

Chemical and Organoleptic Properties Analysis of Breadfruit Leaves (*Artocarpus Altilis*) Herbal Tea with Cinnamon and Clove Addition

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ABSTRACT

Herbal tea is a functional beverage made from herbal ingredient steeping which be dried besides tea leaves. Breadfruit leaves is a herbal ingredient that can be utilized to herbal tea product. Breadfruit herbal tea is a functional beverage made from the steeping of dried breadfruit leaves that contains high antioxidant value. The addition of cinnamon and clove that contribute to give natural red colour source and typical aroma could improve the colour and aroma of breadfruit leaves herbal tea. Besides to utilize the antioxidant value, breadfruit leaves herbal tea also helpful to upgrade the usability of breadfruit leaves into herbal tea product.

This research aims to know the antioxidant content (gallic acid, kaempferol and quercetin) and organoleptic properties which consist hedonic quality test (taste) and hedonic test (taste, aroma and colour) from 0,5%, 1% and 1,5% of breadfruit leaves herbal tea with the lowest hedonic score is 1 and the highest is 5. This research is including experiment research using Completely Random Design (CRD) with three kinds of treatment. The analyzed data using One Way ANOVA, if the treatments shows difference significant, then the analyzed data should be proceed by Duncan's Multiple Range Test with 5% confidence interval.

The highest value of gallic acid antioxidant content leads in 1,5% breadfruit leaves herbal tea about 89,60818 µg/g. The highest value of kaempferol antioxidant content leads in 1,5% breadfruit leaves herbal tea about 23,810 µg/g. The highest value of quercetin antioxidant content leads in 1,5% breadfruit leaves herbal tea about 34,382 µg/g. The highest score of flavor hedonic is 3,89, the highest score of aroma hedonic is 3,7, and the highest score of colour hedonic is 3,8. The highest score of flavor hedonic quality is 4,2 with a bit bitter taste criteria.

Keywords: *breadfruit leaves, herbal tea, gallic acid, kaempferol, quercetin*

I. INTRODUCTION

There are so many products that produced by food industry, functional beverage is one of these products. If functional beverage fulfill two main functions involve could give sensory gratification such as good taste or good texture and give nutritional intake, then functional beverage could called as food functional. (Herawati, et al., 2012). According to Hariyadi (2006) functional beverage product had been become food trends nowadays cause many consumers increasingly aware of the weightiness of health. Silalahi (2006) mentioned tea included of functional beverage. Damayanti (2008) mentioned tea is kind of drink that consumed the most after water.

Tea product not only made from tea leaves (*Camelia sinesis*), but also could made from combination of dried herbal plants such as root, stem, flower, leaf, wood, fruit, seed and it usual called as herbal tea (Ravikumar, 2014).

Breadfruit leaves is a herbal ingredient that can be utilized to herbal tea product. According to Zainuddinur, et al. (2016), breadfruit leaves could designed into high quality beverage product and able to maintain the existing ingredient.

According to Riasari, et al. (2015), breadfruit leaves contain tripernoid, phenol and flavonoids. Moreover, breadfruit leaves also contain gallic acid, rutin (Sarawaty, et al., 2015), cyclomunol and quercetin (Mozef, et al., 2015). Several groups of flavonoids compounds that contain in breadfruit leaves are artoindonesianin and quercetin (Harmanto, 2012). The alternative way that could be used for utilize the antioxidant content and upgrade the usability of breadfruit leaves is make these leaves become functional beverage that beneficial for health, rich in antioxidant, and has a good quality into herbal tea product. Processing leaves into tea product

could upgrade value-added and shelf life and also make it more economical, practical and easy to use (Sutisna, 2016).

Seeing the number of tea enthusiasts in Indonesia nowadays, then many tea producer produce variant choices either from flavor or aroma. Addition of flavor and aroma into tea could given by simplisias addition such as orange peel, apple, cinnamon, lemongrass, ginger, clove, etc (Anggraini, 2017). Cinnamon commonly used as flavor and aroma enhancer in foods and beverages processing, among others jelly, cake, confectionary, curry seasoning, soup, liquor, softdrink (Rismunandar and Paimin, 2011), also for mix in drinks such as tea, coffee and cacao (Ferry, 2013).

While clove is kind of spice ingredient that commonly used as foods seasoning. Eugenol compound that contained in clove could processed into synthetic vanili compound, wherein vanili is important flavor as freshener, foods and beverages flavor enhancer such as confectionary, chewing gum, cake, bread and ice cream (Towaha, 2012).

