

The Proximate Analysis and Sensory Hedonic Evaluation of Energy Drink (Agarbomb)

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ABSTRACT

The main purposes of this study are to assess the consumers' acceptance of the sensory attributes of energy powder made from guarana as caffeine and to determine the nutritional values of energy powder made from guarana as a substitute for coffee. The method used to conduct this research is measuring proximate analysis of ash, moisture, protein, fat, and crude fibre to identify energy powder's nutrient content. Besides, it discovers the acceptance of energy drinks towards potential consumers by undergoing a 7-point hedonic sensory evaluation test of 25 semi-panels. The outcomes gained from this research are low protein, low fat, and high minerals due to the high ash content, presenting that it is acceptable for energy drinks since it usually focuses on total energy and sugar for energy boost. The panellist's acceptance is concentrated in viscosity and colour, which might concern Agarbomb's improvement in aroma, taste, and overall acceptability.

Keywords: energy drink, guarana, hedonic sensory, proximate analysis

INTRODUCTION

In Malaysia, the consumption of energy drinks is increasing due to the need for instant energy boosts for the body. Most consumers depend on energy drinks for activities such as staying up for work, driving, avoiding fatigue, or for athletes (Aguilar-Raymundo *et al.* 2019). To attract consumers, creating unique marketing strategies and tools is significant to the evolution of industries (Hussain *et al.* 2021). In the last few years, businesses have reached customers more successfully because of new methods of acquiring consumer data via cutting-edge marketing initiatives and technologies, which include improvising the products to appear unique and become the main highlight of attraction (Amiruddin *et al.* 2022).

The statistics show that young generations consume more energy drinks as they are much needed for driving, playing, studying, and other physical activities (Hasan *et al.* 2019). Consuming energy drinks has highly stimulating effects as it pushes the body to function more than it should to give high cognitive performance. Latest statistics

from Statista (2020) in 2019 show that energy-boosting drinks with a combination of high caffeine and guarana content compared to other functional beverages such as functional water, 'detox' drinks, fermented and probiotic drinks promoting gut health, and others. Consumption of energy drinks was the highest among 25 to 34-year-old Malaysians, which is 49.91%, followed by 16 to 24-year-olds (49.29%) and 35 to 44-year-olds (43.78%). It concludes that 16 to 44 years old are the top three highest age ranges that consume energy drinks frequently as functional beverages.

According to Chen and Voigt (2020), nutrients are needed to follow modernisation and boost the food and beverage industry. Discovering nutrient values in the products can help expand their acceptability. It will indirectly encourage consumers to purchase the products, especially when they match their nutritional needs (Wong *et al.* 2023). As Vandenbrink *et al.* (2020) mentioned, nutrition evaluation is performed in the laboratory to observe and determine the presence of protein, potassium, sodium, and carbohydrates in the products.

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This research mainly focused on determining the nutritional values of energy drinks made from guarana and assessing consumers' acceptance of the sensory attributes of energy drinks.

METHODS

Design, location, and time

The research proposal employed an experimental design and a quantitative technique. Both proximate analysis and sensory evaluation tests were conducted in different settings at Universiti Teknologi MARA, Puncak Alam Campus. Proximate analysis was conducted at the Food Analysis Laboratory, and the sensory evaluation test was held in the Food Sensory Laboratory. Ethical approval was obtained from the Faculty Research Ethics Committee (REC) ref. no: REC/06/2023 (MR/396).

Materials and tools

Twenty-five semi-panelists participated in a 7-point Hedonic sensory evaluation of the Agarbomb powder, Refeul, and Isotonic Energy brands. This sample selection method allowed for diverse feedback on the tested products' sensory attributes.

