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Management of stem rot disease of chickpea caused by *Sclerotinia sclerotiorum* through organic amendments

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Abstract
Chickpea (*Cicer arietinum* L.) is the third most important pulse crop grown all over the world. Stem rot of chickpea caused by *Sclerotinia sclerotiorum* is a serious problem in chickpea which causes an economic yield loss. To manage the ailment various soil amendments were used. Among the treatments, Neem cake was found most effective which delayed appearance of symptom till 92.00 days after sowingfollowed by Linseed cake (85.50 Days after sowing). Seed germination was found maximum in Neem cake (92.16%) followed by Linseed cake (88.27%), Mustard cake (86.15%). Maximum dry weight (g) was found in Neem cake (49.95g) followed by Linseed cake (48.69g). Plant height (cm) was found maximum in Neem cake (58.15 cm) followed by Linseed cake (56.25 cm). The maximum number (53.75) of pods/plant was recorded in Neem cake followed by Linseed cake (50.88). The disease incidence was found minimum in Neem cake (20.69%) followed by Linseed cake (31.26%). The maximum percent disease control (64.03%) was recorded in Neem cake followed by Linseed cake (45.64%). Maximum test weight (20.15gm) was recorded in Neem cake followed by Linseed cake (18.52gm). Maximum yield was found in Neem cake (10.82g) followed by Linseed cake (9.13g). All the treatments were found significantly superior over control in all the parameters. It is safe and eco-friendly method of management of pathogen.

Keywords: chickpea, soil amendments, oilseed cakes, compost, *sclerotinia sclerotiorum*, management

Introduction
Chickpea (*Cicer arietinum* L.) is the third most important pulse crop grown all over the world (San *et al.*, 2022) [7]. It is an important pulse crop grown and consumed all over the world, especially in the Afro-Asian countries. Chickpea seed is a good source of carbohydrates (52.40 to 70.90%), protein (12.40 to 30.60%) and minerals like Ca, Fe, Mg, K, P, Zn and Cu. It also has Vitamin A and B-carotene (Khalifa *et al.*, 2013) [5]. All of the important amino acids are present in significant quantities in chickpea. India contributes more than 70 per cent of the total world production of chickpea and it is grown over 98.5lakh hectares with the production of 119.9 lakh tonnes and productivity 1217 kg/hectare (Anonymous, 2021) [1] but the cultivation of chickpea in the recent years has been greatly hampered due to biotic and abiotic stresses. The crop is suffering from various fungal, bacterial and viral diseases throughout the growing season. Besides Ascochyta blight and Fusarium wilt, stem rot caused by the *Sclerotinia sclerotiorum* has been found to cause considerable economic losses to the crop. The use of organic amendments as a suitable cultural practice for the control of soil borne pathogens including *S. sclerotiorum* (Jajoriya *et al.*, 2022; Bairwa *et al.*,2014; Rousseau *et al.*, 2007) [3, 2, 6]. It is now widely recognized that organic soil amendments an alternative to the noxious chemical fungicides has attained importance in modern agriculture to curtail the hazards of intensive use of toxic pesticides. This approach is self-sustaining, efficient and eco-friendly with long-term action. The present investigations were carried out to generate information on potential of organic amendments applied as soil treatment in pots against chickpea stem rot (*S. sclerotiorum*).

Materials and Methods
The experiment was conducted in the Net house of Department of Plant Pathology, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, U.P. during 2020-21 and 2021-22.
Soil collected and sterilized in autoclave, filled in earthen pots separately. Neem cake (2.77gm/kg soil), Mustard cake (2.53gm/kg soil), Linseed cake (2.28gm/kg soil), Sawdust (1.64gm/kg soil), and Parthenium compost (5gm/kg soil) mixed individually in the sterilized

soil filled pots, two weeks prior to sowing. Soil was inoculated with *S. sclerotiorum* @ 5% will be released in the pots 15 days after sowing. Control pots filled with pathogen inoculated soil without adding amendments. The seeds of susceptible chickpea variety sown in each pot (15 seed per pot) where finally 10 plants were maintained. The experiment conducted in CRD (Completely Randomized Design) with four replications.

