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Research Journal of Agricultural Sciences
An International Journal

P- ISSN: 0976-1675

E- ISSN: 2249-4538

Volume: 12

Issue: 03

Res Jr of Agril Sci (2021) 12: 756–759

Evaluation of three Medicinal Plants and Four Fungicides against Radial Growth of *Colletotrichum capsici* Causal Agent of Chili Anthracnose

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Received: 19 Mar 2021 | Revised accepted: 02 May 2021 | Published online: 11 May 2021
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ABSTRACT

Chili (*Capsicum annum* L.) is a most important crop of all chili growing areas and it suffers from lots of field as well as post-harvest diseases out of that chili anthracnose is a serious disease of field as well as storage condition. A test was conducted for evaluation of the efficacy of different concentration of four different fungicides and three different botanical extracts against radial growth of fungus *Colletotrichum capsici* under in vitro condition. Among all three plant extracts *Ocimum sanctum* showed high amount of inhibition on radial growth of *Colletotrichum capsici* whereas *Datura stramonium* showed second best extract and inhibit 60.08% inhibition and *Azadirachta indica* was least effective extract and inhibit 57.25% radial growth of *Colletotrichum capsici*. Among four tested fungicides Propiconazole showed 100 per cent inhibition of linear growth at 500 and 1000 ppm concentration while at 250 ppm concentration it showed 99.7 per cent inhibition. Second best fungicide was Tebuconazole showed complete inhibition (100%) of mycelial growth at 500 and 1000 ppm concentration, while at 250 ppm concentration it caused 99.4 per cent inhibition over control petri plate. Whereas Bavistin was second least fungicide showed 35.8% (250PPM), 42.2% (500PPM) and 49.2% (1000PPM) respectively and Mancozeb was very least effective fungicide showed 10.3% (250PPM), 27.4 (500PPM) and 40.3% (1000PPM), respectively, inhibit the radial growth of *C. capsici*.

Key words: *Colletotrichum capsici*, Anthracnose, Fungicide, Botanical extracts

Chili (*Capsicum annum* L.), is one of the most important and major spice crops in India and commonly known as Mirch. It is belonging to family Solanaceae, it has been reported that there are different living and non-living factors which causes constrain in chili production in India. Various problems and restraints include high production costs, widespread use of low-quality seed, bad techniques of crop management, insufficient marketing infrastructure, and farmer's lack of knowledge of good and improved production techniques or integrated technology practices [1-2]. In addition of that lots of constraints are there which prevents farmers from gaining that potential yield are various pests and diseases post-harvest losses due to improper infrastructure, administrative problems of farmers regarding their land and seed permits, improper and lack of market information, small land holdings, lack of market information, in spite of the fact that farmers use a lot of inputs [3].

It suffers from lots of field as well as post-harvest diseases. Out of these Anthracnose is one of the most

important disease of Chili under field as well as storage condition. *Colletotrichum capsici* is the causative agent of chili anthracnose disease and it is most important and common pathogen causing anthracnose around the world in a wide range of crops and their varieties including legumes, cereals, perennial crops, vegetables, and fruit trees [4].

Chili anthracnose is very common in sub-tropical and tropical areas. Humid environmental conditions are most suitable for this disease. The ideal host, pathogen and climatic conditions prompt the foundation of disease. The disease is the always raising alarm among the growers and scientist as it is assuming serious proportions year after year. Hence, the present investigation was undertaken to study about chili anthracnose disease with the following objectives [5]. The disease is the always raising alarm among the growers and scientist as it is assuming serious proportions year after year. Therefore, the present investigation, showed inhibition of radial growth of *Colletotrichum capsici* within different concentrations of fungicides and Botanicals were studied under in vitro conditions. And the objectives of the study were to check the efficacy of different botanicals extracts and various fungicides against *Colletotrichum capsici* in-vitro condition.

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The present study was conducted in the laboratory of Dev Bhoomi Group of Institution, Dehradun. Uttarakhand

Fungal pathogen

Pure culture of *Colletotrichum capsici* has been obtained from Indian Type Culture Collection (ITCC), Division of Plant Pathology Indian Agriculture Research Institute, New Delhi with the catalogue number 7389. The pathogen was transferred to PDA (Potato Dextrose Agar) medium in Petri plates and the plates were incubated at $28 \pm 1^\circ\text{C}$ for growth. Sub-cultures were made from the periphery of the mycelial growth, which appeared after 6–7 days.

