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# HISTOPATHOLOGY OF POMEGRANATE ROOTS INFECTED WITH ROOT-KNOT NEMATODES, *MELOIDOGYNE INCOGNITA* (KOFOID AND WHITE, 1919) CHITWOOD, 1949

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## ABSTRACT

Cellular alteration in *Meloidogyne incognita* infected Pomegranate (*Punica granatum* L.) cv. Red Kandhari roots were histologically studied. The common features encountered were hypertrophy and erosion of cortical surface. Damage to all layers of root tissues which comprise of cortex, endodermis, pericycle and vascular parenchyma was observed. The giant cells with ill defined boundaries had section of nematodes and egg masses. A large region with fibrous boundaries at the base was also observed.

**Keywords:** Histopathology, Pomegranate, root-knot nematodes, giant cells, Balochistan.

## INTRODUCTION

Pomegranate (*Punica granatum* L.) is an important fruit crop extensively grown in Balochistan Province, its roots are severely damaged by *Meloidogyne incognita* (Kofoid and White, 1919) Chitwood, 1949 (Khan *et al.*, 2005, 2010). There is only one report on histopathogensis of root-knot nematode infecting pomegranate available from Balochistan (Khan *et al.*, 2008). In the present study we attempted to examine the histopathology of naturally root-knot infected pomegranate roots collected from a farmer's field.

## MATERIALS AND METHODS

Root-knot nematode, *Meloidogyne incognita* infected Pomegranate (*Punica granatum* L.) cultivar Red Kandhari were collected from Mangochar, district Kalat, Balochistan. The roots were washed under tap water to remove the soil particles. Root pieces with galls were selected and cut into small pieces, ½ – ¾ cm long with the help of a sharp blade and fixed in F.A.A. (4:1) in glass vials. Dehydration of roots was carried out in a serial concentration of known volume of ethanol alcohol. Dehydrated root tissues 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 µm thick cross and longitudinal section of roots were cut, stained with haematoxylin and eosin. Photomicrographs were taken using an automatic photographic camera mounted on a research microscope Nickon Optiphot-2.

## RESULTS AND DISCUSSION

The second-stage juveniles of *Meloidogyne incognita* made their point of entry just behind the root crop. After penetration the juveniles entered into cortical region causing hypertrophy and erosion of cortical surface (Fig. 1), probably migration and movement of the larvae contributed to the development of knots in pomegranate roots similar to the findings of SethiKumar *et al.* (2002) in rice. In the middle region several enlarged cells, small cells and normal cells were seen. Several of the giant cells had section of nematodes and egg masses. It was observed that root-knot nematode established feeding sites (giant cells) in the cortex. Formation of giant cells in the upper cortical region followed by a mixed boundary of normal and giant cells with dark stained cell boundaries were prominent (Fig. 2). In an earlier study (Blok *et al.*, 1977) reported that all *Meloidogyne* spp. irrespective of their host range induced giant cells of the same shape and size suggesting that consistent nematode genes and plant genes are involved in giant formation. Several giant cells with ill defined boundaries contained females and egg masses (Fig. 3), two ulcerative tunnels in the surface area were prominent. Damage to all the layers of root tissue which comprise of cortex endodermis, pericycle and vascular parenchyma (Fig. 4). A large region with fibrous boundaries at base was present. From this study it was evident that level of resistance in the pomegranate var. Red Kandhari was low to

*M. incognita*. It is suggested that where resistant planting materials are not readily available use of chemicals alongwith organic amendments is most desirable as a short-term measure of control.

