

## Increasing Salivary Flow Rate and Salivary Ph after Consuming Secang Drink (*Caesalpinia Sappan* L.) Related to Body Mass Index

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### Abstract

Secang wood (*Caesalpinia sappan* Linn) is a plant that has long been used a traditional medicine. Secang has brazilin, which is useful as an antioxidant. Secang drink has strong a taste that comes from polyphenols. The astringent taste in secang drink may increase the salivary flow rate and salivary pH rate. The purpose of this study is to determine the effect of consuming secang drink to salivary flow rate and salivary pH, related to to body mass index.

This study was experimental in 30 students of the faculty of Dentistry, Padjadjaran University. The data obtained was physical examination such as body weight and height. Salivary flow rate and salivary pH were measured before and after consuming secang drink. The data were were analyzed by using a a paired t-test with  $\alpha = 0.05$ .

The results show that the average salivary flow rate before and after consuming secang drink was 0.39 and 0.51ml/ minute respectively. The average salivary pH changes from 6.62 to 6.76. The results of the the paired t-test showed a significant increase in average salivary flow rate, salivary pH before and after consuming secang drink with a p-value of 0.00 less than 0.05. BMI results, 22(73%) have normal, 3 respondents are underweight (10%), and 5 respondents are overweight (17%). The highest BMI (34.9) was found in females, with salivary flow rate 0.85, and salivary pH 7, while the lowest BMI (16.60) was also in females, with salivary flow rate 0.6, and pH 6.

This study suggested that consuming secang drink may increase the salivary flow rate, salivary pH, and related to the body mass index.

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### Introduction

Secang (*Caesalpinia sappan* Linn) is a plant that has long been used as a traditional medicine.<sup>1</sup> Secang has many usage such as anti-bacterial, anti-inflammatory, anti-photoaging, hypoglycemic, vasorelaxant, anti-allergic and antioxidant.<sup>1,2,3</sup> The active substances in secang are brazilin or brazilein that give red color to secang wood.<sup>1,2</sup> The attractive red color produced by the secang drink, and strong tastes can increase salivary flow and salivary pH in the oral cavity. Increasing salivary flow rate can prevent oral diseases such as gingivitis, caries and other periodontal diseases. According to the Indonesian Ministry of Health, dental and oral

health problems in Indonesia increased from 25.9% in 2013 to 57.6% in 2018.<sup>4</sup> The lack of knowledge and awareness of dental and oral hygiene was the most common reason for dental and oral health problems in Indonesia.<sup>4</sup> Dental health problem can be caused by various things, one of which is a decrease in the salivary flow rate. The protection of teeth, bacterial cleansing activity, and buffer activity in saliva will decrease if the volume of saliva in the oral cavity decreases. This condition increases the risk of caries, xerostomia, difficulty in chewing and swallowing.<sup>5</sup> The purpose of this study is to determine the effect of consuming secang drink to salivary flow rates and salivary pH in the oral cavity, related to body mass index (BMI).

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### Materials and methods

This experimental study was performed on 30 students of Faculty of Dentistry, Padjadjaran University. The criteria of the

subjects were good general condition, no smoking, no have a systematic disease, no alcohol consumption, and no drug consumption. Nutritional status was assessed based on BMI. This study categorized the BMI into 3 groups: underweight, normal and overweight.

Secang drinks made from secang powder packed in sachets (15gram) with 175 ml hot water (100°C). First, the secang sachet was soaked in the hot water for 2 minutes, then the sachet was removed and the water will turn red. The water was then left to cool itself. Measurements taken from the subjects before consuming the secang drinks were salivary volume and salivary pH. The procedure selected for this study was a spitting method for collecting unstimulated saliva, then spitting out the saliva to a measuring glass per minute, and repeated it for 10 minutes. Salivary flow rate was calculated for 10 minutes. Salivary pH is also counted by pH meter. The subject was ordered to drink 100 ml of the secang drink (50ml for gargling movement for 30 second than swallow it, 50 ml then swallow), and was asked to wait 1 hour for the second measurements. Then after 1-hour consuming secang drink, the salivary volume and salivary pH of the subject were measured again. The data obtained were analyzed using a paired t-test with  $\alpha = 0.05$ .

## Results

Table 1 shows the demographic characteristics of the study. Of the total 30 respondents who participated in this study, 26 (86.66%) were females and 4 (13.34%) were males, with a mean age and SD of 22.9 years  $\pm$  0.61. The lowest and the highest salivary flow rate before consuming secang drinks were 0.05, and 0.86 ml/minute respectively. While the lowest and the highest salivary flow rate after consuming secang drinks were 0.1 and 1.1 ml/minute respectively.

Gender	Age(year)	Frequency	Percentage (%)
Female	22	7	23.33
Female	23	19	63.33
Male	24	4	13.33
Total	-	30	100

**Table 1.** Sample distribution based on gender and age.

Table 2 shows the average and paired t-test result of salivary flow rate before and after

consuming secang drinks. The average salivary flow rate before and after consuming secang were 0.39 and 0.51 ml/ minute respectively.

