Biological Forum – An International Journal **14(2): 704-707(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Management of Collor Rot of Chickpea caused by *sclerotium rolfsii* through oil Seed Cakes *in vitro*

Rakesh Gurjar[1*], A.R. Wasnekar[2], Mahesh Kumar Mimrot[3], Yashowardhan Singh[4], Pushkar Dev[5] and Jitendra Gurjar[6]

[1]M.Sc. (Agri.), Department of Plant Pathology,
Jawarlal Nehru Krishi Viswa Vidayalaya, Jabalpur (Madhya Pradesh), India.
[2]Scientist, Department of Plant Pathology,
Jawarlal Nehru Krishi Viswa Vidayalaya, Jabalpur (Madhya Pradesh), India.
[3]Ph.D. Research Scholar, Department of Plant Pathology,
Swami Keshwanand Rajasthan Agricultural University, Bikaner, (Rajasthan), India.
[4]Ph.D. Research Scholar, Department of Plant Pathology,
JNKVV, Jabalpur (Madhya Pradesh), India.
[5]Senior Research Fellow, Krish vigyan Kendra Alwar (Rajasthan), India.
[6]Ph.D. Research Scholar, Department of Horticulture,
Swami Keshwanand Rajasthan Agricultural University, Bikaner, (Rajasthan), India.

(Corresponding author: Rakesh Gurjar)*
(Received 07 February 2022, Accepted 27 April, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Chickpea is the world's second most important food legumes next to common bean. Chickpea is a vital source of plant derived edible protein in many countries. It originated in South West Asia and is now grown in over 50 nations. Chickpeas are cultivated on 95.39 lakh hectares in India, with a yield of 90.75 tonnes and a productivity of 951 kg per hectare. Whereas, the total area and production of chickpea in MP is 35.90 lakh hectare and 45.95 lakh tonnes, respectively, having productivity of 1056 kg/ha (Annual Report DPD, 2017-18). Collar rot is a serious soil-borne disease which has directly afflicted chickpea production. Chickpea collar rot is the most serious and difficult disease to control, resulting in substantial yield losses of 60-70 percent under favourable conditions (Nene, 1985). An *in vitro* study was conducted to evaluate the efficiency of oil cake against *S. rolfsii.* Required oil cake Neem seed cake, Groundnut cake, Castor cake, Castor cake, Soybean cake, Cotton cake, Mustard cake, Vermicompost and Farm yard manure through the Poisoned Food Technique, respectively. The Neem seed cake extract at 10 and 20 per cent concentration can be effectively inhibiting the growth of *Sclerotium rolfsii* under *in vitro* condition. Chickpea is one of important pulse crop which is infected with collar rot oil seed cakes can be used in IDM practice for management of this disease.

Keyword: *Sclerotium rolfsii*, oil cake, Management, collor rot, Vermicompost.

INTRODUCTION

Chickpea (*Cicer arietinum* L) is an important legume crop that ranks second in global agriculture. It belongs to the family *Fabaceae*, sub family *Papilionaceae*. Chickpea is a high-protein crop that also improves soil fertility *via* biological nitrogen fixation. It is produced on 95.39 lakh hectares in India, with an annual production of 90.75 lakh tonnes and a yield of 951 kg per hectare. *S. rolfsii* is soil borne pathogen and survives in soil for many years (Allce, 1984). The disease causes damage on root and stem of plant. The pathogen produces sclerotia which overwinter in soil and on plant debris and can survive in a long period causing disease in the following season (Punja, 1985). Various methods for controlling such disease have been investigated including the use of mustard cake, caster cake, neem cake, cotton cake, linseed cake, farm yard manure and soybean cake against the *S. rolfsii*, causing collar rot of chickpea, stem rot and collar rot of groundnut (Dawar, 2010; Kuldhar and Suryawanshi, 2017; Aravind and Brahmbhatt, 2018; Latha and Rajeswari, 2019). In Madhya Pradesh, however, only limited work has been done in the treatment of chickpea collar rot (*Sclerotium rolfsii*) using organic amendments. The focus of this research is to find the most efficient organic amendments for treating the chickpea collar rot disease.