Based on that description, researcher aims to conduct research that utilize breadfruit leaves which be dried to upgrade the usability of breadfruit leaves and utilize antioxidant that content within. This research aims to know antioxidant contents (gallic acid, kaempferol and quercetin) and organoleptic properties breadfruit herbal tea with cinnamon and clove addition. Furthermore, this

research could give information for society that breadfruit leaves could be expanded into herbal tea product caused its utilization still ignored.

II. RESEARCH METHOD

Research Design

This research is an experiment research using Completely Random Design (CRD). The treatments are 3 different percentages of breadfruit leaves that used on breadfruit leaves herbal tea, A1 = breadfruit leaves percentage 0,5%, A2 = breadfruit leaves percentage 1%, A3 = breadfruit leaves percentage 1,5%, each treatments analyzed with two repetitions. Those treatments then analyzed the antioxidant content (gallic acid, kaempferol, quercetin) and organoleptic properties which consist hedonic quality test (flavor) and hedonic test (flavor, aroma and colour) of breadfruit leaves herbal tea.

The ingredients for breadfruit leaves herbal tea among others breadfruit leaves which be dried, cinnamon, clove, sorbitol, and water. The equipments for breadfruit leaves herbal tea processing among others knife, scissor, digital scale, measuring cup, pan and strainer. The equipments for breadfruit leaves herbal tea chemical analysis among others elenmeiyer flask, micropipette, test tube, digital scale, mortar, pestle, vial and spectrophotometer. Breadfruit leaves herbal tea could seen at Table 1.

Table 1 Breadfruit Leaves Herbal Tea Formula

Ingredient	Formula 0,5%	Formula 1%	Formula 1,5%
Dried breadfruit leaves	5 gram	10 gram	15 gram
Cinnamon	2,5 gram	2,5 gram	2,5 gram
Clove	1,25 gram	1,25 gram	1,25 gram
Sorbitol	200 ml	200 ml	200 ml
Water	1.000 ml	1.000 ml	1.000 ml

Source: Zainuddinur, et al., (2007) and Researcher Modification

Research Data

Breadfruit leaves percentages 0,5%, 1% and 1,5% on breadfruit leaves herbal tea then analyzed the antioxidant contents (gallic acid, kaempferol, and quercetin) using HPLC method and organoleptic properties consist of hedonic quality test (flavor) and hedonic test (flavor, aroma and colour) using assessment sheet instrument.

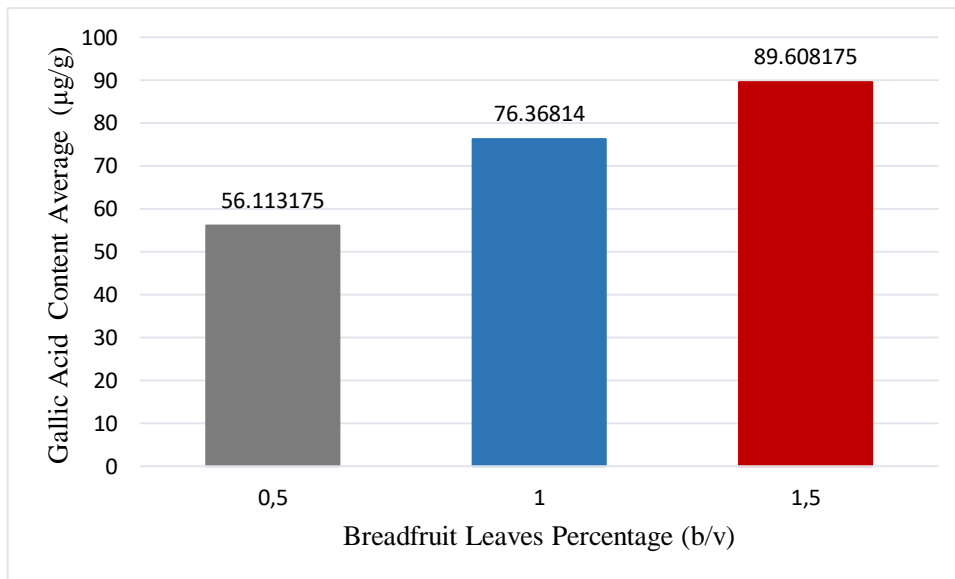
Research Data Analysis

Breadfruit leaves herbal tea analyzed statistically using One Way ANOVA significance level 5%. If significance level shows $p < 0,05$ then it stated there is a significant difference on different percentages of breadfruit leaves herbal tea. If significance level shows $p > 0,05$ then it stated there is no significant difference on different percentages of breadfruit leaves herbal tea. If the treatments shows significant difference, then those datas should be proceed by Duncan’s Multiple Range Test with 5% confidence interval.

