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The Determination of Anna Varieties Apple Juice Beverage Standard Process on Micro and Small Scale Enterprises

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ABSTRACT

The purpose of this study is to determine the standard process in the production of Apple Juice drink from Anna Apple varieties on small micro enterprises (MSEs) in Batu. The study sample was small micro enterprises that produce apple juice from Anna apple varieties. The analysis method is by assessing the organoleptic and laboratory analysis through the effectiveness value and the multiple attributes. The results show that the standard setting process based on the development of the optimal formula of apple juice has a connection with the fruit grade, the preservatives addition level, the pasteurization conditions, and also the apple juice quality would be better if the apple grade is better by indicating the apple ripe level and the Apple maximum flavor. The result novelty of this research is a standard process for apple juice production using Anna varieties on small micro-scale enterprises. This research result is strengthening Nour's research result (Nour *et al*., 2010) which has done a research comparing the nutritional characteristics of different varieties of apples grown in Romania. This weakness of this study is on the indicators used on the apple juice standard quality which is still limited on the organoleptic assessment and the microbes total amount, so that this research could be continue and expand by adding some more indicators such as the mineral content, vitamin C amount and more specific microbes detection.

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INTRODUCTION

Micro and Small Enterprises (MSEs) is one of the regional economy activator which is based on the local area natural resources utilization (Ministry of Industry and Trade, 2002). In 2011, the role of SMEs in creating the national gross domestic product based on the current prices is as big as Rp.4.303, 57 trillion or 57.94% of the national total Gross Domestic Product and was able to absorb 97.24% of labor force.

Fruit juice is one of the instant products that can be consumed as soft drink with a high enough chance of consumer demand. Soft drink industry, including fruit juice has developed rapidly compare with fast food in Western societies (Endrizzi *et al*, 2009) even has a high level position in the world food consumption as a health drink because of the taste, nutritional properties and effects on health (and Nicoleta Muntean, 2010) as well as the potential of innovation and fast growing (Jayalakshmi *et al*, 2011). ASRIM data and the Ministry of Industry in 2013 showed that the beverage industry growth of 8-9% per year with a growth of beverage packaging market by 11-15% compared to year 2012 which is supported by the domestic consumption market increase. Another information from the Indonesian of Bottled Drinking Water Company Association (ASPADIN) and the of Food and Beverage Association (GAPMMI) showed that the sales of bottled drinking water in 2012 increased to 19.8 billion liters from 21.9 to 22.7 billion liters in 2013 with a growth reaching about 10%. Apple juice beverage, produced by the apple processing Industry in Batu is one of the potential products mentioned above.

Mostly MSE in Batu in producing Apple juice uses natural ingredients with some sugar and water added with Anna apple as one of the fruit varieties used. Anna apple fruit, compared with Rome beauty and Manalagi apple, has a better appearance with a red fruit skin color and a more natural sour taste with a highest water content of 84.4% (Soelarso, 1996). The big difference in the chemical composition of the apple will have an impact on the taste of the fruit juice produced. To reach various market segments, the production systems in

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SMEs differ one to another, either on the raw material chosen or on the food additives addition, the process implemented until the quality determination. The process diversity will always appear at the manufacturers side (Kume, 1989) which has an impact on the product diversity (Soekarto, 1990) and satisfaction (Tjiptono, 2005; Herman, 2011; Parasuraman *et al*, 1994) for the consumer expectations and consumer needs fulfillment (Oliver, 1993; Arnould *et al*, 2005). Direct impact can be felt by consumers as a result of the production process which varies between SMEs would result a different product quality starts from the apple juice taste, color, aroma until to the product prices for all consumer segments. Therefore it is necessary to standardize the food processing include apple juice formula to produce an optimum quality product that could meet either for the producer satisfaction (MSEs) or for the consumers satisfaction.

Many factors would affect the apple juice beverage quality, such as the apple quality as the product raw material, the food additives amount, the pasteurization treatment process and of course the apple juice quality itself. The fruit quality can be seen from the grade / size (Astuti, 2010) and from the maturity level (Anggraini and Sofhiani, 2008). The food additive type and amount (additive) between one MSE to another are different, which clearly would affect the product quality. The beverage taste, color, flavor and price would differ one to another. The use of food additives should refer to the latest announcement given by the BPOM Regulation No. 27 of 2013 and its derivatives as well as the Codex *General Standard for Food Additives* (CODEX STAN 192-1995, Rev. 7-2006).

