



2021 Volume:21 Pages:1-4

Antitoxic Effect of *Solanum nigrum* (Black berry) Leaf on Growth and Aflatoxin Production by *Aspergillus flavus*

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ABSTRACT

Solanum nigrum (Black berry) belongs to family Solanaceae and is one of the important medicinal plants. It has been used in traditional Indian medicines. The leaf of the plant was used to observe the antitoxic property of *Aspergillus flavus*, a fungus that produces a very toxic compound aflatoxin which has carcinogenic, mutagenic and teratogenic effects on animals and human beings.

In the Present study, the aqueous extract of *Solanum nigrum* was prepared and used against the growth and aflatoxin production by *Aspergillus flavus*. Five different concentrations viz, 5, 10, 15, 20 and 25% were tested using SMKY liquid medium, in which the inoculum of *A. flavus* was put under sterilized laboratory condition. A control was maintained for each treatment. The study was conducted in replicates and final result is presented here. The dry mycelial weight of *A. flavus* at 5, 10, 15, 20 and 25% concentrations of the plant extract were 920, 830, 780, 640 and 580 mg/ flask, showing an inhibition of 10.7, 13.7, 24.5, 31.5 and 41.4% respectively. The suppression in aflatoxin production was 31.2, 40.5, 51.8, 64.0 and 68.5% respectively.

Key words: - *Solanum nigrum*, *Aspergillus flavus*, fungus, aflatoxin

Paper History: Paper Received on 25/11/2021, Accepted on 02/12/2021 Published on 07/04/2022



INTRODUCTION

Solanum nigrum contains alkaloids named solanine A, 7 α -OH khasianine, 7 α -OH solamargine and 7 α -OH solasonine and has high medicinal value. It is hepatoprotective, diuretic and antipyretic and is used in pneumonia, aching teeth, stomach ache, tonsillitis, wintworms, pain and inflammation.

The leaf of *Solanum nigrum* has antitoxic properties. It inhibits aflatoxin production, produced by fungus *Aspergillus flavus*. According to Clotty et al., (1994), the aflatoxin producer fungus *Aspergillus flavus* is widely distributed in warm climates. Aflatoxin contaminates food and feed commodities. Hesseltine (1976) opined "India is an ideal country for problems of aflatoxin to develop since it has high temperature and high moisture levels during monsoon season and often inadequate storage facilities." Aflatoxin is considered to be one of the biggest threats to mankind.

MATERIAL & METHODS

A toxigenic strain of *Aspergillus flavus* was isolated and cultured on PDA Slants and maintained at low temperature in a refrigerator. Few subcultures of the strain were prepared and kept at room temperature 7- days prior to the experimental works.

The leaf of the plant was thoroughly washed with sterile distilled water and dried in hot air oven at 60⁰C for 4-7 days. Twenty grams of plant part (leaves) was weighed and aqueous extract was prepared.

Finally the blend was adjusted to 100 ml. The extract was filtered through several layers of cheese cloth and the filtrate was centrifuged. The supernatant was used as test extract.

An appropriate amount of the test extract was added to SMKY liquid medium in order to make required concentration of 5, 10, 15, 20 and 25%. After proper sterilization, the entire set was inoculated with 0.5 ml spore suspension (10⁶ spores/ml), prepared from 7- day old culture of the *A. flavus* and incubated at 28 \pm 2⁰ C for 7 days. Three replicates for each treatment were maintained.

After the incubation period, cultures were filtered through Whatman No. 1 filter paper. The filter paper with mycelial mats was dried to constant weight at 60⁰C. The chloroform extract was passed through anhydrous Sodium and evaporated to dryness. The residue was dissolved in 0.5 ml chloroform and kept in a vial for the quantitative estimation using TLC Plate.

RESULT & DISCUSION

The aqueous extract of the plant part (leaf) showed a varying degree of activities on the growth and aflatoxin production by *Aspergillus flavus*. A comprehensive data showing mycelial dry weight, aflatoxin production and the ratio of toxin production versus growth of the fungus at five different concentrations as well as a comparison of inhibition in toxin production and growth of the fungus are presented in fig. 1.



The inhibition patterns in the growth and aflatoxin production by the fungus were remarkably different as compared to all other treatments. A decrease of 4% in growth and 15% in the synthesis of aflatoxin was recorded at 5% of the extract supplement. Thereafter, the inhibition in growth of *A. flavus* was 10.7, 13.7, 24.5 and 31.5% where as suppression in the toxin production was 31.2, 40.5, 51.8 and 64.0% (fig.1). A decreased toxin production at all the extract supplements resulted in lowering of the toxin versus growth ratio which was 0.036 in the control set followed by 0.031 at 5% and 0.019 at 25% concentration of the extract.

The antimicrobial properties of the plant part and the active principles involved have been elucidated in several monumental works. Many of these have been compiled in volumes (Hussain et. al., 1992). In recent past researchers have drawn significant attention in the treatment of ailment by the extracts of *Solanum nigrum* in liver damage (Chou et al., 2008; Linaw et al., 2008).

Control of aflatoxin by the use of plant extracts have been experimented in the recent past and these appear to be an ideal alternative to protect food and feed from the fungal contamination (Mishra and Das, 2003; Reddy et al., 2009).

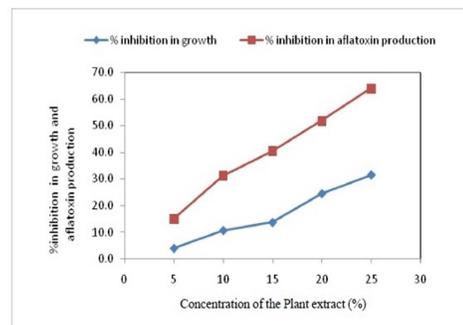


Fig. 1 : Effect of *Solanum nigrum* extract on growth and aflatoxin production by *A. flavus*.

The varied pattern of effectiveness is important in targeting and determining the active principles involved in such processes. It appears that active constituents present in *S. nigrum* primarily interfere the biosynthetic pathways leading to the synthesis of aflatoxin.

CONCLUSION

The natural plant product is of interest as a source of safer or more, effective substitutes for prevalent chemical antimicrobial agents and may provide alternative way to prevent food and feed from fungal or aflatoxin contamination. The contamination of food crop by fungi and accumulation particularly of aflatoxin are serious agricultural problem. *Solanum nigrum* leaf extract has good inhibitor of both growth of *A. flavus* and aflatoxin production. *Solanum nigrum* has high medicinal values. The present findings might help in management of several diseases.



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ACKNOWLEDGEMENT

Authors are thankful to the Head, Department of Botany, H.D. Jain College, Ara for Providing laboratory facilities.

