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Wild fungi and cultivated mushroom biological activities

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ABSTRACT

Wild mushrooms are important non-timber forest products that provides diverse substances and services, especially food and income for local communities from many parts of the world. This study aims the determination of antifungal activity and the flavonoids content of extracts from carpophores of some wild and cultivated fungi. Wild fungi (*Fomes fomentarius*, *Hericium erinaceus*, *Schizophyllum commune*, *Pleurotus ostreatus*) were collected from several forestry regions in Tunisia and *Pleurotus ostreatus* and *Lentinus edodes* fungi species were cultivated in controlled conditions. Extraction was mad using methanol 80% and water as solvents. The total flavonoid content of crude extract was determined by the aluminium chloride colorimetric method. The antifungal activity was tested against five fungal strains: *Alternaria alternate, Penicillium olsonii*, *Ulocladium atrum*, *Phytophtora nicotianae*, *Aspergillus fumigates.* Results showed significant differences between the fungal species and between the two studied extracts. Methanol extracts showed the highest flavonoid amount. The most important value was reached by methanol extract of Wild *Plerotus ostreatus* (2.3 mg RE/ml). Aqueous extract of studied mushrooms showed the most important antifungal activities. *Fomes fomentarius* - Ain Drahem and cultivated *P. ostreatus* aqueous extracts showed the highest inhibitory rate against *Alternaria alternata* species (70% and 63.33% respectively).

MATERIAL & METHODS

A. Fungal Material

Wild fungi (*Fomes fomentarius*, *Hericium erinaceus*, *Schizophyllum commune*, *Pleurotus ostreatus* were collected in Tunisia from Ain Drahem (Northern west), Tbainia (Northern west), Kef Rand (Northern east), and Tunis regions. Cultivated mushroom were *Pleurotus ostreatus* and *Lentinus edodes* species. Fruit bodies were cleaned with distilled water then dried at 40°C. For extracts preparation 20 g of mushroom samples was soaked in 200 ml of solvent (water or methanol 80%) for 24 hours with intermittent shaking. The extracts were filtered through Whatman filter paper into pill vials. The obtained filtrates were used for the experiments

B. Total Flavonoids Content

The total flavonoid content of crude extract was determined by the aluminium chloride colorimetric method and the result was expressed as mg rutin equivalent per mL of juice (mg RE/g).

C. Antifungal Activity

1. Fungal Strains:

The antifungal activity of carpophores of some wild and cultivated fungi tested against five fungal strains: *Alternaria alternata*, *Penicillium olsonii*, *Ulocladium atrum*, *Phytophtora nicotianae* and *Aspergillus fumigates*. Fungal strains were isolated and identified following conventional mycological methods.

2. Antifungal test:

The preparation of the PDA medium was performed by adjusting with distilled water the aqueous extract of the broth of 200 g of potato to 1 liter and adding 20 g of agar and 20 g of glucose. The culture was made on a PDA medium at the rate of 20 ml per Petri dish. 2 ml of juice were introduced into the 20 ml of PDA after having been mixed and homogenized with tween 0.1%.

The results were calculated according to the method of Singh et al. (1996) while calculating the percentage inhibition (I) according to the following formula: I(%) = [(dC-dE) /dC] x 100 Where: dC: witness diameter (mm) dE: diameter in the presence of oil tested (mm).