Seed germination per cent, Plant height (cm), dry weight (g), Number of branches, Number of pods per plant, Test weight (g), Grain yield per plant (g), first appearance of disease, disease incidence and per cent disease control were observed 30 days after sowing to till maturity of crop. Per cent disease incidence and per cent diseased control calculated by using following formula:

$$\text{Per cent disease incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants}} \text{ x } 100$$

$$\text{Per cent disease control} = \frac{C - T}{C} \times 100$$

Where
C = Per cent diseases incidence of control pots
T= Per cent disease incidence in treated pots

Result and Discussion

Soil organic matter is considered as a major component of soil quality because it contributes directly or indirectly too many physical, chemical and biological properties. Thus, soil amendment with composts is an agricultural practice commonly used to improve soil quality and also to manage organic wastes.The presence of antifungal compound in higher plants haslong beenrecognized as an important factor for induced resistance in plants as well as pathogen repellent. Such compounds, being bio-degradable and selective in their toxicity are considered valuable for controlling fungal diseases in plants.

Efficacy of different soil amendments on stem rot incidence during 2020-22 (Pooled)

Efficacy of different soil amendments against stem rot

Two year application of different soil amendments in the chickpea also significantly improved the plant growth related attributes such as germination of seed, plant height, number of pod formation dry matter accumulation and grain yield under stem rot stress during the year 2020-22. Under stem rot stress on chickpea, soil amendment has been found significantly effective as follows;

First appearance of disease- The application of the soil amendments was found significant in terms of delayed appearance of disease symptoms of stem rot on chickpea. Among the treatments, soil amendments with Neem cake observed the first appearance of disease after 92 days after sowing followed by Linseed cake (85 DAS), mustard cake (81.5 DAS), sawdust (74.5 DAS), parthenium compost (74 DAS) compared to control (61.5 DAS).

Effect on seed germination- Soil amendments also improved seed germination. The maximum seed germination was also observed in soil amendments with Neem cake (92.16%) followed by Linseed cake (88.27%), mustard cake (86.15%), sawdust (84.13%), Parthenium compost (83.24%) compared to control (79.87%).

Number of pods per plant- Soil amendments increased pod formation in the plant. The maximum number of pods/plant was observed in Neem cake (53.75) followed by Linseed cake (50.88), mustard cake (50.25), saw dust (48.00), Parthenium compost (46.50) compared to control (26.25).

Plant height (cm)- Soil amendment significantly improved plant height. The maximum plant height was observed in Neem cake (58.15 cm) followed by Linseed cake (56.25 cm), mustard cake (54.83 cm), saw dust (53.05 cm), Parthenium compost (52.34 cm) compared to control (48.31cm).

Dry weight of plant (g)- Soil amendment significantly improved dry weight of plant. The maximum dry weight was observed in Neem cake (49.95 g) followed by Linseed cake (48.69 g), mustard cake (46.98 g), saw dust (43.95 g), Parthenium compost (34.46 g) compared to control (35.13 g).

Plant disease incidence- Soil amendments significantly reduced the disease incidence of stem rot of chickpea. The minimum disease incidence was observed in Neem cake (20.69 %) followed by Linseed cake (31.26 %), mustard cake (35.37 %), saw dust (39.72 %), Parthenium compost (43.43 %) compared to control (57.71 %).

Percent disease control- Soil amendments significantly reduced the losses caused by stem rot of chickpea. The maximum percent disease control was observed in Neem cake (64.03 %) followed by Linseed cake (45.64 %), mustard cake (38.21 %), saw dust (31.02 %), Parthenium compost (24.61 %) compared to control.

Test weight (g)- Soil amendment significantly improved test weight of the seed. The maximum test weight was observed in Neem cake (20.15 g) followed by Linseed cake (18.52 g), mustard cake (17.50 g), saw dust (15.95 g), Parthenium compost (15.18g) compared to control (12.61 g).