Evaluation of fungicides against mycelial growth of C. capsici in-vitro condition

Four different fungicides viz., Bavistin 50% WP (Wettable Powder) [Carbendazim BASF India Ltd., Mumbai, Propiconazole [Tilt 25 EC, 1-(2-(2,4-dichlorophenyl) 4 propyl- 1,3-dioxolanyl-2-methyl)-1H-1,2,4-triazole] Novartis India, Mumbai, Mancozeb, Indofil M-45 75% WP, Manganese ethylene bis-dithiocarbamate plus zinc ions 2%, Tebuconazole 1-(4-Chlorophenyl)- 4,4-dimethyl-3-(1H, 1,2,4-triazol-1-ylmethyl)pentan- 3-ol (Folicur 250EC) Bayer crop science, Mumbai India Ltd, were evaluated *in-vitro* against *C. capsici* by using poisoned food technique [6] at three concentrations viz., 100, 250 and 500 ppm. The deliberated amount of fungicides were carefully mixed in the liquid almost cool Potato Dextrose Agar (PDA) medium before pouring into Petri plates so as to get your desired concentration of each fungicide separately. 20 ml of fungicide alter medium was poured in each 90 mm sterilized Petri plates and allowed to solidify. All the plates were aseptically inoculated with 5 mm disc cut from the 7 days of old actively growing cultures of *C. capsici*. For comparison control plate without any fungicides alter were maintained. The experiments were conducted in completely randomized design with four replication of each treatment and the inoculated plates were incubated at $28 \pm 2^\circ\text{C}$. The colony diameter was measured after 7–14 days when the control plates were full of fungal growth. Inhibition percentage of mycelial growth were calculated by using formula given by [7] as:

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

Where;

I = Per cent inhibition

C = Colony diameter in control

T = Colony diameter in treatment

Evaluation of botanical extracts against mycelial growth of Colletotrichum capsici

To check the efficacy of different plant extracts at different concentrations viz., 5, 10 and 15% was tested against radial growth of *Colletotrichum capsici* by Poisoned food technique [6]. Three different medicinal plant parts were collected from the herbal garden of Dev Bhoomi Group of Institute, and rinsed them first in tap water and then again washed them under distilled water. Fresh leaf/bulb was chopped and keep them for air dry for 2–3 days and make their paste with the help of mortar and pestle thereafter ground them using a mechanical grinder (model DFH 48) [8]. Crude plants extract mixture were poured with molted but cooled

potato dextrose agar (PDA) in required quantity to get the desire culture media containing different concentrations the plants extract at 5, 10 and 15% concentration separately. The molten PDA with different concentrations of plant extracts were poured into different sterilized petri dishes and kept them for solidified. Thereafter a small piece of mycelial growth with PDA was cut from the 10 days old colony of *Colletotrichum capsici* and grown on different leaf/bulb extracts concentration containing plate under sterilized condition. All the inoculated petri dishes containing PDA with alone pathogen served as control were incubated at room temperature $25 \pm 2^\circ\text{C}$. Four replications were prepared for each treatment. The diameter of the colony was measured in two directions and average was recorded. The inhibition of growth of the *Colletotrichum capsici* was calculated by using the formula given below:

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

Where;

I = Per cent inhibition

C = Colony diameter in control

T = Colony diameter in treatment

Data analysis

In the present investigation entitled “Evaluation of three medicinal plants and four fungicides against radial growth of *Colletotrichum capsici* causal agent of Chili Anthracnose” all the experiments in vitro condition were conducted in completely randomized design (CRD). Factorial design was adopted wherever necessary. All the experiments were statistically analyzed following the standard methods [9].

RESULTS AND DISCUSSION

Culture of *Colletotrichum capsici* was ordered from ITCC (Indian Type Culture Collection) Department of Plant Pathology, Indian Agriculture Research Institute, New Delhi with the catalogue number 7389.

Effect of fungicides on radial growth of Colletotrichum capsici in vitro condition

The *in-vitro* study of evaluation of different fungicides on radial growth of *Colletotrichum capsici* through poisoned food technique. Four fungicides, Tebuconazole, Propiconazole, Bavistin, and Mancozeb were evaluated at three concentrations viz., 250, 500 and 1000 ppm by poisoned food technique against *Colletotrichum capsici*. All the tested fungicides significantly ($P = 0.05$) inhibited the mycelial growth at all concentrations of 250–1000ppm. The test fungicides Tebuconazole and Propiconazole completely inhibited mycelial growth at 500 ppm concentration followed by Bavistin and Mancozeb that caused 42.2 and 27.2 per cent inhibition of mycelial growth, respectively (Table 1, Fig 1).

