HISTOPATHOLOGY OF APPLE (MALUS PUMILA MILL.)
ROOTS INFECTED WITH ROOT-KNOT NEMATODE
(MELOIDOGYNE INCOGNITA)

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ABSTRACT

The study examines the histopathological changes in the roots of Apple (Malus pumila Mill.) collected from Mughal farm, Kalat Town during November 2008 resulting from infection with root-knot nematode, Meloidogyne incognita. A number of cells were present with broken walls and disruption of cortical tissue was prominent. Numerous giant cells were found. Several sections of females and egg masses were present in the superficial layer of the medullary region. Prominent nuclei were present in the cells near the feeding sites.

Key Words: Histopathology, Apple roots, Meloidogyne incognita, Balochistan


INTRODUCTION

Apple (Malus pumila Mill.) is one of the most important fruit crops of Pakistan, which is cultivated extensively in Balochistan province. It is affected by many pests and diseases worldwide and nematodes are considered important pests of Apple (Sharma and Kaur, 1987; Qasim et al., 1988; Utkhede et al., 1992; Khan and Khan, 1995; Khan et al., 1996, 1997; Aballay and Erikson, 2006; Islam et al., 2006; Karanastasi et al., 2006. Nematodes damage root system and hamper uptake of water and nutrients. Root-knot nematodes are well known for their interaction and establishing relationship with fungi in disease complexes (Singh et al., 2007). Histological studies appear to be the key to unravelling the association between injuries caused to plants by plant parasitic nematodes. Keeping this in view, the present study was conducted to ascertain the damage caused by root-knot nematode (Meloidogyne incognita (Kofoid & White) Chitwood to apple roots in Balochistan.

MATERIALS AND METHODS

Naturally infested apple roots were collected during November 2008 from Mugal farm, Kalat farm (Balochistan at a depth of 5-40 cm. From a portion of root mature females of root-knot nematodes were dissected from galled tissue, perineal patterns of the females were then prepared and identified as Meloidogyne incognita (Kofoid and White, 1919), Chitwood, 1949, according to Eisenback et al. (1981). The remaining roots were washed thoroughly in running water for 1 hour, fixed in Formalin Acetic-Alcohol (F.A.A.) and processed for histological studies according to Sass (1964). Dehydration was carried in a serial concentrations of ethanol (30, 60, 70, 90 and 100%). The dehydrated root tissues were infiltrated with paraffin wax (52°C) to replace alcohol and then embedded in paraffin wax of same melting point sectioning of paraffin block containing tissue was carried out on a rotary microtome (Spencers, USA) and ribbons of 10 µm thickness were mounted on glass slides coated with Haupt’s adhesive (a mixture of 1g powdered gelatin, 2g phenol crystal, 15 ml glycerin and 100 ml distilled water) which was flooded with 2 percent formalin followed by mild heating of slides for 3 minutes. Staining of microtomed sections of tissues on the slides was carried out with hemotoxylin and eosin. Micrographs were snapped using an automatic photographic camera mounted on a microscope (Nikon Optiphot-2) at the Department of Zoology, University of Karachi.
RESULTS AND DISCUSSION

The second-stage juveniles of *Meloidogyne incognita* after penetration entered into cortex and moved along the cortical layer of the cells. Disruption of cortical tissue was observed and a number of cells were present with broken walls (Fig. 1). Numerous giant cells were also found (Fig. 2), which were feeding sites for nematodes. It is known that all the *Meloidogyne* species irrespective of their host range induce giant cells of same shape and size (Blok et al. 1997). Feeding sites act as sinks for plant phytosynthates and therefore impair plant growth and development (Singh et al. 2007). Deformation and blockage of vascular tissue at feeding sites limit translocation of different nutrients and water resulting in suppression of plant growth and adversely affecting yield (Hussey and Williamson, 1997). It is also reported that the infection weakens plants and predisposes them to bacterial infection (Singh et al. 2007). Several sections of females and egg masses were present in the superficial layer of the medullary region. Prominent nuclei were present in cells near feeding sites (Fig. 3) as reported by Pasha et al. (1987) in eggplant roots infected by M. incognita. Root-knot nematodes have adverse effect on young apple trees (Utkhede et al. 1992).

Efforts must be made to control root-knot nematodes which may become a problem in sandy and sandy-loam soils of Balochistan in trees vigour and reduction in apple yield.
CONCLUSION

It is concluded that Meloidogyne incognita infection can cause noticeable damage to apple roots and consequently can affect fruit production.

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REFERENCES


