Original Research Article **Allied sciences**

International Journal of Pharma and Bio Sciences

ISSN 0975-6299

ANTIFUNGAL ACTIVITY OF SELECTED MEDICINAL PLANTS EXTRACT AGAINST HUMAN PATHOGENIC FUNGUS *CANDIDA ALBICANS*

ARUN KUMAR*[1], VIJAI MALIK[1] AND SHRUTI SAINI[2]

[1] Department of Botany, M.S. College Saharanpur-247001 (U.P.) India
[2] Department of Biotechnology, Satguru Institute of Education & Technology, Nakur-247342 Saharanpur (U.P.) India

ABSTRACT

The present investigation was carried out to observe the antifungal activity of *Alstonia scholaris, Argemone maxicana, Datura alba*, *Solanum nigrum* and *Solanum xanthocarpum.* For this purpose effect of different alcoholic extract concentration was observed on growth performances of *Candida albicans* on 5th and 7thday. Result shows that alcoholic extract concentrations inhibit radial growth of this fungus. Results also indicate that inhibition of fungal growth increase with the increase in the concentration of alcoholic extracts.

KEYWORDS: **Medicinal plants extracts, antifungal activity, alcoholic extract, human pathogenic Fungus, *Candida***

ARUN KUMAR
Department of Botany, M.S. College Saharanpur-247001 (U.P.) India.

***Corresponding author**

Received on : 11-08-2016
Revised and Accepted on : 03-11-2016
DOI: http://dx.doi.org/10.22376/ijpbs.2017.8.1 .b70-73

INTRODUCTION

The medicinal plants were in use since ages, Indian subcontinent uses plants for curing diseases, and the stream of science which deals with plants and its therapeutic effects were governed by Ayurveda. Ayurveda remains an important system of medicine and drug therapy in India. Ayurveda is totally dependent on herbal plants and its derivatives.[1] Herbal medicines can be obtained from various plant parts like root, stem, leaves etc at little or no cost. They usually contain many biologically active ingredients and are used primarily for treating mild or chronic ailments. *Argemone mexicana* contains alkaloids as berberine, protopine, sanguinarine, optisine, chelerythrine etc. The seed oil contains myristic, palmitic, oleic, linoleic acids etc., the plant is diuretic, purgative and destroys worms. It cures leprosy, skin-diseases, inflammations and bilious fever.[2] *Argemone mexicana* leaves are useful in cough, wounds, ulcers and in skin diseases. Also uses as antimalarial activity, anti-helmintic, anti inflammatory, wound healing, anti-bacterial and antifungal activities.[3] Herbal plant extracts of *Datura metel*, *Acalypha indica* and *Phyllanthus amarus* has shown that the ethanol extract shows promising antimicrobial activity against bacterial and fungal human pathogens in comparison to acetone extract.[4] Many plants produce secondary metabolites. These metabolites may serve as potent antimicrobial agents and thus may be useful for human beings. It has been estimated by the World Health Organization (WHO) that 80 percent of the population of some Asian and African countries presently use herbal medicine for some aspect of primary health care.[5] *Datura* plant is an important medicinal plant are used to relieve pain, due to its antioxidants, antimicrobial contents, as it is a well known source of different phytochemicals (secondary metabolites), and it is distributed throughout most of the part of the world, *Datura* grows as a wasteland weed.[6] *Datura* leaves are used as narcotic, anodyne and antispasmodic. Seeds are aphrodisiac, narcotic, antispasmodic and useful in otalgia, gastropathy, skin diseases and good to treat dandruff and lice. The roots are used to treat bites from rabies dogs and are also used to cure insanity.[7] Lupeol and Epicatechin have been identified in the methanol extract of *Alstonia scholaris.* This extract has shown antioxidant and anticancer effect. It also have significant antimicrobial effect against *Staphylococcus aureus* and gram negative organisms like *Escherichia coli*, *Proteus vulgaris*, *Pseudomonas auriginosa* and *Candida albicans*.[8] The phytochemical screening crude extract of *Solanum nigrum* revealed the presence of bonding structures, responsible for presence of alkyl groups, methyl groups, alcohols, ethers, esters, carboxylic acid and anhydrides. Leaves, stem and fruit containes the highest concentration of gentisic acid, luteolin, apigenin, kaempferol, and m-coumaric acid that may be responsible for its antifungal activity.[9] *Solanum xanthocarpum* fruits are eaten as an anthelmintic and for indigestion. Root is an expectorant, used in Ayurvedic medicine for cough, asthma, chest pain, flatulence, sore throat and toothache. The root is an important ingredient of the well-known ayurvedic medicine Dasamula. Kant Kari is used in medicine invarious forms, such as decoction, electuary, ghrita, etc. Medicinal plants represent a rich source of antimicrobial agent. Plants generally produce many secondary metabolites which constitute an important source of microbicides, pesticides, fungicide and many pharmaceutical drugs. Plant products still remain the principal source of pharmaceutical agents used in traditional medicine.[10] Many of the Pharmaceuticals like opium, aspirin, digitalis, quinine etc have a long history of usage as herbal remedies. It is estimated that about 25% of all modern medicines are directly or indirectly derived from higher plants.[11-12] Traditionally herbal medicines provide an interesting, largely unexplored source of potential new drugs.[13] Antifungal activity of eight medicinal plants extract (*Aloe vera, Ocimum sanctum, Centella asiatica, Piper betle, Calotropis gigantea, Vitex negundo, Ocimum basilicum* and *Azadirachta indica*) was assayed by agar well diffusion method on plant pathogenic fungus (red rot disease causing agent) *Colletotrichum falcatum*. The result revealed that the extract of eight medicinal plants have significant reduction in growth of *C. falcatum*.[14] Butanolic extract from bark of the *Alstonia scholaris* have potent anti-tubercle effect and anti-*Mycobacterium tuberculosis* potential and it was concluded that it is a promise for future therapeutic interventions.[15] The present study has been aimed to screen out the antifungal activity of five medicinal plants against *Candida albicans*.

