sp.)였다. 그리고 *Z. japonica*는 고구마뿌리혹선충의 새로운 기주로 기록된다. 조사 골프장의 대부분이 정도의 차이는 있었지만 피해를 받고 있었다. 잔디에서 뿌리혹선충이 기록되기는 우리나라에서는 처음이다.

검색어: 들잔디, 금잔디

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