

## Phytochemical screening and antifungal activity of *Xanthium strumarium* L. and *Datura metel* L.

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### ABSTRACT

The importance of medicinal plants is known worldwide. They serve as the forerunner and the source of the modern medicines. This study was initiated with the aim of studying the potential of medicinal plants against the fungus of genus *Rhizopus* by the means of phytochemical screening and antifungal activity. The selected plants *Xanthium strumarium* L., and *Datura metel* L. were used for phytochemical screening and antifungal activity. Aqueous extract was used for antifungal activity and phytochemical screening. MIC was determined by serial dilution and control experiment was also performed with the help of antibiotic. Phytochemical screening showed presence of phenols, tannins, glycosides, steroids, and alkaloids in both the plants. Antifungal activity showed 4mm and 5mm zones of inhibitions in *Xanthium strumarium* L. and *Datura metel* L. respectively. MIC for *Xanthium strumarium* L. was noted 1mm at 1:5 dilution and 1mm for *Datura metel* L. at for 1:4 dilution. This study shows the potential of these two medicinal plants against fungus of genus *Rhizopus* and concludes that they can be used as remedy.

**Key Words** - Phytochemical screening, Antifungal activity, *Xanthium strumarium* L., *Datura metel* L., *Rhizopus*

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### INTRODUCTION

According to World Health Organizations, most of the modern medicines have their source in medicinal plants (Ayyanar and Ignacimuthu, 2011). Use of drugs to treat ailments have their roots in ethnomedicine. Most of the times the use of medicinal plants is preferred because they are cost-effective (Hoareau and DaSilva, 1999). The phytochemical screening deal with identifying the important phytoconstituents of a plant, and antimicrobial activity deals with checking the effect of plants against particular microorganism (Ayoub *et al.*, 2019). Some of the previous finding suggests use of medicinal plants by studying phytochemicals

and antimicrobial activity against various microorganisms in Gujarat (Parekh and Chanda, 2007; Ram *et al.*, 2015). Also some research shows phytochemical screening and antimicrobial activity of *Xanthium strumarium* L. and *Datura metel* L. against pathogens (Vadlapudi and Kaladhar, 2012; Wadanakar *et al.*, 2022). But not much research has been found related to the efficacy of these two plants against *Rhizopus* genus of fungus. Therefore, in this study, potential of these two medicinal plants: *Xanthium strumarium* L. and *Datura metel* L., were tested against *Rhizopus* genus of fungus.

## MATERIALS AND METHODS

### Collection of plants

Both the plants *Xanthium strumarium* L. and *Datura metel* L. were collected from Junagadh, Gujarat.



Figure 1. Study area map – Junagadh

### Plant extract preparation

Aqueous extract was prepared. Plants were sundried and then crushed with help of mortar pestle and made powder form. Then stored in airtight container. Needed amount of dried powder was taken and added in water to prepare extract for phytochemical screening and antifungal activity (Dar *et al.*, 2016).

### Tests of various phytochemicals

Table 1. Phytochemical screening method

Sl. No.	Name of Test	Procedure	Indication of phytochemical by observation	References
01.	Protein	Add 4% NaOH and a few drops of $\text{CuSO}_4$ in 3ml plant extract	Violet or pink color	(Agidew, 2022; Evans, 2009)
02.	Carbohydrates	Add 1ml $\alpha$ -naphthol and 1ml conc. $\text{H}_2\text{SO}_4$ in 2ml plant extract	Purple or violet color	
03.	Phenol and Tannin	Add 1to 2 drops of 1% $\text{FeCl}_2$ in 2ml plant extract	Blue-black/blue-green precipitate	
04.	Flavonoids	Add 2ml 10% NaOH and 1% HCL in 1ml plant extract	Yellow to colorless	
05.	Saponins	Add 1ml distilled water to 3ml plant extract and shake vigorously	Froth formation	
06.	Glycosides	Add 2ml glacial acetic acid and 1 drop of ferric chloride with 1ml conc. $\text{H}_2\text{SO}_4$ in 3ml plant extract	Brown ring	
07.	Steroids	Add 2 to 3ml of $\text{CHCl}_3$ then add conc. $\text{H}_2\text{SO}_4$ in sides of plant extract	Red and yellow-green layer formation	
09.	Alkaloids	Add 1ml Wagner's reagent to 2ml of plant extract	Brown to reddish-brown color	

### Fungus Identification

Culture of fungus was obtained from Microbiology Lab of Department of Life Sciences, Bhakta Kavi Narsinh Mehta University, Junagadh. Identification of Fungus *Rhizopus* was done up until genus level.

