VOLUME 15, NOMOR 2 JUNI 2021

ISSN: 1907-8056
e-ISSN: 2527-5410

# AGROINTEK

## JURNAL TEKNOLOGI INDUSTRI PERTANIAN

JURUSAN TEKNOLOGI INDUSTRI PERTANIAN
UNIVERSITAS TRUNOJOYO MADURA

Volume 15 No 2 June 2021 ISSN : 1907 –8056
e-ISSN : 2527-5410

# AGROINTEK: Jurnal Teknologi Industri Pertanian

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Agrointek does not charge any publication fee.

Agrointek: Jurnal Teknologi Industri Pertanian has been accredited by ministry of research, technology and higher education Republic of Indonesia: 30/E/KPT/2019. Accreditation is valid for five years. start from Volume 13 No 2 2019.



**Alamat Redaksi**
DEWAN REDAKSI JURNAL AGROINTEK
JURUSAN TEKNOLOGI INDUSTRI PERTANIAN
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Jl. Raya Telang PO BOX 2 Kamal Bangkalan, Madura-Jawa Timur
E-mail: Agrointek@trunojoyo.ac.id

p-ISSN: 1907-8056
e-ISSN: 2527-5410
AGROINTEK
Jurnal Teknologi Industri Pertanian
journal homepage: journal.trunojoyo.ac.id/agrointek

# SENSORY RESPONSE OF WET NOODLES WITH SUBSTITUTION OF SUPER RED DRAGON FRUIT (*Hylocereus costaricensis*) PEEL

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Article history
*Diterima:*
16 Mei 2020
*Diperbaiki:*
12 November 2020
*Disetujui*:
13 November 2020

Keyword
*Dragon fruit; fiber, fruit peel, noodles, pitaya*

**ABSTRACT**

*Innovation in increasing the wet noodles performance was conducted by substituting super red dragon fruit (pitaya) peel (DFP) puree to get DFP wet noodles that have red color and rich in fiber. Wheat flour (WF) was substituted with super red DFP puree in a portion of 0-20%. A single factor experiment arranged in Completely Randomized Design with four replications for each treatment was conducted. Hedonic and quality hedonic properties for color, aroma, texture, and taste were determined. Data were analyzed by the Friedman test continued by the Wilcoxon Sign Rank test. The DFP wet noodle with DFP puree substitution of 10% gave the best hedonic sensory response for overall acceptability with the properties of like for color, texture, and taste, but rather like for aroma. The DFP wet noodles have hedonic quality properties of a light reddish color, slightly scented of dragon fruit peel with a texture of rather hard and rather taste of DFP. The fiber content of the DFP wet noodles was 0.135 ± 0.003%.*



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DOI 10.21107/agrointek.v15i2.7275

## INTRODUCTION

Wet noodle is a popular food in Indonesia, which is served as fried noodle, or boiled noodle, and also served with meatball. Many innovations to promote the new wet noodle characteristic has been developed by adding other food sources like cassava flour (Abidin et al. 2013), tempeh and cornflour (Setyani et al. 2017), breadfruit (Yustina 2017), *Pleurotus* powder (Sung et al. 2008), *Curcuma longa* powder (Song and Jung 2009), onion juice (Shin et al. 2009), betel leaf extract (Nouri et al. 2015), etc.

The substitution of other sources for wheat flour, e.g., *Lychii fructus* powder (Lim et al. 2003) and whey powder (Lee and Kim 2000) are limited as it will change the wet noodle characteristics, especially on noodle texture because of the change of gluten content portion. However, some food sources, e.g., sago, seaweed, and dragon fruit peel (Nurlia et al. 2017), purple sweet potatoes powder (Lee and Yoo 2012), and extract or powder of *Aster scaber* (Kim et al. 2015), can maintain or even increase the sensory performance of original wet noodle.

