International Journal on Recent Advancement in Biotechnology & Nanotechnology
https://www.eurekajournals.com/biotech.html
ISSN: 2582-1571

Impact of Aloe Vera Gel on Inhibiting the Growth of Fungal Pathogens Growing on Foods

Rishabh Chitranshi[1], Saurabh Mishra[2]

[1]School for Bio-Engineering and Sciences, Shobhit University, Gangoh, Saharanpur, UP, India-247341.
[2]S.L. Education Institute, Muradabad, UP, India-244102.

Abstract

Aspergillus flavus and *Aspergillus niger* are well-known food borne fungal pathogen causes very harmful effect on feed and food products. Infection spreads dangerously, especially in foods having excessive moisture and nutrients. Keeping in view of the pathogenicity of fungus the experiment was designed to analyze the impact of garden aloe vera gel in pure form for antifungal assay on both fungal isolates via disc diffusion method. It was clearly observed after aprox 7 days, that aloe gel inhibits the growth of each fungus with a clear zone in comparison to the control plates.

Introduction

Two well-known pathogenic fungi that contaminate food grains and are also prevalent on many types of unprotected organic matter are *Aspergillus flavus* and *Aspergillus niger* (Paterson and Lima 2017). These fungi produce several metabolites, of which aflatoxins are carcinogenic in nature. Additionally, aflatoxins are considered the most potent mycotoxins. It is capable of causing a range of harmful consequences (sarma et. al. 2017). Therefore, Pathogenic strains of *A. Flavus* and A. Niger are in dire need of control over aflatoxin production (Daou et. al. 2021). Consumption of aflatoxin-contaminated food causes serious diseases or can be fatal if consumed in large numbers (Mahato et. al. 2019). Therefore, inhibiting mold growth on substrates is important to reduce the harmful effects of aflatoxins (Bianchiniand Bullerman 2009). On the other hand Aloe vera (Aloe barbadensis Miller) is a member of the family Liliaceae, widely used as a natural treatment and alternative therapy for various types of diseases, and several studies have suggested the healing, cosmetic, and nutritional benefits of this plant (Babu and Noor 2020). Like other plants *A. vera* is rich in vitamins (E, C, and A) and has a low fat and high fibre content (Miranda et. al. 2009), which are responsible for its therapeutic and functional properties. The plant also has impactful antifungal properties against various pathogenic microorganisms and hence it may become beneficial to inhibit the growth of fungal pathogens. Hence, the aim of this study was to evaluate the impect of A. vera gel on selected food borne disease causing fungal pathogens.

Materials and Methods

Sample collection

Aloe vera species used in this research study were obtained from the University Garden area in the campus of Shobhit University, Gangoh, District Saharanpur, Uttar Pradesh. Moreover, pathogenic fungi were obtained from infected peanut seeds, which were stored for 3–4 weeks under moist conditions.

Purification of fungus

The surface of every infected groundnut was being sanitized for 30 seconds with 1 percent sodium hypochlorite before undergoing three thorough rinses with sterilized distilled water. Infected seeds were extracted from their shells and allowed to air dry before being put on potato dextrose agar (Hi media) plates. Fungal colonies started to develop on seeds after 5-7 days of incubation at 28°C. These were removed and further purified on PDA plates. Then, for future investigations and examination, pure fungal colonies were used in duplicate (Chitranshi and Arora 2019).

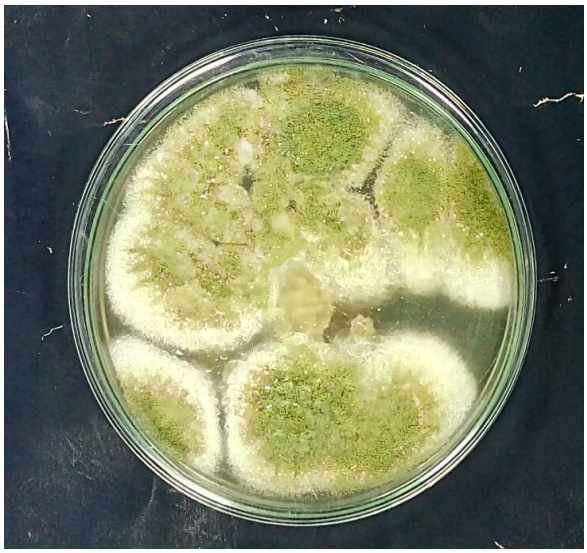
Analysis of antifungal activity

The disc diffusion assay method was used to test antifungal activity of Aloe vera gel against two chronic plant pathogenic fungi *Aspergillus niger and A. flavus*. Firstly, 2-3 fresh Aloe Vera leaves were plucked and washed thoroughly in tap water, then rinsed with distilled water two to three times. Now gel was separated from the leaves and collected into a beaker. Further, small filter paper discs dipped in aloe vera gel were placed on a PDA plate at a certain distance between which the fungus was growing and the zone of inhibition was observed after 5-7 days of incubation at 28°C.

