International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(4): 881-885

Received: 01-05-2020
Accepted: 05-06-2020

Vinod Kumar Bairwa
M.Sc., Department of Plant Pathology, SKNAU, Jobner, Jaipur, Rajasthan India

Shailesh Godika
Professor, Department of Plant Pathology, SKNAU, Jobner, Jaipur, Rajasthan India

Jitendra sharma
Ph.D., Research Scholar, Department of Plant Pathology, SKNAU, Jobner, Jaipur, Rajasthan India

Rohit Kumar Nayak
Ph.D., Research Scholar, Department of Entomology, SKNAU, Jobner, Jaipur, Rajasthan India

Nitisha Gahlot
Ph.D., Research Scholar, Department of Plant Pathology, MPUAT, RCA, Udaipur, Rajasthan India

Sushila Choudhary
M.Sc., Department of Plant Pathology, SKNAU, Jobner, Jaipur, Rajasthan India

Corresponding Author:
Rohit Kumar Nayak
Ph.D., Research Scholar, Department of Entomology, SKNAU, Jobner, Jaipur, Rajasthan India

Management of Sclerotinia rot disease of brinjal (*Sclerotinia sclerotiorum* Lib.) through indigenous materials under *in vitro* and *in vivo* conditions

Vinod Kumar Bairwa, Shailesh Godika, Jitendra Sharma, Rohit Kumar Nayak, Nitisha Gahlot and Sushila Choudhary

DOI: https://doi.org/10.22271/chemi.2020.v8.i4f.9714

Abstract
The investigation was carried out in the department of plant pathology, SKN College of Agriculture, Jobner, Jaipur (Rajasthan) during *Kharif*, 2017 to evaluate the efficacy of indigenous materials against sclerotinia rot disease of brinjal under *in vitro* and *in vivo* conditions. The six indigenous materials i. e. neem oil, garlic extract, castor oil, cow urine, heeng powder and turmeric powder were tested by poisoned food technique against sclerotinia rot pathogen. Among six indigenous materials, extract of garlic was found most effective in inhibiting mycelial growth (69.71, 95.72 and 98.00%) of *Sclerotinia sclerotiorum* at 5, 10 and 15 per cent, respectively followed by neem oil (63.96, 89.64 and 92.00%) and cow-urine (59.20, 81.21 and 84.00%) over control. Heeng powder was found least effective in inhibiting mycelial growth of *S. sclerotiorum* over control. The study indicates that all the three concentrations (5, 10 and 15%) of garlic extract were effective in reducing the sclerotinia rot disease incidence.

Keywords: Sclerotinia rot, indigenous materials, extract of garlic and mycelial growth

1. Introduction
Brinjal (*Solanum melongena* L.) is a staple vegetable plant of the family Solanaceae. It is also known as eggplant or aubergine. In world, India has second position in area and production of brinjal after China. In India, brinjal occupies 668.7 thousand hectares area with annual production 12399.9 thousand metric ton and average productivity of 18.5 MT/ha (Anonymous, 2017) [1]. In India, major growing states of brinjal crop are West Bengal, Odisha, Gujarat, Bihar and Madhya Pradesh etc. Among these, In Rajasthan state, brinjal is grown in 197.90 thousand hectares area with an annual production of 1928.60 MT (Anonymous, 2017) [1]. In Rajasthan, major brinjal growing districts are Jaipur, Alwar, Bharatpur, Dausa and Tonk. The anti-ascorbic acid (vitamin- C) contents are present in green leaves of brinjal plant. It is supposed to contain certain medicinal properties and white brinjal is said to be good for diabetic patients. It can also cure toothache and liver complains (Chouhan, 1981) [3]. Brinjal crop suffers from many fungal diseases. Among these, some economically important diseases of brinjal are root rot of brinjal caused by *Fusarium solani* (Marschil, 1981) [8], leaf spot and fruit rot incited by *Alternaria alternata* (Kapoor and Hingorani, 1958) [7], phomopsis blight caused by *Phomopsis vexans* (Walker, 1951) [14], cercospora leaf spot caused by *Cercospora melongenae* (Hare, 1949) [5] etc. Sclerotinia rot disease of brinjal caused by *Sclerotinia sclerotiorum* (Lib.) de Bary is identified as other names *viz*., white blight or stem blight or white mould or white canker or stem rot etc. has become a serious problem of brinjal. *Sclerotinia sclerotiorum*, is a soil borne pathogen with wide host range and has the ability to survive in for long periods in the form of sclerotia (Purdy, 1979; Willetts & Wong, 1980) [10, 15]. Brinjal was first listed as one of the many hosts of *Sclerotinia sclerotiorum* in New Zealand in 1932. Stem rot (*S. sclerotiorum*) on brinjal has been reported for the first time under greenhouse conditions. In India, *Sclerotinia* stem rot was reported for the first time by Shaw and Ajrekar (1915) [12] on several hosts including brinjal. Iqbal *et al*., (2003) [6], have reported Sclerotinia rot incidence of brinjal upto 47.3 per cent for the first time under greenhouse conditions.

