Print ISSN: 0976-2876 Online ISSN: 2250-0138

Available online at: http://www.ijsr.in

INDIAN JOURNAL OF SCIENTIFIC RESEARCH

DOI:10.32606/IJSR.V15.I2.00008

Received: 11-11-2024 Accepted: 06-01-2025 Publication: 31-01-2025

Indian J.Sci.Res. 15 (2): 41-44, 2025 Original Research Article

ANTIFUNGAL ASSAY OF SOME COMMON HERBS AGAINST *Alternaria brassicae* (BERK.) SACC.

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ABSTRACT

Oil seed brassicas are exposed to various pathogens which affect the productivity of these crops. Among these diseases Alternaria blight is most important disease worldwide in distribution. Although the leaf spot disease caused by *Alternaria brassicae* is more destructive than the others. Synthetic pesticides are known to be the most effective method of the pest and disease control. However, they are not considered as a long-term solution due to the problem such as health hazards, environmental pollution and toxic effect on non-targeted organisms, residual effect and causing resistance in pest and disease. This study reveals the antifungal properties of aqueous extracts obtained from different parts of 21 different herbaceous plants. The results showed that the aqueous extract of leaf of *Vernonia cinerea* belonging to the family Asteraceae was found to be highly effective (98.78 % inhibition of mycelial growth) against the test pathogen *Alternaria brassicae* The next maximum inhibition 87.27% was recorded in *Spilanthes acmella* flower of the family Asteraceae.

KEYWORDS: Herbaceous Plants, Antifungal Activity, *Alternaria brassicae*

In agricultural industry, losses due to plant diseases are estimated to be about 14% worldwide in distribution (Agrios, 2005) and 20% for major foods and cash crops (Oerke *et al.*, 1994). It is not only reduces the quantity but also affect the quality of the plant products. Oil seed brassicas often called rapeseed-mustard is the third most important oilseed commodity in the world after soybean and palm. India is the third largest producer with global contribution of 28.3% acreage and 19.8% production of these oilseed brassicas (Shekhawat *et al.* 2012). Oil seed brassicas are exposed to various pathogens which infect the productivity of oilseed brassicas. Among these diseases Alternaria blight is most important and common disease worldwide. The Alternaria leaf spot disease caused by *Alternaria brassicae* is more destructive species than the other two species namely *Alternaria brassicicola* and *Alternaria raphani*. *Alternaria brassicae* is known to produce four phytotoxins named as destruxins (Agarwal *et al.*, 1994). There are many methods which are presently being used to manage Alternaria blight of Brassicas that is chemical, cultural, modification of nutrient and biological.

Synthetic pesticides including fungicides are known to be the most effective method of the pest and disease control. However, they are not considered as a long-term solution due to the problem such as health hazards, environmental pollution, toxic effect on non-targeted organisms, residual effect and causing resistance to pest and disease causing agents (Matthews, 2015). Most of these synthetic compounds have been found to exhibit teratogenicity, mutagenicity, carcinogenicity phytotoxicity and residual effect (Bajaj and Ghosh, 1975). Integrated pest management (IPM) for conserving agro ecosystem includes the use of pest-resistance cultivars, holding pests at tolerable levels, and making use of natural products (Rai and Carpinella, 2006). Due to increased awareness on the risks involved in use of fungicides, much attention is being paid on the integrated approach of pathogen management. Plants produce secondary metabolites such as flavonoids, alkaloids, terpenoids etc. Some of the secondary-derived compounds may therefore prove to be beneficial in the treatment of microbial infections in animals and human beings (Suleiman *et al.*, 2010). At present, natural plant products as environmentally safest option that have received much attention for controlling phytopathogenic diseases.

From the above account it is apparent that there is need to investigate new fungitoxicants, which are easily biodegradable and provide inexhaustible resources (Beye, 1978). The area of Azamgarh, a district of eastern U.P. has a rich flora and knowledge of indigenous plants is well documented (Srivastava, 1986; Chandra 1984; Beg *et al.* 2006). Therefore, the present study was carried out to investigate the *in vitro* potential antifungal activity of some herbaceous plants against the *Alternaria brassicae* (Berk.) Sacc., causing blight in the genus of *Brassica*.

