Product development of germinated brown rice drink mixed with instant beetroot powder

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Abstract

The objectives of this research are to develop products of germinated brown rice juice with beetroot powder and to study the physical, chemical, and microbiological quality of the product, as well as to study consumer acceptance of the product. According to the results, they showed that germinated brown rice juice, instant beetroot powder at 7%, had a sensory test score for color, smell, taste, texture, and overall preference at the highest level which were 7.12±0.65, 7.23±0.61, 6.90±0.63, 7.20±0.56 and 7.14±0.82 respectively. The physical quality in terms of color, L* = 78.10±0.42, a* = 7.06±0.18, and b* = 4.63±0.10 and solubility (%), the result was 41.93±0.42. The water absorption index was 11.95±0.05 and the puffing capacity was 0.34±0.01. In the aspect of chemical quality, it was found that the water activity (a_w) was 0.3302±0.003, the pH value was 6.55±0.01, the moisture content was 6.39±0.10, the ash, fat, protein, and fiber content were 2.11±0.03, 2.14±0.02, 6.46±0.10 and 1.12±0.22, respectively. According to the microbiological quality, it was found that the mean quantity of microorganisms was found which was yield was less than $1x10^4$ CFU/g and the mean yeast and mold content was less than 10 CFU/g, which was within the community product standards. In terms of consumer acceptance of the total of 200 consumers towards this product, it was found that the overall preference had an average score of 7.18±0.87. If there was a germinated brown rice drink with instant beetroot powder for sale, the consumers would make their purchase decisions, accounting for 85%.

Keywords: Beetroot, Brown rice, Drink, Germinate, Instant

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Introduction

Nowadays, not only is rice a staple food for Thai people, Thai farmers are also able to increase the value of their rice by transforming it into germinated brown rice in order to be able to preserve it for a long time and help create added value. Bringing rice to generate the new product which is germinated brown rice has become trendy in many countries in the functional food group. Moreover, germinated brown rice is also more beneficial than normal brown rice. Germinated brown rice is the introduction of brown rice through the germination process which during the germination process of the rice, it is activated by hydrolytic enzymes, which lead to the formation and accumulation of some bioactive substances such as γ-amino butyric acid (GABA), free amino acids, and antioxidants [1]. Germinated brown rice contains more bioactive compounds than white rice or normal brown rice, [2] which contains gamma-amino butyric acid (GABA) 15 times more than normal brown rice. GABA is an amino acid which has its important role to act as a neurotransmitter in the central nervous system and is also considered an inhibitory neurotransmitter. It acts to maintain balance in the brain, helps relax the brain, assists in deeper sleep, and can prevent brain damage that causes memory loss (Alzheimer's), weight loss, good skin, slow down ageing. Besides what mentioned, it is effective in digestion and absorption in the body as well and has high in nutrients that are beneficial to the body, which several studies have shown that eating germinated brown rice continuously helps to speed up the metabolism of the brain, helps prevent colon cancer, helps maintain blood sugar levels, and helps with blood pressure, and prevents heart disease as well. For beetroot (*Beta vulgaris* L.), it is a healthy vegetable with very important nutrients due to its relatively high bioactive substances. It contains betalains, vitamin C (ascorbic acid), carotenoids, polyphenols, flavonoids, and saponins [3]; betalains is an amino acid that inhibits the occurrence of cancer. It can help reduce the growth of tumors. It also makes the blood, wind and circulatory system work better. It is rich in vitamin C. It helps to increase oxygen to the cells in the body which helps them to stay away from cancer. There is a purple substance called anthocyanin, which has property acting as antioxidant that reduces carcinogens and helps reduce the risk of heart disease and paralysis as well. Beetroot also contains dietary fiber. This will help lower blood pressure and lower cholesterol [4]. Therefore, beetroot is considered the vegetable that is quite beneficial. Beetroot should be processed into powder for longer storage and is an essential ingredient in health care products. The production of powdered beverages is gaining great attention nowadays which adds the value and makes it more convenient for consumers. Moreover, the product is lightweight and convenient transportation too.