Among the five tested fungicides Tebuconazole showed 100 per cent inhibition of linear growth at 500 and 1000 ppm concentration while at 250 ppm concentration it caused 99.7 per cent inhibition. Second best fungicide Propiconazole showed complete inhibition of mycelial growth at 500 and 1000 ppm concentration, while at 250 ppm concentration it caused 99.4 per cent inhibition.

The next was Bavistin which caused 35.8 per cent inhibition of linear growth at 250 ppm concentration. At 500 ppm it caused 42.2 per cent inhibition of growth and 49.2 per

cent inhibition of growth at 1000 ppm. At 1000 ppm Mancozeb caused 40.3 per cent inhibition of growth and at

500 ppm and 250 ppm concentration it caused 27.2 and 10.3 per cent growth inhibition of mycelial growth.

Table 1 Effect of fungicides on radial growth of *Colletotrichum capsici*

Percentage Growth Inhibition (%)					
Concentrations (ppm)	Tebuconazole	Propiconazole	Bavistin	Mancozeb	Mean*
250	99.7	99.4	35.8	10.3	61.3
500	100	100	42.2	27.2	67.35
1000	100	100	49.2	40.3	72.38
	SEm±			4.754	
	CD at 5%			15.746	

*Mean of three replications

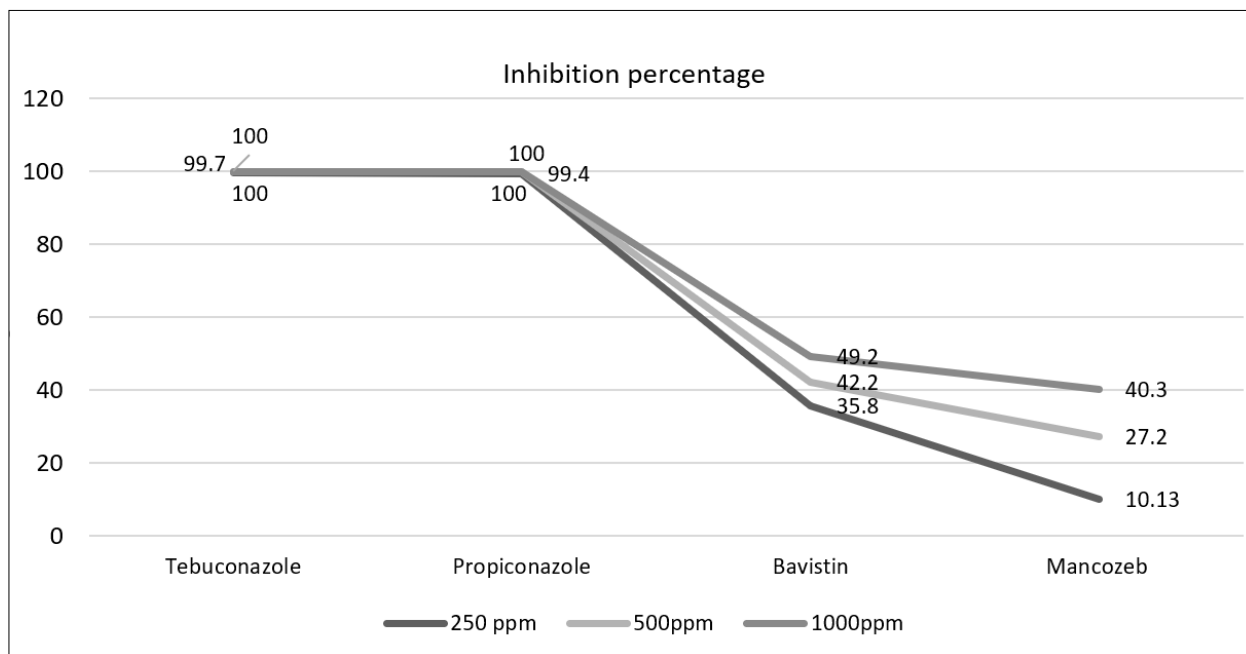


Fig 1 Effect of fungicides on radial growth of *Colletotrichum capsici*

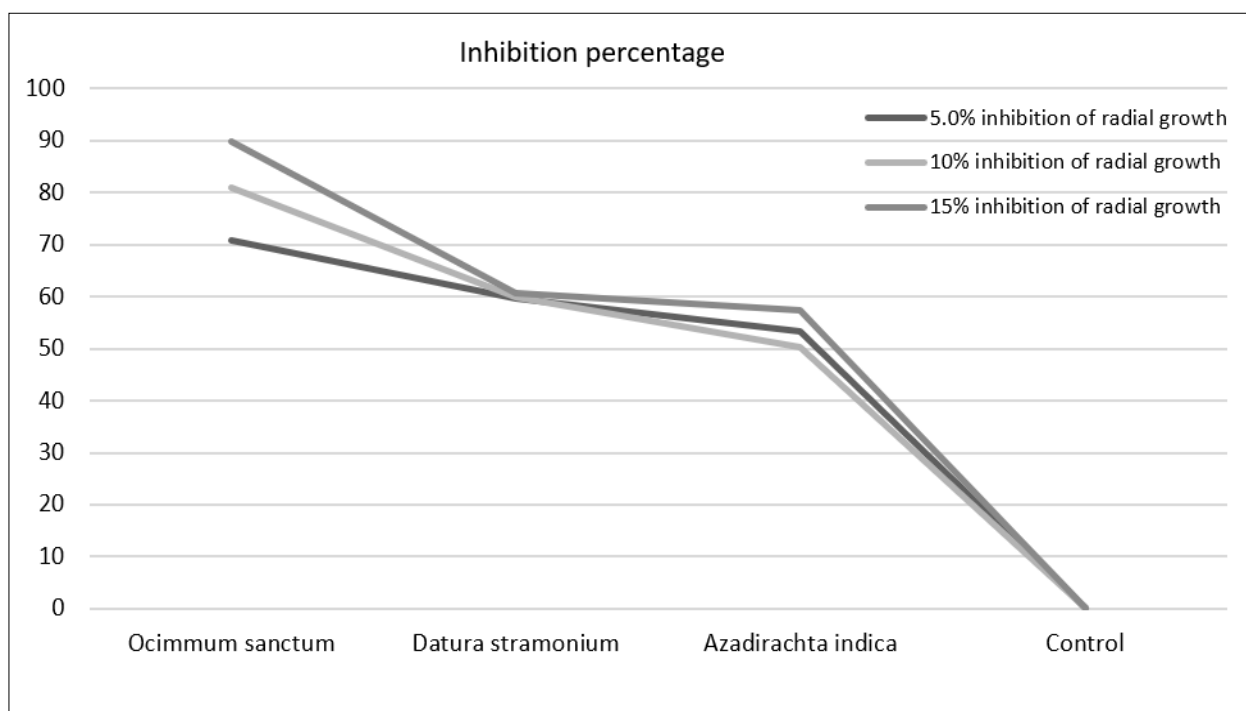


Fig 2 Effect of botanical extracts on radial growth of *Colletotrichum capsici* in vitro condition

Effect of botanical extracts on radial growth of *Colletotrichum capsici* in vitro condition

Investigation on reducing radial growth of *Colletotrichum capsici* by using botanical extracts revealed

