Environment & Ecology 35 (3) : 1643—1646, April—June 2017
Website: environmentandecology.com ISSN 0970-0420

Bio-Efficacy of Different Fungicides and Plant Extracts *in vitro* Against *Alternaria helianthi* Causing Blight of Sunflower

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Received 30 September 2016; Accepted 1 October 2016; Published online 26 October 2016

Abstract The present investigation was carried out to know the efficacy of seven different fungicides and four plant extracts against *Alternaria helianthi* causing Alternaria blight of sunflower *in vitro* condition using 'poisoned food technique'. Among the fungicides, hexaconazole and propiconazole were most effective which completely inhibited mycelial growth of the fungus followed by tricyclazole and carbendazim + mancozeb (Saaf). Among the plant extracts, pestoneem was found best in inhibiting the mycelial growth of *Alternaria helianthi* followed by garlic clove extract.

Keywords Fungicides, Plant extracts, *Alternaria helianthi*, *In-vitro* evaluation.

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Introduction

Sunflowr (*Helianthus annuus* L.) is now the third largest producing oilseed in the world after soybean and rapeseed and mustard. It is an important oilseed crop in India. It is one of the fastest growing oilseed crops in India. Among various diseases infecting sunflower, *Alternaria* blight of sunflower caused by *Alternatia helianthi* (Hansf.) Tubaki and Nishihara has been recognized as a potentially destructive disease in India. The disease causes more more than 80% of yield loss under severe epiphytothic conditions [1]. Fungicidal applications to control diseases have become a must with commercial introduction of high yielding, but susceptible varieties. Now a days apart from the fungicides, plant extracts are gaining importance in the management of plant diseases. These not only reduce the cost but also avoid environmental pollulation and (hence) eco-friendly. Therefore, the present investigation was carried out to evaluate the efficacy of fungicides and plant extracts against the pathogen and thus served as a guide for field testing.

Materials and Methods

The present investigation was carried out to know the efficacy of different systemic, non-systemic fungicides as well as plant extracts against *Alternaria helianthi* in the Department of Plant pathology, College of Agriculture, Chiplima, Sambalpur, Orissa University of Agriculture and Technology, Bhubaneswar

Table 1. Per cent inhibition of radial growth of *Alternaria helianthi* by different fungicides. *Average of three replications.

Sl. No.	Fungicides	% inhibition of mycelial growth* at different concentrations 0.05%	0.10%	Mean %
1	Copper oxychloride	33.87	42.83	38.35
2	Mancozeb	63.53	69.60	66.57
3	Carbendazim + mancozeb	80.33	82.77	81.55
4	Propiconnazole	100.00	100.00	100.00
5	Hexaconazole	100.00	100.00	100.00
6	Carbendazim	26.53	32.73	29.63
7	Tricyclazole	83.20	100.00	91.60
	SEm±	1.02	1.08	–
	CD at 1% level	4.31	4.53	–

Table 2. Per cent inhibition of radial growth of *Alternaria helianthi* by plant extracts. *Average of four replications.

Sl. No.	Plant extracts	% inhibition of mycelial growth* at different concentrations 5%	10%	Mean %
1	Neem leaf extract	18.25	28.50	23.38
2	Garlic clove extracet	27.50	42.50	35.00
3	Pestoneem	63.25	76.75	70.00
4	Ginger rhizome extract	16.50	24.25	20.38
	SEm±	1.27	1.50	–
	CD at 1% level	5.50	6.45	–

using 'poisoned food technique'. The fungus *Alternaria helianthi* was isolated from diseased leaves of sunflower plants in the instructional firm of College of Agriculture, Chiplima, sambalpur. Systemic as well as non-systemic fungicides were evaluated at 0.05% and 0.1% concentrations, whereas plant extracts including one ready made commercial neem based formulation (Pestoneem) were evaluated at 5% and 10% concentrations.

Disease free plant parts of the selected plant species were washed thoroghly 2–3 times with running tap water and once with sterile water, and used for extraction. Throughly washed fresh plant material (50 g) was macerated with 50 ml sterile distilled water in a pestle and mortur. The macerate was first filtered through double-layered muslin cloth and then centrifuged at 4000 g for 30 min. The supernatant was filtered through Whatman No. 1 filter paper and sterilized at 120°C for 20 min. The extract was preseved aseptically in a brown bottle at 5°C until further use [2]. The extracts thus obtained served as the crude extract (100% concentration).

The fungicides and plant extracts were incorporated aseptically to potato dextrose agar (PDA) cooled to 45°C so as to give the required concentrations. Twenty ml of the poisoned medium was poured in each flat-bottomed petriplates. The plates were then inoculated with half cm dise of 8 days old mycelial mat of *A. helianthi* and incubated at 28± 1°C. Three replications were maintained for each fungicide and four replications were maintained for each plant extract. The fungus grown on PDA without any fungicide or plant extract served as control. The radial growth of the colony was recorded, when maximum growth in control plates was noticed. The per cent inhibition of mycelia growth of the fungus was calculated by using the formula proposed by Vincent [3].