As a result of the aforementioned reasons, the researcher has the idea to develop a product of the germinated brown rice with beetroot powder to suit consumers who love being healthy today. The physical, chemical, and microbiological qualities of the product as well as the consumer acceptance of the germinated brown rice drink with the instant beetroot powder were studied.

Material and Methods

1. Study on the quantities of germinated brown rice and beetroot powder for making germinated brown rice juice with instant beetroot powder

The process for preparing germinated brown rice powder was done by washing and soaking 105 jasmine brown rice in the ratio of rice: water at 1: 2 for 4 hours, then drained the steeping water by putting in a container with holes to allow water to flow out. Wrapped in a thin white cloth. Left it in a dark place for 18 hours to get fresh brown rice. Then brought the brown rice to bakery in a hot air incubator at 50°C for 2 hours. Ground the brown rice with a fine grinder to get the germinated brown rice powder. For the process of preparing the dried beetroot, it could be done by cleaning beetroot, sliced it using the cutter; made to a thickness of 1 mm. After that, dried beetroot pieces at 60°C until the moisture content of the beetroot pieces reached 2.33%. After that, brought the beetroot pieces to grind with the grinder for 3 minutes to acquire the beetroot powder. Brought the beetroot power to mix with the germinated brown rice powder at the ratio of 1, 3, 5, 7 and 9, respectively, of total weight. The germinated brown rice juice formula with instant beetroot powder consisted of germinated brown rice, beetroot powder, milk powder, and sugar. The amount of beetroot and germinated brown rice powder were varied according to the ratio. Used 30% milk powder and 15% sugar for all formulas. Brought the finished germinated brown rice juice mixed with beetroot powder to test for sensory quality using a 9-Point Hedonic Scaling [5] with a score of 1-9, a score indicating preference and acceptance of characteristics. Score of 1 means dislike the most and score of 9 means like the most. 100 testers were used to assess the preferences of germinated brown rice drink mixed with beetroot powder characteristics such as color, smell, taste, appearance, texture, and overall preference by controlling the serving temperature at 65°C and comparing the mean value through the method of Randomized Completely Block Design (RCBD) with the Duncan's new multiple range test (DMRT) method using the SPSS preset program at a percentage confidence level .95 ($p \leq 0.05$).

2. Study on the physical, chemical and microbiological qualities of germinated brown rice drink mixed with instant beetroot powder

The formula of germinated brown rice mixed with instant beetroot powder that received the most sensory test score was 7%, consisting of 48% germinated brown rice powder, 7% beetroot powder, 30% milk powder, and 15% sugar was analyzed. The physical, chemical, and microbiological qualities were as follows:

2.1 Physical properties analysis

2.1.1 CIE system for evaluating color; L* a* b* Sphere (Chroma Meter CR 300 Series, Japan) in which L* color value (brightness value from 0-100 where 0 means dark object, 100 means object has light color) a* (+ means red color, - means an object has a green color) and b* (+ means yellow color, - means blue color).

2.1.2 Water solubility index (WSI) was analyzed according to the method [6] by using 1 gram of powder sample into a centrifuge tube,

adding 10 ml of water, and then centrifuging at rotational speed of 3,000 rpm for 10 minutes, pouring the clear liquid (supernatant), and putting it in a moisture can and baking it at 105°C for 24 hours. Water solubility index (WSI) was calculated as follows.

$$= \frac{\text{Dry mass of sample soluble in supernatant (g)} \times 100}{\text{Dry mass of the whole sample (g)}}$$

2.1.3 Water absorption index (WAI) [7] was analyzed by weighing 2.5 g of powdered product in 50 ml of water at a temperature of 60°C, stirred and mixed for 30 minutes. Then, separated at a speed of 3,000 rpm for 30 minutes to separate the clear part and gel. The resulting gel was weighed to calculate the WAI value.

$$= \frac{\text{Gel weight}}{\text{Initial dry sample weight}}$$

2.1.4 Analysis of swelling power (SP) [8] was done by calculating the water absorption index (WAI) and dissolution index (WSI).

$$= \frac{\text{Water absorption index (WAI)}}{\text{(0.1 x (100 - Solubility index) (WSI)}}$$

2.2 Chemical properties analysis [6]

1) Water activity value (a_w) using the water activity meter

2) pH

3) Moisture content; it was to find the weight loss due to evaporation of water and volatile matter within the specified temperature.