that in different concentration leaf extracts of *Ocimum sanctum* showed maximum inhibition of radial growth of *C. capsici* i.e. 89.82% at 15% concentration, 80.95 at 10% concentration and 70.7% at 5% concentration whereas second effective botanical extract was *Datura stramonium* showed 60.61% inhibition at 15% concentration, 60.3% at 10%

concentration and 59.6% at 5% concentration while the least effective extracts was *Azadirachta indica* showed 57.25, 53.33 and 50.18 per cent inhibition at 15, 10 and 5 percent concentration respectively (Table 2, Fig 2). This investigation revealed that if we increase the concentration of leaf/bulb extracts inhibition percentage will also increase significantly.

Table 2 Effect of botanical extracts on radial growth of *Colletotrichum capsici*
Concentration (%)

Botanical extracts	5.0% inhibition of radial growth	10% inhibition of radial growth	15% inhibition of radial growth	Mean*
<i>Ocimum sanctum</i>	70.7	80.95	89.82	80.28
<i>Datura stramonium</i>	59.6	60.03	60.65	60.08
<i>Azadirachta indica</i>	53.33	50.18	57.25	53.58
Control	00.00	00.00	00.00	00.00
SEm±		0.173		
CD at 5%		0.695		

CONCLUSION

In the investigation of evaluation of fungicides and botanicals extracts against mycelial growth of *Colletotrichum capsici*. The best Fungicides were Tebuconazole and Propiconazole inhibit 100% mycelial growth of *C. capsici* at 500 and 1000ppm concentration. Whereas best and highly

efficient botanical extracts was *Ocimum sanctum* inhibit 89.82% mycelial growth at 15% concentration. While the least effective fungicide and botanical extracts were Mancozeb and *Azadirachta indica* inhibit 40.3% at 1000ppm and 57.25% at 15% concentration respectively. It is also concluded that if we increased the concentration level the inhibition percentage will also increase.

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