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ACCEPTABILITY AND NUTRITIONAL VALUE OF SNACKS MADE FROM SERE KEDELE (NATURALLY FERMENTED SOYBEAN) FOR TOURISTS

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ABSTRACT

Sere kedele is a food product that naturally ferments soybeans. Sere kedele is rich in nutrients such as protein, but has a pungent taste so it needs to be combined with other foods such as banana weevils with a tasteless taste and rich in fiber. To improve the taste, variations of processing into sticks and brownies were developed. This study aims to produce a formula of sere kedele and banana weevil with acceptable organoleptic quality and optimal nutritional quality. This type of research is an experiment with a Randomized Group design, using 5 kinds of formulas (F1, F2, F3, F4, F5). Based on the formula, a way of processing into sticks and brownies was developed. The acceptability assessment was carried out with organoleptic tests by 30 tourist panelists. The difference in acceptability between formulas was analyzed with the ANOVA Test.

The results showed that all sere kedele and banana weevil formulas processed into sticks and brownies were liked or acceptable to tourists. The formula chosen for the F3 stick (sere kedele composition: banana weevil = 1:1), and the brownis F5 (sere kedele composition: banana weevil = 1:3). Nutritional value of the formula of sere kedele and selected banana weevil per 100 grams for sticks 600.1 7 kcal; protein 12.83%; fat 39.04%; carbohydrates 49.39%; potassium 169.45 mg ; iron 4.28 mg. Brownis contains 345.4 kcal of energy; protein 5.9%; fat 18.6%; carbohydrates 38.58%, potassium 245.1 mg; iron 2.0 mg. The fiber content of the formula of sere kedele and selected banana weevils per 100 grams for sticks is 8.46% and brownie is 9.13%. There is a difference in overall reception from brownis sere kedele ($p=0.009 < \alpha=0.05$). However, there was no difference in overall reception of the sere kedele stick ($p=0.615 > \alpha=0.05$).

1. INTRODUCTION

Sere kedele is a food product based on naturally fermented soybeans. Sere kedele has similarities with the fermentation of soybeans such as Natto in Japan. The similarity in this soybean fermentation product is that there are dominant bacteria that help the soybean fermentation process take place, namely Bacillus subtilis (Tamang, 2015), Fermented food has many health benefits because of the good nutritional content. Sere kedele has a relatively high protein content (14.90% - 20.93%), but low-fat content (5.34%-9.50%) and low carbohydrate content (10.81%-12.97%) (Widyantari, et al, 2017). The results of research (Sipayung, et al, 2019) showed that spontaneously fermented sere kedele had a crude fiber content of 7.62% and a carbohydrate content of 19.47%. The results of research by Dewantari, et al (2021) show that sere kedele has a protein content of 13.18%, fat 9.43%, carbohydrates 10.39%, potassium 467.73 mg and dietary fiber 6.76%. Sere kedele has not been widely known by the public. The weakness of sere kedele is that the

aroma is pungent so that it is not liked by all circles. Processing is limited only as a side dish by sautéing or making pepes. The pungent aroma and taste need to be combined with other foods to obtain an aroma and taste that is acceptable to all circles. For this reason, sere kedele is formulated with banana weevils with the aim of increasing acceptability and nutritional value. Banana weevil is banana plant waste that has not been optimally utilized. Banana weevil has a tasteless taste. Banana weevil contains a carbohydrate content of 8.91%, fiber of 5.85% and potassium of 752.5 mg.

Based on the advantages and disadvantages of the food, a formula made from sere kedele and banana weevil is made that complements each other so as to improve the nutritional quality and taste of the food. To increase sensory acceptance, a way of processing formulas into sticks and brownists was also developed that is preferred by all circles. By doing so, it will provide better benefits for health. In addition, food development is needed to preserve and increase economic value by processing it into dishes for tourists.

2. MATERIALS AND METHODS

Experimental research using Randomized Group Design. Formulation of sere kedele and banana weevil with 5 kinds of formulas as in table 1. The main ingredients of the study were soybeans obtained from Denpasar City and klutuk banana weevils obtained from Pejeng Kawan Village, Tampaksiring District, Gianyar Regency. The research began with the manufacture of sere kedele by washing soybeans thoroughly and then boiling for 4-5 hours then draining and cooling. After cooling it is fermented naturally in a sealed container for ± 30 hours (Walianingsih, 2015), and spices are added. Based on the sere kedele, a formulation with banana weevil was made with 5 formulas according to table 2. Furthermore, healthy snacks are made rich in nutrients, in the form of sticks and brownies. Each snack is made with a variety of 5 formulas (Fig.1).