III. THE RESULTS

Gallic Acid

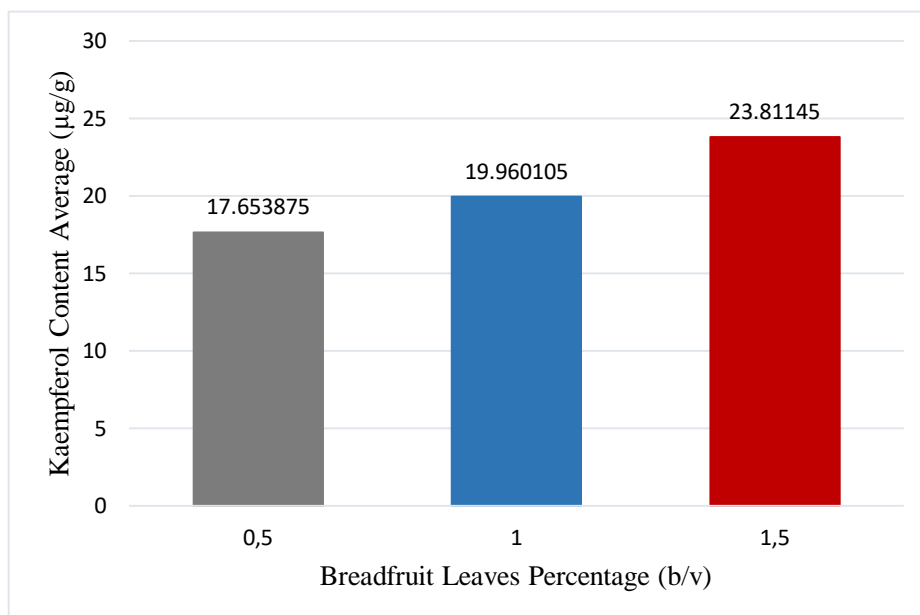
Gallic acid content average using HPLC method of breadfruit leaves herbal tea on different percentages could seen at Picture 1.



Picture 1 Gallic Acid Content Average of Breadfruit Herbal Tea

Kaempferol

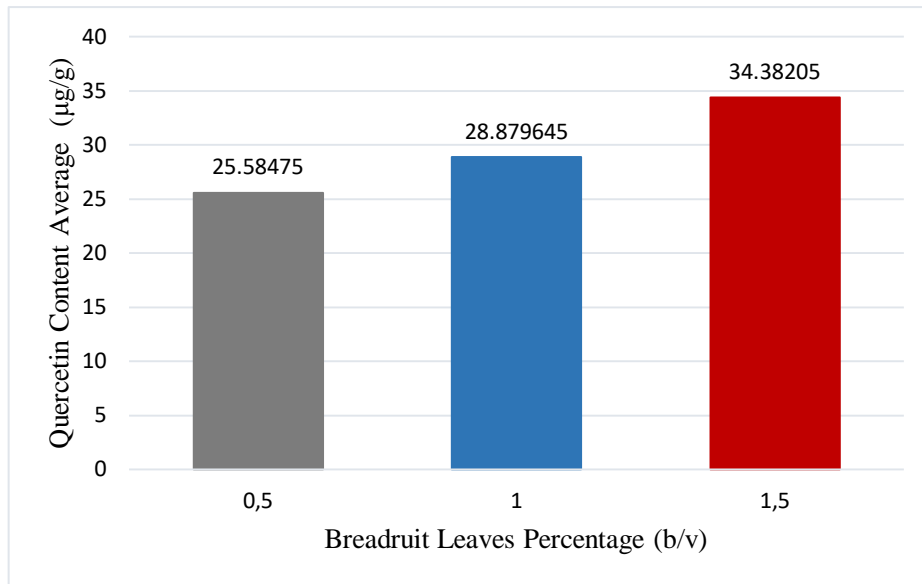
Kaempferol content average using HPLC method of breadfruit leaves herbal tea on different percentages could seen at Picture 2.