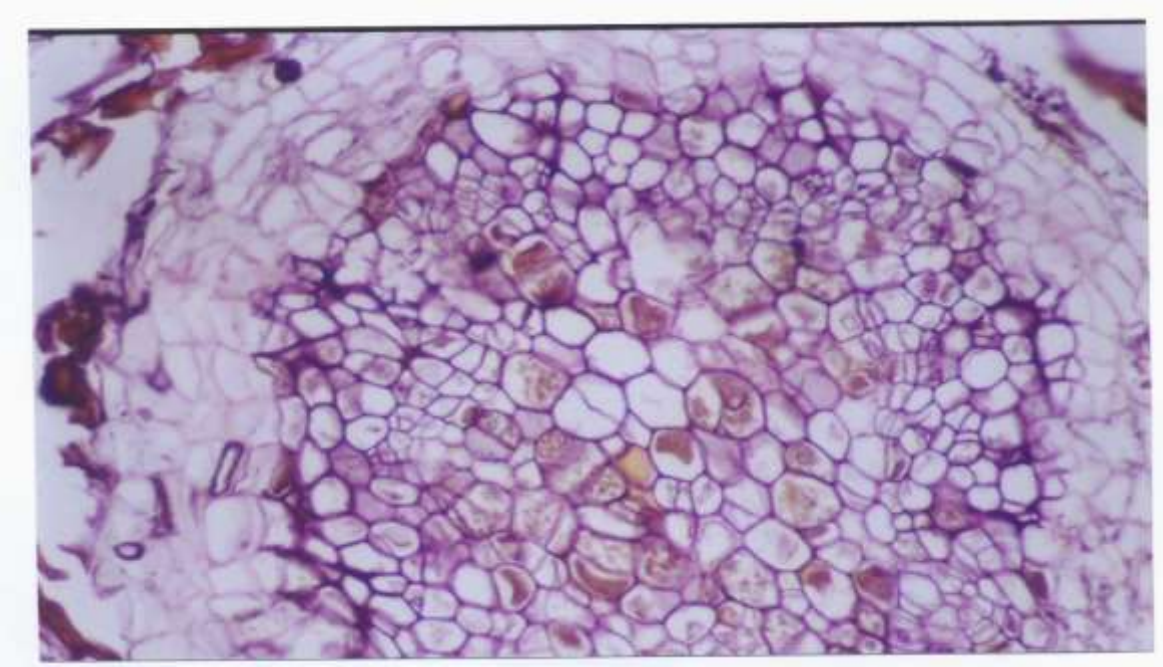

Fig.1. Infected root of Pomegranate showing hypertrophy and erosion of cortical surface caused by *Meloidogyne incognita*. Giant cells in cortical region were obvious. In the middle region several enlarged cells, small cells and normal cells were seen. A number of giant cells had section of nematodes and egg masses (x 50).

