

INFLUENCE OF DIFFERENT TREATMENTS ON POPULATION OF NEMATODES AND YIELD OF GUAR (*CYAMOPSIS TETRAGONOLOBA* (L.) TAUB. CV. BHAWALPUR

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ABSTRACT

The impact of different treatments on population of two nematode species associated with guar (*Cyamopsis tetragonoloba* (L.) Taub.) and yield of guar was investigated. All the treatments namely Carbofuran, Fertinmakil Plus, plant extract of *Tridax procumbens* and leaf extract of *Eucalyptus citriodora* significantly decreased the populations of *Rotylenchulus reniformis* and *Pratylenchus penetrans*. However, the yield was elevated significantly by only Carbofuran and plant extract of *Tridax procumbens*.

Keywords: Guar, nematodes populations, nematicides, *Tridax procumbens*, *Eucalyptus Citriodora*, yield.

INTRODUCTION

Guar (*Cyamopsis tetragonoloba* (L.) Taub) is a drought tolerant summer annual crop commonly grown in India and Pakistan (Gomaa and Mohamed, 2007). In Sindh, it is generally grown in May-June and harvested in September-October. It is largely consumed as a vegetable in Indian subcontinent, also used in making pickles. Its gum has, however, a vast range of industrial applications and major share of demands come from various industrial sectors (Sultani, 2004). Guar yield is adversely affected by a number of diseases including nematodes (Raut and Sethi, 1980). In the present investigation Fertinmakil Plus (pesticide containing neem cake and a fungicide developed by PCSIR Laboratories Complex in association with CDRI, PARC, University of Karachi); plant extracts of *Tridax procumbens* L.; leaf extracts of *Eucalyptus citriodora* Hook and a nematicide Carbofuran belonging to carbamate group was used for comparison. The objective of the study was to evaluate the potential of nematicides against two plant parasitic nematodes and yield of Guar pods in field trial.

MATERIALS AND METHODS

Experiment was carried out in the field of Crop Diseases Research Institute, PARC, University of Karachi. Each treatment was replicated 4 times and the rows were randomized. The soil samples were collected in the second week of April (Fifteen days prior to sowing) from a depth of 0-35 cm. Population of the two nematode species comprised 70% percent of the total stylet bearing nematodes were 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 ml of soil sample. The initial populations were 166 ± 19.2 *Rotylenchulus reniformis* and 102 ± 3.9 *Pratylenchus zea* per 200 ml soil. Two meter rows were prepared and seed was sown at a distance of 15 cm and a depth of 4 cm. The treatments were Fertinmakil Plus @ 200 ml row⁻¹ and Carbofuran (commercial product Furadan) at 10 g⁻¹, untreated rows were kept as control. The leaf extract of *Eucalyptus citriodora* Hook and the plant extract of *Tridax procumbens* L. were prepared by using 100g of air-dried plant material plunged into 400 ml of 80% ethanol at 50°C, stirred well and soaked for 24 h. The material was produced to a gummy mass in Rotary evaporator (Buchi Rotavapor R-200) and dissolved in 400 ml distilled water. Two hundred ml of each extract was applied to 2 m row of Guar (*Cyamopsis tetragonoloba* (L.) cv. Bhawalpur. 10 days after germination at 15 cm depth by mixing the extract in the soil using a spade.

The extracts were uniformly broadcasted in the furrow and application rate corresponded approximately 1300 kg ha⁻¹ plant material in the form of extract applied to the Guar field. Weeding was done manually and cow manure was used as fertilizer when the crop was 8 weeks old. No fungal disease was observed and insect populations were at low level as there was no other crop present. At the time of harvest soil samples were collected from a depth of 0-35 cm with a soil auger to determine nematode population. Each final sample was a composite of 6-8 cores. To determine the yield, total pod weight/plant from each treatment was determined. Data was subjected either to factorial analysis of variance (FANOVA) or one way analysis of variance (ANOVA). Duncan's multiple range test and Fisher's least significant test (LSD) were used as post-hoc tests (Zar, 1999).

RESULTS AND DISCUSSION

The results of FANOVA showed that all the four treatments viz. Carbofuran, Fertinmakil Plus, *Tridax procumbens* and *Eucalyptus citriodora* and the nematode density were significant ($P < 0.001$). The interaction of treatments \times nematodes was also found significant ($P < 0.001$). Leaving aside the chemical treatment, the best nematode control was obtained by the amendments by Fertinmakil Plus for *Pratylenchus zae* (Table 1), while for *Rotylenchulus reniformis*, *Tridax procumbens* extract was the most suitable treatment. The ANOVA for yield showed significant F-value ($P < 0.05$). The yield was significantly elevated by treatments, Carbofuran gave the highest yield followed by *Tridax procumbens* (Fig. 1). The field experiment demonstrated significant control of nematodes with Fertinmakil Plus, Carbofuran and leaf extracts of *Eucalyptus citriodora* and plant extract of *Tridax procumbens*, while the yield although slightly elevated by all the treatments but was significantly increased only by Carbofuran and *T. procumbens*. The compounds present in the plant materials are either nematocidal or nematostatic in nature (Pandey *et al.*, 2000), or the end products of plant materials after decomposition are responsible for antinemic activity (Rather *et al.*, 2007), similarly release of phenols, alkaloids, terpenes or polyacetylenes are also reported to be responsible to counteract parasitizing nematodes (Gommers, 1981).