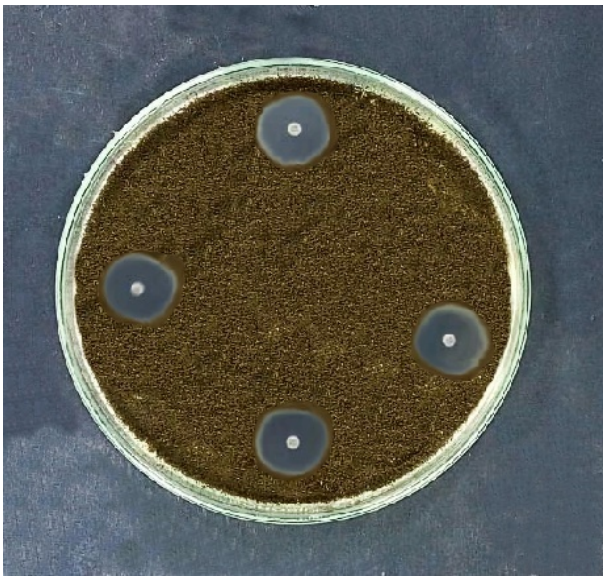
Results and Discussion

In the above experiment, aloe vera gel had a profound effect on fungal growth and as expected aloe vera gel showed significant results by inhibiting the growth of *Aspergillus niger*, and *A. flavus*, indisc diffusion method for antifungal activity analysis (Fig. 3 & 4) in comparison with control (fig. 1 & 2). Aloe vera gel posses' remarkable antifungal activity toward *A. niger* & *A.flavus*. Similarly, Saniasiaya et. al. 2017 observed zone of inhibition for *A. niger*, at different concentrations. Further, according to Pandey et. al. 2011 Aloe vera gel showed highest antifungal activity against *A. niger* than any other seed extract used. The antibacterial activity found promising against *A. niger& A. flavus* strains in comparison to standards (Ahmad et. al. 2022)

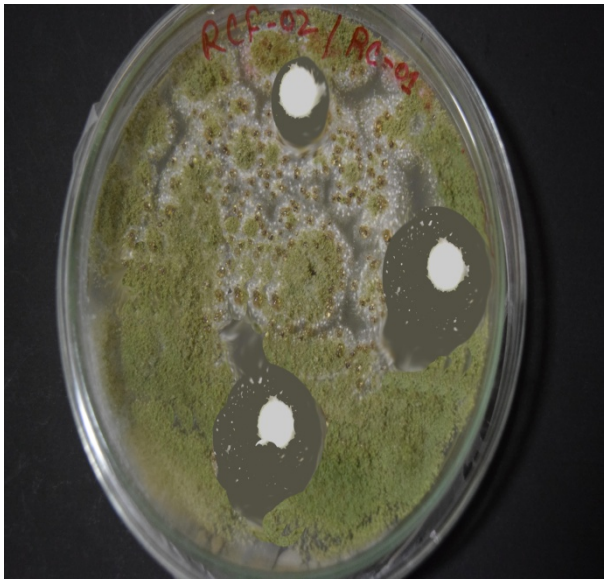
Aspergillus niger control plate



Aspergillus flavus control plate



Aspergillus niger disc diffusion plate



Aspergillus flavus disc diffusion plate

Conclusion

In concluding remark of investigation, the authors found that Aloe vera gel efficiently inhibited *A. niger* and *A. flavus* pathogens that are common in peanuts and have natural qualities that do not affect mankind or animals. As a natural bio-control agent against fungi, aloe gel appears to be the most cost-effective and effective substitute for chemicals. Moreover, these kinds of natural compounds may properly develop as a global alternative for chemical preservatives. Advance study is required on this issue worldwide.

Acknowledgement

The authors of this paper are very thankful to Authorities of Shobhit University, Gangoh, Saharanpur & S.L. Institute, Muradabad, UP for providing such research facility in the Departments.

References

Paterson, R. R. M., & Lima, N. (2017). Filamentous fungal human pathogens from food emphasising Aspergillus, Fusarium and Mucor. Microorganisms, 5(3), 44.

Sarma, U. P., Bhetaria, P. J., Devi, P., & Varma, A. (2017). Aflatoxins: Implications on health. Indian Journal of Clinical Biochemistry, 32(2), 124-133.

Daou, R., Joubrane, K., Maroun, R. G., Khabbaz, L. R., Ismail, A., & El Khoury, A. (2021). Mycotoxins: Factors influencing production and control strategies. AIMS Agriculture and Food, 6(1), 416-447.

Mahato, D. K., Lee, K. E., Kamle, M., Devi, S., Dewangan, K. N., Kumar, P., & Kang, S. G. (2019). Aflatoxins in food and feed: an overview on prevalence, detection and control strategies. Frontiers in microbiology, 10, 2266.

Bianchini, A., &Bullerman, L. B. (2009). Biological control of molds and mycotoxins in foods.

Babu, S. N., & Noor, A. (2020). Bioactive constituents of the genus Aloe and their potential therapeutic and pharmacological applications: A review. Journal of Applied Pharmaceutical Science, 10(11), 133-145.

Miranda, M., Maureira, H., Rodriguez, K., & Vega-Gálvez, A. (2009). Influence of temperature on the drying kinetics, physicochemical properties, and antioxidant capacity of Aloe Vera (Aloe Barbadensis Miller) gel. Journal of Food Engineering, 91(2), 297-304.

Chitranshi, R., & Arora, N. (2019). Isolation and characterization of dominant pathogenic fungus Aspergillus flavus from storage seeds of groundnut, International Journal of Emerging Technologies and Innovative Research, 6(4), 128-131.

Saniasiaya, J., Salim, R., Mohamad, I., & Harun, A. (2017). Antifungal effect of Malaysian Aloe vera leaf extract on selected fungal species of pathogenic otomycosis species in in vitro culture medium. Oman Medical Journal, 32(1), 41.

Pandey, A., Jagtap, J. V., Polshettiwar, S. A., & Kuchekar, B. S. (2011). Formulation and Evaluation of Antibacterial and Antifungal Activity of Herbal Gel Containing Aloe vera, Azadirachtaindica and Lycopersiconesculentum Seed Extract. Res. J. Pharm. Technol, 4, 552-554.

Ahmad, B., Khan, M. I., Naeem, M. A., Alhodaib, A., Fatima, M., Amami, M., & Iqbal, M. (2022). Green synthesis of NiO nanoparticles using Aloe vera gel extract and evaluation of antimicrobial activity. Materials Chemistry and Physics, 126363.