

HISTOPATHOLOGY OF JUJUBE (*ZIZYPHUS MAURITIANA* LAM.) ROOTS INFECTED WITH ROOT-KNOT NEMATODE (*MELOIDOGYNE JAVANICA*)

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ABSTRACT

Histopathological studies revealed that *Meloidogyne javanica* (Treub, 1885) Chitwood, 1949 readily penetrated the roots of Jujube (*Zizyphus mauritiana* Lam.) and affected both the epidermis and the dermis. Giant cells were common, the central region was detached and stellar region cells were damaged.

A number of cells were filled with egg masses while a few had larvae embedded in them with complete cell hypertrophy. The giant cells also showed Karyotic nuclear division and thickening of walls.

Keywords: Jujube, Histopathology, *Meloidogyne javanica*, Sindh, Pakistan.

INTRODUCTION

Jujube (*Zizyphus mauritiana* Lam. Syn *Z. jujuba*) is commonly grown in Sindh Province of Pakistan. The occurrence of nematodes associated with Jujube have been reported by a number of workers (Darekar and Khan, 1981; Dwivedi *et al.*, 1985; 1987; 1988, 1993; Dwivedi, 1987; Siddiqui *et al.*, 1988; Padhi *et al.*, 2004; Khan *et al.*, 2004). But histopathological alterations of Jujube roots associated with *Meloidogyne javanica* have not been reported. Present studies were carried to investigate the extent of damage caused by *M. javanica* (Treub, 1885) Chitwood, 1949. The observations are reported here supported by photomicrographs of affected roots sections.

MATERIALS AND METHODS

Portions of Jujube (*Zizyphus mauritiana* Lam. Syn *Z. jujuba*) roots naturally infected with *Meloidogyne javanica* were collected from a farm at Mirpurkhas, Sindh from a depth of 10-30 cm. They were later cut into ½ and 1 cm long pieces with the help of a blade, fixed in F.A.A. and processed for histological technique according to standard methods of Sass (1964). Dehydration was carried out in serial concentration of known volume of ethanol (alcohol). Dehydrated root tissue were then infiltrated and embedded in paraffin wax at 52°C for 10 days. During the wax infiltration process, air bubbles were removed from root tissue under vacuum. Using a rotary microtome, 12 µ thick sections of roots were cut and stained by Haematoxylin and Eosin. These were then mounted in Canada balsam according to procedure of Johanson (1940). Photomicrographs were taken using an automatic photographic camera mounted on a research microscope Nikon optiphot-2 in the Department of Zoology, University of Karachi.

RESULTS AND DISCUSSION

The examination of stained sections of roots of Jujube revealed that both the epidermis and dermis have been affected by the penetration of *Meloidogyne javanica*. The larvae entered into roots by the puncturing action of the stylet. A large number of necrotic cells were observed (Fig. 1). Some of the sections of roots revealed the establishment of giant cells; the central region was detached and stellar region cells were damaged. Cells of the central region were heavily parasitized by *Meloidogyne javanica* females and larvae (Fig. 2).

In some sections the cells were completely filled with egg masses besides at feeding sites in the endodermis formation of syncytial (giant cell) caused by cell wall dissolution of the adjacent cell was obvious. Coalescence of the cytoplasm was observed while a few cells had larvae embedded in them with complete cell hypertrophy (Fig. 3, 4). Some cells appeared completely empty similar to the condition observed in tobacco roots infected by *Rotylenchus reniformis*. The giant cells also showed Karyotic nuclear division and thickening of walls similar to the findings of Patel *et al.* (1988). Egg masses of *M. javanica* could be seen in the cortical cell (Fig. 4), unlike wheat roots where enlarging females broke the root epidermis to partially protrude out of the root tissue and produce egg sacs, outside the roots (Chandel *et al.*, 2001).

Cell hypertrophy and syncytial formation were the most pronounced responses to the nematode infection. The increasing thickness of cell walls, hypertrophied pericycle was also observed by Cohn (1973) in tomato and Rebois *et al.* (1975) in soybean. Such reaction may probably be due to the hypersensitivity of infected cells to nematode infection.