MATERIALS AND METHODS

Sample Collection

Samples of the following medicinal plants were collected from district Saharanpur & Shiwalik belt of Uttar Pradesh as well as from Garhwal hills of Uttarakhand, India.

1. *Alstonia scholaris*
2. *Argemone maxicana*
3. *Datura alba*
4. *Solanum nigrum*
5. *Solanum xanthocarpum*

The freeze-dried pathogenic fungi *Candida albicans* was obtained from Forest Pathology Division, Forest Research Institute, Dehradun. The culture was maintained on Sabouraud Dextrose Agar (SDA) slants and kept refrigerated until used. The SDA plate cultures were inoculated from the slants and incubated at 25 ± 1°Cfor 7 days.

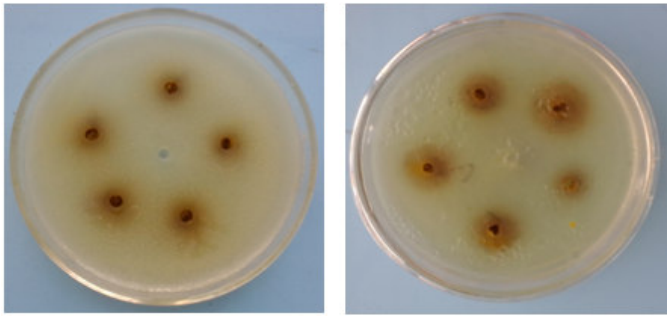
Plant Extract Preparation

For the preparation of various plant extracts 5 gm of fresh plant part was washed 2-3 times with distilled water and then treated with 0.1% $HgCl_2$ solution for sterilization. After surface sterilization plant samples were grounded in mortar & pestle with 50% methanol. The homogenized liquid was filtered and centrifuged at 5000 rpm. The supernatants were used as test extract & volume make up 20 ml using 50% methanol. Further, the extract was diluted into different concentrations, i.e. 10%, 25% and 50%. 20 ml of SDA (Sabouraud Dextroes Agar) culture medium with 5 ml of the above concentration of the extracts were poured in sterile petriplates and allowed to solidify. In the control same volume of distilled water (in place of experimental material) was mixed in appropriate amounts.

Fungal Inoculation

For antifungal activity mycelia discs of 5 mm diameter were cut from the periphery of 7 day old culture of the test organism and were aseptically inoculated upside down on the surface of the SDA medium in plates.Inoculated petriplates were incubated at 25^0 C ± 1^0C and observations were recorded at 5th and 7th day. After 5th and 7th day of incubation, observations were recorded on the basis of colony diameter (cm) on medium and percent inhibition of radial growth was calculated by using following formula:

$$\% \text{ Growth Inhibition} = \frac{\text{Colony diameter in control} - \text{Colony diameter in treated sets} \times 100}{\text{Colony diameter in control}}$$



Picture of culture plates showing zone of inhibition.

OBSERVATIONS AND RESULTS

The present investigation was carried out to observe the antifungal activity of *Alstonia scholaris, Argemone maxicana, Datura alba, Solanum nigrum* and *Solanum xanthocarpum.* For this purpose effect of different alcoholic extracts concentrations with (10%, 25% and 50%) were observed on the growth performances of *Candida albicans* causing human skin diseases are given in table 1.