Procedures

Proximate analysis

Analysis of moisture content. AOAC (1990) and Dhankhar and Techs (2013) methods have been applied to analyse the moisture content of energy powder. A small amount of energy powder, about 5 grams, will be initially dried at 98°C to 100°C, cooled in the dryer, and then precisely weighed in a weighing container as soon as it reaches room temperature. The lid was removed and heated at 110°C in a hot air oven for two hours. After the bowl lid had reached room temperature, it was promptly squeezed, put in the dryer, and weighed. On a dry basis, the weight loss was computed as a percentage of the moisture content.

Determination of ash. Ash content was assessed using the AOAC (1990) and Dhankhar and Tech methods (2013). A shallow aluminium dish spends three hours being dried in an oven set to 105°C. Once it reached room temperature, it was chilled in a desiccator and weighed. The homogenised food sample was accurately

weighed at 5 grams and placed in an aluminium dish. The sample was precisely weighed in a container when it reached room temperature after being accurately dried in an oven at 110°C for three hours. The lid was removed and heated at 110°C in a hot air oven for two hours. Up to yellowish or greyish ash was collected, and the sample was ashed. After reaching room temperature, the dish was removed, chilled in a desiccator, and weighed.

Determination of carbohydrate. The carbohydrate content for energy drinks was calculated based on AOAC (1990). Total carbohydrates were calculated based on the following formula (Dhankhar & Tech 2013):

$$\text{Total carbohydrates} = 100 - (\text{Fat} + \text{Fiber} + \text{Ash} + \text{Protein})$$

Determination of crude protein. The crude protein content of the sample was analysed using two steps which are digestion and determination using the Kjeltex auto analyser with AACC (2000) method No. 46-10 according to the following statement (Dhankhar & Tech, 2013) Tor to oxidize Noxidizerm ammonium sulfate, 1 g of well-ground food sample was put to the digestion tube along with 2 K₂SO₄ (3.5g) catalyst tablets and 12 mL of sulphuric acid. When the mixture was clear, the digestion tube was placed in the rack and digested at 420°C for 45 minutes. The digested sample was then chilled until it reached room temperature.

The digestion tube containing the sample was attached to the distillation unit in the second stage. It has 50 mL of 40% NaOH and 75 mL of water. 25 mL of H₃BO₃ solution was added to the receiver flask for the distillation. The equipment eventually performs automatic titration.

Determination of crude fiber. The crude fiber was estimated according to the procedure outlined in the 32-10 AOAC (1995) method. The first energy drink sample was digested with 1.25% H₂O-SO₄, a 3g sample. It was digested with a solution of 1.25% NaOH, rinsed with distilled water, and filtered once more. The digested sample was heated and placed in a muffle furnace that was kept at 550–650°C for 3–5 hours to obtain grey or white ash.

Sensory evaluation

A panel of 25 semi-trained subjects were chosen for this research. This type of panel should be selected from individuals who are familiar

with the quality of beverages and different classes of products. Panellists must be capable of recognising the differences and communicating their reactions, though they may not formally be trained. Semi-panel individual variations are balanced by involving more panellists (Selahvarzi *et al.* 2021). About 25–30 members are required and should be used as a preliminary screening programme to select a few products for large-scale consumer trials. All of the variables were calculated using a hedonic scale of nine points, from "very like" to "extremely dislike" (Nguyen & Chuyen 2020). The semi-trained panellists were given a pencil, plain water, a hedonic scale evaluation form, and three Agarbomb, ReFeul, and Isotonic Energy samples.

Drinking filtered water was performed for the mouth of beverage particles. As a result, it can stop mistakes from happening. Barylko Pikielna and Matuszewska (2014) state that panellists must consume water between each sample test to prevent errors. The panellists were required to rate the samples using a 7-point hedonic sensory evaluation scale based on their personal preferences after testing them.

Data analysis

All the obtained data was imported into SPSS version 27.0 (Statistical Package for Social Sciences) for data analysis. A study of Variance (ANOVA) and descriptive statistics was performed in the statistical analysis to investigate any significant differences in the acceptances between three types of energy powder concentrations. Excel was used to obtain spider web or sensory evaluations between three different products.

