The Differences in the Preference of Panelists for Organoleptic Test on Mouthwash and Toothpaste of Beluntas Leaf Extract Ingredients

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Abstract: *The purpose of this study was to determine the differences in the preference of panelists for organoleptic tests on mouthwash and tooth paste of beluntas leaf extract. This is aquasi-experimental study. The sample size was 32 panelists, selected from volunteers who met the sample inclusion criteria, hereinafter referred to as organoleptic test panelists, will assess the color, aroma and taste of toothpaste and mouth wash of the 10% concentration of beluntas leaf extract with original, mint and mixed fruit flavors using a five digit of hedonic scale: very fond (5), very like (4), neutral (3), dislike (2) and very dislike (1).The results showed that, panelists preferred the color of toothpaste and mouthwash of mixed fruit flavor followed by mint and original flavors. The difference of the assessment was significant with the value of p = 0.032 (p <0.05). Panelists preferred the aroma of toothpaste with mint flavor, followed by mixed fruit and original flavor, the difference in assessment was significant at p = 0.017 (p <0.05). The panelists' assessment of mouthwash showed that the panelists preferred the aroma of mouthwash with mixed fruit flavor, followed by the flavor of mint and original. The difference in assessment was significant at the value of p = 0.019 (p <0.05). Panelists preferred the taste of toothpaste with mixed fruit flavor followed by mint and original flavor.The difference in assessment was significant at the value of p = 0.004 (p <0.05). The assessment of mouthwash showed that panelists preferred the mouthwash with Mint flavor, followed by mixed fruit and original flavor, but the difference in assessment was not significant at the p value = 0.276 (p> 0.05). It can be concluded that the organoleptic test panelists preferred the mouthwash compared to the toothpaste of beluntas leaf extract product. The most preferred toothpaste products are toothpaste with mint aroma and mixed fruit color and flavor, while the most preferred product of mouthwash is the one with aroma and color of mixed fruit and the taste of mint.*

Keywords: Organoleptic Test, Panelist, Mouthwash and Toothpaste of Beluntas Leaf Extract

1. Introduction

In line with the trend to back to nature, some herbal ingredients can be added as antimicrobial agents in various cosmetic products such as toothpaste and mouthwash. Currently the use of herbal medicines in the world, including in Indonesia continues to increase, makes drug manufacturers interested in continuing to develop it.

According to Soho Global Health's Vice President of Sales and Marketing for Professional Products, herbal products have been used by 80% of the world's population. Based on data from the Directorate General of Pharmaceutical and Medical Devices Development of the Ministry of Health of the Republic of Indonesia in the year 2012, the marketing of herbal medicines in Indonesia reached Rp 13 trillion or around 2% of the total herbal medicine market in the world[1].

Beluntas (Plucheaindica Less) is a plant that is easily found in Indonesia, has an aromatic aroma and has a bitter taste. The extract can be used as one of the active ingredients in mouthwash and toothpaste as a therapeutic agent that serves to prevent plaque accumulation so that it can be developed into toothpaste and mouthwash herbal products to be marketed in Indonesia. Some research results shown that beluntas leaf extract has an antibacterial activity. The active compounds contained therein are alkaloids, flavonoids, triterpenoids, tannins and phenols and other essential oil derivatives[2,3].

Flavonoids and phenols have an antibacterial activity that can inhibit the growth of Escherichia coli bacterial cells[4]. Research results from Nahak et al. (2007), showed that pure extracts of beluntasleaves can reduce 70% of bacteria in saliva[3]. Research conducted by Sulistiyaningsih (2009), showed that beluntas leaf extract has antibacterial activity against Pseudomonas aeruginosa Multi Resistant and Methicillin Resistant Staphylococcus aureus with a minimum inhibitory concentration of 20% and 52% [5]. Results of in vitro research by Nahak (2012), showed that the ethanol extract of beluntas leaves with a concentration of 25% had an inhibitory effect equivalent to 0.12% chlorhexidine to inhibit the growth of Streptococcus mutans bacteria. The results of the study also showed that the higher the concentration of the extract, the greater the inhibitory activity[6].

