Cultivated mushrooms with enhanced β-glucan content as obtained through the valorization of agricultural and agro-industrial by-products

Bekiaris, G.[1]*, Koutrotsios, G.[1], Kyriacou, A.[2], Pletsa, V.[3] and Zervakis, G.I.[1]

[1] *Laboratory of General and Agricultural Microbiology, Department of Crop Science, Agricultural University of Athens, Athens, Greece*
[2] *Department of Nutrition and Dietetics, Harokopio University, Athens, Greece*
[3] *Institute of Biology, Medicinal Chemistry and Biotechnology, National Hellenic Research Foundation, Athens, Greece*
*: *Presenting author: giorgosbekiaris@yahoo.gr*

Introduction

Beta (β)-glucans are linear D-glucose polymers linked with β-glycosidic bonds, and differ with respect to their length/molecular mass, viscosity, solubility and branching structure. They occur in the cell-wall of bacteria, fungi and cereals, and they are considered as biological response modulators with a plethora of health promoting functions (e.g. immunomodulatory, anticancer and prebiotic properties). Mushrooms are relatively rich in β-glucans and are therefore considered as excellent sources of these compounds for humans. However, very little is known regarding edible mushrooms and the effect of production substrates on their β-glucan content. In this study, wild indigenous strains belonging to seven species of basidiomycetes (from the species collection of the Laboratory of General and Agricultural Microbiology/Agricultural University of Athens) were cultivated on conventional and alternative media in order to determine the effect of substrate on mushrooms content in β-glucans.

Materials & Methods

Thirty fungal species/strains were examined, belonging to 7 species of basidiomycetes i.e.:

- *Pleurotus ostreatus*
- *Pleurotus eryngii*
- *Pleurotus nebrodensis*
- *Pleurotus citrinopileatus*
- *Ganoderma lucidum*
- *Hericium erinaceus*
- *Cyclocybe cylindracea*

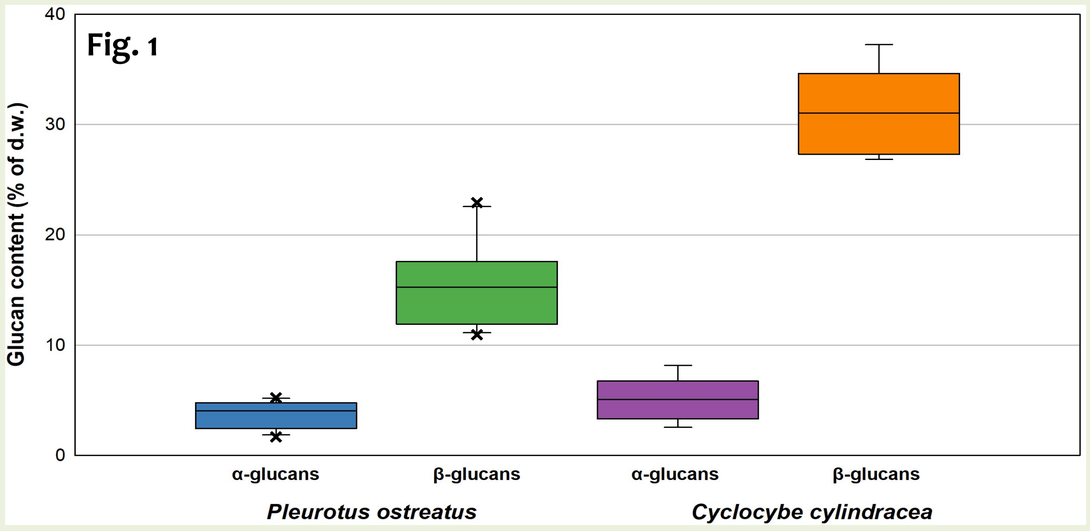
Different types of substrates originating from agricultural and agro-industrial by-products, i.e.:

- wheat straw (WS)
- grape marc (GM)
- olive leaves and pruning (OL, OLPR)
- two-phase olive-mill waste (TPOMW)

were examined on different combinations and mix ratio

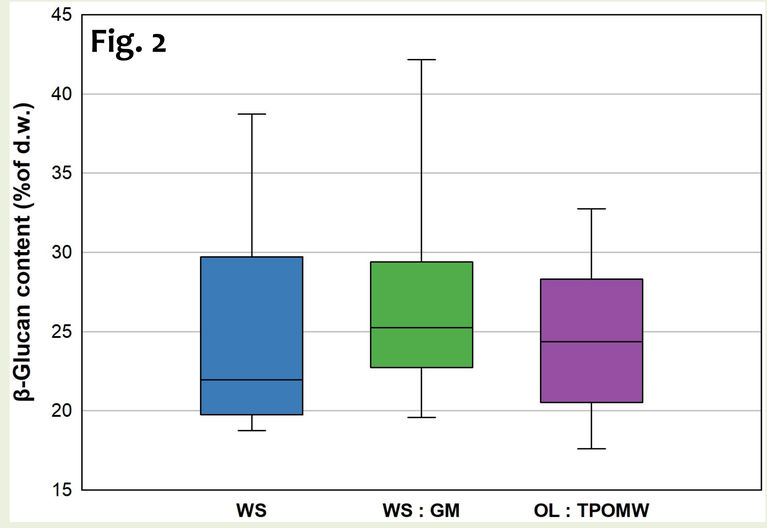
- Determination of the **effect of species/strain** on β-glucan content
- Determination of the **effect of substrate** on the β-glucan content of the produced mushrooms
- Determination of fungal species/ strains and substrate **combinations** with an increased β-glucan content,

