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Production and Characterisation of ZESPRI™ Gold Kiwifruit Vinegar

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Abstract

Gold kiwifruit (Hort 16A) is a relatively new entrant into the international fresh fruit market and is a controlled variety only marketed by Zespri™. Zespri™ gold and the traditional green 'Hayward' kiwifruit are mainly marketed as fresh whole fruit; however there is interest in extending the range of processed products for gold fruit to provide further opportunities to utilize the increasing volumes now becoming available. Vinegar was selected for investigation as it plays an important role in food processing as a condiment, acidulant and preservative, and has also been identified to have various health benefits.

The aims of the project were:

- (1) To evaluate the effect of juice extraction techniques and conditions on juice yield and quality.
- (2) To evaluate the effects of pre-fermentation treatment and fermentation conditions on the fermentation behaviour and quality of Zespri™ gold kiwifruit mashes.
- (3) To identify suitable conditions for acetification of Zespri™ gold kiwifruit wines and investigate the effect of the vinegar elaboration technique on the quality of the resultant kiwifruit vinegars.

Ripe peeled or unpeeled gold kiwifruit was processed in a hammer mill and the juice was extracted using a laboratory scale hydraulic press. Yield was measured for four pressurization cycles, to a maximum pressure of 250MPa. Press aid, and pre-(cellulase) and post-pressing (pectinase) enzymes were used to improve juice yield and quality. Juice yield increased through the first three pressing cycles, but there was little gain in the fourth cycle. A juice of suitable clarity and consistency, and yield of 3.8 L.(5 kg pulp)⁻¹ was obtained with the recommended process conditions of: 2 or 3%(w/w) press aid, 0.15mL.kg⁻¹ pre-press enzyme held at 50°C for 2h, 0.035mL.kg⁻¹ post-press enzyme.

Repeated pressing was found to increase total phenolics but reduced colour intensity in juice. The free-run juice was superior in colour and TP; other physico-chemical parameters were not affected by repeated pressing. Hand peeling and holding pomace at 30-50°C for 2-6h slightly reduced total acidity and significantly (P<0.05) reduced vitamin C. Skin contact and temperature (30-50°C, 2-6h) significantly (P<0.05) increased total phenolics. The character impacting aromatic compounds, ethyl butanoate, hexanal and trans-2-hexanal, were identified in the juice at 10.8, 4.2 and 9.8mg.L⁻¹, respectively. Proteolytic activity attributed to actinidin was about 45% of that observed in 'Hayward' green kiwifruit juice.

Alcoholic fermentation behaviour was evaluated at 20, 30 and 37°C for natural juice and juice supplemented with sucrose to 18°Brix using a wine yeast strain of *Saccharomyces cerevisiae*. Juices obtained from peeled and unpeeled fruit, filtered and unfiltered, were fermented. With sucrose enrichment, wines with 8.1%w/v or 8.0%w/v were obtained at efficiencies of 88% and 87% and productivities of 1.3 and 1.6g.L⁻¹h⁻¹ at 20 and 30°C, respectively. Natural juice at 20°C gave a similar yield but efficiency and productivity

varied from 84-96% and 1.1-0.8g.L⁻¹h⁻¹, respectively. Both sucrose enrichment and high fermentation temperature reduced total vitamin C and total acidity in wine. Many esters which impact positively were identified by GC-MS in the gold kiwifruit wines. These included isoamyl acetate, ethyl acetate, ethyl butanoate, 1-hexyl hexanoate, ethyl decanoate and ethyl octanoate.

Gold kiwifruit wines with up to 7.5%w/v ethanol were subjected to acetic acid fermentation using a commercial cider vinegar as the inoculum. A start up protocol for a simple semi-continuous fermentation system was developed. The best fermentation conditions identified were 29±2°C with flow rate of 0.8L.min⁻¹ of oxygen enriched (40%) air. A yield of up to 5.8% w/v acetic acid was obtained at an efficiency of 85% and productivity of 1.2g.L⁻¹h⁻¹. A sensory panel described the gold kiwifruit vinegar as having stronger wine character than commercial cider vinegar, and equal to cider vinegar in terms of fruity aroma, ethyl acetate aroma and overall impression. The vinegar was found to have a meat tenderizing effect comparable to commercial papain enzyme and left the meat in good eating condition. Gold kiwifruit vinegar could find a niche market as marinating vinegar.

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