Data from in vivo research conducted by Susetyarini (2007), showed that LD50 decoction of beluntas leaves in male white rats was> 375 grams / Kg BW and was practically non toxic[7]. The research results of Nahak, et al. (2015), showed that gargling beluntas leaf extract with 10%, 20% and 30% of concentration can reduce the number of Streptococcus sp. colonies[8]. The results of research of Nahak, et al. (2017), showed that brushing and gargling using toothpaste and mouthwash of 10% beluntas leaf extract was effective to reduce the number of Streptococcus mutans on dental plaque. At the time of the study, several respondents complained that the taste of toothpaste was dense to the bitter and possibly related to the subject's level of preference, so it needed further investigation in terms of its organoleptic[9].

Organoleptic testing is a test based on a sensing process that is subjective[10]. Sensitive stimuli can be mechanical such as pressure or prick, physical for example: heat, cold and color

and chemistry such as aroma and taste. The ability of the sensory organs to give an impression or response can be analyzed or distinguished based on the type of impression, area of impression, duration of impression and hedonic impression, namely the ability to express likes and dislikes by one or a group of panels[10].

Organoleptic assessment requires panelists who act as instruments or tools, consisting of a group of people whose job is to assess the nature or quality of a product based on subjective impressions. The way to test the quality of a product from its organoleptic side is to use a hedonic test (a preference test) which requires the panelist to give his personal response about preferences or vice versa and the levels of preference called the hedonic scale. The level of likeness can be: very like, very fond, like and rather like. Conversely, if the desired response is "dislike" then the hedonic scale can be: very dislike, dislike and rather dislike. The hedonic scale can be stretched or collapsed according to the desired range of scales and converted to a numerical scale so that statistical analysis can be carried out[10].

The purpose of this study was to determine differences in preferences of organoleptic panelists on mouthwash and toothpaste of beluntas leaf extract.

2. Methods

This research is a quasi-organoleptic test experiment with post-test design only without control group design. The instruments used in this study were: beluntas leaf extract and raw materials for toothpaste and mouthwash formula and organoleptic test panelists. The population in this study were organoleptic test volunteers consisting of several ethnic groups in Indonesia, namely: Java, Flores, Lombok, Bali and Timor domiciled in the City of Denpasar. Volunteers who agree to participate as prospective panelists are invited to sign informed consent.

The sample size as many as 32 people with the same number of men and women. Sample inclusion criteria: Men or women aged 20-35 years, can read and write, do not suffer pain that can affect vision, smell and taste, are not taking drugs or certain types of food that can affect the sense of taste and smell and are willing become a panelist. Sample exclusion criteria: Do not heed the restrictions required during the study, were not present during the study and resigned after the signing of the informed consent. Giving samples of toothpaste and mouthwash of beluntas leaf extract to the panelists carried out randomly and each panelist occupies the test booth by drawing.

The type of data collected is primary data in the form of panelists' preference for the color, aroma and taste of toothpaste and mouthwash of beluntas leaf extract using a hedonic scale with 5 digit measurements namely: really like (5), very like (4), neutral (3), dislike (2) and very dislike (1). The research procedures were: making beluntas leaf extract, making toothpaste and mouthwash from beluntas leaf extract. Signing informed consent for volunteers who are willing to become panelists, tasting room preparation and its completeness, labeling samples of test materials, organoleptic testing of test materials by: each panelist is in a

separate room, and evaluating samples of test materials that have been labeled alternately, panelists marked (√) in the hedonic scale column listed in the available check list.

The assessment results were collected by researchers to be statistically analyzed, namely univariate statistics in the form of descriptive tests to find out the frequency and percentage, then differences in data between groups were tested with the Kruskal Wallis test.

