Antimicrobial property of some Ethnobotanicals against flower Blight of Marigold

Abstract

Marigold is infected with more than ten diseases all over the world. Flower blight, caused by *Alternaria zinniae*, is a severe threat to marigold cultivation in India and Odisha, resulting in economic losses. The research aimed to look at the efficacy of several botanicals that are readily available in *in-vi tro* circumstances. At 10% and 20% concentrations, eight plant extracts, including *Aloe vera*, *Azadirachta indica*, *Allium sativum*, *Zingiber officinale*, *Curcuma longa*, *Phyllanthus emblica*, *Withania somnifera*, and *Ocimum tenuiflorum* were tested against the pathogen. At a 10 percent concentration, *Allium sativum* inhibited mycelial growth the most, with 77.93 percent, followed by *Phyllanthus emblica* (63.38 percent), and *Curcuma longa* (53.99 percent). The least inhibited plant was *Ocimum tenuiflorum*, which showed 1.41 percent inhibition. The result at 20% concentration followed the same result as the 15% concentration. *Allium sativum* had the highest level of inhibition at 87.32 percent, followed by *Phyllanthus emblica* (85.92 percent) and *Curcuma longa* (73.71 percent). *Ocimum tenuiflorum* had the least inhibition, with 10.80 percent. The presence of Allicin in Allium sativum may explain its effectiveness against marigold flower blight, although more research is needed. Furthermore, the effective plant products against marigold flower blight could be evaluated in the field.

Key Words: Marigold, Phytoextracts, Garlic extract, Allicin, *Alternaria tagetica*, Flower blight

Introduction

Marigold is a commercially crucial ornamental flower crop that belongs to the *Tagetes* genus and the Asteraceae family. It features a diverse range of blooms with appealing color, shape, and size that appeal to various flower growers. Marigold flowers are widely used for religious and social purposes (Bos and Yadav 1998). They are a collection of perennial plants with a variety of habits that display both self and cross-pollination.

African or Mexican marigold (*Tagetes erecta L.*) and French marigold (*Tagetes patula L.*), both of which originated in Mexico and South Africa, are two of the 33 species of marigold that are commonly grown. Although *T. erecta* (African marigold) is native to Mexico, it is thought to have originated in India because of its adaptability, popularity, and widespread cultivation (Desai, 1967, Asif, 2008). It is primarily grown in Madhya Pradesh, with Himachal ranking ninth in marigold production and area (Shukla and Thakur, 2018).

Marigold is one of India's most widely produced loose flower crops. Marigold production climbed to 24,5810 quintals in 2013-14 in Odisha, up from 14,581 quintals in 2003-04. Marigold data for 2017 was reported at 608.968 Ton. This is an increase from the 603.179 Ton amount from the previous year. Marigold data is updated annually, with an average of 504.453 Ton between March 2012 and March 2017, with six observations. The data peaked at 608.968 Ton in 2017 and fell to a new low of 360.206 Ton in 2013. Except during the hot

summer months, when high temperatures diminish the size and number of flowers, Odisha's climate is ideal for marigold growth.

Marigold (*Tagetes sp*.) is economically important due to its showy flowers, tagetes oil, and a variety of pharmacological activities such as antibacterial activity, anti-microbial activity, insecticidal activity, hepatoprotective activity, mosquitocidal activity, Nematicidal activity, wound healing activity, anti-oxidant and analgesic activity, Larvicidal activity, sub-acute toxicity, and so on. Because of its colorful flowers, tagetes oil, and anti-nematicidal effects, the plant is economically important (Usman et al., 1972). Marigold flowers are offered as loose flowers in the market, and are excellent as a bedding plant. They are also utilized for aesthetic and medicinal uses (Tripathy and Gupta, 1991, Khalil et al., 2007). Its floral extract is used as a blood purifier, to treat bleeding piles, and to treat eye problems and ulcers (Bos and Yadav, 1998). Marigold plants have antinematicidal properties (Olabiyi and Oyedunmade, 2007) and have been discovered to be particularly efficient against the nematode Pratylenchus penetrans. Because the flowers are high in carotenoid pigment, they are used to make food pigments. Flower petal powder is used in chicken feed to guarantee that egg yolks and broiler skin are appropiately colored (Shukla and Thakur 2018).

Even though marigold has insecticidal, fungicidal, bactericidal, and insecticidal properties, pathogenic microorganisms including fungi, viruses, and bacteria, can damage the plant and produce diseases that reduce yield. Marigold is afflicted by various fungi, bacteria, viruses, and nematodes.