Based on the diversity condition of apple beverage production process in the MSE, it is necessary to determine the production process standard, such as, the raw material quality standard, the food additive amount, the pasteurization standard process and of course the product quality standard. The optimization methods could be implemented to optimize the formula in the beverage development (Bhuiyan *et al.,* 2012) so that the best composition could be found not just for the physical appearance, chemically, proper organoleptic and meet the consumer need, but also the proper and safe level of the food additive. The standard process optimization is done in a form of apple beverage formula development based on the integration between the MSE real conditions, the theoretical evaluation, based on previous research and supported by a laboratory research. A comprehensive evaluation should be done in determining the chemical composition through a laboratory research and consumer sensory attributes (Jan and Dorcus, 2012; Huor *et al.,* 2006). The first product parameter seen by the consumer is the organoleptic beside the physical appearance, and product chemical content (Bagde and Tumane, 2011). The purpose of this research is to produce an optimal formula as a basis for developing a quality standard apple juice in terms of physical, chemical and organoleptic comprehensively.

MATERIAL AND METHODS

This paper is part of a research dissertation on engineering support system decision for standard optimization process model for apple juice in small micro enterprises in Batu.

The research Object: MSEs producing apple juice with Anna apples varieties which is the MSE with a brand name of "Alam Segar" and "Snappel".

Methods: The optimal process standards determination based on a formula combining organoleptic assessment and laboratory observation by implementing the "Effectiveness Index" and "Multiple Attribute".

The first research step is by assessing the apple juice consumer satisfaction from two SMEs based on organoleptic assessment on trained respondents, followed by optimization using apple grade alternative treatment, the levels of use of preservatives and pasteurization conditions (temperature and time) which is equipped with a laboratory test parameters observing the total sugar beverage content, acidity level, total dissolved solids and total microbes.

RESULTS AND DISCUSSION

In determining Anna apple juice standard process, first what to do is to pay attention on the organoleptic predilection score towards the apple juice beverage produce by MSEs in Batu. Organoleptic has a very strong relation with the food or drink sensory properties, with a sensory characteristic include the product taste, product appearance, product aroma, product size and even sound (Theuer, 2006). The respondent organoleptic assessment result is shown in Table 1.

Table 1: Organoleptic Assessment against Apple Juice Drinks .

No.	Apple Juice drinks from MSEs		Mean Score				
		Color		Aroma		Apple taste	
		Score	Notation	Score	Notation	Score	Notation
1	Snappel	3.41	tn	2.30	tn	2.30	tn
2	Alam Segar	3.31	tn	2.66	tn	2.56	tn

Source: Data Analysis Result (2013)

Description:

- Favorite Score towards apple color, aroma and flavor (1-5) where 1 = extremely don't like, 3 = fairly like, 5 = like very much.
- Different notations shows the significant different treatment α = 0.05%
- tn shows here is no significant difference.

Color is the first sensory properties observed when consumers choose a food product which is strongly associated with the screening process prior to the next production process (Abdalla *et al*., 2010). Supported by Zellner and Durlach (2002), that product color is one of the main factors that affect the ability of satisfying beverage. The sense of aroma is considered a determinant part of neuromarketing as a strong element to attract consumers subconscious (Carrasco, 2011). The product aroma would affect the consumers flavor with regard to the sense of smell, causing a desirability to consume. Flavor is one of the main factors that influence satisfaction drinks to eliminate hunger (Beucler *et al*., 2005; Zellner and Durlach, 2002) and consumer acceptance of products beverages (Bhuiyan *et al*., 2012). To improve product quality, especially flavor sensory characteristic is strongly associated with the raw materials used (Karangwa *et al*., 2010). The higher mean score obtained show a sense of apple beverages increasingly favored by consumers. The results show respondents scores favorite brands of apple beverages using varieties Anna are the color (3.31 to 3.41), aroma (2.33 to 2.66) and flavor (2.3 to 2.56). Based on the scores preference for color, aroma and apple flavour, the best brand selection by comparing the value of the product of each brand using the weighting is determined by the respondents through the effectiveness index. The determination result by the mean value of the highest product with the selection of the best treatment results shown in Figure 1. (De Garmo *et al*., 1984).

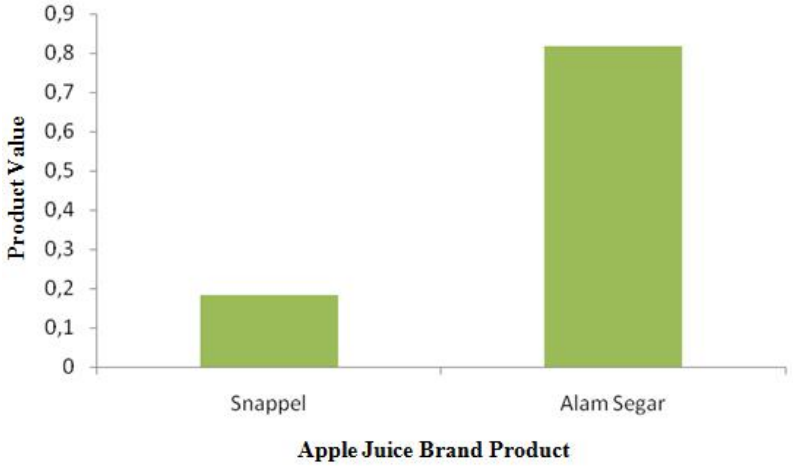

Fig. 1: The best selection Results based on the Effectiveness Index.

