BUKTI KORESPONDENSI

Judul Artikel : Incorporated Monascus Fermented Durian Seeds and Rice Bran into Bread: Study on its Physicochemical and Sensory Properties

Jurnal : Food Research
Volume 3, Issue 3, Juni 2019

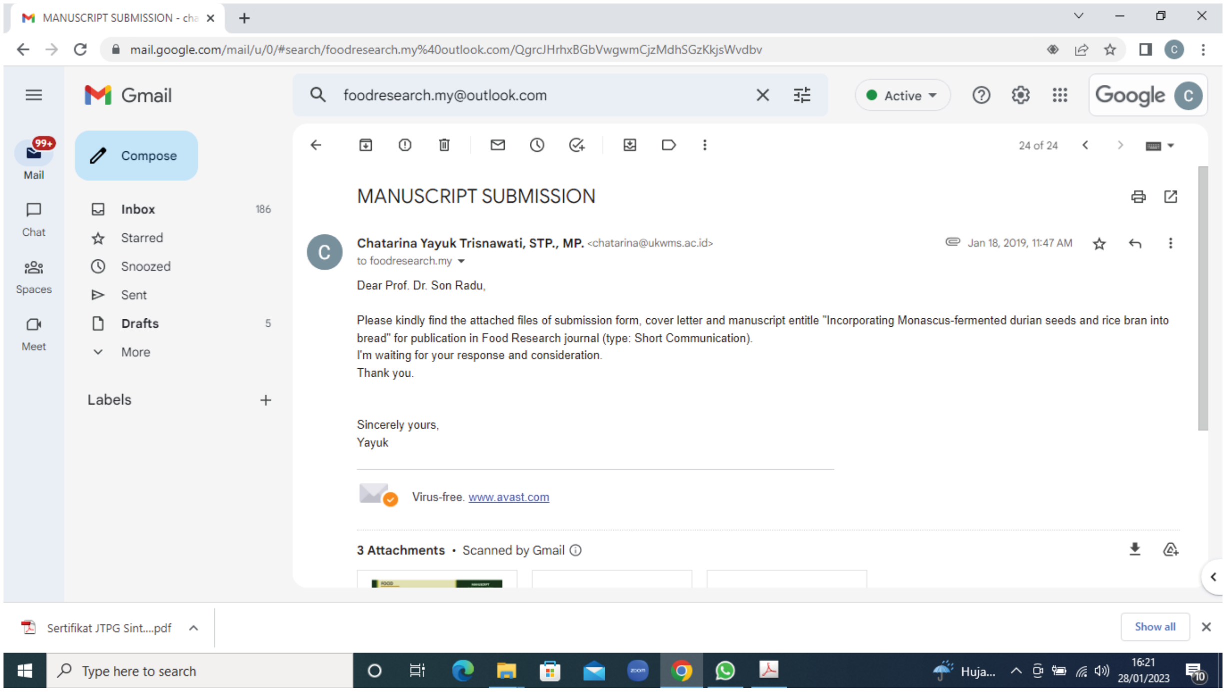
Penulis : *Trisnawati, C.Y., Srianta, I., Nugerahani, I. and Marsono, Y.

No.	Perihal	Tanggal
1.	Bukti konfirmasi submit artikel dan artikel yang di-submit	18 Januari 2019
2.	Bukti konfirmasi balasan penerimaan artikel	20 Januari 2019
3.	Bukti konfirmasi review dan hasil review dari Reviewer	21 Januari 2019
4.	Bukti konfirmasi submit revisi artikel, respon kepada reviewer, artikel yang di-resubmit dan balasannya	26 Januari 2019
5.	Bukti konfimasi artikel diterima dan acceptance letter serta permintaan pengisian form Article Processing Charge (APC)	28 Januari 2019
6.	Bukti konfirmasi submit form APC dan balasannya	30 Januari 2019
7.	Bukti konfirmasi galley proof artikel	5 Februari 2019
8.	Bukti konfirmasi submit galley proof artikel revisi pertama	6 Februari 2019
9.	Bukti konfirmasi revisi galley proof artikel dan galley proof artikel setelah revisi pertama	7 Februari 2019
10.	Bukti konfimasi submit galley proof hasil revisi kedua	8 Februari 2019
11.	Bukti konfimasi galley proof hasil revisi kedua dan persetujuan galley proof	9 Februari 2019
12.	Bukti konfirmasi artikel published online	20 Februari 2019

1.

Bukti konfirmasi submit artikel dan artikel yang di-submit

(18 Januari 2019)



MANUSCRIPT SUBMISSION

Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id> Jan 18, 2019, 11:47 AM
to foodresearch.my

Dear Prof. Dr. Son Radu,

Please kindly find the attached files of submission form, cover letter and manuscript entitle "Incorporating Monascus-fermented durian seeds and rice bran into bread" for publication in Food Research journal (type: Short Communication).
I'm waiting for your response and consideration.
Thank you.

Sincerely yours,
Yayuk

Virus-free. www.avast.com

3 Attachments • Scanned by Gmail

Type: Short Communication

Incorporating *Monascus*-fermented durian seeds and rice bran into bread

Trisnawati, C. Y.[1*], Srianta, I.[1], Nugerahani , I.[1] and Marsono, Y.[2]

[1]Department of Food Technology, Widya Mandala Catholic University Surabaya, Jalan Dinoyo 42 – 44 Surabaya, Indonesia 61265

[2]Department of Food and Agricultural Product Technology, Gadjah Mada University, Jalan Flora, Bulaksumur, Yogyakarta Indonesia

*corresponding author: chatarina@ukwms.ac.id ; phone +6231 5678478; fax +6231 5610818

Abstract

Monascus-fermented durian seeds (MFDS) and rice bran (RB) have been incorporated into bread dough formulation. This research was aimed at physicochemical and sensory evaluation of bread formulated with the both active ingredients. Bread made from 4 dough formulas i.e. control, with MFDS, RB and MFDS-RB -incorporating have been evaluated the physicochemical and sensory properties. The results suggested that no significant differences on both physical and sensory properties of bread with MFDS-incorporating and control. Ash, crude fiber and total phenolic contents found on breads with RB and MFDS-RB incorporating were significantly higher than those of control. The breads are being in further evaluation for the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

Keywords : bread, Monascus-fermented durian seeds, rice bran, physical and sensory properties

1. Introduction

Bread is one of the oldest foods and popular around the world. In the breadmaking, wheat flour, water, salt, sugar and yeast are mixed into viscoelastic dough subjected to fermentation and baking (Sivam et al., 2010). Incorporating active ingredients into bread have grown rapidly, since the increased consumer awareness on health. Purple sweet potato flour, soy flour, flaxseed, green tea extract, whole grain rye, coriander leaf powder, grape seed and garlic have been incorporated into bread (Conforti & Davis, 2006; Hardoko, Hendarto & Siregar, 2010; Wang, Zhou & Isabelle, 2007; Zielinski et al., 2007; Das, Raychaudhuri & Chakraborty, 2012; Meral & Dogan, 2013; Suleria et al., 2015).

Monascus fermented- durian seed is a product of solid state fermentation with Monascus purpureus culture on durian seed substrate (Srianta et al., 2012a; Srianta et al., 2012b). The MFDS potential as anti-diabetes agent with α-glucosidase inhibition, antioxidant and in vivo anti-hyperglycemia activities (Srianta et al., 2013; Srianta et al., 2014; Nugerahani et al., 2017). MFDS has not been incorporated into food product. On the other hand, rice bran is also known as a potential ingredient for the development of anti-diabetic food. Qureshi et al. (2002) reported that consumption of 20 g of rice bran can reduce blood glucose in patients with type I and II diabetes mellitus. The content of tocopherol, tocotrienol, oryzanol, and polyphenols in rice bran also plays a role in controlling blood sugar levels. Trisnawati and Sutedja (2010) reported that rice bran has been used in the development of functional food products.

The aims of this study were to incorporate Monascus-fermented durian seeds and rice bran into bread and to evaluate the physicochemical and sensory properties of the bread.

2. Materials and Methods

2.1. Materials, micoorganism and chemicals

All ingredients except MFDS were obtained from local distributors. MFDS was prepared in the laboratory. Durian seeds were obtained from home industry of durian processing. *Monascus purpureus* M9 was used in the MFDS preparation. It was maintained and subcultured on PDA monthly. All chemicals were analytical grade obtained from local distributors.

2.2. Preparation of Monascus-fermented durian seeds

Monascus-fermented durian seeds were prepared according to our previous research (Srianta et al., 2012). Durian seeds were prepared by boiling, peeling, cutting and sterilization. After that, the 50 g of sterilized durian seeds cut were inoculated with 7-days *Monascus purpureus* starter with a total spore of about 10^5 spores/mL. Incubation was carried out at room temperature (± 30°C) for 14 days, then dried at 45°C for 24 hours. The dried MFDS was ground to obtain powder form. The MFDS was used as ingredient in bread formulation.

2.3. Bread formulation and processing

Four bread formulas were: 1) control, consist of 200 g of wheat flour, sugar 10 g of sugar, 8 g of margarine, 2 g of salt, 0.6 g of bread improver, 3 g of baker yeast and 124 g of water; 2) MFDS, consist of those of control ingredients with MFDS incorporating at 0.15 g; 3) RB, consist of those of control ingredients with RB incorporating at 20 g; and 4) MFDS+RB, consist of those of control ingredients with MFDS and RB incorporating at 0.15 g and 20 g.

The ingredients were mixed in a mixer (Phillips HR 1559 model) into viscoelastic dough, then fermented at 30°C for 30 minutes. The dough was rolled, rounded and placed in a baking dish, and baked in an oven (Gas Bakery Oven RFL-12C model) at 180 °C for 30 minutes.

2.4. Evaluation of bread characteristics

2.4.1. Physicochemical analysis

The physical properties analysis of the bread: specific loaf volume according to AACC (2000), color by using color reader (Konica Minolta CR-10, Konica Minolta Optics, Inc., Japan) and texture profiles including hardness, cohesiveness and springiness by using texture analyzer with cylinder probe P36R (TA-XT plus, Exponent Lite software). The chemical analysis of moisture, ash, protein, and crude fiber contents analysis refer to AOAC method (AOAC 925.10, AOAC 923.03, AOAC 984.13 and AOAC 978.10 respectively). Total phenolic content analysis was conducted according to Lee et al. (2008).

2.4.2. Sensory evaluation

Sensory evaluation of the bread was conducted by using hedonic method (Stone and Sidel, 2004). A 7-point scoring was used with 1 representing extremely dislike and 7 representing extremely like. Fourty untrained panelists participated in the sensory evaluation, and had no previous or present taste or smell disorders. Bread samples were labeled with three-digit codes and randomnly presented to avoid bias of order of presentation. The panelists scored for colour, texture, aroma, taste and overall preferences of the bread from the 4 formulas. The study was in accordance with the Declaration of Helsinki (Anon, 2017).

2.5. Statistical Analysis

The experiments were conducted triplicate. The obtained data were subjected to analysis of variance (ANOVA) with $\alpha = 5\%$ and followed by the Duncan Multiple Range Test (DMRT) with $\alpha = 5\%$. SPSS (version 19.0) were used in the analysis.

3. Results and Discussion

3.1. Physicochemical characteristics

Breads made from 4 different formulas were visually different in their height and colour (Figure 1). Incorporating RB alone or combination with MFDS into the formula affected the specific loaf volume, colour, hardness, cohesiveness and springiness (Table 1), ash, protein, crude fiber and total phenolic content (Tabel 2) of the breads significantly. This results indicate that existence of rice bran in the formula contribute significantly in the colour, structure and texture properties of the breads. Specific loaf volume of breads with RB and MFDS-RB incorporation were higher than those of control and with MFDS ($p<0.05$). This results may be related to the fiber content in rice bran which has high water absorption capacity, as reported by Rafe, Sadeghian and Hoseini-Yazdi (2017). This results reflected that rice bran reduced the fermentation and proofing rates of dough, which related to the water availability for yeast activity. In the breadmaking, proteins in wheat flour need water to form gluten, which then contribute to form viscoelastic matrix that can stretch properly by CO_2 during fermentation and proofing. High fiber content in the bread dough with RB incorporation can reduce water availability in the system for the gluten formation, which cause the dough can not stretch properly by CO_2. Durian seed contain high amount of gum with high water absorption capacity of 1112.15% (Cornelia, Siratantri and Prawira, 2015). However the MFDS incorporation do not affect significantly on the specific loaf volume, may be due to the MFDS incorporated in low amount.

Bread with RB and MFDS-RB incorporation were visually darker brown than those of bread with MFDS only. Colour measurement by using colour reader (Table 1) also show that L* of crumb of bread in which rice bran presence were higher than those of control and with MFDS alone. Sharma, Chauhan and Agrawal (2004) also found the similar result that rice bran become darker after extrusion cooking, that occured may be due to the browning reaction mainly Maillard during the heating process. The presence of high fiber and pheophytin in the rice bran may be also contribute to the darker formation (Aung et al., 2014; Hussien et al., 2017). MFDS incorporation affected only on the redness value, higher red value is resulted by the MFDS presence. The MFDS contain red pigments produced during the Monascus solid state fermentation (Srianta et al., 2012).

Hardness, cohesiveness and springiness of bread with MFDS incorporation was not significantly different with the control ($p>0.05$), but those was significantly different with the bread with RB presence. Bread dough with RB incorporation increased the water absorption requirement. High fiber content of the rice bran causes high water absorption capacity of the bread dough. The limited gluten formed in the dough, the heavy loaves bread obtained. This may be related to higher hardness values and lower cohesiveness and springiness values, which is in close agreement with Lima, Guaraya andChampagne (2002).

RB and MFDS+RB incorporation affected on ash, crude fiber and total phenolic contents in the breads significantly ($p<0.05$). This results related to the chemical composition of rice bran that high contents in ash, fiber and phenolic compounds. MFDS contain phenolic compound (Srianta et al., 2014), but the bread with MFDS incorporation was not significant different with the control ($p>0.05$). This may be due to the low level of MFDS incorporated into the bread dough.

3.2. Sensory Characteristics

The overall preference scores of the breads with RB and MFDS+RB were significantly different with the control and with MFDS only. Overall preference was determined on the basis of colour, aroma, texture and taste. Panelists gave lower scores to the breads colour in which RB presence. Interestingly, there were no significant different of aroma and taste preferences among control, with MFDS incorporation and with RB incorporation.

4. Conclusions

Incorporating MFDS do not affected signicantly on the almost all of physicochemical and sensory characteristics of breads, whereas the incorporating RB affected significantly on those properties. The breads are being in further evaluation for the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

5. Acknowledgment

Thanks to Kopertis Wilayah VII Jawa Timur, Directorate General of Higher Education, Ministry of National Education, Republic of Indonesia for the financial support through competitive research Penelitian terapan Unggulan Perguruan Tinggi with contract number of 115AE/WM01.5/N/2018.

6. References

AOAC. (1997). *Official Methods of Analysis of The Association of Official Analytical Chemists*. Washington DC: Association of Official Analytical Chemists.

Association of Analytical Communities. (2006). *Official Methods of Analysis of AOAC International 18th Edition*. Gaithersburg: AOAC International.

Ardiansyah. (2004). *Sehat dengan Mengkonsumsi Bekatul*. www. Gizinet.com (20 Juni 2016)

Infodatin Kementerian Kesehatan. (2014). *Pusat Data dan Informasi Kementerian Kesehatan Republik Indonesia*. Jakarta

IDF Diabetes Atlas. (2015). *International Diabetes Federation Diabetes Atlas,* 7th Edition. www.diabetesatlas.org

Jiamyangyuen, S., Srijesdaruk, V. and Harper, W.J. (2005). Extraction of rice bran protein concentrate and its application in bread. *Songklanakarin Journal of Science and Technology*, 27(l): 55 - 64.

Kahlon, T. S. and Chow, F.I. (2000). Lipidemic response of hamsters to rice bran, uncooked or processed white and brown rice, and processed corn starch. *Cereal Chemistry*, 77(5) : 673 – 678.

Kartika, B., Hastuti, P. dan Supartono, W. (1988). *Pedoman Uji Inderawi Bahan Pangan*. Yogyakarta : Pusat Antar Universitas Pangan dan Gizi, Universitas Gadjah Mada.

Marsono Y., Triwitono, P dan Kanoni, S. (2005). Indeks Glisemik Kacang buncis (*Phasaolus vulgaris*) dan Kacang Panjang (*Vigna sesquipedalis*) serta Uji Efek Hipoglikemiknya pada Tikus *Sprague Dawley*. *Biota*, X (3):183-191.

Nugerahani, I., Sutedja, A.M., Srianta, I., Widharna, R.M. and Marsono, Y. (2017). In vivo evaluation of Monascus-fermented durian seed for antidiabetic and antihypercholesterol agent. *Food Research*, 1(3): 83-88.

Qureshi, A.A., Sami, S.A. and Khan, F.A. (2002). Effects of stabilized rice bran, its soluble and fiber fractions on blood glucose levels and serum lipid parameters in humans with diabetes mellitus Types I and II. *Journal of Nutritional Biochemistry*, 13(3): 175-187.

Saunders, R. M. (1990). The properties of rice bran as a food stuff. *Cereal Foods World*. 35:632- 635.

Spears, J. K., Grieshop, C.M. and Fahey, G.C.Jr. (2004). Evaluation of stabilized rice bran as an ingredient in dry extruded dog diets. *Journal of Animal. Science*,. 82 : 1122-1135.

Srianta, I., Hendrawan, B., Kusumawati, N. and Blanc, P.J. (2012). Study on durian seed as a new substrate for angkak production. *International Food Research Journal*, 19(3): 941-945.

Srianta, I., Kusumawati, N., Nugerahani, I., Artanti, N. and Xu, G.R. (2013). *In vitro* α-glucosidase inhibitory activity of *Monascus*-fermented durian seed extracts. *International Food Research Journal*, 20 (2): 533-536.

Srianta, I., Nugerahani, I., Kusumawati, N., Suryatanijaya, E., Subianto, C., Tewfik, S. and Tewfik, I. (2014). Therapeutic antioxidant activity of Monascus-fermented durian seed: a potential functional food ingredient. *International Journal of Food, Nutrition and Public Health*, 7(1): 53-59.

Sudarmadji, S., Haryono, B dan Suhardi. (1997). *Prosedur Analisa untuk Bahan Makanan dan Pertanian*. Yogyakarta: Liberty.

Roshental, A.J. (1999). *Food Texture Measurement and Perception*. Maryland: Aspen Publisher, Inc.

Sutedja, A.M. dan Trisnawati, C.Y. (2008). Children Sensories Acceptance to Rice Cake Enriched with Defatted Rice Bran. *Proceeding of International Conference on Food Science and Technology.* ISBN: 978-979-1268-36-3. FMQM-05

Szczesniak, A.S. (2002). Texture is a Sensory Property. *Food Quality and Preference*, 13: 215–225.

Takakori, Z., Zare, M., Iranparvare, M. and Mehrabi, Y. (2004). Effect Of Rice Bran On Blood Glucose And Serum Lipid Parameters In Diabetes II Patients. *The Internet Journal of Nutrition and Wellness,* 2(1): 1-5.

Trisnawati, Ch. Y. dan Sutedja, A.M. (2010). Pemanfaatan Beras dan Bekatul Beras dalam Pembuatan *Cake*. *Prosiding Seminar Nasional Teknik Kimia Soebardjo Brotohardjono VII*. ISSN: 1978-0427. A3(1-7)

Widowati, S. (2008). Karakteristik beras instan fungsional dan peranannya dalam menghambat kerusakan pankreas. *Jurnal Pangan* 17(3): 51-60.

Figure 1. Picture of bread with MFDS and RB incorporation. The breads made from different formula. (A) Control bread, (B) bread with MFDS incorporation, (C) bread with RB incorporation, (D) bread with MFDS+RB incorporation. The ingredients were mixed in a mixer into viscoelastic dough, then fermented at 30^{o}C for 30 minutes. The dough was rolled, rounded and placed in a baking dish, and baked in an oven at 180 °C for 30 minutes.

Table 1. Physical characteristics of bread with MFDS and RB incorporation**

Bread formula	Specific volume (cm^3/g)	Colour			Texture profile		
		L*	a*	b*	hardness	cohesiveness	springiness
Control	5.45[b]	75.54[b]	0.41[a]	11.18[a]	128.89[a]	0.80[b]	0.91[b]
MFDS	5.03[b]	72.56[b]	1.24[b]	9.94[a]	160.81[a]	0.79[b]	0.93[b]
RB	3.78[a]	66.57[a]	3.82[c]	18.18[b]	643.54[b]	0.65[a]	0.81[a]
MFDS+RB	3.91[a]	68.4[a]	4.31[c]	18.43[b]	784.46[b]	0.64[a]	0.78[a]

Note: **Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

Table 2. Chemical composition of bread with MFDS and RB incorporation

Bread formula	Moisture (%)	Ash (%)	Protein (%)	Crude fiber (%)	Total phenolic (%)
Control	36.15[a]	1.05[a]	9.29[a]	0.10[a]	0.138[a]
MFDS	37.24[a]	1.06[a]	8.83[a]	0.12[a]	0.168[ab]
RB	37.35[a]	1.50[b]	8.57[a]	0.24[ab]	0.197[b]
MFDS+RB	37.65[a]	1.49[b]	8.60[a]	0.37[b]	0.193[b]

Note: **Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

Table 3. Sensory characteristics of bread with MFDS and RB incorporation

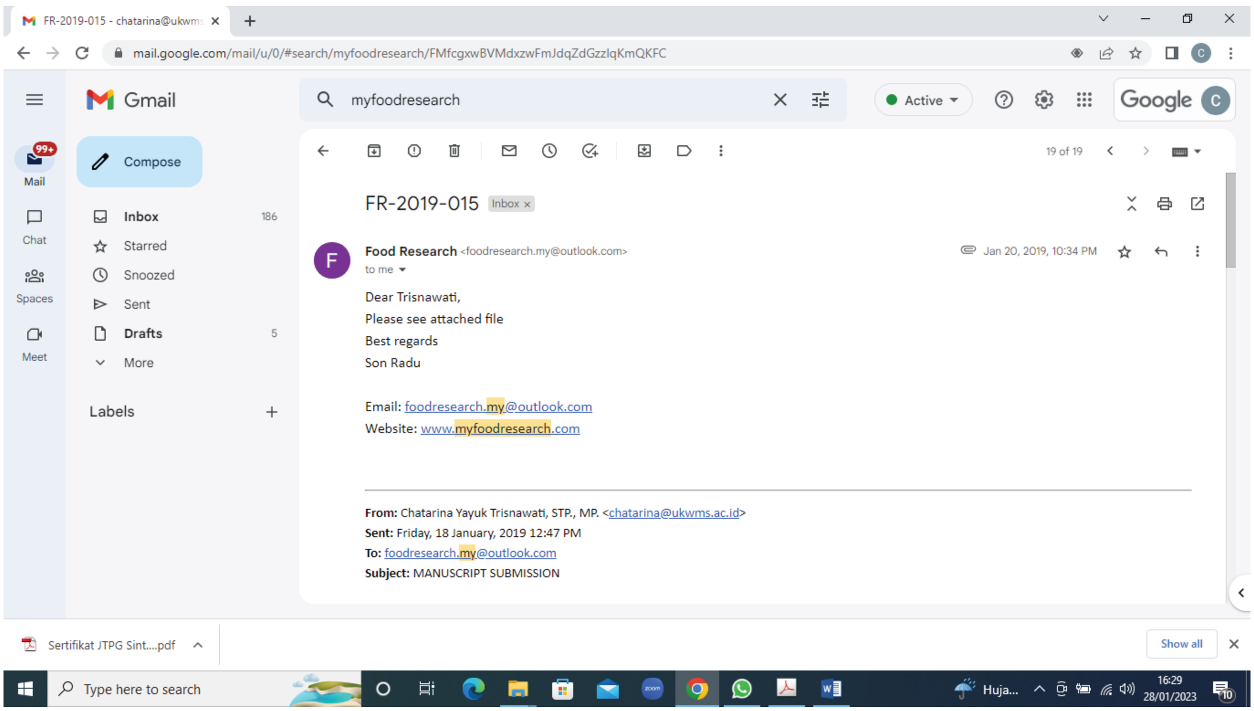
Bread formula	Preference				
	Colour	Aroma	Texture	Taste	*Overall*
Control	5.80[c]	5.03[b]	5.30[c]	5.05[b]	5.20[c]
MFDS	6.08[c]	4.48[ab]	4.48[b]	4.80[b]	5.20[c]
RB	3.80[b]	4.80[b]	5.13[c]	4.48[b]	4.48[b]
MFDS+RB	2.53[a]	4.05[a]	3.35[a]	3.15[a]	3.88[a]

Note: **Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

2.

Bukti konfirmasi balasan penerimaan artikel

(20 Januari 2019)



FR-2019-015 Inbox

Food Research <foodresearch.my@outlook.com>

to me

Jan 20, 2019, 10:34 PM

Dear Trisnawati,

Please see attached file

Best regards

Son Radu

Email: foodresearch.my@outlook.com

Website: www.myfoodresearch.com

From: Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id>

Sent: Friday, 18 January, 2019 12:47 PM

To: foodresearch.my@outlook.com

Subject: MANUSCRIPT SUBMISSION

FOOD
RESEARCH

20th January 2019

Authors: Trisnawati, C. Y., Srianta, I., Nugerahani , I. and Marsono, Y.

Manuscript title: Incorporating *Monascus*-fermented durian seeds and rice bran into bread

Manuscript ID: FR-2019-015

Dear Trisnawati,

This message is to acknowledge the receipt of the above manuscript that you submitted via email to Food Research. Your manuscript has been successfully checked-in. Please refer to the assigned manuscript ID number in any correspondence with the Food Research Editorial Office or with the editor.

Your paper will be reviewed by three or more reviewers assigned by the Food Research editorial board and final decision made by the editor will be informed by email in due course. Reviewers' suggestions and editor's comments will be then made available via email attached file. You can monitor the review process for your paper by emailing us on the "Status of my manuscript".

If your manuscript is accepted for publication, Food Research editorial office will contact you for the production of your manuscript.

Thank you very much for submitting your manuscript to Food Research.

Sincerely,

Professor Dr. Son Radu
Chief Editor
Email: foodresearch.my@outlook.com

3.

Bukti konfirmasi review dan hasil review dari Reviewer

(21 Januari 2019)

FR-2019-015 - chatarina@ukwms

mail.google.com/mail/u/0/#search/myfoodresearch/FMfcgxwBVMdxzwFmJdqZdGzzlqKmQKFC

Food Research <foodresearch.my@outlook.com> Jan 21, 2019, 10:40 AM

to me

Dear Trisnawati,

Manuscript FR-2019-015 entitled "Incorporating *Monascus*-fermented durian seeds and rice bran into bread" which you submitted to Food Research, has been reviewed. The comments of the reviewer(s) are included in the attached file.

The reviewer(s) have recommended publication, but also suggest some revisions to your manuscript. Therefore, I invite you to respond to the reviewer(s)' comments and revise your manuscript. Once the revised manuscript is prepared, please send it back to me for further processing.

