JOURNAL OF AGRICULTURE & SOCIAL SCIENCES
1813–2235/2006/02–3–182–184
http://www.fspublishers.org

Screening of Different Sunflower Cultivars Against Root-knot Nematode (*Meloidogyne incognita*)

ABDUL REHMAN, RUBAB BIBI† AND MIAN HAFEEZ ULLAH[1]
Department of Plant Pathology, University of Agriculture, Faisalabad–38040, Pakistan
†*Institute of Pure and Applied Biology, Baha-ud-Din Zakariya University, Multan*
[1]Corresponding author's e-mail: mianhafeezullahyazman@yahoo.com

ABSTRACT

Sunflower is attacked by many diseases, which reduce the yield and quality significantly under optimal conditions. According to an estimate root knot nematode (*M. incognita*) cause 16.44% yield losses in infected sunflower plants followed by yellowing, stunting and killing of plants in the field. Since nematodes are of great economic importance, so much attention has been paid to their control. Among various control measures, evolving of resistant varieties is the economical mean for controlling plant parasitic nematodes. Present studies were planned to screen the different sunflower cultivars against root knot nematode (*M. incognita*). Five sunflower cultivars were used for screening i.e. FH-75, Beimisal-205, Hysin-33, Super-25 and Engro 9704. FH-75 proved the most tolerant against root knot nematode infestation. It gave minimum reduction in plant height and minimum increase in fresh and dry root weight. The varieties BEIMISAL-205, Hyson-33, Super-25 and Engro-9704 exhibited tolerance respectively. Engro-9704 was the most susceptible variety to root knot nematode infestation.

Key Words: Sunflower; Nematode; Screening cultivar

INTRODUCTION

Sunflower (*Helianthus annus* L.) is an important oil seed crop. This crop as an oil seed crop was introduced in Pakistan during 1960 with the object of bridging the gap between the production and consumption of edible oil in the country (Burney *et al.,* 1990). The acreage under sunflower crop is on the increase since then. Sunflower is a short duration oil seed crop of 90 - 120 days. Its superior grade oil is used for baking and medicinal purpose and inferior oil is used in varnishes and wood industry. Its cakes are utilized as poultry and cattle feed. It is a rich source of vitamin E, A, D and K as well flavour substances.

In Pakistan total area under sunflower crop is about 113998 hectares with the total production 149502 tonnes (Anonymous, 2000). So the average yield is about 1311.44 kg/ha. Which is much lower than the yield potential of 2890 kg/hectare of existing sunflower cultivars in Pakistan (Mirza & Beg, 1982). Sunflower production in Pakistan is also very low as compared to other countries of the world, such as France 2600, China 1709, USA 1479 and Turkey 1406 kg/ha (Anonymous, 1997). This low yield may be attributed to several reasons such as occasional adverse climatic conditions, poor agronomic methods of cultivation, non-availability of improved seed and prevalence of diseases caused by various pathogens. Sunflower is attacked by many diseases, which reduce the yield and quality significantly under optimal conditions (Mirza & Beg, 1983).

Nematode cause significant losses in the crop yield. According to an estimate by the United States, Department of Agriculture (USDA) total loss due to nematodes is $ 4 x 10^9 per annum (James, 1981). Amongst nematodes root knot nematode (*Meloidogyne incognita*) has also been proved to be a threat to sunflower crop. Root knot disease of sunflower is becoming one of the most serious calamities for the successful cultivation of sunflower crop. On account of alarming loses (16.44% yield losses) it requires immediate and due attention to minimize its predation. Among various control measures evolving of resistant varieties is the most economical mean for controlling plant parasitic nematodes. Keeping in view the economic importance of root knot nematode (*M. incognita*) present studies were planned to screen the different cultivars against root knot nematode (*M. incognita*).

MATERIALS AND METHODS

Collection of root samples. Sunflower diseased plants infested with root-knot nematodes were collected from Field/research area of oil seed section, Ayub Agriculture Research Institute, Faisalabad and vegetable area near Ayub Hall, University of Agriculture, Faisalabad. Root samples with galls were carefully lifted with trowel up to one foot depth from the rhizosphere of the plants together with 1.5 - 2 pounds of adhering soil. The samples were collected in polyethylene bags and immediately brought to laboratory. They were placed in incubator at 15°C to keep the material fresh.

Isolation of nematodes (whitehead & Hemming, 1965). Isolation of nematodes was done by Whitehead and Hemming (1965) tray method. A sieve to support was made from a plastic covered letter basket (22 x 32 cm) or other

large plastic basket inside, which was placed a course plastic mesh or seed tray and on top of this a double layer of tissue paper or milk filters. The basket was placed in collecting tray with 100 gm of finally crumbled soil was evenly spread in a thin layer over filter in the basket. Water was carefully added inside edge of the collecting tray until soil layer looked wet. To obtain edge of the collecting tray until soil layer looked wet. To obtain a clean extract it was important not to move the tray once the water had been added. Evaporation was lessened by covering polyethylene sheeting. The nematodes were collected on floor of tray after 24 h. The basket was then slowly and carefully removed and nematode suspension from the tray was poured in the beaker and allowed to settle for 2 - 4 h then the supernatant water was decanted out or siphoned off.

Mass culturing of *M. incognita.* For mass culturing and preparation of nematode suspension brinjal was used as host plant. Plants were inoculated with isolated second stage juveniles. After three weeks when brinjal plants started showing the symptoms were carefully lifted from micro plots in the field area Department of Plant Pathology, University of Agriculture, Faisalabad. Roots were washed carefully in running tap water. Then roots were placed on the tissue paper for extraction of 2nd stage juveniles by Whitehead and Hemming Tray method. After 24 h water was collected in a beaker and nematode suspension was prepared for the inoculation of sunflower plants.

