



Valorization of agri-food wastes for *Pleurotus ostreatus* growth



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Background

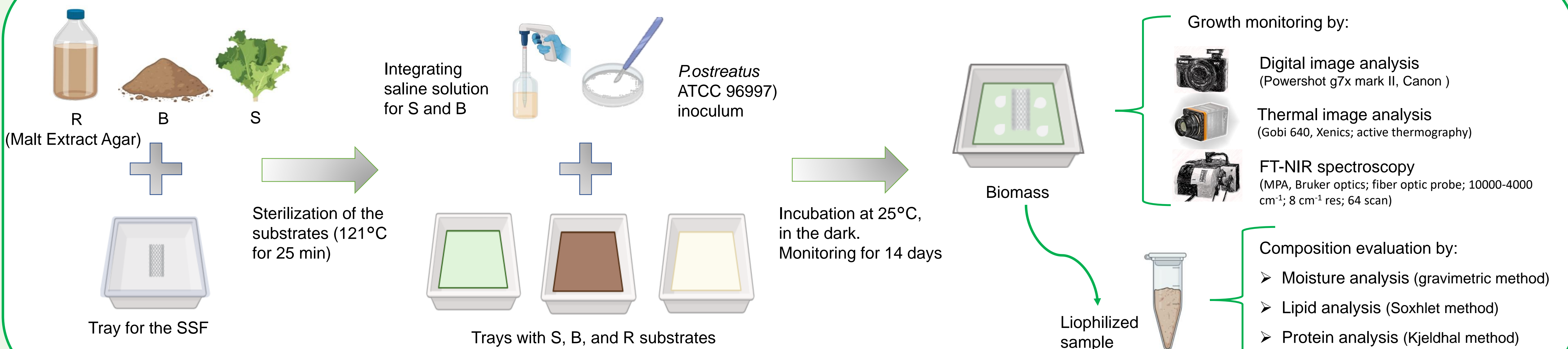
Edible mushrooms rich in bioactive compounds (also called **medicinal mushrooms**) are gaining popularity due to the concerns around the consumption of animal products and the demand for **new protein sources**. The use of **agri-food wastes as substrates** for mushroom production is an alternative method to reduce the environmental impact of their disposal.

Aim

This study investigates the use of fresh-cut salad waste (S) and brewer's spent grain (B) as substrates in Solid State Fermentation processes for the growth of *P. ostreatus*. To study the growth rate, innovative analytical technologies were used, while compositional analyses were performed on the biomasses.

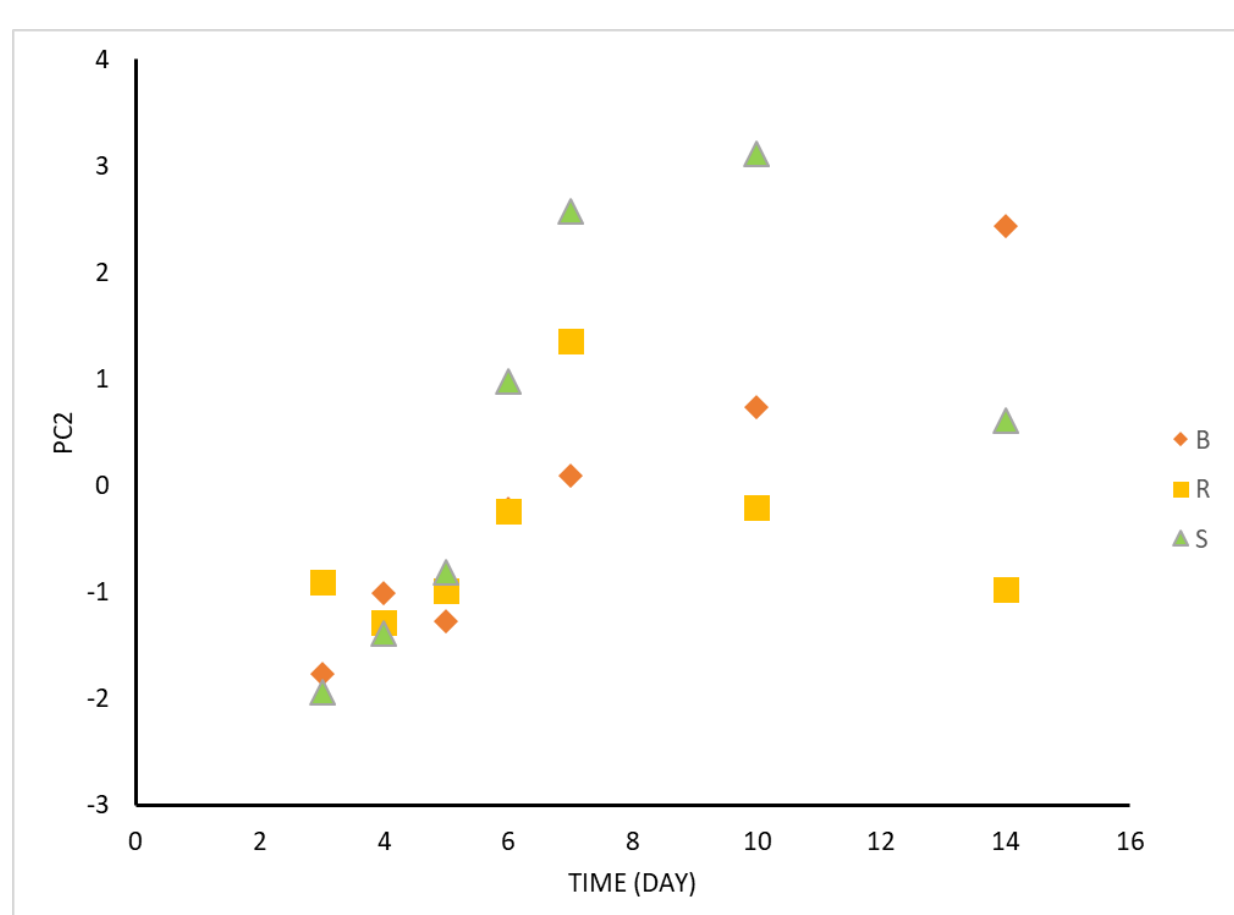
#ProductDevelopmentAndInnovation
#AlternativeProteins
#Plant-basedFood #Sustainability

