

# The impact of probiotic fermentation of bee pollen on the nutritional and antioxidant properties

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## INTRODUCTION

Bee pollen has a high nutritional value, being a good source of protein, carbohydrates, lipids, and fibers, but also bioactive compounds such as polyphenols, flavonoids, and vitamins. All of these make it the ideal medium to be used as a substrate for fermentation being considered by some authors probiotic and prebiotic (Zuluaga-Dominguez et al. 2019; Mora-Adames et al., 2021).

## OBJECTIVE

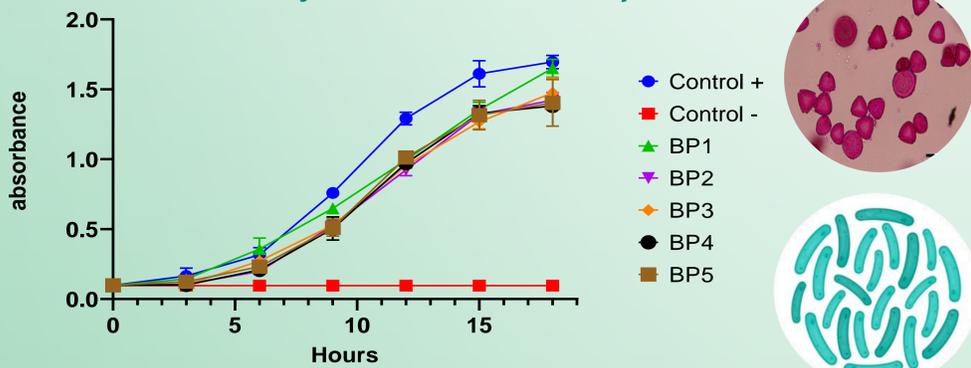
The aim of this study was the use of lactic acid bacteria, in the solid fermentation of bee pollen to obtain a product with high nutritional properties and beneficial bacteria for the intestinal microbiota of bees.

## MATERIALS AND METHODS

Four samples of bee pollen collected from the USAMV Cluj Apiary were analyzed before and after the fermentation process in order to determine the energy value, the biologically active compounds and to determine the antioxidant activity using spectrophotometric and HPLC methods. *Lactobacillus plantarum* was used for the fermentation process of the bee pollen.

## RESULTS

### Viability of *Lactobacillus plantarum*

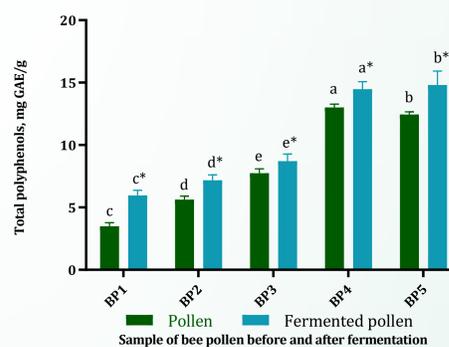


### Chemical composition and energy value

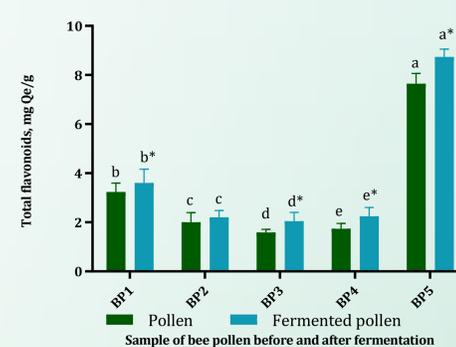
Sample	Water (%)	Ash (%)	Protein (%)	Lipid (%)	Total carbohydrates (%)	Energy value kcal/100 g
BP1	20.21±0.51	2.44±0.12	22.80±0.18	6.11±0.21	68.65	431.77
BP2	26.39±0.40	2.65±0.25	22.36±0.17	7.58±0.18	67.41	438.55
BP3	23.47±0.31	2.25±0.11	19.88±0.21	4.11±0.24	73.76	422.15
BP4	27.81±0.11	2.62±0.14	17.65±0.24	4.62±0.16	75.11	423.28
BP5	23.77±0.25	2.81±0.21	23.11±0.12	6.66±0.20	67.41	433.14
BP1 Ferm.	14.32±0.12	2.41±0.10	20.71±0.10	5.94±0.14	70.94	431.01
BP2 Ferm.	14.65±0.17	2.70±0.12	20.00±0.22	7.48±0.31	69.87	437.54
BP3 Ferm.	13.89±0.23	2.31±0.12	18.06±0.18	4.19±0.21	75.44	422.32
BP4 Ferm.	13.53±0.17	2.59±0.22	17.06±0.09	4.28±0.11	76.11	421.64
BP5 Ferm.	13.67±0.13	2.76±0.11	21.71±0.15	5.99±0.12	69.54	429.83