Table 1. Formulation of Sere Kedele and Banana Weevil

Material	Formula Composition				
	F1	F2	F3	F4	F5
Sere kedele	3	2	1	1	1
Banana weevil	1	1	1	2	3

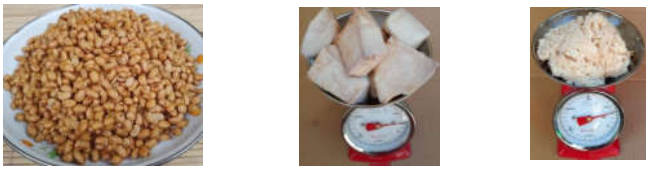

Figure 1. a variety of 5 formulas

Making sere kedele sticks by means of banana weevils grated, squeezed and steamed ± 15 minutes. Sere kedele is steamed ± 15 minutes and mashed. Sere kedele is mixed with garlic and onion that has been mashed. Add wheat flour and tapioca, ground pepper, salt, powdered broth, and finely sliced orange leaves. Knead until the dough is smooth. Take a portion of the dough then flatten it with a noodle maker and cut it into pieces about 0.5 cm wide and 10 cm long, sprinkle with flour so that it does not stick. Then fry until cooked / brownish yellow. Making brownis sere kedele by means of b-onggol bananas grated, squeezed and steamed ± 15 minutes. Sere kedele is steamed ± 15 minutes and mashed. Beat the eggs and granulated sugar until fluffy, add wheat flour, sere kedele and banana weevil. Add the melted chocolate, baking powder and melted butter. Beat the dough thoroughly and rise (± 10 minutes). Grease a baking sheet with butter and flour, pour the dough, then ventilate at 180°C for ± 30 minutes.

Development of the sere kedele formula in l a yoke a n in L a bor a thorium Dietetics Jurus a n Gizi Polt e kk e s Ministry of Health Denpas a r. Test the nutritional value and fiber inl a kukan at PT Saraswanti Indo Genetech. To determine the level of liking or feasibility of a product to be accepted by panelists (consumers) an organoleptic test is carried out, with a hedonic method (liking test) including: color, aroma, taste, and texture. Panelists are tourists who

work or vacation in villas in Pejeng Kawan Village, Tampaksiring District, Gianyar Regency as many as 30 people. Panelists were asked to provide an assessment based on the level of likability. The scores used are 5 (very like), 4 (like), 3 (somewhat like), 2 (dislike), and 1 (very disliked). Protein levels were analyzed with Kjeltech, fat levels were analyzed with Weibull, potassium, sodium, magnesium, calcium, iron, calcium, phosphorus, and zinc levels were analyzed by the OES ICP method. W a ktu p e n el i ti a n padain March-October 2022. The difference in acceptability between formulas was tested by fingerprint analysis (*One Way* ANOVA) at α = 0.05. If the Anova test results differ significantly ($p<0.05$) then a comparative test is carried out with the Post Hoc test.

3. RESULTS AND DISCUSSION

1. Acceptability and Nutritional Value of Sere Kedele Sticks

1. Acceptability of Sere Kedele Sticks

Sticks are light foods that are long flat in shape that have a savory and crunchy taste made from the basic ingredients of wheat flour, eggs, butter, water and as well as additional spices (Putri et al**.**, 2022). Table 2 shows the favorability level of the color parameters of the sere kedele sticks ranging from 3.53 to 4.20 meaning that they are liked by the panelists. Formula F5 (sere kedele composition: banana weevil = 1:3) with the highest hedonic number of 4.20 and followed by F2 (sere kedele composition: banana weevil = 2:1) with a hedonic number of 4.17. The results of the *One-Way Anova* test showed that there was a difference in the acceptance of the aroma from the sere kedele stick ($p=0.004 < \alpha=0.05$). Thus, the composition of sere kedele and banana weevil affects the acceptance of the color of the sere kedele stick. Based on the Post Hoc test, there was a difference in acceptance of the color of the sere kedele stick between F5 and F3. However, there is no difference in color acceptance between F5 and F1, F2 and F4. In terms of aroma, the favorability level of sere kedele sticks between 3.93- 4.17 means that they are liked by the panelists. The formula with the highest degree of favorability is F1 (sere kedele composition: banana weevil = 3:1) with a hedonic number of 4.17. *One Way Anova* test results showed no difference in the taste of the sere kedele sticks (Fig. 2) ($p=0.512 > \alpha=0.05$). Thus, the composition of sere kedele and banana weevil does not affect the reception of the aroma of the sere kedele stick.