Characteristic symptoms such as fluffy white mycelial mats were found on the surface of infected tissues of stem, leaves and fruits and associated with the development of many prominent dark sclerotia of irregular shape and size (Iqbal *et al.*, 2003) [6]. Management of soil borne pathogen is very difficult and application of chemical fungicides are often cost prohibitive, impractical and hazardous to environment and human health. Keeping this view, the need was felt for an alternative method to manage this disease in eco-friendly manner by using indigenous materials i.e. neem oil, garlic extract, castor oil, cow urine, heeng powder and turmeric powder. Therefore, the present study was carried out to evaluate the efficacy of six indigenous materials against the pathogen causing Sclerotinia rot in brinjal.

2. Materials and Methods

The experiment "Management of sclerotinia rot disease of brinjal (*Sclerotinia sclerotiorum* Lib.) through indigenous materials under *in vitro* and *in vivo* conditions" was carried out at department of plant pathology, SKN College of Agriculture, Jobner, Jaipur (Rajasthan) during *Kharif* season, 2017.

2.1 Fungitoxicity of indigenous materials against *Sclerotinia sclerotiorum* (*in vitro*): Laboratory experiment was carried out to find out the fungitoxicity of six indigenous materials (Table 1) against the pathogen. Each indigenous material was diluted in order to achieve three concentrations *viz.*, 5, 10 and 15 per cent. Petri plates containing PDA supplemented with different indigenous material, each with three concentrations and replicated three times were inoculated with seven days old culture (5 mm dia. disc). A suitable check (without indigenous material) was also maintained. Fungal colony was measured after 7 days of inoculation at 18 ± 1℃. The linear growth of test fungus was recorded and per cent mycelial growth inhibition was calculated by using Bliss (1934) [2] formula.

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

Where,
I = Per cent mycelial inhibition
C = Growth of fungal plant pathogen in control (mm)
T = Growth of fungal plant pathogen in dual culture plate (mm)

Table 1: List of different indigenous materials

S.No.	Indigenous materials	Concentration (%)
1	Neem oil	5,10,15
2	Garlic extract	5,10,15
3	Castor oil	5,10,15
4	Cow urine	5,10,15
5	Heeng powder	5,10,15
6	Turmeric powder	5,10,15

2.2 Efficacy of indigenous materials against Sclerotinia rot of Brinjal (*in vivo*): The experiment was carried out in earthen pots (30 cm dia.) with host cultivar. The pathogen multiplied on sorghum grains at 18 ± 1 ˚C for one week was used as soil inoculum. Prior to sowing, pots were filled with sterilized soil. The soil was sterilized at 1.045 kg/cm^2 for one hour for three consecutive days. Host cultivar of brinjal was sown in these pots as susceptible check with four replications.

2.3 Indigenous materials were tested by applying as following methods: Under *in vitro* condition, planting materials (seeds/ seedlings) were soaked/ dipped separately in freshly prepared neem oil, garlic extract, castor oil, cow urine, heeng powder and turmeric powder @ 5, 10, and 15 per cent concentrations whereas under *in vivo* condition, only three significant indigenous materials (garlic extract, neem oil and cow urine) were used @ 10 per cent for 15 min.

a. **Seed application:** Seeds were dipped separately in freshly prepared indigenous materials 15 min. The seeds were drained of water and then air dried before sowing. The pots were inoculated with fungal inoculum multiplied on sorghum grains before sowing. For inoculation, the upper 5 cm layer of soil of each pot was thoroughly mixed with inoculum @ 20 g/pot. Five seedlings were maintained per pot and kept in cage house. The disease incidence and per cent disease control were calculated 60 DAS by using following formula.

