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# SCREENING OF SOME MEDICINAL PLANTS OF DISTRICT AZAMGARH AGAINST PHYTOPATHOGENIC FUNGI *Fusarium lycopersici* SACC.

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## ABSTRACT

**The yield of crops are badly affected by certain factors among which fungal diseases are major cause of yield loss throughout the world. Chemical fungicides are commonly used for management of plant diseases which are considerably reduce the incidence of diseases, however their use is costly as well as environmentally undesirable. Medicinal plants are used by many tribal groups as a source of medicine for the treatment of various diseases in both humans and animals. These plants produce secondary metabolites that have antimicrobial properties, thus screening of medicinal plants provide another alternative for chemical fungicides that are relatively non-toxic and cost-effective. This study investigated the antifungal properties of aqueous extracts obtained from different parts of 21 different medicinal plants. The result showed that the aqueous extract of leaf of *Blumea lacera* belonging to the family Asteraceae was found to be highly effective (87.00 % inhibition of mycelial growth) against the test pathogen *Fusarium lycopersici*. The next maximum inhibition 85.95% was recorded in *Blumea lacera* Inflorescence of the family Asteraceae.**

**KEYWORDS:** Medicinal Plants Extracts, Antifungal Activity, *Fusarium lycopersici*

Losses in productivity of the plants caused by pathogens, animals and weeds altogether range between 20 and 40% in global agricultural productivity (Savary, *et al.* 2012). The yield of crops are badly affected by certain factors among which fungal diseases are major cause of yield loss throughout the world (Prusky, 2011). The majority of the plant diseases are caused by phytopathogenic fungi. Degradation of grains, vegetables and fruits caused by pathogenic fungi may lead to loss of entire product. For eg. Fungi such as *Fusarium* spp. growing on plants are able to produce mycotoxins that can seriously harm consumers. *Tomato (Lycopersicon esculentum)* is important crop affected by many pathogens, but among these wilt of tomato is very serious and destructive disease caused by *Fusarium lycopersici* Sacc. According to Snyder and Hausen (1940) it is one of the most prevalent and damaging disease of tomato that causes considerable losses to the crop especially susceptible varieties and under favourable weather conditions. Yield loss due to wilt disease is 25.14 – 47.94% in Uttar Pradesh has been recorded (Enespa and Dwivedi, 2014). Tomato wilt disease caused by *Fusarium lycopersici* is considered as one of the most important disease of tomato both in field and greenhouse grown worldwide (Abdel Monaim, 2012).

Synthetic chemical agents are heavily used to control the phytopathogenic fungi, which results in resistance development in the pathogens and accumulation of chemicals in the environment (Matthews, 2015). Recently it has been pointed out that over 200 species of plant pathogens are resistant to chemical pesticides and most of these pesticides have various side effects (Verma and Dubey, 1999). Synthetic chemicals are also toxic to human beings and cause mutagenicity, carcinogenicity and teratogenicity (Goldman and Koduru, 2000). So there is a need for plant-based compounds for ecofriendly applications to control the crop damage caused by fungi, bacteria, nematodes and other organisms. Plants produce secondary metabolites such as flavonoids, alkaloids, terpenoids etc. Some of the secondary-derived compounds may therefore have beneficial effects in the treatment of microbial infections in animals and humans (Suleiman *et al.*, 2010). Medicinal plants are well-known natural sources for the treatment of various diseases since antiquity (Maregesi *et al.*, 2008). About 20,000 plant species used for medicinal purposes are reported by WHO (Gullece *et al.*, 2006; Maregesi *et al.*, 2008). Many medicinal plants have fungicidal properties against different fungal species including phytopathogenic fungi. (Rates, 2001).

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

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medicinal 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 medicinal plants against the *Fusarium lycopersici* Sacc., the causal organism of wilt of tomato.

## MATERIALS AND METHODS

Twenty one medicinal plants belonging to nineteen families were collected from different places in the district Azamgarh, Eastern Uttar Pradesh. The fresh parts of selected medicinal 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 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 *Fusarium lycopersici* 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 $= \frac{C-T}{C} \text{x} 100$

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 42 aqueous extracts of 21 different medicinal plants belonging to 19 families were screened for their antifungal activities against *Fusarium lycopersici* 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 *Blumea lacera* belonging to the family Asteraceae was found to be highly effective (87.00 % inhibition of mycelial growth) against the test pathogen *Fusarium lycopersici*. The next maximum inhibition 85.95% was recorded in *Blumea lacera* Inflorescence of the family Asteracea. The leaf of *Curcuma longa*, *Amaranthus spinosus* and *Aloe barbadensis* also showed significant mycelial inhibition 78.26, 76.40 and 75.90 percent, respectively. The *Blumea lacera* is an important plant having several medicinal uses. 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 these 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). 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)

