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Assessment of organic amendments on population dynamics and incidence of rhizoctonia rot of gram

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Abstract
Chickpea (*Cicer arietinum* L.) is one of the most important pulse crops in India. The crop is grown in Western Maharashtra mainly in *Rabbi* season. The chickpea is severely attacked by *Rhizoctonia bataticola* (*R.bataticola*). Organic amendments, such as neem, soybean, castor, safflower, groundnut cakes and vermicompost, compost, FYM, gypsum, poultry manure were applied to chickpea, which was reduce the incidence and survival of *R. bataticola.* Many of these amendments reduced pathogen population. The lowest *R.bataticola* population was observed in neem cake treatment (4.5 x 10^{-3} /g) followed by castor cake (6 x 10^{-3} /g) and cotton cake (8 x 10^{-3} /g) as compared to control (30.5 x 10^{-3} /g).In case of organic amendment level assessment it observed that as level increases the population of microbe's decreases. Least incidence of *Rhizoctonia* root rot was observed in neem cake treatment (0-10%) followed by gypsum and poultry (5-10%) at different growth stages as compared to control (70%) Groundnut cake (15-40%) and safflower cake (25-35%) showed least adverse effect over incidence *Rhizoctonia* rot of chickpea.

Keywords: organic amendment, *Rhizoctonia bataticola*, neem cake, chickpea

1. Introduction
Chickpea is the world's third most important pulse crop, after dry beans (*Phaseolus vulgaris* L.) and dry peas (*Pisum sativum* L.). The *Rhizoctonia bataticola* is the best known plant pathogens in terms of economic damage in agricultural productions all over the world. The diseases resulted in yield losses to the extent of 30 to 70 percent in the fields and made economic problems for growers. Soybean rotcauses 30- 77 percent loss in soybean in Vidharbh region of Maharashtra (Pawar *et al*., 2014) [5]. The organic amendments *viz*., neem cake, ground nut cake, FYM, soybean cake, cotton cake were used in different concentrations. The highest per cent growth of inhibition was observed in neem cake and the lowest per cent growth inhibition was observed in groundnut cake (Pandey *et al*., 2014) [4]. Organic soil amendments neem cake, FYM, Soybean cake, Cotton cake stimulates the activities of microorganisms that are antagonistic to plant-parasitic nematodes (Anis *et al.,* 2010) [1]. Soil suppressiveness to control the soil borne fungal pathogen *Rhizoctonia solani* by incorporation of dried plant residues into soil carried out by (Joeke *et al*., 2012) and (Kasuya *et al.,* 2006) [3]. The use of organic by-products as amendments to reduce soilborne plant diseases is gaining the interest of growers. Now days there is tremendous pressure on farmers to use eco-friendly practices like manures and organic cakes for control soil borne diseases. Antagonist effect of organic matter decomposition level and cellulose amendment on the inoculum potential of *Rhizoctonia solani* in Hardwood Bark Media observed (Chung *et al.,* 1888) [2]. We found that certain organic amendments controlled *Rhizoctonia* rot of chickpea. Therefore, it is decided to see the effect of organic amendment on population dynamics of soil borne plant pathogen on chickpea (*Cicer arietinum* L.) *var*. JG-62.

2. Material and Methods
Various oilseed cakes were obtained from the local market, Rahuri *viz.,* neem cake, ground nut cake, soybean cake, cotton cake, vermicompost, castor cake, compost, poultry manure, gypsum, safflower cake and FYM etc.

Fungal culture: *Rhizoctonia bataticola*
Potting mixture: Earthen pot filled with potting mixture (soil + sand) and organic matter was added as per treatment @ 5, 10 and 15 gm/kg soil. The pot was inoculated with test pathogen multiplied on sand: maize media @ 10gm/kg mixture.
Seed: The pure seeds of chickpea var. JG-62 were used for raising chickpea.

Assessment of microbial population by serial dilution method
Microbial population of different fungus from organic matter and sick soil by serial dilution method. Microbial count of collected sample were assessed at 10^{-3}, 10^{-4}, 10^{-5} dilution at different growth stages of plant.