Besides the physical characteristics changing, the addition/substitution of other food sources is also aimed to improve sensory, chemical, or microbiological characteristics like the color (Oktiarni et al. 2012), increasing in antioxidant activity (Hwang et al. 2011), or prolong the shelf-life (Lee et al. 1999) of the wet noodle.

According to the content of natural coloring agent, fiber, and antioxidant and antimicrobial activity, dragon fruit became popular as an addition or substitution source for wheat flour in wet noodle produce. Dragon fruit components in the form of its extract of fruit flesh (Engelen 2019), fruit peel (Sumardana et al. 2017, AR et al. 2019, Enjelina et al. 2019) were used as minor addition substances in wet noodle produce, as well as dragon fruit peel juice (Savitri and Suwita 2017). There is no report on the addition/substitution of the dragon fruit component in puree or a higher portion. Here, we report the effect of a high percentage of dragon fruit peel (DFP) puree as a substitution source for wheat flour on wet noodle sensory characteristics. This finding led to the use of DFP as antioxidant and fiber sources in red wet noodle produce.

## METHODS

### Materials

Super red dragon fruits were obtained from farmers surround Samarinda, while high protein wheat (protein content of 13% db), egg, salt, and tapioca were purchased from mini-market in Samarinda.

### Experimental Design and Analysis Data

This experiment is a single factor experiment arranged in Completely Randomized Design with five levels of treatment (substitution of DFP), i.e., 0, 5, 10, 15, and 20%. The formula of wheat and super red DFP puree was 100 g for each treatment. Sensory properties of hedonic and quality hedonic of color, aroma, texture, and taste were determined. The data were analyzed by Friedman then continued by Wilcoxon Signed Rank Test ($p < 0.05$) between the treatment level. The dragon fruit wet noodles showing the best sensory response then analyzed for fiber content.

### Experimental Procedure

#### *Dough Preparation and Mie Making*

DFP puree was prepared by crushing the sliced peel (the peel was free of peel scale) of one medium size dragon fruit of 1,000 g (276.43 grams peel per fruit) in 50 mL water using a blender (Kirin, KBB-315SG, made in China) for 4 minutes. The yield of DFP puree was 309.98 g.

Materials (a mixture of wheat and DFP puree 100 g, egg 20 g, salt 2 g, and water 50 mL) were mixed in Automatic Noodle Maker (Oxone, OX-356, made in China) for 4 minutes. The water is added step by step to form a good dough. Then the noodles were extruded while tapioca flour was sprinkled to make each single good strand noodle form.

The noodles were then put into 500 mL of boiled water added by 10 mL vegetable oil. The noodles were cooked for 5 minutes. The noodles were then assayed for the sensory test following the cooling process for 1 hour.

#### *Assays*

The sensory test of hedonic and quality hedonic for color, aroma, texture, and taste was conducted by 25 semi-trained panelists (Soekarto, 1985), while fiber was assayed as suggested by (Sudarmadji et al., 2003).

## RESULTS AND DISCUSSION

### Sensory characteristics of DFP wet noodles

Substitution of super red DFP puree up to 20% into wheat flour significantly affected ($p < 0.05$) all of the sensory response of DFP wet noodles (Table 1.). It increased the sensory hedonic response. The DFP puree substitution of 10% showed the best sensory hedonic response of DFP cooked wet noodles based on overall acceptability (data of all attributes: color, aroma, texture, and taste). The 10% of DFP puree substitution showed the highest sensory hedonic on the wet noodle texture.

### Uncooked DFP wet noodle

The increase of DFP puree substitution increased the hedonic response of uncooked DFP wet noodles for color, aroma, and texture. The substitution of DFP puree up to 20% leveled the hedonic response to one level from rather like to like, which produced the uncooked DFP wet noodle with characteristics of red, very scented of DFP, and had a texture of hard.