4) Fat content

5) Total ash content

6) Fiber content

7) Protein content

2.3 Microbiological analysis [9]

1) Total microbial count

2) Yeast and mold bacteria

Performed 3 experiments repeatedly. Statistical data was analyzed by finding means and standard deviations.

3. Study on consumer acceptance of germinated brown rice drink mixed with instant beetroot powder

The formula of germinated brown rice drink mixed with instant beetroot powder that received the most sensory test score was 7%, consisting of 48% germinated brown rice powder, 7% beetroot powder, 30% milk powder, and 15% sugar. This formula was brought to test the consumer acceptance. The target group towards the product

did the Central Location Test which was conducted with 200 consumers in Mueang district, Lampang province through the questionnaires containing consumer data, information about product consumption, behavior information on acceptance of germinated brown rice drink mixed with instant beetroot powder. The sensory characteristics of color, smell, taste, texture and overall preference were scored by nine levels of preference (9-Point Hedonic Scaling). The statistics were analyzed by means of frequency, percentage, arithmetic means and the standard deviations.

4. Protection of the rights of the sample group

In this study, the researcher defended the sample group's rights by informing the product tester that this product contains germinated brown rice, beetroot, powdered milk. Anyone who has food allergy to one of the ingredients should not go through the tasting. For tasting, it was volunteered by the tasters to answer or not to answer questions which had no effect to drink tasting or product sales in the said place. The information obtained was presented as an overview which did not identify the respondents.

Results and Discussion

1. The results of the study on the quantities of germinated brown rice powder and beetroot powder for making germinated brown rice drink mixed with instant beetroot powder

The results of sensory quality analysis of germinated brown rice drink mixed with instant beetroot powder at the ratio of 1, 3, 5, 7 and 9, respectively by 100 testers were used to assess the likelihood of different characteristics of germinated brown rice drink mixed with instant beetroot powder, namely color, smell, taste, texture and overall preference using a 9-Point Hedonic Scaling sensory test with a score of 1-9. The score indicated preference and acceptance of features, with 1 being the most disliked and 9 being the most liked. The test results were as shown in Table 1.

Table 1 Sensory quality analysis of germinated brown rice drink mixed with instant beetroot powder

Sensory characteristics	1 Formula (1%)	2 Formula (3%)	3 Formula (5%)	4 Formula (7%)	5 Formula (9%)
Colour	$6.24^{b} \pm 0.72$	$6.38^{b} \pm 0.86$	$6.70^{ab} \pm 0.91$	$7.12^{a} \pm 0.65$	$7.02^{a} \pm 0.77$
Smell	$6.40^{b} \pm 0.64$	$6.62^{b} \pm 0.71$	$6.62^{b} \pm 0.85$	$7.23^{a} \pm 0.61$	$6.94^{ab} \pm 0.78$
Taste	$5.96^{c} \pm 0.88$	$6.01^{c} \pm 0.76$	$6.30^{bc} \pm 0.65$	$6.90^{a} \pm 0.63$	$6.45^{b} \pm 0.84$
Texture	$6.44^{b} \pm 0.92$	$6.60^{b} \pm 0.69$	$6.67^{b} \pm 0.71$	$7.20^{a} \pm 0.56$	$6.88^{ab} \pm 0.63$
Overall preference	$6.41^{b} \pm 0.91$	$6.55^{b} \pm 0.74$	$6.60^{b} \pm 0.81$	$7.14^{a} \pm 0.82$	$6.64^{b} \pm 0.62$

Note : Mean ± standard deviation

: The letters a, b, c horizontally mean there is a statistically significant difference ($p \leq 0.05$).