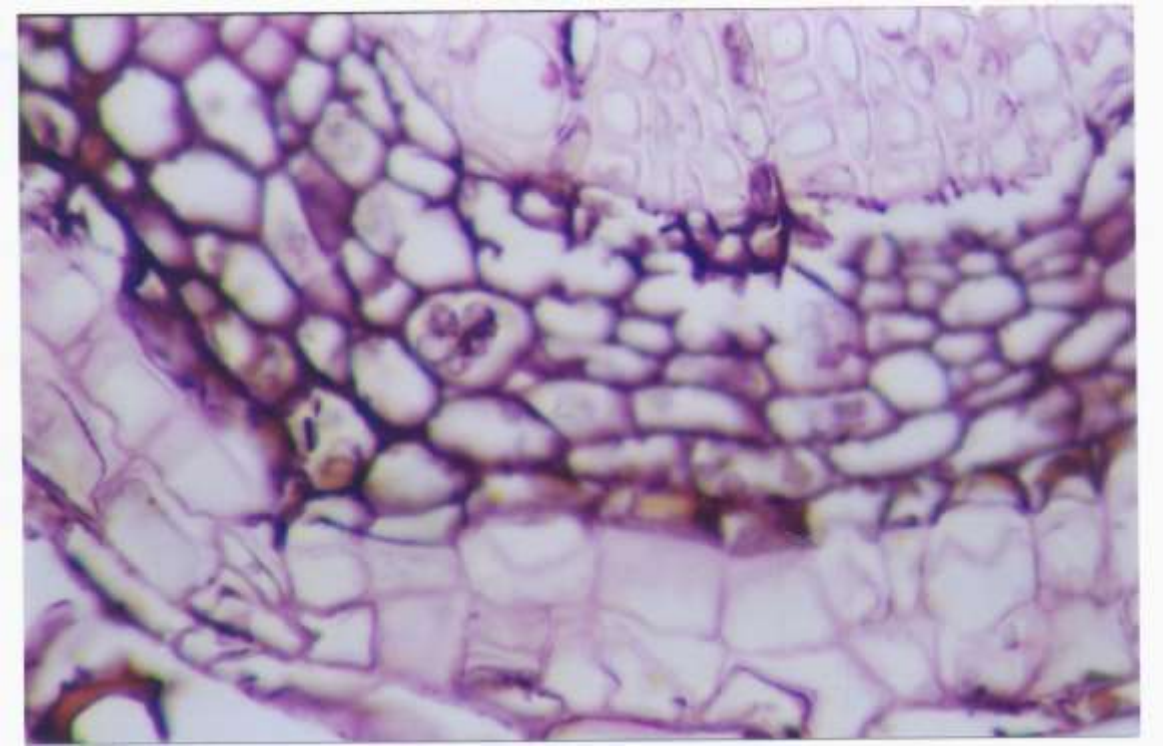

Fig.2. Formation of giant cells in the upper cortical region followed by a mixed boundary of normal and giant cells (x 100).

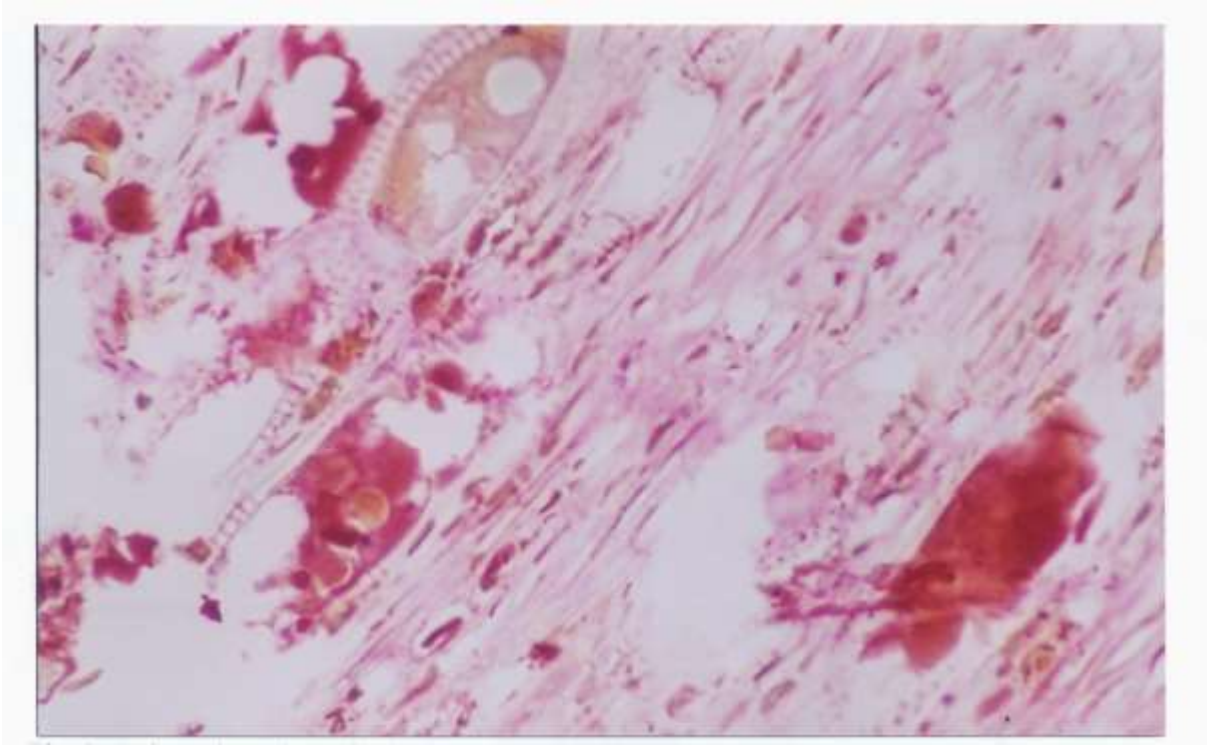

Fig.3. Enlarged portion of middle region of infected root showing giant cells. Several cells contain sections of female nematode and egg masses. Cortical portion on the top left showed giant cells with ill defined boundaries (x 100).