Materials and Methods



Results

The three innovative analytical technologies proved effective in monitoring *P. ostreatus* growth. The digital image analysis (Fig. 1) revealed the ability of S and B to guarantee valuable biomass growth rates (15.6% surface/day; 14.2% surface/day) comparable to the reference medium (14.0% surface/day). Thermal images (Fig. 1) can add further information on the thickness of the grown biomass, thus giving a more precise indication of the amount present in the tray.



As for FT-NIR spectroscopy, the spectra acquired on the biomass surface were elaborated by PCA. The PC2 scores plotted as a function of growing time (Fig. 2) showed an increasing trend until 10 days, and then a stabilization for all the substrates.

Fig 2: Results of FT-NIR analysis on biomass surface: PC2 scores as a function of growing time.

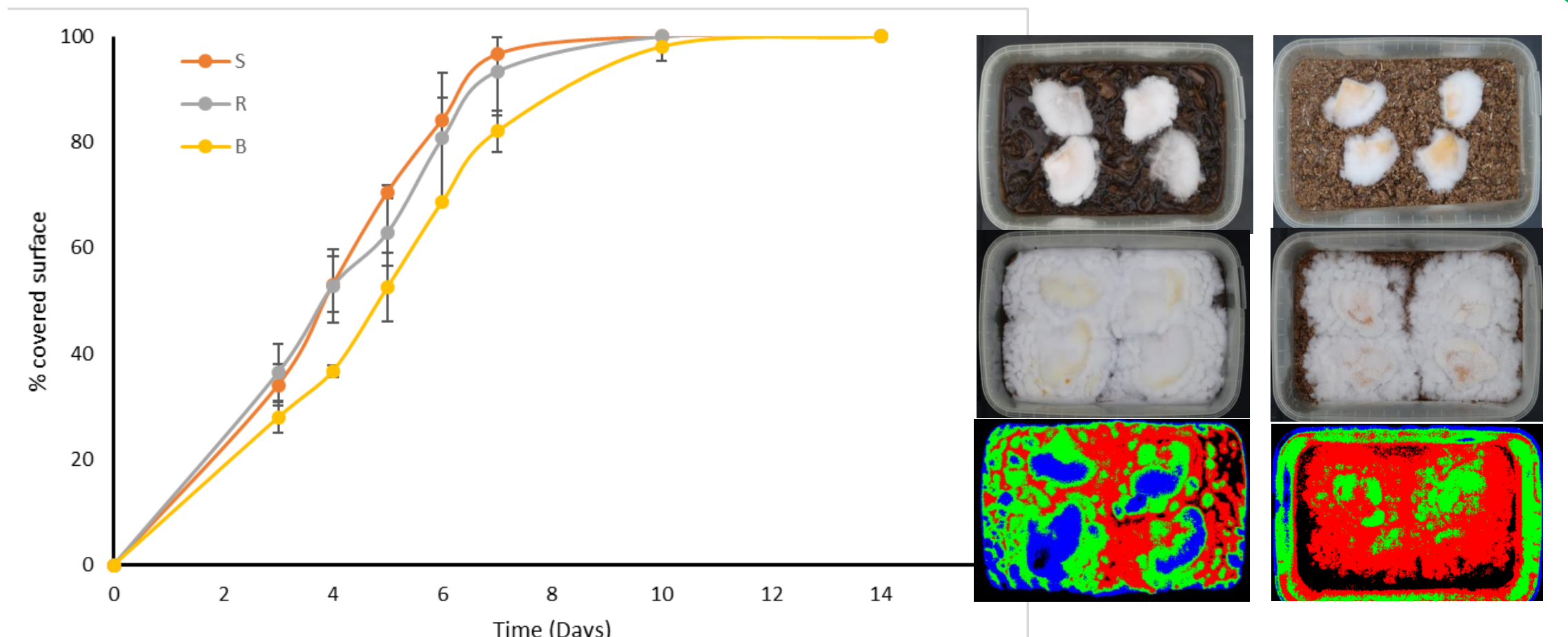


Fig. 1: Growth curves of *P. ostreatus* in the different substrates. The digital images of S (left) and B (right) samples at days 3 and 7 are also shown. At 7 days the thermal images for each substrate are shown.

