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Exploring the Antifungal Potential of Camphor Oil against *Aspergillus parasiticus* using the Poisoned Food Technique

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Abstract:

The present study investigates the effect of camphor oil on *Aspergillus parasiticus* using the Poisoned Food Technique. *Aspergillus parasiticus* is a common fungal pathogen known to cause various agricultural and food-related diseases. Camphor oil, derived from the camphor tree, has shown promising antimicrobial properties in previous studies. In this experiment, the Poisoned Food Technique was employed to evaluate the antifungal potential of different concentrations of camphor oil viz., 20%, 40%, 60%, 80% and 100% against *Aspergillus parasiticus* isolated from okra (*Abelmoschus esculentus*). Different concentrations of camphor oil were incorporated into the growth medium, and the inhibition of fungal growth was measured. The results indicate that camphor oil exhibits a significant antifungal effect on *Aspergillus parasiticus* at all concentrations. These findings suggest that camphor oil has potential as a natural alternative to synthetic fungicides in controlling *Aspergillus parasiticus* and mitigating its detrimental impacts on agriculture and food safety.

Keywords: *Aspergillus parasiticus*, *Abelmoschus esculentus*, camphor oil, antifungal activity, Poisoned Food Technique, agricultural diseases, food safety.

Introduction:

Aspergillus parasiticus is a fungal species known for its role as a plant pathogen, causing significant economic losses in agricultural settings. As a member of the *Aspergillus* genus, it thrives in various environments and is particularly adept at colonizing crops and stored food products. This filamentous fungus primarily affects plants during the pre- and post-harvest stages. It produces aflatoxins, potent mycotoxins that can contaminate crops such as corn, peanuts, cottonseed, and tree nuts. These toxins pose a serious health risk to both humans and animals, as they are highly carcinogenic and may lead to liver and other organ damage. *Aspergillus parasiticus* is highly opportunistic, taking advantage of weakened or stressed plants to establish infection. The fungus enters the plant through wounds or natural openings, such as stomata. Once inside, it invades and colonizes plant tissues, interfering with vital physiological processes and causing symptoms like wilting, discoloration, and lesion formation. Prevention and control of *Aspergillus parasiticus* involve a combination of good

agricultural practices and post-harvest measures. Farmers need to implement proper crop rotation, use disease-resistant varieties, and maintain optimal irrigation and fertilization practices to minimize plant stress. Adequate storage conditions, temperature control, and moisture management are crucial in limiting fungal growth in stored crops. Regular monitoring and early detection of fungal presence are vital to prevent extensive damage. *Aspergillus parasiticus* is a formidable plant pathogen that poses significant challenges to agricultural industries and food safety. Proactive management strategies and vigilant monitoring are essential to mitigate its impact on crops and minimize the risk of aflatoxin contamination.[1,2,3,4]

Camphor oil, derived from the camphor tree (*Cinnamomum camphora*), has been recognized for its potential antifungal properties. The oil contains active compounds like camphor, which have shown inhibitory effects against various fungal strains. As an antifungal agent, camphor oil works by disrupting the cell membrane of fungi, impairing their growth and reproduction. This leads to the death or suppression of fungal activity. Its effectiveness has been observed in treating fungal infections of the skin, such as athlete's foot and nail fungus. One of the advantages of using camphor oil is its natural origin, which may appeal to those seeking alternative remedies. Camphor oil possesses antifungal properties that may offer a natural alternative for managing fungal infections, but further research is needed to establish its efficacy and safety fully. This research paper aims to investigate the potential antifungal efficacy of camphor oil against *Aspergillus parasiticus* and explore its applicability as a natural fungicide.[5,6,7,8]

Materials and Methods:

- Sample collection

Seed Sample

Untreated seeds of okra were collected from Indian Institute of Horticultural Research, Bengaluru, Karnataka, India.

Fungal strain

Aspergillus parasiticus was isolated from okra seeds by agar plate method.