Group	Average (ml/minute)	Difference (ml/minute)	N	t-test	t-table	p-value	Sig.
Before consuming secang drinks	0.39	0.12	30	5.13	1.699	0.000	.000
After consuming secang drinks	0.51						

**Table 2.** Average and paired t-test results of salivary flow rate before and after consuming secang drink.

Group	Average	Difference	N	t-test	t-table	p-value	Sig.
Before consuming secang drinks	6.61	0.15	30	7.73	1.699	0.000	.000
After consuming secang drinks	6.76						

**Table 3.** Average and paired t-test results of salivary pH before and after consuming secang drink.

The lowest and highest salivary pH before consuming secang drink were 6 and 7 respectively. The lowest and the highest salivary pH after consuming secang drink were 6.16 and 7.11 respectively. Table 3 shows the average and paired t-test result of salivary pH before and after consuming secang drink. The average pH before and after consuming secang were 6.61 and 6.76 respectively. The paired t-test results showed a significant increase of salivary flow rate and salivary pH after consuming secang drinks with a p-value of 0.00 less than 0.05, and the results are presented in Table 2 and 3. Table 4 shows the nutritional status of the respondents in the study. In general, 22(73%) have normal BMI, 3 respondents are underweight (10%), and 5 respondents are overweight (17%).

Category	Frequency	Percentage (%)
underweight	3	10
Normal	22	73
overweight	5	17
Total	30	100

**Table 4.** Characteristics of nutritional status.

## Discussion

Secang drink is a traditional health drink that tastes fresh and is widely consumed especially in provinces of Central Java and

Jogjakarta provinces, Indonesia.<sup>6</sup> Secang drink is derived from secang wood shavings. People can find this drink in sachets, make it easy to consume. According to a study in the central laboratory of Padjadjaran University, secang drink contain brazilein and was tested by the phytochemical test, brazilein is an oxidized brazilin. The test results show that Brazilin is the highest content in the sample of secang wood shavings.<sup>7</sup> Brazilin that give red color to secang wood and strong tastes can increase the salivary flow rate and salivary pH effect which can relax and fresh the body.<sup>1,2</sup> In general, the subjects are a student who have normal BMI 22(73%), 3 respondents are underweight (10%), and 5 respondents are overweight (17%).

The average BMI was normal, this result is consistent with the outcomes of the Indonesian Basic Health Research (RIKERDAS) in 2013, that the majority of Indonesian students have normal nutritional status (70%).<sup>8</sup> According to the results, in general of the respondents of the study groups belonged to the age group of 22-24 years, and there were 8 respondents (26,7%), with a very significant increasing salivary flow rate, then another respondent were significant differences. This is related increased in salivary may be affected by stimuli, both mechanical stimuli and chemical stimuli.<sup>10</sup>

Mechanical stimuli are obtained from the gargling movements when consuming secang drink. Gargling is an activity to wash a mouth with a liquid and keep it in motion using the muscles of the oral cavity. Muscle contraction in the lip, cheek, and tongue are innervated by the facial nerve (N.VII). This nerve is connected to the submandibular and sublingual salivary glands, then the salivary secretions can happen.<sup>9</sup> Muscle contraction on the throat is innervated by the glossopharyngeal nerve (N.IX). This nerve connected to the parotid gland. A synapse will be filled with acetylcholine when the impulse comes, then acetylcholine will bind to the secretory parotid gland cell receptors that will activate the salivary secretion. Another factor that affects increasing the salivary flow rate is a chemical stimulus. Taste is one of the chemical stimuli and the most effective stimulus for stimulating saliva.<sup>9</sup>

Chemical stimuli in this study obtained through the strong taste of the secang drink. The taste buds will receive a strong taste effect from secang drink, then trigger facial nerve (N.VII). The facial nerve innervates 2/3 front part of the

tongue that can deliver taste sensation to submandibular and sublingual salivary glands which trigger increase salivary secretion.<sup>11</sup> A visual stimulus such as food color also may increase salivary secretion.<sup>11</sup> The red color of a beverage may stimulate appetite and desire to consume the drink.<sup>12</sup> Brazilin that give red color to secang wood and strong tastes can increase the salivary flow rate and salivary pH effect through visualization.<sup>13</sup>

According to the results, there were 26 respondents (86.66%), with significant increasing salivary pH, then others also increased salivary pH nevertheless not significant differences. The paired t-test results showed a significant increase in salivary flow rate and salivary pH, a p-value of 0.00 less than 0.05 (Table 4 and 5). The average pH was 6.62 change to 6.76. The increase in salivary flow rate is also followed by an increase of bicarbonate ions ( $\text{HCO}_3^-$ ) which play a role in salivary buffer activity.<sup>14,15</sup> Finally, salivary pH also happens. Nutritional status (BMI) results, in general, 22(73%) have normal BMI, 3 respondents were underweight (10%), and 5 respondents were overweight (17%). The highest BMI was found in females, 34.9% of them with salivary flow rate 0.85, and salivary pH 7. While the lowest BMI was also found in females, 16.60, 0.6, and 6 respectively. According to the results, it may be seen that there is a relationship between the salivary condition and BMI.<sup>16</sup> The findings of this study are in accordance with the previous study by Idress et al (2018), showing that unstimulated whole salivary flow rate (UWSFR) was significantly affected by body mass index.<sup>17</sup> This suggest that there may be related relationship between the salivary condition and BMI. The overall result of this study revealed that most students have normal an average nutritional status (BMI) with an average salivary flow rate, salivary pH: 0.51 and 6.76 respectively.

## Conclusions

This study concludes that consuming secang drink may increase the salivary flow rate and salivary pH and related to the body mass index.

## Declaration of Interest

The authors report no conflict of interest.

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