

## OCCURRENCE OF CITRUS NEMATODE (*TYLENCHUS SEMIPENETRANS*) IN SARGODHA DISTRICT

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**Abstract:** In a survey during the year 2002 on the occurrence of citrus nematode, *Tylenchus semipenetrans* (Cobb) 57 soil and root samples were collected from 36 localities of district Sargodha in Pakistan. The analysis revealed that 54.38% of the samples were infested with the nematode. Maximum infestation (61.11%) was recorded in Tehsil Bhalwal followed by Sillanwali, Sargodha, Shahpur and Sahiwal showing 57.14, 53.33, 50.00 and 44.44% infestation, respectively.

**Keywords:** Citrus, infestation, Pakistan, Sargodha, *Tylenchus semipenetrans*.

### INTRODUCTION

Citrus production is one of the world's largest agricultural industries. World trade in citrus is second only to bananas and more than double the volume of apples. Citrus fruit is highly nutritive and refreshing being a source of vitamins A and C, organic acids, amino acids, sugars and carotenoids. Citrus is sown in more than 125 countries in the belt within 35° latitude north and south of equator [Duncan and Cohn 1990].

Pakistan is one of the top ten citrus producing countries of the world. The area under citrus cultivation in Pakistan during 2000-2001 was approximately 198.7 thousand hectares, which is increasing every year. In Pakistan 1951.5 thousand tonnes of citrus was produced, earning 720.572 million rupees, during the year 2000-2001 [Anonymous 2002]. Out of total produce of citrus in the country, Punjab province contributes 95%, and of the total citrus production of the province Sargodha contributes 25%. Citrus is also a source of foreign exchange earnings for Pakistan. The export of citrus was 82750.80 tonnes during 1999-2000.

Citrus is attacked by a number of insect pests and diseases causing heavy losses both in quality and quantity. Among the nematodes, citrus nematode, *Tylenchus semipenetrans* (Cobb) has been recognized as one of the greatest threats throughout the world. It occurs in all citrus producing regions of the world and limits production of citrus fruits under a wide range of environmental and adaphic conditions. In main citrus producing regions of the United States, the nematode infests from 50 to 60% of the citrus orchard in California and Florida to as much as 90% in Texas and Arizona. Similar statistics have been reported worldwide [Heald and O'Bannon 1987].

In Pakistan, nematode problem is more serious and complex than in the developed countries. The reasons for this are many and varied. Firstly, the country lies in the tropical and sub-tropical regions where climate is

suitable for the activity and reproduction of the nematode throughout the year. Secondly, soils are very favorable for nematode infestation, especially in irrigated areas. Perennial and other crops grown in the same field year after year are often heavily attacked by nematodes.

The citrus nematode causes "slow decline" and the affected trees show reduced terminal growth, chlorosis and shedding of terminal leaves, dieback of branches and considerable reduction in number and size of fruit. Roots of infested trees show brownish discoloration and ultimately decay resulting in reduced volume. Copper and Zinc deficiency symptoms are more pronounced in attacked trees [van Gundy and Martin 1961].

As citrus orchards are declining in District Sargodha, therefore present survey was conducted to ascertain the occurrence of citrus nematode in the district.

### **MATERIALS AND METHODS**

Soil and root samples from symptomatic and asymptomatic plants from 36 localities of district Sargodha were collected up to 30 cm depth. Samples were taken at a distance of 60 to 90 cm away from the tree trunk. Upper 15 cm soil was removed and then samples were collected by digging the soil. The soil along with feeder roots was collected in polyethylene bags and brought to Nematology Laboratory, University of Agriculture, Faisalabad for analysis. Juveniles were extracted from the soil by modified Whitehead and Hemming tray method [Whitehead and Hemming 1965]. The number of nematodes recovered from the soils of each sample was counted by using a counting dish.

Feeder roots were washed under tap water carefully to remove soil particles and blotted dry. One gram of fresh feeder roots was placed in a blender and 20 ml of 10% sodium hypochlorite solution was added. Volume was increased up to 200 ml by adding water and blended for 45 seconds. The suspension was poured over 100 and 325 mesh sieves and females were collected in a beaker and their numbers were counted.

### **RESULTS AND DISCUSSION**

The results of analysis of soil and root samples are given in Table 1. It is clear from the table that 31 out of 57 samples were infested with citrus nematode showing 54.38% infestation. Maximum samples (61.11%) were found infested with the nematode in Tehsil Bhalwal, while minimum infestation (44.44%) was observed in Tehsil Sahiwal. Percentage of samples infested in Tehsil Sargodha, Sillanwali and Shahpur was 53.33, 57.14 and 50.00, respectively.

