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Research Article

"Antifungal activity of Hot and Cold Wheat Oil"

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Abstract

The present study investigates the antifungal activity of hot-pressed and cold-pressed wheat germ oil (WGO) obtained from different wheat (*Triticum aestivum*) varieties. Wheat germ oil, a byproduct of wheat milling, is a rich source of tocopherols, fatty acids, sterols, and phenolic compounds known for antimicrobial and health-promoting properties. Four wheat varieties—Lokwan, Ajit, Sarita, and 24/96—were used for extraction and evaluation. Hot-pressed oil was extracted using direct flame-heating followed by manual pressing, while cold-pressed oil samples were procured commercially. Antifungal activity was assessed against pathogenic fungi (*Penicillium spp., Penicillium glabrum, Cladosporium spp., Trichoderma spp., Fusarium spp., Aspergillus niger, and Colletotrichum capsici*) using the disc diffusion method on potato dextrose agar (PDA). Results showed that hot-pressed WGO exhibited stronger antifungal activity, with maximum inhibition zones of 1.6 cm against *Penicillium* and *Cladosporium* species. In contrast, cold-pressed oil demonstrated weaker inhibition, with zones ≤1.2 cm, and no activity against *Fusarium, Penicillium glabrum,* or *Colletotrichum capsici*. The study concludes that hot-pressed WGO retains bioactive compounds effective against certain dermal fungal pathogens and could be further developed into cost-effective natural antifungal formulations.

INTRODUCTION

Wheat (*Triticum aestivum*) is one of the most widely cultivated cereal crops worldwide, contributing significantly to human nutrition and food security. During wheat milling, wheat germ—rich in lipids, proteins, vitamins, and phytochemicals—is separated as a byproduct. Wheat germ oil (WGO), extracted from this fraction, has been recognized as a potent source of biologically active compounds including tocopherols, phytosterols, unsaturated fatty acids, and phenolic compounds (Barnes, 1982; Kaur et al., 2018). WGO typically contains 42–59% linoleic acid, 15–20% palmitic acid, and 12–16% oleic acid (Barnes, 1983). It is particularly rich in vitamin E (α-tocopherol), making it valuable antioxidant oil used in pharmaceutical, cosmetic, and food industries (Costa et al., 2015). Apart from its nutritional applications, WGO has been reported to possess antimicrobial, antioxidant, and

antifungal activities (Ahmad et al., 2011; Ali Mohammadi et al., 2015).

Natural plant-derived oils have gained interest as alternatives to synthetic antifungals due to their eco-friendly, cost-effective, and multipurpose therapeutic potential (De Sousa Barros et al., 2015). Previous studies have documented antifungal activity of several essential oils, including clove, peppermint, and oregano (Devi et al., 2010; Bassolé et al., 2010). However, studies on the antifungal properties of WGO remain limited, particularly concerning differences in extraction methods such as hot pressing versus cold pressing. The present research aimed to evaluate the antifungal activity of hot- and cold-pressed WGO obtained from different wheat varieties against human pathogenic fungi causing dermal infections.

Materials and Methods

Plant Material

Seeds from four wheat varieties—Lokwan, Ajit, Sarita, and 24/96—were procured locally. Commercial cold-pressed WGO samples were purchased online.

Extraction of Wheat Germ Oil

Hot pressing method:

5–10 g of wheat seeds from each variety were heated on a red-hot iron spoon for 1–2 minutes and manually pressed using a sterilized spatula. The released oil was collected in a brass plate. Whatman filter paper discs were immediately dipped into the oil for antifungal assays.

Cold pressing method: Commercially available cold-pressed WGO was used directly for testing.

Test Fungal Strains: Fungal pathogens tested include such as, *Penicillium spp.Penicillium glabrum Cladosporium spp. Trichoderma spp. Fusarium spp. Aspergillus niger* and *Colletotrichum capsici* Cultures were maintained on Potato Dextrose Agar (PDA).

Antifungal Assay

The disc diffusion method was used (Cox et al., 2000). Oil-impregnated Whatman filter paper discs were placed on PDA plates pre-inoculated with fungal cultures. Plates were incubated at 36 °C for 24 h. The antifungal activity was recorded by measuring the zone of inhibition (cm) around each disc.

Results

State-wise Wheat Production:

Wheat production percentages across selected Indian states are shown in Table 1. Punjab exhibited the highest production (18%), while Rajasthan recorded the lowest (10%).

Antifungal Activity of Hot-Pressed Wheat Germ Oil

Hot-pressed WGO demonstrated significant antifungal activity (Table 2). The Lokwan and Sarita varieties showed maximum inhibition (1.6 cm) against *Penicillium* and *Cladosporium spp*., respectively.

Discussion

The present study confirmed that wheat germ oil possesses antifungal properties, with significant differences observed between extraction methods. Hot-pressed oil exhibited superior antifungal activity compared to cold-pressed oil. This could be attributed to higher concentrations of heat-stable bioactive compounds such as linoleic acid, tocopherols, and sterols, which disrupt fungal cell membranes and inhibit ergosterol biosynthesis (Ahmad et al., 2011; Cox et al., 2000). Cold-pressed oil, while generally considered retaining more thermolabile antioxidants, showed weaker antifungal effects. This may be due to differences in extraction efficiency, oil composition, or degradation during storage of commercial samples. Interestingly, *Fusarium* spp. showed resistance in both treatments, consistent with reports that Fusarium species often possess intrinsic tolerance to plant-derived antifungals (Ali Mohammadi et al., 2015). Previous studies on essential oils such as clove (Devi et al., 2010) and peppermint (De Sousa Barros et al., 2015) demonstrated comparable antifungal activity, suggesting that wheat germ oil could be developed into natural antifungal formulations for topical use against skin infections such as ringworm, candidiasis, and mycoses.

Conclusion

Hot-pressed wheat germ oil demonstrated stronger antifungal activity than cold-pressed oil against selected pathogenic fungi. Lokwan and Sarita varieties were particularly effective, inhibiting *Penicillium* and *Cladosporium* species. Given its availability and cost-effectiveness, wheat germ oil shows promise as a natural antifungal agent for dermal applications and as an eco-friendly alternative to synthetic fungicides in food preservation. Further research is needed to isolate and characterize the active compounds responsible for antifungal activity.

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