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DISTRIBUTION AND OCCURRENCE OF PLANT PARASITIC NEMATODES IN BALOCHISTAN

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ABSTRACT

During an extensive survey of Cereals, Vegetables and Cash crops in Balochistan province 32 known species of plant parasitic nematodes were recorded for the first time on a number of crops at different locations. The important nematode species found during the survey were *Anguina tritici, Ditylenchus dipsaci, Helicotylenchus digonicus, H. indicus, Longidorus elongatus, Meloidogyne hapla, M. incognita, M. .javanica, Merlinius brevidens, Pratylenchus brachyurus, P. penetrans, P. thornei, P. zeae, Scutylenchus quettensis,Tylenchorhynchus annulatus, T.brassicae and T.mashhoodi.*

Key Words: Balochistan, Plant Parasitic Nematodes, .

INTRODUCTION

Balochistan is the largest province of Pakistan in terms of area. It is located between 62 to 70° longitude and 25 to 32° latitude in the Northern Hemisphere. It is surrounnded by Afghanistan in the North, Arabian Sea in the South, North West Frontier Province and Punjab in the East and Iran in the West. Balochistan is divided into five ecological zones ranging from seacoast to areas above 6000ft. In plains summer is very hot and temperature raises up-to as high as 52ºC and winters are mild. In the cooler regions summers are moderate to mild , but in the winter mercury falls down to -20ºC. Therefore, a wide range of crops are cultivated in the Balochistan province. Agriculture in Balochistan provides the means of livelihood for most of its population. The climatic conditions in Balochistan province are favourable for growing wide diversity of cereals, vegetables and fruit crops.

Nematodes continue to threaten agricultural crops through out the world. Nematodes parasitize man, animals, insects and plants. Plant parasitic nematodes have been found virtually in all agricultural areas of the world and in every crop. However, damage caused by nematodes is often difficult to distinguish from damage due to other factors. An estimated over all average annual yield loss of the world's major crops due to damage by plant parasitic nematode was 12.3% (Sasser, 1989). Damage to agricultural crops due to nematodes is more in Pakistan as compared to developed countries. In Pakistan very little work has been done on the crop losses due to plant parasitic nematodes. In Balochistan this aspect is all together neglected by the nematologists. There are some survey reports on occurrence of plant parasitic nematodes in Balochistan province, but these reports are confined to few crops and localities (Bilqees and Khan, 1982; Bilqees *et al*., 1988; Khan *et al*., 1987; Qasim and Ghaffar, 1986; Qasim *et al*., 1988; Maqbool and Shahina, 2001). . This is the first comprehensive report of plant parasitic nematodes associated with cereals, vegetables and cash crops in Balochistan province.

MATERIALS AND METHODS

During a survey of cereals, vegetables and others economically important crops in 2001-2002, Soil samples were collected from twenty-six crops cultivated in 21 localities of Balochistan province. These samples were analyzed using Cobb sieving decanting and Baermann modified funnel technique (Southy, 1986). Nematodes were recovered after 48h, and gently killed in hot water (Goodey, 1957) and fixed in TAF for microscopic examination. Nematodes were then transferred to 1.25% glycerin solution containing traces of picric acid and allowed to dehydrate slowly. Processed nematodes were mounted in absolute glycerin for identification.

RESULTS AND DISCUSSION

A total number of 32 known species of plant parasitic nematodes *Anguina tritici, Aphelenchus avenae, Basiria graminicola, Boleodorus acutus, Ditylenchus dipsaci, Helicotylenchus digonicus, H.dihystera, H. indicus, Hoplolaimus indicus, Longidorus elongatus, Meloidogyne hapla, M.incognita, M, javanica, Merlinius brevidens, Pratylenchus brachyurus, P. neglectus, P. penetrans, P. pratensis, P. thornei, P. zeae, Psilenchus hilarulus, Quinisulcius capitatus, Q. solani, Scutylenchus koreanus, S. quettensis, Tylenchorhynchus annulatus, T. brassicae, T. clarus, T.cylindricus, T. mashhoodi, Tylenchus butteus* and *Zygotylenchus guevarai* were recovered from the soil

samples collected from twenty one loacalities around twenty six cereals, vegetables and cash crops cultivated in Balochistan province. (Table. 1). Of these nematode species *A. avenae* was the most predominant specie recovered from 81% followed by *H.. indicus* 76%, *P. penetrans* 76%, *T. annulatus* 71%, *S. quettensis* 67%, *T. mashhoodi* 67%, *D. dipsaci* 62%, *P. thornei* 52.3%, *Tylenchus butteus* 52.3% and *H. digonicus* 52.3% of the localities surveyed.