3. Result

Kruskal-Wallis test results of panelist organoleptic assessment of the color of toothpaste and extracts of beluntas leaf extract with various flavors are shown in the table below:

Table 1: Kruskal-Wallis test results of Panelist Organoleptic Assessment of Toothpaste and mouthwash Color of Beluntas Leaf Extract with Various Flavor

No	Color Assessment	Flavor	n	Mean Rank	X^2	df	p
1	Toothpaste	Original	32	43,44	2,119	2	0,347
		Mint		49,02			
		Mixed Fruit		**53.05**			
2	Mouthwash	Original		42,84	6,883	2	0,032
		Mint		44,28			
		Mixed Fruit		**58,36**			

The table above shows that panelists preferred the color of toothpaste and mouthwash with mixed fruit flavors, followed by mint and original flavors. The difference in assessment for mouthwash was significant with p = 0.032 (p <0.05), while the assessment of toothpaste color was not significant with p = 0.347 (p> 0.05).

The results of the Kruskal-Wallis test to determine differences in panelist ratings of the aroma of toothpaste and mouthwash with various flavors are shown in the following table:

Table 2: Kruskal-Wallis Test Results of Panelist Organoleptic Assessment of Aroma of Toothpaste and Mouthwash of Beluntas Leaf Extract with Various Flavor

No	Assessment of Aroma	Flavor	n	Mean Rank	X^2	df	p
1	Toothpaste	Original	32	37,56	8,160	2	0,017
		Mint		**54,94**			
		Mixed Fruit		53,00			
2	Mouthwash	Original		39,17	7,931	2	0,019
		Mint		48,89			
		Mixed Fruit		**57,44**			

The table above shows that the panelists preferred the aroma of toothpaste with mint flavor, followed by mixed fruit and original flavor, the difference in the assessment was significant at p = 0.017 (p <0.05). Panelists' assessment of mouthwash showed that panelists preferred the aroma of mouthwash with mixed fruit flavor, followed by mint and original flavor. The difference in assessment was significant at p = 0.019 (p <0.05).

The results of the Kruskal-Wallis test to determine differences in panelist ratings of the taste of toothpaste and mouthwash with various flavors are shown in the following table:

Table 3: Kruskal-Wallis Test Results of Panelist Organoleptic Assessment of Taste of Toothpaste and Mouthwash of Beluntas Leaf Extract with Various Flavor

No	Assessment of Taste	Flavor	n	Mean Rank	X^2	df	p
1	Toothpaste	Original	32	35,81	10,893	2	0,004
		Mint		52,83			
		Mixed Fruit		**56,86**			
2	Mouthwash	Original		45,06	2,573	2	0,276
		Mint		**54,70**			
		Mixed Fruit		45,73			

The table above shows that the panelists preferred the taste of toothpaste with mixed fruit flavors followed by mint and original flavors. The difference in assessment was significant at p = 0.004 (p <0.05). The assessment of mouthwash showed that panelists preferred the taste of mouthwash with Mint flavor, followed by mixed fruit and original flavor, but the difference was not significant at p = 0.276 (p> 0.05).

Kruskal-Wallis test results to determine differences in panelist ratings of toothpaste and mouthwash's color with various flavors based on ethnicity are shown in the following table:

Table 4: Kruskal-Wallis Test Results of Panelist Organoleptic Assessment of Toothpaste and Mouthwash's Color with Various Flavors Based on Ethnic

No	Color Assessment	Flavor	Ethnic	n	Mean Rank	X^2	df	p
1	Toothpaste	Original	Jawa	6	15,08	15,267	4	0,004
			Flores	6	9,50			
			Lombok	6	10,08			
			Bali	6	21,08			
			Timor	**8**	**24,19**			
		Mint	Jawa	6	15,92	18,135	4	0,001
			Flores	6	9,25			
			Lombok	6	8,17			
			Bali	6	21,33			
			Timor	**8**	**25,00**			
		Mixed Fruit	Jawa	6	15,17	18,529	4	0,001
			Flores	6	11,00			
			Lombok	6	8,42			
			Bali	6	17,08			
			Timor	**8**	**27,25**			
2	Mouthwash	Original	Jawa	6	12,83	9,736	4	0,045
			Flores	6	15,50			
			Lombok	6	9,42			
			Bali	**6**	**22,50**			
			Timor	8	21,81			
		Mint	Jawa	6	15,92	4,048	4	0,400
			Flores	6	15,25			
			Lombok	6	11,33			
			Bali	**6**	**21,00**			
			Timor	8	18,38			
		Mixed Fruit	Jawa	6	18,08	5,696	4	0,223
			Flores	6	10,08			
			Lombok	6	16,00			
			Bali	6	16,08			
			Timor	**8**	**20,81**			

The table above shows that the Timorese preferred the color of toothpaste with the original flavor, followed by the Balinese, Javanese, Lombok and Flores. This preference difference is significant with p = 0.004 (p <0.05). The Balinese prefer the colors of the original mouthwash followed by the Timorese, Flores, Javanese and Lombok, this preference difference is significant with a value of p = 0.045 (p <0.05).

