



PERFORMANCE OF LEAVES AND THEIR RESPECTIVE OIL SEED CAKES ON PLANT GROWTH PARAMETERS AND SOIL POPULATION OF ROOT KNOT NEMATODE ON OKRA

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Abstract

As a remedial, safe & cost effective approach, the plant protectionist around the country switched on to safer tactics using organic amendments, botanical antagonists and/ or soil solarization as evidenced by sporadic literature to search for a better option against chemical farming. In continuance with search of safe sustainable components against toxic chemical pesticide based farming concentrating on soil health enriched by organic amendments in the form of oil seed cake and their respective leaves on plant growth parameters and soil population of infective second stage juveniles. In this study carried out under pot culture on autoclaved sandy loam soil in comparison of oil seed cakes of both edible and non-edible forms viz. Mustard, Neem, Karanj and castor along with their respective leaves have been investigated for their performance on plant growth and nematicidal properties of infective second stage juveniles on okra Cv. Parbhani kranti. In general, the performance of the oilseed cake exhibited better results in Plant growth parameters with reduction in population of *M. incognita* larvae.

It is noteworthy that the castor cake showed outstanding performance on plant growth parameters and in suppression of root knot population in comparison to all others.

Key words: organic amendments, non-edible oil seed cakes,

Introduction

Organic farming has strongly attracted the growers, being an important priority area in view of the growing demand for safe and healthy food and long term sustainability which was switched on by the plant protectionist through enriching the soil by amending of oil seed cakes, botanical antagonists and/or vermicompost (Singh and Sitaramaiah, 1966; Goswami and Vijaylaxmi, 1981; Muller and Gooch, 1982; Akhtar and Alam, 1991; Lopes, 2009 Goswami and Neetu Singh, 2012).

Organic sources are effective option as a source of macro and micronutrients and have required potential to improve yield and to save environment from chemical fertilizers. One important change resulting from the addition of organic matter is a potential increase in available nutrients, including an increase in organic carbon (Guidi *et al.*, 1988). Biopesticidal properties found in the above mentioned oil seed cakes, Botanical antagonists, vermicompost etc. have an added character in the form of active ingredients as a better substitute than the toxic

chemical pesticides proving it as a boon for the farmers in controlling plant-parasitic nematodes (Alam, 1991, Goswami and Neetu Singh, 2013), by improvements of soil structure and fertility, alteration of the level of plant-resistance, release of nemato-toxic compounds and instigating the activities of microorganisms that are antagonistic to phytonematodes (Pera *et al.*, 1983; Bhattacharya and Goswami, 1987; Gowda, 1999; Oka, 2010). A number of organic additives of plant origin, including oil-cakes, chopped plant parts and seed dressing made from plant extracts, have been used to control nematodes (Muller and Gooch, 1982; Tiyagi *et al.*, 2001; Akhtar and Alam, 1993).

In the comparative study of both leaves and oil seed cakes of neem (*Azadirachta indica*), Mustard (*Brassica juncea*), Karanj (*Pongamia pinnata*) and castor (*Ricinus communis*), is undertaken in which the last one, popularly referred as industrial crop in tropical and sub-tropical parts of the world capable of growing under low rainfall and also low fertility conditions.

Materials and Method

Shade dried leaves of neem (*Azadirachta indica*), Mustard (*Brassica juncea*), Karanj (*Pongamia pinnata*), Castor (*Ricinus communis*) while for the oil seed cakes of each of the above, except castor being subjected to detoxification as additional treatment was undertaken to eliminate toxic protein, Ricin through thermal treatment in an Autoclave at 1.23 kg/cm² (15 psi) for 90 minutes of alkaline treatment with calcium hydroxide or calcium oxide diluted in water 1:10 at a dose 60g per kg meal ricin.