Table1. Plant parasitic nematodes associated with different crops in Balochistan Province.

NEMATODES	CROPS	LOCALITIES
Anguina tritici (Steinbuch,1799)Filipjev, 1936	Wheat	Dhadhar, Khuzdar, Pishin, Sibi
Aphelenchus avenae Bastin, 1865	Alfalfa	Darg, Gulistan, Punjpai
	Cabbage	Chaman, Sariab
	Carrot	Kalat, Mastung, Sariab
	Chillies	Chaman
	Cumin	Quetta
	Egg plant	Chaman, Darg, Gulistan
	Mint	Sariab
	Mustard	Mastung, Quetta, Sariab
	Okra	Barg, Chaman, Nushki
	Onion	Punjpai, Quetta, Sariab, Zahri
	Potato	Kalat, Mangochar, Mastung,Sariab, Pishin
	Radish	Quetta, Sariab
	Sugar beet	Sariab
	Sugarcane	Harnai
	Sunflower	Barg
	Tobacco	Mangochar
	Tomato	Mangochar
	Turnip	Kalat,Sariab
	Water melon	Nushki, Punjpai
	Wheat	Pishin, Sheikh wasil, Sariab, Gulistan, Qila-abdullah, Zahri
Basiria graminicola Siddiqi, 1959	Maize	Mastung
	Potato	Kalat, Mangochar
	Wheat	Gulistan
Boleodorus acutus Thorne & Malek, 1968	Cabbage	Chaman, Sariab
	Chillies	Chaman
	Cumin	Zahri
	Egg plant	Chaman
	Maize	Mastung
	Potato	Kalat, Mangochar, Pishin
	Tobacco	Pishin
	Wheat	Gulistan, Sariab, Zahri
Ditylenchus dipsaci(Kuhn, 1857) Filipjev, 1936	Alfaalfa	Darg, Gulistan, Punjpai
	Cabbage	Chaman
	Chillies	Chaman, Kalat

Table 1 Cont'd….

NEMATODES	CROPS	LOCALITIES
	Cumin	Quetta
	Egg plant	Chaman, Darg, Gulistan
	Maize	Mastung
	Okra	Barg, Sibi
	Onion	Punjpai, Quetta
	Radish	Quetta
	Sunflower	Barg
	Tobacco	Mangochar, Pishin
	Tomato	Chaman, Mangochar
	Wheat	Sariab
Helicotylenchus digonicus	Cabbage	Chaman, Sariab
Perry in Perry Darling &Thorne, 1956	Egg plant	Chaman, Gulistan, Punjpai
	Maize	Khanozai, Mastung, Sariab
	Mustard	Mastung, Quetta
	Okra	Sibi
	Sorghum	Khanozai, Nushki, Sibi
	Turnip	Kalat, Sariab
	Wax gourd	Khanozai, Quetta
H. dihystera	Sorghum	Quetta
(Cobb, 1893) Sher, 1936	Sugarcane	Harnai
H. indicus Siddiqi, 1963	Alfalfa	Darg,Gulistan
	Baffalo gourd	Quetta
	Carrot	Kalat, Mastung, Sariab
	Chillies	Chaman, Kalat, Quetta
	Egg plant	Chaman, Gulistan, Sariab
	Mint	Sariab
	Muskmelon	Nushki
	Mustard	Quetta, Sariab
	Onion	Barg, Punjpai, Sheikh wasil, Zahri
	Potato	Kalat, Mangochar, Pishin, Sariab
	Sugar beet	Mastung, Sariab
	Sunflower	Barg
	Tobacco	Mangochar, Pishin
	Tomato	Kalat, Sibi
	Turnip	Kalat, Sariab
	Wheat	Qila-abdullah, Quetta, Sheikh wasil, Sariab, Zahri
Hoplolaimus indicus Sher, 1963	Potato	Punjpai
	Turnip	Kalat, Sariab
	Wheat	Sariab
Longidorus elongatus(deMan, 1876)	Wheat	Sariab

Table 1 Cont'd….