METHOD AND MATERIAL

A study was conducted to check the efficacy of oil cake against *S. rolfsii* under *in vitro* conditions. The pathogen was isolated from infected gram seedlings by hyphal tip method of fungal isolation. Identification of *Sclerotium rolfsii* were done by morphological characters formed white mat of hyaline mycelium with formation of initially white sclerotia which later turned into brown hard structure. Sclerotia were black, varied from spherical to irregular in shape and measured 80 to 85 µm in diameter. Pycnidial production was not observed in culture plates. Required oil cake Neem seed cake, Groundnut cake, Castor cake, Castor cake, Soybean cake, Cotton cake, Mustard cake, Vermicompost and Farm yard manure (through the Poisoned Food Technique), respectively were obtained from Microbes Research and Production Canter, JNKVV Jabalpur (M.P.). The experiment was conducted during 2019-20, with eight treatments and one untreated control. All the six tested oil cake extracts, Vermicompost and Farm yard manure significantly inhibited the growth of *S. rolfsii* under *in-vitro* conditions. However, inhibition in growth of *S. rolfsii* varied from treatment to treatment. The observation on collar rot of chickpea was recorded at 72 hours and 120 hours by the using of Poison food technique.

Thirty gram well ground powder of each cake was suspended in 150 ml sterile distilled water in flask and left for 25 days. The flasks were shaken for thorough mixing and dissolution of the content. After 25 days the flaks were thoroughly shaken and content were filtered through double layered muslin cloth and autoclaved for 20 minutes. The autoclaved extracts were individually added in previously sterilized melted and cooled potato dextrose agar medium as per required concentration at the time of pouring in Petri plates and mixed thoroughly. All the plates were incubated at 28±1˚C after placing the five mm disc of actively growing seven days old pure culture of *Sclerotium rolfsii*. Each treatment was replicated three times with control.

The Petri plates with pathogen inoculated at one end alone, served as control. The Petri plates were then incubated at 28±2˚C. Three replications were maintained in each treatment. Per cent growth inhibition of mycelia growth over control was calculated by using the formula given by Vincent (1947):

$$I = \frac{C - T}{C} \times 100$$

Were,

I = Per cent inhibition in growth of test pathogen

C = Radial growth (mm) in control

T = Radial growth (mm) in treatment.

RESULT AND DISCUSSION

A set of eight oil cake extract including Neem seed cake, Groundnut cake, Castor cake, Soybean cake, Cotton cake, Mustard cake, Vermicompost and Farm yard manure were used to evaluate their efficacy in inhibiting *S. rolfsii* at 10 and 20 per cent concentration under in-vitro condition using poison food technique. The maximum per cent growth inhibition (68.18) in growth of *S. rolfsii* was recorded in Neem seed cake extract followed by Groundnut cake extract where 62.16 per cent inhibition was recorded after 72 hours of incubation period at 10 per cent concentration. However, at 20 per cent concentration, maximum inhibition of 77.77 per cent in growth of *S. rolfsii* was recorded by Neem seed cake extract after 72 hours of incubation. However, minimum inhibition of per cent was recorded in 20 per cent Farm yard manure extract.

After 120 hours of incubation, Maximum inhibition of 61.85 per cent in growth of *S. rolfsii* was recorded by 20 per cent Neem seed cake extract. However, minimum inhibition of 15.33 per cent was recorded in 20 per cent Farm yard manure extract. In this way, out of eight oil cake extracts tested, two oil cake extract namely Groundnut cake and Neem seed cake showed more than 50 per cent inhibition in growth of *S. rolfsii* at 20 per cent concentration after 120 hours of incubation period.

Table 1: Effect of oil cake extracts on radial growth of *Sclerotium rolfsii* after 72 hours incubation period.

T.No.	Name of extract	Radial growth of target pathogen (mm)			Per cent growth inhibition		
		10% Con.	20% Con.	Average	10% Con.	20% Con.	Average
T_1	Neem seed cake	20.77	14.50	17.63	68.18	77.77	72.98
T_2	Groundnut cake	24.70	20.07	22.38	62.16	69.24	65.70
T_3	Castor cake	36.67	30.73	33.70	43.82	52.88	48.35
T_4	Soybean cake	41.67	35.60	38.38	36.93	45.42	41.18
T_5	Cotton cake	27.37	22.23	24.80	58.07	65.92	61.99
T_6	Mustard cake	43.40	37.47	40.43	33.51	42.56	38.03
T_7	Vermicompost	50.57	47.57	49.07	22.53	27.08	24.80
T_8	Farm yard manure	52.97	49.30	51.13	18.85	24.42	21.64
T_9	Control	65.25	65.25	65.25	-	-	-
SE(m) ±		0.35	0.23	-	-	-	-
CDat 5%		1.05	0.68	-	-	-	-

Table 2: Effect of oil cake extract on radial growth of S*clerotium rolfsii* after 120 hours incubation period.