Evaluation of resistance in sunflower cultivars against root-knot nematode (*Meloidogyne incognita*). Seeds of sunflower cultivars HYSIN-33, Bemaisal-205, FH-75, Engro-9704 and Super-25 were sown in the individual pots. After three weeks of germination each pot was inoculated with freshly hatched 2nd stage juveniles @ 10 J_2S/100 g soil and replicated four times. The pots were placed in a completely randomized design in a glasshouse, where the temperature during the growth period ranged from 25 - 30°C. Plants were allowed to grow for six weeks and then removed from their containers. The stems were cut off and the soil was gently washed from the root system. Then these were taken to laboratory. Data were recorded on the basis of plant height, fresh weight of roots and dry weight of roots.

RESULTS AND DISCUSSION

The screening of sunflower cultivars revealed that none of the sunflower cultivar was immune to root-knot nematode, though the incidence varied from cultivar to cultivar. Amongst the 5 sunflower cultivars viz; Engro-9704, Super-25, Hysin-33, Beimaisal-205 and FH-75. (Table I, II & III) showed that FH-75 was found to be most tolerant to the attack of root-knot nematodes. It gave maximum increase in plant height and minimum increase in fresh and dry root weight due to the less root-knot formation. Engro-9704 was fund to be the most susceptible. It gave maximum reduction in plant height, maximum increase in fresh and dry root weight. Although the resistance against the root-knot nematodes in the available sunflower germplasm is scarce yet efforts are being made to

Table I. Reduction in plant height (cm) among five sunflower cultivars

No.	Varieties	Treatment	Means
1	Engro-9704	Control	59
		Treated	47
		Red. Over Control	12a
2	Super-25	Control	55
		Treated	55
		Red. Over Control	10ab
3	Hysin-33	Control	57
		Treated	48.75
		Red. Over Control	8.25abc
4	Beimisal-205	Control	55.25
		Treated	49.25
		Red. Over Control	6bc
5	FH-75	Control	44.25
		Treated	40.5
		Red. Over Control	3.75c

The analysis of variance showed that differences in the plant height reduction due to infestation were significant.

Table II. Increase in fresh root weight (g) among five sunflower cultivars

No.	Varieties	Treatment	Means
1	Engro-9704	Control	11.83
		Treated	15.88
		Red. Over Control	4.05a
2	Super-25	Control	10.18
		Treated	13.20
		Red. Over Control	3.02b
3	Hysin-33	Control	9.4
		Treated	11.70
		Red. Over Control	2.3c
4	Beimisal-205	Control	9.15
		Treated	11.27
		Red. Over Control	2.12c
5	FH-75	Control	7.28
		Treated	8.55
		Red. Over Control	1.27d

The analysis of variance showed that differences in the increase in fresh root weight (g) were highly significant

Table III. Increase in dry root weight (g) among five sunflower cultivars

No.	Varieties	Treatment	Means
1	Engro-9704	Control	3.62
		Treated	4.95
		Red. Over Control	1.33a
2	Super-25	Control	3.48
		Treated	4.52
		Red. Over Control	1.04b
3	Hysin-33	Control	3.13
		Treated	3.98
		Red. Over Control	0.85c
4	Beimisal-205	Control	2.83
		Treated	3.47
		Red. Over Control	0.64d
5	FH-75	Control	2.78
		Treated	3.20
		Red. Over Control	0.42e

The statistical analysis showed that differences in the increase in dry root weight were highly significant.

find resistant sources for commercial exploitation. Since the differences in susceptibility to the disease were significant and FH-75 was more tolerant to the pathogen, so it could be recommended to the farmers for commercial cultivation.

The results on the occurrence of the root knot nematode (*Meloidogyne* spp.) in sunflower crop are in conformity with (Krishnappa & Setty, 1983; Montasser *et al*., 1985; Zazzerini & Tosi, 1997).

REFERENCES

Anonymous, 1997. FAO Production Year Book. *Economic and Social Department Rome*, 51: 107

Anonymous, 2000. *Agricultural Statistics of Pakistan*. Ministry of Food, Agriculture Division, Planning Unit, Islamabad Pakistan

Burney, K., I. Ahmad and M. Aslam, 1990. Charcol rot an important disease of sunflower and its control. *Prog. Farm.*, 10: 34–6

James, W.C., 1981. Estimated losses of crops from plant pathogens in CRC Head Book of Pest Management in Agriculture, 1: 79–94

Krishnappa, K. and K.G.H. Setty, 1983. Study on races of root-knot nematode *Meloidogyne incognita* in India with particular reference to Karantaka. *Abstracts of Papers Presented at the 3rd Nematology symposium Solan*, P: 58. India, November, 24–26

Mirza, M.S. and Beg, 1982. Diseases of sunflower in Pakistan. *FAO Information Bull.*, 6: 55–6

Montasser, S.A., A.A. Al-Sayed and A.M. Kheir, 1985. Response of some sunflower cultivars to parasitism by three nematode species. *Pakistan J. Nematol*., 3: 91

Zazzerini, A. and L. Tosi, 1997. First report of root-knot nematodes (*Meloidogyne* spp.) on sunflower in Mozambique. *Pl. Dis.*, 81: 1333

Zhang, X.W., X.L. Qian and J.W. Liu, 1989. Evaluation of the resistance to root knot nematode of water melon. *J. Fruit Sci.*, 6: 33–8 (Nematole Abst. 60(3): 1092, 1991)

(Received 18 February 2006; Accepted 12 July 2006)