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PLANT- PARASITIC NEMATODES: A SERIOUS THREAT TO AGRICULTURAL CROPS IN SAUDI ARABIA

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KEYWORDS

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ABSTRACT

The plant-parasitic nematodes *Meloidogyne* spp. were first reported on tomato plants in 1957 in the Eastern region of Saudi Arabia. Since then, many other plant parasitic nematodes have been reported causing serious losses to many economically important agricultural crops. Until now, several efforts have been made to control these nematodes either in the greenhouse or in the open fields. To achieve a successful control of these nematodes, comprehensive nematological surveys must be carried out to determine the abundance and the economic importance of the plant-parasitic nematodes. Thus, a total of 30 nematode genera have been reported to be associated with different plant species all over the kingdom. We have classified these genera into three major groups according to their economic importance. The first group included the genera of the highest prevalence and economic impact (e.g. *Meloidogyne* spp., *Heterodera avenae* and *Tylenchulus semipenetrans*). The second group included those genera that have a relatively medium importance and prevalence (e.g. *Pratylenchus* spp., *Tylenchorhynchus* spp., *Helicotylenchus* spp., *Trichodorus* spp., *Criconemella* spp., *Longidorus* spp., *Xiphenema* spp., *Hopolaimus* spp., *Paratylenchus* spp., *Hemicyclophora* spp. and *Ditylenchus* spp). While the third group included the nematodes of the least prevalence and economic importance. We believe this information would be of great importance to lay out meaningful control strategies.

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1 Introduction

Food security is one of the necessary requirements for all nations. This process is surrounded by a lot of obstacles and problems. One of the most important obstacles is the plant diseases. The nematode diseases are also one of the most important and dangerous disease which attacking many economic crops throughout the world, similarly in Saudi Arabia (Al-Hazmi et al., 1995).

The first report on the nematodes in Saudi Arabia was almost Sixty one years ago, when Talhouk (1957) wrote about pests of various crops in the Eastern region of the kingdom of Saudi Arabia, including root-knot nematodes on tomatoes. Since then, many researchers continuously published various researches (Ayoub, 1959; Abdou, 1972; Abu-Yaman & Abu-Bian, 1972; Al-Hazmi, 1984), books (Al-Yahya et al. 1986), MSc (Al-Twigry, 2011; Al-Zarqaa, 2014; Javeed, 2015) and Ph.D theses (Al-Nadhari, 2014), posters, pamphlets and reports on the plant parasitic nematode. The present work is an evaluation study aimed to; (1) evaluating the most important and dangerous plant-parasitic nematode that threaten the economic plants in Kingdom of Saudi Arabia during the last Sixty one years, (2) proposing the most appropriate control strategies to manage these nematode pests in Saudi Arabia.

2 Material and Methods

During the past 30 years nematologist have collected soil and root

samples from different fields and crops of Saudi Arabia. Plant-parasitic nematode were extracted from soil by sieving and centrifuge floatation (Jenkins, 1964; Barker, 1985) and by blender Baermann tray method from root (Hooper, 1986). Extracted females were examined under a stereoscope microscope and identified up to the generic level (Mai & Lyon, 1975). Further, females of root-knot nematodes were identified up to the species level by using the perineal pattern (Jepson, 1987) while the cyst nematodes were identified following the keys of Mulvey & Golden (1983) and Golden (1986). Plant-parasitic nematode diseases detected in Saudi Arabia were grouped into three major groups according to their economic importance. The first group included the genera of the highest prevalence and economic impact. While second group included those genera that have a relatively medium importance and prevalence and the third group included the nematodes with least prevalence and economic importance. This was based on the economic importance of the crop itself, then the economic damage caused by the nematodes to the crop.

3 Results and Discussion

3.1 Plant parasitic nematodes with highest prevalence and economic impact

The results of this study showed that root-knot nematodes, cereal cyst nematode, and citrus nematode are the most dangerous nematode pests to the agricultural crops in Saudi Arabia (Figure 1).



Figure 1. Plant parasitic nematodes with highest prevalence and economic impact

3.1.1 Root-knot nematodes

Root-knot nematodes (*Meloidogyne* spp.) are the first nematode recorded in SA before Sixty-one years (Talhouk, 1957). These nematodes are widespread in the different agricultural areas and causes serious damage to many agricultural crops (Sasser & Carter 1982; Al-Hazmi, 1985; Al-Hazmi et al., 1995; Abdelrafaa et al., 2018).

3.1.2 Cereal cyst nematode

Cereal cyst nematode are the nematode which recognized as a most damaging pathogen of wheat and barley in the middle and north of the SA (Osman & Soliman, 1994; Dawabah et al., 2015).

3.1.3 Citrus nematode

The citrus nematode, *Tylenchulus semipenetrans*, was first recorded in 1977 from Saudi Arabia. The nematode may cause serious losses (up to 70%) to the citrus production in some heavily-infested sites of Saudi Arabia (Oteifa, 1979; Al-Yahya et al., 1986; Khalifah, 1987).

3.2 Plant parasitic nematodes with medium importance and prevalence

This group includes the nematodes which are of less prominence values and less economic importance, compared to the first group.

The list of these nematodes includes; *Pratylenchus* spp., *Tylenchorhynchus* spp., *Helicotylenchus* spp., *Trichodorus* spp., *Criconemella* spp., *Longidorus* spp., *Xiphenema* spp., *Hopolaemus* spp., *Paratylenchus* spp., *Hemicycliophora* spp. and *Ditylenchus* spp. (Fatmi, 1969; Natour, 1970; Martin, 1971; Eissa, 1977; El-Sherif et al., 1990) (Figure 2).

3.3 Plant parasitic nematodes with least importance and prevalence

This list included the stylet bearing nematodes which were frequently reported around the roots of the economic plants, but their prominence values, distribution and economic impacts were very low. Among of these nematodes *Anguina tritici*, *Aphelenchoides* spp., *Tetylenchus*, *Tylenchus*, *Zygotylenchus* and others were the most common one (Natour, 1970; Martin, 1971; Eissa, 1977; El-Sherif et al., 1990) (Figure 3).

Present study was a preliminary study and should be considered as a guideline related to the economic importance of plant parasitic nematodes in Saudi Arabia. Further detailed study is required to assess the total losses and loss caused by particular nematode species. Nematode population should be evaluated periodically and frequently change the strategy of nematode management. Use of resistant cultivars, crop rotation, bio-control, soil solarization and use of nematicid-*es are the some possible nematode management strategy in Saudi Arabia.



Figure 2 Plant parasitic nematodes with medium importance and prevalence



Figure 2 Plant parasitic nematodes with medium importance and prevalence

Conflict of Interest

Authors declare that there is no conflict of interests arising from this study.

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