Picture 2 Kaempferol Content Average of Breadfruit Leaves Herbal Tea

Quercetin

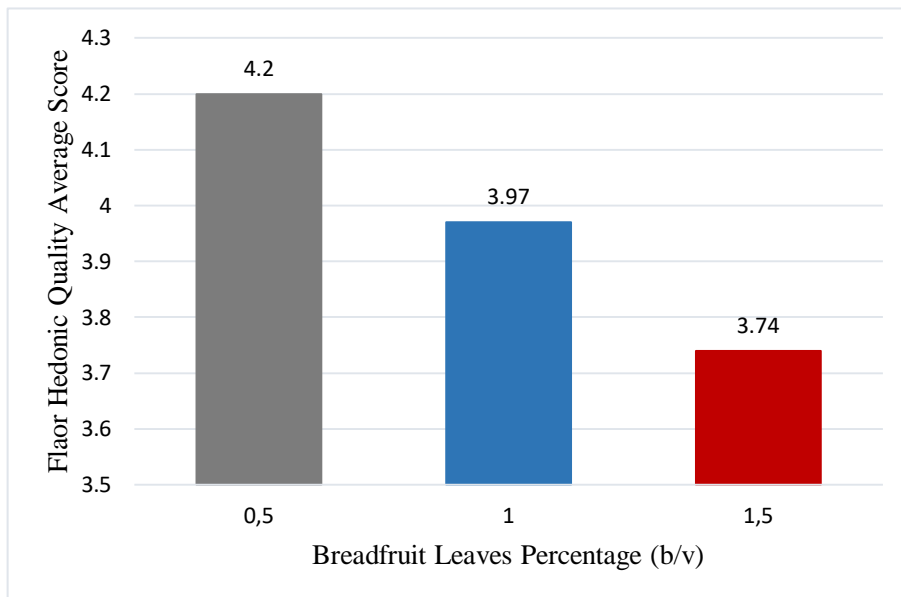
Quercetin content average using HPLC method of breadfruit leaves herbal tea on different percentages could be seen at Picture 3.



Picture 3 Quercetin Content Average of Breadfruit Leaves Herbal Tea

Flavor Hedonic Quality

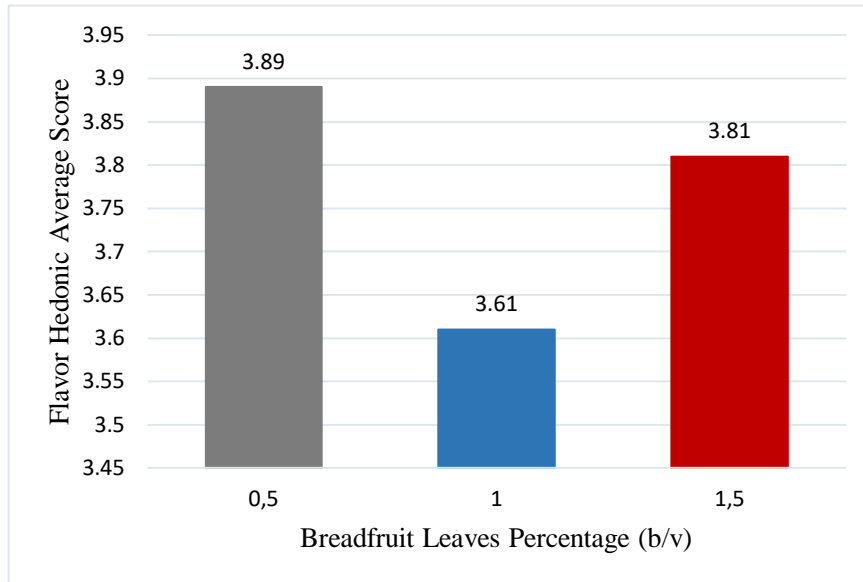
Flavor hedonic quality of breadfruit leaves herbal tea on different percentages could be seen on Picture 4.