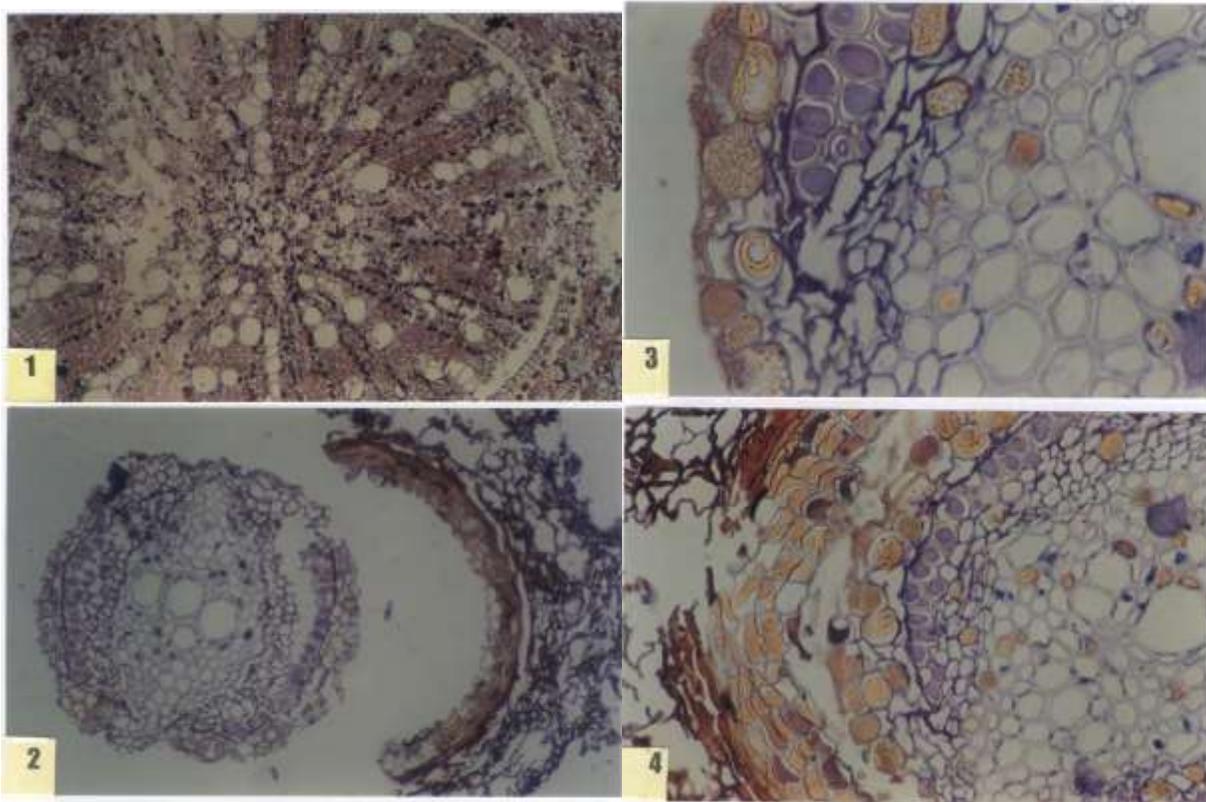


Fig.1. Section showing necrotic cells (x 50).

Fig.2 Showing giant cells, detached central region with cells parasitized by larvae & females and damaged stellar region cells (x 50).

Fig.3. Cells with egg masses obvious in central region and pericycle (x 100).

Fig.4. Showing penetration of larvae and cells completely filled with egg masses (x 200).

Meloidogyne attack both roots and storage roots causing knots or swelling of different shapes. If the initial nematode population is high they cause pruning effect which can overcome by vigorous growth and excessive lateral root trees production (Jatala, 1989). Infested Jujube exhibit general symptoms of damage associated with poor root growth such as stunting, yellowing and the tendering to wilt during warmer periods of the day especially in young trees.

Histopathology of infected roots showed cell hypertrophy and syncytial formation as the most pronounced responses to nematode infection. Our findings are similar to those observed on castor, tomato and papaya (Sivakumar and Seshadari, 1972) date-palm (Khan *et al.*, 2003a; 2004a) and chilli (Khan *et al.*, 2003).

Since *M. javanica* has a greater tolerance to drought and high temperate than other *Meloidogyne* species (Daulton and Nusbawn, 1961, 1962; Taylor *et al.*, 1982) control measures are required preventing the buildup of high population densities.

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