T. No.	Name of extract	Radial growth of target pathogen (mm)			Per cent growth inhibition		
		10% Con.	20% Con.	Average	10% Con.	20% Con.	Average
T_1	Neem seed cake	45.20	34.33	39.77	49.78	61.85	55.81
T_2	Groundnut cake	54.57	44.37	49.47	39.37	50.70	45.04
T_3	Castor cake	67.77	59.43	63.60	24.72	33.96	29.33
T_4	Soybean cake	74.63	65.23	69.93	17.07	27.52	22.30
T_5	Cotton cake	60.47	55.60	58.03	32.18	38.22	35.52
T_6	Mustard cake	71.13	62.20	66.67	20.96	30.89	25.93
T_7	Vermicompost	77.43	75.07	76.25	13.96	16.59	15.28
T_8	Farm yard manure	79.13	76.20	77.67	12.07	15.33	13.70
T_9	Control	90.00	90.00	90.00	-	-	-
SE(m) ±		0.34	0.21	-	-	-	-
CD at 5%		1.01	0.63	-	-	-	-

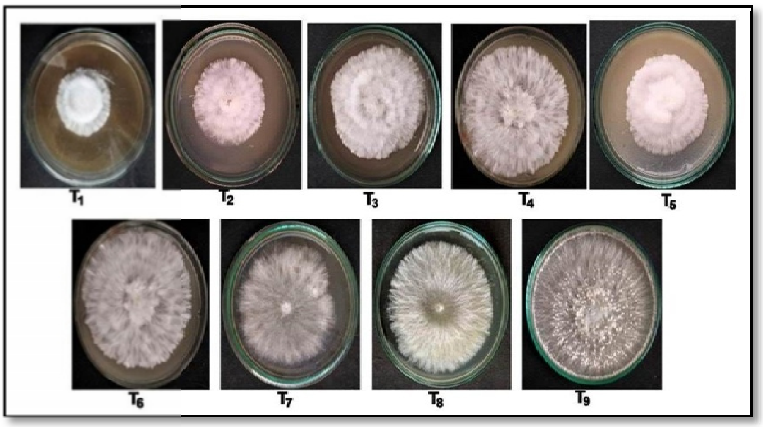

Plate 1: *In-vitro* efficacy of oil cack extract against *Sclerotium rolfsii* at 10% concentration.

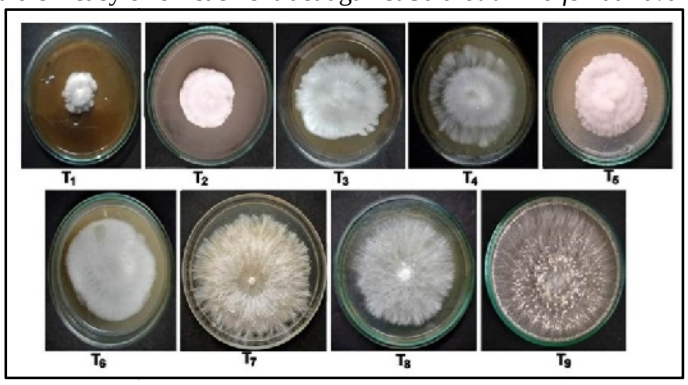

Plate 2: *In-vitro* efficacy of oil cake extract against *Sclerotium rolfsii* at 20% concentration.

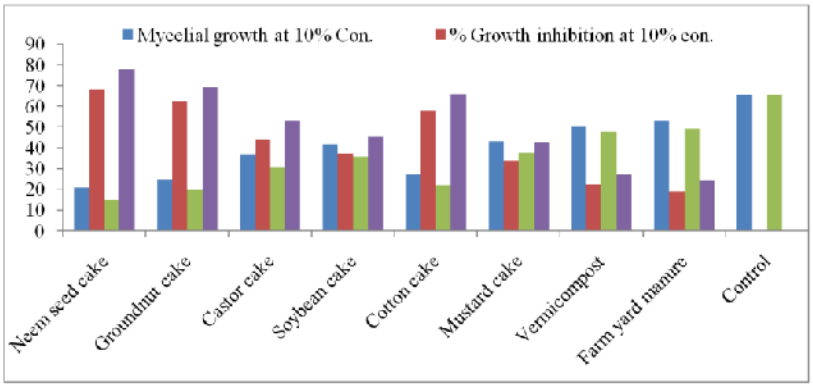

Fig. 1. Effect of oil cake extracts on radial growth of *Sclerotium rolfsii* after 72 hours incubation period.