Kruskal-Wallis test results to determine differences in the panelist assessment of the aroma of toothpaste and mouthwash of beluntas leaf extract with various flavors based on ethnicity are shown in the following table:

Table 5: Kruskal-Wallis Test Results of Panelist Organoleptic Assessment of Aroma of Toothpaste and Mouthwash with Various Flavor Based on Ethnic

No	Assessment of Aroma	Flavor	Ethnic	n	Mean Rank	X^2	df	P
1	Toothpaste	Original	Jawa	6	13,67	8,502	4	0,075
			Flores	6	8,67			
			Lombok	6	18,17			
			Bali	**6**	**22,17**			
			Timor	8	19,00			
		Mint	Jawa	6	14,00	13,677	4	0,008
			Flores	6	7,67			
			Lombok	6	14,00			
			Bali	6	22,17			
			Timor	**8**	**22,63**			
		Mixed Fruit	Jawa	6	12,00	16,747	4	0,002
			Flores	6	6,50			
			Lombok	6	15,83			
			Bali	6	22,83			
			Timor	**8**	**23,13**			
2	Mouthwash	Original	Jawa	6	14,83	4,448	4	0,349
			Flores	6	12,33			
			Lombok	6	14,67			
			Bali	6	17,17			
			Timor	**8**	**21,75**			
		Mint	**Jawa**	**6**	**21,00**	3,195	4	0,526
			Flores	6	12,50			
			Lombok	6	15,92			
			Bali	6	15,00			
			Timor	8	17,69			
		Mixed Fruit	**Jawa**	**6**	**20,17**	6,668	4	0,155
			Flores	6	11,33			
			Lombok	6	18,92			
			Bali	6	12,25			
			Timor	8	19,00			

The table above shows that there is a difference in the taste of toothpaste with mint and mixed fruit flavors from various tribes, and the difference is significant with p = 0.008 and p = 0.002 (p <0.05).

Kruskal-Wallis test results to determine differences in the organoleptic panelist assessment of the taste of toothpaste and extract mouthwash with various flavors based on ethnicity are shown in the following table:

Table 6: Kruskal-Wallis Test Results of Panelist Organoleptic Assessment of Toothpaste and Mouthwash Taste with Various Flavor Based on Ethnic

No	Taste Assessment	Flavor	Ethnic	n	Mean Rank	X^2	df	p
1	Toothpaste	Original	Jawa	6	14,67	8,523	4	0,074
			Flores	6	12,00			
			Lombok	6	13,67			
			Bali	6	15,25			
			Timor	8	24,31			
		Mint	Jawa	6	16,10	8,968	4	0,062
			Flores	6	8,50			
			Lombok	6	13,25			
			Bali	6	18,33			
			Timor	8	21,88			
		Mixed Fruit	Jawa	6	17,58	11,793	4	0,019
			Flores	6	7,50			
			Lombok	6	12,50			
			Bali	6	20,42			
			Timor	8	22,50			
2	Mouthwash	Original	Jawa	6	16,33	4,776	4	0,311
			Flores	6	13,67			
			Lombok	6	15,17			
			Bali	6	13,67			
			Timor	8	21,88			
		Mint	Jawa	6	18,00	2,376	4	0,667
			Flores	6	12,33			
			Lombok	6	15,00			
			Bali	6	17,00			

			Timor	8	19,25		
		Mixed Fruit	Jawa	6	16,83		
			Flores	6	10,00		
			Lombok	6	14,33	10,850	4	0,028
			Bali	6	13,67		
			Timor	8	24,88		

The table above shows that there are differences in preferences for the taste of toothpaste and mouthwash with mixed fruit flavor from various of ethnic groups, and the difference is significant with $p = 0.019$ and $p = 0.028$ ($p < 0.05$). Regarding to the taste of other flavor of toothpaste and mouthwash, there were no significant differences in preference between ethnic groups.