RESULTS AND DISCUSSION

Table 1 shows the proximate analysis of the Agarbomb energy drink. The proximate analysis includes moisture, ash, protein, crude fibre, fat, and carbohydrate content. For energy drinks, proximate analysis is used to determine their composition and analyse how different elements, such as the contents and consumption habits of the beverage, affect their physical characteristics and colour stability (Choi *et al.* 2019). The moisture content attained from the analysis of the Agarbomb energy drink is 7.09 ± 0.02 . This shows that the moisture content

in the energy drink powder is in the ideal range as, according to research by Akhter *et al.* (2020), dried food products such as energy powder drinks should attain a moisture content of less than 10%. Compare this to the moisture content in instant mango drinks by Akhter *et al.* (2020). Agarbomb energy drinks contain a higher moisture content than mango instant drinks, with a 4.6 to 0.2% moisture content.

Low moisture content in products can determine the extended shelf life (El Wakeel 2007). Moisture can encourage various chemical processes, microbiological development, and enzymatic degradation, resulting in product deterioration and decreased quality. The powder has a longer shelf life since it is less likely to deteriorate over time with a lower moisture content reading. Besides that, the chance of caking or clumping of products, which can happen when the powder particles absorb water, is lowered with less moisture.

Besides, ash content was analysed with the results of 90.56 ± 0.62 , showing that high mineral content such as calcium, magnesium, potassium, and sodium are discovered in the energy drink. Based on the Akhter *et al.* (2020) study, the importance of determining the minerals in the ash is that having high mineral content would help in hydration support, which can improve the capacity of the human body to absorb and hold onto water. The drink of instant mango powder is lower (Mohammed *et al.* 2017) than the Agarbomb energy drink. Higher ash-content energy drinks could help the body remain hydrated, which is important for general health

Table 1. Subject distribution based on research variables

Proximate composition	(Mean±SD)
Moisture content (%)	7.09±0.02
Ash content (%)	90.56±0.62
Protein (%)	0.07±0.04
Crude fibre (%)	16.95±0.00
Fat (%)	0.00±0.00
Carbohydrate (%)	0.66±0.00

SD: Standard Deviation

and performance. Moreover, it has many minerals in muscle function and bone health.

Besides that, the proximate protein analysis for the Agarbomb energy drink is 0.07 ± 0.04 . Although protein is an essential macronutrient in diets, there are a few unique reasons for types of beverages, such as energy drinks, to apply a lesser amount of protein. In their study, Akhter *et al.* (2010) mentioned that low protein is found in fruits and vegetables as it is proved that Agarbomb and mango instant drinks attained the same protein content, which is 0.07 ± 0.04 . The concrete reason for low protein is rapid absorption and digestion. Frequently, individuals devote themselves to energy drinks to get a quick increase in energy, alertness, and determination. A low-protein energy drink might be beneficial when quick absorption and digestion are required. Proteins typically take longer to digest than carbohydrates, which can hinder the absorption of the beverage's other nutrients and active substances (Hamilton *et al.* 2020).

Meanwhile, 16.95 ± 0.00 was attained for proximate analysis of Agarbomb crude fibre. The concept of "crude fiber" refers to the indigestible portion of dietary fibre in non-plant-based meals. The significance of crude fiber in the needs of energy drinks is less concerning than other nutrients, and most energy drinks would exclude the large levels of fibre. Energy drinks focus on introducing consumers to an immediate boost in energy, concentration, and alertness (McWhirter *et al.* 2020). Adding carbs, caffeine, and other stimulants would be the most concerning components in every energy drink. In other words, the primary goal of energy drinks is to focus more quickly on obtaining energy rather than dietary fiber.