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

Where, I=Per cent inhibition, C=Radial growth in control, T=Radial growth in treatment.

Details of fungicides/plant extracts tested for mycelial growth inhibition are given below :

Sl. No.	Common name	Trade name	Chemical name
Fungicides			
1	Carbendazim	Bavistia 50 WP	Methyl 1–2 benzinidazole carbamate

2	Hexacona zole	Danzole plus 5% EC	(RS)-2-(2,4-dichloro-phenyl)-1-(IH-1,2,3-triazol-1-yl) Hexan-2-01
3	Propicona-zole	Tilt 25 EC	1-[2-(2,4-dichlorophe-nyl)-4-propyl-1,3-dio-xolan-2-yl] methyl]-1, 2.4-triazole
4	Tricyclazole	Beam 75 WP	5-methyl-1,2,4-trizole (3.4-6)-benzothiazole
5	Copper oxy-chloride	Blue copper 50 WP	Copper-oxychloride
6	Mancozeb	Indofil M-45 75 WP	Co-ordination product of zinc ion and manga-nese ethylene bis dithio-carbamate
7	Carbendazim +Mancozeb	Saaf (12 + 63% WP)	Combined product of Carbendazim and man-cozeb

Sl No.	Common name/Trade name	Botanical name	Plant parts used
Plant extracts			
1	Garlic	*Allium sativum* L.	Clove
2	Ginger	*Gingiber officinale*	Rhizome
3	Pestoneem (Neem-based formulation)	*Azadiracta indica* Juss	Kernels
4	Neem	*Azadiracta indica* Juse	Leaf

Results and Discussion

Seven fungicides were evaluated to know their efficacy against *Alternaria helianthi* by 'poisoned food technique' at two concentrations viz., 0.05% and 0.1% as described earlier and results are presented in Table 1.

All the fungicides differed significantly with respect to per cent inhibition of mycelial growth of *Alternaria helianthi*. Irrespective of the concentration of the fungicides, maximum mean inhibition (100%) of growth of *Alternaria helianthi* was observed in propiconazole and hexaconazole. These were followed by the fungicides tricylazole (91.6%) and carbendazim + mancozeb (81.55%). Minimum mean inhibition was observed in carbendazim (29.63%). As the concentration of fungicides increased from 0.05% to 0.1%, inhibition of mycelial growth of the fungus was also increased. With respect to concentration, maximum inhibition (100%) was observed in propiconazole at 0.05%, which was on par with 0.1% propiconazole, hexaconazole at 0.05% and 0.1% and tricyclazole at 0.1%. The least inhibition was observed in carbendazim at 0.05% (26.53%). The present findings are in agreement with Mesta et al. [4] who reported that hexaconazole and propiconazole were most effective in inhibition mycelia growth of the fungus as well as spore germination of *Alternaria helianthi in vitro*. Thejakumar and Devappa [5] evaluated ten fungicides *in vitro* condition against *Alternaria alternata* causing leaf spot disease of chilli. They reported that propiconazole at all concentration viz., 500, 1000 and 2000 ppm completely inhibitied mycelial growth of the fungus followed by mancozeb at 1000 and 2000 ppm. Wadibhasme et al. [6] evaluated six non-systemic and three systemic fungicides *in vitro* against *A. helianthi* and recorded that dithane M-45 was the most effective fungicide followed by fytalon and dithane Z-78.

Four plant extracts including one commercial formulation were evaluate to know their efficacy against *Alternaria helianthi* by 'poisoned food technique' at two concentrations viz., 5% and 10% described earlier and results are presented in Table 2. The results revealed that all the plant extracts tested *in vitro* significantly reduced per cent inhibition of mycelia growth of the test fungus. Among the plant extracts, pestoneem was found best which showed highest mean mycelial inhibition of the test fungus (70%) followed by garlic clove extract (35%). Ginger rhizome extract was found least effective in inhibiting mycelia growth of the test fungus (20.38%). With respect to concentration, pestoneem (76.75%) was found best in inhibiting mycelia growth of the fungus at 10% concentration, whereas least inhibition (16.50%) was observed in ginger rhizome extract at 5% concentration. Mesta et al. [4] reported that neem leaf extracts and neem kernel extract were effective in reducing spore germination as well as mycelial growth of *Alternaria helianthi*. Anonymous [7] reported that garlic bulb extract was effective against *Alternaria helianthi*. Kantwa et al. [8] reported that garlic clove extract was most effective in inhibiting mycelial growth and sporulation of *Alternaria alternate* followed by neem and datura leaf extracts. Our results

suggest that plant extracts can be used for management of Alternaria blight of sunflower which will be eco-friendly.

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