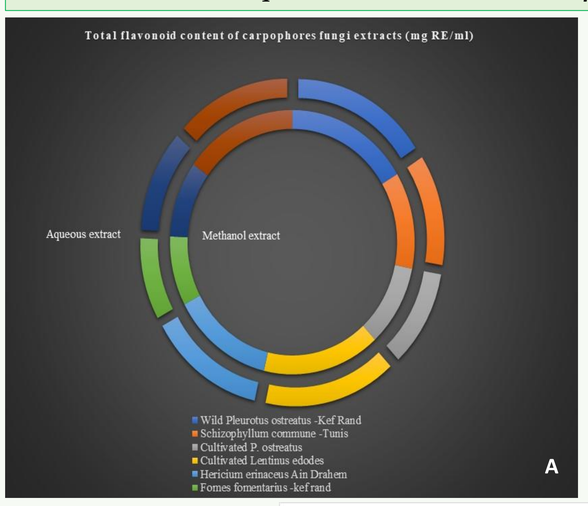
RESULTS

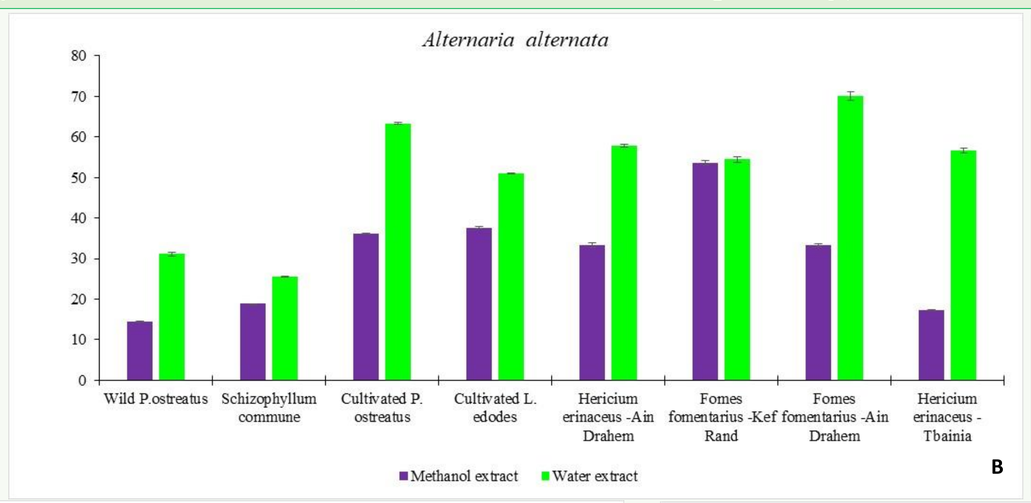
A. Total Flavonoids Content

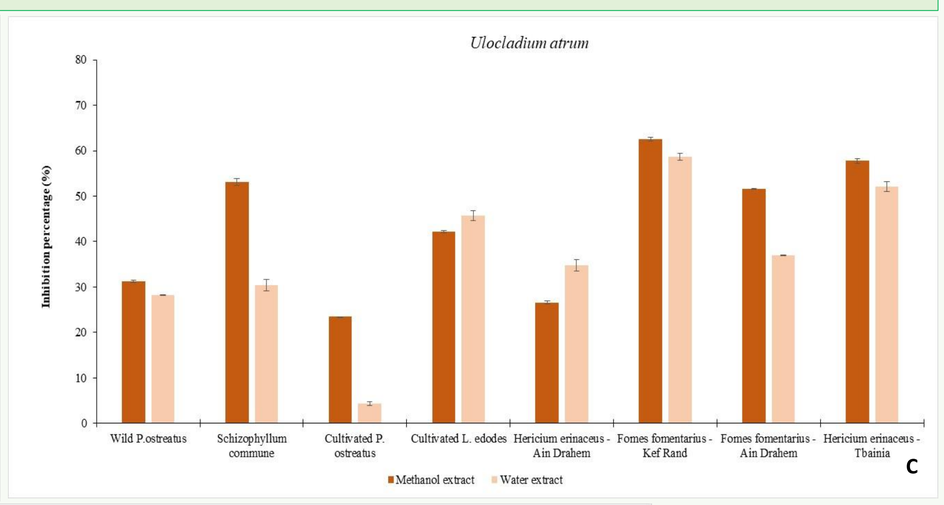
Significant differences were observed according to the fungal species and between the two studied extracts on flavonoid contents (p<0,05). Methanol extracts showed the highest flavonoid amount. The most important value was reached by methanol extract of Wild *Pleurotus ostreatus* (2.3 mg RE/ml), This concentration may slightly differ depending on the mushroom species, as well as genetic and environmental factors,