Because we are trying to facilitate timely publication of manuscripts submitted to Food Research, your revised manuscript should be submitted by 27th JANUARY 2019. If it is not possible for you to submit your revision by this date, please let us know.

Once again, thank you for submitting your manuscript to Food Research and I look forward to receiving your revised manuscript.

Sincerely,
Professor Dr. Son Radu
Editor-in-Chief, Food Research
foodresearch.my@outlook.com

FR-2019-015 additional comments

mail.google.com/mail/u/0/#search/myfoodresearch/FMfcgxwBVMgHZRMCVnzdGfgRhZZqVFTk

FR-2019-015 additional comments

Food Research <foodresearch.my@outlook.com> Mon, Jan 21, 2019, 2:16 PM

to me

Dear Trisnawati,
PLease inclkude these new comments in revising your manuscript
Best regards
Son Radu

Email: foodresearch.my@outlook.com
Website: www.myfoodresearch.com

From: Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id>
Sent: Friday, 18 January, 2019 12:47 PM
To: foodresearch.my@outlook.com
Subject: MANUSCRIPT SUBMISSION

FR-2019-015.doc
Sertifikat JTPG Sint....pdf

Type: Short Communication

Incorporating *Monascus*-fermented durian seeds and rice bran into bread [please consider paraphrasing the title with more reflective words]

Formatted: English (United Kingdom)

Abstract

Monascus-fermented durian seeds (MFDS) and rice bran (RB) have been incorporated into bread dough formulation [what was the rationale to incorporate these two ingredients; e,g to boost the nutrients or nutraceuticals contents??]. This research was aimed at improving physicochemical and sensory evaluation of bread formulated with ~~the~~ both active ingredients. Bread made from ~~4dough~~ four dough formulas i.e. control, with MFDS, RB and MFDS-RB -incorporating have been evaluated the physicochemical and sensory properties. The results suggested that no significant differences on both physical and sensory properties of bread with MFDS-incorporating and control [insert p-values] . Ash, crude fiber and total phenolic contents found on breads with RB and MFDS-RB incorporating were significantly higher than those of control [insert p-values]. What the health significance of this work??. The breads are being in further evaluation for the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

Formatted: English (United Kingdom)

Keywords : bread, Monascus-fermented durian seeds, rice bran, physical and sensory properties

1. Introduction

Bread is one of the oldest foods and popular around the world. In the breadmaking, wheat flour, water, salt, sugar and yeast are mixed into viscoelastic dough subjected to fermentation and baking (Sivam et al., 2010). Incorporating active ingredients into bread have grown rapidly, since the increased consumer awareness on health. Purple sweet potato flour, soy flour, flaxseed, green tea extract, whole grain rye, coriander leaf powder, grape seed and garlic have been incorporated into bread [explain why for each stated ingredients – perhaps include a table] (Conforti & Davis, 2006; Hardoko, Hendarto & Siregar, 2010; Wang, Zhou & Isabelle, 2007; Zielinski et al., 2007; Das, Raychaudhuri & Chakraborty, 2012; Meral & Dogan, 2013; Suleria et al., 2015).

Monascus fermented- durian seedisa product of solid state fermentation with Monascus purpureus culture on durian seed substrate (Srianta et al., 2012a; Srianta et al., 2012b). The MFDS potential as anti-diabetes agent with α-glucosidase inhibition, antioxidant and in vivo anti-hyperglycemiaactivities (Srianta et al., 2013; Srianta et al., 2014; Nugerahani et al., 2017). MFDS has not been incorporated into food product.On the other hand, rice bran is also known as a potential ingredient for the development of anti-diabetic food. Qureshi et al. (2002) reported that consumption of 20 g of rice bran can reduce blood glucose in patients with type I and II diabetes mellitus [substantiate with value]. The content of tocopherol, tocotrienol, oryzanol, and polyphenols in rice bran also plays a role in controlling blood sugar levels. Trisnawati and Sutedja (2010) reported that rice bran has been used in the development of functional food products [give examples].

The aims of this study were to incorporateMonascus-fermented durian seeds and rice bran intobread and to evaluate the physicochemical and sensory properties of the bread [paraphrase the aim].

2. Materials and Methods

2.1. Materials, micoorganism and chemicals

All ingredients except MFDS were obtained from local distributors. MFDS was prepared in the laboratory. Durian seeds were obtained from home industry of durian

Formatted: Indonesian

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

processing. *Monascus purpureus* M9 was used in the MFDS preparation. It was maintained and subcultured on PDA monthly. All chemicals wereanalytical grade obtained from local distributors [manufacturers of these chemicals/reagents].

2.2. Preparation of Monascus-fermented durian seeds

Monascus-fermented durian seeds were prepared according to our previous research (Srianta et al., 2012). Durian seeds were prepared by boiling, peeling, cutting and sterilization. After that, the 50 g of sterilized durian seeds cut were inoculated with 7-days*Monascus purpureus* starter with a total spore of about 10^5 spores/mL. Incubation was carried out at room temperature (± 30ºC) for 14 days, then dried at 45ºC for 24 hours. The dried MFDS was grounded to obtain powder form. The MFDS was used as ingredient in bread formulation.

2.3. Bread formulation and processing

Four bread formulas were: 1) control, consist of 200 g of wheat flour, sugar 10 g of sugar [parpahrare ; perhaps list the ingredients in table?], 8 g of margarine, 2 g of salt, 0.6 g of bread improver, 3 g of baker yeast and 124 g of water; 2) MFDS, consist of those of control ingredients with MFDS incorporating at 0.15 g; 3) RB, consist of those of control ingredients with RB incorporating at 20 g; and 4) MFDS+RB, consist of those of control ingredients with MFDS and RB incorporating at 0.15 g and 20 g.

The ingredients were mixed in a mixer [paraphrase] (Phillips HR 1559 model) into viscoelastic dough, then fermented at 30ºC for 30 minutes. The dough was rolled, rounded and placed in a baking dish, and baked in an oven (Gas Bakery Oven RFL-12C model) at 180 °C for 30 minutes.

2.4. Evaluation of bread characteristics

Formatted: Highlight

Formatted: Highlight

2.4.1. Physicochemical analysis

The physical properties analysis of the bread: specific loaf volume according to AACC (2000), color by using color reader (Konica Minolta CR-10, Konica Minolta Optics, Inc., Japan) and texture profiles including hardness, cohesiveness and springiness by using texture analyzer with cylinder probe P36R (TA-XT plus, Exponent Lite software). The chemical analysis of moisture, ash, protein,and crude fiber contents analysis refer to AOAC method (AOAC925.10, AOAC923.03, AOAC984.13 andAOAC 978.10respectively). Total phenolic content analysis was conducted according to Lee et al. (2008).

2.4.2. Sensory evaluation

Sensory evaluation of the bread was conducted by using hedonic method (Stone and Sidel, 2004). A 7-point scoring was used with ~~1~~ one representing extremely dislike and 7 representing extremely like. Fourty untrained panelists participated in the sensory evaluation, and had no previous or present taste or smell disorders. Bread samples were labeled with three-digit codes and randomnly presented to avoid biasof order of presentation. The panelists scored for colour, texture, aroma, taste and overall preferences of the bread from the 4 formulas. The study was in accordance with the Declaration of Helsinki (Anon, 2017).

2.5. Statistical Analysis

The experiments were conducted triplicate. The obtained data were subjected to analysis of variance (ANOVA) with $\alpha = 5\%$ and followed by the Duncan Multiple Range Test (DMRT) with $\alpha = 5\%$. SPSS (version 19.0) were used in the analysis.

3. Results and Discussion

3.1. Physicochemical characteristics

Breads made from four (4) different formulaswere visually different in their height and colour (Figure 1). Incorporating RB alone or combination with MFDS into the formulaaffected the specific loaf volume, colour, hardness, cohesiveness and springiness (Table 1), ash, protein, crude fiber and total phenolic content (Tabel 2) of the breads significantly [insert p-values].This results indicate that existence of rice bran in the formula contribute significantly in the colour, structure and texture propertiesof the breads. Specific loaf volume of breads with RB and MFDS-RB incorporation were higher than those of control and with MFDS ($p<0.05$). This results may be related to the fiber content in rice bran which has high water absorption capacity, as reported by Rafe, Sadeghian and Hoseini-Yazdi (2017). This results reflected that rice bran reduced the fermentation and proofing rates of dough, which related to the water availability for yeast activity. In the breadmaking, proteins in wheat flour need water to form gluten, which then contribute to form viscoelastic matrix that can stretch properly by CO_2 during fermentation and proofing. High fiber content in the bread dough with RB incorporation can reduce water availability in the system for the gluten formation, which cause the dough can not stretch properly by CO_2. Durian seed contain high amount of gum with high water absorption capacity of 1112.15% (Cornelia, Siratantri and Prawira, 2015). However the MFDS incorporation do not affect significantly on the specific loaf volume, may be due to the MFDS incorporated in low amount.

Bread with RBand MFDS-RB incorporation were visually darker brown than those of bread with MFDS only. Colour measurement by using colour reader (Table 1) also show that L* of crumb of bread in which rice bran presence were higher than those of control and with MFDS alone. Sharma, Chauhan and Agrawal [please follow Harvard system] (2004) also found the similar result that rice bran become darker after extrusion cooking, that occured

Formatted: Highlight

may be due to the browning reaction mainly Maillard during the heating process. The presence of high fiber and pheophytin in the rice bran may be also contribute to the darker formation (Aung et al., 2014; Hussien et al., 2017). MFDS incorporation affected only on the redness value, higher red value is resulted by the MFDS presence. The MFDS contain red pigments produced during the Monascus solid state fermentation (Srianta et al., 2012).

Hardness, cohesiveness and springiness of bread with MFDS incorporation was not significantly different with the control (p>0.05), but those was significantly different with the bread with RB presence. Bread dough with RB incorporation increased the water absorption requirement. High fiber content of the rice bran causes high water absorption capacity of the bread dough. The limited gluten formed in the dough, the heavy loaves bread obtained. This may be related to higher hardness values and lower cohesiveness and springiness values, which is in close agreement with Lima, Guaraya andChampagne (2002).

RB and MFDS+RB incorporation affectedon ash, crude fiber and total phenolic contents in the breads significantly (p<0.05). This results related to the chemical composition of rice bran that high contents in ash, fiber and phenolic compounds. MFDS contain phenolic compound (Srianta et al., 2014), but the bread with MFDS incorporation was not significant different with the control (p>0.05).This may be due to the low level of MFDS incorporated into the bread dough.

3.2. Sensory Characteristics

The overall preference scores of the breads with RB and MFDS+RB were significantly different with the control and with MFDS only. Overall preference was determined on the basis of colour, aroma, texture and taste. Panelists gave lower scores to the breads colour in which RB presence. Interestingly, there were no significant different of aroma and taste preferences among control, with MFDS incorporation and with RB incorporation.

What the potential health impact of this research???

Formatted: English (United Kingdom)

4. Conclusions

Incorporating MFDS do not affected signicantly on the almost all of physicochemical and sensory characteristics of breads, whereas the incorporating RB affected significantly on those properties. The breads are being in further evaluation for the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

5. Acknowledgment

Thanks to Kopertis Wilayah VII Jawa Timur, Directorate General of Higher Education, Ministry of National Education, Republic of Indonesia for the financial support through competitive research Penelitian terapan Unggulan Perguruan Tinggi with contract number of 115AE/WM01.5/N/2018.

6. References

AOAC. (1997). *Official Methods of Analysis of The Association of Official Analytical Chemists*. Washington DC: Association of Official Analytical Chemists.

Association of Analytical Communities. (2006). *Official Methods of Analysis of AOAC International 18th Edition*. Gaithersburg: AOAC International.

Ardiansyah. (2004). *Sehat dengan Mengkonsumsi Bekatul*. www. Gizinet.com (20 Juni 2016)

Infodatin Kementerian Kesehatan. (2014). *Pusat Data dan Informasi Kementerian Kesehatan Republik Indonesia*. Jakarta

IDF Diabetes Atlas. (2015). *International Diabetes Federation Diabetes Atlas*, 7th Edition. www.diabetesatlas.org

Jiamyangyuen, S., Srijesdaruk, V. and Harper, W.J.(2005). Extraction of rice bran protein concentrate and its application in bread. *SongklanakarinJournal of Science and Technology,* 27(l): 55 - 64.

Kahlon, T. S. and Chow, F.I.(2000). Lipidemic response of hamsters to rice bran, uncooked or processed white and brown rice, and processed corn starch. *Cereal Chemistry,* 77(5) : 673 – 678.

Kartika, B., Hastuti, P. dan Supartono, W. (1988). *Pedoman Uji Inderawi Bahan Pangan*. Yogyakarta : Pusat Antar Universitas Pangan dan Gizi, Universitas Gadjah Mada.

Marsono Y., Triwitono, P dan Kanoni, S. (2005). Indeks Glisemik Kacang buncis (*Phasaolus vulgaris*) dan Kacang Panjang (*Vigna sesquipedalis*) serta Uji Efek Hipoglikemiknya pada Tikus *Sprague Dawley*. *Biota*, X (3):183-191.

Nugerahani, I., Sutedja, A.M., Srianta, I., Widharna, R.M. and Marsono, Y. (2017). In vivo evaluation of Monascus-fermented durian seed for antidiabetic and antihypercholesterol agent. *Food Research*, 1(3): 83-88.

Qureshi, A.A., Sami, S.A. and Khan, F.A. (2002). Effects of stabilized rice bran, its soluble and fiber fractions on blood glucose levels and serum lipid parameters in humans with diabetes mellitus Types I and II. *Journal of Nutritional Biochemistry,* 13(3): 175-187.

Saunders, R. M. (1990). The properties of rice bran as a food stuff. *Cereal Foods World*. 35:632- 635.

Spears, J. K., Grieshop, C.M. and Fahey, G.C.Jr. (2004). Evaluation of stabilized rice bran as an ingredient in dry extruded dog diets. *Journal of Animal. Science,.* 82 : 1122-1135.

Srianta, I., Hendrawan, B., Kusumawati, N. and Blanc, P.J. (2012). Study on durian seed as a new substrate for angkak production. *International Food Research Journal*, 19(3): 941-945.

Srianta, I., Kusumawati, N., Nugerahani, I., Artanti, N. and Xu, G.R. (2013). *In vitro* α-glucosidase inhibitory activity of *Monascus*-fermented durian seed extracts. *International Food Research Journal,*20 (2): 533-536.

Srianta, I., Nugerahani, I., Kusumawati, N., Suryatanijaya, E., Subianto, C., Tewfik, S. and Tewfik, I. (2014). Therapeutic antioxidant activity of Monascus-fermented durian seed: a potential functional food ingredient. *International Journal of Food, Nutrition and Public Health,* 7(1): 53-59.

Sudarmadji, S., Haryono, B dan Suhardi. (1997). *Prosedur Analisa untuk Bahan Makanan dan Pertanian*. Yogyakarta: Liberty.

Roshental, A.J. (1999). *Food Texture Measurement and Perception*. Maryland: Aspen Publisher, Inc.

Sutedja, A.M. dan Trisnawati, C.Y.(2008). Children Sensories Acceptance to Rice Cake Enriched with Defatted Rice Bran. *Proceeding of International Conference on Food Science and Technology*.ISBN: 978-979-1268-36-3. FMQM-05

Szczesniak, A.S. (2002). Texture is a Sensory Property. *Food Quality and Preference,* 13: 215–225.

Takakori, Z., Zare, M., Iranparvare, M. and Mehrabi, Y. (2004). Effect Of Rice Bran On Blood Glucose And Serum Lipid Parameters In Diabetes II Patients. *The Internet Journal of Nutrition and Wellness,* 2(1): 1-5.

Trisnawati, Ch. Y. dan Sutedja, A.M.(2010). Pemanfaatan Beras dan Bekatul Beras dalam Pembuatan *Cake*. *Prosiding Seminar Nasional Teknik Kimia Soebardjo Brotohardjono VII*. ISSN: 1978-0427. A3(1-7)

Widowati, S. (2008). Karakteristik beras instan fungsional dan peranannya dalam menghambat kerusakan pankreas. *Jurnal Pangan* 17(3): 51-60.

What P1, P2, P3 and P4 refer in the text/figure-1 title below

Formatted: English (United Kingdom)

Figure 1. Picture of bread with MFDS and RB incorporation. The breads made from different formula. (A) Control bread, (B) bread with MFDS incorporation, (C) bread with RB incorporation, (D) bread with MFDS+RB incorporation. The ingredients were mixed in a mixer into viscoelastic dough, then fermented at 30ºC for 30 minutes. The dough was rolled, rounded and placed in a baking dish, and baked in an oven at 180 °C for 30 minutes.

Table 1. Physical characteristicsof bread with MFDS and RB incorporation**

Bread formula	Specific volume (cm^3/g)	Colour			Texture profile		
		L*	a*	b*	hardness	cohesiveness	springiness
Control	5.45^b	75.54^b	0.41^a	11.18^a	128.89^a	0.80^b	0.91^b
MFDS	5.03^b	72.56^b	1.24^b	9.94^a	160.81^a	0.79^b	0.93^b
RB	3.78^a	66.57^a	3.82^c	18.18^b	643.54^b	0.65^a	0.81^a
MFDS+RB	3.91^a	68.4^a	4.31^c	18.43^b	784.46^b	0.64^a	0.78^a

Note: **Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

Table 2. Chemical composition of bread with MFDS and RB incorporation

Bread formula	Moisture (%)	Ash (%)	Protein (%)	Crude fiber (%)	Total phenolic (%)
Control	36.15^a	1.05^a	9.29^a	0.10^a	0.138^a
MFDS	37.24^a	1.06^a	8.83^a	0.12^a	0.168^{ab}
RB	37.35^a	1.50^b	8.57^a	0.24^{ab}	0.197^b
MFDS+RB	37.65^a	1.49^b	8.60^a	0.37^b	0.193^b

Note: **Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

Table 3. Sensory characteristics of bread with MFDS and RB incorporation

Bread formula	Preference				
	Colour	Aroma	Texture	Taste	*Overall*
Control	5.80^c	5.03^b	5.30^c	5.05^b	5.20^c
MFDS	6.08^c	4.48^{ab}	4.48^b	4.80^b	5.20^c
RB	3.80^b	4.80^b	5.13^c	4.48^b	4.48^b

MFDS+RB	2.53[a]	4.05[a]	3.35[a]	3.15[a]	3.88[a]

Note: **Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

Type: Short Communication

Incorporating *Monascus*-fermented durian seeds and rice bran into bread

Abstract

Monascus-fermented durian seeds (MFDS) and rice bran (RB) have been incorporated into bread dough formulation. This research was aimed at physicochemical and sensory evaluation of bread formulated with the both active ingredients. Bread made from 4 dough formulas i.e. control, with MFDS, RB and MFDS-RB -incorporating have been evaluated the physicochemical and sensory properties. The results suggested that no significant differences on both physical and sensory properties of bread with MFDS-incorporating and control. Ash, crude fiber and total phenolic contents found on breads with RB and MFDS-RB incorporating were significantly higher than those of control. The breads are being in further evaluation for the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

Keywords : bread, Monascus-fermented durian seeds, rice bran, physical and sensory properties

1. Introduction

Bread is one of the oldest foods and popular around the world. In the breadmaking, wheat flour, water, salt, sugar and yeast are mixed into viscoelastic dough subjected to fermentation and baking (Sivam et al., 2010). Incorporating active ingredients into bread have grown rapidly, since the increased consumer awareness on health. Purple sweet potato flour, soy flour, flaxseed, green tea extract, whole grain rye, coriander leaf powder, grape seed and garlic have been incorporated into bread (Conforti & Davis, 2006; Hardoko, Hendarto &

Commented [w1]: Pls find another word , to avoid repeatedness

Commented [w2]: Not in references listed

Commented [w3]: Not in references listed

Commented [w4]: Not in references listed

Siregar, 2010; Wang, Zhou & Isabelle, 2007; Zielinski et al., 2007; Das, Raychaudhuri & Chakraborty, 2012; Meral & Dogan, 2013; Suleria et al., 2015).

Commented [w5]: Not in references listed
Commented [w6]: Not in references listed
Commented [w7]: Not in references listed
Commented [w8]: Not in references listed

Monascus fermented- durian seed is a product of solid state fermentation with Monascus purpureus culture on durian seed substrate (Srianta et al., 2012a; Srianta et al., 2012b). The MFDS potential as anti-diabetes agent with α-glucosidase inhibition, antioxidant and in vivo anti-hyperglycemia activities (Srianta et al., 2013; Srianta et al., 2014; Nugerahani et al., 2017). MFDS has not been incorporated into food product. On the other hand, rice bran is also known as a potential ingredient for the development of anti-diabetic food. Qureshi et al. (2002) reported that consumption of 20 g of rice bran can reduce blood glucose in patients with type I and II diabetes mellitus. The content of tocopherol, tocotrienol, oryzanol, and polyphenols in rice bran also plays a role in controlling blood sugar levels. Trisnawati and Sutedja (2010) reported that rice bran has been used in the development of functional food products.

Commented [w9]: Not in references listed

The aims of this study were to incorporate Monascus-fermented durian seeds and rice bran into bread and to evaluate the physicochemical and sensory properties of the bread.

2. Materials and Methods

2.1. Materials, micoorganism and chemicals

All ingredients except MFDS were obtained from local distributors. MFDS was prepared in the laboratory. Durian seeds were obtained from ~~home industry of~~ durian processing home industry. *Monascus purpureus* M9 (obtained from?) was used in the MFDS preparation. It was maintained and subcultured on PDA (Merck?) monthly. All chemicals were analytical grade obtained from local distributors.

2.2. Preparation of Monascus-fermented durian seeds

Monascus-fermented durian seeds were prepared according to our previous research (Srianta et al., 2012). Durian seeds were prepared by boiling, peeling, cutting and sterilization. After that, the 50 g of sterilized durian seeds cut were inoculated with 7-days *Monascus purpureus* starter with a total spore of about 10^5 spores/mL. Incubation was carried out at room temperature (± 30^{o}C) for 14 days, then dried at 45^{o}C for 24 hours. The dried MFDS was ground to obtain powder form. The MFDS was used as ingredient in bread formulation.

2.3. Bread formulation and processing

Four bread formulas were: 1) control, consist of 200 g of wheat flour, sugar 10 g of sugar, 8 g of margarine, 2 g of salt, 0.6 g of bread improver, 3 g of baker yeast and 124 g of water; 2) MFDS, consist of those of control ingredients with MFDS incorporating at 0.15 g; 3) RB, consist of those of control ingredients with RB incorporating at 20 g; and 4) MFDS+RB, consist of those of control ingredients with MFDS and RB incorporating at 0.15 g and 20 g.

Formatted: Highlight

Commented [w10]: Any logical reason/ previous research results to obtain different amount of MFDS and RB?

Formatted: Highlight

The ingredients were mixed in a mixer (Phillips HR 1559 model) into viscoelastic dough, then fermented at 30^{o}C for 30 minutes. The dough was rolled, rounded and placed in a baking dish, and baked in an oven (Gas Bakery Oven RFL-12C model) at 180 °C for 30 minutes.

2.4. Evaluation of bread characteristics

2.4.1. Physicochemical analysis

The physical properties analysis of the bread: specific loaf volume according to AACC (2000), color by using color reader (Konica Minolta CR-10, Konica Minolta Optics, Inc., Japan) and texture profiles including hardness, cohesiveness and springiness by using texture analyzer with cylinder probe P36R (TA-XT plus, Exponent Lite software). The chemical analysis of moisture, ash, protein,and crude fiber contents analysis refer to AOAC method (AOAC925.10, AOAC923.03, AOAC984.13 andAOAC 978.10 respectively). Total phenolic content analysis was conducted according to Lee et al. (2008).

Commented [w11]: Not in references listed

2.4.2. Sensory evaluation

Sensory evaluation of the bread was conducted by using hedonic method (Stone and Sidel, 2004). A 7-point scoring was used with 1 representing extremely dislike and 7 representing extremely like. Fourty untrained panelists participated in the sensory evaluation, and had no previous or present taste or smell disorders. Bread samples were labeled with three-digit codes and randomnly presented to avoid biasof order of presentation. The panelists scored for colour, texture, aroma, taste and overall preferences of the bread from the 4 formulas. The study was in accordance with the Declaration of Helsinki (Anon, 2017).

Commented [w12]: Not in references listed

Commented [w13]: Not in references listed

2.5. Statistical Analysis

The experiments were conducted triplicate. The obtained data were subjected to analysis of variance (ANOVA) with α = 5% and followed by the Duncan Multiple Range Test (DMRT) with α = 5%. SPSS (version 19.0) were used in the analysis.

3. Results and Discussion

3.1. Physicochemical characteristics

Breads made from 4 different formulas were visually different in their height and colour (Figure 1). Incorporating RB alone or combination with MFDS into the formula affected the specific loaf volume, colour, hardness, cohesiveness and springiness (Table 1), ash, protein, crude fiber and total phenolic content (Tabel 2) of the breads significantly.This results indicate that existence of rice bran in the formula contribute significantly in the colour, structure and texture properties of the breads. Specific loaf volume of breads with RB and MFDS-RB incorporation were higher than those of control and with MFDS ($p<0.05$). This results may be related to the fiber content in rice bran which has high water absorption capacity, as reported by Rafe, Sadeghian and Hoseini-Yazdi (2017). This results reflected that rice bran reduced the fermentation and proofing rates of dough, which related to the water availability for yeast activity. In the breadmaking, proteins in wheat flour need water to form gluten, which then contribute to form viscoelastic matrix that can stretch properly by CO_2 during fermentation and proofing. High fiber content in the bread dough with RB incorporation can reduce water availability in the system for the gluten formation, which cause the dough can not stretch properly by CO_2. Durian seed contain high amount of gum with high water absorption capacity of 1112.15% (Cornelia, Siratantri and Prawira, 2015). However the MFDS incorporation do not affect significantly on the specific loaf volume, may be due to the MFDS incorporated in low amount.

Bread with RB and MFDS-RB incorporation were visually darker brown than those of bread with MFDS only. Colour measurement by using colour reader (Table 1) also show that L* of crumb of bread in which rice bran presence were higher than those of control and with MFDS alone. Sharma, Chauhan and Agrawal (2004) also found the similar result that rice bran become darker after extrusion cooking, that occured may be due to the browning reaction mainly Maillard during the heating process. The presence of high fiber and pheophytin in the rice bran may be also contribute to the darker formation (Aung et al., 2014; Hussien et al., 2017). MFDS incorporation affected only on the redness value, ~~higher red value is resulted by the MFDS presence~~. The MFDS contain red pigments produced during the Monascus solid state fermentation (Srianta et al., 2012).