Alternaria zinnia causes marigold leaf spot and flower blight, a major disease in the country, particularly in Odisha. Dark brown necrotic spots on flowers, leaves, and stems are the primary signs of the disease. As the disease progresses, the spots grow and coalesce, causing the leaves to dry up. The disease has now emerged as a major biotic limitation to of high-yielding fragrant African marigold variants. Adult flower buds exhibit fewer symptoms but still fail to open due to the pathogen's effect. Young flower buds shrivel, turn a deep brown hue, and dry up throughout the disease. The pathogen that affects the plant's leaves causes blight and dark necrotic patches on the tips and margins of older leaves.

Plant extracts are the natural method that controls many diseases due to their antimicrobial activities. The plant extract has no side effects or residual effects. Chemical methods are very harmful to the environment but plant extract help to secure the environment with effective control. We take eight plant extracts such as an extract of Tulsi, Ginger, Neem, Garlic, Aloe Vera, Ashwagandha, Amla, and Turmeric. In two concentrations, we checked their effectiveness i.e., 10% and 20%. Chemicals used to treat plant diseases have a variety of adverse environmental consequences. As a result, everyone is opting for organic disease management, and most plants contain antimicrobial qualities. In light of these facts, the Department of Plant Pathology, Institute of Agricultural Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar, Odisha (India), conducted research on the "Evaluation of the antimicrobial ability of certain plant extracts against plant pathogens".

Materials and Methods:

1. Collection of Plant Sample

The antimicrobial activity of eight plant extracts from Garlic, Neem, Tulsi, Turmeric, Ginger, Aloe vera, Ashwagandha, and Amla was tested for controlling *Alternaria tagetica in vitro* and *in vivo*. Fresh plant parts were used for the extraction process. There are different plant parts that are used for extraction which are listed below (Table 1).

Table.1 various plant components and extracts with their popular names, scientific names, and usage

Treatment Number	Common Name	Scientific Name	Plant Part Used
1.	Aloe vera	*Aloe vera*	Leaf
2.	Neem	*Azadirachta indica*	Leaf
3.	Garlic	*Allium sativum*	Bulb
4.	Ginger	*Zingiber officinale*	Rhizome
5.	Turmeric	*Curcuma longa*	Rhizome
6.	Amla	*Phyllanthus emblica*	Fruit
7.	Ashwagandha	*Withania somnifera*	Root
8.	Tulsi	*Ocimum tenuiflorum*	Leaf

2. Extraction of Plant extract

Fresh plant materials were collected and cleaned in tap water before being distilled. These leaves were left to dry naturally in the open air. A hundred grams of fresh material were cut and then crushed with 100ml sterile water (1:1 w/v) in a surface-sterilized pestle and mortar. After that, placed in a Rotary Shaker for 12 hours. With the use of Whatman's no. 1 filter paper, the extracts were filtered. The extracts were centrifuged for 10 minutes at 1500 rpm. Finally, the acquired supernatant was used to prepare a stock solution.

3. Poison Food Technique

The poisoned food technique was employed *in-vitro* to investigate the antifungal mechanism of plant extracts. To obtain 10 and 20% concentrations, 6 ml and 12 ml of the stock solution were mixed with 60 and 60 ml of sterilized molten PDA medium, respectively. The medium was thoroughly shaken to ensure that the extract was evenly distributed. Each sterilized Petri plate added 20 mL of medium.

A sterile cork borer disc was used to cut out 5 mm diameter discs of mycelium from the edge of an actively growing culture, which was then deposited in the center of each Petri plate. The single pathogen was grown on PDA dishes to maintain the controls.

Each treatment was replicated three times, with plates incubated at 28°±1^{0}C until the control dishes reached their maximum radial growth. According to Vincent's formula (1947), the percent inhibition over control was computed.

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

C

Where,

I = Percent inhibition of mycelium

C = Mycelium growth in control

T = Mycelium growth in treatment

Results and Discussion

Table 2 shows that at a 10% concentration, *Allium sativum* inhibited mycelial growth the most (77.93 percent), followed by *Phyllanthus emblica* (63.38 percent), and *Curcuma longa* (53.99 percent) among the plant extracts. The least inhibited plant was *Ocimum tenuiflorum*, which showed 1.41 percent inhibition. The result at 20% concentration followed the same pattern as the result at 10% concentration. *Allium sativum* had the highest level of inhibition at 87.32 percent, followed by *Phyllanthus emblica* (85.92 percent) and *Curcuma longa* (73.71 percent). *Ocimum tenuiflorum* had the least inhibition, with 10.80 percent. The current findings are supported by Wszelaki and Miller's (2005) findings, which showed that garlic extracts greatly reduced tomato leaf blight disease. Panchal et al. (2009) found that significantly slowest mycelial growth. In vitro, garlic clove extracts were used in the medium (10 percent). Gachande (2010) evaluated extracts of 15 plant components against Alternaria solani isolates' spore germination and mycelial development. The extracts of Allium sativum were shown to be the most effective in controlling fungal growth. Chethana et al. (2012) tested the bio-efficacy of six plant items against Alternaria porri (Ellis.) Cif., which causes purple blotch disease in onions.

