

Evaluation of Different Chemicals Against Root Knot Nematode (*Meloidogyne incognita*) on Sunflower

ABDUL REHMAN, RUBAB BIBI† AND MIAN HAFEEZ ULLAH¹

Department of Plant Pathology, University of Agriculture, Faisalabad–38040, Pakistan

†Institute of Pure and Applied Biology, Baha-ud-Din Zakariya University, Multan

¹Corresponding 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, use of nematicides have been found to be highly effective and reliable in controlling a wide range of nematode. Present studies were planned to see the effectiveness of different chemicals for control of this nematode. Five sunflower cultivars were used for i.e., FH75, Bemisal-205, Hysin-33, Super-25 and Engro-9704. Five Nematicides: Rugby-10 G, Furadan 3 G, advantage 5 G and Unihypo-3.6 G were evaluated against root knot nematode. Rugby 10 G proved the most effective. It gave minimum decrease in plant height, minimum increase in fresh and dry root weight. Rugby 10 G proved to be the best in reducing root knot disease and increasing plant vigour, followed by Furadan-3 G, advantage-5 G and Unihypo 3.6 G, respectively.

Key Words: Sunflower; Nematode; Nematicides

INTRODUCTION

Sunflower (*Helianthus annuus* 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 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 10⁹ 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 losses (16.44% yield losses) it requires immediate and due attention to minimize its predation. Among various control measures, the use of nematicides have been found to be highly effective and reliable in controlling a wide range of nematode. Keeping in view the economic importance of root knot nematode (*M. incognita*) present studies were planned to see the effectiveness of different chemicals for the control of this nematode.

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 letterbasket (22 x 32 cm) or other large plastic basket inside, which was placed a coarse 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 nematicides for the control of root-knot nematode disease on sunflower. Sunflower cultivar Hysin-33, were sown into earthen pots (20 x 22 cm) containing formalin sterilized sandy loam soil. The weight of the soil/pot was 6.5 kg. Each pot contained two plants. Three weeks after germination four nematicides viz; Furadan 3 G, Advantage 5 G, Rugby 10 G and Unihyp 3.6 G at commercially recommended dosage rate of 10 kg/acre, 6 kg/acre, 8 kg/acre and 10 kg/acre, respectively were applied by drenching. Four pots were kept as un-treated (control). On the following day, approximately 6000 freshly hatched second stage juveniles were pipetted through holes made in the surface of the soil, around the base of each plant. The pots were placed in a completely randomized design in a glass house. Clean hand pump water was used for irrigation throughout the period of studies. Daily temperature ranged between 25 - 32°C. Growth of plants, were observed from time to time and symptoms, if any were recorded.

After six weeks of inoculation, plants and soil were gently removed from pots and the roots were washed free of soil in running water. Data on fresh and dry weight of root and plant height were recorded. The data were statistically analyzed (Completely Randomized Design).

RESULTS AND DISCUSSION

The nematicides considerably reduced the root-knot disease. Among the test nematicides such as: Rugby, 10 G Furadan, 3 G advantage, 5 G and Unihypo 3.6 G, Rugby 10 G proved to be the most effective in reducing root-knot disease. It gave maximum increase in plant height, maximum reduction in fresh and dry weight of root. (Table I, II & III) showed that Rugby 10 G proved to be the best in reducing root-knot disease and increasing plant vigour, followed by Furadan and advantage. Unihypo proved least

Table I. Effect of Nematicidal drench on plant height (cm) of sunflower seedlings

No.	Treatments	Means
1	Rugby	54.75a
2	Furadan	47.50ab
3	Advantage	41.25b
4	Unihypo	40.75b
5	Control	28.25c

Analysis indicate that the differences in the average height of plants due to nematicides were highly significant among the treatments.

Table II. Effect of Nematicidal drench on fresh root weight (g) of sunflower

No.	Treatments	Means
1	Rugby	2.725c
2	Furadan	5.300bc
3	Advantage	7.875ab
4	Unihypo	8.625ab
5	Control	12.15a

Analysis showed that differences in reduction of fresh root weight due to nematicidal application were highly significant.

Table III. Effect of Nematicidal drench on dry root weight (g) of sunflower

No.	Treatments	Means
1	Rugby	0.7750d
2	Furadan	1.725cd
3	Advantage	3.450bc
4	Unihypo	5.400b
5	Control	8.175a

Statistically analysis showed that the differences in the reduction of dry root weight due to nematicides were highly significant.

effective. It should, however, be kept in mind that these nematicides are highly efficient in reducing disease incidence and increasing plant vigour only at their recommended doses. At their abnormal doses these might be phytotoxic. Results on the efficacy of these nematicides were in conformity with Devappa *et al.* (1998), Devappa and Krishnappa (1997), Prasad and Narayava (2000), Gurbinder *et al.* (1999).

REFERENCES

- Anonymous, 1997. FAO Production year book. *Economic and Social Department Rome*, 51: 107
- Burney, K., I. Ahmad and M. Aslam, 1990. Charcol rot and important disease of sunflower and its control. *Prog. Farm.*, 10: 34-6
- Devappa, V., K. Krishnappa and Reddy, 1997. Management of root knot nematode *Meloidogyne incognita* in sunflower. *Mysore J. Agric. Sci.*, 31: 155-8
- Devappa, V., K. Krishnappa and Reddy, 1998. Estimation of avoidable losses in yield due to root knot nematode *Meloidogyne incognita* in sunflower. *Indian J. Nematol.*, 28: 95-6
- Gurbinder, S., H.K. Chhabra, V.K. Kaul and G. Singh, 1999. Management Concomitant infection of *Meloidogyne incognita* and *Macrophomina phaseolina* on sunflower. *Pl. Dis. Res.*, 14: 40-4
- James, W.C., 1981. Estimated losses of crops from plant pathogens in CRC Head Book of Pest Management in Agriculture, 1: 79-97
- Mirza, M.S., A. Beg and Y. Ahmad, 1983. First report of *A. helianthi* on sunflower from Pakistan. *FAO Pl. Prot. Bull.*, 32: 147
- Prasad, D. and R. Narayana, 2000. Effect of carbosulfan and triazophos on the penetration and development of *Meloidogyne incognita* on sunflower. *Annals Pl. Protect. Sci.*, 8: 58-61

(Received 18 February 2006; Accepted 12 July 2006)