- Antifungal assay

Effect of camphor oil on *Aspergillus parasiticus* was studied by Poisoned Food Technique. Different concentrations of camphor oil viz., 20%, 40%, 60%, 80% and 100% were incorporated in potato dextrose agar media at 1000 ppm. Control plates without camphor oil were also prepared. After inoculation the plates were kept at 28°C for seven days. After seven days plates were observed for the effect of camphor oil on *Aspergillus parasiticus*.

Results:

Results revealed that camphor oil exhibited significant effect against *Aspergillus parasiticus*. Control showed the growth of 40 mm, 20% showed complete growth, 40% showed the growth of 30 mm, 60% showed the growth of 39 mm, 80% showed growth of 35 mm and 100% showed complete inhibition.

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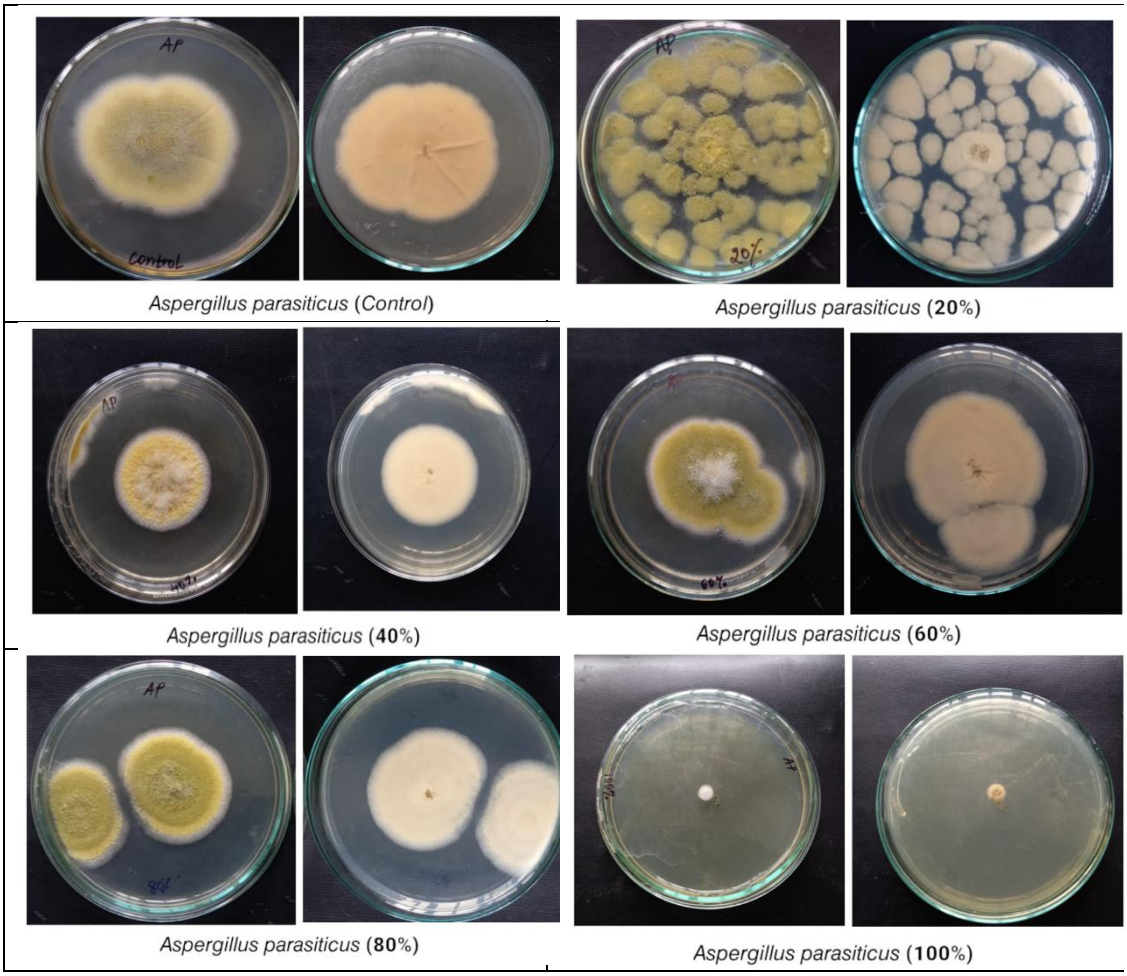