$$\text{Per cent Disease Incidence} = \frac{\text{No. of infected plants}}{\text{Total No. of plants}} \times 100$$

$$\text{Per cent disease control} = \frac{\text{Disease in control} - \text{Disease in treatment}}{\text{Disease in control}} \times 100$$

b. **Seedling dipping application:** The roots of uprooted seedlings were dipped in the indigenous materials for 10 minutes separately. After ten minutes, drained of water and then air dried the treated seedlings before transplanting in the fungal inoculated pots. Observations on the disease incidence and per cent disease control were recorded in the all treatments 60 days after sowing.

c. **Seed-cum-seedling application:** The seeds soaking and roots of seedlings were dipped in the indigenous materials for 10 minutes. Drained of the water and then air dried the treated seeds and seedlings before sowing/ transplanting in the fungal inoculated pots. The observations were recorded on the disease incidence and per cent disease control after 60 days of seed sowing.

3. Results and Discussion

3.1 Efficacy of indigenous materials against *Sclerotinia sclerotiorum* (*in vitro*): In this study, the efficacy of six indigenous materials was tested *in vitro* against *S. sclerotiorum* on PDA by poisoned food technique and found that all the concentrations (5, 10 and 15%) of garlic extract were found significantly superior over other treatments (Table 2 & Fig. 1 and Plate 1). Among six indigenous materials, extract of garlic was found most effective in inhibiting mycelial growth (69.71, 95.72 and 98.00%) of *S. sclerotiorum* at 5, 10 and 15 per cent, respectively followed by neem oil (63.96, 89.64 and 92.00%) over control. Heeng powder was found least effective in inhibiting mycelial growth of *S. sclerotiorum* over control. The results are in agreement with Yadav (2009) who studied the biopesticidal effect of botanicals on the management of *S. sclerotiorum* pathogen of mustard diseases under *in vitro* condition. The results are also in line with Tripathi and Tripathi (2009) [13], Sharma *et al.* (2016) [11] and Fagodia *et al.* (2017) [4] while working with *S. sclerotiorum in vitro.*

Plate 1: Efficacy of indigenous materials against *S. sclerotiorum* by poisoned food technique at 7th day of incubation at 18 ± 1°C

Table 2: Efficacy of indigenous materials against *S. sclerotiorum* by poisoned food technique at 7th day of incubation at 18 + 1^{0}C

Treatment	Per cent inhibition mycelial growth at various* concentrations (%)			Mean
	5	10	15	
Garlic extract	69.71	95.72	98.00	87.81
	(56.61)	(78.06)	(81.87)	(69.57)
Neem oil	63.96	89.64	92.00	81.87
	(53.11)	(71.22)	(73.57)	(64.80)
Turmeric powder	6.56	25.32	27.91	19.93
	(14.84)	(30.21)	(31.89)	(26.51)
Castor oil	6.07	20.12	23.35	16.51
	(14.26)	(26.65)	(28.90)	(23.98)
Heeng powder	2.80	21.88	24.25	16.31
	(9.63)	(27.89)	(29.50)	(23.82)
Cow urine	59.20	81.21	84.00	74.80
	(50.30)	(64.31)	(66.42)	(59.87)
Control	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Mean	29.76	47.70	49.93	
			SEm+	CD(p=0.5)
		I	0.44	1.26
		C	0.29	0.82
		BxC	0.76	2.17

* Average of three replications
Figures given in parentheses are angular transformed values

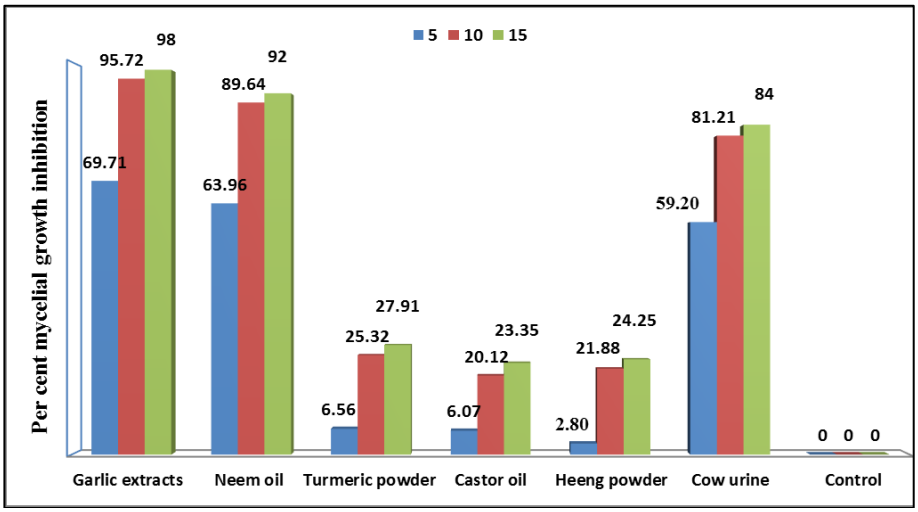

Fig 1: Efficacy of indigenous materials against *S. sclerotiorum* by poisoned food at 7th day of incubation at 18 ± 1˚C

