



Technical Parameters Influencing to *Cayratia trifolia* Fox Grape Wine Making

N. P. Minh^{1*}, L. Q. Thuan², M. H. Dai², D. T. Son³, H. T. Luu⁴, N. T. Dan⁵

1. Faculty of Food Technology - Biotech, Dong A University, Da Nang City, Vietnam.
2. Can Tho University, Can Tho City, Vietnam.
3. Vinh Long University of Technology Education, Vinh Long Province, Vietnam.
4. Labone Scientific Co. Ltd, Ho Chi Minh City, Vietnam.
5. Rainbow Technique Trading Co. Ltd, Ho Chi Minh City, Vietnam.

*Corresponding Author: N. P. Minh

Abstract

Cayratia trifolia is a weak herbaceous climber. Its fruit is fleshy, juicy, dark purple or black. *Cayratia trifolia* Linn. Is a medicinally important plants and used in the treatment of various diseases. In order to utilize this valuable fruit, objective of this study focused on major technical parameters such as sugar supplementation and yeast ratio in the primary fermentation; different clarifying agents such as gelatin, kaolin, egg white, bentonite in the secondary fermentation. Results showed that sugar concentration and yeast ratio in the initial must were very important to the ethanol, titratable acidity and aroma in wine. Gelatin was suitable in fining step to control haze turbidity in wine. From this study, consumers had more chance to enjoy a healthy food drink originated from natural source.

Keywords: *Cayratia trifolia*, Wine, Yeast, Sugar, Gelatin, Ethanol, Acidity, Turbidity.

Introduction

Fox grape (*Cayratia trifolia*) is a perennial climber having trifoliated leaves. Fruits are fleshy, juicy, dark purple or black [1]. It has a rich source of bioactive components such as yellow waxy oil, steroids/terpenoids, flavonoids, tannins, kaempferol, myricetin, quercetin, triterpenes and epifriedelanol with antioxidant, antimicrobial, anticancer, anti-inflammatory, anti-diabetic, antiviral, neuroprotective, cardioprotective properties that can control tumor, neuralgia and splenopathy [2, 3].

Infusion of seeds along with extract of tubers is traditionally given orally to diabetic patients to check sugar level of blood. The paste of tubers is applied on the affected part in the treatment of snake bite [4]. One study characterized the selected thermo tolerant yeasts and to evaluate their use in *Cayratia trifolia* fermentation at high temperatures [5]. There was not many research mentioned to processing of *Cayratia trifolia* fox grape into wine.

Therefore, objective of this study focused on the investigation of some major technical parameters such as sugar supplementation and yeast ratio in the primary fermentation, clarifying agents in the secondary fermentation affecting to the wine quality during fermentation from *Cayratia trifolia* fox grape.

Materials and Method

Material

Cayratia trifolia fruits were naturally collected from Bac Lieu and Soc Trang province, Vietnam. After collecting, they must be conveyed to laboratory within 8 hours for experiments. They were washed under tap water to remove foreign matters. They were set on stainless tray to drip the remaining water. After that, they were arrange layer by layer with sugar and *Saccharomyces cerevisiae* in different ratio for the primary fermentation at 37°C in 4 weeks.

The secondary fermentation would be continued in fining by treating with different clarifying agents such as gelatin, kaolin, egg white, bentonite for 3 weeks at 8°C. This research was conducted in 2019 by laboratory of Can Tho University.

Researching Procedure

Effect of Sugar Supplementation for Primary Fermentation

Cayratia trifolia fruits were mixed with sugar supplementation at different ratio: 5%, 7%, 9%, 11% with *Saccharomyces cerevisiae* 0.2%. After 4 weeks of fermentation at 37°C, we analyzed the residual soluble dry matter (°Brix), ethanol (%v/v), acidity (g/l), and sensory characteristics (score) in wine.

Effect of Yeast Inoculate for Primary Fermentation

Cayratia trifolia fruits inoculated with *Saccharomyces cerevisiae* at different ratio (0.20%, 0.25%, 0.30%, 0.35%). After 4 weeks of fermentation at 37°C, we analyzed the residual soluble dry matter (°Brix), ethanol (%v/v), acidity (g/l), and sensory characteristics (score) in wine.