Commented [w14]: Not in references listed

Commented [w15]: Not in references listed

Commented [w16]: Not in references listed

Commented [w17]: Not in references listed

Commented [w18]: Not in references listed

Hardness, cohesiveness and springiness of bread with MFDS incorporation was not significantly different with the control (p>0.05), but those was significantly different with the bread with RB presence. Bread dough with RB incorporation increased the water absorption requirement. High fiber content of the rice bran causes high water absorption capacity of the bread dough. The limited gluten formed in the dough, the heavy loaves bread obtained. This may be related to higher hardness values and lower cohesiveness and springiness values, which is in close agreement with Lima, Guaraya andChampagne (2002).

Commented [w19]: Not in references listed

RB and MFDS+RB incorporation affected on ash, crude fiber and total phenolic contents in the breads significantly (p<0.05). This results related to the chemical composition of rice bran that high contents in ash, fiber and phenolic compounds. MFDS contain phenolic compound (Srianta et al., 2014), but the bread with MFDS incorporation was not significant different with the control (p>0.05).This may be due to the low level of MFDS incorporated into the bread dough.

3.2. Sensory Characteristics

The overall preference scores of the breads with RB and MFDS+RB were significantly different with the control and with MFDS only (table 3). Overall preference was determined on the basis of colour, aroma, texture and taste. Panelists gave lower scores to the breads colour in which RB presence. Interestingly, there were no significant different of aroma and taste preferences among control, with MFDS incorporation and with RB incorporation.

4. Conclusions

Incorporating MFDS do not affected signicantly on the almost all of physicochemical and sensory characteristics of breads, whereas the incorporating RB affected significantly on those properties. The breads are being in further evaluation for the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

5. Acknowledgment

Thanks to Kopertis Wilayah VII Jawa Timur, Directorate General of Higher Education, Ministry of National Education, Republic of Indonesia for the financial support through competitive research Penelitian terapan Unggulan Perguruan Tinggi with contract number of 115AE/WM01.5/N/2018.

6. References

AOAC. (1997). *Official Methods of Analysis of The Association of Official Analytical Chemists*. Washington DC: Association of Official Analytical Chemists.

Association of Analytical Communities. (2006). *Official Methods of Analysis of AOAC International 18th Edition*. Gaithersburg: AOAC International.

Ardiansyah. (2004). *Sehat dengan Mengkonsumsi Bekatul*. www. Gizinet.com (20 Juni 2016)

Infodatin Kementerian Kesehatan. (2014). *Pusat Data dan Informasi Kementerian Kesehatan Republik Indonesia*. Jakarta

IDF Diabetes Atlas. (2015). *International Diabetes Federation Diabetes Atlas*, 7th Edition. www.diabetesatlas.org

Jiamyangyuen, S., Srijesdaruk, V. and Harper, W.J.(2005). Extraction of rice bran protein concentrate and its application in bread. *SongklanakarinJournal of Science and Technology*, 27(l): 55 - 64.

Commented [w20]: Not cited in the manuscript

Commented [w21]: Not cited in the manuscript

Commented [w22]: Not cited in the manuscript

Commented [w23]: Not cited in the manuscript

Kahlon, T. S. and Chow, F.I.(2000). Lipidemic response of hamsters to rice bran, uncooked or processed white and brown rice, and processed corn starch. *Cereal Chemistry*, 77(5) : 673 – 678.

Kartika, B., Hastuti, P. dan Supartono, W. (1988). *Pedoman Uji Inderawi Bahan Pangan*. Yogyakarta : Pusat Antar Universitas Pangan dan Gizi, Universitas Gadjah Mada.

Marsono Y., Triwitono, P dan Kanoni, S. (2005). Indeks Glisemik Kacang buncis (*Phasaolus vulgaris*) dan Kacang Panjang (*Vigna sesquipedalis*) serta Uji Efek Hipoglikemiknya pada Tikus *Sprague Dawley*. *Biota*, X (3):183-191.

Nugerahani, I., Sutedja, A.M., Srianta, I., Widharna, R.M. and Marsono, Y. (2017). In vivo evaluation of Monascus-fermented durian seed for antidiabetic and antihypercholesterol agent. *Food Research*, 1(3): 83-88.

Qureshi, A.A., Sami, S.A. and Khan, F.A. (2002). Effects of stabilized rice bran, its soluble and fiber fractions on blood glucose levels and serum lipid parameters in humans with diabetes mellitus Types I and II. *Journal of Nutritional Biochemistry*, 13(3): 175-187.

Saunders, R. M. (1990). The properties of rice bran as a food stuff. *Cereal Foods World*. 35:632- 635.

Spears, J. K., Grieshop, C.M. and Fahey, G.C.Jr. (2004). Evaluation of stabilized rice bran as an ingredient in dry extruded dog diets. *Journal of Animal. Science*,. 82 : 1122-1135.

Srianta, I., Hendrawan, B., Kusumawati, N. and Blanc, P.J. (2012). Study on durian seed as a new substrate for angkak production. *International Food Research Journal*, 19(3): 941-945.

Commented [w24]: Not cited in the manuscript

Commented [w25]: Not cited in the manuscript

Commented [w26]: Not cited in the manuscript

Commented [w27]: Not cited in the manuscript

Commented [w28]: Not cited in the manuscript

Srianta, I., Kusumawati, N., Nugerahani, I., Artanti, N. and Xu, G.R. (2013). *In vitro* α-glucosidase inhibitory activity of *Monascus*-fermented durian seed extracts. *International Food Research Journal*,20 (2): 533-536.

Srianta, I., Nugerahani, I., Kusumawati, N., Suryatanijaya, E., Subianto, C., Tewfik, S. and Tewfik, I. (2014). Therapeutic antioxidant activity of Monascus-fermented durian seed: a potential functional food ingredient. *International Journal of Food, Nutrition and Public Health,* 7(1): 53-59.

Sudarmadji, S., Haryono, B dan Suhardi. (1997). *Prosedur Analisa untuk Bahan Makanan dan Pertanian*. Yogyakarta: Liberty.

Commented [w29]: Not cited in the manuscript

Roshental, A.J. (1999). *Food Texture Measurement and Perception*. Maryland: Aspen Publisher, Inc.

Commented [w30]: Not cited in the manuscript

Sutedja, A.M. dan Trisnawati, C.Y.(2008). Children Sensories Acceptance to Rice Cake Enriched with Defatted Rice Bran. *Proceeding of International Conference on Food Science and Technology*.ISBN: 978-979-1268-36-3. FMQM-05

Szczesniak, A.S. (2002). Texture is a Sensory Property. *Food Quality and Preference,* 13: 215–225.

Commented [w31]: Not cited in the manuscript

Takakori, Z., Zare, M., Iranparvare, M. and Mehrabi, Y. (2004). Effect Of Rice Bran On Blood Glucose And Serum Lipid Parameters In Diabetes II Patients. *The Internet Journal of Nutrition and Wellness,* 2(1): 1-5.

Commented [w32]: Not cited in the manuscript

Trisnawati, Ch. Y. dan Sutedja, A.M.(2010). Pemanfaatan Beras dan Bekatul Beras dalam Pembuatan *Cake*. *Prosiding Seminar Nasional Teknik Kimia Soebardjo Brotohardjono VII*. ISSN: 1978-0427. A3(1-7)

Widowati, S. (2008). Karakteristik beras instan fungsional dan peranannya dalam menghambat kerusakan pankreas. *Jurnal Pangan* 17(3): 51-60.

Commented [w33]: Not cited in the manuscript

Figure 1. Picture of bread with MFDS and RB incorporation. The breads made from different formula. (A) Control bread, (B) bread with MFDS incorporation, (C) bread with RB incorporation, (D) bread with MFDS+RB incorporation. The ingredients were mixed in a mixer into viscoelastic dough, then fermented at 30ºC for 30 minutes. The dough was rolled, rounded and placed in a baking dish, and baked in an oven at 180 °C for 30 minutes.

Commented [w34]: Better if it's given a scale to relativity obtain

Table 1. Physical characteristicsof bread with MFDS and RB incorporation**

Bread formula	Specific volume (cm^3/g)	Colour L*	a*	b*	Texture profile hardness	cohesiveness	springiness
Control	5.45^b	75.54^b	0.41^a	11.18^a	128.89^a	0.80^b	0.91^b
MFDS	5.03^b	72.56^b	1.24^b	9.94^a	160.81^a	0.79^b	0.93^b
RB	3.78^a	66.57^a	3.82^c	18.18^b	643.54^b	0.65^a	0.81^a
MFDS+RB	3.91^a	68.4^a	4.31^c	18.43^b	784.46^b	0.64^a	0.78^a

Note: **Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

Commented [w35]: L? a? b?

Table 2. Chemical composition of bread with MFDS and RB incorporation

Bread formula	Moisture (%)	Ash (%)	Protein (%)	Crude fiber (%)	Total phenolic (%)
Control	36.15^a	1.05^a	9.29^a	0.10^a	0.138^a
MFDS	37.24^a	1.06^a	8.83^a	0.12^a	0.168^{ab}
RB	37.35^a	1.50^b	8.57^a	0.24^{ab}	0.197^b
MFDS+RB	37.65^a	1.49^b	8.60^a	0.37^b	0.193^b

Note: **Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

Table 3. Sensory characteristics of bread with MFDS and RB incorporation

Bread formula	Preference Colour	Aroma	Texture	Taste	*Overall*
Control	5.80^c	5.03^b	5.30^c	5.05^b	5.20^c
MFDS	6.08^c	4.48^{ab}	4.48^b	4.80^b	5.20^c
RB	3.80^b	4.80^b	5.13^c	4.48^b	4.48^b

MFDS+RB	2.53[a]	4.05[a]	3.35[a]	3.15[a]	3.88[a]

Note: **Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

Commented [w36]: Give number means 1-7 preference

Commented [w37]: The mean from untrained panelist were 40 or 3?

FOOD
RESEARCH

MANUSCRIPT EVALUATION FORM

Date	20th January 2019
Manuscript Identification Number:	FR-2019-015
Please return by:	20th February 2019
Title of Manuscript:	Incorporating *Monascus*-fermented durian seeds and rice bran into bread

1. IF YOU CANNOT REVIEW THIS MANUSCRIPT OR MEET THE DEADLINE, PLEASE INFORM US WITHOUT DELAY.
2. Your review should consider the article's scholarly merit including originality of the research issue and/or methodology, adequacy and rigor of the research methodology and techniques used, quality and rigor of data analysis, comprehensiveness of literature review, and the readability and presentation of the article. Please provide detailed and specific comments to all items. Also, where appropriate please provide suggestions for revision.

Please indicate your recommendation by circling **one** of the items below:

A. ACCEPT AS SUBMITTED (with routine editing)

B. ACCEPT WITH SUGGESTED REVISIONS

C. POSSIBLY ACCEPT AFTER EXTENSIVE REVISION

D. REJECT

FOOD
RESEARCH

COMMENT SHEET

Using item 2 in page 1 as a guideline, please indicate the reasons for your recommendations. Most author(s) will appreciate frankness, combined with a modicum of tact. Even if you recommend that the manuscript be accepted for publication, please provide some general comments to the author(s).

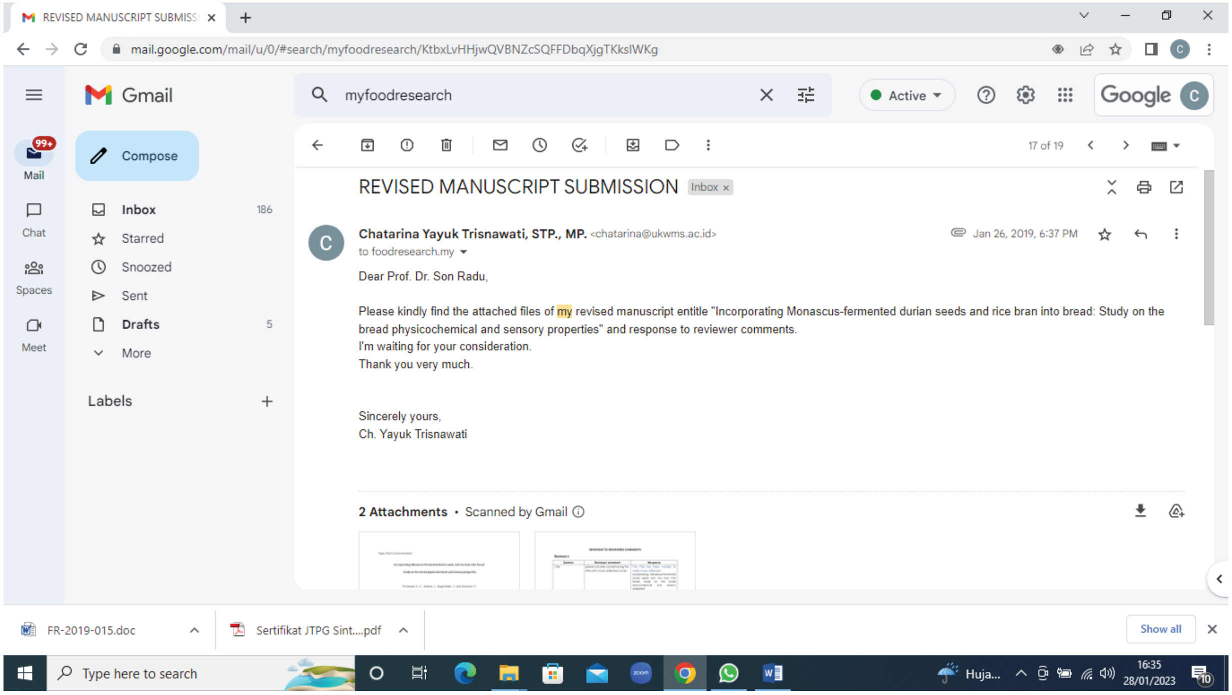
Interesting and originally insight on the use of MFDS and Rice bran in the functionally medicinal food developing
Minor revision on the writing the citation and references – pls use mendeley or related program to improving the paper
Scientific reason on the amount added of MFDS and RB to the dough, must be clearly stated and elaborate in the discussion especially to the promising use of the bread
The picture better if completed with the scale
Some others minor writing

Please return Manuscript and/or Review Comments to:
Professor Dr. Son Radu
Food Research
Email: foodresearch.my@outlook.com

4.

Bukti konfirmasi submit revisi artikel, respon kepada reviewer, artikel yang di-resubmit dan balasannya

(26 Januari 2019)



REVISED MANUSCRIPT SUBMISSION

Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id>
to foodresearch.my

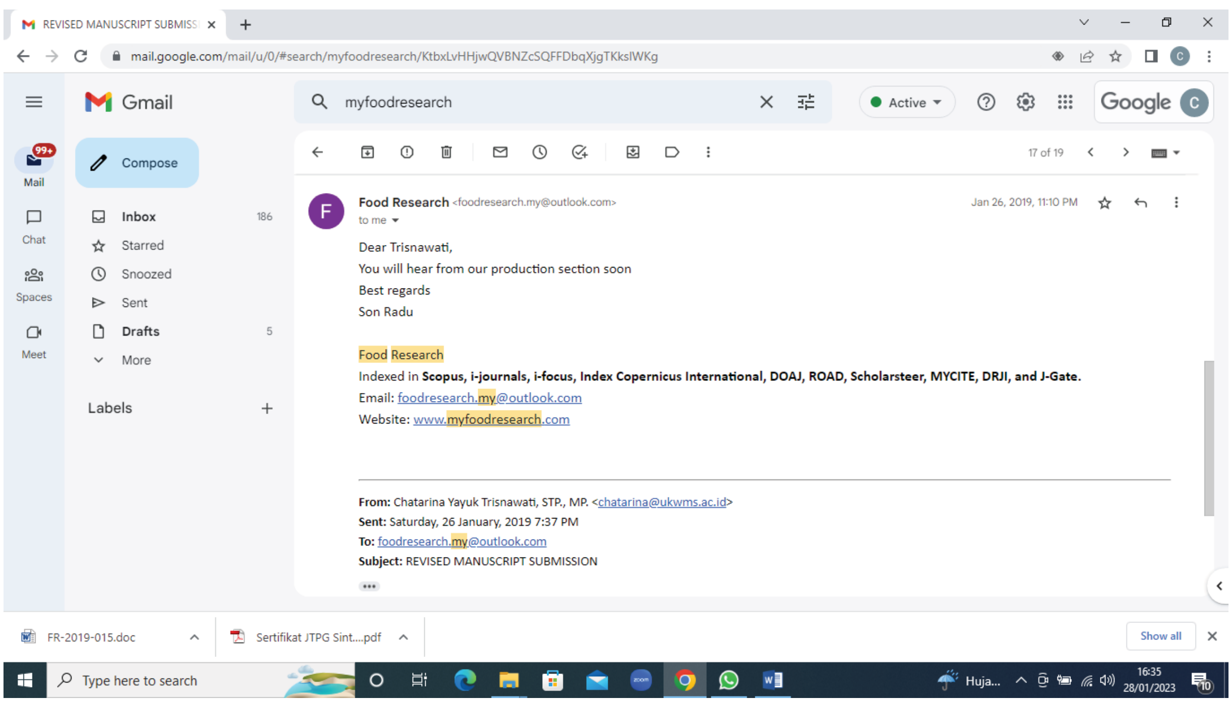
Jan 26, 2019, 6:37 PM

Dear Prof. Dr. Son Radu,

Please kindly find the attached files of my revised manuscript entitle "Incorporating Monascus-fermented durian seeds and rice bran into bread: Study on the bread physicochemical and sensory properties" and response to reviewer comments.
I'm waiting for your consideration.
Thank you very much.

Sincerely yours,
Ch. Yayuk Trisnawati

2 Attachments • Scanned by Gmail



REVISED MANUSCRIPT SUBMISSION

Food Research <foodresearch.my@outlook.com>
to me

Jan 26, 2019, 11:10 PM

Dear Trisnawati,
You will hear from our production section soon
Best regards
Son Radu

Food Research
Indexed in **Scopus, i-journals, i-focus, Index Copernicus International, DOAJ, ROAD, Scholarsteer, MYCITE, DRJI, and J-Gate.**
Email: foodresearch.my@outlook.com
Website: www.myfoodresearch.com

From: Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id>
Sent: Saturday, 26 January, 2019 7:37 PM
To: foodresearch.my@outlook.com
Subject: REVISED MANUSCRIPT SUBMISSION

Type: Short Communication

Incorporating *Monascus*-fermented durian seeds and rice bran into bread: Study on the bread physicochemical and sensory properties

Trisnawati, C. Y.[1*], Srianta, I.[1], Nugerahani , I.[1] and Marsono, Y.[2]

[1]Department of Food Technology, Widya Mandala Catholic University Surabaya,

Jalan Dinoyo 42 – 44 Surabaya, Indonesia 61265

[2]Department of Food and Agricultural Product Technology, Gadjah Mada University,

Jalan Flora, Bulaksumur, Yogyakarta Indonesia

*corresponding author: chatarina@ukwms.ac.id; phone +6231 5678478; fax +6231 5610818

Abstract

Monascus-fermented durian seeds (MFDS) and rice bran (RB) have been incorporated into bread dough formulation. This research was aimed at physicochemical and sensory evaluation of bread formulated with the both active ingredients. Bread made from four dough formulas i.e. control, with MFDS, RB and MFDS-RB-incorporatinghave been evaluated the physicochemical and sensory properties. The results suggested that no significant differences on both physicochemical and sensory properties of bread with MFDS-incorporating and control ($p>0.05$). Ash, crude fiber and total phenolic contents found on breads with RB and MFDS-RB incorporating were significantly higher than those of control ($p<0.05$). The breads are being in further evaluation for the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

Keywords : bread, *Monascus*-fermented durian seeds, rice bran, physicochemical and sensory properties

1. Introduction

Bread is one of the oldest foods and popular around the world. In the breadmaking, wheat flour, water, salt, sugar and yeast are mixed into viscoelastic dough subjected to fermentation and baking (Sivam *et al*., 2010). Incorporating active ingredients into bread have grown rapidly, since the increased consumer awareness on health. Purple sweet potato flour, soy flour, flaxseed, green tea extract, whole grain rye, coriander leaf powder, grape seed and garlic have been incorporated into bread (Conforti and Davis, 2006; Hardoko *et al*., 2010; Wang *et al*., 2007; Zielinski *et al*., 2007; Das *et al*., 2012; Meral and Dogan, 2013; Suleria *et al*., 2015).

Monascus fermented-durian seed is a product of solid state fermentation with *Monascus purpureus* culture on durian seed substrate (Srianta *et al*., 2012a; Srianta *et al*., 2012b). The MFDS potential as anti-diabetes agent with α-glucosidase inhibition, antioxidant and in vivo anti-hyperglycemiaactivities (Srianta *et al*., 2013; Srianta *et al*., 2014; Nugerahani *et al*., 2017). MFDS has not been incorporated into food product.On the other hand, rice bran is also known as a potential ingredient for the development of anti-diabetic food. Qureshi *et al*. (2002) reported that consumption of 20 g of rice bran can reduce blood glucose levels in patients with type I and II diabetes mellitus. The content of tocopherol, tocotrienol, oryzanol, and polyphenols in rice bran also plays a role in controlling blood sugar levels.Trisnawati and Sutedja (2010) reported that rice bran has been used in the development of functional food products, i.e. cake with rice flour.

The aims of this study were to study the physicochemical and sensory properties of bread with *Monascus*-fermented durian seeds and rice bran incorporation.

2. Materials and Methods

2.1. Materials, microorganism and chemicals

All ingredients except MFDS were obtained from local distributors. MFDS was prepared in the laboratory. Durian seeds were obtained from durian processinghome industry. *Monascus* *purpureus* M9 was used in the MFDS preparation. It was maintained and subcultured on PDA monthly. All chemicals wereanalytical grade obtained from local distributors.

2.2. Preparation of Monascus-fermented durian seeds

Monascus-fermented durian seeds were prepared according to our previous research (Srianta *et al*., 2012a). Durian seeds were prepared by boiling, peeling, cutting and sterilization. After that, the 50 g of sterilized durian seeds cut were inoculated with 7-days *Monascus purpureus* starter with a total spore of about 10^5 spores/mL. Incubation was carried out at room temperature (± 30°C) for 14 days, then dried at 45°C for 24 hours. The dried MFDS was ground to obtain powder form. The MFDS was used as ingredient in bread formulation.

2.3. Bread formulation and processing

Four bread formulas were: 1) control, consist of 200 g of wheat flour, 10 g of sugar, 8 g of margarine, 2 g of salt, 0.6 g of bread improver, 3 g of baker yeast and 124 g of water; 2) MFDS, consist of those of control ingredients with MFDS incorporating at 0.15 g; 3) RB, consist of those of control ingredients with RB incorporating at 20 g; and 4) MFDS+RB, consist of those of control ingredients with MFDS and RB incorporating at 0.15 g and 20 g.

The ingredients were mixed in a mixer (Phillips HR 1559 model) into viscoelastic dough, then fermented at 30°C for 30 minutes. The dough was rolled, rounded and placed in a baking dish, and baked in an oven (Gas Bakery Oven RFL-12C model) at 180 °C for 30 minutes.

2.4. Evaluation of bread characteristics

2.4.1. Physicochemical analysis

The physical properties analysis of the bread: specific loaf volume according to AACC (2000), color by using color reader (Konica Minolta CR-10, Konica Minolta Optics, Inc., Japan) and texture profiles including hardness, cohesiveness and springiness by using texture analyzer with cylinder probe P36R (TA-XT plus, Exponent Lite software). The chemical analysis of moisture, ash, protein,and crude fiber contents analysis refer to AOAC method (AOAC 925.10, AOAC 923.03, AOAC 984.13 and AOAC 978.10 respectively). Total phenolic content analysis was conducted according to Lee *et al*. (2008).

2.4.2. Sensory evaluation

Sensory evaluation of the bread was conducted by using hedonic method (Stone and Sidel, 2004). A 7-point scoring was used with 1 representing extremely dislike and 7 representing extremely like. Fourty untrained panelists participated in the sensory evaluation, and had no previous or present taste or smell disorders. Bread samples were labeled with three-digit codes and randomnly presented to avoid biasof order of presentation. The panelists scored for colour, texture, aroma, taste and overall preferences of the bread from the four formulas. The study was in accordance with the Declaration of Helsinki (Anon, 2017).

2.5. Statistical Analysis

The experiments were conducted triplicate. The obtained data were subjected to analysis of variance (ANOVA) with α = 5% and followed by the Duncan Multiple Range Test (DMRT) with α = 5%. SPSS (version 19.0) were used in the analysis.

3. Results and Discussion

3.1. Physicochemical characteristics

Breads made from four different formulas were visually different in their height and colour (Figure 1). Incorporating RB alone or combination with MFDS into the formula affected the specific loaf volume, colour, hardness, cohesiveness and springiness (Table 1), ash, protein, crude fiber and total phenolic content (Tabel 2) of the breads significantly ($p<0.05$). This results indicate that existence of rice bran in the formula contribute significantly in the colour, structure and texture properties of the breads. Specific loaf volume of breads with RB and MFDS-RB incorporation were higher than those of control and with MFDS ($p<0.05$). This results may be related to the fiber content in rice bran which has high water absorption capacity, as reported by Rafe *et al* (2017). This results reflected that rice bran reduced the fermentation and proofing rates of dough, which related to the water availability for yeast activity. In the breadmaking, proteins in wheat flour need water to form gluten, which then contribute to form viscoelastic matrix that can stretch properly by CO_2 during fermentation and proofing. High fiber content in the bread dough with RB incorporation can reduce water availability in the system for the gluten formation, which cause the dough can not stretch properly by CO_2. Durian seed contain high amount of gum with high water absorption capacity of 1112.15% (Cornelia *et al*, 2015). However the MFDS incorporation do not affect significantly on the specific loaf volume, may be due to the MFDS incorporated in low amount.

Bread with RBand MFDS-RB incorporation were visually darker brown than those of bread with MFDS only. Colour measurement by using colour reader (Table 1) also show that L* of crumb of bread in which rice bran presence were higher than those of control and with MFDS alone. Sharma *et al* (2004) also found the similar result that rice bran become darker after extrusion cooking, that occured may be due to the browning reaction mainly Maillard during the heating process. The presence of high fiber and pheophytin in the rice bran may be also contribute to the darker formation (Aung *et al*., 2014; Hussien *et al*., 2017). MFDS incorporation affected only on the redness value, higher red value is resulted by the MFDS presence. The MFDS contain red pigments produced during the Monascus solid state fermentation (Srianta *et al*., 2012b).

Hardness, cohesiveness and springiness of bread with MFDS incorporation was not significantly different with the control ($p>0.05$), but those was significantly different with the bread with RB presence. Bread dough with RB incorporation increased the water absorption requirement. High fiber content of the rice bran causes high water absorption capacity of the bread dough. The limited gluten formed in the dough, the heavy loaves bread obtained. This may be related to higher hardness values and lower cohesiveness and springiness values, which is in close agreement with Lima *et al.* (2002).

RB and MFDS+RB incorporation affectedon ash, crude fiber and total phenolic contents in the breads significantly ($p<0.05$). This results related to the chemical composition of rice bran that high contents in ash, fiber and phenolic compounds. MFDS contain phenolic compound (Srianta *et al*., 2014), but the bread with MFDS incorporation was not significant different with the control ($p>0.05$).This may be due to the low level of MFDS incorporated into the bread dough.