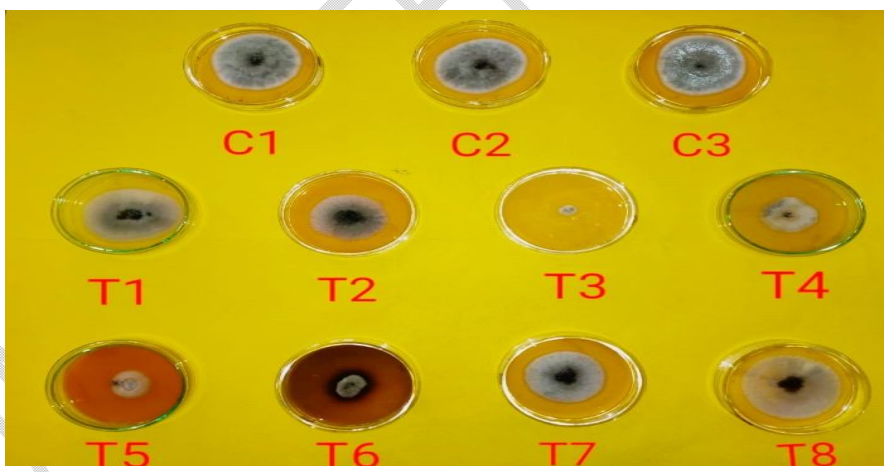

Fig.1. At 10 percent Concentration

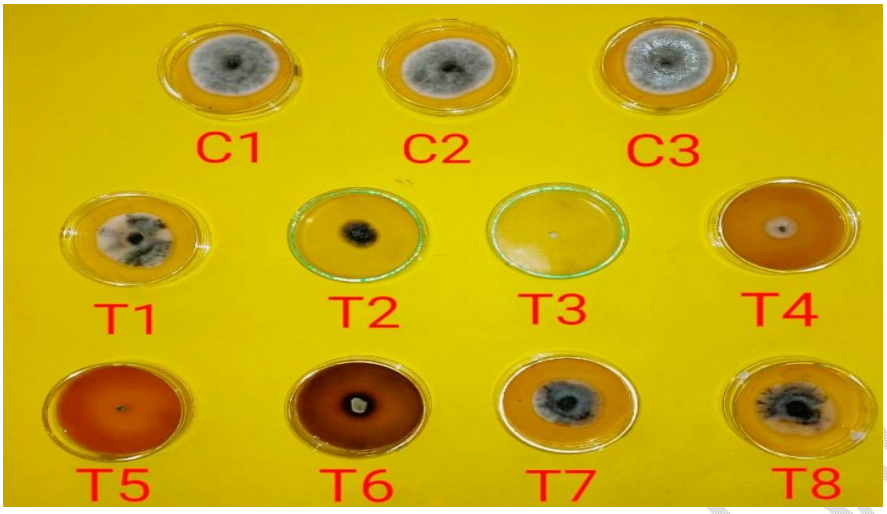

Fig.2. At 20 percent Concentration

Table.2 In vitro bio-assay of plant extracts

Treatment Number	Scientific Name of Botanicals	Growth Inhibition	
		10% concentration	**20% concentration**
1.	*Aloe vera*	6.10	13.62
2.	*Azadirachta indica*	27.23	43.66
3.	*Allium sativum*	77.93	87.32
4.	*Zingiber officinale*	35.21	59.62
5.	*Curcuma longa*	53.99	73.71
6.	*Phyllanthus emblica*	63.38	85.92
7.	*Withania somnifera*	20.66	19.25
8.	*Ocimum tenuiflorum*	1.41	10.80
SE (m)		5.138	4.474
CD (0.05)		15.537	13.529

Conclusion

The in-vitro investigation on the impact of plant extract on *Alternaria zinnia*'s mycelia growth revealed that at a 10% concentration, *Allium sativum* inhibited mycelial growth the most (77.93 percent), followed by *Phyllanthus emblica* (63.38 percent), and *Curcuma longa* (53.99 percent) among the plant extracts. The least inhibited plant was *Ocimum tenuiflorum*, which showed 1.41 percent inhibition. The result at 20% concentration followed the same pattern as the result at 10% concentration. *Allium sativum* had the highest level of inhibition at 87.32 percent, followed by *Phyllanthus emblica* (85.92 percent) and *Curcuma longa* (73.71 percent). *Ocimum tenuiflorum* had the least inhibition, with 10.80 percent. These plant extracts may be trailed under field conditions to know more about their efficacy against the pathogen so that it can be recommended in the farmer's field condition.

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