Fig 1: Antifungal activity of camphor oil against *Aspergillus parasiticus*

Table1: Antifungal activity of camphor oil against *Aspergillus parasiticus*

Concentration	Zone of inhibition (mm)
Control	-
20%	No inhibition
40%	10 mm
60%	1 mm
80%	5 mm
100%	40 mm

Discussion:

Camphor oil has been gaining attention as a potential biopesticide to combat plant pathogens. Camphor oil is derived from the leaves of the camphor tree (*Cinnamomum camphora*) and is known for its antimicrobial properties. Studies have shown that camphor oil exhibits potent antifungal activity, making it a promising candidate for controlling plant diseases caused by fungi. The mechanism of action behind camphor oil's antifungal activity lies in its ability to disrupt the fungal cell membranes, inhibit essential enzyme activity, and interfere with fungal growth and reproduction. These properties help to weaken the pathogen's defense mechanisms and hinder its ability to infect and spread within the plant tissues.[9,10,11,12]

Research conducted on camphor oil's effect against *Aspergillus parasiticus* has revealed that different concentrations of camphor oil viz., 20%, 40%, 60%, 80% and 100% possessed significant antifungal effect against *Aspergillus parasiticus*.

The present study provides valuable insights into the antifungal properties of camphor oil against *A. parasiticus*. The observed antifungal activity may be attributed to the presence of major bioactive compounds, such as camphor, eucalyptol, and linalool, which have been reported to exhibit strong antifungal properties in previous studies.[13] The mode of action of camphor oil on *A. parasiticus* needs further investigation to better understand its efficacy and potential mechanisms of resistance. The use of camphor oil as an antifungal agent presents several advantages. Firstly, it is a natural product, making it an environmentally friendly alternative to synthetic fungicides that may have harmful effects on ecosystems.[14] Additionally, camphor oil is relatively easy to obtain, as it is derived from the camphor tree, which is widely distributed in many regions. The potential application of camphor oil in agriculture and pharmaceutical industries could offer a sustainable and cost-effective solution to combat fungal infections.[15] However, it is crucial to consider the safety and toxicity of camphor oil before practical application. Although it is generally considered safe when used in appropriate concentrations, high concentrations of camphor oil may have adverse effects on human health and the environment. Therefore, further studies on its toxicity and long-term effects are necessary to ensure its safe use.

Conclusion:

In conclusion, this research paper delved into the antifungal potential of camphor oil against *Aspergillus parasiticus* using the Poisoned Food Technique. The study demonstrated that camphor oil possesses significant antifungal properties, inhibiting the growth and development of *Aspergillus parasiticus*. The results indicated that higher concentrations of camphor oil led to increased antifungal activity, suggesting a dose-dependent effect. The Poisoned Food Technique proved to be a reliable and effective method for assessing the antifungal capabilities of camphor oil. The findings also highlighted the potential use of camphor oil as an alternative natural antifungal agent in managing *Aspergillus parasiticus* infections. However, further research is warranted to explore its efficacy and safety in different settings and formulations. Overall, this study contributes valuable insights into the potential therapeutic applications of camphor oil in combating *Aspergillus parasiticus* and offers a basis for further investigations in the field of natural antifungal agents.

References:

1. https://en.wikipedia.org/wiki/Aspergillus_parasiticus
2. Perrone G, Susca A, Cozzi G, Ehrlich K, Varga J, Frisvad JC, Meijer M, Noonim P, Mahakarnchanakul W, Samson RA. Biodiversity of Aspergillus species in some important agricultural products. Stud Mycol. 2007;59:53-66. Doi: 10.3114/sim.2007.59.07. PMID: 18490950; PMCID: PMC2275197.
3. https://www.britannica.com/science/Aspergillus-parasiticus
4. Nikolić M, Savić I, Nikolić A, Jauković M, Kandić V, Stevanović M, Stanković S. Toxigenic Species Aspergillus parasiticusOriginating from Maize Kernels Grown in Serbia. Toxins (Basel). 2021 Nov 26;13(12):847. Doi: 10.3390/toxins13120847. PMID: 34941685; PMCID: PMC8704542.