For all of amended treatments the rate was 50g for each pot separately. Adequate control treatment was maintained with FYM in the present glass house study using 10cm earthen pots containing 500g of sterilized autoclaved sandy loam soil followed by inoculation with about 2000 freshly hatched larvae of *M. incognita*. Five replication were maintained for each of the above treated pots which were regularly watered for two weeks. After 15 days, three weeks old healthy seedlings of *Parbhani kranti* raised after surface sterilization with 0.01% HgCl₂ transplanted singly in above soil amendment mixture.

After a period of 45 days of nematization five replicates for each treatment was selected for the observation with regards to shoot length and weight root length and weight along with larval count of 500g soil. The data was statistically analyzed.

Results and discussion

With the new era of investigation for targeting the health of soil, crops and finally the consumers through safe and cost effective sustainable components as a

remedial and alternative to expensive and toxic chemical farming having made the farmland as dumpyard of toxic chemicals through indiscriminate and overuse of agrochemicals.

In the present study, attempts has been made to enrich the soil health through organic amendment of different oil seed cakes and/or their respective leaves which have been reported to be highly nematicidal. With this ideology the present authors have initiated investigation for better crop production and quality by organic amendment.

Previous results have shown that application of oil-cakes has achieved a lot of success in controlling nematodes in the soil. (Alam,1991; Goswami *et al.* (1993) reported that decomposed products of groundnut, mahua, mustard, karanj and neem oil-cakes affected the mortality of *M. incognita*. Mustard cake was found to be most nematotoxic even from the first week. Cruciferous residues including chopped leaves of cabbage and cauliflower etc. have been successfully demonstrated in reducing sol borne hidden enemies including root knot nematode and rot/wilt causing fungi (Neetu Singh and Goswami, 2014). Besides neem, karanj, sal etc castor having been recognized as potential against a good number of fungal and bacterial diseases (Lopes *et al.* 2009).

Incorporation of castor cake and leaves has proved significantly effective both in improving the biomass and reduction in soil population of root knot nematode. It is clear from the table that all the amendments including Neem, Mustard Sal and castor, in general, exhibited better plant growth parameters with significant reduction of nematode population. It is noteworthy that although most

Table 1: Performance of plant growth parameters and *M. incognita* population as influenced by soil amendment with leaves and their respective oil seed cakes on okra.

S.N.	No. of treatments	Shoot Length (cm)	Shoot Weight (g)	Root length (cm)	Root weight (g)	Biomass (g)	Nematode population per 500 g soil
1.	Neem cake	57.5	37.2	18.7	13.2	50.5	694
2.	Neem leaves	56.7	35.7	17.9	13.0	48.8	773
3.	Musturd cake	55.2	33.4	18.2	12.3	45.7	912
4.	Musturd leaves	52.5	29.6	17.3	11.7	41.2	831
5.	Karanj cake	49.2	28.9	16.2	14.0	43.1	1160
6.	Karanj leaves	46.4	26.4	15.3	13.2	40.1	1230
7.	Castor cake	58.3	38.3	19.7	13.6	51.7	672
8.	Lime treated detoxified castor cake	62.5	42.2	20.3	15.4	57.5	711
9.	Castor leaves	57.3	37.1	18.4	12.5	49.4	822
10.	Vermicompost	44.7	28.2	13.5	8.9	38.0	2563
11.	Control	37.5	21.9	11.2	6.4	29.1	4985
	CD@ 0.05%	2.41	5.32	2.11	2.87	4.37	7.91

outstanding performance is apparent in case of castor while comparing other amendments neem succeeded in its performance next in merit list followed by Sal oil seed cake.

Having reported the high toxic activities as nematicidal properties possessed by ricin its lethal performance is attributed towards killing the nematodes much more than the performance of active compound like azadiractin and karanjin originated from neem and karanj respectively. Last but not the least, and also clear from the table 1, the performance as natural fertilizer after the removal of toxic protein *i.e.* ricin showed outstanding response on all the given plant growth parameters when compared with all other cakes under investigation. This positive and cost effective findings of detoxified castor oil seed cake would prove to be one of the most highly beneficial and cost effective component for farmers in package of practices particularly for enriching the soil health.

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