Picture 4 Flavor Hedonic Quality Average of Breadfruit Leaves Herbal Tea

Flavor Hedonic

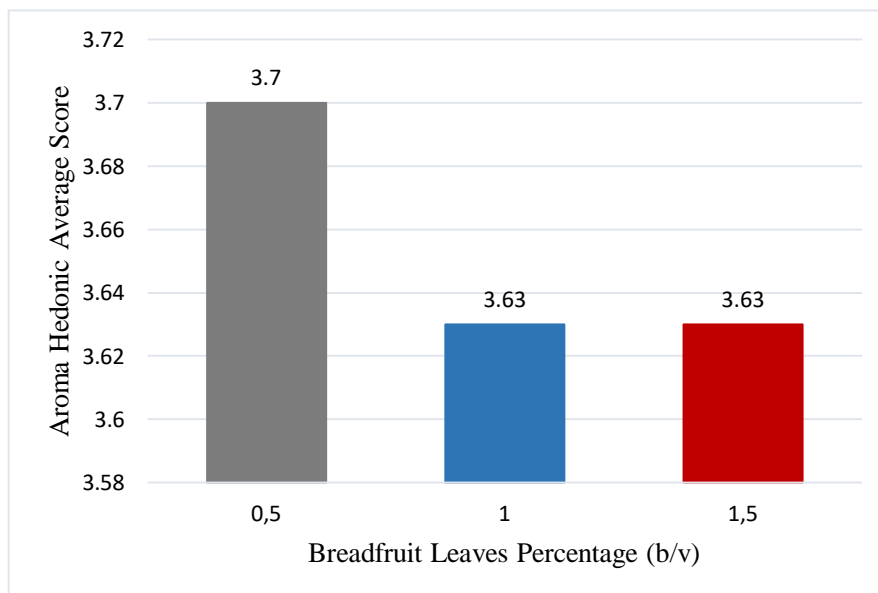
Flavor hedonic of breadfruit leaves herbal tea on different percentages could seen on Picture 5.



Picture 5 Flavor Hedonic Average of Breadfruit Leaves Herbal Tea

Aroma Hedonic

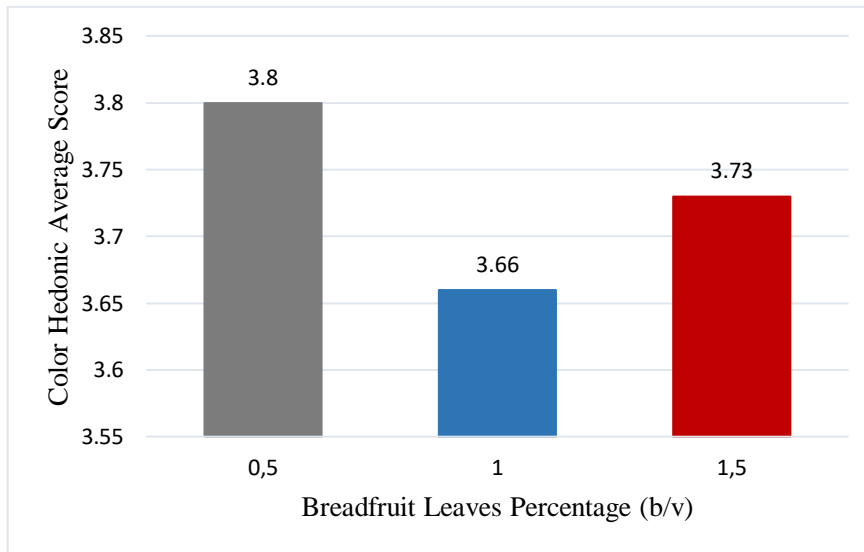
Aroma hedonic of breadfruit leaves herbal tea on different percentages could seen on Picture 6.



Picture 6 Aroma Hedonic Average of Breadfruit Leaves Herbal Tea

Color Hedonic

Color hedonic of breadfruit leaves herbal tea on different percentages could be seen on Picture 7.



Picture 7 Color Hedonic Average of Breadfruit Leaves Herbal Tea

IV. DISCUSSION

Gallic Acid

Based on analysis results, gallic acid content of breadfruit leaves herbal tea on different percentages shows that there is significant difference. The lowest gallic acid content of breadfruit leaves herbal tea leads in 0,5% percentage about 56,11318 µg/g, while the highest gallic acid content of breadfruit leaves herbal tea leads in 1,5% percentage about 89,60818 µg/g. Gallic acid content of breadfruit leaves herbal tea average has increased by increasing of dried breadfruit leaves percentage that added to breadfruit leaves herbal tea. It shows that addition of breadfruit leaves directly proportional by gallic acid content of breadfruit leaves herbal tea. The higher dried breadfruit leaves percentage added, then the higher gallic acid content that contained in those breadfruit leaves herbal teas. According to Triana (2019), gallic acid content in breadfruit leaves wedang has increased by increasing of breadfruit leaves percentage added while the highest gallic acid content leads in 6% percentage and followed by 4% and 5%.

