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Fermentation of brewer's spent grain with *Pleurotus ostreatus*: A pathway to nutritional enhancement

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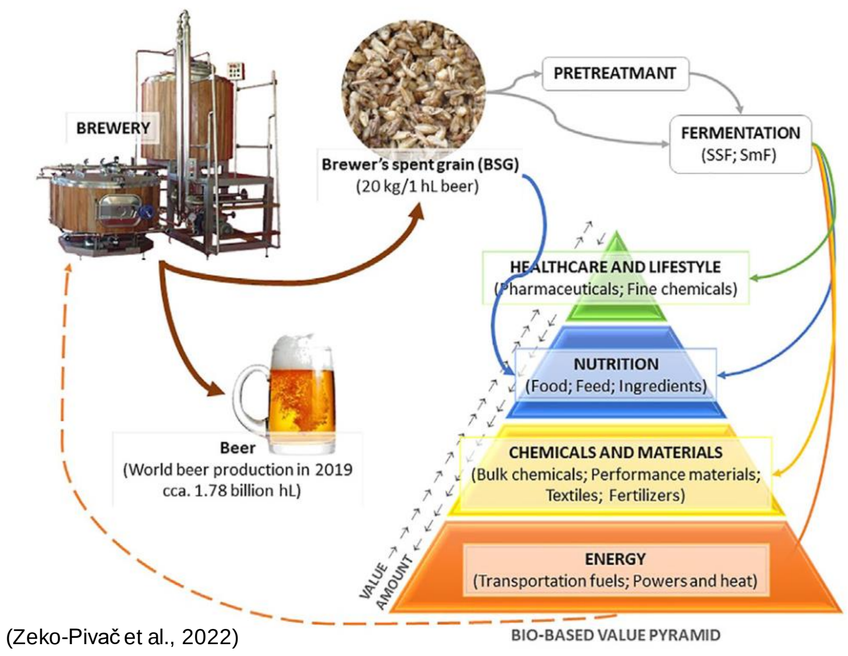
INTRODUCTION & AIM



(Zeko-Pivač et al., 2022)

- **Brewer's spent grain (BSG)** is the principal byproduct of beer production, which still retains **valuable nutritional components** for the circular economy but the presence of **antinutrients** like **Phytic Acid** makes its use **challenging** as a component of **foods** and **feeds**.
- **Phytic acid** is the principal **phosphorus storage** form in grains and legumes and complexes with proteins and minerals, thereby **hindering digestion** and **absorption**.
- Content of **Phytic acid** can be reduced through **solid-state fermentation (SSF)** with **edible fungi** that produce phytases, resulting in the **release of bioavailable soluble phosphorus**.
- Edible fungi-based SSF also produces **beneficial bioactives** enhancing BSG **nutritional quality** and digestibility.

To enhance the nutritional quality, BSG was used as a substrate for SSF with *Pleurotus ostreatus*, targeting phytic acid reduction and phosphorus release

METHODS

BSG was obtained from a local brewery and dried (120°C for 2 h) for preservation. It was then rehydrated to 65% (w/w), autoclaved, and subject to SSF by *P. ostreatus* var. *florida* mycelium (strain A01 from CISPHoCoMe, Argentina) at 25°C for 14 and 21 days. A non-inoculated Control group was included (n=4). The products were then dried and ground, and each sample was assessed for phytic acid (Haug & Lantzsch, 1983), acid-soluble phosphorus, and total phosphorus (AOAC 965.17) as detailed in Pascual et al. (2025).

RESULTS & DISCUSSION

***P. ostreatus* mycelium** grew very efficiently and consumed **~35 and 39%** of the BSG dry mass in 14 and 21 days, respectively ($p < 0.0001$).

Phytic acid was **reduced by ~81%** ($p < 0.0001$), from 10.4 ± 0.3 mg/g in control to 2.0 ± 0.7 mg/g after 14 days and remaining after 21 days (**Fig. 1A**).

Acid-soluble phosphorus was **increased by ≥ 100%** throughout fermentation times, from 1.8 ± 0.1 mg/g in control, reaching to 3.8 ± 0.2 mg/g at 21 days ($p < 0.05$, **Fig. 1B**), suggesting higher bioavailability.

Total phosphorus also **increased by ~49 and 60%** in myceliated samples, from 4.3 ± 0.1 mg/g in Control to 6.4 ± 0.1 and 6.9 ± 0.2 mg/g after 14 and 21 days, respectively ($p < 0.01$, **Fig. 1C**), indicating substrate consumption.

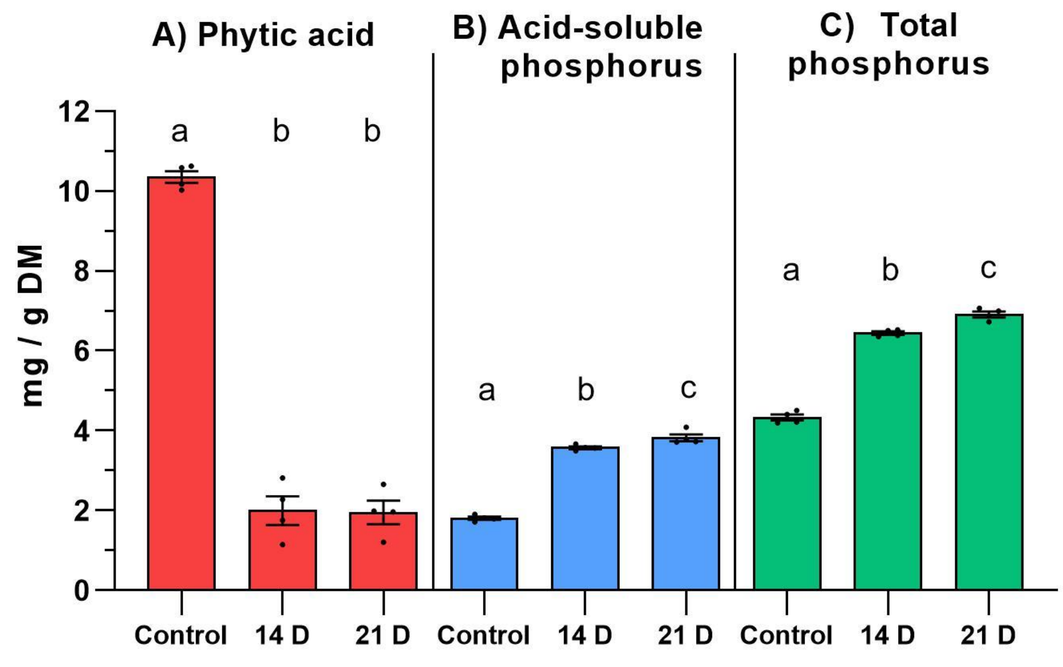


Figure 1. Content of Phytic acid (A), Acid-soluble phosphorus (B), and Total phosphorus (C) at different fermentation times of BSG with *Pleurotus ostreatus* mycelium. Results are expressed as mean ± SD. Different letters indicate significant differences (Tukey, $p < 0.05$; n = 4).

CONCLUSION

- **BSG can be revalorized through SSF with *P. ostreatus*, by reducing the phytic acid while enhancing phosphorus content, particularly in its bioavailable form.**
- **These findings underscore the potential of upcycling byproducts like BSG, promoting resource efficiency in food systems and contributing to sustainable practices.**

REFERENCES

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