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The Effect of Banana (*Musa Paradisiaca*) Consumption on Salivary pH Changes Among High school students

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ABSTRACT

Salivary pH plays an important role in maintaining oral health because changes in acidity may affect enamel integrity and dental caries risk. Banana consumption may influence salivary conditions through its nutritional composition and the mechanical stimulation produced during chewing. This study aims to analyze the effect of banana consumption on changes in salivary pH among students at SMA Negeri 3 Banda Aceh. A quasi-experimental study with a pretest-posttest control group design was conducted on 58 students selected through purposive sampling, with 29 students in the chicken banana group and 29 in the Ambon banana group. Salivary pH was measured before and after consumption using a digital pH meter. The data were analyzed using the Shapiro-Wilk test, paired t-test, and independent sample t-test at a significance level of 0.05. The mean salivary pH in the chicken banana group increased from 6.5031±0.09419 to 6.9241±0.11556 ($p<0.001$), whereas the Ambon banana group decreased from 6.4252±0.13190 to 6.1421±0.13932 ($p<0.001$). The posttest comparison between groups was also significant ($p<0.001$). It was concluded that banana consumption affected salivary pH, and chicken banana was more effective in increasing salivary pH toward a neutral condition.

INTRODUCTION

Saliva is an important component of the oral environment because it contributes to lubrication, cleansing, digestion, antimicrobial activity, and acid-base balance. Its buffering system helps maintain an oral pH that supports tooth integrity, while a more acidic environment may increase the risk of enamel demineralization and dental caries (Dodds et al., 2005; Humphrey & Williamson, 2001). Salivary pH can be influenced by dietary intake, salivary flow, oral conditions, and the timing of measurement (Foglio-Bonda et al., 2017; Muddugangadhar et al., 2015).

Bananas provide carbohydrates, fiber, minerals, and water, and chewing can stimulate salivary secretion. Fermentable carbohydrates may also contribute to temporary changes in oral acidity. This study examined chicken banana (Musa acuminata Colla) and Ambon banana (Musa paradisiaca), two banana types consumed by the study population, because their consumption was expected to produce different salivary pH responses. Previous research reported significant salivary pH changes after chicken banana consumption (Afrina et al., 2014), while other work has described the relationship between chewing, salivary flow, and oral pH (Sari et al., 2018).

An initial assessment at SMA Negeri 3 Banda Aceh indicated that the assessed students tended to have salivary pH values below neutral. The study therefore aimed to determine the effect of banana consumption on salivary pH changes and to compare the effects of chicken banana and Ambon banana among students of SMA Negeri 3 Banda Aceh.

METHOD

This study used a quasi-experimental pretest-posttest control group design. The intervention group consumed chicken banana (Musa acuminata Colla), while the control group consumed Ambon banana (Musa paradisiaca) as a comparison. The study was conducted at SMA Negeri 3 Banda Aceh on 17 June 2026. The population consisted of 360 tenth-grade students in the 2025/2026 academic year. A sample of 58 students was selected using purposive sampling, consisting of 29 students in each group. Inclusion criteria

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were willingness to participate, liking bananas, being healthy, and having no oral or dental health problems. Students who did not consent, did not like bananas, used orthodontic appliances or prostheses, or were fasting were excluded.

Participants were instructed not to eat or drink except water for 60 minutes and not to brush their teeth or use mouthwash for one hour before measurement. Saliva was collected using the spitting method for five minutes in a sterile container. Salivary pH was measured with a digital pH meter calibrated at pH 7; the electrode was rinsed with sterile distilled water and dried before measurement. Each participant consumed one prepared banana according to group assignment, then waited 30 minutes before posttest saliva collection. Six enumerators assisted the one-day data collection after a perception-alignment procedure.

Data were entered, checked, and summarized descriptively. Normality was assessed using the Shapiro-Wilk test. Because the data were normally distributed, paired t-tests were used to compare pretest and posttest values within each group, and independent sample t-tests were used to compare the groups. Statistical significance was set at $\alpha=0.05$.