3.2 Efficacy of indigenous materials against Sclerotinia rot of Brinjal (*in vivo*)

a. **Seed application:** The revealed that minimum disease incidence was observed with garlic extract (40.71%) followed by neem oil (46.25%), as compared to control (60.23%) (Table 3 and Fig. 2). Maximum reduction in disease incidence over control was observed with garlic extract (32.41%) followed by neem oil (23.21%) over control. Minimum reduction in disease incidence was observed in cow-urine (19.86%).

b. **Dipping application:** The findings were similar trend of results was obtained as in seed application method. The highest reduction in disease incidence over control was observed in garlic extract (25.47%) followed by neem oil (17.13%). Minimum reduction in disease incidence was observed in cow urine (11.66%) (Table 3 and Fig. 2).

c. **Seed-cum- dipping application:** The minimum disease incidence was recorded in garlic extract (20.61%) followed by neem oil (34.10%) over control (60.23%) (Table 3 and Fig. 2). Maximum reduction in disease incidence over control was observed in garlic (65.78%) followed by neem oil (43.38%). Minimum reduction in disease incidence was observed in cow-urine (35.40%).

In the present experiment seed-cum-seedling dipping of indigenous materials was found most effective to control the disease for reducing disease incidence, followed by seed application and seedling dipping alone. Garlic extract was found most effective in reducing the disease incidence, followed by neem oil. Garlic has been known for its antifungal and antibacterial activities because of chemical compounds such as allicin and ajoene that are effective against bacteria and fungi. These findings are in agreement with the results of Meena *et al*. (2013) [9], Sharma *et al*. (2016) [11] and Fagodia *et al*. (2017) [4]. They reported the effectiveness of garlic clove extract in disease control against *S. Sclerotiorum.*

Table 3: Efficacy of indigenous materials against Sclerotinia rot of brinjal (*in vivo*)

Treatment	Dose (%)	Per cent disease incidence	Per cent disease control
Seed soaking in garlic extract	10	40.71	32.41
		(39.65)	
Seedling dip in garlic extract	10	44.89	25.47
		(42.07)	
Seed soaking + seedling dip in garlic extract	10	20.61	65.78
		(27.00)	
Seed soaking in neem oil	10	46.25	23.21
		(42.85)	
Seeding dip in neem oil	10	49.91	17.13
		(44.95)	
Seed soaking + seedling dip in neem oil	10	34.10	43.38
		(35.73)	
Seed soaking in cow urine	10	48.27	19.86
		(44.01)	
Seedling dip in cow urine	10	53.21	11.66
		(46.84)	
Seed soaking + seedling dip in cow urine	10	38.91	35.40
		(38.59)	
Control		60.23	-
		(50.90)	
SEm+		0.73	-
CD (p=0.05)		2.16	-

* Average of three replications
* Seed soaking- 10 minute
* Seedling dip – 10 minute
Figures given in parentheses are angular transformed values