The acceptance of red wet noodles by the panelist shows that DFP puree could be used as natural color in wet noodle products. The very low substitution (5 % DFP) could have leveled the color, aroma, and texture from white to reddish, not scented of DFP to scented of DFP, and chewy to hard, respectively. The dragon fruit contains betanin, phyllocacton, and hylocerenin, which belong to betacyanin, a water-soluble pigment of red-violet, stable in the pH range of 3-7 (Strack et al. 2003, Ding et al. 2009).

### Cooked DFP wet noodle

The substitution of DFP puree increased the hedonic response of cooked DFP wet noodles. The DFP puree substitution alone of 10% showed an optimum increase of the hedonic response for all performance. It is in line with the use of other substance like seaweed and dragon fruit peel (Nurlia et al. 2017), purple sweet potatoes powder (Lee and Yoo 2012), and *Aster scaber* extract or powder (Kim et al. 2015), which showed an increase of the hedonic response. However, the use of hot water extract of DFP did not show the same effect. The more addition of hot water extract of DFP led to a slightly decreasing sensory hedonic of color, aroma, texture and taste of wet noodle produced from banana tuber flour, but it did not affected significantly (Sumardana et al. 2017).

The DFP puree gave a consistent performance in color, aroma, texture, and taste of the cooked wet noodles. The cooking process did not change the hedonic quality characteristics of the DFP wet noodles. All of the attributes had the same score for uncooked and cooked DFP wet noodles. Agne *et al.* (2010) and de Mello *et al.* (2015) showed that the betacyanin from dragon fruit peel stabile at 25$^{o}$C and only slightly decrease by heating at 100$^{o}$C for 10 minutes.

Besides acting as a natural coloring agent, the betacyanin in the DFP shows an antioxidant activity, which is higher than that in the dragon fruit flesh, i.e., 28 and 175 mmol of TEAC/g of flesh and peel dried extract, respectively (Wu et al. 2006). This finding shows that DFP puree could be considered as a substitute substance to design the new type of wet noodles to have a unique color of red and rich in antioxidants.

One of the critical characteristics of wet noodle is texture. The substitution of DFP puree affected the texture of the uncooked and cooked DFP wet noodles significantly. The DFP substitution made the texture of the wet noodle became hard and rather hard for uncooked and cooked DFP wet noodle, respectively. However, the hedonic response of the DFP wet noodles texture increased, which means that the texture of the DFP wet noodle is continuing and not easy to break. It may be caused by the high pectin content of DFP of about 15-20 % of dry basis (Ismail et al. 2012, Megawati and Ulinuha, 2015). The pectin shows a high water holding capacity (de Moura et al. 2017), so that the DFP wet noodle became more elastic and not easy to break.

The use of DFP extract did not affect the taste of wet noodles (Enjelina et al., 2019). However, this experiment showed that the use of DFP puree significantly affected the hedonic response of the wet noodles. The wet noodle became tasted of DFP.

### Fiber content

The fiber content of dragon fruit peel used in this experiment was 0.675%, which is lower than the fiber content of dragon fruit peel from Malang, Indonesia (7.32%) (Savitri and Suwita 2017), and from Melaka, Malaysia (4.30%) (Jamilah et al. 2011). (Rohin et al. 2006) reported a broad range of fiber content of dragon fruit flesh, which was 0.90 and 10.01% for dragon fruit from Taiwan and Malaysia, respectively.

Table 1 Effect of super red DFP substitution on the sensory response of wet noodles