RESULT

Table 1. Frequency distribution of respondent characteristics

Characteristic	Chicken banana n (%)	Ambon banana n (%)	Total n (%)
Age 15 years	10 (34.5)	9 (31.0)	19 (32.8)
Age 16 years	19 (65.5)	20 (69.0)	39 (67.2)
Male	14 (48.3)	17 (58.6)	31 (53.4)
Female	15 (51.7)	12 (41.4)	27 (46.6)

All participants in the chicken banana group had acidic salivary pH before consumption and shifted to the neutral category after the intervention. In the Ambon banana group, all participants were acidic at pretest and remained acidic at posttest.

Table 2. Salivary pH categories before and after banana consumption

Group	Time	Acidic n (%)	Neutral n (%)	Basic n (%)
Chicken banana	Pretest	29 (100)	0 (0)	0 (0)
Chicken banana	Posttest	0 (0)	29 (100)	0 (0)
Ambon banana	Pretest	29 (100)	0 (0)	0 (0)
Ambon banana	Posttest	29 (100)	0 (0)	0 (0)

The Shapiro-Wilk results indicated normal distributions for all measurements: chicken banana pretest $p=0.516$ and posttest $p=0.191$; Ambon banana pretest $p=0.244$ and posttest $p=0.381$.

Table 3. Mean salivary pH before and after consumption

Group	N	Pretest Mean±SD	Posttest Mean±SD	Change	p
Chicken banana	29	6.5031±0.09419	6.9241±0.11556	−0.42103	<0.001
Ambon banana	29	6.4252±0.13190	6.1421±0.13932	0.28310	<0.001

The independent sample t-test showed a significant posttest difference between groups ($p<0.001$), with a higher mean salivary pH in the chicken banana group (6.9241) than in the Ambon banana group (6.1421).

DISCUSSION

The findings showed significant changes in salivary pH after banana consumption, but the direction differed between the two groups. In the chicken banana group, mean pH increased from 6.5031 to 6.9241, shifting all participants from the acidic to the neutral category. This pattern suggests that chewing-related stimulation may have increased salivary secretion and supported buffering activity. Salivary flow and buffering capacity are closely associated with salivary pH (Mese & Matsuo, 2007; Muddugangadhar et al., 2015).

The increase after chicken banana consumption may be related to the physical characteristics and nutrient content of the fruit described in the thesis. Chewing stimulates the salivary glands, while increased salivary flow is associated with greater bicarbonate availability and acid neutralization. Saliva consequently provides an important protective system for oral tissues through cleansing and buffering functions (Dodds et al., 2005; Lenander-Lumikari & Loimaranta, 2000).

In contrast, the Ambon banana group showed a decrease in mean pH from 6.4252 to 6.1421. The thesis discussion interpreted this decrease as potentially related to fermentable carbohydrate metabolism by oral microorganisms, which can produce organic acids and temporarily lower oral pH. This interpretation is compatible with the Stephan curve concept, in which oral pH may fall after carbohydrate exposure and subsequently recover through salivary buffering (Stephan, 1944; Fejerskov et al., 2015).

The significant posttest difference supports the study hypothesis that the two banana types were associated with different salivary pH responses. The result is related to Afrina et al. (2014), who also reported a significant salivary pH change after chicken banana consumption. Differences in direction or magnitude across studies may reflect participant characteristics, measurement procedures, oral conditions, and the timing of post-consumption assessment.

The study has practical relevance for oral-health education because fruit consumption is a common dietary behavior among adolescents. However, the findings should be interpreted within the study conditions. The thesis identified potential confounding factors including oral hygiene, previous food intake, salivary flow rate, and general health status. Future studies should use larger samples, longer observation periods, and tighter standardization of fruit quantity and other relevant factors.

CONCLUSION

Banana consumption produced significant changes in salivary pH among students of SMA Negeri 3 Banda Aceh. Chicken banana consumption increased mean salivary pH from 6.5031 to 6.9241 and shifted participants from an acidic to a neutral category, whereas Ambon banana consumption decreased mean pH from 6.4252 to 6.1421. The posttest difference between groups was statistically significant ($p<0.001$). Chicken banana was therefore more effective than Ambon banana in increasing salivary pH toward a neutral condition. Future research should consider larger samples, longer observation periods, and control of oral hygiene, dietary intake, salivary flow, and other relevant factors.

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