The results shows that "Alam Segar" is the best apple beverages brands. Furthermore by using some analysis formulas a list of the Anna apple production process optimal standard shown in Table 2.

Table 2: Anna apple varieties production process standard.

No.	Quality Indicators	Result
1	Apple Quality	
a	*Grade*	B
b	Texture Maturity (kg / cm $^{2)}$	4.89
c	Acid levels (%)	0,525
d	Total sugar (%)	4.20
2	Production Process Conditions	
a	Optimal Use of Preservative Levels (ppm)	200
b	Pasteurization optimal temperature (º C)	85
	Pasteurization Optimal Time (minutes)	25
3	Apple Juice Beverage Quality	
a	Color	4.23
b	Aroma	2.88
c	Apple taste	3.55
a	Acid levels (%)	0.325
b	Total sugar (%)	13.89
c	Total Dissolved Solids (° Brix)	4
d	Total Microbial (total plate count) (Colonies / ml)	5.10 ^{1}

The Apple fruit size or grade is one of the important factors determining the quality as the basis of agricultural products which will affect the quality of processed products produced and profitability of manufacturers (Sagare and Sunil, 2013). The process of harvesting maturity will also be able to harm and degrade the quality of the fruit is too ripe for causing damage to the fruit like rotting fruit, water loss, bruising mechanical and physiological disorders (Crisosto *et al*., 1995). This could have a negative impact on the quality of flavor and texture and product acceptance in the market. Fruit maturity indices should be clear to improve and maintain the quality of the fruit both physiological and growth in soil (Crisosto *et al*., 1995). The addition of preservatives is very important for instant products including apple juice in containers. The use of preservatives on the MSEs levels are still very diverse, whereas the standard maximum use of preservatives has been clearly stated in the National Agency of Drugs AND Foods Controls No. 36 of 2013 (600 ppm) and Codex STAN 2006 (1,000 ppm). Type of preservative used for the production of apple beverages is Sodium Benzoate. The use of preservatives benzoic acids and sodium benzoate is considered safe to use in the maximum allowable of 0.1 % , and even most of the state until the range of 0.15 to 0.25 % (Durrani *et al*., 2010). Evaluation of the use of preservatives will have an impact on the sensory quality of the product in addition to the chemical composition of the product as well.

The combination of the preservatives used and pasteurized at a lower temperature proved to be a decrease in microbial activity (Nwachukwu and Ezeigbo, 2013). The previous research from Rattanathanalerk (2005) and Canumir (2002) that the pasteurization process also resulted a decrease of fruit quality which is decreasing the vitamin C levels, total acidity, total dissolved solids. On products with a high acid content (pH range 3-4) heating with a high temperature should be avoid because it will damage the nutritional value of the product, especially for the beverage flavor, so the pasteurized process should reach the optimum temperature. The process standards required by the product to be compete in the free trade is coordinated by the WTO (World Trade Organization). It is expected that the apple beverages process standardization will keep the product consistency and would protect the consumer and a fair competition among business industries.

The novelty of this study is that the standard process of apple beverages for Anna varieties which is reinforcing a research done by Nour (Nour *et al*, 2010). Nour is comparing the nutritional characteristics of different Apple varieties grown in Romania. The weakness of this study is the indicators used to measure the apple beverages standard quality which is just limited to the sensory evaluation and total microbial number. These indicators should be extend referring to International Organization for Standardization (ISO) and Codex related to the mineral content, vitamin C and specific microbes.

Conclusion:

To decide for a specific standard process based on the apple juice beverage optimal formula development, there is a relation between the apple grade, the additional preservative level, the pasteurization conditions and apple juice product quality. The better the apple grade of each variety the higher the apple juice quality. The riper the apple fruit to be used the better the apple juice flavor could be. Supported by the production process conditions, by minimizing the preservative level, a lower pasteurized temperature level and a longer pasteurized time would resulted a better apple juice product quality, the product damage could be minimized either for the sensory or the nutritional. These results could be proof by measuring the apple juice quality whether it is close to both ISO or Codex standards with the indicator of acidity, total sugar, total dissolved solids and total plate count and organoleptic.

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