Effect of Clarifying Agent in the Secondary Fermentation to Wine Quality

Cayratia trifolia wine was preserved at 8°C for 3 weeks as the secondary fermentation with the supporting of different fining agent such as gelatin, kaolin, egg white, bentonite at 0.5%. We monitored sensory characteristics (score) in wine.

Physico-chemical, Sensory and Statistical Analysis

Total soluble solid (°Brix) was examined by refractometer. Titratable acidity (g/L) content in juice was analyzed by titration. Ethanol (%v/v) in wine was measured by spectrophotometer. Sensory score was evaluated by a group of panelist using 9 point-Hedonic scale. The experiments were run in triplicate with three different lots of samples. Statistical analysis was performed by the Statgraphics Centurion XVI.

Result & Discussion

Effect of Sugar Supplementation for Primary Fermentation

Cayratia trifolia fruits were mixed with sugar supplementation at different ratio: 5%, 7%, 9%, 11% with *Saccharomyces cerevisiae* 0.1%. Our results were elaborated in Table 1. We could clearly see that 9% of sugar supplementation was adequate for wine making to achieve the best wine quality.

Table 1: Effect of sugar supplementation for primary fermentation

Criteria	Sugar supplementation (%)			
	5	7	9	11
Residual soluble solid (°Brix)	2.38±0.03 ^d	3.08±0.02 ^e	4.15±0.02 ^b	6.29±0.03 ^a
Ethanol (%v/v)	4.27±0.01 ^d	5.48±0.00 ^e	7.22±0.01 ^a	6.05±0.01 ^b
Acidity (g/l)	1.30±0.00 ^b	1.71±0.03 ^{ab}	1.95±0.03 ^a	1.80±0.03 ^{ab}
Sensory score	6.41±0.04 ^b	7.25±0.01 ^{ab}	7.98±0.00 ^a	7.50±0.02 ^{ab}

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant ($\alpha = 5\%$)

Sugar is an important nutrient and influence the flavor of wine, it has a direct relationship of the degree of fermentation and is an important precursor of wine aroma, directly affect the taste and quality of fruit wine [6].

Effect of Yeast Inoculate for Primary Fermentation

The alcoholic fermentation of grape must is initiated by a complex yeast community comprising a high proportion of oxidative and weakly fermentative yeasts [7]. In pure fermentation, the ability of inoculated *Saccharomyces cerevisiae* to

suppress the wild microflora is one of the most important features determining the starter ability to dominate the process [8]. The inoculation of musts using selected *Saccharomyces* strains does not ensure their dominance at the end of fermentation [9]. In our current study, *Cayratia trifolia* fruits inoculated with *Saccharomyces cerevisiae* at different ratio (0.20%, 0.25%, 0.30%, 0.35%). Our results were elaborated in Table 1. We could clearly see that 0.25% of yeast was adequate for wine making to achieve the best wine quality.

Table 2: Effect of yeast inoculate for primary fermentation

Criteria	Yeast ratio (%)			
	0.20	0.25	0.30	0.35
Soluble dry matter (°Brix)	4.15±0.02 ^a	3.01±0.03 ^{ab}	2.13±0.00 ^{ab}	2.04±0.02 ^b
Ethanol (%v/v)	7.22±0.01 ^b	7.94±0.04 ^{ab}	8.55±0.03 ^a	8.60±0.01 ^a
Acidity (g/l)	1.95±0.03 ^b	2.07±0.01 ^{ab}	2.29±0.01 ^a	2.32±0.04 ^a
Sensory score	7.98±0.00 ^b	8.12±0.02 ^{ab}	8.45±0.04 ^a	8.48±0.02 ^a

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant ($\alpha = 5\%$)

One study characterized the selected thermotolerant yeasts and to evaluate their use in *Cayratia trifolia* fermentation at high temperatures. *S. cerevisiae* HG1.3 producing the highest ethanol concentration of 9.9% (v/v) in *Cayratia trifolia* wine fermentation at 37°C [5].

