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BRANding: Exploring the Functional Potential of Pigmented Rice Bran in Cacao Wine

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Abstract

Cacao (*Theobroma cacao*) pulp, rich in sugar, is ideal for wine production and fermentation. Pigmented rice bran (PRB), a nutrient-rich by-product, offers fiber, vitamins, minerals, and antioxidants like anthocyanin and proanthocyanidin. This study explored the functional ingredient potential of PRB to enhance the nutritional profile of cacao wine. Cacao-PRB wine samples (Control, F1-5%, F2-10%, F3-15% PRB w/v) were fermented for 30 days. Parameters like TSS, %ABV, pH, TA, and temperature were monitored. Post-fermentation, assessments included total phenolic content, SO₂ level, antioxidant activity, color, turbidity, and sensory evaluation by FGD (n=7). Throughout fermentation, pH and TSS declined while TA and %ABV steadily increased. By the end of fermentation, samples with PRB showed higher alcohol content (14.80-15.07% ABV) and lower residual sugar (0.4-0.6°Brix) compared to the control (11.92% ABV; 3.5°Brix). A plateau in %ABV and TSS in PRB samples from day 25 to 30 suggested readiness for bottling after 25 days. Free SO₂ levels (0.0085-0.0139 ppm) were within safe limits. Higher PRB concentrations resulted in a deeper color and significantly elevated TPC (Control - 0.071, F1 - 0.348, F2 - 0.417, and F3 - 0.447 mg GAE/mL), attributed to anthocyanin content. The F3 sample had the highest TPC and a notably redder, more yellow hue. Sensory evaluation favored the Control and F1 samples for overall acceptability due to their good flavor profile, sweetness, and mild flavor. Overall, PRB can enhance the nutritional profile of cacao pulp wine but should be limited to 5% to maintain desirable sensory properties. The addition of PRB also accelerated fermentation, allowing for bottling after 25 days.