



## Merits of probiotic biocatalysis immobilized on wheat bran for the production of functional foods



Dear editor

We have read the article entitled “Production of a potentially synbiotic fermented Cornelian cherry (*Cornus mas* L.) beverage using *Lactobacillus paracasei* K5 immobilized on wheat bran”, which was published recently in *Biocatalysis and Agricultural Biotechnology* (Mantzourania et al., 2019). The authors have developed a ready-to-serve beverage with potential synbiotic properties using probiotic *L. paracasei* and shown immobilization with wheat bran enhanced bacteria viability. The article is interesting and informative for food microbiologists. Similar approaches can be potentially applied during the development of other functional foods, especially using wheat bran immobilized probiotics. Therefore, we are glad to write a correspondence on this paper to extend readers’ understanding and point out a few questions that may inspire novel ideas.

- Probiotics as well as synbiotics are particularly investigated for improving the commercial value or enhancing functionality during biocatalysis of different kinds of agricultural substances. As stated by authors on fruit juice-based functional beverages, similar advantages also presented on vegetable or cereal-based functional beverages fermented with probiotics, like higher contents of vitamins, antioxidants and polyphenols (Enujiugha and Badejo, 2017; Min et al., 2018).
- Fruit juices are generally considered as a difficult matrix for the growth and survival of probiotics, e.g. due to their very low pH values. Authors adjusted the pH of cornelian cherry juice to 3.5 by addition of 0.1 M NaOH solution. Meanwhile, the substrates were allowed to ferment at 30 °C for only 1 day. By our understanding, to support effective growth of bacteria, the value of pH was normally adjusted to near neutral range (Dimitrovski et al., 2016). Long-time (e.g. 3–5 days) fermentation may improve the beneficial properties more significantly (Sankar et al., 2018).
- Authors used 2 g of free *L. paracasei* K5 cells (free cells; FC) or 2 g of the immobilized biocatalyst (immobilized cells; IC) in 100 mL of the fermentation substrate. We believe 2 g FC should have more cell counts than 2 g IC as the later was embedded with wheat bran. However, there are equal amount of viable cells at 0 h in table 3.
- It is clear that there is no proliferation of inoculated probiotic *L. paracasei* K5 in the fruit juice, as cell counts steadily declined though wheat bran alleviated the trend in the adverse condition (Table 3). However, accumulation of typical metabolites, like lactic acid and acetic acid increased significantly (Table 1). These results seem somewhat conflict with each other.
- In table 1, authors should supply footer on “ND”, not detectable or non-detected? *L. paracasei* is facultatively heterofermentative ([https://en.wikipedia.org/wiki/Lactobacillus\\_paracasei](https://en.wikipedia.org/wiki/Lactobacillus_paracasei)), which means it produces both lactic acid and acetic acid simultaneously. We are quite confused why there is no acetic acid even lactic acid can be as high as 14.7/26.8 mg/100 mL, even using HPLC assay.
- It may be much better if authors provided total phenolics content (TPC) at 0 h (Table 2). The higher amount of phenolics in IC group might be introduced by wheat bran used during immobilization (Verma et al., 2008). If the difference of TPC exists before incubation, then the conclusion may different.

### References

- Dimitrovski, D., Velickova, E., Dimitrovska, M., Langerholc, T., Winkelhausen, E., 2016. Synbiotic functional drink from jerusalem artichoke juice fermented by probiotic *Lactobacillus plantarum* pcs26. *J. Food Sci. Technol.* 53 (1), 766–774. <https://doi.org/10.1007/s13197-015-2064-0>.
- Enujiugha, V.N., Badejo, A.A., 2017. Probiotic potentials of cereal-based beverages. *Crit. Rev. Food Sci. Nutr.* 57 (4), 790–804. <https://doi.org/10.1080/10408398.2014.930018>.
- Mantzourania, I., Terpoub, A., Alexopoulou, A., Bezirtzoglou, E., Bekatoroub, A., Plessasa, S., 2019. Production of a potentially synbiotic fermented Cornelian cherry (*Cornus mas* L.) beverage using *Lactobacillus paracasei* K5 immobilized on wheat bran. *Biocatal. Agric. Biotechnol.* 17, 347–351. <https://doi.org/10.1016/j.bcab.2018.12.021>.
- Min, M., Bunt, C.R., Mason, S.L., Hussain, M.A., 2018. Non-dairy probiotic food products: an emerging group of functional foods. *Crit. Rev. Food Sci. Nutr.* 1–45. <https://doi.org/10.1080/10408398.2018.1462760>.
- Sankar, G.S., Sankar, S.S., Subrata, S., Venkatachalam, S., Chang, P.S., 2018. Use of a potential probiotic, *Lactobacillus plantarum* 17, for the preparation of a rice-based fermented beverage. *Front. Microbiol.* 9, 473. <https://doi.org/10.3389/fmicb.2018.00473>.
- Verma, B., Hucl, P., Chibbar, R.N., 2008. Phenolic content and antioxidant properties of bran in 51 wheat cultivars. *Cereal Chem.* 85 (4), 544–549. <https://doi.org/10.1094/cchem-85-4-0544>.

Juan Li<sup>a</sup>, Shufan Tian<sup>b</sup>, Zhongke Sun<sup>a,c,\*</sup>

<sup>a</sup> College of Life Sciences and Agronomy, Zhoukou Normal University, 466001, China

<sup>b</sup> The 1st High School of Zhoukou, Zhoukou 466001, China

<sup>c</sup> Institute of Food and Drug Inspection, Zhoukou Normal University, 466001, China

E-mail address: [sunzh@daad-alumni.de](mailto:sunzh@daad-alumni.de) (Z. Sun).

\* Correspondence to: Room A407, Life Science Building, East Wenchang Road, Chuanhui District, Zhoukou City 466001, China.