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Research article

Effect of Processing Steps on Bioactive Compounds and Antioxidant Activities of High Anthocyanin Mulberry Fruit Powder

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Abstract The objective of this research was to determine the amounts of bioactive compounds and antioxidant activities in each processing step in the production of high anthocyanin powder (HAP) from mulberry fruits to investigate suitable processing methods. For fresh mulberry fruits derived of Chiang Mai varieties, both in-season and off-season fruits had similar amounts of total anthocyanin content (TAC) and total phenolic compounds (TPC). In-season mulberry fruits had the highest potential to be used as a raw material for further study because of high antioxidant activities, large fruit size, and high productivity. Two methods of HAP production were tested. The first method used whole fruit drying with different drying methods included hot air drying (HAD), vacuum drying (VD), and freeze drying (FD). Hot air drying at 50, 60 and 70°C showed a decreased concentration of anthocyanins, which were 60% lower than that of fresh fruits. Vacuum drying at 55 and 75°C could provide high anthocyanin content and was similar to freeze drying, which had 87–97% anthocyanin retention. Vacuum drying at 75°C was most suitable for HAP production because of the short drying time (22.3 ± 0.4 hours), high anthocyanin retention (87.21%), high phenolic compound content, and high antioxidant activities. The second method used fermented and concentrated mulberry juice. This process used the following steps: yeast fermentation to decrease the sugar content, filtration to get rid of solid parts, evaporation to concentrate the solution, drying with different drying methods (vacuum drying and freeze drying), and crushing to powder. Throughout fermentation, filtration, and evaporation, high phenolic compound content and antioxidant activities were observed and 77.29% of anthocyanins were retained. However, these values decreased dramatically after the drying step. Therefore, drying the concentrated solution was not effective for HAP production. Of the processing methods tested, directly drying whole mulberry fruits with VD at 75°C was most suitable for HAP production. This method provided $13.06\% \pm 0.35$ production yield of HAP, contained 13.51 ± 0.08 mg/g DW of total anthocyanins, and 27.47 ± 0.50 mg GAE/g DW of total phenolic compounds. Additionally, the antioxidant activities by DPPH, TRAP, and TEAC assays were 2.91 ± 0.19 , 16.22 ± 0.31 , and 22.34 ± 0.29 mmol GAE/g DW, respectively.

Keywords: Anthocyanins, Antioxidant activities, Bioactive compounds, Mulberry fruits, Powder

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