Outcome



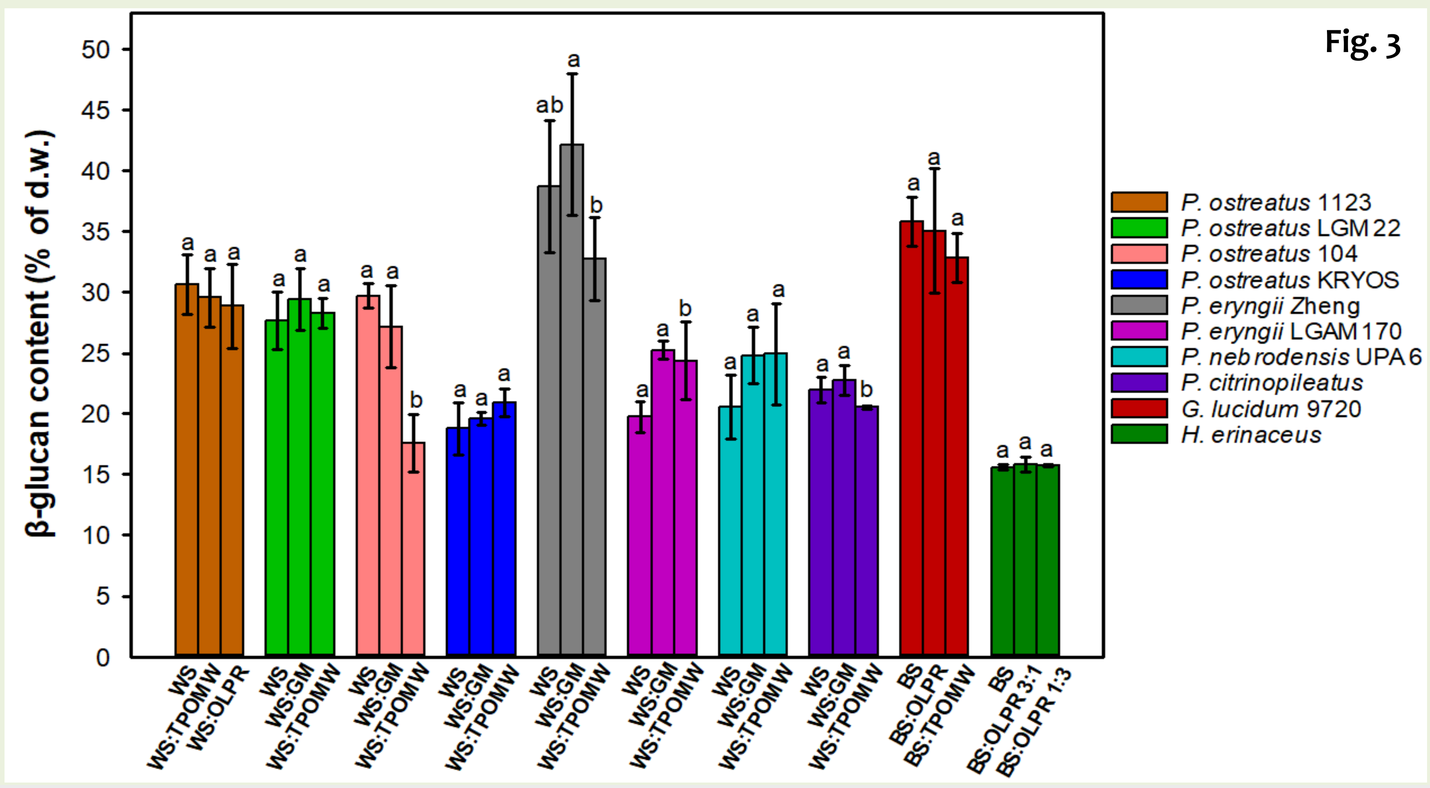
- Twelve *P. ostreatus* strains (Fig.1)
- Non-significant strain effect in α-glucan content (ranging between 1,67-5,23% of d.w.)
- Relatively significant effect on β-glucan content (ranging between 10,94-22,92% of d.w.)

- Seven *C. cylindracea* strains (Fig.1)
- Stronger strain effect on α-glucan content than *P. ostreatus* (ranging between 2,53-8,16% of d.w.)
- More significant effect on β-glucan content than *P. ostreatus* (ranging between 26,85-37,25% of d.w.)



- Seven strains, belonging to *P. ostreatus*, *P. eryngii*, *P. nebrodensis*, *P. citrinopileatus*) (Fig.2)
- WS:GM substrate had the smallest range on β-glucan content followed by OL:TPOMW.
- β-Glucan content in the strains cultivated on the conventional WS ranged a lot evaluating the strong effect observed previously (Fig. 1)

- β-Glucan content of ten strains belonging to six species cultivated on different substrates (Fig.3)
- WS:GM seems to enhance β-glucan content (observed at 4 out 7 cases)
- Some species/strains (e.g. *H. erinaceus* and *P. ostreatus* LGM22) found to be affected the less or even not affected by changes in cultivation substrate
- Highest β-glucan content by the combination of *P. eryngii* Zheng cultivated on WS:GM
- Lowest β-glucan content by *H. erinaceus* and *P. ostreatus* 104 cultivated on WS:TPOMW



Acknowledgements

This research has been co-financed by the European Union and Greek national funds through the Operational Program Competitiveness, Entrepreneurship and Innovation, under the call RESEARCH – CREATE – INNOVATE (project code: T1EDK-03404).