Effect of Clarifying Agent in the Secondary Fermentation to Wine Quality

Cayratia trifolia wine was preserved at 8°C for 3 weeks as the secondary fermentation with the supporting of different fining agent such as gelatin, kaolin, egg white, bentonite at 0.5%.

Table 3: Effect of clarifying agent in the secondary fermentation to wine quality

Criteria	Fining agent 0.5%			
	Gelatin	Kaolin	Egg white	Bentonite
Sensory score	8.89±0.02 ^a	8.52±0.04 ^c	8.57±0.03 ^{bc}	8.75±0.030 ^b

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant ($\alpha = 5\%$)

One study compared the effectiveness of gelatin and kaolin in clarifying wine variously produced from locally available fruits (pawpaw, pineapple, cashew and banana). Gelatin was a better clarifier than kaolin [10]. Wheat gluten was used as clarifying agent of musts and white wines [11].

Conclusion

References

- Dinesh Kumar, Sunil Kumar, Jyoti Gupta, Renu Arya, and Ankit Gupta (2011) A review on chemical and biological properties of *Cayratia trifolia* Linn. (Vitaceae). *Pharmacogn Rev.*, 5(10): 184-188.
- AK Gupta, M Shamar (2007) Review on Indian medical plant. *Council of Medical Research*, 7: 879-882.
- PC Perumal, S Sowmya, P Pratibha, B Vidya, P Anusooriya, Starlin S Ravi, VK Gopalakrishnan (2015) Isolation, structural characterization and in silico drug-like properties prediction of a natural compound from the ethanolic extract of *Cayratia trifolia* (L.). *Pharmacognosy Reviews*, 7(1): 121-125.
- Sumitra Singh, Rajinder Mann, Surendra Kr Sharma (2012) Phytochemical analysis and pharmacognostical standardization of stem of *Cayratia trifolia* (Linn.) Domin. *Int. J. Pharm. Sci. Res.*, 3(11): 4503-4506.
- Doan Thi Kieu Tien, Huynh Xuan Phong, Mamoru Yamada, Ha Thanh Toan, Ngo Thi Phuong Dung (2019) Characterization of newly isolated thermotolerant yeasts and evaluation of their potential for use in *Cayratia trifolia* wine production. *Vietnam Journal of Science, Technology and Engineering*, 61(1): 68-73.
- Xiao Gong, Lina Ma, Junwei Yin, Mao Lin, Jihua Li (2017) Change in soluble sugar and organic acids during fermentation of dragon fruit wine. *2nd International Conference on Materials Science, Machinery and Energy Engineering*, 123: 1284-1288.
- Bahareh Bagheri, Florian F Bauer, Mathabatha E Setati (2017) The Impact of *Saccharomyces cerevisiae* on a wine yeast consortium in natural and inoculated fermentations. *Front Microbiol.*, 8: 1988.

8. Maurizio Ciani, Angela Capece, Francesca Comitini, Laura Canonico, Gabriella Siesto, Patrizia Romano (2016) Yeast interactions in inoculated wine fermentation. *Front Microbiol.*, 7: 555.
9. Capece A, Romaniello R, Siesto G, Pietrafesa R, Massari C, Poeta C (2010) Selection of indigenous *Saccharomyces cerevisiae* strains for Nero d'Avola wine and evaluation of selected starter implantation in pilot fermentation. *Int. J. Food Microbiol.*, 144: 187-192.
10. Awe S (2018) Effect of clarifying agents (gelatin and kaolin) on fruit wine production. *International Journal of Agriculture Innovations and Research*, 6(4): 130-132.
11. Richard Marchal, Laurence Marchal-Delahaut, Franck Michels, Maryline Parmentier, Armelle Lallement, Philippe Jeandet (2002) Use of wheat gluten as clarifying agent of musts and white wines. *Am. J. Enol. Vitic.*, 53(4): 308-314.