In the aspect of color sensory characteristic, it was found that the beetroot content in germinated brown rice drink product was found to have a statistically significant difference ($p \leq 0.05$). It was found that 7% of beetroot powder content had the highest color preference score of 7.12±0.65, followed by beetroot content at the ratios of 9%, 5% and 3%, respectively, which were 7.02±0.77, 6.70±0.91 and 6.38±0.86, respectively. The lowest color preference score of 6.24±0.72 indicated that the use of beetroot at a ratio of 7% resulted in the product having the most acceptable color characteristic for the consumers.

In terms of attribute, it was found that the beetroot powder content in germinated brown rice drink product was found to have statistically significant difference ($p \leq 0.05$). It was found that 7% of beetroot powder content had the highest smell preference score of 7.23±0.61, followed by beetroot powder content at the ratios of 9%, 5% and 3%, respectively with smell preference scores of 6.94±0.78, 6.62±0.85 and 6.62±0.71, respectively. As for the amount of beetroot powder in the ratio of 1%, it was found to have the lowest smell preference score of 6.4±0.64, indicating that the beetroot powder affected the smell sensory characteristic of germinated brown rice drink mixed with instant beetroot powder. Beetroot powder content ratio of 7% resulted in the product having the smell characteristic that was most accepted by consumers.

For taste sensory characteristic, it was found that the beetroot powder content in germinated brown rice drink product was found to have a statistically significant difference ($p \leq 0.05$). It was found that 7% of beetroot powder content had the highest taste preference score which was 6.90±0.63, followed by the beet content at the ratios of 9%, 5% and 3%, with the taste preference scores of 6.45±0.84, 6.30±0.65, and 6.01±0.76, respectively. beetroot powder content in the ratio of 1% was found to have the lowest taste preference score which was 5.96±0.88, indicating that the beet content had an effect on the taste sensory characteristic of the germinated brown rice drink with instant beetroot powder. The amount of beet at a ratio of 7% resulted in the product having the most acceptable taste characteristic for the consumers.

In terms of texture sensory characteristic, it was found that the beetroot powder content in germinated brown rice drink product was found to have a statistically significant difference in the beetroot powder content ($p \leq 0.05$). It was found that the 7% beetroot powder content had the highest texture preference score of 7.20±0.56. Beetroot content at the ratios of 9%, 5%, 3% and 1% had the texture preference scores of 6.88±0.63, 6.67±0.71, 6.60±0.69, and 6.44±0.92, respectively. The results showed that the beetroot powder t content has an effect on the texture sensory characteristic of the product. The amount of beet at a ratio of 7% resulted in the product having the most acceptable taste characteristic for the consumers.This was because it was a suitable ratio of beetroot powder and germinated brown rice content which were suitable that did not cause the drink to clump. As a result, the consumers gave the highest score for texture preference.

In terms of overall sensory characteristic, it was found that the beetroot powder content in sprouted brown rice water product was found. It was found that the beetroot powder content in germinated brown rice drink product was found to have a statistically significant difference in the root content ($p \leq 0.05$), with 7% of beetroot powder content having the highest overall preference score of 7.14± 0.82. Beetroot powder content in the ratios of 9, 5, 3 and 1 had the overall preference scores of 6.64±0.62, 6.60±0.81, 6.55±0.74, and 6.41±0.91, respectively. This affected the sensory characteristics of the rice drink. The amount of beet at the 7% ratio resulted in the overall preference characteristic of the product being accepted by most consumers.

In addition, from the analysis of the sensory characteristics of consumers on germinated brown rice drink product mixed with instant beetroot powder in the ratios of 1%, 3%, 5%, 7% and 9%, respectively, it was found that the amount of beetroot powder content in germinated brown rice drink product had a significant effect on the sensory characteristics test scores in terms of color, smell, taste, texture, and overall preference which were all statistically significant ($p \leq 0.05$). It was found that 7% of beetroot powder content had test scores of sensory characteristics of color, smell, taste, texture, and overall preferences that were most liked by the consumers which were 7.12±0.65, 7.23±0.61, 6.90±0.63, 7.20±0.56, and 7.14±0.82 respectively. It also has the good natural color of germinated brown rice and beetroot powder. It also smells good according to the natural germinated brown rice mixed with beetroot powder without other unpleasant smells such as rancid and bitter [10]. Therefore, a 7% beet content ratio was selected for the study of the physical, chemical, and microbiological qualities of the product, and taken a consumer acceptance survey of 200 people.