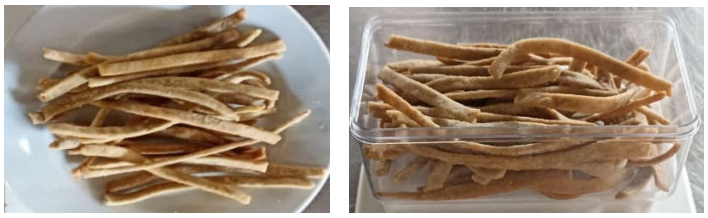

Figure 2. Sere Kedele Stick

Table 2. Sere Kedele Onion Stick Favorability Level

Formula	Color	Aroma	Taste	Texture	Sum
F1	4,07[a]	4,17[a]	4,03[a]	4,17[a]	4,20[a]
F2	4,17[a]	3,93[a]	3,90[a]	4,10[a]	4,00[a]
F3	3,53[b]	4,13[a]	4,20[a]	4,10[a]	4,10[a]
F4	3,97[a]	4,00[a]	4,03[a]	4,03[a]	4,03[a]
F5	4,20[a]	3,97[a]	4,20[a]	4,37[a]	4,20[a]

Values followed by different letters in the same column showed significant differences ($p<0.05$) with the Anova test.

The taste liking level of sere kedele sticks ranges from 3.90-4.20 meaning it is liked by the panelists. The formulas with the highest hedonic numbers are F3 (sere kedele composition: banana weevil = 1:1) and F5 (sere kedele composition: banana weevil = 1:3) with a hedonic number of 4.20. *One Way Anova* test results showed no difference in the taste of the sere kedele stick ($p=0.572 > \alpha=0.05$). Thus, the composition of sere kedele and banana weevil does not affect the acceptance of the taste of sere kedele sticks. The favorability level of the sere kedele stick texture ranges from 4.03-4.37 meaning it is liked by the panelists. The most preferred Stik texture is F5 (sere kedele composition: banana weevil = 1:3) with a hedonic number of 4.37. *One Way Anova* test results showed no difference in acceptance

of the texture of the sere kedele stick (p=0.335 > α=0.05). Thus, the composition of sere kedele and banana weevil does not affect the acceptance of the texture of sere kedele sticks. Overall, all sere kedele stick formulas were liked by the panelists, the formula chosen was F3 (sere kedele composition: banana weevil = 1:1. *One Way Anova* test results showed no difference in overall acceptance of sere kedele sticks (p=0.615 > α=0.05). Thus, the composition of sere kedele and banana weevil does not affect the overall reception of sere kedele sticks.

2. Nutritional Value and fiber sticks sere kedele

The nutritional value and fiber of sere kedele sticks are presented in table 3. In table 3, it appears that the increase in the proportion of sere kedele (decrease in the proportion of banana weevils) in processed sticks is also accompanied by an increase in the content of energy, protein, fat, carbohydrates, calcium, forfor, magnesium, sodium, iron, zinc, vitamin E and fiber. On the contrary, an increase in the proportion of sere kedele on the stick occurs a decrease in water and potassium content. The carbohydrate value of sere kedele sticks ranges from 49.02%-49.76% equivalent to Dwi Kristiastuti's research (2016) of 52.11%. The protein value of the stick formula ranges from 9.63-16.04%, according to the study is higher than the research (Putri, et al., 2022) 8.317% Iron content ranges from 3.94-4.63%, according to the research of (Dwi Kristiastuti, 2016) 3.28 mg, Kandungan fiber stick ranges from 8.23-8.69%, higher than the research (Putri et al., 2022) 1.997%. The water content of sticks ranges from 0.89 – 2.86% lower than the results of research (Kaimudin et al., 2021) of3.32 - 4.87%. The contribution of protein from sere kedele sticks to the fulfillment of the Nutritional Adequacy Rate (AKG) for the age group of 30-49 years is 19.74 – 21.38%; fiber contribution 23.50-28.20%. The nutritional contribution of the stick is further listed in table 4.