### Media preparation and MIC determination

Media preparation was done by Potato Dextrose Agar. MIC determination was performed by serial dilution according to (Balakumar *et al.*, 2011).

### Antifungal activity

Antifungal activity was performed by agar well diffusion method according to (Balouiri *et al.*, 2016).

### Control experiment for antifungal activity

Control experiment was performed with the help of Fluconazole according to (Lewis *et al.*, 1998).

## RESULTS

### Phytochemical screening results

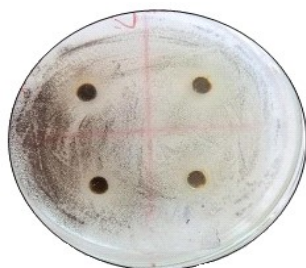
**Table 2. Phytochemicals in *Xanthium strumarium* L. and *Datura metel* L.**

No.	Name of Phytochemical	<i>Xanthium strumarium</i> L.	<i>Datura metel</i> L.
01.	Protein	-	-
02.	Carbohydrates	-	-
03.	Phenol and Tannin	+	+
04.	Flavonoids	-	+
05.	Saponins	-	+
06.	Glycosides	+	+
07.	Steroids	+	+
09.	Alkaloids	+	+

+ indicates presence of the compound and - indicates absence of compound

### Antifungal activity results

Antifungal activity showed positive results in both the plants. *Xanthium strumarium* L. plant extract showed 4mm zone of inhibition and *Datura metel* L. plant extract showed 5mm zone of inhibition.



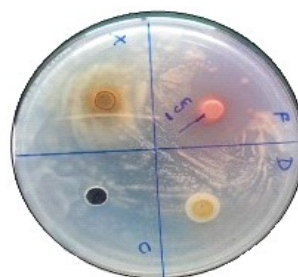
**Figure 2. Zone of inhibition obtained by using aqueous extract of *Xanthium strumarium* L. against fungus of genus *Rhizopus***



**Figure 3. Zone of inhibition obtained by using aqueous extract of *Datura metel* L. against fungus of genus *Rhizopus***

### Control experiment result

Control experiment performed with the help of Fluconazole showed 1cm zone of inhibition.



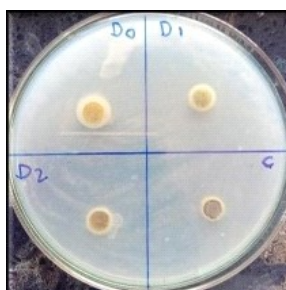
**Figure 4. Zone of inhibition obtained by using Fluconazole**

### MIC result

MIC for *Xanthium strumarium* L. was noted 1mm at 1:5 dilution and 1mm for *Datura metel* L. at for 1:4 dilution.



**Figure 5. MIC for *Xanthium strumarium* L.**



**Figure 6. MIC for *Datura metel* L.**

## DISCUSSION

The experiments performed in this study shows importance of two medicinal plants (Fan *et al.*, 2019; Soni *et al.*, 2012). Phytochemicals present in these plants play an important role in treating

ailments (Sahoo *et al.*, 2020; Sharma *et al.*, 2021). Earlier studies show presence of important phytochemicals present in both the plants (Muthusamy *et al.*, 2014; Sharifi-Rad *et al.*, 2015). Also, antifungal activity of both the plants have supporting studies with respect to various fungal genus (Asma *et al.*, 2013; Chukunda *et al.*, 2019; Devkota and Das, 2016; Hanif *et al.*, 2022; Rajesh and Sharma, 2002; Rodino *et al.*, 2014; Wondmnew *et al.*, 2016; Yadav *et al.*, 2013; Yusuf *et al.*, 2011). The results of antifungal activity are due to the presence of phytochemicals phenols, glycosides, steroids, and alkaloids (Simonetti *et al.*, 2020; Singh *et al.*, 2007; Tagousop *et al.*, 2018; Yang *et al.*, 2006).

### CONCLUSION

Medicinal plants *Xanthium strumarium* L. and *Datura metel* L. shows potential with respect to their ability to act against fungus. This study gives evidences that both of these plants can be used as antifungal agents. The phytochemicals present in both the compounds phenols, glycosides, steroids, and alkaloids can be used in further studies to create new drugs.

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### AUTHOR CONTRIBUTION STATEMENT

Anjana Solanki performed the experiment, Pratikkumar Chavada wrote the paper, Rajesh Raviya designed the framework of the experiment, supervised the experiment, analyzed and interpreted the data.

### CONFLICT OF INTEREST

The authors do not have any conflict of interest

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