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MANAGEMENT OF NEMATODES ASSOCIATED WITH CHILLI USING FERTINEMAKIL-PLUS AND CARBOFURAN

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Abstract

The effect of Fertinemakil-Plus and Carbofuran was investigated on the population densities of three nematodes and yield of chilli. The populations of *Meloidogyne incognita, Longidorus elongatus* and *Rotylenchus capsicumi* were significantly reduced by both the nematicides.

Chilli (*Capsicum annuum* L.) is a major crop of Sindh, Pakistan. It is not only an important ingredient in food but is also used for essence production. Chillies are an excellent source of vitamins A, B, C, E and P. It is the largest traded species in international market. In Sindh chillies are grown on an area of 38400 hectares, with a production of 53700 metric tons, with average yield of 1.7 metric tons per hectare (Ziaf *et al.*, 2011). Chilli is attacked by a number of pathogens including plant nematodes which lower its yield. The objective of this study was to test the potential of Fertinemakil-Plus and Carbofuran against nematodes in chilli field and their effect on yield.

Materials and Methods

The experiment was conducted during 2011 at the Crop Diseases Research Institute, Pakistan Agricultural Research Council, Karachi University campus. The temperature during the trial varied from 24° to 38°C. The soil samples were collected in the last week of March from a depth of 5-25 cm. Population density of the three nematodes comprised 78% of total stylet bearing nematodes as determined by a sieving and decantation and modified Baermann funnel technique (Southey, 1986). Five ml aliquots (15 replicates) of nematode suspension were used for nematode counts and value converted to number of nematodes per 200 cm3 of soil samples. The initial population densities were 61.5±11.87 *Meloidogyne incognita* (Kofoid & White, 1919) Chitwood, 1949 second stage larvae, 113.5±5.67 *Longidorus elongatus* (de Man, 1876) Thorne & Swanger, 1936 and 67.7±15.54 *Rotylenchus capsicumi* (Firoza & Maqbool, 1991).

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After assessing the nematode populations, the five weeks old chilli seedlings of varieties Kunri-2 and Medium Tall were transferred in two-metre rows. After a week the treatments were applied. Fertinemakil-Plus prepared by P.C.S.I.R. in collaboration with CDRI @ 200 g row-1 and Carbofuran (commercial product Furadan) purchased from FMC Corporation at 10g row-1. The distance between rows was 85 cm and between the plants in a row 40 cm. Untreated rows were kept as control. Each treatment was replicated four times. At the time of harvest, soil samples were analyzed for nematode populations. To estimate the yield, total of four pickings from each treatment were done. The first picking was done at 13 weeks and the interval between pickings was 14-16 days. Data was subjected either to factorial analysis of variance (FANOVA) or one way analysis of variance (ANOVA). Duncan's multiple range test (LSD) were used as post-hoc tests (Zar, 1999).

Results and Discussion

The results of factorial analysis of variance showed that the differences among treatments as well as the nematode populations were significant at $p < 0.001$. The population density of all three nematodes namely *M. incognita*, *L. elongatus* and *R. capsicumi* was adversely affected by Carbofuran while Fertinemakil-Plus showed lesser but significant difference ($p < 0.001$) over the controls. When compared with the initial populations, *L. elongatus* population density was reduced more than the other two nematodes. The two chilli varieties Kunri-2 and Medium Tall of chillies neither differed with respect to initial populations nor with regard to the nematicidal effect of Carbofuran and Fertinemakil-Plus. They were equally abated by the nematicide.

The yield of chilli was significantly increased over the controls ($p < 0.01$) in both Kunri-2 and Medium Tall. However, the two varieties did not differ significantly in the yield. Carbofuran application gave greater yield than Fertinemakil-Plus. The interaction of nematicides and varieties was found non-significant (Fig. 1, 2).

Studies on the control of nematodes associated with chilli from Pakistan are few (Khan *et al.*, 2004; Khan *et al.*, 1991; Khan & Shaukat, 2001). Presence of M. incognita suggests that this endoparasitic nematode would eventually cause harm to the roots thus affect the yield. Singh *et al.*, (2006) reported that both *M. incognita* and *M. javanica* were the most prevalent nematodes associated with chilli in Champawat district of Uttaranchal, India. Earlier Fertinemakil-Plus (a combination of neem cake and fungicide) has been successfully used in the control of nematodes associated with mungbean (Khan *et al.*, 2008); maize (Khan *et al.*, 2009) and guar (Shaukat *et al.*, 2010).

