Antifungal activity of leaf extracts of Tridax procumbens against Helminthosporium sativum isolated from Luffa acutangula

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***Abstract*— The antifungal activity of medicinal weed plant *Tridax procumbens* was studied against the fungal pathogen *Helminthosporium sativum* isolated from *Luffa acutangula*. Leaf of the weed plant was screened with three different solvents including aqueous and two organic solvents of ethanol and methanol. Three different concentrations of solvents including 50ml, 100ml, and 150ml were prepared of plant extracts to test against the fungal pathogen. Disc diffusion method was used to study the effect of the botanical plant extracts against the isolated fungal pathogen. All plant extracts showed positive results except ethanol 50ml with no zone of inhibition. However, methanol 100ml and ethanol 150ml showed the best antifungal activity against *H. sativum* with average colony diameter of 31.7 mm and 28.5 mm respectively. Majority of the plant extracts showed neutral to positive impact against the growth retardation of *H. sativum*. Plant extracts can potentially be used as an alternative to commercial fungicides and therefore less hazardous to crop plants and environment.**

***Index Terms*— Botanical, fungal pathogen, medicinal weed plants, plant extracts.**

INTRODUCTION

Luffa acutangula is a medicinal plant, usually referred to as a ridge gourd. It is prevalent in the subtropical region of Asia. It is healthy food and contains a good amount of fiber, vitamins, and minerals including Vitamin B2, Vitamin C, carotene, niacin, calcium, phosphorus, iron and small quantities of iodine and fluorine. It is reported to contain many phytochemicals such as flavonoids, saponins, glycosides, tannin, terpenoids, carbohydrate, alkaloids, and many more (Munshi *et al*. 2010). Fungi constitute the largest number of plant pathogens and are responsible for a range of serious plant diseases. Most vegetable diseases are caused by fungi. Fungicides in powdered form are around 90% sulfur that is very toxic to crops. Fungicides residues have been found on food for human consumption, mostly from postharvest treatment.Some fungicides are dangerous to human health,such as vinclozolin (Saini *et al*. 2018).

Tridax procumbens, also known as "coat buttons" is a perennial plant from the Asteraceae family, native to Central and South America (Hilliard, 1977).The plant is categorized as a weed plant due to wide growth in vacant areas with no proper cultivation facilities. *Tridax procumbens* is well known for its medicinal properties with Ayurvedic, ethnobotanical and unani values. (Maldhure, 2015).

T. procumbens is used as an antibacterial, antifungal, and antiviral treatment. The versatility of the species is most likely due to the plant's defense mechanisms, secondary metabolites such as flavonoids, alkaloids, tannins, carotenoids, and saponins (Ravikumar *et al*. 2005). This research aims to highlight the importance of this weed plant due to its valuable medicinal properties. The study was conducted to screen the antifungal activity of *T. procumbens* against the fungal pathogens specifically *Helminthosporium sativum* isolated from *Luffa acutangula*. Different solvents including organic and aqueous were used for the extraction method. Leaf extracts of this plant have shown strong antimicrobial activity against pathogen *Helminthosporium sativum* with a zone of inhibition ranging from 17 to 30mm.

MATERIAL AND METHODS

Plant materials

Diseased leaves of *Luffa acutangula* were collected randomly from different locations of Ajmer city

located centrally in the state of Rajasthan. The collection was done aseptically in January- March 2015. The leaves were washed thoroughly in distilled water twice followed by 70% ethanol and transferred to the Potato dextrose agar medium. The culture was incubated for about ten days. Isolation and identification of fungal structures were conducted.

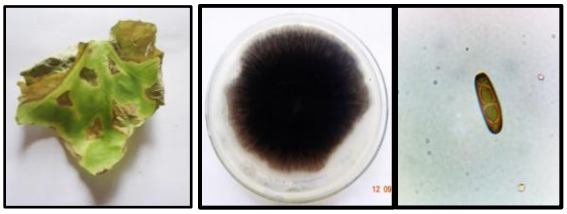

Figure 1. Diseased Luffa acutangula. A. Leaf. B. Fungal culture of Helminthosporium sativum. C. Conidia of Helminthosporium sativum

PLANT EXTRACTS

Weed plants having medicinal properties were studied and located at several placed in the city. *Tridax procumbens* were selected for the research which was widely distributed with a great source of phytochemical components. Leaves, stem, and roots were taken to prepare the plant extracts in three different solvents. The plant parts were aseptically collected, washed, and processed for the extraction process. The parts were dried and crushed in three concentrations mainly 50ml, 100ml, and 150ml of each solvent and centrifuged for 10-15 minutes (10000rpm). The plant extract obtained by filtration was collected and stored for antifungal bioassay.