Table 3. Nutritional Value and Fiber of Sere Kedele Sticks

Parameters	F1	F2	F3	F4	F5
Ash Content (%)	1.88	1.86	1.83	1.79	1.77
Moisture Content (%)	0.89	1.58	1.77	1.97	2.86
Energy (kcal)	635.14	623.49	600.17	576.86	565.2
Protein (%)	16.04	14.97	12.83	10.70	9.63
Fat (%)	41.34	40.57	39.04	37.51	36.74
Carbohydrates (%)	49.76	49.63	49.39	49.14	49.02
Calcium (mg)	120.53	106.62	78.79	50.97	37.05
Phosphorus (mg)	572.66	571.06	568.06	565.06	563.56
Magnesium	42.77	39.35	32.51	25.67	22.25
Iron (mg)	4.63	4.51	4.28	4.05	3.94
Zinc (mg)	2.69	2.53	2.20	1.87	1.7
Potassium (mg)	100.79	123.68	169.45	215.22	238.11
Sodium (mg)	414.98	403.53	380.63	357.74	346.29
Vitamin E (mg)	6.18	6.08	5.88	5.68	5.58
Fiber content (%)	8.69	8.62	8.46	8.31	8.23

Table 4. Contribution of Nutrients and Fiber Sere Kedele Stick Formula Towards the Fulfillment of AKG Age 30-49 Years

Parameters	Value per 100 grams	Man		Woman	
		AKG	%AKG	AKG	%AKG
Energy (kcal)	600.17	2550	23.54	2150	27.91
Protein (g)	12.83	65	19.74	60	21.38
Fats (g)	39.04	70	55.77	60	65.07
Carbohydrates (g)	49.39	415	11.90	340	14.53
Calcium (mg)	78.79	1000	7.88	1000	7.88
Phosphorus (mg)	568.06	700	81.15	700	81.15
Magnesium (mg)	32.51	360	9.03	340	9.56
Iron (mg)	4.28	9	47.56	18	23.78
Zinc (mg)	2.20	11	20.00	8	27.50

Potassium (mg)	169.45	4700	3.61	4700	3.61
Sodium (mg)	380.63	1500	25.38	1500	25.38
Vitamin E (mcg)	5.88	15	39.20	15	39.20
Fiber (g)	8.46	36	23.50	30	28.20

Source: AKG (2019)

In table 4, 100 grams of sere kedele sticks can meet 21.38% of daily protein sufficiency. This result is equivalent to 100 g of snack bars can meet 29% of daily protein needs. Tempeh mlanding snack bar is high in fiber, a source of protein and iron minerals and low in fat (Palupi, E, 2022).

3. Acceptability and Nutritional Value of Brownis Sere Kedele

1. Acceptability of brownis sere kedele

Table 5 shows the color parameters of brownis sere kedele (Fig. 3) with a favorability level between 3.90 and 4.20 meaning that they are liked by the panelists. Formula F4 (sere kedele composition: banana weevil = 1:2) with the highest hedonic number of 4.20 and followed by F5 (sere kedele composition: banana weevil = 1:3) with a hedonic number of 4.13. *One Way Anova* test results showed no difference in color acceptance from brownis sere kedele ($p=0.179 > \alpha=0.05$). Thus, the composition of sere kedele and banana weevil does not affect the acceptance of the color of the brownis sere kedele.