2. The results of physical, chemical and microbiological quality studies of germinated brown rice drink mixed with instant beetroot powder

The formula of germinated brown rice drink mixed with instant beetroot powder received the most sensory test scores (7%) contained 48% germinated brown rice powder, 7% beetroot powder, 30% milk powder, and 15% sugar which were brought to test for physical quality analysis, chemical quality, and microbiological quality as shown in Table 2.

Table 2 Physical, chemical and microbiological qualities of germinated brown rice drink mixed with instant beetroot powder

Quality	Germinated brown rice drink mixed with instant beetroot powder
Physical quality	
Color value	L* = 78.10±0.42 a* = 7.06±0.18 b* = 4.63±0.10
Solubility(%)	41.93±0.42
Water absorption index	1.95±0.05
Inflating capacity	0.34±0.01
Chemical quality	
Water activity (a_w)	0.3302±0.003
pH	6.37±0.01
Moisture content	6.39±0.10
Ash content	2.11±0.03
Fat content	2.14±0.02
Protein content	6.46±0.10
Fiber content	1.12±0.34
Microbiological quality	
Average microorganism (CFU/g)	$< 1 \times 10^4$
Average yeast and mold (CFU/g)	< 10

From table 2, the physical quality analysis results of germinated brown rice drink mixed with instant beetroot powder showed that the germinated brown rice drink mixed with instant beetroot powder had color values of L* = 78.10±0.42, a* = 7.06±0.18 and b* = 4.63± 0.10 where the product was quite bright in color. (L*) because there were only 7% of germinated brown rice and beetroot powder content, while the color value (a*) was positive which was a red color similar to the raw material used which was beetroot. Color values (b*) was positive with a yellow color similar to the ingredient used which was germinated brown rice. The color values were considered as important factors of consumer acceptance. The colors occurred should have similar colors to the processed ingredients which were inconsistent with [11, 12] what mentioned that the evaluation of the color of a

product affects its acceptance of consumers as well. In terms of solubility (%), it was 41.93±0.42, depending on the chemical composition, size, shape, particle density. Moreover, the moisture content had an effect on the density of the product. This would increase the density of the product as well. As a result, the solubility decreased as the product particles stuck together. This reduced the dispersibility of particles in the water [13] which was not high in germinated brown rice drink mixed with instant beetroot powder product. It was inconsistent with the standards. Therefore, the solubility was suitable. The water absorption index was 1.95± 0.05. The mixture consisted of germinated brown rice, beetroot powder, milk powder, and sugar powder were mixed which would increase the ability to absorb water through the gaps between particles well and cause the inflating capacity of 0.34± 0.01, which resulted in rice water drink having good solubility and recovery ability.

Chemical quality of germinated brown rice drink mixed with instant beetroot powder was found to have the water activity (a_w) of 0.3302±0.003, which was a very small amount of water activity. Therefore, it could prevent degradation and make the germinated brown rice drink mixed with instant beetroot powder have a long shelf life which was in line with the community product standard (PPP 1068/2558) stating that the value of water activity (a_w) that must not exceed 0.6. The water activity (a_w) is considered as an important factor in the control and prevent the deterioration of food products which directly affects the shelf life of the product due to it is a factor that determines the level of water activity that microorganisms use for growth [10]. Therefore, the deterioration of food products during storage was caused by the main cause which was the higher the moisture content and the a_w content. The good powder samples should have low moisture content and low level of a_w with high level of dissolution ability which is considered an important property of powdered food products [14]. The pH was 6.37±0.01 with a weak acidity. In addition, the important substances in beetroot such as betalains, which are red substance, was stable at a pH range of 3-7. It is an amino acid that has properties to inhibit the growth of tumors and cancer, helps keep the blood flowing well and assists better blood circulation. The germinated brown rice drink mixed with instant beetroot powder had a pH in the non-degradation range. It is important in beet with a pH range of 3-7 for moisture content. Its wet base percentage was equal to 6.39±0.10. The product had gone through a water removal process by using heat under controlled conditions to remove the water in the food by evaporating water to extend the shelf life of food too. This also helps prevent spoilage due to microorganisms, chemical reaction, and enzymes as well. The inactivation of enzymes will help prevent changes of product quality due to the brown discoloration reaction [11]. Moreover, this product had a relatively low moisture content so it could be stored for a long time. Ash content (wet base percentage) was 2.11± 0.03 and fat content (wet base percentage) was equal to 2.14± 0.02. However, low temperature product development process was used. The process temperature of germinated brown rice powder was 50°C and the beetroot powder was processed using the