Antifungal activity of Alstonia scholaris on Candida albicans

Results in table 1 shows that the growth is inhibited by alcoholic extract concentration and the inhibition rate increases with the increase in doses of plant part extract. Thus, radial growth of these fungi in 10%, 25% and 50% root extract concentration is 83.3%, 73.3% and 53.3% of the control respectively at 7th day. Result further shows that the growth is inhibited more in 75% shoot and seed extract concentration as compared to 10% alcoholic extract concentration. Thus, in 10% shoot and seed extract concentration the radial growth of this fungi was 85.7% and 76.6% of control respectively, at 7th day, while, these values in 50% shoot and seed concentrations are 60.7% and 46.6% of the control respectively on 7th day.

Antifungal activity of Argemone maxicana on Candida albicans

Table 1 shows the effect of different concentrations of alcoholic extracts of various plant parts of *Argemone maxicana* on growth of *Candida albicans.* Result shows that the radial growth of *Candida albicans* is affected by various concentration of alcoholic extract of this plant parts. Observation further shows that with the increase in concentration of this medicinal plant parts the rate of inhibition of fungal growth also increases. Thus, in 10%, 25% and 50% alcoholic concentration of root the radial growth is 80.0%, 65.0% and 55.0% of the control respectively at 7th day of growth. Result further shows that like root extract, shoot and seed extract also inhibits radial growth of fungi, however, this inhibition is more in higher concentration as compared to lower concentration of various plant parts of *Argemone maxicana*.

Antifungal activity of Datura alba on Candida albicans

Results from table 1 shows that the growth of *Candida albicans* also inhibited by the alcoholic extract of various parts of *Datura alba*. Thus, radial growth values of this fungus are 85.0%, 75% and 60.0% of control in 10%, 25% and 50% alcoholic root extract concentration respectively at 7th day of growth. Result also shows that with the increase in plant extract concentration, the rate of inhibition increases. Thus, in 10% alcoholic shoot extract the radial growth is 90.0% of the control whereas same growth in 50.0% shoot extract is 65.0% of the control.

Antifungal activity of Solanum nigrum on Candida albicans

Table 1 result shows that various concentrations of alcoholic extract of *Solanum nigrum* also inhibit the radial growth of *Candida albicans*. Observation shows that with the increase in the concentration of alcoholic plant part extracts like root extract, shoot extract and seed extract, the rate of inhibition increases. Thus, in 10% alcoholic root extract the growth is ca. 90% of the control whereas in 50% root extract concentration, the growth is 71.4% of the control. Result further shows that shoot and seed extract also causes increase in inhibition rate like root extract.

Antifungal activity of Solanum xanthocarpum on Candida albicans

Results in table 1 shows that the growth of *Candida albicans* also inhibited by the alcoholic extract of various parts of *Solanum xanthocarpum*. Thus, radial growth values of *Candida albicans* is 92.3%, 69.2% and 53.8% of control in 10%, 25% and 50% alcoholic root extract concentration respectively. The growth of *Candida albicans* also affected in the presence of various alcoholic extract concentrations of shoot and seed. Result also shows that with the increase in plant extract concentration the rate of inhibition increases. Thus, in 10% alcoholic shoot extract the radial growth is 86.6% of the control whereas same growth in 50% shoot extract is 43.3% of the control.

Table 1
Antifungal activity of *Alstonia scholaris, Argemone maxicana, Datura alba, Solanum nigrum, Solanum xanthocarpum* on growth performance of *Candida albicans*

Days	*Alstonia scholaris*			*Argemone maxicana*			*Datura alba*			*Solanum nigrum*			*Solanum xanthocarpum*		
	Root	Shoot	Seed	Root	Shoot	Seed	Root	Shoot	Seed	Root	Shoot	Seed	Root	Shoot	Seed
Growth in Control 0% extract															
5th	2.0	1.6	1.9	1.6	1.5	1.8	1.3	1.2	1.4	1.8	1.5	1.6	1.2	1.4	1.6
7th	3.0	2.8	3.0	2.0	2.2	2.0	2.0	2.0	2.2	2.1	2.2	2.4	2.6	3.0	2.8
Growth in 10% alcoholic extract															
5th	1.6	1.5	1.8	1.3	1.2	1.6	1.0	1.1	1.3	1.6	1.4	1.4	1.0	1.1	1.2
7th	2.5	2.4	2.3	1.6	1.8	1.5	1.7	1.8	2.0	1.9	2.0	2.0	2.4	2.6	2.2
Growth in 25% alcoholic extract															
5th	1.5	1.5	1.6	1.0	1.0	1.2	0.9	1.0	1.0	1.0	1.0	1.1	0.9	1.1	1.2
7th	2.2	2.1	2.0	1.3	1.4	1.1	1.5	1.6	1.8	1.7	1.8	1.6	1.8	1.5	1.6
Growth in 50% alcoholic extract															
5th	1.3	1.2	1.0	0.8	0.7	1.0	0.8	0.8	0.9	0.9	0.8	1.2	0.8	0.8	1.0
7th	1.6	1.7	1.4	1.1	1.2	1.0	1.2	1.3	1.6	1.5	1.4	1.2	1.4	1.3	1.2