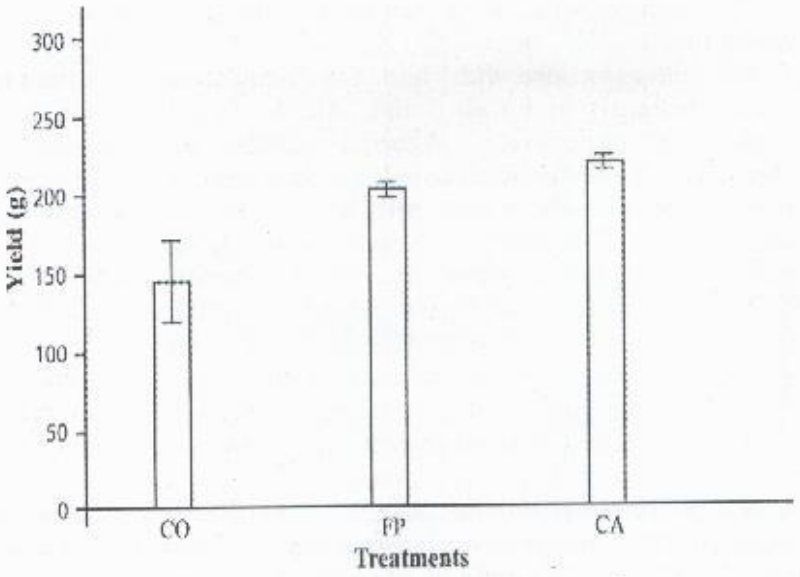

Fig. 1. Yield in different treatments of chilli var. Kunri-2 (CO = Control; FP = Fertinemakil-Plus; CA = Carbofuran).

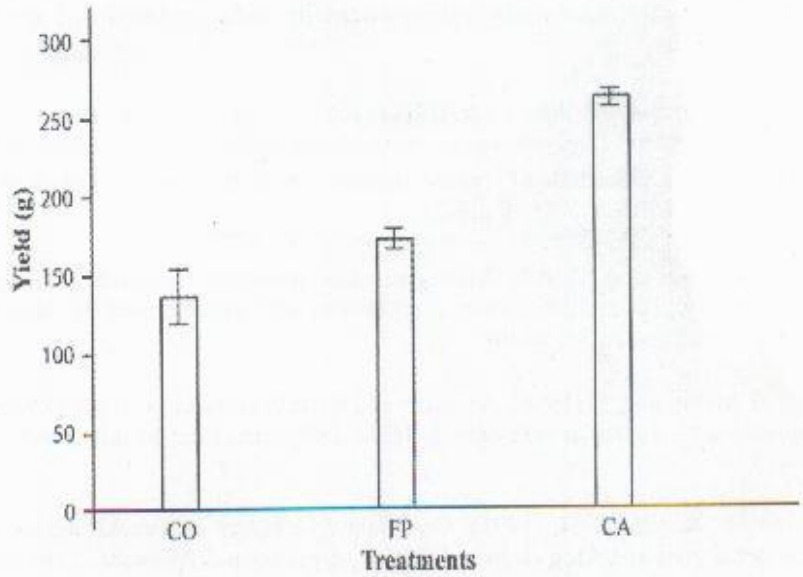

Fig. 2. Yield in different treatments of chilli var. Medium Tall (CO = Control; FP = Fertinemakil-Plus; CA = Carbofuran).

Sivakumar & Gunasekaran (2011) used three formulations based on neem oil and Pongamia oil viz., No. 60EC (C), No. 60EC (A) and No. PO60EC (C) against *M. incognita* associated with chilli. The formulations were tried as seed treatment and seedling root tip @ 2 m/l. All the formulations reduced the population/densities respectively. Agbenin (2009) reported that neem (*Azadirachta indica* L.) is the best example of plant with nematicidal properties and is available commercially in some parts of the world. Its seed powder gives good result in field and greenhouse. Several materials are in use as organic amendments. However, the choice of materials for amendments will determine its efficacy of control. The use of organic amendments that are disease-free and with a narrow C: N ratio will improve soil fertility while more efficiently reducing the level of nematodes and minimizing the risk of increasing the level of another soil-borne pathogen and pest. Ahmad & Khan (2004) found greater improvement in growth and reduced reproduction factor and root-galling in soil amendments with leaves of *Calotropis procera* while least with kale sawdust in chilli. The best protection against *M. incognita* was observed on integration of organic additives with *Paecilomyces lilacinus* which resulted in increased plant growth and reduced population build-up of nematodes and root galling. Akhtar & Mahmood (1996) suggested that organic amendments change the physical and trophic structure of soil, which affects pathogen development and overall growth performance of the plant. From the present study, it can be inferred that Fertinemakil-Plus not only controls nematode populations but improves the yield of chilli. Besides botanical formulations must be encouraged as they are easy to apply, are of low cost and offer environmentally safer methods of nematode control.

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