Yield (g/plant)- Soil amendment significantly improved yield of the plant. The maximum yield per plant was observed in Neem cake (10.82 g) followed by Linseed cake (9.13 g), mustard cake (8.59 g), saw dust (8.27 g), Parthenium compost (7.55g) compared to control (4.97 g).

Our result was well corroborated with the finding of Shivpuri *et al.*, (1997) [10] and Kapoor *et al.*, (2006) [4] who reported that the neem based pesticides were highly effective against the *S. sclerotiorum.* Neem cake possibly enhances the disease control by release of volatile substances during decomposition that induced disease resistance or tolerance on the root surface (Singh, 1983) [11]. It is well known fact that the cake improves physio-chemical properties of the soil and increase the vigour of the crop by supplying nutrients and promoting anti-microbial populations in the rhizosphere (Sharma and Sharma, 1986). Tripathi *et al.*, (2010) [12] reported that the neem cake extract, mustard cake extract, farm yard manure extract reduces the mycelia growth of *S. sclerotiorum.* Sharma *et al.*, (2011) found that the application of mustard cake reduced the stem rot incidence and increases seed yield in cauliflower. Bairwa *et al.*, (2014) [2] reported that Neem cake (1 ton hac^{-1}) was found best treatment to manage the disease and gives maximum yield.

Table 1: Efficacy different soil amendments on stem rot incidence during 2020-22 (Pooled data of two year)

Treatment	First appearance of disease (DAS)	Seed germination (%)	Dry weight of plant (g)	Number of pods per plant	Plant height (cm)	PDI (Days after disease appearance)	PDC (Days after disease appearance)	Test weight (g)	Yield/plant (g)
						30 days	30 days		
T_1 (Linseed cake)	85.50	88.27	48.69	50.88	56.25	31.26 (33.98)	45.64 (42.48)	18.52	9.13
T_2 (Saw dust)	74.50	84.13	45.26	48.00	53.05	39.72 (39.05)	31.02 (33.81)	15.95	8.27
T_3 (Neem Cake)	92.00	92.16	49.95	53.75	58.15	20.69 (27.04)	64.03 (53.13)	20.15	10.82
T_4 (Parthenium compost)	74.00	83.24	43.95	46.50	52.34	43.43 (41.21)	24.61 (29.71)	15.18	7.55
T_5 (Mustard cake)	81.50	86.15	46.98	50.25	54.83	35.57 (36.60)	38.21 (38.16)	17.50	8.59
T_6 (Control)	61.50	79.87	34.46	26.25	48.31	57.71 (49.42)	0.00 (0.00)	12.61	4.97
SEm±		0.176	0.428	1.852	0.248	0.616	1.286	0.192	0.148
C.D. at 5%		0.527	1.282	5.545	0.743	1.845	3.850	0.576	0.443

*PDI (Per cent Disease Incidence), PDC (Per cent Disease Control), DAS (Days after sowing), Figure in parenthesis are angular transformed value