NEMATODES	CROPS	LOCALITIES
Thorne & Swanger, 1936	Potato	Sariab
Meloidogyne hapla Chitwood, 1949	Chillies	Chaman
	Mint	Sariab
	Potato	Mastung
M. Incognita	Tobacco	Pishin
(Kofoid & White, 1919) Chitwood, 1949		
M. Javanica	Egg plant	Gulistan, Mangochar, Sariab
(Treub, 1885) Chitwood, 1949	Wax gourd	Khanozai
Merlinius brevidens	Maize	Mastung, Quetta, Sariab
(Allen, 1955) Siddiqi, 1970	Mustard	Quetta, Sariab
	Sugar beet	Sariab
	Tobacco	Mastung
	Turnip	Sariab
	Wheat	Gulistan, Quetta, Sariab
Pratylenchus brachyurus(Godfrey, 1929)	Mustard	Mastung
Filipjev & Schuurman Stekhoven, 1941	Turnip	Sariab
P. neglectus(Rensch, 1924)	Sugarcane	Harnai
Filipjev & Schuurman Stekhoven, 1941		
P. penetrans(Cobb, 1917)	Alfalfa	Darg, Gulistan
Filipjev & Schuurman Stekhoven, 1941	Barley	Kalat, Khuzdar, Mastung
	Cabbage	Chaman, Sariab
	Chillies	Chaman, Kalat, Quetta
	Maize	Bostan, Khanozai, Mastung, Pishin, Quetta, Sariab
	Onion	Barg, Mangochar, Zahri
	Rasish	Quetta
	Sugar beet	Mastung, Sariab
	Sugarcane	Harnai
	Sunflower	Barg
	Tobacco	Mangochar, Pishin
	Tomato	Chaman, Mangochar
	Wax gourd	Khanozai, Quetta
	Wheat	Gulistan,Qila-abdullah,Sariab
P. pratensis(deMan,1880) Filipjev, 1936	Cumin	Quetta
	Egg plant	Chaman, Gulistan, Punjpai
	Okra	Barg, Sibi
	Sorghum	Khanozai
P. thornei Sher & Allen, 1953	Barley	Kalat, Khuzdar, Mastung, Pishin, Quetta, Sariab
	Maize	Bostan, Khanozai
	Tobacco	Mangochar, Pishin
	Wheat	Gulistan,Qila-abdullah

Table 1 Cont'd….

NEMATODES	CROPS	LOCALITIES
P. zeae Graham, 1951	Maize	Bostan, Khanozai, Mastung, Sariab
	Mustard	Mastung
	Onion	Quetta
	Sorghum	Nushki, Sibi
	Wheat	Gulistan,Qila-abdullah
Psilenchus hilarulus deMan, 1921	Alfalfa	Barg, Gulistan
	Cabbage	Chaman, Sariab
	Egg plant	Chaman
	Tobacco	Pishin
	Wheat	Sariab
Quinisulcius capitatus(Allen, 1955) Siddiqi, 1971	Barley	Kalat, Khuzdar, Mastung, Pishin, Quetta, Sariab
Q. solani Maqbool, 1982	Chillies	Chaman
	Tomato	Chaman
Scutylenchus koreanus	Sugar beet	Sariab
(Choi &Geraert, 1971) Siqqiqi, 1979	Tobacco	Mastung
	Wheat	Sariab
S. quettensis	Cabbage	Chaman, Sariab
Maqbool, Ghazala & Fatima, 1984	Carrot	Kalat, Mastung, Sariab
	Cumin	Quetta, Zahri
	Egg plant	Chaman, Gulistan, Punjpai
	Maize	Khanozai, Mastung
	Mustard	Mastung, Quetta, Sariab
	Okra	Nushki
	Onion	Barg, Mangochar, Mastung, Sheikh wasil, Zahri
	Potato	Kalat, Mangochar, Mastung, Pishin, Sariab
	Radish	Quetta
	Sugar beet	Mastung, Sariab
	Tobacco	Mastung, Pishin
	Turnip	Sariab
	Wheat	Gulistan, Sheikh wasi,l Sariab, Zahri
Tylenchorhynchus annulatus	Barley	Kalat, Khuzdar, Mastung, Pishin, Quetta, Sariab
(Cassidy, 1930) Golden, 1971		
	Cumin	Quetta
	Egg plant	Chaman, Darg, Gulistan
	Maize	Bostan, Khanozai, Mastung
	Mint	Sariab
	Mustard	Mastung, Quetta, Sariab
	Radish	Quetta, Sariab
	Sorghum	Nushki, Sibi
	Sugar beet	Mastung, Sariab
	Sugarcane	Harnai

Table 1 Cont'd…..