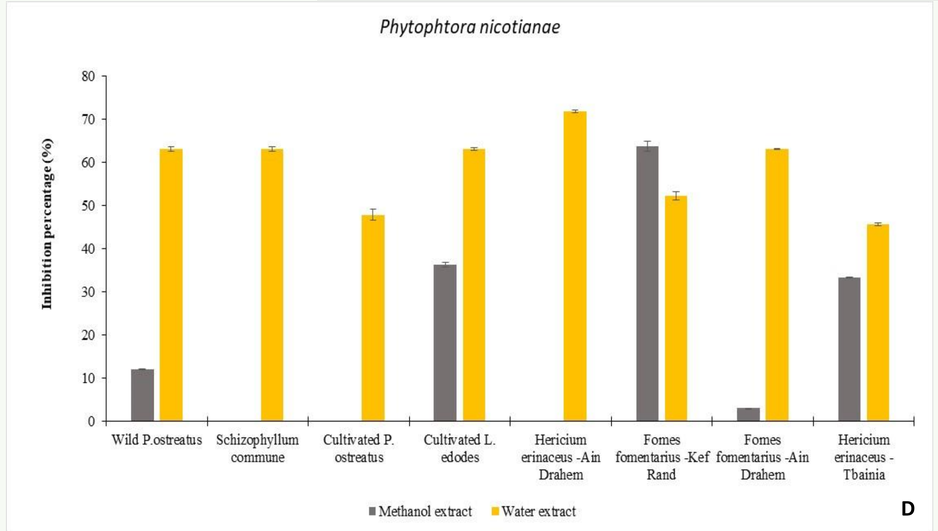
B. Antifungal Activity

Results (Fig. 1) showed that aqueous extracts of studied mushrooms allowed the most important antifungal activities. In fact, the solvent used to extract secondary metabolites with antifungal properties is an important factor and depends on polarity. Differences in inhibition values of different extracts could be related to the difference on interactions type of phenolic compounds with membrane proteins of phytopathogens species and to the responses of these pathogens to phenols and flavonoids contents. *Fomes fomentarius* -Ain Drahem and cultivated *P. ostreatus* aqueous extracts showed the highest inhibitory rate against *Alternaria alternata* species (70% and 63.33% respectively) followed by cultivated *L. edodes*, *Fomes fomentarius* and *Hericium erinaceus* -Tbainia aqueous extracts. *Ulocladium atrum* phytopathogen fungal species was mostly inhibited with methanolic extracts of *Fomes fomentarius* -Kef Rand (62.5%), *Hericium erinaceus* -Tbainia (57.81%) and *Shizophyllum commune* (53.13%). Aqueous extracts of *Fomes formentarius* -Kef Rand and *Hericium erinaceus* -Tbainia also made inhibition of this pathogen growth. Aqueous extracts were also more inhibitor than methanolic one against *Phytophtora nicotiana* species with similar inhibition rates (approximately 63%) for all wild studied fungi species. Methanol extract has higher inhibition than aqueous one for *Fomes fomentarius* -Kef Rand (63.64 % and 52.17% respectively).









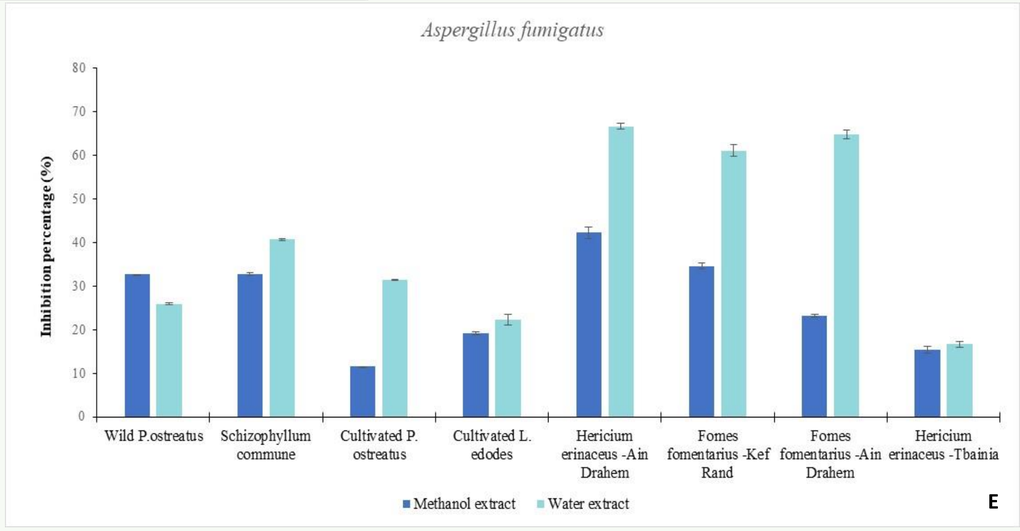


Fig 1. Flavonoid contents (A) and antifungal activities against phytopathogen fungi: *A. Alternaria*, *Ulocladium atrum*, *Phytophtora nicotiana* and *A. fumigatus* (B, C, D, E respectively) of aqueous and methanolic extracts of studied fungi

CONCLUSIONS

The results found here highlighted the properties of wild mushrooms. The valorization of mushroom extracts as bio-fungicides must be tested at the agricultural level. Similarly, the purification of bioactive compounds could improve the commercial value of wild mushrooms and open new perspectives for mushroom cultivation projects in the local development program of forest areas.