DISCUSSION AND CONCLUSION

Studies on herbal plant extracts showed that the various solvent extracts showed promising antimicrobial activity against fungal human pathogens. These extracts can be utilized for isolation and characterization of therapeutically active chemical constituents used in modern medicines. Alcoholic plant extracts used here showed significant antifungal activity against *Candida*. So this antifungal property provides a scientific basis for the use of these plants as suitable antifungal agent. These extracts can be used against skin infection caused by *Candida.* This study also encourages that these plant should be cultivated in large scale to increase the use of these plant in traditional medicine. Results with different alcoholic extract concentration of *Alstonia scholaris, Argemone maxicana, Datura alba, Solanum nigrum, Solanum xanthocarpum* on the radial growth of pathogenic fungus like *Candida albicans* clearly shows that alcoholic extract concentration inhibits radial growth of opportunistic fungi. Result indicates that inhibition of fungal growth increase with the increase in the concentration of alcoholic extracts.

CONFLICT OF INTEREST

Conflict of interest declared none.

REFERENCES

1. Tyagi R, Sharma G, Jasuja ND, Menghani E. Indian medicinal plants as an effective antimicrobial agent. Journal of Critical Reviews. 2016; 3(2):69-71.
2. Khade KA. Report on Antimicrobial activity and phytochemical screening of *Argemone Mexicana* Linn. AE International Journal of Multidisciplinary Research. 2015; 3(8):1-7.
3. Al-Madhagi W, Albarai I, Alariqi W, Alammari M, Noman NM, Mohamed K. Extraction, formulation and evaluation of yemeni *Argemone Mexicana linn* as antimicrobial and wounds healing agent. European Journal of Biomedical and Pharmaceutical Sciences. 2016; 3(6):627-633.
4. Sekar D, Kolanjinathan K, Saranraj P, Gajendiran K. Screening of *Phyllanthus amarus, Acalypha indica* and *Datura metel* for its antimicrobial activity against selected pathogens. International Journal of Pharmaceutical & Biological Archives. 2012; 3(5):1231-1235.
5. Akerele O. Summary of WHO guidelines for the assessment of herbal medicines. Herbal Gram. 1993; 28:13-19.
6. Al-Ghamdi AY. Inhibition of *Candida albicans* and *Streptococcus mutans* with *Datura* leaf and seed extracts. International Journal of Pharmacy and Pharmaceutical Sciences. 2015; 7(2):403-406.
7. Shah H, Verma S, Tripathi R. Antifungal screening and quantification of *Datura metel* Linn. Columbia Journal of Pharmaceutical Sciences. 2014; 1:01-09.
8. Thara KM, Zahra F. Biochemical, HPLC, LC-MS Analysis and Biological activities of methanol extract of *Alstonia scholaris.* International Journal of Phytotherapy. 2013; 3(2):61-74.
9. Shahbaz H, Jabeen K, Iqbal S. Evaluation of antifungal activity of S*olanum nigrum* against *Aspergillus niger* the cause of black rot disease of onion. Pakistan Journal of Phytopathology. 2015; 27(02):121-125.
10. Gaherwal S, Shiv G, Wast N. Antifungal activity of *Solanum xanthocarpum* (kantkari) leaf extract. World Journal of Zoology. 2014; 9(2):111-114.
11. Cragg GM, Newman DJ, Snader KM. Natural products in drug discovery and development. Journal of Natural Products. 1997; 60(1):52-60.
12. Shu YZ. Recent natural products based drug development: A pharmaceutical industry perspective. Journal of Natural Products. 1998; 61(8):1053-1071.
13. Udgirkar RF, Kadam P, Kale N. Antibacterial activity of some Indian medicinal plant: a review. International Journal of Universal Pharmacy and Biosciences. 2012; 1(1):1-8.
14. Prince L, Prabakaran P. Antifungal activity of medicinal plants against plant pathogenic fungus *Colletotrichum falcatum.* Asian Journal of Plant Science and Research. 2011; 1 (1):84-87.
15. Antony M, James J, Misra CS, Mundur Sagadevan LD, Thaliyil Veettil AK,Thankamani, V. Anti mycobacterial activity of the plant extracts of *Alstonia scholaris.* International Journal of Current Pharmaceutical Research. 2012; 4(1):40-42.