NEMATODES	CROPS	LOCALITIES
	Tobacco	Pishin
	Turnip	Kalat, Sariab
	Wax gourd	Khanozai, Quetta
	Wheat	Gulistan, Sheikh wasil, Sariab
T. brassicae Siddiqi, 1961	Alfalfa	Darg, Gulistan
	Baffalo gourd	Quetta
	Cabbage	Chaman, Sariab
	Cumin	Quetta
	Mustard	Mastung, Quetta, Sariab
	Turnip	Sariab
T. clarus Allen, 1955	Sugarcane	Harnai
T. cylindricus Cobb, 1913	Potato	Kalat, Mastung, Pishin
T. mashhoodi Siddqi & Basir, 1959	Carrot	Sariab
	Chillies	Chaman, Kalat, Quetta
	Egg plant	Chaman, Darg, Gulistan, Punjpai
	Muskmelon	Nushki
	Okra	Barg, Nushki, Sibi
	Potato	Kalat, Mangochar, Mastung, Pishin
	Radish	Quetta, Sariab
	Sorghum	Khanozai, Sibi
	Tomato	Chaman, Mangochar
	Water melon	Nushki, Punjpai
Tylenchus butteus Thorne & Malek, 1968	Cabbage	Chaman, Sariab
	Carrot	Kalat, Mastung, Sariab
	Chillies	Chaman
	Cumin	Quetta
	Egg plant	Chaman, Darg, Gulistan, Punjpai
	Maize	Sariab
	Mint	Sariab
	Muskmelon	Nushki
	Mustard	Mastung
	Onion	Mastung, Quetta
	Potato	Mangochar, Mastung, Sariab
	Tobacco	Mangochar, Pishin
	Turnip	Sariab
	Water melon	Nushki, Punjpai
	Wheat	Gulistan, Qila-abdullah, Sariab
Zygotylenchus guevarai	Potato	Kalat, Sariab
(Tobar Jimenez, 1963) Braun & Loof, 1966		

Occurrence of plant parasitic nematodes with respect of crop revealed that *A.. avenae* was the predominant nematode species recovered from soil around 77% of the crops surveyed, followed by *H. indicus, Tylenchus butteus, P. penetrans, S. quettensis, T. annulatus. D. dipsaci, T. mashhoodi, H. digonicus* and *T. brassicae* recovered from 62%, 57.7%, 53.8%. 50.0%, 38.4%, 30.7% and 23.0% of the crops surveyed. (Table 2)

Although *A. avenae* was the most predominant nematode recovered from majority of the localities and crops, there is no information about the extent of damage caused by this nematode on cereals and vegetables. Spiral nematode *Helicotylenchus* species were commonly found in vegetables crops, but none of them has studied for causing losses to the vegetable crops. Stem and bulb nematode *Ditylenchus dipsaci* is known to attack a number of cereal and vegetable crops all over the world. There are reports that this nematode known to cause serious damage to Wheat, Maize, Onion, Garlic, Tomato, Cucumber (Bridge and Hunt, 1986; Decker, 1969). Stunt nematode *Tylenchorhynchus* and *Merlinius* spp have been found in the rhizosphere of vegetable crops.

M. . brevidens is responsible for poor growth in maize (Upadhyaya and Swarup, 1981).*T. brassicae* and *T. mashhoodi* are considered to be of potential importance in vegetable crops including tomato and cruciferous crops. The growth of plant is adversely affected when high population of these nematodes occur (Khan, 1969). Lesion nematodes *Pratylenchus* spp known to attack cereals and vegetable crops including tomato, egg plant, okra, carrot, onion, water melon and pumpkin (Baxter and Blake, 1968). *P. brachyurus* has been found to be responsible for 28.5% reduction in yield of Maize crop in Nigeria (Egunjobi, 1974). *P. thornei* known to cause significant losses in wheat Crop of Mexico (Vangundy *et al*, 1974). *P. zeae* have been shown to reduce plant growth (Elliot and Bird, 1985).

Root-knot nematode *Meloidogyne* spp were recovered from few crops grown in Balochistan province. There are evidences that these nematodes are capable of causing yield losses in cereals and veetables (Lamberti, 1979; Roberto *et al*., 1981).

Keeping in view the importance of plant parasitic nematodes in agricultural production attention must be given to population dynamics. Population studies enable to determined the extend of damage cause by plant parasitic nematodes and to develop strategies for nematode management including integrated management programs as well as development of biological control methods.

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