3.2. Sensory Characteristics

The overall preference scores of the breads with RB and MFDS+RB were significantly different with the control and with MFDS only (Table 3). Overall preference was determined on the basis of colour, aroma, texture and taste. Panelists gave lower scores to the breads colour in which RB presence. Interestingly, there were no significant different of aroma and taste preferences among control, with MFDS incorporation and with RB incorporation.

4. Conclusions

Incorporating MFDS do not affected signicantly on the almost all of physicochemical and sensory characteristics of breads, whereas the incorporating RB affected significantly on those properties. The breads are being in further evaluation for the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

5. Acknowledgment

Thanks to Ministry of Research, Technology, & Higher Education, Republic of Indonesia for the financial support through competitive research Penelitian Terapan Unggulan Perguruan Tinggi with contract number of 115AE/WM01.5/N/2018.

6. References

AACC. (2000). *Approved Methodsof the American Association of Cereal Chemist.* 10th Edition.St. Paul, MN: American Association of Cereal Chemists.

Anon. (2017). *Declaration of Helsinki.*

AOAC. (1990). *Official Methods of Analysis of the Association of Official Analytical Chemists.* 15th Edition.Arlington, Virginia: Association of Official Analytical ChemistsInc.

Aung, L. L., Tertre, E., Worasith, N., Suksabye, P., and Thiravetyan, P. (2014). The capacity of activated kaolins to remove colour pigments from rice bran oil: the effect of acid concentration and pre-heating prior to activation. *Clay Minerals,* 49, 513 – 526.

Conforti, F. D., and Davis, S. F. (2006). The effect of soya flour and flaxseed as a partial replacement for bread flour in yeast bread. *International Journal of Food Science*, 41, 52. DOI: 10.1111/j.1365-2621.2006.01410.x.

Cornelia, M., Siratantri, T., and Prawita, R. (2015). Utilization of extract durian (*Durio zibethinus L.*) seed gum as an emulsifier in vegan mayonnaise. *Procedia Food Science*, 3, 1 – 18. DOI: 10.1016/j.profoo.2015.01.001.

Das, L., Raychaudhuri, U., and Chakraborty, R. (2012). Supplementation of common white bread by coriander leaf powder. *Food Science & Biotechnology*, 21, 2.

Hardoko, Hendarto, L., and Siregar, T. M. (2010). Pemanfaatan ubi jalar ungu (*Ipomoea batatas L. Poir*) sebagai pengganti sebagian tepung terigu dan sumber antioksidan pada roti tawar. *Jurnal Teknologi dan Industri Pangan*, XXI, 1, 25 – 32.

Hussien, A. M. S., Abbas, H. M., Bayoumi, H. M., and El-Aziz, M. A. (2017). Properties of full fat rice bran and yoghurt fortified with it. *International Journal of Dairy Science*, 12, 3, 170 – 176. DOI: 10.3923/ijds.2017.170.176.

Lee, Y. L., Yang, J. H., and Mau, J. L. (2008). Antioxidant properties of water extract from *Monascus* fermented soybeans. *Food Chemistry*, 106, 1128 – 1137.

Lima, I., Guaraya, H., and Champagne, E. (2002). The functional effectiveness of reprocessed rice bran as an ingredient in bakery product. *Nahrung*, 46, 2, 112 – 117.

Meral, R., and Dogan, I. S. (2013). Quality and antioxidant activity of bread fortified with flaxseed. *Italian Journal of Food Science*, 25, 1, 51 – 56.

Nugerahani, I., Sutedja, A.M., Srianta, I., Widharna, R.M. and Marsono, Y. (2017). In vivo evaluation of Monascus-fermented durian seed for antidiabetic and antihypercholesterol agent. *Food Research,* 1(3): 83-88.

Qureshi, A.A., Sami, S.A. and Khan, F.A. (2002). Effects of stabilized rice bran, its soluble and fiber fractions on blood glucose levels and serum lipid parameters in humans with diabetes mellitus Types I and II. *Journal of Nutritional Biochemistry,* 13(3): 175-187.

Rafe, A., Sadeghian, A., and Hoseini-Yazdi, S. Z. (2017). Physicochemical, functional, and nutritional characteristics of stabilized rice bran from tarom cultivar. *Food Science and Nutrition*, 5, 407 – 414. DOI: 10.1002/fsn3.407.

Sharma, H. R., Chauhan, G. S., and Agrawal, K. (2004). Physico-chemical characteristics of rice bran processed by dry heating and extrusion cooking. *International Journal of Food Properties*, 7, 3, 603 – 614. https://doi.org/10.1081/JFP-200033047.

Sivam, A. S., Waterhouse, D. S., Quek, S., and Perera, C. O. (2016). Properties of bread dough with added fiber polysaccharides and phenolics antioxidant: a review. *Journal of Food Science,* 75, 163 – 174.

Srianta, I., Novita, Y., and Kusumawati, N. (2012a). Production of *Monascus* pigments on durian seed: effect of supplementation of carbon source. *Journal of Pure and Applied Microbiology*, 6, 59 – 63.

Srianta, I., Hendrawan, B., Kusumawati, N., and Blanc, P.J. (2012b). Study on durian seed as a new substrate for angkak production. *International Food Research Journal,* 19, 3, 941-945.

Srianta, I., Kusumawati, N., Nugerahani, I., Artanti, N., and Xu, G.R. (2013). *In vitro* α-glucosidase inhibitory activity of *Monascus*-fermented durian seed extracts. *International Food Research Journal,* 20, 2, 533 - 536.

Srianta, I., Nugerahani, I., Kusumawati, N., Suryatanijaya, E., Subianto, C., Tewfik, S., and Tewfik, I. 2014. Therapeutic antioxidant activity of *Monascus*-fermented durian seed: a potential functional food ingredient. *International Journal of Food, Nutrition and Public Health,* 7, 1, 53 - 59.

Stone, H., and Sidel. J. (2004). *Sensory evaluation practices*. (3rd ed.). Redwood City: Academic Press.

Suleria, H.A.R., Khalid, N., Sultan, S., Raza, A., Muhammad, A., and Abbas, M. (2015). Functional and nutraceutical bread prepared by using aqueous garlic axtract. *Internet Journal of Food Safety*, 17, 10 – 20. https://www.researchgate.net>publication.

Trisnawati, Ch. Y. dan Sutedja, A.M.(2010). Pemanfaatan Beras dan Bekatul Beras dalam Pembuatan *Cake*. *Prosiding Seminar Nasional Teknik Kimia Soebardjo Brotohardjono VII*. ISSN: 1978-0427. A3(1-7)

Wang, R., Zhou, W., and Isabelle, M. (2007). Comparison study of the effect of green tea extract (GTE) on the quality of bread by instrumental analysis and sensory evaluation. *Food Research International*, 40, 470 – 479.

Zielinski, H., Michalska, A., Ceglinska, A., and Lamparski, G. (2008). Antioxidant properties and sensory quality of traditional rye bread as affected by the incorporation of flour with different extraction rate in the formulation. *European Food Research and Technology*, 226, 4, 671 – 680.

Figure 1. Picture of bread with MFDS and RB incorporation. The breads made from different formula: control (P1), MFDS (P2), RB (P3) and MFDS+RB (P4) as mentioned in the Materials and Methods. The ingredients were mixed in a mixer into viscoelastic dough, then fermented at 30^{o}C for 30 minutes. The dough was rolled, rounded and placed in a baking dish, and baked in an oven at 180 °C for 30 minutes.

Table 1. Physical characteristicsof bread with MFDS and RB incorporation**

Bread formula	Specific volume (cm^3/g)	Colour			Texture profile		
		L*	a*	b*	Hardness (g)	Cohesiveness	Springiness
Control	5.45^b	75.54^b	0.41^a	11.18^a	128.89^a	0.80^b	0.91^b
MFDS	5.03^b	72.56^b	1.24^b	9.94^a	160.81^a	0.79^b	0.93^b
RB	3.78^a	66.57^a	3.82^c	18.18^b	643.54^b	0.65^a	0.81^a
MFDS+RB	3.91^a	68.4^a	4.31^c	18.43^b	784.46^b	0.64^a	0.78^a

Note: * L = lightness, a = redness, b = yellowness
**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

Table 2. Chemical composition of bread with MFDS and RB incorporation

Bread formula	Moisture (%)	Ash (%)	Protein (%)	Crude fiber (%)	Total phenolic (%)
Control	36.15^a	1.05^a	9.29^a	0.10^a	0.138^a
MFDS	37.24^a	1.06^a	8.83^a	0.12^a	0.168^{ab}
RB	37.35^a	1.50^b	8.57^a	0.24^{ab}	0.197^b
MFDS+RB	37.65^a	1.49^b	8.60^a	0.37^b	0.193^b

Note: **Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

Table 3. Sensory characteristics of bread with MFDS and RB incorporation

Bread formula	Preference				
	Colour	Aroma	Texture	Taste	*Overall*
Control	5.80^c	5.03^b	5.30^c	5.05^b	5.20^c
MFDS	6.08^c	4.48^{ab}	4.48^b	4.80^b	5.20^c
RB	3.80^b	4.80^b	5.13^c	4.48^b	4.48^b
MFDS+RB	2.53^a	4.05^a	3.35^a	3.15^a	3.88^a

Note: **Values are means ± standard deviations (n=40 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

RESPONSE TO REVIEWERS COMMENTS

Reviewer 1

Section	Reviewer comment	Response
Title	please consider paraphrasing the title with more reflective words	The title has been revised to make more reflective: Incorporating *Monascus*-fermented durian seeds and rice bran into bread: Study on the bread physicochemical and sensory properties
Abstract	Insert p values and some minor editing	The p values have been added and some minor editing have been done
Introduction	explain why for each stated ingredients – perhaps include a table	I think introduction section should be concise and without table. The stated ingredients do not need explanation, readers can read the cited references
	Paraphrase the aim	Done
Materials and Methods	Manufacturers of these chemicals/reagents	Too many chemicals to be mention along with the manufactures. I think that We mention that written in the manuscripts are clear
Results and Discussion	Insert p values and some minor editing	The p values have been added and some minor editing have been done
Figure	What P1, P2, P3 and P4 refer in the text/figure-1 title below	It has been revised

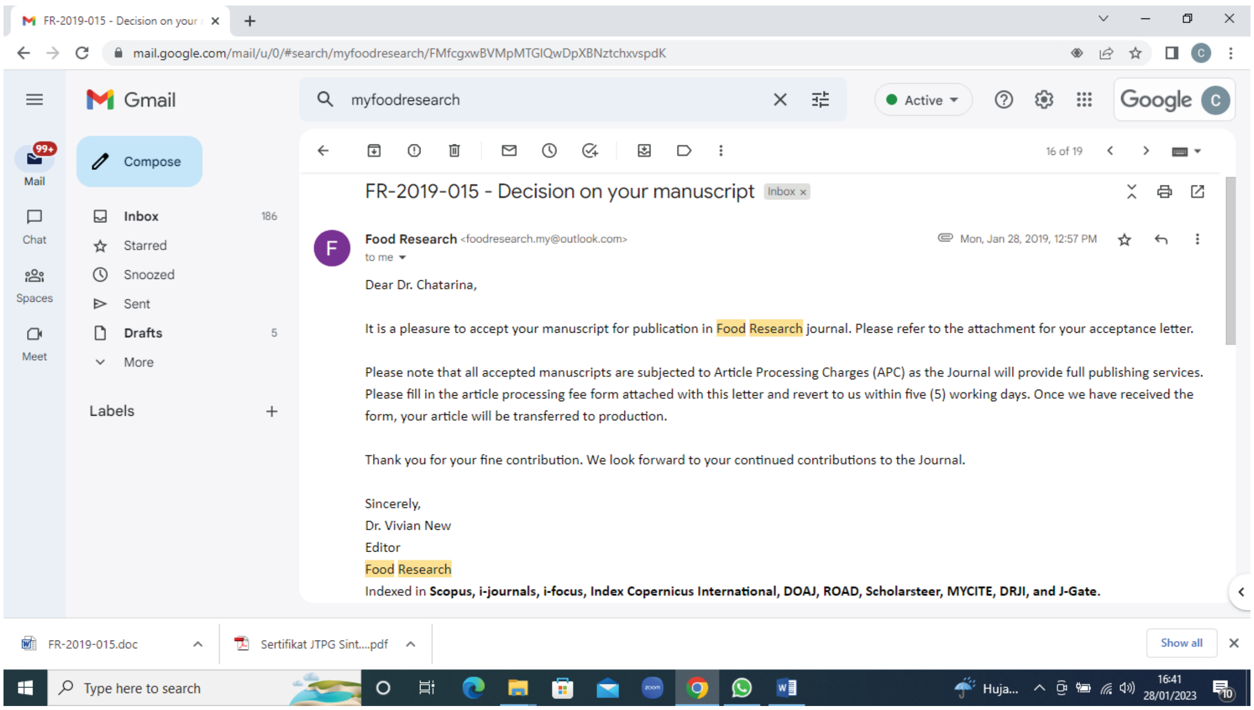
Reviewer 2

Section	Reviewer comment	Response
General	Interesting and originally insight on the use of MFDS and Rice bran in the functionally medicinal food developing	Thank you for this possitive comment
	Minor revision on the writing the citation and references – pls use mendeley or related program to improving the paper	It has been revised and completed
	Scientific reason on the amount added of MFDS and RB to the dough, must be clearly stated and elaborate in the discussion especially to the promising use of the bread	It has been stated and elaborated
	Some others minor writing	It has been revised

5.

Bukti konfimasi artikel diterima dan acceptance letter serta permintaan pengisian form Article Processing Charge (APC)

(28 Januari 2019)



FR-2019-015 - Decision on your manuscript

Food Research <foodresearch.my@outlook.com>
to me

Mon, Jan 28, 2019, 12:57 PM

Dear Dr. Chatarina,

It is a pleasure to accept your manuscript for publication in Food Research journal. Please refer to the attachment for your acceptance letter.

Please note that all accepted manuscripts are subjected to Article Processing Charges (APC) as the Journal will provide full publishing services. Please fill in the article processing fee form attached with this letter and revert to us within five (5) working days. Once we have received the form, your article will be transferred to production.

Thank you for your fine contribution. We look forward to your continued contributions to the Journal.

Sincerely,
Dr. Vivian New
Editor
Food Research
Indexed in **Scopus, i-journals, i-focus, Index Copernicus International, DOAJ, ROAD, Scholarsteer, MYCITE, DRJI, and J-Gate.**

FOOD
RESEARCH

28th January 2019

Dear Dr. Trisnawati, C.Y.

ACCEPTANCE LETTER

Food Research, is pleased to inform you that the following manuscript has been accepted for publication in Food Research journal.

Manuscript Title	:	Incorporating *Monascus*-fermented durian seeds and rice bran into bread: study on the bread physicochemical and sensory properties
Authors	:	Trisnawati, C. Y., Srianta, I., Nugerahani, I. and Marsono, Y.

We thank you for your fine contribution to the Food Research journal and encourage you to submit other articles to the Journal.

Yours sincerely,

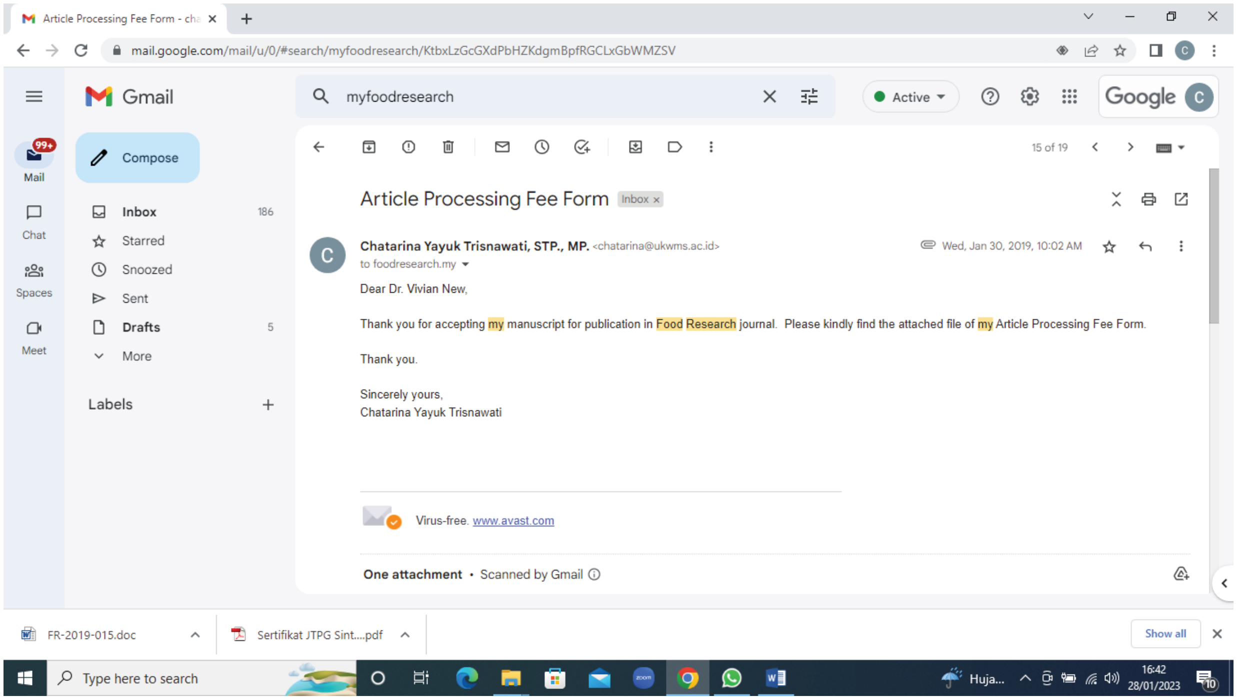
Professor Dr. Son Radu
Chief Editor
Food Research

foodresearch.my@outlook.com http://www.myfoodresearch.com

6.

Bukti konfirmasi submit form APC dan balasannya

(30 Januari 2019)



Article Processing Fee Form

Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id>
to foodresearch.my
Wed, Jan 30, 2019, 10:02 AM

Dear Dr. Vivian New,

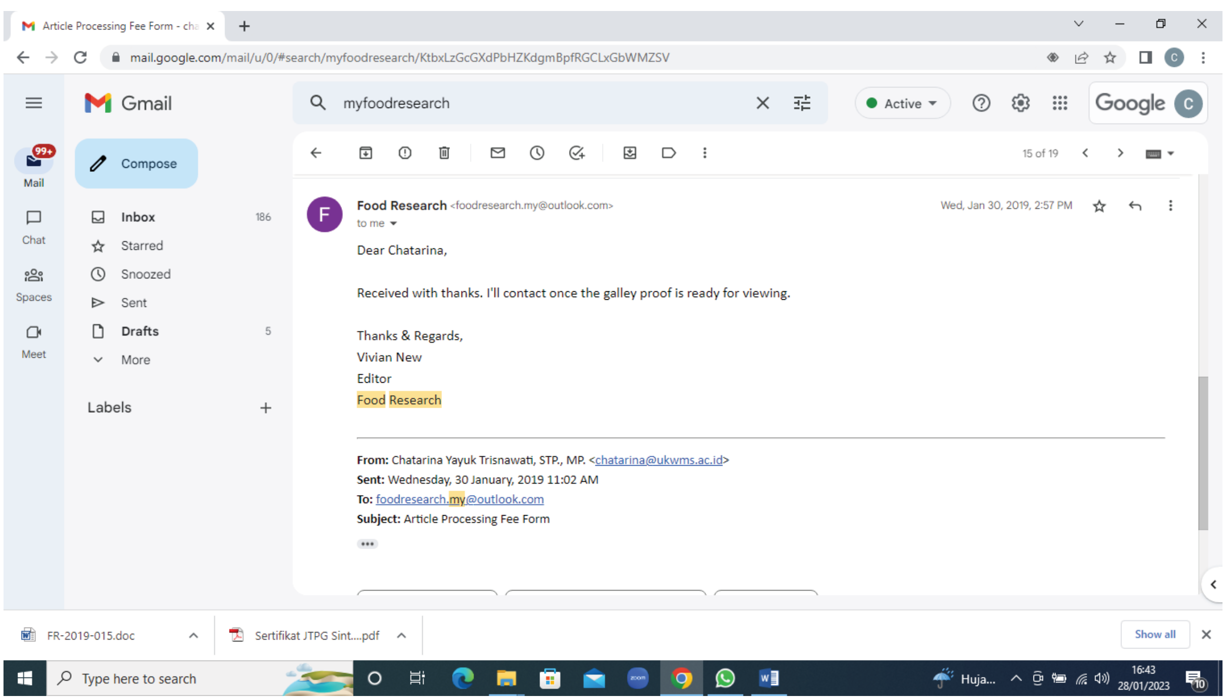
Thank you for accepting my manuscript for publication in Food Research journal. Please kindly find the attached file of my Article Processing Fee Form.

Thank you.

Sincerely yours,
Chatarina Yayuk Trisnawati

Virus-free. www.avast.com

One attachment • Scanned by Gmail



Food Research <foodresearch.my@outlook.com>
to me
Wed, Jan 30, 2019, 2:57 PM

Dear Chatarina,

Received with thanks. I'll contact once the galley proof is ready for viewing.

Thanks & Regards,
Vivian New
Editor
Food Research

From: Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id>
Sent: Wednesday, 30 January, 2019 11:02 AM
To: foodresearch.my@outlook.com
Subject: Article Processing Fee Form

FOOD
RESEARCH

FR/APC/01/03/2018

ARTICLE PROCESSING FEE FORM

Please note that all accepted manuscripts are subjected to Article Processing Charges (APC).

In order for us to proceed with the publication of your paper in our Journal, please complete the form by filling in the necessary details and revert to the Editorial Office within five (5) working days from the date of the email.

No. of Journal Pages	Page Charge
5 pages or under	USD 100
6th to 8th page	USD 25/page
9th page and above	USD 30

*The final number of pages of your paper in the journal will be determined by the Journal.
* If remittance is overdue, the rate of 1.5% of the APC is added to the original cost

Once we receive the form, we will begin the production of your article. We will send the galley proof for approval when it is ready along with an invoice of the total APC. Authors are given the flexibility of editing and correcting the proof once. Subsequent editing and correcting of the proof will be charged separately.

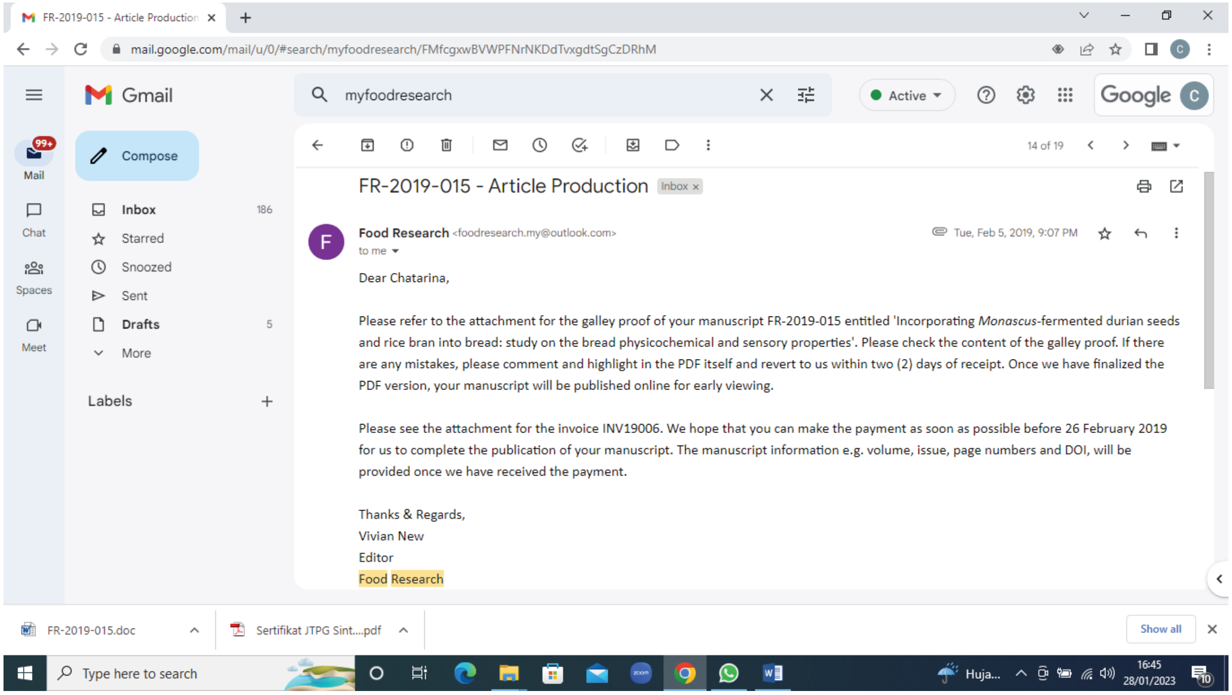
CORRESPONDING AUTHOR INFORMATION			
Name	Trisnawati, C.Y.	**Manuscript ID**	FR-2019-015
Manuscript Title	Incorporating *Monascus*-fermented durian seeds and rice bran into bread: study on the bread physicochemical and sensory properties		
Affiliations	Trisnawati, C. Y., Srianta, I., Nugerahani, I. and Marsono, Y.		

INVOICE RECIPIENT			
Name	Chatarina Yayuk Trisnawati	**Salutation**	S.TP., MP.
Address	Department of Food Technology, Widya Mandala Catholic University Surabaya, Jalan Dinoyo 42 – 44 Surabaya, Indonesia 61265		
Email	chatarina@ukwms.ac.id		

7.

Bukti konfirmasi galley proof artikel

(5 Februari 2019)



FR-2019-015 - Article Production

Food Research <foodresearch.my@outlook.com>
to me
Tue, Feb 5, 2019, 9:07 PM

Dear Chatarina,

Please refer to the attachment for the galley proof of your manuscript FR-2019-015 entitled 'Incorporating *Monascus*-fermented durian seeds and rice bran into bread: study on the bread physicochemical and sensory properties'. Please check the content of the galley proof. If there are any mistakes, please comment and highlight in the PDF itself and revert to us within two (2) days of receipt. Once we have finalized the PDF version, your manuscript will be published online for early viewing.

Please see the attachment for the invoice INV19006. We hope that you can make the payment as soon as possible before 26 February 2019 for us to complete the publication of your manuscript. The manuscript information e.g. volume, issue, page numbers and DOI, will be provided once we have received the payment.

Thanks & Regards,
Vivian New
Editor
Food Research

Food Research (2019) : pp - pp
Journal homepage: http://www.myfoodresearch.com

FOOD RESEARCH

SHORT COMMUNICATION

Incorporating *Monascus*-fermented durian seeds and rice bran into bread: study on the bread physicochemical and sensory properties

[1,*]Trisnawati, C.Y., [1]Srianta, I., [1]Nugerahani , I. and [2]Marsono, Y.