Based on analysis results, fresh breadfruit leaves contained gallic acid compound average about 2.465,94 µg/g. Gallic acid content on fresh breadfruit leaves is higher than gallic acid content on breadfruit leaves herbal tea products. Gallic acid content has reduced and it suspected caused by breadfruit leaves herbal tea has through several processes such as drying processing. Luximon-Ramma, et al. (2002), mentioned that phenolic content difference between extract from fresh sample and dried sample caused by drying processing.

Kaempferol

Based on analysis results, kaempferol content of breadfruit leaves herbal tea on different percentages shows that there is significant difference. The lowest kaempferol content of breadfruit leaves herbal tea leads in 0,5% percentage about 17,654 µg/g, while the highest kaempferol content of breadfruit leaves herbal tea leads in 1,5% percentage about 23,810 µg/g. Kaempferol content of breadfruit leaves herbal tea average has increased by increasing of dried breadfruit leaves percentage that added to breadfruit leaves herbal tea. It shows that addition of breadfruit leaves directly proportional by kaempferol content of breadfruit leaves herbal tea. The higher dried breadfruit leaves percentage added, then the higher kaempferol content that contained in those breadfruit leaves herbal teas. According to Triana (2019), kaempferol content in breadfruit leaves wedang has increased by increasing of breadfruit leaves percentage added while the highest kaempferol content leads in 6% percentage and followed by 4% and 5%.

Based on analysis results, fresh breadfruit leaves contained kaempferol compound average about 668,025 µg/g. Kaempferol content on fresh breadfruit leaves is higher than kaempferol content on breadfruit leaves herbal tea products. Kaempferol content has reduced and it suspected caused by breadfruit leaves herbal tea has through several processes such as drying processing. According to Yamin, et al. (2017), drying processing cause flavonoids compound reduced.

Quercetin

Based on analysis results, quercetin content of breadfruit leaves herbal tea on different percentages shows that there is significant difference. The lowest quercetin content of breadfruit leaves herbal tea leads in 0,5% percentage about 25,585 µg/g, while the highest quercetin content of breadfruit leaves herbal tea leads in 1,5% percentage about 34,382 µg/g. Quercetin content of breadfruit leaves herbal tea average has increased by increasing of dried breadfruit leaves percentage that added to breadfruit leaves herbal tea. It shows that addition of breadfruit leaves directly proportional by quercetin content of breadfruit leaves herbal tea. The higher dried breadfruit leaves percentage added, then the higher quercetin content that contained in those breadfruit leaves herbal teas. According to Triana (2019), quercetin content in breadfruit leaves wedang has increased by increasing of breadfruit leaves percentage added while the highest quercetin content leads in 6% percentage and followed by 4% and 5%.

Based on analysis result, fresh breadfruit leaves contained quercetin compound average about 963,252 µg/g. Quercetin content on fresh breadfruit leaves is higher than quercetin content on breadfruit leaves herbal tea products. Quercetin content has reduced and it suspected caused by breadfruit leaves herbal tea has through several processes such as drying processing. According to Yamin, et al. (2017), drying processing cause flavonoids compound reduced.

Flavour Hedonic Quality

Based on analysis results, it known breadfruit leaves herbal tea on 0,5% percentage has the highest average score than 1% and 1,5% and its score about 4,2. On 0,5 % breadfruit leaves herbal tea percentage produce rather bitter flavour, on 1% breadfruit leaves herbal tea percentage produce quite bitter flavour, and on 1,5% breadfruit leaves herbal tea percentage produce quite bitter flavour. Flavour hedonic quality average has decreased by increasing of dried breadfruit leaves percentage that added to breadfruit leaves herbal tea. It shows that the higher dried breadfruit leaves percentage added, then the higher bitterness level that produced in those breadfruit leaves herbal teas.

Bitter taste felt by panelists suspected caused by tannin content that contained on breadfruit leaves. According to Suryanto and Wehantouw (2009), breadfruit extrat contain phenolic, flavonoids an tannin compounds. Tannin is a bitter compound (Sari, et al., 2011). According to Tahir, et al . (2017), tannin compound that contained on breadfruit leaves cause bitter taste on breadfruit leaves drink.