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MATERIALS AND METHODS

Forty one samples taken from twenty one herbaceous plants belonging to ten families were collected from different places in the district Azamgarh, Eastern Uttar Pradesh. The fresh aerial parts of selected herbaceous plants were collected from various areas of Azamgarh district of Eastern Uttar Pradesh. The taxonomical identification of the plant species was performed in the department of Botany Shibli National P.G. College Azamgarh with the help of flora of Duthie (1903-1929). Twenty grams of plant parts were taken from each fresh samples and surface sterilized with 70% alcohol and finally with sterilized distilled water. Then they were crushed by pestle and mortar and extracted with 20 ml of sterilized distilled water and filtered aseptically through double layered cheese cloth. The poisoned food technique was used in the screening of aqueous extracts for their antifungal properties evaluation (Grover and Moore, 1962). Five ml aqueous extract of each plant parts were mixed with 10 ml of molten Czapeck's Dox Agar medium in a pre-sterilized petriplates separately and swirled properly. In control set the medium was supplemented with the same amount of sterilized distilled water. A mycelial disc (4 mm diameter) cut from the periphery of 7 days old culture of *Alternaria brassicae* was aseptically inoculated in the centre of each petriplate. For each treatment and control three replicates were maintained. Finally, the antifungal activity of each extract was calculated in terms of inhibition percentage of mycelia growth by using the following formula (Mohana and Raveesha, 2007).

Percent inhibition of mycelial growth $= \frac{C-T}{C}$x100

Where C = Average increase in mycelial growth in control plate,

T = Average increase in mycelial growth in treatment plate

RESULTS AND DISCUSSION

A total of 41 aqueous extracts of 21 different herbaceous plants belonging to 10 families were screened for their antifungal activities against *Alternaria brassicae* (Berk.) Sacc. Result shows the impact of various treatments on fungal mycelial growth in comparison with non-treated control. A marked variability of the extract was observed. All plants showed more or less inhibitory tendency towards mycelial growth. The aqueous extract of leaf of *Vernonia cinerea* Linn. belonging to the family Asteraceae was found to be highly effective (98.78 % inhibition of mycelial growth) against the test pathogen *Alternaria brassicae*. The next maximum inhibition 87.27% was recorded in *Spilanthes acmella* Linn. flower extract of the family Asteracea. The stem of *Ageratum conyzoides* Linn., leaf of *Physalis minima* Linn. and stem of *Gnaphalium indicum* Linn. also showed significant mycelial inhibition 79.60, 69.78 and 69.21 percent, respectively. The mycelium inhibition varies from family to family and species to species. The variation of fungitoxicity from family to family has been observed by Hajek (1961) who reported the legumes (Fabaceae) to be more active than grasses (Gramineae). The antifungal effect of aqueous extract of plants can be attributed to the presence of different phytochemicals that can act alone or in combination as proven by other studies (Field *et al.*, 2006, Giordani *et al.*, 2008, Aphajal and Beg, 2019). The compounds that inhibit the establishment and growth of plant pathogen are termed phytoalexins. Several plant derived compounds such as certain oligosaccharides, isoflavonoides, terpenoides and acetylenic acid have been demonstrated to be strong elicitors of phytoalexins. We must not overlook the fact that practically all natural antimicrobial compounds are completely biodegradable without leaving any residue and thus limit pesticidal pollution (Table 1).

On the basis of above experiment, it is concluded that most of the plants contain fungitoxic compounds which inhibit the mycelial growth of test fungus. Further studies on antifungal spectrum, isolation and chemical characterization of active compound from plants are needed, which can be a major effort compare to synthesizing a new synthetic compounds.

Table 1: Screening of different parts of herbaceous plant extracts on mycelial inhibition (%) of *Alternaria brassicae* (Berk.) Sacc.