Nematode population in soil and number of females in roots are given in Table 2. In Tehsil Bhalwal nematode in soil ranged from 2,024 to 21,080 per kg of soil and number of females ranged from 495 to 1,832 per gram of root. Similarly, nematode population in one kg of soil ranged from 2,818 to 18,120; 1,078 to 11,758; 3,146 to 14,270 and 1,300 to 9,854 and

female per gram of root ranged from 268 to 1,646; 120 to 990; 312 to 1,384 and 178 to 1,030 in Tehsil Sargodha, Sahiwal, Sillanwali and Shahpur, respectively.

**Table 1:** Infestation of Citrus Nematode (*Tylenchus semipenetrans*) in District Sargodha.

Tehsil	Localities showing nematode infestation	Localities free from nematode infestation	Number of Samples			% Infestation
			Total	Infested	Not infested	
Bhalwal	Kot Miana, 15/SB, 23, 33 & 36/NB, Moazim Abad, Jan Mohammad Wala	22 & 32/NB, 13/SB, Channi Rehan	18	11	7	61.11
Sargodha	56/NB, 26, 28, 46 & 122/SB	108 & 112/NB, 32, 47 & 110/SB	15	8	7	53.33
Sahiwal	Aroo Wala, Wah Maken	Chakbandi, Sikanderpur, Radhan	9	4	5	44.44
Sillanwali	120 & 122/NB	121 & 126/NB	7	4	3	57.14
Shahpur	Yare Wala, Sultan Mehmood Wala, Aqil Shah	Sultanpur, Kot Pehlwan, Chak Sheikhanwala	8	4	4	50.00
Total			57	31	26	54.38

The present survey confirms the occurrence of citrus nematode in District Sargodha. Since its first report in roots of citrus trees in California in 1912 and its description [Cobb 1913], its occurrence has been reported from all over the major citrus growing regions of the world. By 1914, it had been reported parasitizing citrus roots in Florida, Malta, Spain, Australia and South America [Cobb 1914].

**Table 2:** Citrus Nematode (*Tylenchus semipenetrans*) population in soil and roots.

Nematodes	Tehsil				
	Bhalwal	Sargodha	Sahiwal	Sillanwali	Shahpur
Per kg of Soil	2,024-21,080	2,818-18,120	1,078-11,758	3,146-14,270	1,300-9,854
Per gm of Soil	495-1,832	268-1,646	120-990	312-1,384	178-1,030

According to Thorne [1961] 90-95% citrus orchards in south California were infested by this nematode. Survey of citrus nurseries in India revealed 75% infestation with citrus nematode [Mani *et al.* 1988]. In China (Sichuan) 94.7% of the orchard were found infested [Zhu *et al.* 1992]. Likewise the nematode was found infesting citrus orchards in NWFP [Khan *et al.* 1990] and in most of citrus orchards in the Punjab [Ahmad and Khan 1973]. Similar statistics have been given by other researchers from different countries [Noling and Duncan 1988, Robinson *et al.* 1987]. In the present survey, nematode population and number of females per gram of root varied in different localities. This is because many factors affect citrus nematode population and infestation. These include host

variety, age, soil texture, moisture, pH, nutrient status, temperature, soil depth etc. Reproductive rates of different races of nematode obviously vary with rootstock [O'Bannon and Hutchinson 1974]. Tree age has a marked effect on population size and distribution of the nematode [Bellow *et al.* 1986].

The nematode is sensitive to extreme moisture deficits but population development occurs across the normal range of agricultural soils [van Gundy and Martin 1961, van Gundy *et al.* 1964]. Similarly population will increase between temperatures of 20-31°C with maximum development at 25° C and very slow development at the extremes [O'Bannon *et al.* 1966]. Davis [1984] reported that nematode population peaked in April and declined to lowest levels in August and September. Highest number of nematodes was obtained at 120 cm distance from the tree trunk up to 30 cm depth [Chawla and Sharma 1984]. *T. semipenetrans* can be found in any soil texture, but greatest damage occurs in shallow, poorly drained soils with organic matter contents from 2-3% [O'Bannon and Essar 1985]. The present study confirms the presence of citrus nematode in district Sargodha and suggests further intensive survey and measures to control the nematode.

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