Flavor Hedonic

Hedonic flavor of breadfruit leaves herbal tea on each percentages about 0,5%, 1% and 1,5% approaching same fondness level (netral). Panelists fondness level to breadfruit leaves herbal tea flavor on 0,5% and 1,5% has almost the same fondness level about 3,89 and 3,81 and its more preferable than breadfruit leaves herbal tea flavor on 1% percentage and its score average about 3,61.

Based on flavor hedonic quality analysis, it known that rather bitter and quite bitter flavor (breadfruit leaves herbal tea 0,5% and 1,5% percentage) more preferable by panelists. Panelists' reasons on assessing breadfruit leaves herbal tea flavor quite diverse, some give assessments the higher breadfruit leaves herbal tea percentages then the most bitter flavour that produced, and conversely. Moreover, some give assessments that the all percentages has almost the same bitterness level.

Another flavor that felt by panelists is cinnamon and clove distinctive taste and it caused by those both herbs addition. Cinnamon contained viscous reddish liquid which gives cinnamon distinctive taste and aroma called oleoresin (Lestari, 2013; Djafar dan Redha, 2012). Moreover, according to Indriyani (2015), clove addition on herbal tea could gives clove distinctive pungent.

Hedonik Aroma

Hedonic aroma of breadfruit leaves herbal tea on each percentages about 0,5%, 1% and 1,5% approaching same fondness level (netral). Panelists fondness level to breadfruit leaves herbal tea aroma on 0,5% percentage which its average score about 3,7 more preferable than breadfruit leaves herbal tea aroma on 1% and 1,5% which has same fondness level about 3,63 and 3,63.

Panelists' reasons on assessing breadfruit leaves herbal tea aroma quite diverse, some give assessments 1% percentage has strong cinnamon aroma, some give assessments that all those percentages has cinnamon and clove blend of aroma. Moreover, some give assessments that those all percentages dominated by cinnamon aroma.

Cinnamon and clove give contribution to breadfruit leaves herbal tea aroma. Cinnamon has distinctive fragrance derived from eugenol and cinnamaldehyde compound. Qin, et al. (2010) mentioned that eugenol and cinnamaldehyde compound that contained in cinnamon give distinctive fragrance and taste. Moreover, clove also has distinctive aroma derived from eugenol content that contained in clove. According to Towaha (2012), clove's eugenol compound has pleasant aroma and pungent, and its also gives clove distinctive aroma.

Color Hedonic

Hedonic color of breadfruit leaves herbal tea on each percentages about 0,5%, 1% and 1,5% approaching same fondness level (netral). Panelists fondness level to breadfruit leaves herbal tea color on 0,5% percentage which its average score about 3,8 more preferable than breadfruit leaves herbal tea color on 1% and 1,5% which has same fondness level about 3,66 and 3,73.

Panelists' reasons on assessing breadfruit leaves herbal tea flavor quite diverse, some give assessments 1% percentage has most appropriate color. Moreover, some give assessments that all those percentages has resemble tea color commonly.

Breadfruit leaves herbal tea's steeping color formed by pigments and substances from each ingredients. Breadfruit leaves herbal tea has brownish red steeping color. This color formed by cinnamon and clove addition and also

breadfruit leaves drying processing. According to Ranggawati, et al. (2018), anthocyanin and cinnamaldehyde content which contained in cinnamon give reddish color. Indriyani (2015) mentioned clove contained atsiri oil in the from of calcium oxalate 12% and tannin 7% so that could give brownish color. Moreover, according ro Rizqi (2014), drying processing cause chlorophyll's green color from breadfruit leaves oxidized to brownish so that have an impact to breadfruit leaves herbal tea's steeping color.

V. CONCLUSION

The highest value of gallic acid antioxidant content leads in 1,5% breadfruit leaves herbal tea about 89,60818 µg/g. The highest value of kaempferol antioxidant content leads in 1,5% breadfruit leaves herbal tea about 23,810 µg/g. The highest value of quersetin antioxidant content leads in 1,5% breadfruit leaves herbal tea about 34,382 µg/g. The highest score of flavor hedonic quality leads in 0,5%. The highest score of flavor hedonic leads in 0,5%. The highest score of aroma hedonic leads in 0,5%. The highest score of color hedonic leads in 0,5%.

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