Figure 3. Brownis Sere Kedele

Table 5. Sere Kedele's Brownis Favorability Level

Formula	Color	Aroma	Taste	Texture	Sum
F1	$4,10^{ab}$	$3,57^{bc}$	$3,63^{b}$	$3,93^{a}$	$3,83^{b}$
F2	$3,90^{b}$	$3,43^{c}$	$3,63^{b}$	$3,67^{a}$	$3,70^{b}$
F3	$4,10^{ab}$	$3,73^{ab}$	$3,70^{b}$	$3,90^{a}$	$3,87^{b}$
F4	$4,20^{a}$	$3,90^{ab}$	$3,97^{ab}$	$4,03^{a}$	$3,83^{b}$
F5	$4,13^{ab}$	$3,97^{a}$	$4,13^{a}$	$3,83^{a}$	$4,33^{a}$

Values followed by different letters in the same column showed significant differences ($p<0.05$) with the Anova test.

Based on the aroma parameters, the favorability level of brownis sere kedele with between 3.43-3.97 means that it is a bit like until it is liked by the panelists. The formula with the highest degree of favorability is F5 (sere kedele composition: banana weevil = 1:3) with a hedonic number of 3.97. The results of the *One Way Anova* test showed that there was a difference in the acceptance of the aroma of brownis sere kedele ($p=0.015 < \alpha=0.05$). Thus the composition of sere kedele and banana weevil affects the reception of the aroma of the sere kedele brownis. Based on the Post Hoc test, there was a difference in acceptance of the aroma of brownis sere kedele between F5 and F2. However, there is no difference in the acceptance of aromas between F5 and F3 and F4. In terms of taste, the favorability level of brownis sere kedele ranges from 3.63-4.13 meaning it is liked by the panelists. The formula with the highest hedonic number is F5 (sere kedele composition: banana weevil = 1:3) which is 4.13. The results of the *One-Way Anova* test showed that there was a difference in the acceptance of the taste of brownis sere kedele ($p=0.026 < \alpha=0.05$). Thus, the composition of sere kedele and banana weevil affects the acceptance of the taste of brownis sere kedele. Based on the Post Hoc test, there was a difference in the acceptance of brownist sere kedele flavors between F5 and F1, F2 and F3. However, there is no difference in the acceptance of aromas between F5 and F4.

For the texture parameter, the level of liking for brownis sere kedele ranges from 3.67-4.03 meaning that it is liked by the panelists. The most preferred brownie texture is F4 (sere kedele composition: banana weevil = 1:2) with a hedonic number of 4.03. *One Way Anova* test results showed no difference in the acceptance of the texture of brownis sere

kedele ($p=0.580 > \alpha=0.05$). Thus, the composition of sere kedele and banana weevil does not affect the acceptance of the texture of the sere kedele brownis. Overall, all brownis sere kedele formulas were favored by panelists (3.70-4.33), with the highest favorability level being F5 (sere kedele composition: banana weevil = 1:3) with a hedonic number of 4.33. This result was higher than the research of Erynola Moniharapon, et al (2018) that the overall level of liking for steamed brownies of banana tongka langit in all treatments ranged from 2.13-3.16.

The results of the *One-Way Anova* test showed that there was an overall difference in reception from brownis sere kedele ($p=0.009 < \alpha=0.05$). Thus, the composition of sere kedele and banana weevil affects the overall reception of the sere kedele brownis. Based on the Post Hoc test obtained there is an overall difference in reception between F5 and F1, F2, F3 and F4.

4. Nutritional Value and Fiber of Brownis Sere Kedele

The nutritional value and fiber of brownis sere kedele is presented in table 6. In table 6, it can be seen that the increase in the proportion of sere kedele (decrease in the proportion of banana weevils) in processed brownies is also accompanied by an increase in the content of energy, protein, fat, carbohydrates, forfor, magnesium, sodium, iron, zinc, vitamin E and fiber. On the contrary, an increase in the proportion of sere kedele in brownies occurred a decrease in potassium levels. The protein value of brownie formula ranges from 5.94-12.35%. The energy value of brownies ranges from 345.44 kcal-415.38 kcal equivalent to the research of Palupi, et al (2022) 385.44 kcal . The protein value of brownies ranges from 5.94-12.35% according to research (Ibrahim, et al., 2017) showing carrot substitution tempeh brownies *(Daucus carota L.)* Protein content ranges from 6.87%- 11.52%. According to Hikmawati Mas'ud, et al (2020), the average protein value of snacks is 6.16 grams per serving. Similarly, according to the research (Gavi, et al (2018) with a protein value of 9.24%. Iron content ranges from 1.98-2.67 mg, zinc content 0.97-1.96 mg, vitamin E 6.42-7.02 mg. The content of brownie fiber ranges from 9.13 - 9.59%, equivalent to the research (Gavi et al., (2018) fiber content of 8.58% and higher than the research of Dimas Rahadian Aji Muhammad (2019) 3.1%. The water content of brownis sere kedele ranges from 23.73-35.83% equivalent to the selected brown steamed brownis of 28.2% (Rahadian dan Muhammad, 2019) and higher than the brownis of bogem fruit flour, which is 14.78% (Fatimah, 2016). The contribution of protein from brownis sere kedele to the fulfillment of the Nutritional Adequacy Rate (AKG) for the age group of 30-49 years, namely 9.14 – 9.90%; fiber contribution 25.36-30.43%. The nutritional contribution of brownis sere kedele is presented in table 7.