[1]*Department of Food Technology, Widya Mandala Catholic University Surabaya, Jalan Dinoyo 42 – 44 Surabaya, Indonesia 61265*

[2]*Department of Food and Agricultural Product Technology, Gadjah Mada University, Jalan Flora, Bulaksumur, Yogyakarta Indonesia*

Article history:
Received: 19 January 2019
Received in revised form: 26 January 2019
Accepted: 27 January 2019
Available Online:

Keywords:
Bread,
Monascus-fermented durian seeds,
Rice bran,
Physicochemical properties,
Sensory properties

DOI:
ffgf

Abstract

Monascus-fermented durian seeds (MFDS) and rice bran (RB) have been incorporated into bread dough formulation. This research was aimed at physicochemical and sensory evaluation of bread formulated with both active ingredients. Bread made from four dough formulas i.e. control, with MFDS, RB and MFDS-RB-incorporating have been evaluated the physicochemical and sensory properties. The results suggested that no significant differences on both physicochemical and sensory properties of bread with MFDS-incorporating and control ($p>0.05$). Ash, crude fiber and total phenolic contents found on bread with RB and MFDS-RB incorporating were significantly higher than those of control ($p<0.05$). The bread was further evaluated of the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

1. Introduction

Bread is one of the oldest foods and popular around the world. In the breadmaking, wheat flour, water, salt, sugar and yeast are mixed into viscoelastic dough subjected to fermentation and baking (Sivam *et al*., 2010). Incorporating active ingredients into bread have grown rapidly, since the increased consumer awareness of health. Purple sweet potato flour, soy flour, flaxseed, green tea extract, whole grain rye, coriander leaf powder, grape seed and garlic have been incorporated into bread (Conforti and Davis, 2006; Wang *et al*., 2007; Zielinski *et al*., 2007; Hardoko *et al*., 2010; Das *et al*., 2012; Meral and Dogan, 2013; Suleria *et al*., 2015).

Monascus fermented-durian seed is a product of solid state fermentation with *Monascus purpureus* culture on durian seed substrate (Srianta, Novita and Kusumawati, 2012; Srianta *et al*., 2012). The MFDS potential as an anti-diabetes agent with α-glucosidase inhibition, antioxidant and in vivo anti-hyperglycemic activities (Srianta *et al*., 2013; Srianta *et al*., 2014; Nugerahani *et al*., 2017). MFDS has not been incorporated into food product. On the other hand, rice bran is also known as a potential ingredient for the development of anti-diabetic food. Qureshi *et al*. (2002) reported that consumption of 20 g of rice bran can reduce blood glucose levels in patients with type I and II diabetes mellitus. The content of tocopherol, tocotrienol, oryzanol, and polyphenols in rice bran also plays a role in controlling blood sugar levels. Trisnawati and Sutedja (2010) reported that rice bran has been used in the development of functional food products, i.e. cake with rice flour.

The aims of this study were to study the physicochemical and sensory properties of bread with *Monascus*-fermented durian seeds and rice bran incorporation.

2. Materials and methods

2.1 Materials, microorganism and chemicals

All ingredients except MFDS were obtained from local distributors. MFDS was prepared in the laboratory. Durian seeds were obtained from durian processing home industry. *Monascus purpureus* M9 was used in the MFDS preparation. It was maintained and subcultured on PDA monthly. All chemicals were analytical grade obtained from local distributors.

2.2 Preparation of Monascus-fermented durian seeds

Monascus-fermented durian seeds were prepared according to our previous research (Srianta *et al*., 2012a). Durian seeds were prepared by boiling, peeling, cutting and sterilization. After that, the 50 g of sterilized

*Corresponding author.
Email: *chatarina@ukwms.ac.id*

eISSN: 2550-2166 /

durian seeds cut were inoculated with 7-days *Monascus purpureus* starter with a total spore of about 10^5 spores/mL. Incubation was carried out at room temperature (± 30°C) for 14 days, then dried at 45°C for 24 hours. The dried MFDS was ground to obtain powder form. The MFDS was used as an ingredient in bread formulation.

2.3 Bread formulation and processing

Four bread formulas were: 1) control, consist of 200 g of wheat flour, 10 g of sugar, 8 g of margarine, 2 g of salt, 0.6 g of bread improver, 3 g of baker yeast and 124 g of water; 2) MFDS, consist of those of control ingredients with MFDS incorporating at 0.15 g; 3) RB, consist of those of control ingredients with RB incorporating at 20 g; and 4) MFDS+RB, consist of those of control ingredients with MFDS and RB incorporating at 0.15 g and 20 g.

The ingredients were mixed in a mixer (Phillips HR 1559 model) until it becomes a viscoelastic dough and then, fermented at 30°C for 30 mins. The dough was rolled, rounded and placed in a baking dish, and baked in an oven (Gas Bakery Oven RFL-12C model) at 180°C for 30 mins.

2.4 Evaluation of bread characteristics

2.4.1 Physicochemical analysis

The physical properties analysis of the bread: specific loaf volume according to AACC (2000), color by using color reader (Konica Minolta CR-10, Konica Minolta Optics, Inc., Japan) and texture profiles including hardness, cohesiveness and springiness by using texture analyzer with cylinder probe P36R (TA-XT plus, Exponent Lite software). The chemical analysis of moisture, ash, protein, and crude fiber contents analysis refer to the AOAC method (AOAC 925.10, AOAC 923.03, AOAC 984.13 and AOAC 978.10 respectively). Total phenolic content analysis was conducted according to Lee *et al*. (2008).

2.4.2 Sensory evaluation

Sensory evaluation of the bread was conducted by using the hedonic method (Stone and Sidel, 2004). A 7-point scoring was used with 1 representing extremely dislike and 7 representing extremely like. Forty untrained panelists participated in the sensory evaluation and had no previous or present taste or smell disorders. Bread samples were labeled with three-digit codes and randomly presented to avoid bias of order of presentation. The panelists scored for colour, texture, aroma, taste and overall preferences of the bread from the four formulas. The study was in accordance with the Declaration of Helsinki (Anon., 2017).

2.5 Statistical analysis

The experiments were conducted triplicate. The obtained data were subjected to analysis of variance (ANOVA) with α = 5% and followed by the Duncan Multiple Range Test (DMRT) with α = 5%. SPSS (version 19.0) were used in the analysis.

3. Results and discussion

3.1 Physicochemical characteristics

Bread made from four different formulas were visually different in their height and colour (Figure 1). Incorporating RB alone or combination with MFDS into the formula affected the specific loaf volume, colour, hardness, cohesiveness and springiness (Table 1), ash, protein, crude fiber and total phenolic content (Table 2) of the bread significantly ($p<0.05$). These results indicated that existence of rice bran in the formula contributed significantly in the colour, structure and texture properties of the bread. Specific loaf volume of bread with RB and MFDS-RB incorporation were higher than those of control and with MFDS ($p<0.05$). This results may be related to the fiber content in rice bran which has high water absorption capacity, as reported by Rafe *et al.* (2017). These results reflected that rice bran reduced the fermentation and proofing rates of dough, which related to the water availability for yeast activity. In the breadmaking, proteins in wheat flour need water to form gluten, which then contributed to form the viscoelastic matrix that can stretch properly by CO_2 during fermentation and proofing. The high fiber content in the bread dough with RB incorporation can reduce water availability in the system for the gluten formation, which causes the dough unable to stretch properly by CO_2. Durian seed contains high amount of gum with high water absorption capacity of 1112.15% (Cornelia *et al.*, 2015). However, the MFDS incorporation does not affect significantly on the specific loaf volume, may be due to the MFDS incorporated in low amount.

Figure 1. Picture of bread with MFDS and RB incorporation. P1: Control; P2: MFDS; P3: RB; and P4: MFDS+RB

Bread with RB and MFDS-RB incorporation was visually darker brown than those of bread with MFDS only. Colour measurement by using colour reader (Table 1) also show that L* of crumb of bread in which rice bran presence was higher than those of control and with MFDS alone. Sharma *et al.* (2004) also found the similar result that rice bran becomes darker after extrusion

Table 1. Physical characteristics of bread with MFDS and RB incorporation**

Bread formula	Specific volume (cm^3/g)	Colour			Texture profile		
		L*	a*	b*	Hardness (g)	Cohesiveness	Springiness
Control	5.45^b	75.54^b	0.41^a	11.18^a	128.89^a	0.80^b	0.91^b
MFDS	5.03^b	72.56^b	1.24^b	9.94^a	160.81^a	0.79^b	0.93^b
RB	3.78^a	66.57^a	3.82^c	18.18^b	643.54^b	0.65^a	0.81^a
MFDS+RB	3.91^a	68.4^a	4.31^c	18.43^b	784.46^b	0.64^a	0.78^a

* L = lightness, a = redness, b = yellowness

**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

Table 2. Chemical composition of bread with MFDS and RB incorporation

Bread formula	Moisture (%)	Ash (%)	Protein (%)	Crude fiber (%)	Total phenolic (%)
Control	36.15^a	1.05^a	9.29^a	0.10^a	0.138^a
MFDS	37.24^a	1.06^a	8.83^a	0.12^a	0.168^{ab}
RB	37.35^a	1.50^b	8.57^a	0.24^{ab}	0.197^b
MFDS+RB	37.65^a	1.49^b	8.60^a	0.37^b	0.193^b

**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

cooking, that occurred may be due to the browning reaction mainly Maillard during the heating process. The presence of high fiber and pheophytin in the rice bran may also contribute to the darker formation (Aung *et al*., 2014; Hussien *et al*., 2017). MFDS incorporation affected only on the redness value, higher red value is resulted by the MFDS presence. The MFDS contain red pigments produced during the Monascus solid state fermentation (Srianta *et al*., 2012).

Hardness, cohesiveness and springiness of bread with MFDS incorporation was not significantly different with the control ($p>0.05$), but those properties were significantly different with the bread with RB presence. Bread dough with RB incorporation increased the water absorption requirement. The high fiber content of the rice bran causes high water absorption capacity of the bread dough. The limited gluten formed in the dough, the heavy loaves bread obtained. This may be related to higher hardness values and lower cohesiveness and springiness values, which is in close agreement with Lima *et al.* (2002).

RB and MFDS+RB incorporation affected ash, crude fiber and total phenolic contents in the bread significantly ($p<0.05$). This results related to the chemical composition of rice bran that high contents in ash, fiber and phenolic compounds. MFDS contain phenolic compound (Srianta *et al*., 2014), but the bread with MFDS incorporation was not significantly different with the control ($p>0.05$). This may be due to the low level of MFDS incorporated into the bread dough.

3.2. Sensory characteristics

The overall preference scores of the bread with RB and MFDS+RB were significantly different with the control and with MFDS only (Table 3). Overall preference was determined on the basis of colour, aroma, texture and taste. Panelists gave lower scores to the bread's colour in which RB presence. Interestingly, there were no significant different of aroma and taste preferences among control, with MFDS incorporation and with RB incorporation.

Table 3. Sensory characteristics of bread with MFDS and RB incorporation

Bread formula	Preference				
	Colour	Aroma	Texture	Taste	Overall
Control	5.80^c	5.03^b	5.30^c	5.05^b	5.20^c
MFDS	6.08^c	4.48^{ab}	4.48^b	4.80^b	5.20^c
RB	3.80^b	4.80^b	5.13^c	4.48^b	4.48^b
MFDS+RB	2.53^a	4.05^a	3.35^a	3.15^a	3.88^a

**Values are means ± standard deviations (n=40 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

4. Conclusion

Incorporating MFDS did not significantly affect almost all of the physicochemical and sensory characteristics of bread, whereas the incorporating RB affected significantly on those properties. The bread are being in further evaluation of the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

Acknowledgment

Thanks to Ministry of Research, Technology and Higher Education, the Republic of Indonesia for the financial support through competitive research Penelitian Terapan Unggulan Perguruan Tinggi with contract number of 115AE/WM01.5/N/2018.

eISSN: 2550-2166

References

AACC. (2000). Approved Methods of the American Association of Cereal Chemist. 10th ed. St. Paul, MN: American Association of Cereal Chemists.

Anon. (2017). Declaration of Helsinki. France: World Medical Association

AOAC. (1990). Official Methods of Analysis of the Association of Official Analytical Chemists. 15th ed. Arlington, Virginia: Association of Official Analytical Chemists Inc.

Aung, L.L., Tertre, E., Worasith, N., Suksabye, P. and Thiravetyan, P. (2014). The capacity of activated kaolins to remove colour pigments from rice bran oil: the effect of acid concentration and pre-heating prior to activation. *Clay Minerals,* 49(4), 513-526. https://doi.org/10.1180/claymin.2014.049.4.02

Conforti, F.D. and Davis, S.F. (2006). The effect of soya flour and flaxseed as a partial replacement for bread flour in yeast bread. *International Journal of Food Science*, 41(s2), 95-101. https://doi.org/10.1111/j.1365-2621.2006.01410.x

Cornelia, M., Siratantri, T. and Prawita, R. (2015). Utilization of extract durian (*Durio zibethinus L.*) seed gum as an emulsifier in vegan mayonnaise. *Procedia Food Science*, 3(2015), 1-18. https://doi.org/10.1016/j.profoo.2015.01.001

Das, L., Raychaudhuri, U. and Chakraborty, R. (2012). Supplementation of common white bread by coriander leaf powder. *Food Science and Biotechnology*, 21(2), 425-433. https://doi.org/10.1007/s10068-012-0054-9

Hardoko., Hendarto, L. and Siregar, T.M. (2010). Pemanfaatan ubi jalar ungu (*Ipomoea batatas L. Poir*) sebagai pengganti sebagian tepung terigu dan sumber antioksidan pada roti tawar (In Bahasa Indonesia). *Jurnal Teknologi dan Industri Pangan*, 21(1), 25 – 32.

Hussien, A.M.S., Abbas, H.M., Bayoumi, H.M. and El-Aziz, M.A. (2017). Properties of full fat rice bran and yoghurt fortified with it. *International Journal of Dairy Science*, 12(3), 170- 176. https://doi.org/10.3923/ijds.2017.170.176

Lee, Y.L., Yang, J.H. and Mau, J.L. (2008). Antioxidant properties of water extract from *Monascus* fermented soybeans. *Food Chemistry*, 106(3), 1128-1137. https://doi.org/10.1016/j.foodchem.2007.07.047

Lima, I., Guaraya, H. and Champagne, E. (2002). The functional effectiveness of reprocessed rice bran as an ingredient in bakery product. *Nahrung*, 46(2), 112 – 117. https://doi.org/10.1002/1521-3803(20020301)46:2<112::AID-FOOD112>3.0.CO;2-N

Meral, R. and Dogan, I.S. (2013). Quality and antioxidant activity of bread fortified with flaxseed. *Italian Journal of Food Science*, 25(1), 51 – 56.

Nugerahani, I., Sutedja, A.M., Srianta, I., Widharna, R.M. and Marsono, Y. (2017). In vivo evaluation of Monascus-fermented durian seed for antidiabetic and antihypercholesterol agent. *Food Research,* 1(3), 83-88. https://doi.org/10.26656/fr.2017.3.023

Qureshi, A.A., Sami, S.A. and Khan, F.A. (2002). Effects of stabilized rice bran, its soluble and fiber fractions on blood glucose levels and serum lipid parameters in humans with diabetes mellitus Types I and II. *Journal of Nutritional Biochemistry,* 13(3), 175-187. https://doi.org/10.1016/S0955-2863(01)00211-X

Rafe, A., Sadeghian, A. and Hoseini-Yazdi, S.Z. (2017). Physicochemical, functional, and nutritional characteristics of stabilized rice bran from tarom cultivar. *Food Science and Nutrition*, 5(3), 407 – 414. https://doi.org/10.1002/fsn3.407

Sharma, H.R., Chauhan, G.S. and Agrawal, K. (2004). Physico-chemical characteristics of rice bran processed by dry heating and extrusion cooking. *International Journal of Food Properties*, 7(3), 603 – 614. https://doi.org/10.1081/JFP-200033047.

Sivam, A.S., Waterhouse, D.S., Quek, S. and Perera, C. O. (2016). Properties of bread dough with added fiber polysaccharides and phenolics antioxidant: a review. *Journal of Food Science,* 75(8), 163 – 174. https://doi.org/10.1111/j.1750-3841.2010.01815.x

Srianta, I., Novita, Y. and Kusumawati, N. (2012). Production of *Monascus* pigments on durian seed: effect of supplementation of carbon source. *Journal of Pure and Applied Microbiology*, 6(1), 59-63.

Srianta, I., Hendrawan, B., Kusumawati, N. and Blanc, P.J. (2012). Study on durian seed as a new substrate for angkak production. *International Food Research Journal,* 19(3), 941-945.

Srianta, I., Kusumawati, N., Nugerahani, I., Artanti, N. and Xu, G.R. (2013). *In vitro* α-glucosidase inhibitory activity of *Monascus*-fermented durian seed extracts. *International Food Research Journal,* 20(2), 533 - 536.

Srianta, I., Nugerahani, I., Kusumawati, N., Suryatanijaya, E., Subianto, C., Tewfik, S. and Tewfik, I. (2014). Therapeutic antioxidant activity of *Monascus*-fermented durian seed: a potential functional food ingredient. *International Journal of Food, Nutrition and Public Health,* 7(1), 53 - 59.

Stone, H. and Sidel. J. (2004). Sensory evaluation practices. 3rd ed. Redwood City: Academic Press.

Suleria, H.A.R., Khalid, N., Sultan, S., Raza, A., Muhammad, A. and Abbas, M. (2015). Functional

and nutraceutical bread prepared by using aqueous garlic extract. *Internet Journal of Food Safety*, 17 (2015), 10 – 20.

Trisnawati, C.Y. and Sutedja, A.M. (2010). Pemanfaatan Beras dan Bekatul Beras dalam Pembuatan Cake (In Bahasa Indonesia). *Prosiding Seminar Nasional Teknik Kimia Soebardjo Brotohardjono VII: Ketahanan Pangan dan Energi,* A3(1-7).

Wang, R., Zhou, W. and Isabelle, M. (2007). Comparison study of the effect of green tea extract (GTE) on the quality of bread by instrumental analysis and sensory evaluation. *Food Research International*, 40(4), 470 – 479. https://doi.org/10.1016/j.foodres.2006.07.007

Zielinski, H., Michalska, A., Ceglinska, A. and Lamparski, G. (2008). Antioxidant properties and sensory quality of traditional rye bread as affected by the incorporation of flour with different extraction rate in the formulation. *European Food Research and Technology*, 226(4), 671 – 680. https://doi.org/10.1007/s00217-007-0576-1

eISSN: 2550-2166

8.

Bukti konfirmasi submit galley proof artikel revisi pertama

(6 Februari 2019)

FR-2019-015-galley proof-revised

mail.google.com/mail/u/0/#search/myfoodresearch/KtbxLwHHnSrPtrhMDPskkzmFjKtxCjhmkg

Gmail

myfoodresearch

Compose

Inbox 186
Starred
Snoozed
Sent
Drafts 5
More

Labels

13 of 19

FR-2019-015-galley proof-revised

Inbox

Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id>
to foodresearch.my

Wed, Feb 6, 2019, 9:58 PM

Dear Dr. Vivian New,

Please kindly find the attachment file for the galley proof of my manuscript FR-2019-015 entitled "Incorporating Monascus-fermented durian seeds and rice bran into bread: study on the bread physicochemical and sensory properties". There are minor revision for the galley proof.

Thanks so much.

Sincerely yours,
Ch. Yayuk Trisnawati

One attachment • Scanned by Gmail

FR-2019-015.doc

Sertifikat JTPG Sint....pdf

Show all

Type here to search

16:46
28/01/2023

Food Research (2019) : pp - pp
Journal homepage: http://www.myfoodresearch.com

FOOD RESEARCH

SHORT COMMUNICATION

Incorporating *Monascus*-fermented durian seeds and rice bran into bread: study on the bread physicochemical and sensory properties

[1,*]Trisnawati, C.Y., [1]Srianta, I., [1]Nugerahani , I. and [2]Marsono, Y.

[1]*Department of Food Technology, Widya Mandala Catholic University Surabaya, Jalan Dinoyo 42 – 44 Surabaya, Indonesia 61265*
[2]*Department of Food and Agricultural Product Technology, Gadjah Mada University, Jalan Flora, Bulaksumur, Yogyakarta Indonesia*

Article history:
Received: 19 January 2019
Received in revised form: 26 January 2019
Accepted: 27 January 2019
Available Online:

Keywords:
Bread,
Monascus-fermented durian seeds,
Rice bran,
Physicochemical properties,
Sensory properties

DOI:
ffgf

Abstract

Monascus-fermented durian seeds (MFDS) and rice bran (RB) have been incorporated into bread dough formulation. This research was aimed at physicochemical and sensory evaluation of bread formulated with both active ingredients. Bread made from four dough formulas i.e. control, with MFDS, RB and MFDS-RB-incorporating have been evaluated the physicochemical and sensory properties. The results suggested that no significant differences on both physicochemical and sensory properties of bread with MFDS-incorporating and control ($p>0.05$). Ash, crude fiber and total phenolic contents found on bread with RB and MFDS-RB incorporating were significantly higher than those of control ($p<0.05$). The bread was further evaluated of the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

1. Introduction

Bread is one of the oldest foods and popular around the world. In the breadmaking, wheat flour, water, salt, sugar and yeast are mixed into viscoelastic dough subjected to fermentation and baking (Sivam *et al.*, 2010). Incorporating active ingredients into bread have grown rapidly, since the increased consumer awareness of health. Purple sweet potato flour, soy flour, flaxseed, green tea extract, whole grain rye, coriander leaf powder, grape seed and garlic have been incorporated into bread (Conforti and Davis, 2006; Wang *et al.*, 2007; Zielinski *et al.*, 2007; Hardoko *et al.*, 2010; Das *et al.*, 2012; Meral and Dogan, 2013; Suleria *et al.*, 2015).

Monascus fermented-durian seed is a product of solid state fermentation with *Monascus purpureus* culture on durian seed substrate (Srianta, Novita and Kusumawati, 2012; Srianta *et al.*, 2012). The MFDS potential as an anti-diabetes agent with α-glucosidase inhibition, antioxidant and in vivo anti-hyperglycemic activities (Srianta *et al.*, 2013; Srianta *et al.*, 2014; Nugerahani *et al.*, 2017). MFDS has not been incorporated into food product. On the other hand, rice bran is also known as a potential ingredient for the development of anti-diabetic food. Qureshi *et al.* (2002) reported that consumption of 20 g of rice bran can reduce blood glucose levels in patients with type I and II diabetes mellitus. The content of tocopherol, tocotrienol, oryzanol, and polyphenols in rice bran also plays a role in controlling blood sugar levels. Trisnawati and Sutedja (2010) reported that rice bran has been used in the development of functional food products, i.e. cake with rice flour.

The aims of this study were to study the physicochemical and sensory properties of bread with *Monascus*-fermented durian seeds and rice bran incorporation.

2. Materials and methods

2.1 Materials, microorganism and chemicals

All ingredients except MFDS were obtained from local distributors. MFDS was prepared in the laboratory. Durian seeds were obtained from durian processing home industry. *Monascus purpureus* M9 was used in the MFDS preparation. It was maintained and subcultured on PDA monthly. All chemicals were analytical grade obtained from local distributors.

2.2 Preparation of Monascus-fermented durian seeds

Monascus-fermented durian seeds were prepared according to our previous research (Srianta *et al.*, 2012a). Durian seeds were prepared by boiling, peeling, cutting and sterilization. After that, the 50 g of sterilized

*Corresponding author.
Email: *chatarina@ukwms.ac.id*

durian seeds cut were inoculated with 7-days *Monascus purpureus* starter with a total spore of about 10^5 spores/mL. Incubation was carried out at room temperature (± 30°C) for 14 days, then dried at 45°C for 24 hours. The dried MFDS was ground to obtain powder form. The MFDS was used as an ingredient in bread formulation.

2.3 Bread formulation and processing

Four bread formulas were: 1) control, consist of 200 g of wheat flour, 10 g of sugar, 8 g of margarine, 2 g of salt, 0.6 g of bread improver, 3 g of baker yeast and 124 g of water; 2) MFDS, consist of those of control ingredients with MFDS incorporating at 0.15 g; 3) RB, consist of those of control ingredients with RB incorporating at 20 g; and 4) MFDS+RB, consist of those of control ingredients with MFDS and RB incorporating at 0.15 g and 20 g.

The ingredients were mixed in a mixer (Phillips HR 1559 model) until it becomes a viscoelastic dough and then, fermented at 30°C for 30 mins. The dough was rolled, rounded and placed in a baking dish, and baked in an oven (Gas Bakery Oven RFL-12C model) at 180°C for 30 mins.

2.4 Evaluation of bread characteristics

2.4.1 Physicochemical analysis

The physical properties analysis of the bread: specific loaf volume according to AACC (2000), color by using color reader (Konica Minolta CR-10, Konica Minolta Optics, Inc., Japan) and texture profiles including hardness, cohesiveness and springiness by using texture analyzer with cylinder probe P36R (TA-XT plus, Exponent Lite software). The chemical analysis of moisture, ash, protein, and crude fiber contents analysis refer to the AOAC method (AOAC 925.10, AOAC 923.03, AOAC 984.13 and AOAC 978.10 respectively). Total phenolic content analysis was conducted according to Lee *et al*. (2008).

2.4.2 Sensory evaluation

Sensory evaluation of the bread was conducted by using the hedonic method (Stone and Sidel, 2004). A 7-point scoring was used with 1 representing extremely dislike and 7 representing extremely like. Forty untrained panelists participated in the sensory evaluation and had no previous or present taste or smell disorders. Bread samples were labeled with three-digit codes and randomly presented to avoid bias of order of presentation. The panelists scored for colour, texture, aroma, taste and overall preferences of the bread from the four formulas. The study was in accordance with the Declaration of Helsinki (Anon., 2017).

2.5 Statistical analysis

The experiments were conducted triplicate. The obtained data were subjected to analysis of variance (ANOVA) with α = 5% and followed by the Duncan Multiple Range Test (DMRT) with α = 5%. SPSS (version 19.0) were used in the analysis.

3. Results and discussion

3.1 Physicochemical characteristics

Bread made from four different formulas were visually different in their height and colour (Figure 1). Incorporating RB alone or combination with MFDS into the formula affected the specific loaf volume, colour, hardness, cohesiveness and springiness (Table 1), ash, protein, crude fiber and total phenolic content (Table 2) of the bread significantly ($p<0.05$). These results indicated that existence of rice bran in the formula contributed significantly in the colour, structure and texture properties of the bread. Specific loaf volume of bread with RB and MFDS-RB incorporation were higher than those of control and with MFDS ($p<0.05$). This results may be related to the fiber content in rice bran which has high water absorption capacity, as reported by Rafe *et al.* (2017). These results reflected that rice bran reduced the fermentation and proofing rates of dough, which related to the water availability for yeast activity. In the breadmaking, proteins in wheat flour need water to form gluten, which then contributed to form the viscoelastic matrix that can stretch properly by CO_2 during fermentation and proofing. The high fiber content in the bread dough with RB incorporation can reduce water availability in the system for the gluten formation, which causes the dough unable to stretch properly by CO_2. Durian seed contains high amount of gum with high water absorption capacity of 1112.15% (Cornelia *et al.*, 2015). However, the MFDS incorporation does not affect significantly on the specific loaf volume, may be due to the MFDS incorporated in low amount.