Table 1. Effect of different treatments on nematode populations associated with Guar.
Mean followed by \pm standard error.

		Treatments				
<i>Rotylenchulus reniformis</i> Linford & Oliveira, 1940	Initial 66 ± 19.2	Control 169 ± 10.8	Carbofuran 16 ± 2.1	Fertinmakil 25 ± 4.0	<i>Tridax procumbens</i> 20 ± 0.9	<i>Eucalyptus citriodora</i> 25 ± 1.9
<i>Pratylenchus zae</i> Graham, 1951	102 ± 3.9	125 ± 25.7	20 ± 3.80	35 ± 4.14	60 ± 17.41	$88.4.2$

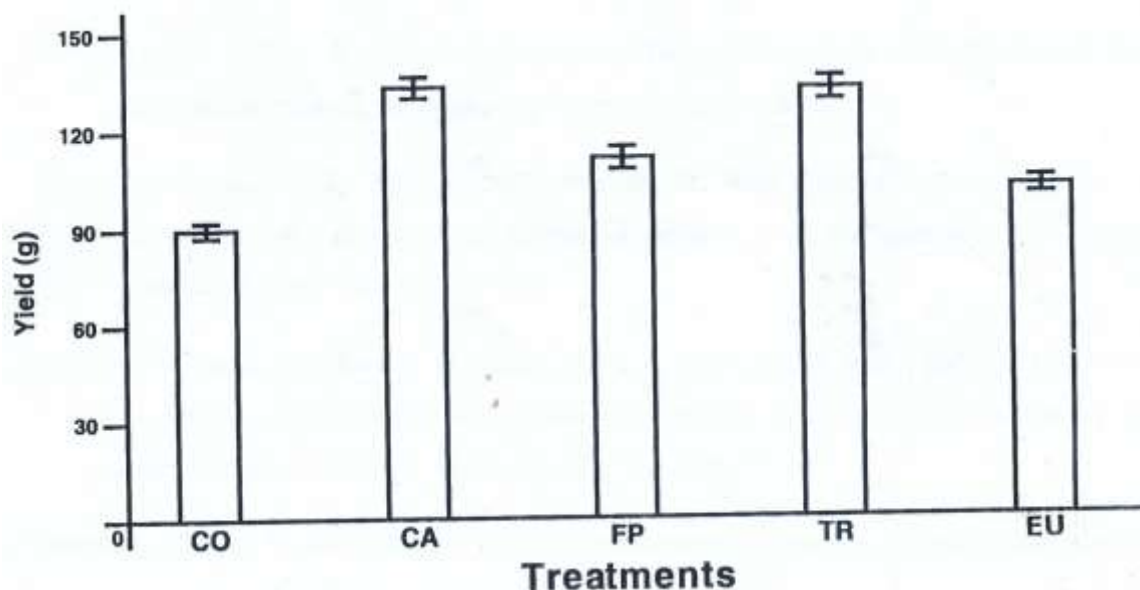


Fig. 1. Effect of different treatments on yield (g) of guar, under field conditions (CO = Control; CA = Carbofuran; FP = Fertinmakil Plus; TR = *Tridax procumbens*; EU = *Eucalyptus citriodora*).

Eucalyptus spp. extracts tended to control nematodes which could be due to the presence of secondary metabolites and leaf-oil, 1-8 cine oil eucalyptol (Bolard *et al.*, 1991, Brophy and Southwell, 2002). *Tridax procumbens* leaves were found to reduce galling index of *Meloidogyne incognita* (D'Addabbo, 1995) and its extracts had antimicrobial properties (Mehta *et al.*, 1983). Fertinmakil Plus was also found to suppress the nematode population and increased yield of mungbean (Khan *et al.*, 2008) and maize (Khan *et al.*, 2009). Muller and Gooch (1982) suggested that organic amendments for control of nematodes have low efficacies which make them unacceptable as control agents as they need to be applied in large amounts for effective nematode control. However, integrating them with chemical nematicides could be effective for nematode control (Radwan *et al.*, 2004; 2007).

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