Assessment of effect of organic treatment on *Rhizoctonia bataticola* by pot culture method with sick soil
Organic amendment *viz*., neem cake, ground nut cake, soybean cake, cotton cake, vermicompost, castor cake, compost, poultry manure, gypsum, safflower cake and FYM were applied at three different levels *i.e.*, @ 5, 10 and 15 g/kg soil in per pot. Three soil borne fungi was assessed against organic amendments. Seed of chickpea var., JG-62 used for assessment. The disease incidencewas recorded at seedling, growth, flowering, pod, physiological maturity stages.

3. Results and Discussion
Population of *Rhizoctonia bataticola* plant pathogens under different level of organic treatment.
Data pertaining in table 1. Among organic treatments significanty lowest *Rhizoctonia bataticola* population was observed in neem cake treatment (4.5 x 10^{-3} /g) followed by castor cake (6 x 10^{-3} /g) and cotton cake (8 x 10^{-3} /g) as compared to control (30.5 x 10^{-3} /g). Groundnut cake (25.5 x 10^{-3} /g) and safflower cake (22 x 10^{-3} /g) did not show any adverse effect over population *Rhizoctonia bataticola.* Regarding effect of level of organic matter on population of *Rhizoctonia bataticola,* it was observed that population of

Rhizoctonia bataticola decreases with increase in application dose of organic matter. Lowest population of *Rhizoctonia bataticola* was observed (4.5 x 10^{-3} /g) at 15g/kg soil application of neem cake followed by castor cake (6 x 10^{-3} /g).In case of interaction effect the application of neem cake @ 15g/kg soil was observed effective.

Table 1: Effect of different organic treatment on population of *Rhizoctonia bataticola under* epiphytotic conditions at different stages of crop. (10^{-3} /g of soil)·

Treatment	Level	Seedling	Growth	Flowering	Maturity
Neem cake	5g/kg	6	6	6	7.5
Cotton cake	10g/kg	4.5	4.5	5	6
	15g/kg	5	4.5	4.5	5
	5g/kg	13.5	13.5	14	12
FYM	10g/kg	11	11.5	11	10.5
	15g/kg	9.5	9.5	8	9
	5g/kg	15.5	16	16.5	12.5
Compost	10g/kg	13.5	13.5	15	11.5
	15g/kg	11	12	13.5	8
	5g/kg	17	15.5	15.5	11.5
	10g/kg	13	12.5	14	12.5
Gypsum	15g/kg	11	9.5	11	9.5
	5g/kg	15.5	17.5	18.5	11.5
Poultry	10g/kg	12.5	12.5	15.5	10
	15g/kg	10	11.5	12.5	10
	5g/kg	16	15	18.5	12.5
Soybean cake	10g/kg	11.5	12.5	17.5	10.5
	15g/kg	9.5	9.5	13	8.5
	5g/kg	19	18	19.5	13
Castor cake	10g/kg	17	15	18.5	9.5
	15g/kg	15.5	12	19	8.5
	5g/kg	11	10.5	16.5	13.5
Safflower cake	10g/kg	10.5	6	14.5	11.5
	15g/kg	9.5	4.5	11	11
	5g/kg	21	18.5	23	14.5
Vermicompost	10g/kg	20	16	22	14
	15g/kg	20	15	20.5	11.5
	5g/kg	17.5	19.5	20	14.5
G.nut cake	10g/kg	14.5	14	17.5	12.5
	15g/kg	13.5	13	16.5	11
	5g/kg	20	22	25	25.5
Control	10g/kg	16.5	19.5	24	24
	15g/kg	15	16.5	20.5	21.5
		24	21.5	23	30.5
Treatment SE(±)		25	24.5	25	29
CD@5%		20.5	23.5	27.5	27.5
		5.59	1.77	0.90	0.61
		1.70	2.22	2.59	1.76
CD@1%		2.29	1.98	3.47	2.36
Level SE(±)		0.31	0.40	0.470	0.32
CD@5%		0.89	1.16	1.35	0.92
CD@1%		1.25	1.64	1.90	1.29
Intraction SE(±)		1.03	1.34	1.57	1.07
CD@5%		NS	NS	NS	NS
CD@1%		NS	NS	NS	NS