Table 6. Nutritional Value and Fiber of Brownis Sere Kedele

Parameters	F1	F2	F3	F4	F5
Ash Content (%)	1.42	1.40	1.37	1.33	1.31
Moisture Content (%)	23.73	25.71	29.66	33.61	35.58
Energy (kcal)	415.38	403.73	380.41	357.10	345.44
Protein (%)	12.35	11.28	9.14	7.01	5.94
Fat (%)	23.20	22.43	20.90	19.37	18.6
Carbohydrates (%)	39.32	39.19	38.95	38.70	38.58
Calcium (mg)	121.94	108.03	80.20	52.38	38.46
Phosphorus (mg)	734.18	732.58	729.58	726.58	725.08
Magnesium	41.17	37.75	30.91	24.07	20.65
Iron (mg)	2.67	2.55	2.32	2.09	1.98
Zinc (mg)	1.96	1.80	1.47	1.14	0.97
Potassium (mg)	107.82	130.71	176.48	222.25	245.14
Sodium (mg)	305.80	294.35	271.45	248.56	237.11
Vitamin E (mg)	7.02	6.92	6.72	6.52	6.42
Fiber content (%)	9.59	9.52	9.36	9.21	9.13

Table 7. Contribution of Nutrients and Fiber Formula of Brownis Sere Kedele Towards the Fulfillment of AKG Age 30-49 Years

Parameters		Laki-laki	Perempuan

	Nilai per 100 grams	AKG	%AKG	AKG	%AKG
Energy (kcal)	345.44	2550	13.55	2150	16.07
Protein (g)	5.94	65	9.14	60	9.90
Fats (g)	18.6	70	26.57	60	31.00
Carbohydrates (g)	38.58	415	9.30	340	11.35
Calcium (mg)	38.46	1000	3.85	1000	3.85
Phosphorus (mg)	725.08	700	103.58	700	103.58
Magnesium (mg)	20.65	360	5.74	340	6.07
Iron (mg)	1.98	9	22.00	18	11.00
Zinc (mg)	0.97	11	8.82	8	12.13
Potassium (mg)	245.14	4700	5.22	4700	5.22
Sodium (mg)	237.11	1500	15.81	1500	15.81
Vitamin E (mcg)	6.42	15	42.80	15	42.80
Fiber (g)	9.13	36	25.36	30	30.43

Source: AKG (2019)

Conclusion

All sere kedele and banana weevil formulas processed into sticks and brownies are loved or acceptable to tourists. The formula is chosen for the F3 stick and the F5 brownis. Nutrient content of sere kedele formula and selected banana weevil per 100 grams for a 600.17 kcal tick energy stick; protein 12.83%; fat 39.04%; carbohydrates 49.39%; potassium 169.45 mg; iron 4.28 mg. Brownis contains 345.4 kcal of energy; protein 5.9%; fat 18.6%; carbohydrates 38.58%, potassium 245.1 mg; iron 2.0 mg. Fiber content of sere kedele formula and selected banana weevil per 100 grams for sticks 8.46% and brownis 9.13%, There is a difference in overall reception from brownis sere kedele ($p=0.009 < \alpha=0.05$). However, there was no difference in overall acceptance of sere kedele sausage ($p=0.074 > \alpha=0.05$) and. There was no difference in overall reception of the Sere Kedele stick ($p=0.615 > \alpha=0.05$).

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