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## Physicochemical quality, Phenolic content and Acceptability of Steamed Sticky Rice Cake Incorporated by *Paederia foetida* Leaf Filtrate

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*Paederia foetida* was an excellent source of phenolic compounds, and the antioxidant activity. Decoction of this plant was widely used for treatment of various diseases. This research evaluated the influence of *Paederia foetida* replacement into glutinous rice cake on physicochemical quality, phenolic content and overall acceptance of the steamed glutinous rice cake. *Paederia foetida* filtrate was experimentally incorporated in different percentages (0-25%). Results showed that steamed sticky rice cake incorporated with *Paederia foetida* filtrate had slightly lower elasticity as compared to the control, while chlorophyll and total phenolic content significantly increased. The incorporation of 15% *Paederia foetida* filtrate was expected to improve consumer acceptability on the steamed sticky rice cake. *Paederia foetida* leaf extract could be used to utilize not only as natural colorant but also quality improvement for this instant dessert.

**Keywords:** *Paederia foetida*, steamed glutinous rice cake, elasticity, phenolic, acceptability, incorporation

### INTRODUCTION

*Paederia foetida* L. was a perennial climbing shrub. Decoction of the whole plant was traditionally utilized in different therapeutic purposes such as stomach disorders, gastritis, indigestion, rheumatic pain, improvement of liver and kidney function (Chanda et al. 2013; Kuma et al. 2015; Shaswat et al. 2018). It's also reported to be applied in gout, vesical calculi, diarrhoea, dysentery, piles, emetic (Chauhan et al. 2010). It possessed antiarthritic, anti-inflammatory, hepatoprotective, antitussive, anti-diarrhoeal activities (De et al. 1994; Afroz et al. 2006; Nosalova et al. 2007; Uddin et al. 2011). It included numerous phytochemical components like iridoid glycosides, volatile oils, triterpenoids,  $\beta$ -sitosterol, arachidic acid, alkaloids and phenolics contributing diverse bioactivities (Wong et al. 1994; Shanmugam et al. 2013; Saeidnia et al. 2014; Peng et al. 2015). The distinct odor of

carbon bisulphide of *P. foetida* was owing to emission of methyl-mercaptan from the damaged leaf tissues following enzymatic cleavage of paederoside (Shaswat et al. 2018).

Glutinous rice was commonly utilized in ready-to-eat products such as rice crackers and steamed rice cakes (Preecha et al. 2018). Steam glutinous rice cake exhibited high moisture, unique viscoelastic property serving as a dessert. Glutinous rice (*Oryza sativa*) was washed, cooked with water, and pounded right after cooking to lose the integrity of rice kernel and to form the viscoelasticity (Chao-Chi and An-I, 2006). The utilization of natural pigments offered no toxic attributes (Kumar and Sinha, 2004). Not many research mentioned to the utilization of leaf extract on physicochemical quality of rice cake. Seung et al. (2012) verified the availability of *Sedum sarmentosum* to improve the nutraceutical value of rice cakes. Eun-Juand

Eun-Kyung (2017) examined *Moringaoleifera* leaf extract to be added to rice flour in the preparation of traditional rice cake. Green black color from *Paederialeaf* extract could be implemented on rice cake in Vietnam traditional food culture (Luu-Dam et al. 2016; Quang-Ung et al. 2018). There was not any research mentioned to the implementation of *Paederialeaf* as chlorophyll pigment for steamed glutinous rice cake. Objective of our study examined the influence of *Paederiafoetidareplacement* into glutinous rice cake on physicochemical quality, phenolic content and overall acceptance of the steamed glutinous rice cake.

## MATERIALS AND METHODS

### Material

Rice powder, glutinous rice powder, coconut milk, salt, sugar, modified starch were purchased in local market. *Paederiafoetidaleaves* were collected in garden. Chemical reagents were all analytical grade.

### Researching method

*Paederiafoetida* leaves were rinsed with clean water to remove dirt and foreign matter. These leaves were ground and pressed to get filtrate. 500 gram of rice powder was soaked overnight, collected sediment and decanted liquid part. 100 gram of glutinous rice powder was added and mixed thoroughly with addition of 5 gram of salt and 25 gram of sugar. *Paederiafoetidafiltrate* was experimentally incorporated in different percentages (0-25%). This mixture powder was set on banana leaf and steamed for 5 minutes. The steamed sticky rice cake was finally evaluated chlorophyll content, phenolic content, elasticity and acceptability.

### Physicochemical and sensory analysis

Chlorophyll content (mg/ kg) was measured following method described by AOAC (1999). Total phenolic content (mg GAE/ 100g) was evaluated using Folin–Ciocalteu assay (Nizar et al. 2014). Elasticity (mm) was measured by a texture analyser. Acceptability (sensory score) was evaluated by a group of panelists using 9 point-Hedonic scale.

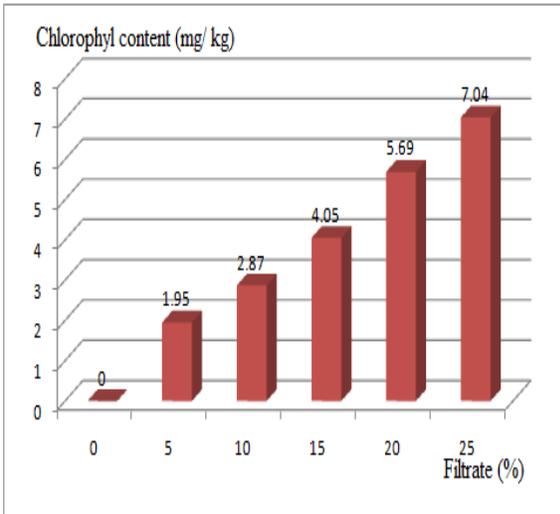
### Statistical analysis

The experiments were run in triplicate with different groups of samples. The data were presented as mean±standard deviation. Statistical