Figure 1. Picture of bread with MFDS and RB incorporation. P1: Control; P2: MFDS; P3: RB; and P4: MFDS+RB

Bread with RB and MFDS-RB incorporation was visually darker brown than those of bread with MFDS only. Colour measurement by using colour reader (Table 1) also show that L* of crumb of bread in which rice bran presence was higher than those of control and with MFDS alone. Sharma *et al.* (2004) also found the similar result that rice bran becomes darker after extrusion

Table 1. Physical characteristics of bread with MFDS and RB incorporation**

Bread formula	Specific volume (cm^3/g)	Colour			Texture profile		
		L*	a*	b*	Hardness (g)	Cohesiveness	Springiness
Control	5.45^b	75.54^b	0.41^a	11.18^a	128.89^a	0.80^b	0.91^b
MFDS	5.03^b	72.56^b	1.24^b	9.94^a	160.81^a	0.79^b	0.93^b
RB	3.78^a	66.57^a	3.82^c	18.18^b	643.54^b	0.65^a	0.81^a
MFDS+RB	3.91^a	68.4^a	4.31^c	18.43^b	784.46^b	0.64^a	0.78^a

* L = lightness, a = redness, b = yellowness
**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

Table 2. Chemical composition of bread with MFDS and RB incorporation

Bread formula	Moisture (%)	Ash (%)	Protein (%)	Crude fiber (%)	Total phenolic (%)
Control	36.15^a	1.05^a	9.29^a	0.10^a	0.138^a
MFDS	37.24^a	1.06^a	8.83^a	0.12^a	0.168^{ab}
RB	37.35^a	1.50^b	8.57^a	0.24^{ab}	0.197^b
MFDS+RB	37.65^a	1.49^b	8.60^a	0.37^b	0.193^b

**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

cooking, that occurred may be due to the browning reaction mainly Maillard during the heating process. The presence of high fiber and pheophytin in the rice bran may also contribute to the darker formation (Aung *et al*., 2014; Hussien *et al*., 2017). MFDS incorporation affected only on the redness value, higher red value is resulted by the MFDS presence. The MFDS contain red pigments produced during the Monascus solid state fermentation (Srianta *et al*., 2012).

Hardness, cohesiveness and springiness of bread with MFDS incorporation was not significantly different with the control (p>0.05), but those properties were significantly different with the bread with RB presence. Bread dough with RB incorporation increased the water absorption requirement. The high fiber content of the rice bran causes high water absorption capacity of the bread dough. The limited gluten formed in the dough, the heavy loaves bread obtained. This may be related to higher hardness values and lower cohesiveness and springiness values, which is in close agreement with Lima *et al.* (2002).

RB and MFDS+RB incorporation affected ash, crude fiber and total phenolic contents in the bread significantly (p<0.05). This results related to the chemical composition of rice bran that high contents in ash, fiber and phenolic compounds. MFDS contain phenolic compound (Srianta *et al*., 2014), but the bread with MFDS incorporation was not significantly different with the control (p>0.05). This may be due to the low level of MFDS incorporated into the bread dough.

3.2. Sensory characteristics

The overall preference scores of the bread with RB and MFDS+RB were significantly different with the control and with MFDS only (Table 3). Overall preference was determined on the basis of colour, aroma, texture and taste. Panelists gave lower scores to the bread's colour in which RB presence. Interestingly, there were no significant different of aroma and taste preferences among control, with MFDS incorporation and with RB incorporation.

Table 3. Sensory characteristics of bread with MFDS and RB incorporation

Bread formula	Preference				
	Colour	Aroma	Texture	Taste	Overall
Control	5.80^c	5.03^b	5.30^c	5.05^b	5.20^c
MFDS	6.08^c	4.48^{ab}	4.48^b	4.80^b	5.20^c
RB	3.80^b	4.80^b	5.13^c	4.48^b	4.48^b
MFDS+RB	2.53^a	4.05^a	3.35^a	3.15^a	3.88^a

**Values are means ± standard deviations (n=40 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

4. Conclusion

Incorporating MFDS did not significantly affect almost all of the physicochemical and sensory characteristics of bread, whereas the incorporating RB affected significantly on those properties. The bread are being in further evaluation of the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

Acknowledgment

Thanks to Ministry of Research, Technology and Higher Education, the Republic of Indonesia for the financial support through competitive research Penelitian Terapan Unggulan Perguruan Tinggi with contract number of 115AE/WM01.5/N/2018.

References

AACC. (2000). Approved Methods of the American Association of Cereal Chemist. 10th ed. St. Paul, MN: American Association of Cereal Chemists.

Anon. (2017). Declaration of Helsinki. France: World Medical Association

AOAC. (1990). Official Methods of Analysis of the Association of Official Analytical Chemists. 15th ed. Arlington, Virginia: Association of Official Analytical Chemists Inc.

Aung, L.L., Tertre, E., Worasith, N., Suksabye, P. and Thiravetyan, P. (2014). The capacity of activated kaolins to remove colour pigments from rice bran oil: the effect of acid concentration and pre-heating prior to activation. *Clay Minerals,* 49(4), 513-526. https://doi.org/10.1180/claymin.2014.049.4.02

Conforti, F.D. and Davis, S.F. (2006). The effect of soya flour and flaxseed as a partial replacement for bread flour in yeast bread. *International Journal of Food Science*, 41(s2), 95-101. https://doi.org/10.1111/j.1365-2621.2006.01410.x

Cornelia, M., Siratantri, T. and Prawita, R. (2015). Utilization of extract durian (*Durio zibethinus L.*) seed gum as an emulsifier in vegan mayonnaise. *Procedia Food Science*, 3(2015), 1-18. https://doi.org/10.1016/j.profoo.2015.01.001

Das, L., Raychaudhuri, U. and Chakraborty, R. (2012). Supplementation of common white bread by coriander leaf powder. *Food Science and Biotechnology*, 21(2), 425-433. https://doi.org/10.1007/s10068-012-0054-9

Hardoko., Hendarto, L. and Siregar, T.M. (2010). Pemanfaatan ubi jalar ungu (*Ipomoea batatas L. Poir*) sebagai pengganti sebagian tepung terigu dan sumber antioksidan pada roti tawar (In Bahasa Indonesia). *Jurnal Teknologi dan Industri Pangan*, 21(1), 25 – 32.

Hussien, A.M.S., Abbas, H.M., Bayoumi, H.M. and El-Aziz, M.A. (2017). Properties of full fat rice bran and yoghurt fortified with it. *International Journal of Dairy Science*, 12(3), 170- 176. https://doi.org/10.3923/ijds.2017.170.176

Lee, Y.L., Yang, J.H. and Mau, J.L. (2008). Antioxidant properties of water extract from *Monascus* fermented soybeans. *Food Chemistry*, 106(3), 1128-1137. https://doi.org/10.1016/j.foodchem.2007.07.047

Lima, I., Guaraya, H. and Champagne, E. (2002). The functional effectiveness of reprocessed rice bran as an ingredient in bakery product. *Nahrung*, 46(2), 112 – 117. https://doi.org/10.1002/1521-3803(20020301)46:2<112::AID-FOOD112>3.0.CO;2-N

Meral, R. and Dogan, I.S. (2013). Quality and antioxidant activity of bread fortified with flaxseed. *Italian Journal of Food Science*, 25(1), 51 – 56.

Nugerahani, I., Sutedja, A.M., Srianta, I., Widharna, R.M. and Marsono, Y. (2017). In vivo evaluation of Monascus-fermented durian seed for antidiabetic and antihypercholesterol agent. *Food Research,* 1(3), 83-88. https://doi.org/10.26656/fr.2017.3.023

Qureshi, A.A., Sami, S.A. and Khan, F.A. (2002). Effects of stabilized rice bran, its soluble and fiber fractions on blood glucose levels and serum lipid parameters in humans with diabetes mellitus Types I and II. *Journal of Nutritional Biochemistry,* 13(3), 175-187. https://doi.org/10.1016/S0955-2863(01)00211-X

Rafe, A., Sadeghian, A. and Hoseini-Yazdi, S.Z. (2017). Physicochemical, functional, and nutritional characteristics of stabilized rice bran from tarom cultivar. *Food Science and Nutrition*, 5(3), 407 – 414. https://doi.org/10.1002/fsn3.407

Sharma, H.R., Chauhan, G.S. and Agrawal, K. (2004). Physico-chemical characteristics of rice bran processed by dry heating and extrusion cooking. *International Journal of Food Properties*, 7(3), 603 – 614. https://doi.org/10.1081/JFP-200033047.

Sivam, A.S., Waterhouse, D.S., Quek, S. and Perera, C. O. (2016). Properties of bread dough with added fiber polysaccharides and phenolics antioxidant: a review. *Journal of Food Science,* 75(8), 163 – 174. https://doi.org/10.1111/j.1750-3841.2010.01815.x

Srianta, I., Novita, Y. and Kusumawati, N. (2012). Production of *Monascus* pigments on durian seed: effect of supplementation of carbon source. *Journal of Pure and Applied Microbiology*, 6(1), 59-63.

Srianta, I., Hendrawan, B., Kusumawati, N. and Blanc, P.J. (2012). Study on durian seed as a new substrate for angkak production. *International Food Research Journal,* 19(3), 941-945.

Srianta, I., Kusumawati, N., Nugerahani, I., Artanti, N. and Xu, G.R. (2013). *In vitro* α-glucosidase inhibitory activity of *Monascus*-fermented durian seed extracts. *International Food Research Journal,* 20(2), 533 - 536.

Srianta, I., Nugerahani, I., Kusumawati, N., Suryatanijaya, E., Subianto, C., Tewfik, S. and Tewfik, I. (2014). Therapeutic antioxidant activity of *Monascus*-fermented durian seed: a potential functional food ingredient. *International Journal of Food, Nutrition and Public Health,* 7(1), 53 - 59.

Stone, H. and Sidel. J. (2004). Sensory evaluation practices. 3rd ed. Redwood City: Academic Press.

Suleria, H.A.R., Khalid, N., Sultan, S., Raza, A., Muhammad, A. and Abbas, M. (2015). Functional

and nutraceutical bread prepared by using aqueous garlic extract. *Internet Journal of Food Safety*, 17 (2015), 10 – 20.

Trisnawati, C.Y. and Sutedja, A.M. (2010). Pemanfaatan Beras dan Bekatul Beras dalam Pembuatan Cake (In Bahasa Indonesia). *Prosiding Seminar Nasional Teknik Kimia Soebardjo Brotohardjono VII: Ketahanan Pangan dan Energi,* A3(1-7).

Wang, R., Zhou, W. and Isabelle, M. (2007). Comparison study of the effect of green tea extract (GTE) on the quality of bread by instrumental analysis and sensory evaluation. *Food Research International*, 40(4), 470 – 479. https://doi.org/10.1016/j.foodres.2006.07.007

Zielinski, H., Michalska, A., Ceglinska, A. and Lamparski, G. (2008). Antioxidant properties and sensory quality of traditional rye bread as affected by the incorporation of flour with different extraction rate in the formulation. *European Food Research and Technology*, 226(4), 671 – 680. https://doi.org/10.1007/s00217-007-0576-1

9.

Bukti konfirmasi revisi galley proof artikel dan galley proof artikel setelah revisi pertama

(7 Februari 2019)

FR-2019-015-galley proof-revise

mail.google.com/mail/u/0/#search/myfoodresearch/KtbxLwHHnSrPtrhMDPskkzmFjKtxCjhmkg

Gmail

myfoodresearch

Active

Compose

Mail

Chat

Spaces

Meet

Inbox 186

Starred

Snoozed

Sent

Drafts 5

More

Labels

13 of 19

Food Research <foodresearch.my@outlook.com> Thu, Feb 7, 2019, 4:12 PM

to me

Dear Chatarina,

Noted. I have edited the galley proof. For the sentence in the abstract, I have corrected the grammar as sentences should be in past tense.
Please check.
I look forward to the approval of the galley proof.

Thanks & Regards,
Vivian New
Editor
Food Research
Indexed in **Scopus, i-journal, i-focus, Index Copernicus International, DOAJ, ROAD, Scholarsteer, MYCITE, DRJI and J-Gate**
Email: foodresearch.my@outlook.com
Website: www.myfoodresearch.com

From: Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id>
Sent: Wednesday, 6 February, 2019 10:58 PM
To: foodresearch.my@outlook.com

FR-2019-015.doc

Sertifikat JTPG Sint....pdf

Show all

Type here to search

Huja...

16:46
28/01/2023

Food Research (2019) : pp - pp
Journal homepage: http://www.myfoodresearch.com

FOOD RESEARCH

SHORT COMMUNICATION

Incorporating *Monascus*-fermented durian seeds and rice bran into bread: study on the bread physicochemical and sensory properties

[1,*]Trisnawati, C.Y., [1]Srianta, I., [1]Nugerahani , I. and [2]Marsono, Y.

[1]*Department of Food Technology, Widya Mandala Catholic University Surabaya, Jalan Dinoyo 42 – 44 Surabaya, Indonesia 61265*
[2]*Department of Food and Agricultural Product Technology, Gadjah Mada University, Jalan Flora, Bulaksumur, Yogyakarta Indonesia*

Article history:
Received: 19 January 2019
Received in revised form: 26 January 2019
Accepted: 27 January 2019
Available Online:

Keywords:
Bread,
Monascus-fermented durian seeds,
Rice bran,
Physicochemical properties,
Sensory properties

DOI:
ffgf

Abstract

Monascus-fermented durian seeds (MFDS) and rice bran (RB) have been incorporated into bread dough formulation. This research was aimed at physicochemical and sensory evaluation of bread formulated with both active ingredients. Bread made from four dough formulas i.e. control, with MFDS, RB and MFDS-RB-incorporating have been evaluated the physicochemical and sensory properties. The results suggested that no significant differences on both physicochemical and sensory properties of bread with MFDS-incorporating and control ($p>0.05$). Ash, crude fiber and total phenolic contents found on bread with RB and MFDS-RB incorporating were significantly higher than those of control ($p<0.05$). The bread was being in further evaluation of the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

1. Introduction

Bread is one of the oldest foods and popular around the world. In the breadmaking, wheat flour, water, salt, sugar and yeast are mixed into viscoelastic dough subjected to fermentation and baking (Sivam *et al*., 2010). Incorporating active ingredients into bread have grown rapidly, since the increased consumer awareness of health. Purple sweet potato flour, soy flour, flaxseed, green tea extract, whole grain rye, coriander leaf powder, grape seed and garlic have been incorporated into bread (Conforti and Davis, 2006; Wang *et al*., 2007; Zielinski *et al*., 2007; Hardoko *et al*., 2010; Das *et al*., 2012; Meral and Dogan, 2013; Suleria *et al*., 2015).

Monascus fermented-durian seed is a product of solid state fermentation with *Monascus purpureus* culture on durian seed substrate (Srianta, Novita and Kusumawati, 2012; Srianta *et al*., 2012). The MFDS potential as an anti-diabetes agent with α-glucosidase inhibition, antioxidant and in vivo anti-hyperglycemic activities (Srianta *et al*., 2013; Srianta *et al*., 2014; Nugerahani *et al*., 2017). MFDS has not been incorporated into food product. On the other hand, rice bran is also known as a potential ingredient for the development of anti-diabetic food. Qureshi *et al*. (2002) reported that consumption of 20 g of rice bran can reduce blood glucose levels in patients with type I and II diabetes mellitus. The content of tocopherol, tocotrienol, oryzanol, and polyphenols in rice bran also plays a role in controlling blood sugar levels. Trisnawati and Sutedja (2010) reported that rice bran has been used in the development of functional food products, i.e. cake with rice flour.

The aim of this research was to study the physicochemical and sensory properties of bread with *Monascus*-fermented durian seeds and rice bran incorporation.

2. Materials and methods

2.1 Materials, microorganism and chemicals

All ingredients except MFDS were obtained from local distributors. MFDS was prepared in the laboratory. Durian seeds were obtained from durian processing home industry. *Monascus purpureus* M9 was used in the MFDS preparation. It was maintained and subcultured on PDA monthly. All chemicals were analytical grade obtained from local distributors.

2.2 Preparation of Monascus-fermented durian seeds

Monascus-fermented durian seeds were prepared according to our previous research (Srianta *et al*., 2012a). Durian seeds were prepared by boiling, peeling, cutting and sterilization. After that, the 50 g of sterilized

*Corresponding author.
Email: *chatarina@ukwms.ac.id*

eISSN: 2550-2166 /

durian seeds cut were inoculated with 7-days *Monascus purpureus* starter with a total spore of about 10^5 spores/mL. Incubation was carried out at room temperature (± 30°C) for 14 days, then dried at 45°C for 24 hours. The dried MFDS was ground to obtain powder form. The MFDS was used as an ingredient in bread formulation.

2.3 Bread formulation and processing

Four bread formulas were: 1) control, consist of 200 g of wheat flour, 10 g of sugar, 8 g of margarine, 2 g of salt, 0.6 g of bread improver, 3 g of baker yeast and 124 g of water; 2) MFDS, consist of those of control ingredients with MFDS incorporating at 0.15 g; 3) RB, consist of those of control ingredients with RB incorporating at 20 g; and 4) MFDS+RB, consist of those of control ingredients with MFDS and RB incorporating at 0.15 g and 20 g.

The ingredients were mixed in a mixer (Phillips HR 1559 model) until it becomes a viscoelastic dough and then, fermented at 30°C for 30 mins. The dough was rolled, rounded and placed in a baking dish, and baked in an oven (Gas Bakery Oven RFL-12C model) at 180°C for 30 mins.

2.4 Evaluation of bread characteristics

2.4.1 Physicochemical analysis

The physical properties analysis of the bread: specific loaf volume according to AACC (2000), color by using color reader (Konica Minolta CR-10, Konica Minolta Optics, Inc., Japan) and texture profiles including hardness, cohesiveness and springiness by using texture analyzer with cylinder probe P36R (TA-XT plus, Exponent Lite software). The chemical analysis of moisture, ash, protein, and crude fiber contents analysis refer to the AOAC method (AOAC 925.10, AOAC 923.03, AOAC 984.13 and AOAC 978.10 respectively). Total phenolic content analysis was conducted according to Lee *et al*. (2008).

2.4.2 Sensory evaluation

Sensory evaluation of the bread was conducted by using the hedonic method (Stone and Sidel, 2004). A 7-point scoring was used with 1 representing extremely dislike and 7 representing extremely like. Forty untrained panelists participated in the sensory evaluation and had no previous or present taste or smell disorders. Bread samples were labeled with three-digit codes and randomly presented to avoid bias of order of presentation. The panelists scored for colour, texture, aroma, taste and overall preferences of the bread from the four formulas. The study was in accordance with the Declaration of Helsinki (Anon., 2017).

2.5 Statistical analysis

The experiments were conducted triplicate. The obtained data were subjected to analysis of variance (ANOVA) with α = 5% and followed by the Duncan Multiple Range Test (DMRT) with α = 5%. SPSS (version 19.0) were used in the analysis.

3. Results and discussion

3.1 Physicochemical characteristics

Bread made from four different formulas were visually different in their height and colour (Figure 1). Incorporating RB alone or combination with MFDS into the formula affected the specific loaf volume, colour, hardness, cohesiveness and springiness (Table 1), ash, protein, crude fiber and total phenolic content (Table 2) of the bread significantly ($p<0.05$). These results indicated that existence of rice bran in the formula contributed significantly in the colour, structure and texture properties of the bread. Specific loaf volume of bread with RB and MFDS-RB incorporation were higher than those of control and with MFDS ($p<0.05$). This results may be related to the fiber content in rice bran which has high water absorption capacity, as reported by Rafe *et al.* (2017). These results reflected that rice bran reduced the fermentation and proofing rates of dough, which related to the water availability for yeast activity. In the breadmaking, proteins in wheat flour need water to form gluten, which then contributed to form the viscoelastic matrix that can stretch properly by CO_2 during fermentation and proofing. The high fiber content in the bread dough with RB incorporation can reduce water availability in the system for the gluten formation, which causes the dough unable to stretch properly by CO_2. Durian seed contains high amount of gum with high water absorption capacity of 1112.15% (Cornelia *et al.*, 2015). However, the MFDS incorporation does not affect significantly on the specific loaf volume, may be due to the MFDS incorporated in low amount.

Figure 1. Picture of bread with MFDS and RB incorporation. P1: Control; P2: MFDS; P3: RB; and P4: MFDS+RB

Bread with RB and MFDS-RB incorporation was visually darker brown than those of bread with MFDS only. Colour measurement by using colour reader (Table 1) also show that L* of crumb of bread in which rice bran presence was higher than those of control and with MFDS alone. Sharma *et al.* (2004) also found the similar result that rice bran becomes darker after extrusion

Table 1. Physical characteristics of bread with MFDS and RB incorporation**

Bread formula	Specific volume (cm^3/g)	Colour			Texture profile		
		L*	a*	b*	Hardness (g)	Cohesiveness	Springiness (mm)
Control	5.45^b	75.54^b	0.41^a	11.18^a	128.89^a	0.80^b	0.91^b
MFDS	5.03^b	72.56^b	1.24^b	9.94^a	160.81^a	0.79^b	0.93^b
RB	3.78^a	66.57^a	3.82^c	18.18^b	643.54^b	0.65^a	0.81^a
MFDS+RB	3.91^a	68.4^a	4.31^c	18.43^b	784.46^b	0.64^a	0.78^a

* L = lightness, a = redness, b = yellowness

**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

Table 2. Chemical composition of bread with MFDS and RB incorporation

Bread formula	Moisture (%)	Ash (%)	Protein (%)	Crude fiber (%)	Total phenolic (%)
Control	36.15^a	1.05^a	9.29^a	0.10^a	0.138^a
MFDS	37.24^a	1.06^a	8.83^a	0.12^a	0.168^{ab}
RB	37.35^a	1.50^b	8.57^a	0.24^{ab}	0.197^b
MFDS+RB	37.65^a	1.49^b	8.60^a	0.37^b	0.193^b

**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

cooking, that occurred may be due to the browning reaction mainly Maillard during the heating process. The presence of high fiber and pheophytin in the rice bran may also contribute to the darker formation (Aung *et al*., 2014; Hussien *et al*., 2017). MFDS incorporation affected only on the redness value, higher red value is resulted by the MFDS presence. The MFDS contain red pigments produced during the Monascus solid state fermentation (Srianta *et al*., 2012).

Hardness, cohesiveness and springiness of bread with MFDS incorporation was not significantly different with the control ($p>0.05$), but those properties were significantly different with the bread with RB presence. Bread dough with RB incorporation increased the water absorption requirement. The high fiber content of the rice bran causes high water absorption capacity of the bread dough. The limited gluten formed in the dough, the heavy loaves bread obtained. This may be related to higher hardness values and lower cohesiveness and springiness values, which is in close agreement with Lima *et al.* (2002).

RB and MFDS+RB incorporation affected ash, crude fiber and total phenolic contents in the bread significantly ($p<0.05$). This results related to the chemical composition of rice bran that high contents in ash, fiber and phenolic compounds. MFDS contain phenolic compound (Srianta *et al*., 2014), but the bread with MFDS incorporation was not significantly different with the control ($p>0.05$). This may be due to the low level of MFDS incorporated into the bread dough.

3.2. Sensory characteristics

The overall preference scores of the bread with RB and MFDS+RB were significantly different with the control and with MFDS only (Table 3). Overall preference was determined on the basis of colour, aroma, texture and taste. Panelists gave lower scores to the bread's colour in which RB presence. Interestingly, there were no significant different of aroma and taste preferences among control, with MFDS incorporation and with RB incorporation.

Table 3. Sensory characteristics of bread with MFDS and RB incorporation

Bread formula	Preference				
	Colour	Aroma	Texture	Taste	Overall
Control	5.80^c	5.03^b	5.30^c	5.05^b	5.20^c
MFDS	6.08^c	4.48^{ab}	4.48^b	4.80^b	5.20^c
RB	3.80^b	4.80^b	5.13^c	4.48^b	4.48^b
MFDS+RB	2.53^a	4.05^a	3.35^a	3.15^a	3.88^a

**Values are means ± standard deviations (n=40 for each group). Values in a column with the same letters are not significantly ($p>0.05$) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test ($\alpha = 0.05$).

4. Conclusion

Incorporating MFDS did not significantly affect almost all of the physicochemical and sensory characteristics of bread, whereas the incorporating RB affected significantly on those properties. The bread are being in further evaluation of the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

Acknowledgment

Thanks to Ministry of Research, Technology and Higher Education, the Republic of Indonesia for the financial support through competitive research Penelitian Terapan Unggulan Perguruan Tinggi with contract number of 115AE/WM01.5/N/2018.

References

AACC. (2000). Approved Methods of the American Association of Cereal Chemist. 10th ed. St. Paul, MN: American Association of Cereal Chemists.

Anon. (2017). Declaration of Helsinki. France: World Medical Association

AOAC. (1990). Official Methods of Analysis of the Association of Official Analytical Chemists. 15th ed. Arlington, Virginia: Association of Official Analytical Chemists Inc.

Aung, L.L., Tertre, E., Worasith, N., Suksabye, P. and Thiravetyan, P. (2014). The capacity of activated kaolins to remove colour pigments from rice bran oil: the effect of acid concentration and pre-heating prior to activation. *Clay Minerals,* 49(4), 513-526. https://doi.org/10.1180/claymin.2014.049.4.02

Conforti, F.D. and Davis, S.F. (2006). The effect of soya flour and flaxseed as a partial replacement for bread flour in yeast bread. *International Journal of Food Science*, 41(s2), 95-101. https://doi.org/10.1111/j.1365-2621.2006.01410.x

Cornelia, M., Siratantri, T. and Prawita, R. (2015). Utilization of extract durian (*Durio zibethinus L.*) seed gum as an emulsifier in vegan mayonnaise. *Procedia Food Science*, 3(2015), 1-18. https://doi.org/10.1016/j.profoo.2015.01.001

Das, L., Raychaudhuri, U. and Chakraborty, R. (2012). Supplementation of common white bread by coriander leaf powder. *Food Science and Biotechnology*, 21(2), 425-433. https://doi.org/10.1007/s10068-012-0054-9

Hardoko., Hendarto, L. and Siregar, T.M. (2010). Pemanfaatan ubi jalar ungu (*Ipomoea batatas L. Poir*) sebagai pengganti sebagian tepung terigu dan sumber antioksidan pada roti tawar (In Bahasa Indonesia). *Jurnal Teknologi dan Industri Pangan*, 21(1), 25 – 32.