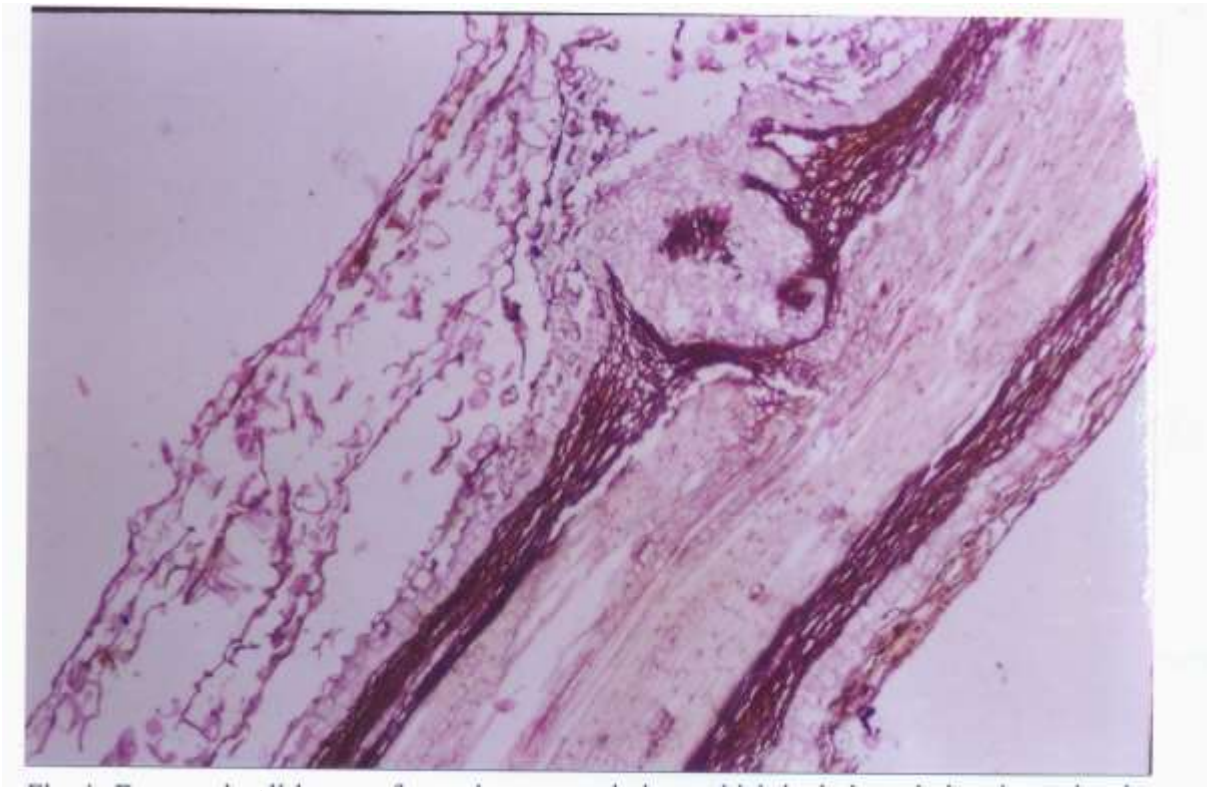

Fig.4. Damage in all layers of root tissue was obvious which include endodermis, pericycle and vascular parenchyma. Cortical region appeared acellular due to damage and only scattered fibrous tissue was seen. A large lesion with fibrous boundaries at the base was present. Underlying tissue does not appear healthy (x 20).

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