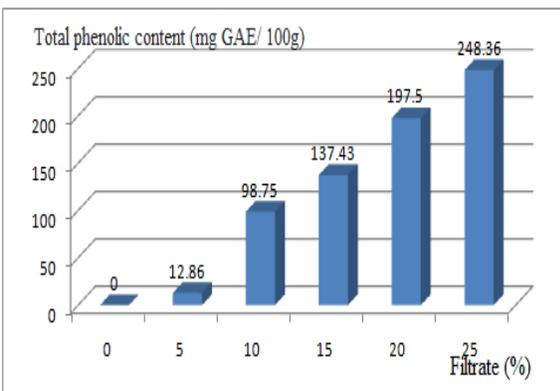
analysis was performed by the Statgraphics Centurion version XVI.

## RESULTS AND DISCUSSION

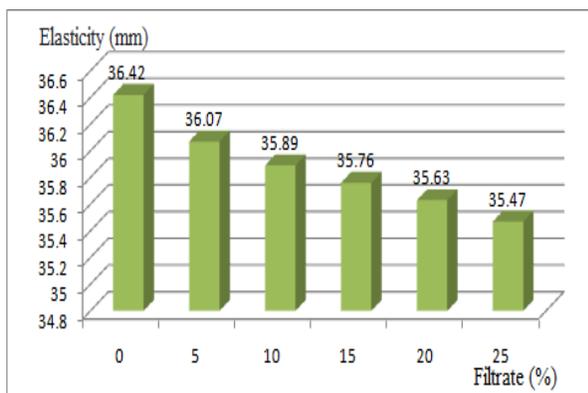
Chlorophyll demand increased in line with increasing awareness for using natural colorants (Hung et al. 2014; Sigurdson et al. 2017; Indrasti et al. 2018). Steamed sticky rice cake incorporated with *Paederiafoetidafiltrate* had slightly lower elasticity as compared to the control (figure 3), while chlorophyll and total phenolic content significantly increased (figure 1 and 2). It could be explained that sugar and fibre contained in *Paederiafoetidafiltrate* might interrupt the amylose-amylopectin network. This phenomenon indicated that the stickiness of the rice cake decreased by following *Paederiafoetidafiltrate* incorporation. This finding was similar to wheat noodles incorporated with *Caulerpa* sp. seaweed (Agusman and Wahyuni, 2020). The supplementation of 15% *Paederiafoetidafiltrate* was expected to improve consumer acceptance on the steamed sticky rice cake. Much more addition of this filtrate (> 15%) caused a reduction of acceptability (figure 4). Our results were similar to findings in different literatures. Seung et al. (2012) verified the availability of *Sedum sarmentosum* to improve the nutraceutical value of rice cakes. They proved that hardness of rice cakes significantly and directly increased with lyophilized sedum powder. Pore ratio and expansion rate decreased in samples containing more than 10% sedum powder compared to the control. Total polyphenol contents of the sedum powder -treated groups were significantly elevated. Incorporation of 10% the rice powder with sedum powder efficiently enhanced the antioxidant and nutritional values of rice cake as well as its overall acceptance. Eun-Juand Eun-Kyung (2017) examined *Moringaoleifera* leaf extract to be added to rice flour in the preparation of traditional rice cake. *M. oleifera* extracts significantly increased the antioxidant activities of rice cake. The control groups showed significantly higher values for hardness, cohesiveness, chewiness and adhesiveness compared to the *M. oleifera* leaf extract-added groups. Acceptability was highest for the 0.1% *M. oleifera* leaf extract group in sensory evaluations.



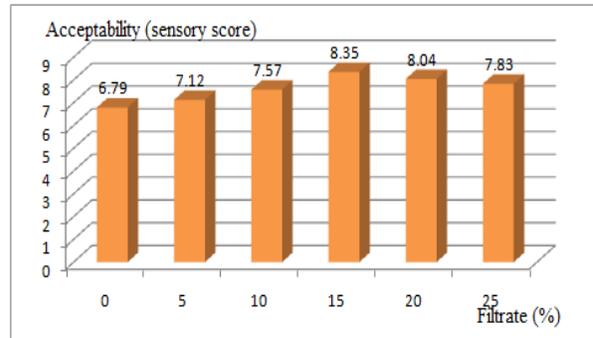
**Figure 1: Chlorophyll content (mg/ kg) in the steamed sticky rice cake by incorporation of *Paederiafoetida*filtrate (%)**



**Figure 2: Total phenolic content (mg GAE/ 100g) in the steamed sticky rice cake by incorporation of *Paederiafoetida*filtrate (%)**



**Figure 3: Elasticity (mm) of the steamed sticky rice cake by incorporation of *Paederiafoetida*filtrate (%)**



**Figure 4: Acceptability of the steamed sticky rice cake by incorporation of *Paederiafoetida*filtrate (%)**

**CONCLUSION**

*Paederiafoetida* L. was a climbing shrub responsible for various ethnomedicinal applications with immense pharmacological benefits due to significant amount of phenolics in spite of distinct odor of carbon bisulphide when the leaves were crushed. This reseach proved that The incorporation of 15% *Paederiafoetida*filtrate was expected to improve physicochemical quality, phenolic content and consumer acceptability on the steamed sticky rice cake..

**CONFLICT OF INTEREST**

The authors declared that present study was performed in absence of any conflict of interest.

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**AUTHOR CONTRIBUTIONS**

Nguyen Phuoc Minh arranged the experiments and also wrote the manuscript.

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