## RESULTS

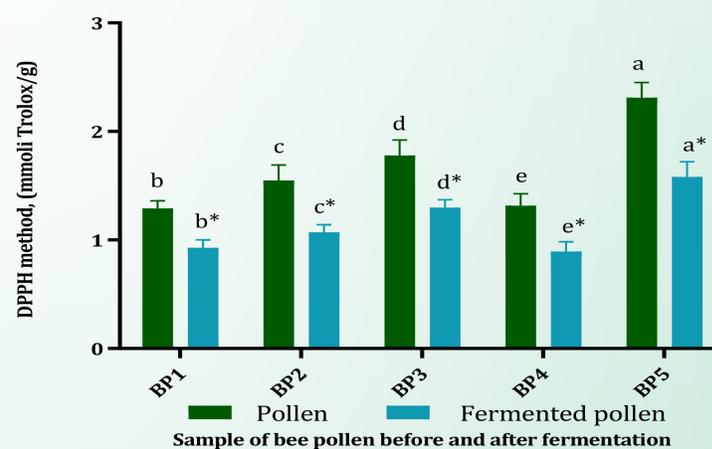
### Total polyphenols content Folin Chocalteu method



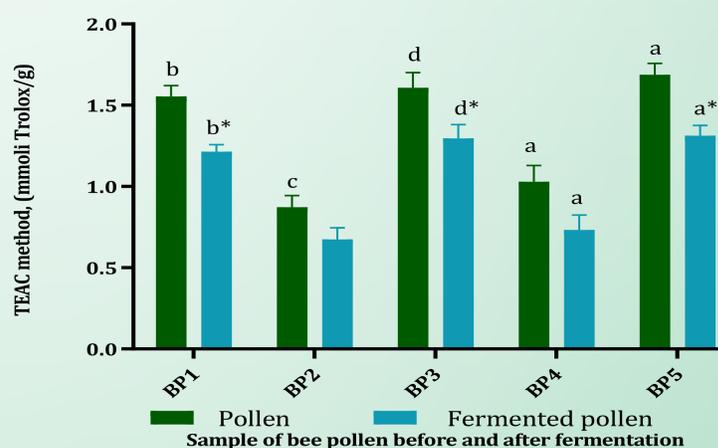
### Total flavonoids content AlCl3 method



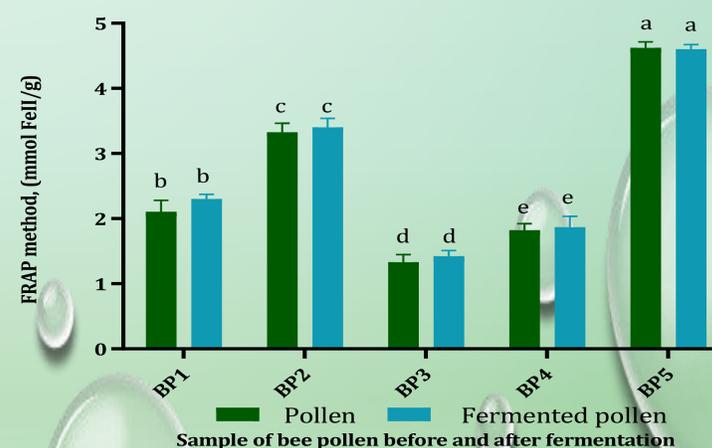
### Antioxidant activity



DPPH method



ABTS method



FRAP method

## CONCLUSIONS

The obtained results show that probiotic fermentation of bee pollen seems to increase the nutritional and biological value of bee pollen, but further studies are required to evaluate the bioavailability of the probiotic bacteria from fermented pollen for bees and its beneficial impact on their gut microbiota.

## REFERENCES

1. Mora-Adames, W.I.; Fuenmayor, C.A.; Benavides-Martín, M.A.; Algecira-Enciso, N.A.; Quicazán, M.C. Bee Pollen as a Novel Substrate in Pilot-Scale Probiotic-Mediated Lactic Fermentation Processes. *LWT* 2021, 141, 110868,  
 2. Zuluaga-Dominguez, C.M.; Quicazan, M. Effect of Fermentation on Structural Characteristics and Bioactive Compounds of Bee-Pollen Based Food. *J. Apic. Sci.* 2019, 63, 209–222, <https://doi.org/10.1515/jas-2018-0010>