S.N.	Name of the Plants	Family	Part Used	Mycelial inhibition (%)
1.	*Ageratum conyzoides* Linn.	Asteraceae	Leaf	64.70
2.	*Ageratum conyzoides* Linn.	Asteraceae	Stem	79.60
3.	*Amaranthus spinosus* Linn.	Amaranthaceae	Leaf	10.15
4.	*Amaranthus spinosus* Linn.	Amaranthaceae	Stem	61.60
5.	*Anagallis arvensis* Linn.	Primulaceae	Whole Plant	68.36

6.	*Argemone mexicana* Linn.	Papaveraceae	Leaf	23.95
7.	*Argemone mexicana* Linn.	Papaveraceae	Flower	58.44
8.	*Argemone mexicana* Linn.	Papaveraceae	Seed	62.39
9.	*Eclipta alba* Linn.	Asteraceae	Leaf	44.000
10.	*Eclipta alba* Linn.	Asteraceae	Stem	67.00
11.	*Gnaphalium indicum* Linn.	Asteraceae	Leaf	61.11
12.	*Gnaphalium indicum* Linn.	Asteraceae	Stem	69.21
13.	*Heliotropium indicum* Linn.	Boraginaceae	Leaf	45.46
14.	*Heliotropium indicum* Linn.	Boraginaceae	Stem	60.76
15.	*Hyptis suaveolens* Piot.	Lamiaceae	Leaf	50.61
16.	*Hyptis suaveolens* Piot.	Lamiaceae	Stem	5269
17.	*Hyptis suaveolens* Piot.	Lamiaceae	Inflorescence	69.00
18.	*Mentha spicata* Linn.	Lamiaceae	Leaf	50.33
19.	*Mentha spicata* Linn.	Lamiaceae	Stem	60.50
20.	*Nicotiana plumbaginifolia* Viv.	Solanaceae	Leaf	70.90
21.	*Nicotiana plumbaginifolia* Viv.	Solanaceae	Stem	68.10
22.	*Ocimum sanctum* Linn.	Lamiaceae	Leaf	60.78
23.	*Ocimum sanctum* Linn.	Lamiaceae	Flower	40.16
24.	*Oxalis corniculata* Linn.	Oxalidaceae	Leaf	54.46
25.	*Oxalis corniculata* Linn.	Oxalidaceae	Whole plant	47.69
26.	*Parthenium hysterophorus* Linn.	Asteraceae	Leaf	65.18
27.	*Parthenium hysterophorus* Linn.	Asteraceae	Stem	68.10
28.	*Physalis minima* Linn.	Solanaceae	Leaf	69.78
29.	*Physalis minima* Linn.	Solanaceae	Stem	35.60
30.	*Polygonum lanigerum* R.Br.	Polygonaceae	Whole plant	44.94
31.	*Ravina humilis* Linn.	Phytolaccaceae	Leaf	25.37
32.	*Solanum nigrum* Linn.	Solanaceae	Leaf	15.38
33.	*Solanum nigrum* Linn.	Solanaceae	Stem	12.60
34.	*Solanum surattense* Burm.f.	Solanaceae	Leaf	41.18
35.	*Sonchus arvensis* Linn.	Asteraceae	Leaf	46.68
36.	*Spilanthes acmella* Linn.	Asteraceae	Leaf	60.10
37.	*Spilanthes acmella* Linn.	Asteraceae	Stem	54.53
38.	*Spilanthes acmella* Linn.	Asteraceae	Flower	87.27
39.	*Vernonia cinerea* (L.) Less.	Asteraceae	Leaf	98.78
40.	*Vernonia cinerea (L.) Less.*	Asteraceae	Stem	45.12
41.	*Xanthium strumarium* Linn.	Asteraceae	Leaf	44.05

ACKNOWLEDGEMENT

The author is highly thankful to the Department of Botany, Shibli National College, Azamgarh for providing the facilities in laboratory during research work.

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