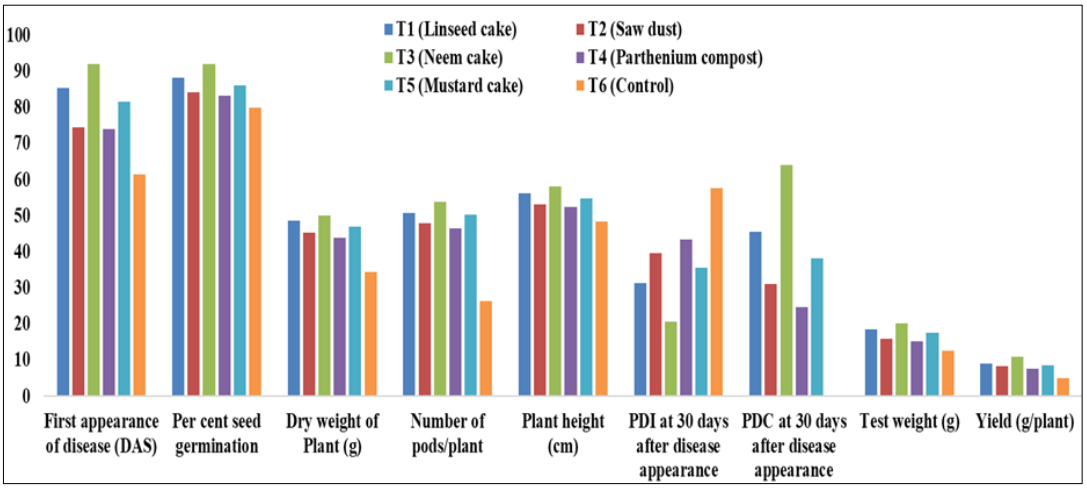

Fig 1: Efficacy of different soil amendments on disease incidence in chickpea stem during the year 2020-22 (pooled)

Conclusion

Efficacy of different soil amendments *viz*., Linseed cake, Sawdust, Neem cake, Parthenium compost and Mustard cake were evaluated for management of stem rot disease of chickpea in pot condition during 2020-21 and 2021-22. Among the amendments, Neem cake was found effective in curtailing the disease incidence, delayed the appearance of disease and increase in germination percentage, dry weight of plant (g), number of pods per plant, plant height (cm), test weight (100 seeds) and yield (g)/plant. Among the amendments, Neem cake was found most effective which delayed the disease appearance till 92.00 days after sowing and maximum seed germination (92.16%) as compared to control 61.50 days after sowing and seed germination (79.87%) in pooled data. All the treatments were found significantly superior over control.

References

1. Anonymous. Agricultural statistics at a glance, Min. of Agri. & FW (DA&FW), Directorate of Economics and Statistics, GOI; 2021, 42-43.
2. Bairwa SK, Godara SL, Meena S, Jatav NK, Bairwa RC. Effects of fertilizers and soil amendments on the incidence of Sclerotinia stem rot in Indian mustard (*Brassica juncea* L.). African Journal of Microbiology Research. 2014;8(42):3650-3655.
3. Jajoriya A, Ahir RR, Meena R, Sharma D. Management studies on *Sclerotinia sclerotiorum (*Lib.) de Bary, causing sclerotinia rot of cauliflower through plant extracts, and amendments. The Pharma Innovation. 2022;11(8):600-603.
4. Kapoor AS, Paul YS, Singh A. Integrated management of white rot and root rot – wilt disease complex of pea. Indian Phytopathology. 2006;59(4):467-474.
5. Khalifa GK, Eljack AE, Mohammed MI, Elamin OM, Mohamed ES. Yield stability in common bean genotypes (*Phaseolus vulgaris* L.) in the Sudan. Global Journal of Plant Breeding and Genetics. 2013;5(10):203-208.
6. Rousseau G, Rioux S, Dostaler D. Effect of crop rotation and soil amendments on Sclerotinia stem rot on soybean in two soils. Canadian Journal of Plant Science. 2007;87(3):602-614.
7. San SH, Sagar D, Kalia VK, Krishnan V. Effect of different chickpea genotypes and its biochemical constituents on biological attributes of *Helicoverpa armigera* (Hubner). Legume Research. 2022;45(4):514-520.
8. Sharma P, Meena PD, Rai PK, Kumar S, Siddiqui SA. Evaluation of soil amendments, botanical and fungicide against *Sclerotinia sclerotiorum* causing stem rot of Indian mustard. Journal of Mycology and Plant Pathology. 2011;41(1):151 (Abstract)
9. Sharma RC, Sharma SL. Effect of soil amendments and artificial defoliation of infected leaves on sclerotinia stalk rot of cauliflower. Indian Journal of Plant Pathology. 1986;4:126-128.
10. Shivpuri A, Sharma OP, Jhamaria SL. Fungitoxic properties of plant extracts against pathogenic fungi. Journal of Plant Pathology and Mycology. 1997;27:24-31.

11. Singh RS. Organic amendments for root diseases control through management of soil microbiota and host. Journal of Plant Pathology. 1983;13:11-16.
12. Tripathi SC, Tripathi AK, Chaturvedi C. Effect of different organic amendments on the growth of *Sclerotinia sclerotiorum (*Lib.) de Bary *in vitro.* Vegetos. 2010;23(2):191-193.