One of the most important parameter for the biomass production, and so for the scaling-up of the process, is the yield, calculated as the percentage ratio between the weight of the lyophilized biomass at the end of the growing period and the weight of the initial substrate. Considering the day 10, the highest growth (Fig. 3) was evidenced in B (4.1% yield in dry matter, d.m.) compared to S (1.8%) and R (1.2%).

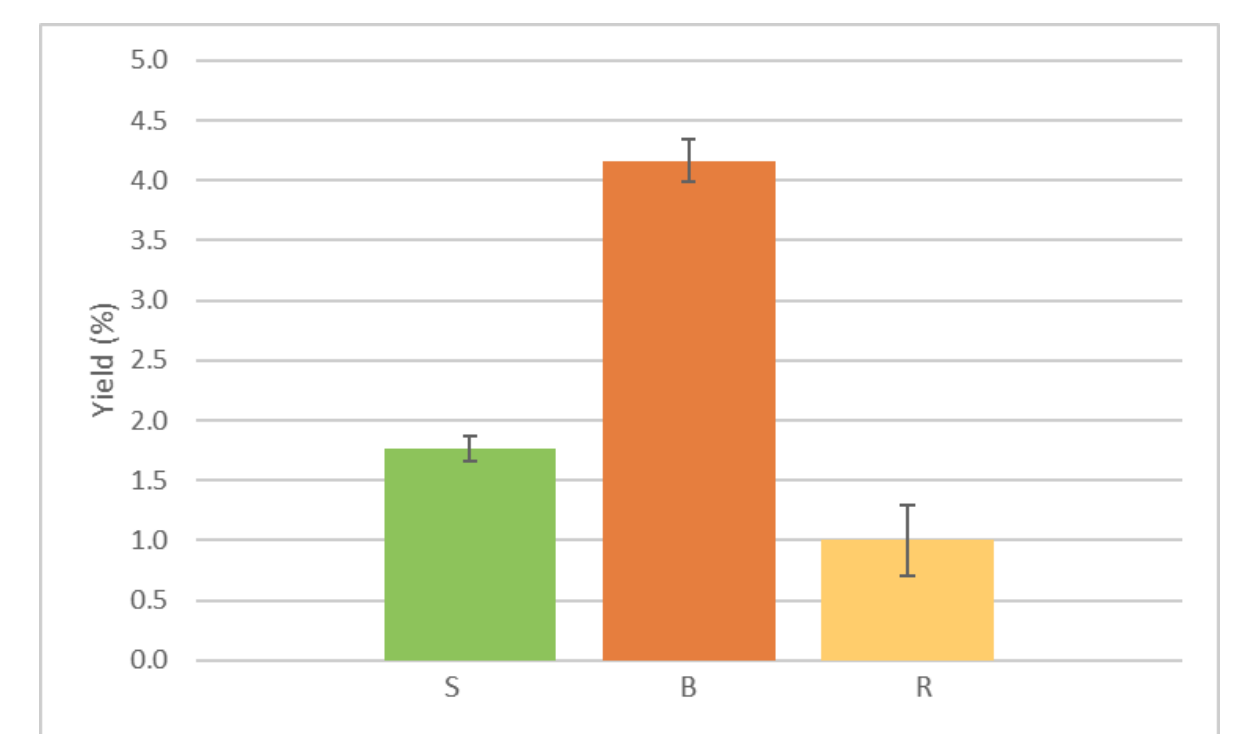


Fig. 3: Yields of *P. ostreatus* biomass in the different substrates.

| | S | B | R |
|---------------------|------|------|------|
| Protein (% on d.m.) | 29.9 | 27.8 | 16.0 |
| Lipid (% on d.m.) | 0.7 | 6.3 | 0.4 |

Table 1: Results of composition of the biomasses at day 10, obtained by the different substrates (S, fresh-cut salad waste; B, brewer's spent grain; R, reference).

The compositional analyses performed on the freeze-dried biomasses obtained after 10 days of growing (Table 1) showed a higher protein content in the fungal biomasses grew on S and B rather than on R. The biomass lipid content was similar for R and S, while higher for B.

Conclusions

The results demonstrated the potential of wastes generated from fresh-cut salad and beer production as valuable substrates for *P. ostreatus* growth. This approach contributes to advancement in sustainable practices in the production of alternative proteins. Fostering the development of new protein sources is essential to encourage consumers towards nutritious and healthy diet, considering the escalating protein demand driven by population growth.

Acknowledgments

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