Kruskal-Wallis test results to determine the order of preference of panelists on toothpaste and mouthwash products of beluntas leaf extract with various flavors are shown in the following table:

Table 7: Kruskal-Wallis test results to Find Out the Order of Organoleptic Panelists' Preference for Toothpaste and mouthwash products with various flavors

No	Type of test material	n	Mean rank	X^2	df	p
1	Toothpaste color with *original flavor*		181,11			
2	Toothpaste color with *mint flavor*		208,13			
3	**Toothpaste color with *mixed fruit flavor***		**220,66**			
4	Toothpaste aroma with *Original flavor*		235,95			
5	**Toothpaste aroma with *mint flavor***		**318,28**			
6	Toothpaste aroma with *mixed fruit flavor*		315,66			
7	Toothpaste taste with *original flavor*		169,39			
8	Toothpaste taste with *mint flavor*		270,55			
9	**Toothpaste taste with mixed fruit *flavor***	32	**295,00**	98,951	17	0,000
10	Mouthwash color with *original flavor*		290,80			
11	Mouthwash color with *mint flavor*		296,17			
12	**Mouthwash color with *mixed fruit flavor***		**366,34**			
13	Mouthwash aroma with *Original flavor*		318,28			
14	Mouthwash aroma with *mint flavor*		383,09			
15	**Mouthwash aroma with mixed fruit *flavor***		**432,02**			
16	Mouthwash taste with *Original flavor*		275,09			
17	**Mouthwash taste with *mint flavor***		**334,38**			
18	Mouthwash taste with *mixed fruit flavor*		282,11			

The table above shows that toothpaste products of beluntas leaf extract that are most favored by organoleptic test panelists are toothpaste with mint aroma, as well as mixed fruit color and taste, while the most preferred mouthwash product is mouthwash with mixed fruit aroma and color and mint taste. This difference was significant at $p = 0,000$ ($p < 0.05$).

4. Discussion

The hedonic test is the test most widely used to measure the level of liking for a product using a hedonic scale, for example very like, like, rather like, neutral, dislike and very dislike. Hedonic tests are often used to assess products that are still in the development phase and end products in terms of their organoleptic. The use of hedonic scales in practice requires a number of panelists as organoleptic evaluators[10,11]. The aim of this study was to determine differences in organoleptic panelists' preference for color, aroma and taste of toothpaste and mouthwash of beluntas leaf extract.

The results of the panelists' assessment of the color of toothpaste and mouthwash of beluntas leaf extract. Regarding to the color of toothpaste, the Kruskal-Wallis test results showed that panelists preferred the color of toothpaste and mouthwash with mixed fruit flavors, followed by mint and original flavors. The difference in the assessment of the color of toothpaste was not significant with a value of $p = 0.347$ ($p > 0.05$). There is a significant difference in the color of mouthwash with p value = 0.032 ($p < 0.05$). This means, that panelists prefer the color of toothpaste and mouthwash with mixed fruit flavor compared to other flavors. Panelists also prefer the color of mouthwash compared to toothpaste.

The results of the panelist's assessment of the aroma of toothpaste and mouthwash of beluntas leaf extract. Regarding toothpaste, most panelists stated that they really liked the aroma of toothpaste with mint flavor. Kruskal-Wallis test results to determine differences in ratings show that panelists prefer the aroma of toothpaste with mint flavor, followed by mixed fruit and original flavor, the difference in assessment is significant at $p = 0.017$ ($p < 0.05$). Regarding the aroma / smell of mouthwash, most panelists prefer the aroma of mouthwash with mixed fruit flavor, followed by mint and original flavor. The difference in assessment was significant at $p = 0.019$ ($p < 0.05$). These results indicate that panelists prefer the aroma of toothpaste with mint flavor compared to other flavors, whereas for mouthwash, panelists prefer the aroma of mouthwash with mixed fruit flavor compared to the others, and this difference in preference is significant with the value $p < 0.05$.