Hussien, A.M.S., Abbas, H.M., Bayoumi, H.M. and El-Aziz, M.A. (2017). Properties of full fat rice bran and yoghurt fortified with it. *International Journal of Dairy Science*, 12(3), 170- 176. https://doi.org/10.3923/ijds.2017.170.176

Lee, Y.L., Yang, J.H. and Mau, J.L. (2008). Antioxidant properties of water extract from *Monascus* fermented soybeans. *Food Chemistry*, 106(3), 1128-1137. https://doi.org/10.1016/j.foodchem.2007.07.047

Lima, I., Guaraya, H. and Champagne, E. (2002). The functional effectiveness of reprocessed rice bran as an ingredient in bakery product. *Nahrung*, 46(2), 112 – 117. https://doi.org/10.1002/1521-3803(20020301)46:2<112::AID-FOOD112>3.0.CO;2-N

Meral, R. and Dogan, I.S. (2013). Quality and antioxidant activity of bread fortified with flaxseed. *Italian Journal of Food Science*, 25(1), 51 – 56.

Nugerahani, I., Sutedja, A.M., Srianta, I., Widharna, R.M. and Marsono, Y. (2017). In vivo evaluation of Monascus-fermented durian seed for antidiabetic and antihypercholesterol agent. *Food Research,* 1(3), 83-88. https://doi.org/10.26656/fr.2017.3.023

Qureshi, A.A., Sami, S.A. and Khan, F.A. (2002). Effects of stabilized rice bran, its soluble and fiber fractions on blood glucose levels and serum lipid parameters in humans with diabetes mellitus Types I and II. *Journal of Nutritional Biochemistry,* 13(3), 175-187. https://doi.org/10.1016/S0955-2863(01)00211-X

Rafe, A., Sadeghian, A. and Hoseini-Yazdi, S.Z. (2017). Physicochemical, functional, and nutritional characteristics of stabilized rice bran from tarom cultivar. *Food Science and Nutrition*, 5(3), 407 – 414. https://doi.org/10.1002/fsn3.407

Sharma, H.R., Chauhan, G.S. and Agrawal, K. (2004). Physico-chemical characteristics of rice bran processed by dry heating and extrusion cooking. *International Journal of Food Properties*, 7(3), 603 – 614. https://doi.org/10.1081/JFP-200033047.

Sivam, A.S., Waterhouse, D.S., Quek, S. and Perera, C. O. (2016). Properties of bread dough with added fiber polysaccharides and phenolics antioxidant: a review. *Journal of Food Science,* 75(8), 163 – 174. https://doi.org/10.1111/j.1750-3841.2010.01815.x

Srianta, I., Novita, Y. and Kusumawati, N. (2012). Production of *Monascus* pigments on durian seed: effect of supplementation of carbon source. *Journal of Pure and Applied Microbiology*, 6(1), 59-63.

Srianta, I., Hendrawan, B., Kusumawati, N. and Blanc, P.J. (2012). Study on durian seed as a new substrate for angkak production. *International Food Research Journal,* 19(3), 941-945.

Srianta, I., Kusumawati, N., Nugerahani, I., Artanti, N. and Xu, G.R. (2013). *In vitro* α-glucosidase inhibitory activity of *Monascus*-fermented durian seed extracts. *International Food Research Journal,* 20(2), 533 - 536.

Srianta, I., Nugerahani, I., Kusumawati, N., Suryatanijaya, E., Subianto, C., Tewfik, S. and Tewfik, I. (2014). Therapeutic antioxidant activity of *Monascus*-fermented durian seed: a potential functional food ingredient. *International Journal of Food, Nutrition and Public Health,* 7(1), 53 - 59.

Stone, H. and Sidel. J. (2004). Sensory evaluation practices. 3rd ed. Redwood City: Academic Press.

Suleria, H.A.R., Khalid, N., Sultan, S., Raza, A., Muhammad, A. and Abbas, M. (2015). Functional

and nutraceutical bread prepared by using aqueous garlic extract. *Internet Journal of Food Safety*, 17 (2015), 10 – 20.

Trisnawati, C.Y. and Sutedja, A.M. (2010). Pemanfaatan Beras dan Bekatul Beras dalam Pembuatan Cake (In Bahasa Indonesia). *Prosiding Seminar Nasional Teknik Kimia Soebardjo Brotohardjono VII: Ketahanan Pangan dan Energi,* A3(1-7).

Wang, R., Zhou, W. and Isabelle, M. (2007). Comparison study of the effect of green tea extract (GTE) on the quality of bread by instrumental analysis and sensory evaluation. *Food Research International*, 40(4), 470 – 479. https://doi.org/10.1016/j.foodres.2006.07.007

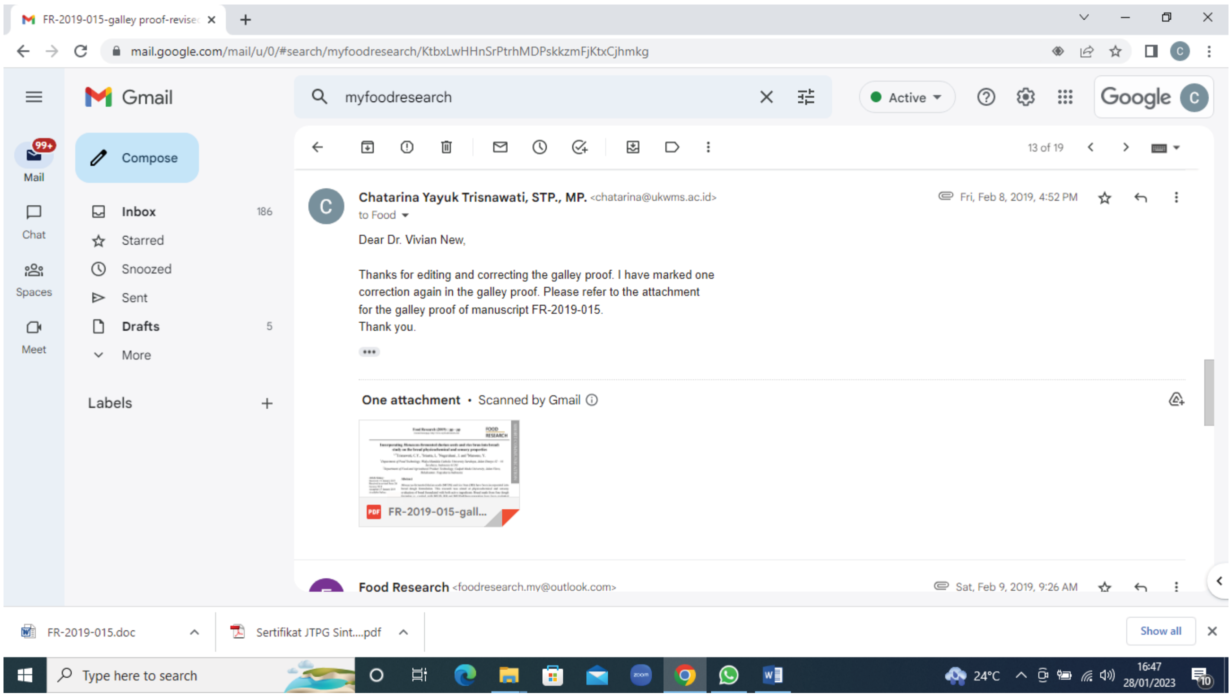
Zielinski, H., Michalska, A., Ceglinska, A. and Lamparski, G. (2008). Antioxidant properties and sensory quality of traditional rye bread as affected by the incorporation of flour with different extraction rate in the formulation. *European Food Research and Technology*, 226(4), 671 – 680. https://doi.org/10.1007/s00217-007-0576-1

eISSN: 2550-2166

10.

Bukti konfimasi submit galley proof hasil revisi kedua

(8 Februari 2019)


FR-2019-015-galley proof-revise
mail.google.com/mail/u/0/#search/myfoodresearch/KtbxLwHHnSrPtrhMDPskkzmFjKtxCjhmkg
Gmail
myfoodresearch
Active
Compose
Mail
Chat
Spaces
Meet
Inbox 186
Starred
Snoozed
Sent
Drafts 5
More
Labels
13 of 19
Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id>
to Food
Fri, Feb 8, 2019, 4:52 PM
Dear Dr. Vivian New,
Thanks for editing and correcting the galley proof. I have marked one correction again in the galley proof. Please refer to the attachment for the galley proof of manuscript FR-2019-015.
Thank you.
One attachment • Scanned by Gmail
FR-2019-015-gall...
Food Research <foodresearch.my@outlook.com>
Sat, Feb 9, 2019, 9:26 AM
FR-2019-015.doc
Sertifikat JTPG Sint....pdf
Show all
Type here to search
24°C
16:47
28/01/2023

Food Research (2019) : pp - pp
Journal homepage: http://www.myfoodresearch.com

FOOD RESEARCH

SHORT COMMUNICATION

Incorporating *Monascus*-fermented durian seeds and rice bran into bread: study on the bread physicochemical and sensory properties

[1,*]Trisnawati, C.Y., [1]Srianta, I., [1]Nugerahani , I. and [2]Marsono, Y.

[1]*Department of Food Technology, Widya Mandala Catholic University Surabaya, Jalan Dinoyo 42 – 44 Surabaya, Indonesia 61265*

[2]*Department of Food and Agricultural Product Technology, Gadjah Mada University, Jalan Flora, Bulaksumur, Yogyakarta Indonesia*

Article history:
Received: 19 January 2019
Received in revised form: 26 January 2019
Accepted: 27 January 2019
Available Online:

Keywords:
Bread,
Monascus-fermented durian seeds,
Rice bran,
Physicochemical properties,
Sensory properties

DOI:
ffgf

Abstract

Monascus-fermented durian seeds (MFDS) and rice bran (RB) have been incorporated into bread dough formulation. This research was aimed at physicochemical and sensory evaluation of bread formulated with both active ingredients. Bread made from four dough formulas i.e. control, with MFDS, RB and MFDS-RB-incorporating have been evaluated the physicochemical and sensory properties. The results suggested that no significant differences on both physicochemical and sensory properties of bread with MFDS-incorporating and control ($p>0.05$). Ash, crude fiber and total phenolic contents found on bread with RB and MFDS-RB incorporating were significantly higher than those of control ($p<0.05$). The bread was being in further evaluation of the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

1. Introduction

Bread is one of the oldest foods and popular around the world. In the breadmaking, wheat flour, water, salt, sugar and yeast are mixed into viscoelastic dough subjected to fermentation and baking (Sivam *et al*., 2010). Incorporating active ingredients into bread have grown rapidly, since the increased consumer awareness of health. Purple sweet potato flour, soy flour, flaxseed, green tea extract, whole grain rye, coriander leaf powder, grape seed and garlic have been incorporated into bread (Conforti and Davis, 2006; Wang *et al*., 2007; Zielinski *et al*., 2007; Hardoko *et al*., 2010; Das *et al*., 2012; Meral and Dogan, 2013; Suleria *et al*., 2015).

Monascus fermented-durian seed is a product of solid state fermentation with *Monascus purpureus* culture on durian seed substrate (Srianta, Novita and Kusumawati, 2012; Srianta *et al*., 2012). The MFDS potential as an anti-diabetes agent with α-glucosidase inhibition, antioxidant and in vivo anti-hyperglycemic activities (Srianta *et al*., 2013; Srianta *et al*., 2014; Nugerahani *et al*., 2017). MFDS has not been incorporated into food product. On the other hand, rice bran is also known as a potential ingredient for the development of anti-diabetic food. Qureshi *et al*. (2002) reported that consumption of 20 g of rice bran can reduce blood glucose levels in patients with type I and II diabetes mellitus. The content of tocopherol, tocotrienol, oryzanol, and polyphenols in rice bran also plays a role in controlling blood sugar levels. Trisnawati and Sutedja (2010) reported that rice bran has been used in the development of functional food products, i.e. cake with rice flour.

The aim of this research was to study the physicochemical and sensory properties of bread with *Monascus*-fermented durian seeds and rice bran incorporation.

2. Materials and methods

2.1 Materials, microorganism and chemicals

All ingredients except MFDS were obtained from local distributors. MFDS was prepared in the laboratory. Durian seeds were obtained from durian processing home industry. *Monascus purpureus* M9 was used in the MFDS preparation. It was maintained and subcultured on PDA monthly. All chemicals were analytical grade obtained from local distributors.

2.2 Preparation of Monascus-fermented durian seeds

Monascus-fermented durian seeds were prepared according to our previous research (Srianta *et al*., 2012a). Durian seeds were prepared by boiling, peeling, cutting and sterilization. After that, the 50 g of sterilized

*Corresponding author.
Email: *chatarina@ukwms.ac.id*

durian seeds cut were inoculated with 7-days *Monascus purpureus* starter with a total spore of about 10^5 spores/mL. Incubation was carried out at room temperature (± 30°C) for 14 days, then dried at 45°C for 24 hours. The dried MFDS was ground to obtain powder form. The MFDS was used as an ingredient in bread formulation.

2.3 Bread formulation and processing

Four bread formulas were: 1) control, consist of 200 g of wheat flour, 10 g of sugar, 8 g of margarine, 2 g of salt, 0.6 g of bread improver, 3 g of baker yeast and 124 g of water; 2) MFDS, consist of those of control ingredients with MFDS incorporating at 0.15 g; 3) RB, consist of those of control ingredients with RB incorporating at 20 g; and 4) MFDS+RB, consist of those of control ingredients with MFDS and RB incorporating at 0.15 g and 20 g.

The ingredients were mixed in a mixer (Phillips HR 1559 model) until it becomes a viscoelastic dough and then, fermented at 30°C for 30 mins. The dough was rolled, rounded and placed in a baking dish, and baked in an oven (Gas Bakery Oven RFL-12C model) at 180°C for 30 mins.

2.4 Evaluation of bread characteristics

2.4.1 Physicochemical analysis

The physical properties analysis of the bread: specific loaf volume according to AACC (2000), color by using color reader (Konica Minolta CR-10, Konica Minolta Optics, Inc., Japan) and texture profiles including hardness, cohesiveness and springiness by using texture analyzer with cylinder probe P36R (TA-XT plus, Exponent Lite software). The chemical analysis of moisture, ash, protein, and crude fiber contents analysis refer to the AOAC method (AOAC 925.10, AOAC 923.03, AOAC 984.13 and AOAC 978.10 respectively). Total phenolic content analysis was conducted according to Lee *et al*. (2008).

2.4.2 Sensory evaluation

Sensory evaluation of the bread was conducted by using the hedonic method (Stone and Sidel, 2004). A 7-point scoring was used with 1 representing extremely dislike and 7 representing extremely like. Forty untrained panelists participated in the sensory evaluation and had no previous or present taste or smell disorders. Bread samples were labeled with three-digit codes and randomly presented to avoid bias of order of presentation. The panelists scored for colour, texture, aroma, taste and overall preferences of the bread from the four formulas. The study was in accordance with the Declaration of Helsinki (Anon., 2017).

2.5 Statistical analysis

The experiments were conducted triplicate. The obtained data were subjected to analysis of variance (ANOVA) with α = 5% and followed by the Duncan Multiple Range Test (DMRT) with α = 5%. SPSS (version 19.0) were used in the analysis.

3. Results and discussion

3.1 Physicochemical characteristics

Bread made from four different formulas were visually different in their height and colour (Figure 1). Incorporating RB alone or combination with MFDS into the formula affected the specific loaf volume, colour, hardness, cohesiveness and springiness (Table 1), ash, protein, crude fiber and total phenolic content (Table 2) of the bread significantly ($p<0.05$). These results indicated that existence of rice bran in the formula contributed significantly in the colour, structure and texture properties of the bread. Specific loaf volume of bread with RB and MFDS-RB incorporation were higher than those of control and with MFDS ($p<0.05$). This results may be related to the fiber content in rice bran which has high water absorption capacity, as reported by Rafe *et al.* (2017). These results reflected that rice bran reduced the fermentation and proofing rates of dough, which related to the water availability for yeast activity. In the breadmaking, proteins in wheat flour need water to form gluten, which then contributed to form the viscoelastic matrix that can stretch properly by CO_2 during fermentation and proofing. The high fiber content in the bread dough with RB incorporation can reduce water availability in the system for the gluten formation, which causes the dough unable to stretch properly by CO_2. Durian seed contains high amount of gum with high water absorption capacity of 1112.15% (Cornelia *et al.*, 2015). However, the MFDS incorporation does not affect significantly on the specific loaf volume, may be due to the MFDS incorporated in low amount.

Figure 1. Picture of bread with MFDS and RB incorporation. P1: Control; P2: MFDS; P3: RB; and P4: MFDS+RB

Bread with RB and MFDS-RB incorporation was visually darker brown than those of bread with MFDS only. Colour measurement by using colour reader (Table 1) also show that L* of crumb of bread in which rice bran presence was higher than those of control and with MFDS alone. Sharma *et al.* (2004) also found the similar result that rice bran becomes darker after extrusion

Table 1. Physical characteristics of bread with MFDS and RB incorporation**

Bread formula	Specific volume (cm^3/g)	Colour			Texture profile		
		L*	a*	b*	Hardness (g)	Cohesiveness	Springiness (mm)
Control	5.45^b	75.54^b	0.41^a	11.18^a	128.89^a	0.80^b	0.91^b
MFDS	5.03^b	72.56^b	1.24^b	9.94^a	160.81^a	0.79^b	0.93^b
RB	3.78^a	66.57^a	3.82^c	18.18^b	643.54^b	0.65^a	0.81^a
MFDS+RB	3.91^a	68.4^a	4.31^c	18.43^b	784.46^b	0.64^a	0.78^a

* L = lightness, a = redness, b = yellowness
**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

Table 2. Chemical composition of bread with MFDS and RB incorporation

Bread formula	Moisture (%)	Ash (%)	Protein (%)	Crude fiber (%)	Total phenolic (%)
Control	36.15^a	1.05^a	9.29^a	0.10^a	0.138^a
MFDS	37.24^a	1.06^a	8.83^a	0.12^a	0.168^{ab}
RB	37.35^a	1.50^b	8.57^a	0.24^{ab}	0.197^b
MFDS+RB	37.65^a	1.49^b	8.60^a	0.37^b	0.193^b

**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

cooking, that occurred may be due to the browning reaction mainly Maillard during the heating process. The presence of high fiber and pheophytin in the rice bran may also contribute to the darker formation (Aung *et al*., 2014; Hussien *et al*., 2017). MFDS incorporation affected only on the redness value, higher red value is resulted by the MFDS presence. The MFDS contain red pigments produced during the Monascus solid state fermentation (Srianta *et al*., 2012).

Hardness, cohesiveness and springiness of bread with MFDS incorporation was not significantly different with the control (p>0.05), but those properties were significantly different with the bread with RB presence. Bread dough with RB incorporation increased the water absorption requirement. The high fiber content of the rice bran causes high water absorption capacity of the bread dough. The limited gluten formed in the dough, the heavy loaves bread obtained. This may be related to higher hardness values and lower cohesiveness and springiness values, which is in close agreement with Lima *et al.* (2002).

RB and MFDS+RB incorporation affected ash, crude fiber and total phenolic contents in the bread significantly (p<0.05). This results related to the chemical composition of rice bran that high contents in ash, fiber and phenolic compounds. MFDS contain phenolic compound (Srianta *et al*., 2014), but the bread with MFDS incorporation was not significantly different with the control (p>0.05). This may be due to the low level of MFDS incorporated into the bread dough.

3.2. Sensory characteristics

The overall preference scores of the bread with RB and MFDS+RB were significantly different with the control and with MFDS only (Table 3). Overall preference was determined on the basis of colour, aroma, texture and taste. Panelists gave lower scores to the bread's colour in which RB presence. Interestingly, there were no significant different of aroma and taste preferences among control, with MFDS incorporation and with RB incorporation.

Table 3. Sensory characteristics of bread with MFDS and RB incorporation

Bread formula	Preference				
	Colour	Aroma	Texture	Taste	Overall
Control	5.80^c	5.03^b	5.30^c	5.05^b	5.20^c
MFDS	6.08^c	4.48^{ab}	4.48^b	4.80^b	5.20^c
RB	3.80^b	4.80^b	5.13^c	4.48^b	4.48^b
MFDS+RB	2.53^a	4.05^a	3.35^a	3.15^a	3.88^a

**Values are means ± standard deviations (n=40 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

4. Conclusion

Incorporating MFDS did not significantly affect almost all of the physicochemical and sensory characteristics of bread, whereas the incorporating RB affected significantly on those properties. The bread are being in further evaluation of the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

Acknowledgment

Thanks to Ministry of Research, Technology and Higher Education, the Republic of Indonesia for the financial support through competitive research Penelitian Terapan Unggulan Perguruan Tinggi with contract number of 115AE/WM01.5/N/2018.

References

AACC. (2000). Approved Methods of the American Association of Cereal Chemist. 10th ed. St. Paul, MN: American Association of Cereal Chemists.

Anon. (2017). Declaration of Helsinki. France: World Medical Association

AOAC. (1990). Official Methods of Analysis of the Association of Official Analytical Chemists. 15th ed. Arlington, Virginia: Association of Official Analytical Chemists Inc.

Aung, L.L., Tertre, E., Worasith, N., Suksabye, P. and Thiravetyan, P. (2014). The capacity of activated kaolins to remove colour pigments from rice bran oil: the effect of acid concentration and pre-heating prior to activation. *Clay Minerals,* 49(4), 513-526. https://doi.org/10.1180/claymin.2014.049.4.02

Conforti, F.D. and Davis, S.F. (2006). The effect of soya flour and flaxseed as a partial replacement for bread flour in yeast bread. *International Journal of Food Science*, 41(s2), 95-101. https://doi.org/10.1111/j.1365-2621.2006.01410.x

Cornelia, M., Siratantri, T. and Prawita, R. (2015). Utilization of extract durian (*Durio zibethinus L.*) seed gum as an emulsifier in vegan mayonnaise. *Procedia Food Science*, 3(2015), 1-18. https://doi.org/10.1016/j.profoo.2015.01.001

Das, L., Raychaudhuri, U. and Chakraborty, R. (2012). Supplementation of common white bread by coriander leaf powder. *Food Science and Biotechnology*, 21(2), 425-433. https://doi.org/10.1007/s10068-012-0054-9

Hardoko., Hendarto, L. and Siregar, T.M. (2010). Pemanfaatan ubi jalar ungu (*Ipomoea batatas L. Poir*) sebagai pengganti sebagian tepung terigu dan sumber antioksidan pada roti tawar (In Bahasa Indonesia). *Jurnal Teknologi dan Industri Pangan*, 21(1), 25 – 32.

Hussien, A.M.S., Abbas, H.M., Bayoumi, H.M. and El-Aziz, M.A. (2017). Properties of full fat rice bran and yoghurt fortified with it. *International Journal of Dairy Science*, 12(3), 170- 176. https://doi.org/10.3923/ijds.2017.170.176

Lee, Y.L., Yang, J.H. and Mau, J.L. (2008). Antioxidant properties of water extract from *Monascus* fermented soybeans. *Food Chemistry*, 106(3), 1128-1137. https://doi.org/10.1016/j.foodchem.2007.07.047

Lima, I., Guaraya, H. and Champagne, E. (2002). The functional effectiveness of reprocessed rice bran as an ingredient in bakery product. *Nahrung*, 46(2), 112 – 117. https://doi.org/10.1002/1521-3803(20020301)46:2<112::AID-FOOD112>3.0.CO;2-N

Meral, R. and Dogan, I.S. (2013). Quality and antioxidant activity of bread fortified with flaxseed. *Italian Journal of Food Science*, 25(1), 51 – 56.

Nugerahani, I., Sutedja, A.M., Srianta, I., Widharna, R.M. and Marsono, Y. (2017). In vivo evaluation of Monascus-fermented durian seed for antidiabetic and antihypercholesterol agent. *Food Research,* 1(3), 83-88. https://doi.org/10.26656/fr.2017.3.023

Qureshi, A.A., Sami, S.A. and Khan, F.A. (2002). Effects of stabilized rice bran, its soluble and fiber fractions on blood glucose levels and serum lipid parameters in humans with diabetes mellitus Types I and II. *Journal of Nutritional Biochemistry,* 13(3), 175-187. https://doi.org/10.1016/S0955-2863(01)00211-X

Rafe, A., Sadeghian, A. and Hoseini-Yazdi, S.Z. (2017). Physicochemical, functional, and nutritional characteristics of stabilized rice bran from tarom cultivar. *Food Science and Nutrition*, 5(3), 407 – 414. https://doi.org/10.1002/fsn3.407

Sharma, H.R., Chauhan, G.S. and Agrawal, K. (2004). Physico-chemical characteristics of rice bran processed by dry heating and extrusion cooking. *International Journal of Food Properties*, 7(3), 603 – 614. https://doi.org/10.1081/JFP-200033047.

Sivam, A.S., Waterhouse, D.S., Quek, S. and Perera, C. O. (2016). Properties of bread dough with added fiber polysaccharides and phenolics antioxidant: a review. *Journal of Food Science,* 75(8), 163 – 174. https://doi.org/10.1111/j.1750-3841.2010.01815.x

Srianta, I., Novita, Y. and Kusumawati, N. (2012). Production of *Monascus* pigments on durian seed: effect of supplementation of carbon source. *Journal of Pure and Applied Microbiology*, 6(1), 59-63.

Srianta, I., Hendrawan, B., Kusumawati, N. and Blanc, P.J. (2012). Study on durian seed as a new substrate for angkak production. *International Food Research Journal,* 19(3), 941-945.

Srianta, I., Kusumawati, N., Nugerahani, I., Artanti, N. and Xu, G.R. (2013). *In vitro* α-glucosidase inhibitory activity of *Monascus*-fermented durian seed extracts. *International Food Research Journal,* 20(2), 533 - 536.

Srianta, I., Nugerahani, I., Kusumawati, N., Suryatanijaya, E., Subianto, C., Tewfik, S. and Tewfik, I. (2014). Therapeutic antioxidant activity of *Monascus*-fermented durian seed: a potential functional food ingredient. *International Journal of Food, Nutrition and Public Health,* 7(1), 53 - 59.

Stone, H. and Sidel. J. (2004). Sensory evaluation practices. 3rd ed. Redwood City: Academic Press.

Suleria, H.A.R., Khalid, N., Sultan, S., Raza, A., Muhammad, A. and Abbas, M. (2015). Functional

and nutraceutical bread prepared by using aqueous garlic extract. *Internet Journal of Food Safety*, 17 (2015), 10 – 20.

Trisnawati, C.Y. and Sutedja, A.M. (2010). Pemanfaatan Beras dan Bekatul Beras dalam Pembuatan Cake (In Bahasa Indonesia). *Prosiding Seminar Nasional Teknik Kimia Soebardjo Brotohardjono VII: Ketahanan Pangan dan Energi,* A3(1-7).