temperature of 60°C which was the relatively low temperature in heating. So, it prevented oxidation. As a result, the product did not have a fat rancidity with protein content (wet base percentage) equal to 6.46±0.10. In the drying process of germinated brown rice powder and beetroot powder, the loss of protein needed to be taken into account to maintain the nutritional value as much as possible. Therefore, the use of heat in drying was relatively low. The fiber content (wet base percentage) was 1.12± 0.22. From the analysis results, it could be seen that the germinated brown rice drink mixed with instant beetroot powder product had a relatively high nutritional value that germinated brown rice contained protein, vitamins, minerals, and Gamma Aminobutyric Acid (GABA), an amino acid produced by the process of decarboxylation of glutamic acid. This acid plays an important role in the central nervous system as a neurotransmitter causing the work of the brain and the nervous system to work better. It helps relieve stress and has properties in lowering blood pressure. Beetroot contains betanins, vitamin C (ascorbic acid), carotenoids, polyphenols, flavonoids, and saponins [3]. Moreover, it also contains dietary fiber, which can help lower blood pressure and lower cholesterol.

In terms of Microbiological quality of the germinated brown rice drink mixed with instant beetroot powder product, it was found that the average number of microorganisms in total was less than $1x10^4$CFU/g. The mean yeast and mold content is less than 10 CFU/g, which is within the Community Product Standard [10].

3. The study results of consumer acceptance of germinated brown rice drink product mixed with instant beetroot powder

The study results of the consumer acceptance of germinated brown rice drink product mixed with instant beetroot powder by sensory evaluation in terms of color, smell, taste, texture, and overall preference conducted through a 9-point preference score (9-Point Hedonic Scaling) was given to 200 testers to determine the acceptance of the testers. It was found that the general data of all 200 testers accounted for 100%. There were 94 males accounting for 47.00%, 106 females accounting for 53.00%; there were 38 people aged lower than 20 years accounting for 19.00%; 69 people aged between 21-30 years old accounting for 34.50%, 53 people aged between 31-40 years old representing 26.50%; 29 people aged between 41-50 years representing 14.50%, 11 people aged between 51-60 years old representing 5.50 percent, 0 people aged over age 60 years old representing 0.00%. The education levels of the sample groups were 22 people having primary education level accounting for 11.00%, 31 people having secondary education representing 15.50%, 44 people having diploma accounting for 22.00%, 70 people having bachelor degree accounting for 35.00%, 33 people having higher than bachelor degree accounting for 16.50%, and 0 people having others accounting for 0.00 percent. For occupations of the sample groups, there were 40 people who are students accounting for 20.00%, civil servants/state enterprises of 31 people representing 15.50%, private company

employees 47 people representing 23.50%, personal business occupation of 56 people accounting for 28.0%, 11 rice entrepreneurs accounting for 5.50%, and other occupations of 15 people representing 7.50%. In terms of average monthly income of the sample group, the average monthly income was less than 5,000 baht for 35 people representing 17.50%; the average monthly income of 5,000-10,000 baht for 14 people, or 7.00%; the average monthly income of 10,001-20,000 baht for 51 people accounting for 25.50%; the average monthly income of 20,001-30,000 baht of 78 people, representing 39.00%; the average monthly income higher than 30,001 of 22 people representing 11.00%.

In terms of information on consumer behavior on the germinated brown rice drink mixed with instant beetroot powder product collected from a group of 200 people, representing 100%, the number of persons who had consumed the germinated brown rice drink mixed with instant beetroot powder product was 174 people or 87.00% and the number of those who had never consumed the germinated brown rice drink mixed with instant beetroot powder product was 26 persons or 13.00% as shown in Table 3.

