Process Development of Blueberry Wine with High Content of Functional Compounds

Supervisor: Yutaka KITAMURA; Toru OKUDA; Mito KOKAWA

王　宏璞 (201821166)

1. Background

Blueberry is well known for its high nutritional content such as phenolic compounds, especially rich in skin and seeds. Therefore, it is suitable to make into wine with higher functional compounds and antioxidant capacity. However, pomace, a kind of by-product that contains most of bioactive compounds, is produced during winemaking process. To increase the utilization of pomace, Micro Wet Milling (MWM) system is used to produce wine with a smaller particle size, which can reserve more nutritional compounds and increase the taste of wine.

2. Objectives:

The aim of this study is to establish a process for producing blueberry wine rich in functional compounds by MWM system and investigate effect of MWM on wine properties by comparing with wine manufacturing by using potassium metabisulfite (PM, a kind of food additives usually used in winery).

3. Materials and methods:

In the research, Rabbiteye blueberry (*Vaccinium virgatum*) was used for fermentation by wine yeast. The total soluble solids content was enriched up to 21°Brix before fermentation to obtain a potential alcohol level of approximately 12%vol. Fermentation was conducted at 22±1℃, and total soluble solids and alcohol content were measured during fermentation.

Blueberry wine fermentation following the conditions above was conducted by different processes, including filtration (Wine 2), MWM before (Wine 4) and after fermentation (Wine 3), then physicochemical properties and functional content such as total polyphenol content (TPC) and anthocyanin content (TAC) were analyzed. Antioxidant activity was also determined to find a relationship with functional compounds.

In order to investigate the effect of MWM on wine properties, blueberry wine fermented with potassium metabisulfite addition (40, 60, 80, 100 mg SO_2/L wine) was used to compare with wine produced by MWM after fermentation.

4. Results and discussion:

Blueberry wine fermentation could complete after 35 days when total soluble solids content reached a constant level (6-7 ˚Brix). Total soluble solids and alcohol content changed fast in the first 20 days of fermentation and then became slower until finish.

The TPC, TAC and antioxidant activity of wine with MWM after fermentation (Wine 3) was the highest compared with MWM before fermentation (Wine 4) and without MWM (Wine 1), which indicated phenolic content and antioxidant activity of blueberry wine could be improved by applying MWM after fermentation. Physicochemical properties such as pH, brix and alcohol content didn't show so much difference among wines produced with and without MWM. But wine color was changed along with anthocyanin content and could be improved by MWM after fermentation.

Results of comparison with PM addition experiment showed that wine produced with MWM after fermentation had the similar effect with wine produced with 100 mg SO_2/L and 40-60 mg SO_2/L addition on TPC and TAC, respectively.

5. Conclusion:

The wine fermentation could complete within 35 days. MWM could increase functional compounds such as total polyphenol and anthocyanin content in blueberry wine when it was applied after fermentation. Antioxidant activity of blueberry wine also increased along with these functional compounds. MWM could also improve taste of wine by decreasing particle size. Moreover, blueberry wine with pasteurization and MWM after fermentation might have the potential to replace potassium metabisulfite used in the winery.