Resistance of Soybean Varieties to *Pratylenchus dakotaensis*, a New Root-Lesion Nematode Species Infecting Soybean

EXECUTIVE SUMMARY

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Importance of the Research

Root-lesion nematodes are among important nematode pests affecting soybean production. A new root-lesion nematode, *Pratylenchus dakotaensis* that was reported in North Dakota soybean fields showed significant reproduction in greenhouse bio-assays and resided more in roots than soil. Using resistant varieties and detecting nematodes early are key management strategies. Similarly, it is important to increase the nematode population in controlled environment to know its impact on yields. Therefore, this research focuses on identifying resistance levels of soybean varieties, developing a molecular assay to detect it directly from roots, and establish a system to increase its population in lab and greenhouse.

Research Conducted

Resistance levels of ten soybean varieties used in the region were assessed for *P. dakotaensis* through repeated greenhouse experiments using naturally infested soil (Fig. 1). A rapid qPCR assay was developed to detect and quantify this new species directly from infected soybean roots. The specificity and detection limit of the assay were also determined. A standard curve was generated. The assay was validated through correlation analysis between numbers of nematodes artificially inoculated and estimates made by using the qPCR assay. A system for culture and increase of this nematode was developed using corn explants in Gamborg's GB-5 medium.

Research Findings

Among those ten varieties screened, nine were found to be moderately susceptible, one was found to be susceptible, and none of them were resistant or moderately resistant in combined analysis (Fig. 2). The resistance rating results were mostly similar in both experiments. A new DNA-based molecular assay was developed for detection and quantification of this new species from infected soybean roots directly and it is sensitive and specific (Fig. 3). There was a strong, positive correlation between the numbers of nematodes inoculated into roots and detected by the developed qPCR assay. Furthermore, the population of this new nematode species can be increased in lab using corn explants and GB5 medium whereas Barnes can be used in greenhouse to increase its pure population.

Benefits

These findings can help growers to choose soybean varieties rationally to avoid susceptible or moderately susceptible varieties having higher nematode reproduction. This research also provides a crucial tool for early and rapid detection and quantification of this new nematode

species from soybean roots in ND. Further research should focus on identifying resistant soybeans and new sources of resistance. Efficient nematode detection is essential for effective management of the nematode disease.

Figure 1. Soybean plants in the large cone-type container greenhouse trial for resistance responses to *Pratylenchus dakotaensis*.

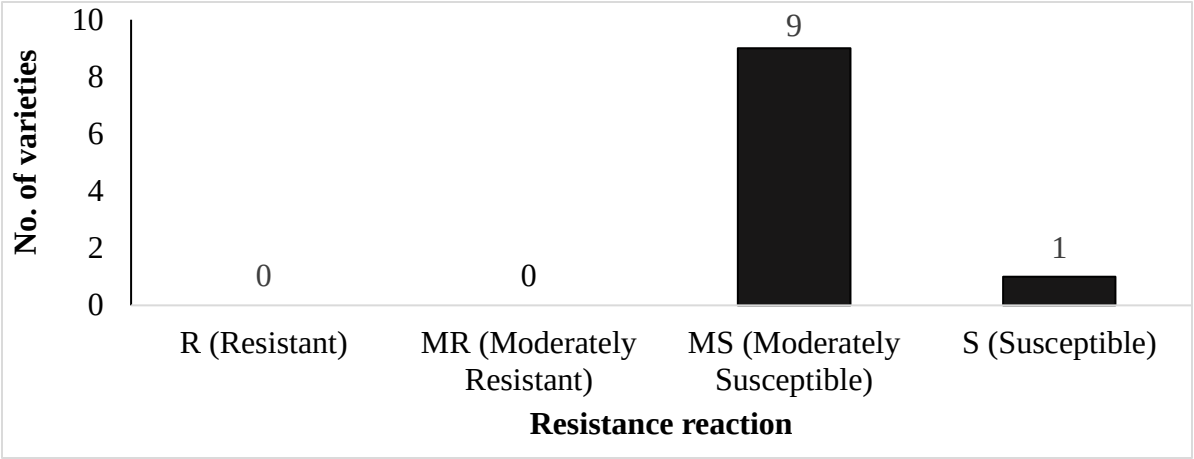

Figure 2. Classification of the resistance responses of ten soybean varieties to the new root-lesion nematode species (*Pratylenchus dakotaensis*) based on combined data of the two trials.

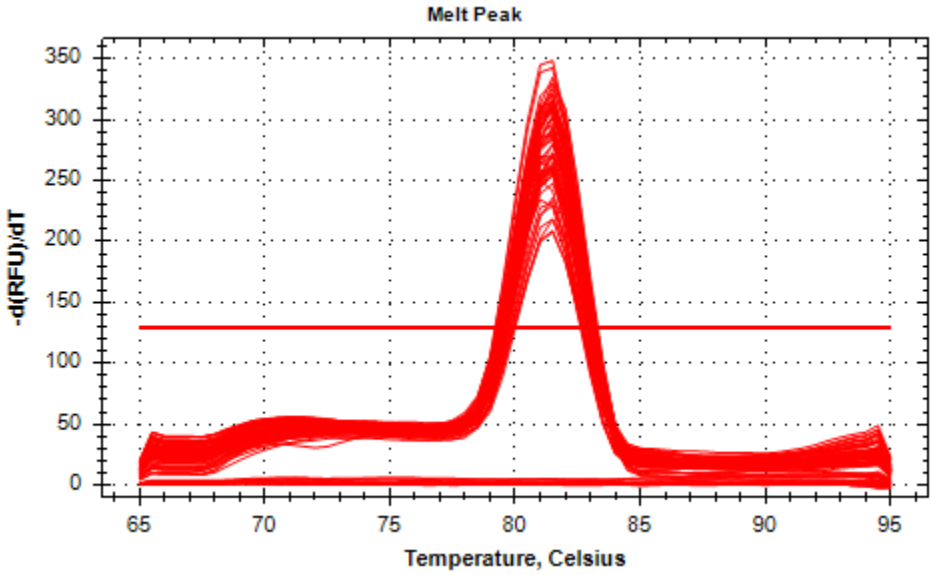

Figure 3. *Pratylenchus dakotaensis* melting curve profile. A single melting peak was observed at 81.5˚C and no amplification was observed for negative controls, indicating that the qPCR assay is specific.