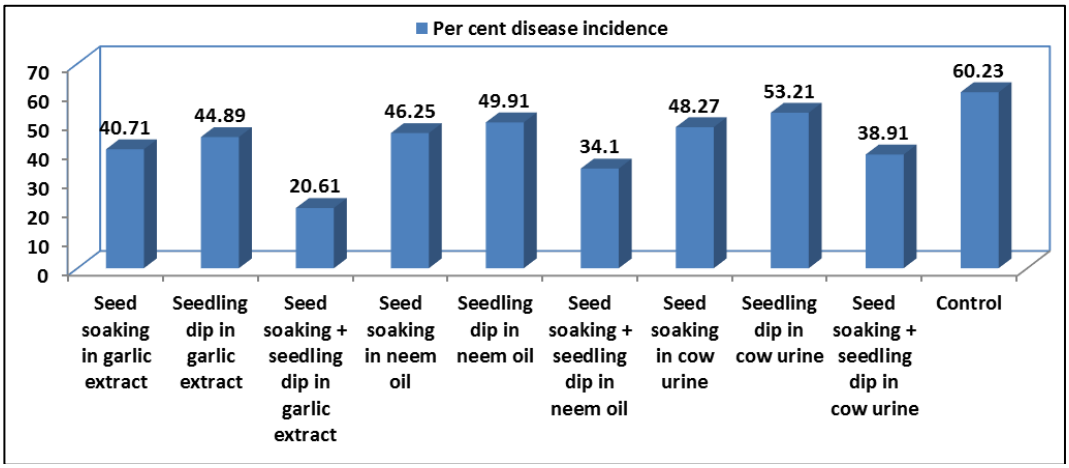

Fig 2: Efficacy of indigenous materials against Sclerotinia rot of brinjal (*in vivo*)

4. Conclusion

From the present experimentation, it was concluded that garlic extract at 5, 10 and 15 per cent concentrations was found most effective followed by neem oil in inhibiting mycelial growth of Sclerotinia rot of brinjal *in vitro.* Under *in vivo* condition, the most effective method to control the disease incidence was seed-cum-seedling dipping application of indigenous material, followed by seed application and seedling dipping alone. Garlic extract was found most effective against Sclerotinia rot of brinjal followed by neem oil in reducing per cent disease incidence. The indigenous materials help in reducing Sclerotinia disease incidence. These materials are eco-friendly as well as cost effective for crop production.

5. References

1. Anonymous. Horticulture Statistics at a Glance 2017.
2. Bliss CL. The method of probits. Science, 1934, 79:38.
3. Chouhan DVS. Vegetable Production in India. Edn 3. Ramprasad and Sons, Agra, India, 1981, 150-158.
4. Fagodia RK, Godika S, Fagodia B. Effect of physical parameters on the growth and sclerotia formation of *Sclerotinia sclerotiorum* (Lib.) de Bery, causing stem rot of coriander. Annals of Plant and Soil Research. 2017; 19(1):54-58.
5. Hare WW. Fungicidal control of Cercospora blight of pepper. Phytopathology. 1949; 39:496-500.
6. Iqbal SM, Ghafoor AAZ, Haqqani AM. Pathogenicity and fungicidal efficacy for Sclerotinia rot of brinjal. International Journal of Agriculture and Biology. 2003; 05(4):618–620.
7. Kapoor JN, Hingorani MK. Alternaria leaf spot and fruit rot of brinjal. Indian Journal of Agricultural Sciences. 1958; 28:109-114.
8. Marcshil EM. Fungal wilts disease of plants. National Pathology Research Laboratory, US Department of Agriculture Collection Station, Academic Press Texas, 1981, 393-394.
9. Meena PD, Gour RB, Gupta JC, Singh HK, Awasthi RP, Netam RS *et al*. Non- chemical agents provide tenable, eco-friendly alternatives for the management of the major diseases devastating Indian mustard (*Brassica juncea*) in India. Crop Protection. 2013; 53:169-174.
10. Purdy LH. *Sclerotinia sclerotiorum* history, disease and symptomatology, host range, geographic distribution and impact. Phytopathology. 1979; 69:875-880.
11. Sharma J, Godika S, Yadav AL, Meena S. Fungitoxicity of plant extracts against Sclerotinia rot of Indian mustard incited by *Sclerotinia sclerotiorum*. In 6th International conference on "plant pathogen and people" Challenges in Plant Pathology to Benefit Humankind, Feb. 23-27, New Dehli, India, 2016, 406-407.
12. Shaw FJW, Ajrekar SL. The genus *Rhizoctonia* in India. Department of Agriculture in India, Botanical series. 1915; 7:177-194.
13. Tripathi AK, Tripathi SC. Management of Sclerotinia stem rot of Indian mustard through plant extracts. Vegetos. 2009; 22(1):1-3.
14. Walker JC. Diseases of Vegetable Crops. McGraw-Hill, New York. 1951; 41(9):306-308.
15. Willetts HJ, Wong AL. The biology of *Sclerotinia sclerotiorum*, *S. trifoliorum* and *S. minor* with emphasis on specific nomenclature. Botanical Review. 1980; 46:101-165.
16. Yadav MS. Biopesticidal effect of botanicals on the management of mustard diseases. Indian Phytopathology. 2009; 62 (4):488-492.