Table 3 Information on consumption behavior of the germinated brown rice drink mixed with instant beetroot powder product

Information	Frequency	(%) Percentage
Have you ever consumed the germinated brown rice drink mixed with instant beetroot powder product		
Yes	174	81.00
No	26	19.00

Results of the consumer acceptance study of the germinated brown rice drink mixed with instant beetroot powder product by sensory characteristics in terms of color, smell, taste, texture and overall preference through a 9-point preference score (9-PointHedonic Scale) was given to 200 testers to determine the acceptance of the testers. Affection at the mean score was 7.43±0.79. For smell characteristic, the mean score was 7.22± 0.91. For taste had a preference level at mean score 7.16± 0.94. For texture, the mean score was 7.03± 1.04, and for overall preference level, the mean score was 7.18± 0.87 as shown in Table 4.

Table 4 Results of consumer acceptance of the germinated brown rice drink mixed with instant beetroot powder product

Sensory characteristics	Consumer acceptance of the germinated brown rice drink mixed with instant beetroot powder product
Colour	7.43±0.79
Smell	7.22±0.91
Taste	7.16±0.94
Texture	7.03±1.04
Overall preference	7.18±0.87

For information on acceptance of the germinated brown rice drink mixed with instant beetroot powder product collected from a group of 200 testers or 100%, if there was the germinated brown rice drink mixed with instant beetroot powder product for sale, there were 178 consumers who were interested in it accounting for 89.00% because of its novelty, beautiful color, delicious taste, and nutritional value There were not interested in 22 people, accounting for 11.00% because they did not like the texture.

If there was the germinated brown rice drink mixed with instant beetroot powder product available in volume of 20 grams, consumers could buy for 15 baht for 36 people or 18.00%; consumers who could buy for 20 baht were 146 people or 73.00%; 18 people could buy at the price of 25 baht or 9.00%. If there was the germinated brown rice drink mixed with instant beetroot powder product available for sale, 170 consumers would purchase accounting for 85.00% because of its novelty, colorful, delicious taste, and nutritional value. There were 30 people who were not interested representing 15.00% because they did not like the texture of the drink.

Conclusion

Sensory characteristics analysis of consumers on the germinated brown rice drink mixed with instant beetroot powder product was found that the germinated brown rice drink mixed with instant beetroot powder product containing beetroot powder at 7 percent content had sensory test scores for color, smell, taste, appearance, texture, and overall preference at 7.12±0.65, 7.23±0.61, 6.90±0.63, 7.20±0.56, and 7.14±0.82, respectively. The ingredient content of the drink contained 48% germinated brown rice powder, 7% beetroot powder, 30% milk powder, and 15% sugar. Physical, chemical and microbiological quality analyzes of products were found that the germinated brown rice drink mixed with instant beetroot powder product's physical qualities of color L* = 78.10±0.42, a* = 7.06±0.18 and b* = 4.63±0.10; solubility (%) was 41.93±0.42. The water absorption was 1.95±0.05 and the puffing capacity was 0.34±0.01. Chemical quality of the germinated brown rice drink mixed with instant beetroot powder product was found that it had the same water activity (a_w) of 0.3302±0.003 which was the period with very little free water. It could prevent degradation and extend long shelf life. The pH value

was 6.55±0.01. The moisture content (wet base percentage) was 6.39±0.10. The ash content (wet base percentage) was 2.11±0.03. The fat content (wet base percentage) was 2.14±0.02. The protein content (wet base percentage) was 6.46±0.10. The microbiological quality of the germinated brown rice drink mixed with instant beetroot powder product was found that it had the mean total microorganism content was less than 1 x 10^4 CFU/g. The mean yeast and mold content was less than 10 CFU/g, which was within the community product standards. If there was the germinated brown rice drink mixed with instant beetroot powder product for sale, 85% of consumers would purchase the beverages. The knowledge gained from this research could be used as a guideline for further production of the germinated brown rice drink mixed with instant beetroot powder product at the industrial level.

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