The results of the panelists' assessment of the taste of toothpaste and mouthwash of beluntas leaf extract. With regard to toothpaste, the results of the Kruskal-Wallis test to determine differences in preferences for the taste of toothpaste showed that panelists preferred the taste of toothpaste with mixed fruit flavors followed by mint and original flavors. The difference in assessment was significant at p = 0.004 (p <0.05). Regarding the taste of mouthwash, panelists stated they preferred the taste of mouthwash with Mint flavor, followed by mixed fruit and original flavor, but the difference in assessment was not significant at p = 0.276 (p> 0.05). These results indicate that panelists prefer the taste of toothpaste with mixed fruit flavor compared to the others, whereas for mouthwash, panelists prefer the taste of mouthwash with mint flavor compared to the others.

Organoleptic assessment results based on ethnicity, it is known that Timorese preferred the color of toothpaste with original flavor, mint or mixed fruit, followed by the Balinese, Javanese, Lombok and Flores. This preference difference is significant with p = 0.004 (p <0.05). With regard to the color of mouthwash, it is seen that the Balinese prefer the original mouthwash color followed by Timorese, Flores, Javanese and Lombok, and this preference difference is significant with a value of p = 0.045 (p <0.05).

The results of the panelist assessment of organoleptic test on the aroma / odor of toothpaste and mouth rinse based on ethnicity revealed that there were differences in the taste preferences of toothpaste with mint and mixed fruit flavors from various tribes, and the difference was significant with p = 0.008 and p = 0.002 (p <0.05). With respect to the aroma / odor of toothpaste and other mouthwash, there is no significant difference in preference between ethnic groups.

The results of the panelist assessment of organoleptic test on taste of toothpaste and mouthwash based on ethnicity revealed that there was a difference in preference for taste of toothpaste and mouthwash with mixed fruit flavor from various ethnic, and the difference was significant with p = 0.019 and p = 0.028 (p < 0.05). With respect to the aroma of toothpaste and other mouthwash, there is no significant difference in preference between ethnic groups.

Kruskal-Wallis test results to find out what products of beluntas leaf extract are most preferred, and what flavor is most preferred, it is known that organoleptic test panelists prefer mouthwash products compared to toothpaste products. The most preferred toothpaste products by panelists are toothpaste with mint aroma, and mixed fruit color and taste, while the most preferred mouthwash product is mouthwash with mint aroma and mixed fruit color. This difference of assessment was significant at p = 0,000 (p <0.05).

The results of this study suggest that the toothpaste and mouthwash formula from beluntas leaf extract can be used as one of the herbal products in Indonesia, as well as answering trends for "back to nature", where some herbal ingredients can be added as antimicrobial agents in various cosmetic products such as toothpaste and mouthwash. Given the current use of herbal medicines in the world continues to increase as well in Indonesia, so it is expected that drug manufacturers are interested in continuing to develop herbal medicines, especially beluntas leaf extract to be one of the herbal products that is cheap and easily accessible to the public. The results of this study are also expected to support the statement of Vice President of Sales and Marketing for Soho Global Health Products, which states that herbal products have been used by 80% of the world's population, whereas in Indonesia, based on data from the Directorate General of Pharmaceutical Development and Medical Devices at the Ministry of Health, stated that in 2012 it had reached Rp 13 trillion or around 2% of the total herbal medicine market in the world[1], thus it was hoped that the toothpaste and mouthwash formula of beluntas leaf extract could be developed into herbal products to be marketed in Indonesia.

5. Conclusion

Based on the results of research and discussion it can be concluded that:
1) Toothpaste products of beluntas leaf extract that are most favored by organoleptic test panelists are toothpaste with the aroma of mint, as well as mixed fruit color and taste.
2) The most preferred mouthwash products are mouthwashes with aroma and color of mixed fruit flavor and mint flavor.
3) Based on ethnicity, it is known that Timorese like almost all toothpaste and mouthwash products of beluntas leaf extract with various flavors, while the Flores people do not like almost all toothpaste and mouthwash products of beluntas leaf extract

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