Effect of organic amendment on incidence of rot diseases of chickpea under artificial inoculation condition

Data pertaining presented in table 2. Among organic treatments significantly least incidence of *Rhizoctonia* rot was observed in neem cake treatment (0-10%) followed by gypsum and poultry (5-10%) at different growth stages as compared to control (70%) Groundnut cake (15-40%) and safflower cake (25-35%) showed least adverse effect over incidence *Rhizoctonia* rot of chickpea. Regarding effect of level of organic matter on incidence *Rhizoctonia* rot of chickpea, it was observed that incidence *Rhizoctonia* rot of chickpea decreases with increase in application dose of organic matter. Lowest incidence of *Rhizoctonia* rot was observed in neem cake treatment was 0% at 15g/kg soil application of neem cake followed by gypsum (0-5%).Similar result were observed by (Pandey *et al.*,2014) [4] studied that the effect of organic soil amendment (FYM, Vermi-compost, Green manure, Neem cake) against soil borne pathogen *i.e*. collar rot of chickpea. He got similar result that among all the treatments with Neem cake were more effective in controlling wilt disease of chickpea (46.7%), as compared to Farm Yard Manure (39.9%), Vermi-compost (39.3%) and Green manure (26.2%).

Table 2: Effect of different organic treatment on incidence of *Rhizoctonia* rot of chickpea under artificial inoculation condition at different stages (%).

Treatment	Level	Seedling	Growth	Flowering	Pod	Maturity	Total
Neem cake	5g/kg	5	5	0	0	0	10
	10g/kg	0	0	0	0	0	0
	15g/kg	0	0	0	0	0	0
Cotton cake	5g/kg	10	0	0	5	0	15
	10g/kg	0	0	5	5	5	15
	15g/kg	0	5	0	0	0	5
FYM	5g/kg	5	5	0	5	0	15
	10g/kg	5	0	0	0	0	5
	15g/kg	0	0	0	5	5	10
Compost	5g/kg	5	5	0	0	5	15
	10g/kg	5	0	0	5	0	10
	15g/kg	5	5	5	0	0	15
Gypsum	5g/kg	0	0	5	5	0	10
	10g/kg	0	0	0	5	0	5
	15g/kg	0	5	0	0	0	5
Poultry	5g/kg	0	0	0	0	0	0
	10g/kg	0	0	0	5	5	10
	15g/kg	0	0	5	5	0	10
Soybean cake	5g/kg	5	5	5	10	5	30
	10g/kg	0	5	5	5	0	15
	15g/kg	0	0	5	10	5	20
Castor cake	5g/kg	5	0	0	5	0	10
	10g/kg	0	10	5	0	5	20
	15g/kg	0	0	5	5	0	10
Safflower cake	5g/kg	5	5	5	10	0	25
	10g/kg	0	10	5	10	10	35
	15g/kg	0	5	5	5	10	25
Vermicompost	5g/kg	0	0	0	5	0	5
	10g/kg	5	0	5	5	5	20
	15g/kg	0	5	10	0	0	15
G.nut cake	5g/kg	10	5	10	10	5	40
	10g/kg	0	5	0	10	0	15
	15g/kg	0	5	10	10	0	25
control		10	10	5	25	20	70
		10	5	10	10	10	45
		10	20	10	15	10	65
Treatment SE(±)		2.57	3.17	3.17	3.25	2.58	4.17
CD@5%		5.00	5.05	5.90	5.65	4.20	NS
CD@1%		6.22	6.77	7.97	7.59	5.63	NS
Level SE(±)		1.55	1.65	1.65	1.70	1.35	2.17
CD@5%		2.55	2.52	2.97	2.82	2.10	6.23
CD@1%		3.30	3.38	3.98	3.79	2.81	8.76
Intraction SE(±)		5.2	5.49	5.49	5.64	4.48	7.22
CD@5%		8.6	8.74	10.21	9.79	7.27	NS
CD@1%		11.6	11.37	13.81	13.1	9.75	NS

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