ANTIFUNGAL BIOASSAY

Disc diffusion methodology was conducted for studying the antifungal activity of *T. procumbens* against the isolated fungal pathogen (Perez *et al*. 1990). Autoclaved disc of 4mm with uniform size for all was prepared and soaked in the plant extracts prepared of different solvents. The containers were labeled of each solvent and concentration to avoid mixing. The discs were soaked overnight and checked after 24 hours for a change of color. Before the placement of the disc, the Petri dishes were loaded with a Potato dextrose agar medium. Potato dextrose broth already inoculated with the fungal pathogen *H. sativum*was prepared two days before the experiment. The broth was poured on the media surface followed by the sterile disc impregnated with the plant extracts that were placed at the center of the Petri dishes. The incubation period of seven days was kept for the Petri dishes with regular observation. After the incubation period, the inhibitory zone was measured in millimeters.

Figure2. Tridax procumbens

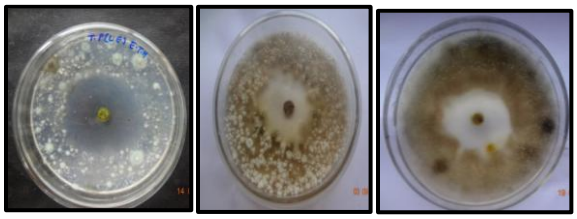

Figure 3. Effect of *Tridax procumbens* leaf extracts prepared in different solvents against *Helminthosporium sativum*. A. Ethanol extract B. Methanol extract C. Aqueous extract.

RESULTS AND DISCUSSION

The weed plant *T. procumbens* screened for antifungal activity showed positive results for the majority of the experiments conducted against the growth inhibition of H. sativum. Figure 3. shows the zone inhibition created by the plant extracts prepared in the three different solvents including ethanol, methanol, and aqueous. The results in Table 1 show the positive results of all the three solvents in different concentrations except ethanol in 50ml. Methanol showed the best results compared to the other solvents with a maximum of 31.7 mm in 100ml concentration. However, ethanol showed strong positive results in 150ml with 28.5mm of colony diameter against the pathogen. A similar study was conducted by Ojha and Goyal (2019) on the antifungal activity of ethanol extracts of two medicinal plant extracts against the fungal pathogens isolated from Aegle marmelos. However, the two

pathogens included Alternaria and Curvularia in the research. The ethanolic plant extracts of both the medicinal botanical extracts showed strong positive results for the growth inhibition of both the fungal pathogens (Ojha and Goyal, 2019). Among the three solvents tested against *H. sativum*, methanol showed the best results followed by aqueous, and ethanol.

Table1. Effect of leaf extracts of *Tridex procumbens* against *Helminthosporium Sativum* isolated from *Luffa acutangula.* The average measurements of colony diameter were taken for evaluations.

Solvent	Concentration (mg/ml)	*Helminthosporium sativum*
		Colony diameter (mm)
Ethanol	50	0.0
	100	12.7
	150	28.5
Methanol	50	19.2
	100	31.7
	150	17.9
Aqueous	50	21.1
	100	22.9
	150	20.2

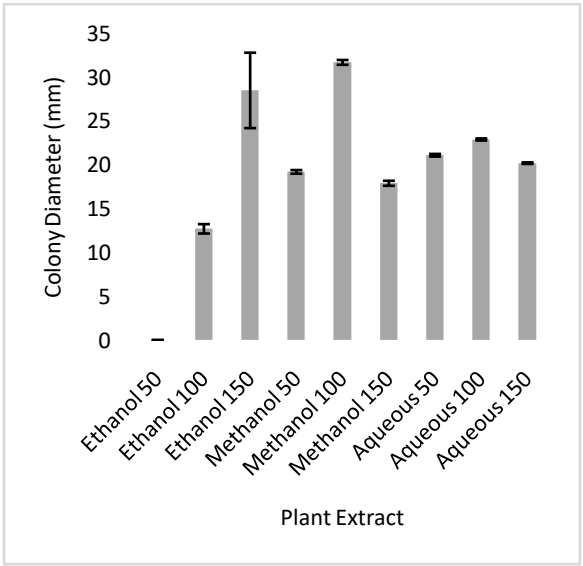

Figure 4. Effect of leaf extract of Tridax procumbens on fungus isolated from Luffa acutangula using three different concentrations of 50 ml, 100 ml, and 150 ml. The average measurements of colony diameter were taken for evaluations

CONCLUSION

Weed plants due to their enormous growth without proper nutrition, supplements, and care can be a great alternative to commercial fungicides. Moreover, several weed plants having medicinal properties and phytochemical constituents can be a better substitute for important cultivated plants for plant extracts. Bio-fungicides are herbal fungicides which are comparatively cheaper and strongly effective for the growth retardation of the fungal pathogens found on vegetables and crop plants. *Luffa acutangula* is a vegetable plant found at several places of Asian countries. Therefore, this plant was studied to isolate the fungal pathogens and screen the antifungal activity of the weed medicinal plant.

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