**Table 1: Screening of different parts of medicinal plant extracts on mycelial inhibition (%) of *Fusarium lycopersici* Sacc.**

| S.N. | Name of the Plants | Family | Part Used | Mycelial inhibition (%) |
|---|---|---|---|---|
| 1 | *Adhatoda vasica* Nees. | Acanthaceae | Leaf | 75.60 |
| 2 | *Adhatoda vasica* Nees. | Acanthaceae | Flower | 68.00 |
| 3 | *Aegle marmelos* (Linn.) Corr. | Rutaceae | Leaf | 42.60 |
| 4 | *Aloe barbadensis* Mill. | Liliaceae | Leaf | 75.90 |
| 5 | *Amaranthus spinosus* Linn. | Amaranthaceae | Leaf | 76.40 |
| 6 | *Andrographis paniculata* (Burm.f.) Wall. ex Nees. | Acanthaceae | Leaf | 63.69 |

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|---|---|---|---|---|
| 7 | *Andrographis paniculata* (Burm.f.) Wall. ex Nees. | Acanthaceae | Stem | 27.32 |
| 8 | *Andrographis paniculata* (Burm.f.) Wall. ex Nees. | Acanthaceae | Fruit | 43.61 |
| 9 | *Asparagus racemosus* Willd. | Liliaceae | Leaf | 38.75 |
| 10 | *Asparagus racemosus* Willd. | Liliaceae | Root | 62.61 |
| 11 | *Azadirachta indica* A.Juss. | Meliaceae | Leaf | 73.84 |
| 12 | *Azadirachta indica* A.Juss. | Meliaceae | Bark | 65.25 |
| 13 | *Azadirachta indica* A.Juss. | Meliaceae | Flower | 43.39 |
| 14 | *Azadirachta indica* A.Juss. | Meliaceae | Fruit | 74.45 |
| 15 | *Blumea lacera* (Burm.f.) D.C. | Asteraceae | Leaf | 87.00 |
| 16 | *Blumea lacera* (Burm. f.) DC. | Asteraceae | Inflorescence | 85.95 |
| 17 | *Boerahaavia diffusa* Linn. | Nyctaginaceae | Leaf | 62.20 |
| 18 | *Boerahaavia diffusa* Linn. | Nyctaginaceae | Stem | 56.10 |
| 19 | *Boerahaavia diffusa* Linn. | Nyctaginaceae | Root | 28.90 |
| 20 | *Calotropis procera* (Ait) R. Br. | Asclepiadaceae | Stem | 24.20 |
| 21 | *Calotropis procera* (Ait) R. Br. | Asclepiadaceae | Leaf | 19.35 |
| 22 | *Cannabis sativa* Linn. | Canabiaceae | Leaf | 65.45 |
| 23 | *Cannabis sativa* Linn. | Canabiaceae | Stem | 52.32 |
| 24 | *Convolvulus arvensis* (Linn.) Diels. | Convolvulaceaea | Leaf | 19.04 |
| 25 | *Curcuma longa* Linn. | Zingiberaceae | Leaf | 43.20 |
| 26 | *Curcuma longa* Linn. | Zingiberaceae | Rhizome | 78.26 |
| 27 | *Datura metel* Linn. | Solanaceae | Leaf | 44.06 |
| 28 | *Datura metel* Linn. | Solanaceae | Stem | 43.90 |
| 29 | *Datura metel* Linn. | Solanaceae | Fruit | 45.76 |
| 30 | *Evolvulus alsinoides* Linn. | Convolvulaceae | Whole plant | 32.00 |
| 31 | *Mentha spicata* Linn. | Lamiaceae | Leaf | 63.00 |
| 32 | *Mentha spicata* Linn. | Lamiaceae | Stem | 50.30 |
| 33 | *Nicotiana plumbaginifolia* Viv. | Solanaceae | Leaf | 40.10 |
| 34 | *Nicotiana plumbaginifolia* Viv. | Solanaceae | Stem | 39.20 |
| 35 | *Nyctanthes arbor-tristis* Linn. | Oleaceae | Leaf | 56.10 |
| 36 | *Ocimum sanctum* Linn. | Lamiaceae | Leaf | 39.10 |
| 37 | *Ocimum sanctum* Linn. | Lamiaceae | Stem | 37.32 |
| 38 | *Ocimum sanctum* Linn. | Lamiaceae | Inflorescence | 36.10 |
| 39 | *Solanum nigrum* Linn. | Solanaceae | Leaf | 43.20 |
| 40 | *Solanum nigrum* Linn. | Solanaceae | Stem | 42.30 |
| 41 | *Terminalia arjuna* (Roxb. ex DC.) Wt. & Arn. | Combretaceae | Leaf | 57.01 |
| 42 | *Terminalia arjuna* (Roxb. ex DC.) Wt. & Arn. | Combretaceae | Bark | 55.60 |

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