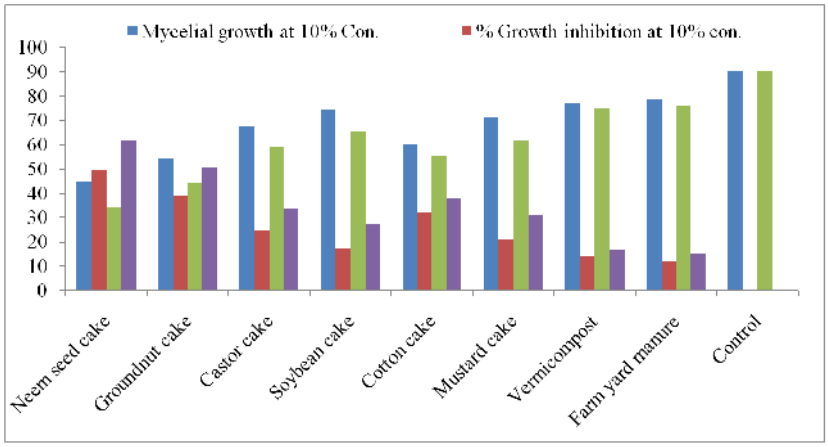

Fig. 2. Effect of oil cake extract on radial growth of *Sclerotium rolfsii* after 120 hours incubation period.

Similarly result reported by Dhingani *et al.* (2013) in which out of several organic extracts tested neem cake had the maximum mycelial growth inhibition (59.40%) followed by farm yard manure, castor cake and mustard cake. Also, Dubey *et al.* (2009) reported that autoclaved neem extracts had growth inhibition of 19.7, 30.6 and 42.3 per cent at one, five and ten percentage, respectively.

CONCLUSION

Collar rot disease caused by *Sclerotium rolfsii*, is a serious threat to chickpea and its control has acquired very limited success. Present investigation was carried out with a view to ascertain the cultural factors responsible for the growth of the *Sclerotium rolfsii* and management option to minimize the disease. Oil seed cakes like Neem seed cake extract, Groundnut cake extract and Cotton cake have proved to be highly effective in inhabiting the growth of pathogen *in vitro* at 72 and 120 hrs.

REFERENCES

Allce, D. (1984). Studies on antifungal properties of some plant extract. MSc (Agri.) Thesis submitted to the (unpub.), TNAU, Coimbtore. pp.93.

Aravind, T. and Brahmbhatt, A. B. (2018). Management of root and collar rot (*Macrophomina phaseolina* (Tassi) Goid.) of OKRA (*Abelmoschus esculentus* (L.) Moench) through bioagents, oil cakes and fungicides *Journal of Pharmacognosy and Phytochemistry*, *7(*4): 631-635.

Dawar, J. (2010). Studies on collar rot (*Sclerotium rolfsii* sacc.) of safflower (*Carthamus tinctorius*). Thesis JNKVV, Jabalpur. pp27.

Dhingani, J. G., Solanky, K. U., and Kansara, S. S. (2013). Management of root rot disease of chickpea through botanicals and oil cakes. *The Bioscan*, *8*(3): 736-742.

Dubey, R. C., Kumar, H. and Pandey, R. R. (2009). Fungitoxic effect of neem extracts on growth and sclerotial survival of *Macrophomina phaseolina in vitro*. *Journal of American Sciences*, *5*(5): 17-24.

Kuldhar, D. P. and Suryawanshi, A. P. (2017). Integrated management of stem rot and pod rot (*Sclerotium rolfsii*) of groundnut (*Arachis hypogaea* L.). *Agric. Update* 12(techear-1): 238-246.

Latha, P. and Rajeswari, E. (2019). Evaluation of biocontrol agents, fungicides and organic amendments against sclerotium wilt (*Sclerotium rolfsii* Sacc.) of jasmine (*Jasminum sambac* (L.) Aiton). *Journal of Pharmacognosy and Phytochemistry. SP2*: 897-902.

Nene, Y. L., Reddy, M. V, Saxena, M. C. and Singh, K. B. (1987). Chickpea disease and their control. *The Chickpea*, *6*: 233-270.

Punja, Z. K. (1988). *Sclerotium* (*Atheliya rolfsii)*, a pathogen of many plant species. In: Sidhu GS, ed. Genetics of plant pathogenic Fungi. London: *Academic Press*, *6*: 523-534.

How to cite this article: Rakesh Gurjar, A.R. Wasnekar, Mahesh Kumar Mimrot, Yashowardhan Singh, Pushkar Dev and Jitendra Gurjar (2022). Management of Collor Rot of Chickpea caused by *sclerotium rolfsii* through oil Seed Cakes *in vitro*. *Biological Forum – An International Journal*, *14*(2): 704-707.