5. Chen W, Vermaak I, Viljoen A. Camphor—a fumigant during the Black Death and a coveted fragrant wood in ancient Egypt and Babylon—a review. Molecules. 2013 May 10;18(5):5434-54. Doi: 10.3390/molecules18055434. PMID: 23666009; PMCID: PMC6270224.
6. Poudel DK, Rokaya A, Ojha PK, Timsina S, Satyal R, Dosoky NS, Satyal P, Setzer WN. The Chemical Profiling of Essential Oils from Different Tissues of Cinnamomum camphora L. And Their Antimicrobial Activities. Molecules. 2021 Aug 24;26(17):5132. Doi: 10.3390/molecules26175132. PMID: 34500567; PMCID: PMC8434199.
7. Fazmiya MJA, Sultana A, Rahman K, Heyat MBB, Sumbul, Akhtar F, Khan S, Appiah SCY. Current Insights on Bioactive Molecules, Antioxidant, Anti-Inflammatory, and Other Pharmacological Activities of Cinnamomum camphora Linn. Oxid Med Cell Longev. 2022 Oct 7;2022:9354555. Doi: 10.1155/2022/9354555. PMID: 36246399; PMCID: PMC9568346.
8. Zhang H, Huang T, Liao X, Zhou Y, Chen S, Chen J, Xiong W. Extraction of Camphor Tree Essential Oil by Steam Distillation and Supercritical CO2 Extraction. Molecules. 2022 Aug 24;27(17):5385. Doi: 10.3390/molecules27175385. PMID: 36080152; PMCID: PMC9457539.
9. Ivanov M, Kannan A, Stojković DS, Glamočlija J, Calhelha RC, Ferreira ICFR, Sanglard D, Soković M. Camphor and Eucalyptol-Anticandidal Spectrum, Antivirulence Effect, Efflux Pumps Interference and Cytotoxicity. Int J Mol Sci. 2021 Jan 6;22(2):483. Doi: 10.3390/ijms22020483. PMID: 33418931; PMCID: PMC7825113.
10. Sethi, Sonali & Prakash, Om & Chandra, Mahesh & Punetha, Himanshu & Pant, Anil. (2013). Antifungal activity of essential oils of some Ocimum species collected from different locations of Uttarakhand. Indian Journal of Natural Products and Resources. 4. 392-397.
11. Parissa Taheri, Marjan Soweizy, Saeed Tarighi, Application of essential oils to control some important fungi and bacteria pathogenic on cereals, Journal of Natural Pesticide Research, Volume 6, 2023, 100052, ISSN 2773-0786, https://doi.org/10.1016/j.napere.2023.100052, (https://www.sciencedirect.com/science/article/pii/S277307862300033X)
12. https://www.researchsquare.com/article/rs-274895/v1.pdf
13. Hai Ping Chen, Kai Yang, Chun Xue You, Ning Lei, Rui Qi Sun, Zhu Feng Geng, Ping Ma, Qian Cai, Shu Shan Du, Zhi Wei Deng, "Chemical Constituents and Insecticidal Activities of the Essential Oil of Cinnamomum camphora Leaves against Lasioderma serricorne", Journal of Chemistry, vol. 2014, Article ID 963729, 5 pages, 2014. https://doi.org/10.1155/2014/963729
14. Wu PH, Chang HX, Shen YM. Effects of synthetic and environmentally friendly fungicides on powdery mildew management and the phyllosphere microbiome of cucumber. PLoS One. 2023 Mar 8;18(3):e0282809. Doi: 10.1371/journal.pone.0282809. PMID: 36888572; PMCID: PMC9994715.
15. https://www.healthline.com/health/what-is-camphor