Wang, R., Zhou, W. and Isabelle, M. (2007). Comparison study of the effect of green tea extract (GTE) on the quality of bread by instrumental analysis and sensory evaluation. *Food Research International*, 40(4), 470 – 479. https://doi.org/10.1016/j.foodres.2006.07.007

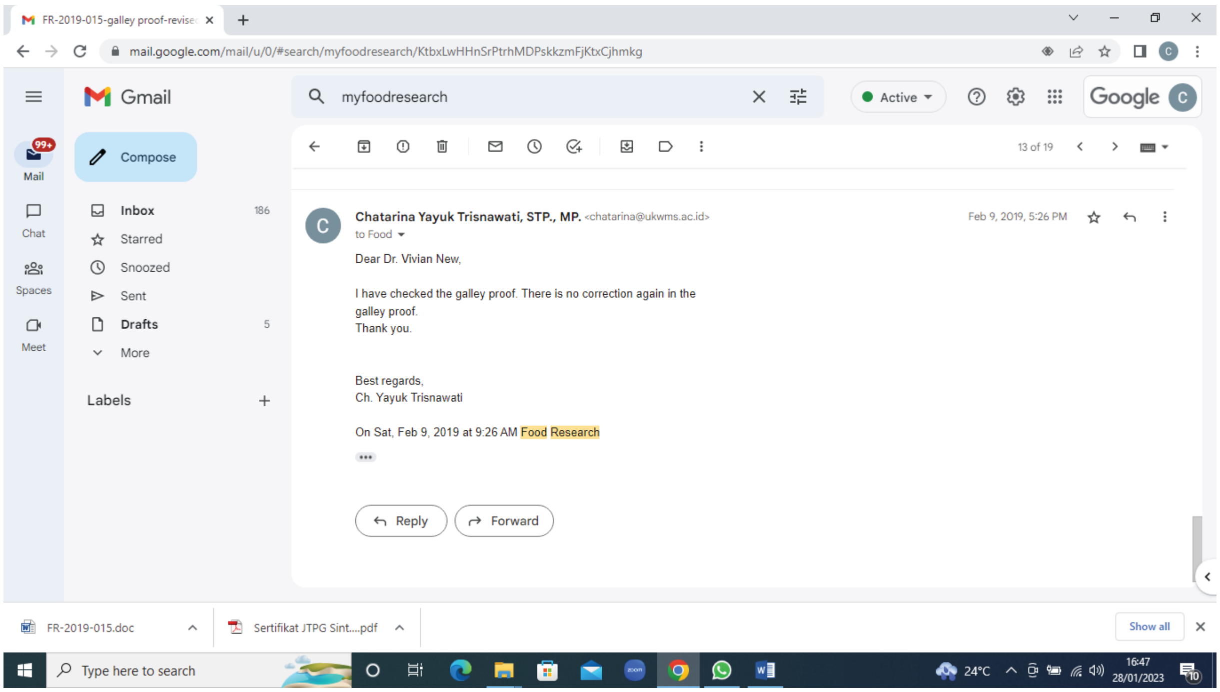
Zielinski, H., Michalska, A., Ceglinska, A. and Lamparski, G. (2008). Antioxidant properties and sensory quality of traditional rye bread as affected by the incorporation of flour with different extraction rate in the formulation. *European Food Research and Technology*, 226(4), 671 – 680. https://doi.org/10.1007/s00217-007-0576-1

eISSN: 2550-2166

11.

Bukti konfimasi galley proof hasil revisi kedua dan persetujuan galley proof

(9 Februari 2019)


FR-2019-015-galley proof-revise
mail.google.com/mail/u/0/#search/myfoodresearch/KtbxLwHHnSrPtrhMDPskkzmFjKtxCjhmkg
Gmail
myfoodresearch
Active
Google
Compose
Mail
Chat
Spaces
Meet
Inbox 186
Starred
Snoozed
Sent
Drafts 5
More
Labels
13 of 19
Chatarina Yayuk Trisnawati, STP., MP. <chatarina@ukwms.ac.id>
to Food
Feb 9, 2019, 5:26 PM
Dear Dr. Vivian New,
I have checked the galley proof. There is no correction again in the galley proof.
Thank you.
Best regards,
Ch. Yayuk Trisnawati
On Sat, Feb 9, 2019 at 9:26 AM Food Research
Reply
Forward
FR-2019-015.doc
Sertifikat JTPG Sint....pdf
Show all
Type here to search
24°C
16:47
28/01/2023

Food Research (2019) : pp - pp
Journal homepage: http://www.myfoodresearch.com

FOOD RESEARCH

SHORT COMMUNICATION

Incorporating *Monascus*-fermented durian seeds and rice bran into bread: study on the bread physicochemical and sensory properties

[1,*]Trisnawati, C.Y., [1]Srianta, I., [1]Nugerahani , I. and [2]Marsono, Y.

[1]*Department of Food Technology, Widya Mandala Catholic University Surabaya, Jalan Dinoyo 42 – 44 Surabaya, Indonesia 61265*
[2]*Department of Food and Agricultural Product Technology, Gadjah Mada University, Jalan Flora, Bulaksumur, Yogyakarta Indonesia*

Article history:
Received: 19 January 2019
Received in revised form: 26 January 2019
Accepted: 27 January 2019
Available Online:

Keywords:
Bread,
Monascus-fermented durian seeds,
Rice bran,
Physicochemical properties,
Sensory properties

DOI:
ffgf

Abstract

Monascus-fermented durian seeds (MFDS) and rice bran (RB) have been incorporated into bread dough formulation. This research was aimed at physicochemical and sensory evaluation of bread formulated with both active ingredients. Bread made from four dough formulas i.e. control, with MFDS, RB and MFDS-RB-incorporating have been evaluated the physicochemical and sensory properties. The results suggested that no significant differences on both physicochemical and sensory properties of bread with MFDS-incorporating and control ($p>0.05$). Ash, crude fiber and total phenolic contents found on bread with RB and MFDS-RB incorporating were significantly higher than those of control ($p<0.05$). The bread was being in further evaluation of the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

1. Introduction

Bread is one of the oldest foods and popular around the world. In the breadmaking, wheat flour, water, salt, sugar and yeast are mixed into viscoelastic dough subjected to fermentation and baking (Sivam *et al*., 2010). Incorporating active ingredients into bread have grown rapidly, since the increased consumer awareness of health. Purple sweet potato flour, soy flour, flaxseed, green tea extract, whole grain rye, coriander leaf powder, grape seed and garlic have been incorporated into bread (Conforti and Davis, 2006; Wang *et al*., 2007; Zielinski *et al*., 2007; Hardoko *et al*., 2010; Das *et al*., 2012; Meral and Dogan, 2013; Suleria *et al*., 2015).

Monascus fermented-durian seed is a product of solid state fermentation with *Monascus purpureus* culture on durian seed substrate (Srianta, Novita and Kusumawati, 2012; Srianta *et al*., 2012). The MFDS potential as an anti-diabetes agent with α-glucosidase inhibition, antioxidant and in vivo anti-hyperglycemic activities (Srianta *et al*., 2013; Srianta *et al*., 2014; Nugerahani *et al*., 2017). MFDS has not been incorporated into food product. On the other hand, rice bran is also known as a potential ingredient for the development of anti-diabetic food. Qureshi *et al*. (2002) reported that consumption of 20 g of rice bran can reduce blood glucose levels in patients with type I and II diabetes mellitus. The content of tocopherol, tocotrienol, oryzanol, and polyphenols in rice bran also plays a role in controlling blood sugar levels. Trisnawati and Sutedja (2010) reported that rice bran has been used in the development of functional food products, i.e. cake with rice flour.

The aim of this research was to study the physicochemical and sensory properties of bread with *Monascus*-fermented durian seeds and rice bran incorporation.

2. Materials and methods

2.1 Materials, microorganism and chemicals

All ingredients except MFDS were obtained from local distributors. MFDS was prepared in the laboratory. Durian seeds were obtained from durian processing home industry. *Monascus purpureus* M9 was used in the MFDS preparation. It was maintained and subcultured on PDA monthly. All chemicals were analytical grade obtained from local distributors.

2.2 Preparation of Monascus-fermented durian seeds

Monascus-fermented durian seeds were prepared according to our previous research (Srianta, Novita and Kusumawati, 2012). Durian seeds were prepared by boiling, peeling, cutting and sterilization. After that, the

*Corresponding author.
Email: *chatarina@ukwms.ac.id*

50 g of sterilized durian seeds cut were inoculated with 7 -days *Monascus purpureus* starter with a total spore of about 10^5 spores/mL. Incubation was carried out at room temperature (± 30°C) for 14 days, then dried at 45°C for 24 hours. The dried MFDS was ground to obtain powder form. The MFDS was used as an ingredient in bread formulation.

2.3 Bread formulation and processing

Four bread formulas were: 1) control, consist of 200 g of wheat flour, 10 g of sugar, 8 g of margarine, 2 g of salt, 0.6 g of bread improver, 3 g of baker yeast and 124 g of water; 2) MFDS, consist of those of control ingredients with MFDS incorporating at 0.15 g; 3) RB, consist of those of control ingredients with RB incorporating at 20 g; and 4) MFDS+RB, consist of those of control ingredients with MFDS and RB incorporating at 0.15 g and 20 g.

The ingredients were mixed in a mixer (Phillips HR 1559 model) until it becomes a viscoelastic dough and then, fermented at 30°C for 30 mins. The dough was rolled, rounded and placed in a baking dish, and baked in an oven (Gas Bakery Oven RFL-12C model) at 180°C for 30 mins.

2.4 Evaluation of bread characteristics

2.4.1 Physicochemical analysis

The physical properties analysis of the bread: specific loaf volume according to AACC (2000), color by using color reader (Konica Minolta CR-10, Konica Minolta Optics, Inc., Japan) and texture profiles including hardness, cohesiveness and springiness by using texture analyzer with cylinder probe P36R (TA-XT plus, Exponent Lite software). The chemical analysis of moisture, ash, protein, and crude fiber contents analysis refer to the AOAC method (AOAC 925.10, AOAC 923.03, AOAC 984.13 and AOAC 978.10 respectively). Total phenolic content analysis was conducted according to Lee *et al*. (2008).

2.4.2 Sensory evaluation

Sensory evaluation of the bread was conducted by using the hedonic method (Stone and Sidel, 2004). A 7-point scoring was used with 1 representing extremely dislike and 7 representing extremely like. Forty untrained panelists participated in the sensory evaluation and had no previous or present taste or smell disorders. Bread samples were labeled with three-digit codes and randomly presented to avoid bias of order of presentation. The panelists scored for colour, texture, aroma, taste and overall preferences of the bread from the four formulas. The study was in accordance with the Declaration of Helsinki (Anon., 2017).

2.5 Statistical analysis

The experiments were conducted triplicate. The obtained data were subjected to analysis of variance (ANOVA) with α = 5% and followed by the Duncan Multiple Range Test (DMRT) with α = 5%. SPSS (version 19.0) were used in the analysis.

3. Results and discussion

3.1 Physicochemical characteristics

Bread made from four different formulas were visually different in their height and colour (Figure 1). Incorporating RB alone or combination with MFDS into the formula affected the specific loaf volume, colour, hardness, cohesiveness and springiness (Table 1), ash, protein, crude fiber and total phenolic content (Table 2) of the bread significantly ($p<0.05$). These results indicated that existence of rice bran in the formula contributed significantly in the colour, structure and texture properties of the bread. Specific loaf volume of bread with RB and MFDS-RB incorporation were higher than those of control and with MFDS ($p<0.05$). This results may be related to the fiber content in rice bran which has high water absorption capacity, as reported by Rafe *et al.* (2017). These results reflected that rice bran reduced the fermentation and proofing rates of dough, which related to the water availability for yeast activity. In the breadmaking, proteins in wheat flour need water to form gluten, which then contributed to form the viscoelastic matrix that can stretch properly by CO_2 during fermentation and proofing. The high fiber content in the bread dough with RB incorporation can reduce water availability in the system for the gluten formation, which causes the dough unable to stretch properly by CO_2. Durian seed contains high amount of gum with high water absorption capacity of 1112.15% (Cornelia *et al.*, 2015). However, the MFDS incorporation does not affect significantly on the specific loaf volume, may be due to the MFDS incorporated in low amount.

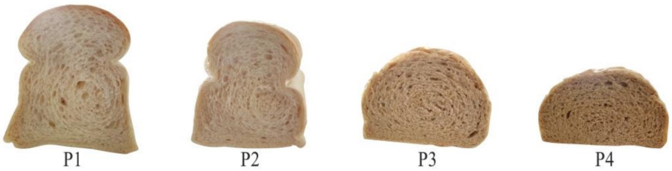


Figure 1. Picture of bread with MFDS and RB incorporation. P1: Control; P2: MFDS; P3: RB; and P4: MFDS+RB

Bread with RB and MFDS-RB incorporation was visually darker brown than those of bread with MFDS only. Colour measurement by using colour reader (Table 1) also show that L* of crumb of bread in which rice bran presence was higher than those of control and with MFDS alone. Sharma *et al.* (2004) also found the similar result that rice bran becomes darker after extrusion

Table 1. Physical characteristics of bread with MFDS and RB incorporation**

Bread formula	Specific volume (cm^3/g)	Colour			Texture profile		
		L*	a*	b*	Hardness (g)	Cohesiveness	Springiness (mm)
Control	5.45^b	75.54^b	0.41^a	11.18^a	128.89^a	0.80^b	0.91^b
MFDS	5.03^b	72.56^b	1.24^b	9.94^a	160.81^a	0.79^b	0.93^b
RB	3.78^a	66.57^a	3.82^c	18.18^b	643.54^b	0.65^a	0.81^a
MFDS+RB	3.91^a	68.4^a	4.31^c	18.43^b	784.46^b	0.64^a	0.78^a

* L = lightness, a = redness, b = yellowness
**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

Table 2. Chemical composition of bread with MFDS and RB incorporation

Bread formula	Moisture (%)	Ash (%)	Protein (%)	Crude fiber (%)	Total phenolic (%)
Control	36.15^a	1.05^a	9.29^a	0.10^a	0.138^a
MFDS	37.24^a	1.06^a	8.83^a	0.12^a	0.168^{ab}
RB	37.35^a	1.50^b	8.57^a	0.24^{ab}	0.197^b
MFDS+RB	37.65^a	1.49^b	8.60^a	0.37^b	0.193^b

**Values are means ± standard deviations (n=3 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

cooking, that occurred may be due to the browning reaction mainly Maillard during the heating process. The presence of high fiber and pheophytin in the rice bran may also contribute to the darker formation (Aung *et al*., 2014; Hussien *et al*., 2017). MFDS incorporation affected only on the redness value, higher red value is resulted by the MFDS presence. The MFDS contain red pigments produced during the Monascus solid state fermentation (Srianta *et al*., 2012).

Hardness, cohesiveness and springiness of bread with MFDS incorporation was not significantly different with the control (p>0.05), but those properties were significantly different with the bread with RB presence. Bread dough with RB incorporation increased the water absorption requirement. The high fiber content of the rice bran causes high water absorption capacity of the bread dough. The limited gluten formed in the dough, the heavy loaves bread obtained. This may be related to higher hardness values and lower cohesiveness and springiness values, which is in close agreement with Lima *et al.* (2002).

RB and MFDS+RB incorporation affected ash, crude fiber and total phenolic contents in the bread significantly (p<0.05). This results related to the chemical composition of rice bran that high contents in ash, fiber and phenolic compounds. MFDS contain phenolic compound (Srianta *et al*., 2014), but the bread with MFDS incorporation was not significantly different with the control (p>0.05). This may be due to the low level of MFDS incorporated into the bread dough.

3.2. Sensory characteristics

The overall preference scores of the bread with RB and MFDS+RB were significantly different with the control and with MFDS only (Table 3). Overall preference was determined on the basis of colour, aroma, texture and taste. Panelists gave lower scores to the bread's colour in which RB presence. Interestingly, there were no significant different of aroma and taste preferences among control, with MFDS incorporation and with RB incorporation.

Table 3. Sensory characteristics of bread with MFDS and RB incorporation

Bread formula	Preference				
	Colour	Aroma	Texture	Taste	Overall
Control	5.80^c	5.03^b	5.30^c	5.05^b	5.20^c
MFDS	6.08^c	4.48^{ab}	4.48^b	4.80^b	5.20^c
RB	3.80^b	4.80^b	5.13^c	4.48^b	4.48^b
MFDS+RB	2.53^a	4.05^a	3.35^a	3.15^a	3.88^a

**Values are means ± standard deviations (n=40 for each group). Values in a column with the same letters are not significantly (p>0.05) different. The statistical significance was evaluated by one-way ANOVA followed by DMRT test (α = 0.05).

4. Conclusion

Incorporating MFDS did not significantly affect almost all of the physicochemical and sensory characteristics of bread, whereas the incorporating RB affected significantly on those properties. The bread are being in further evaluation of the functional properties of anti-hypercholesterol and anti-hyperglycemia activities.

Acknowledgment

Thanks to Ministry of Research, Technology and Higher Education, the Republic of Indonesia for the financial support through competitive research Penelitian Terapan Unggulan Perguruan Tinggi with contract number of 115AE/WM01.5/N/2018.

References

AACC. (2000). Approved Methods of the American Association of Cereal Chemist. 10th ed. St. Paul, MN: American Association of Cereal Chemists.

Anon. (2017). Declaration of Helsinki. France: World Medical Association

AOAC. (1990). Official Methods of Analysis of the Association of Official Analytical Chemists. 15th ed. Arlington, Virginia: Association of Official Analytical Chemists Inc.

Aung, L.L., Tertre, E., Worasith, N., Suksabye, P. and Thiravetyan, P. (2014). The capacity of activated kaolins to remove colour pigments from rice bran oil: the effect of acid concentration and pre-heating prior to activation. *Clay Minerals,* 49(4), 513-526. https://doi.org/10.1180/claymin.2014.049.4.02

Conforti, F.D. and Davis, S.F. (2006). The effect of soya flour and flaxseed as a partial replacement for bread flour in yeast bread. *International Journal of Food Science*, 41(s2), 95-101. https://doi.org/10.1111/j.1365-2621.2006.01410.x

Cornelia, M., Siratantri, T. and Prawita, R. (2015). Utilization of extract durian (*Durio zibethinus L.*) seed gum as an emulsifier in vegan mayonnaise. *Procedia Food Science*, 3(2015), 1-18. https://doi.org/10.1016/j.profoo.2015.01.001

Das, L., Raychaudhuri, U. and Chakraborty, R. (2012). Supplementation of common white bread by coriander leaf powder. *Food Science and Biotechnology*, 21(2), 425-433. https://doi.org/10.1007/s10068-012-0054-9

Hardoko., Hendarto, L. and Siregar, T.M. (2010). Pemanfaatan ubi jalar ungu (*Ipomoea batatas L. Poir*) sebagai pengganti sebagian tepung terigu dan sumber antioksidan pada roti tawar (In Bahasa Indonesia). *Jurnal Teknologi dan Industri Pangan*, 21(1), 25 – 32.

Hussien, A.M.S., Abbas, H.M., Bayoumi, H.M. and El-Aziz, M.A. (2017). Properties of full fat rice bran and yoghurt fortified with it. *International Journal of Dairy Science*, 12(3), 170- 176. https://doi.org/10.3923/ijds.2017.170.176

Lee, Y.L., Yang, J.H. and Mau, J.L. (2008). Antioxidant properties of water extract from *Monascus* fermented soybeans. *Food Chemistry*, 106(3), 1128-1137. https://doi.org/10.1016/j.foodchem.2007.07.047

Lima, I., Guaraya, H. and Champagne, E. (2002). The functional effectiveness of reprocessed rice bran as an ingredient in bakery product. *Nahrung*, 46(2), 112 – 117. https://doi.org/10.1002/1521-3803(20020301)46:2<112::AID-FOOD112>3.0.CO;2-N

Meral, R. and Dogan, I.S. (2013). Quality and antioxidant activity of bread fortified with flaxseed. *Italian Journal of Food Science*, 25(1), 51 – 56.

Nugerahani, I., Sutedja, A.M., Srianta, I., Widharna, R.M. and Marsono, Y. (2017). In vivo evaluation of Monascus-fermented durian seed for antidiabetic and antihypercholesterol agent. *Food Research,* 1(3), 83-88. https://doi.org/10.26656/fr.2017.3.023

Qureshi, A.A., Sami, S.A. and Khan, F.A. (2002). Effects of stabilized rice bran, its soluble and fiber fractions on blood glucose levels and serum lipid parameters in humans with diabetes mellitus Types I and II. *Journal of Nutritional Biochemistry,* 13(3), 175-187. https://doi.org/10.1016/S0955-2863(01)00211-X

Rafe, A., Sadeghian, A. and Hoseini-Yazdi, S.Z. (2017). Physicochemical, functional, and nutritional characteristics of stabilized rice bran from tarom cultivar. *Food Science and Nutrition*, 5(3), 407 – 414. https://doi.org/10.1002/fsn3.407

Sharma, H.R., Chauhan, G.S. and Agrawal, K. (2004). Physico-chemical characteristics of rice bran processed by dry heating and extrusion cooking. *International Journal of Food Properties*, 7(3), 603 – 614. https://doi.org/10.1081/JFP-200033047.

Sivam, A.S., Waterhouse, D.S., Quek, S. and Perera, C. O. (2016). Properties of bread dough with added fiber polysaccharides and phenolics antioxidant: a review. *Journal of Food Science,* 75(8), 163 – 174. https://doi.org/10.1111/j.1750-3841.2010.01815.x

Srianta, I., Novita, Y. and Kusumawati, N. (2012). Production of *Monascus* pigments on durian seed: effect of supplementation of carbon source. *Journal of Pure and Applied Microbiology*, 6(1), 59-63.

Srianta, I., Hendrawan, B., Kusumawati, N. and Blanc, P.J. (2012). Study on durian seed as a new substrate for angkak production. *International Food Research Journal,* 19(3), 941-945.

Srianta, I., Kusumawati, N., Nugerahani, I., Artanti, N. and Xu, G.R. (2013). *In vitro* α-glucosidase inhibitory activity of *Monascus*-fermented durian seed extracts. *International Food Research Journal,* 20(2), 533 - 536.

Srianta, I., Nugerahani, I., Kusumawati, N., Suryatanijaya, E., Subianto, C., Tewfik, S. and Tewfik, I. (2014). Therapeutic antioxidant activity of *Monascus*-fermented durian seed: a potential functional food ingredient. *International Journal of Food, Nutrition and Public Health,* 7(1), 53 - 59.

Stone, H. and Sidel. J. (2004). Sensory evaluation practices. 3rd ed. Redwood City: Academic Press.

Suleria, H.A.R., Khalid, N., Sultan, S., Raza, A., Muhammad, A. and Abbas, M. (2015). Functional

and nutraceutical bread prepared by using aqueous garlic extract. *Internet Journal of Food Safety*, 17 (2015), 10 – 20.

Trisnawati, C.Y. and Sutedja, A.M. (2010). Pemanfaatan Beras dan Bekatul Beras dalam Pembuatan Cake (In Bahasa Indonesia). *Prosiding Seminar Nasional Teknik Kimia Soebardjo Brotohardjono VII: Ketahanan Pangan dan Energi,* A3(1-7).

Wang, R., Zhou, W. and Isabelle, M. (2007). Comparison study of the effect of green tea extract (GTE) on the quality of bread by instrumental analysis and sensory evaluation. *Food Research International*, 40(4), 470 – 479. https://doi.org/10.1016/j.foodres.2006.07.007

Zielinski, H., Michalska, A., Ceglinska, A. and Lamparski, G. (2008). Antioxidant properties and sensory quality of traditional rye bread as affected by the incorporation of flour with different extraction rate in the formulation. *European Food Research and Technology*, 226(4), 671 – 680. https://doi.org/10.1007/s00217-007-0576-1

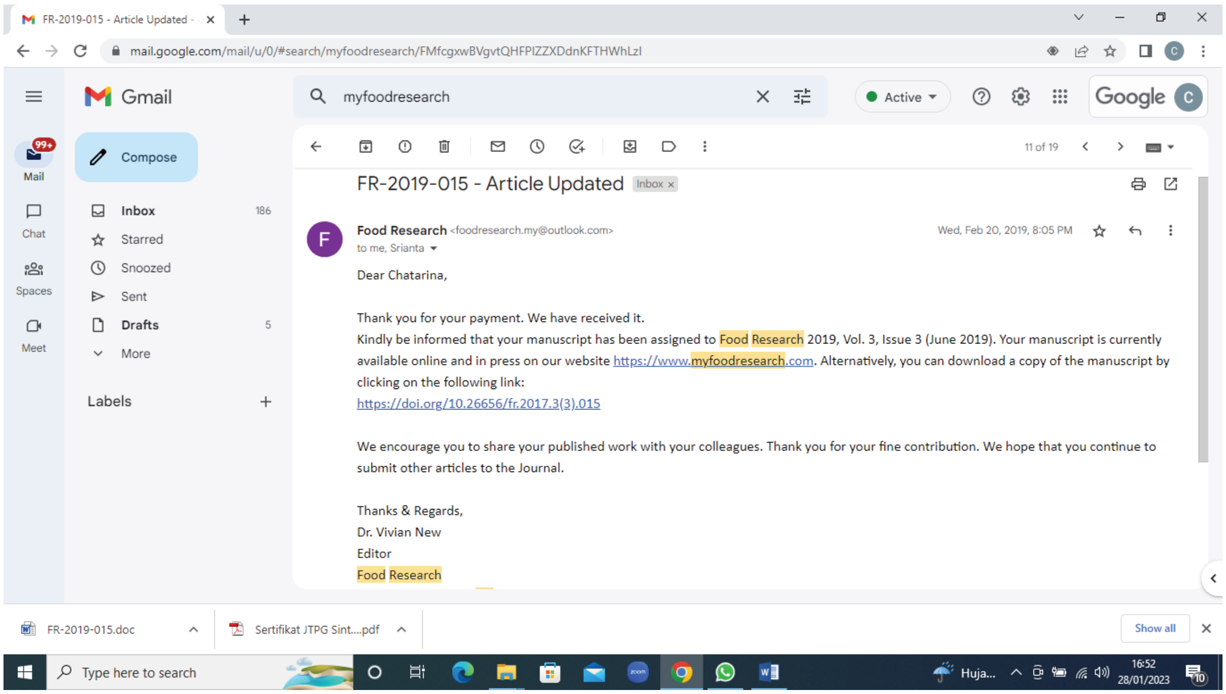
SHORT COMMUNICATION

eISSN: 2550-2166

12.

Bukti konfirmasi artikel published online

(20 Februari 2019)



FR-2019-015 - Article Updated

Food Research <foodresearch.my@outlook.com>

to me, Srianta

Wed, Feb 20, 2019, 8:05 PM

Dear Chatarina,

Thank you for your payment. We have received it.

Kindly be informed that your manuscript has been assigned to Food Research 2019, Vol. 3, Issue 3 (June 2019). Your manuscript is currently available online and in press on our website https://www.myfoodresearch.com. Alternatively, you can download a copy of the manuscript by clicking on the following link:

https://doi.org/10.26656/fr.2017.3(3).015

We encourage you to share your published work with your colleagues. Thank you for your fine contribution. We hope that you continue to submit other articles to the Journal.

Thanks & Regards,

Dr. Vivian New

Editor

Food Research