| Attributes | Substitution of DFP puree into wheat flour (%) | | | | | *p** |
|---|---|---|---|---|---|---|
| | 0 | 5 | 10 | 15 | 20 | |
| ***Uncooked DFP wet noodles*** | | | | | | |
| *Hedonic* | | | | | | |
| Color | 3.0 a | 4.0 ab | 3.0 a | 4.0 c | 4.0 bc | 0.0005 |
| Aroma | 3.0 a | 3.0 a | 3.0 ab | 3.0 a | 4.0 b | 0.0310 |
| Texture | 3.0 a | 4.0 b | 4.0 ab | 4.0 c | 4.0 c | 0.0005 |
| Overall acceptability‡ | 3.0 a | 3.0 b | 3.0 ab | 4.0 c | 4.0 d | 0.0005 |
| *Hedonic quality* | | | | | | |
| Color | 2.0 a | 4.0 b | 4.0 c | 4.0 c | 5.0 c | 0.0005 |
| Aroma | 1.0 a | 4.5 b | 5.0 b | 5.0 b | 5.0 c | 0.0005 |
| Texture | 1.0 a | 5.0 b | 5.0 b | 5.0 b | 5.0 b | 0.0005 |
| ***Cooked DFP wet noodles*** | | | | | | |
| *Hedonic* | | | | | | |
| Color | 2.0 a | 4.0 b | 4.0 b | 4.0 b | 4.5 b | 0.0005 |
| Aroma | 2.0 a | 4.0 c | 4.0 c | 3.0 b | 3.0 b | 0.0005 |
| Texture | 2.0 a | 4.0 b | 4.5 c | 4.0 c | 4.0 c | 0.0005 |
| Taste | 2.0 a | 4.0 b | 4.0 c | 4.0 c | 5.0 c | 0.0005 |
| Overall acceptability‡ | 2.0 a | 4.0 b | 4.0 c | 4.0 b | 4.0 b | 0.0005 |
| *Hedonic quality* | | | | | | |
| Color | 2.0 a | 4.0 bc | 4.0 b | 4.0 b | 5.0 c | 0.0005 |
| Aroma | 2.0 a | 4.0 b | 4.0 c | 5.0 c | 5.0 c | 0.0005 |
| Texture | 2.0 a | 2.0 a | 4.0 b | 4.0 b | 5.0 c | 0.0005 |
| Taste | 2.0 a | 4.0 b | 4.0 b | 5.0 c | 5.0 c | 0.0005 |

Note: Data were median, calculated from 4 replications assessed by 25 semi-trained panelists. All performance data are calculated as the average of other attributes. The data were analyzed by the Friedman test (*). Data within the same row, followed by different letters, were significantly different (Wilcoxon Sign Rank Test, $p < 0.05$). The formula is based on 100 g of mixing of wheat flour and DFP puree. Hedonic sensory scale 1-5 for very dislike, dislike, rather like, like, like very much. Hedonic quality sensory scale 1-5 is for **color** (very white, white, mild reddish, reddish, red), **aroma** (not scented of DFP, very soft scented of DFP, mildly scented of DFP, scented of DFP, very scented of DFP), **texture** (chewy, rather chewy, not chewy, rather hard, hard), **taste** (tasteful, tasted of wheat flour, rather tasted of wheat flour, rather tasted of DFP, tasted of DFP).

The cooked DFP noodle having the best hedonic sensory response. The noodle with 10% DFP puree substitution has a fiber content of 0.135±0.003%. The fiber content of noodle substituted by other food source is varied, e.g., 3.18, 0.48, 2.02, 1.53-2.29% for noodle substituted by 20% of breadfruit (Yustina 2017), 5% of banana tuber (Sumardana et al. 2017), 15% of dragon fruit peel juice and rice bran composite of 9 to 5 (Savitri and Suwita 2017), added by 0-2% of CMC (Nasruddin et al. 2018), respectively.

## CONCLUSION

The substitution of dragon fruit peel (DFP) puree increased significantly ($p < 0.05$), the sensory hedonic of wet noodles. The substitution of 10% DFP puree gave the best hedonic sensory response with the quality hedonic sensory of a light reddish color, slightly scented of dragon fruit peel with a texture of rather hard and rather taste of DFP. The red color of the DFP wet noodle is stable during the cooking process. However, the dragon fruit from Samarinda is not suitable for designing DFP wet noodles rich in fiber due to the low content of fiber.

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