Next, the fat contained in the Agarbomb energy drink is 0 g. The presence of fat in energy drinks is frequently not significant, and almost all the ones available are made to be either fat-free or minimal in fat. Since fatty acids take longer to digest and metabolise than carbs, fats provide an unsteady and enduring energy source. Fats would be out of place in energy drinks because the idea is to provide consumers with an immediate energy boost. When the body's supply of carbohydrates runs out, it might use the concentrated energy in fat. Some of the fat's crucial purposes are as a cushion and protector for internal organs such as the heart, kidneys, lungs, and intestine. (Mohammed *et al.* 2017)

Lastly, the carbohydrate content in Agarbomb is 0.66 ± 0.00 , meaning it only consists of 0.66 g of carbs per serving. The energy drink offers an ideal alternative for any individual who favours low-calorie or low-carbohydrate drinks because 0.66 g are considered low-carbohydrate since typical carbohydrates contained in energy drinks are 11% to 12%. It is tempting for those on a strict diet or attempting to consume fewer carbohydrates. While a low-carb energy drink may offer a small amount of increase in energy from carbohydrates, it still contains other stimulants like caffeine from guarana and B vitamins, which help with alertness and focus (Nowak & Goslinski 2020). A low-carb energy drink could prove a better option for consumers with certain medical conditions, such as diabetes or insulin resistance, to help control blood sugar levels.

A study of the developed Agarbomb energy drink shows that most characteristics outperformed those of the existing instant drink powder. The instant drink powder's proximate analysis shows it is safe for human ingestion. Proximate analysis is crucial in producing commercial food because businesses must ensure that the final goods are safe and nutritious and comply with all applicable laws and legal regulations. It continues to be the only method for preserving and observing food products' quality and remaining shelf life.

Sensory evaluation

Table 2 shows significant differences in acceptability of colour, aroma, taste, viscosity, and overall acceptance (Okokon & Okokon 2019) between Agarbomb, ReFeul and Isotonic Energy as the p-value was less than 0.05. All the samples had significant differences due to the different main focus of attributes for each energy drink. Agarbomb is moderately accepted for colour with the mean of 5.481.09 followed by Isotonic Energy (4.32 ± 1.65) and ReFeul (4.24 ± 1.88). For aroma, ReFeul gained the highest mean (5.64 ± 1.60), assuring that most of the panellists agreed ReFeul had the likeable aroma, followed by Agarbomb with the mean of 4.84 ± 1.72 and Isotonic Energy with the mean of 4.08 ± 1.85 . Besides, there is a huge gap between the three energy drinks for the taste attribute. ReFuel attained the highest figure, which is 6.00 ± 1.38 go around with Agarbomb (3.96 ± 1.95) and Isotonic Energy (2.76 ± 1.56).

Table 2. Descriptive table of energy drinks

Samples	Colour (Mean±SD)	Aroma (Mean±SD)	Taste (Mean±SD)	Viscosity (Mean±SD)	Overall acceptance (Mean±SD)
Agar bomb	5.48±1.09	4.84±1.72	3.96±1.95	4.92±1.15	4.40±1.60
Refeul	4.24±1.88	5.64±1.60	6.00±1.38	4.24±1.99	5.36±1.38
Isotonic energy	4.32±1.65	4.08±1.85	2.76±1.56	3.16±1.72	2.80±1.44

SD;: Standard Deviation

Next for viscosity, Agarbomb hit the uppermost reading, which is 4.92±1.15, followed by ReFuel (4.24±1.99) and Isotonic Energy (3.16±1.72). Lastly, the overall acceptability of the energy drink by the panellists through hedonic scale evaluation is attained by ReFuel with the reading of 5.36±1.38 followed by Agarbomb (4.40±1.61) and Isotonic Energy (2.80±1.44).

Based on Table 2, there are significant differences in acceptability of colour, aroma, taste, viscosity, and overall acceptance between Agarbomb, ReFeul, and Isotonic Energy as the p-value was less than 0.05, which is similar to the previous study of functional energy drink by Selahvarzi *et al.* (2021). All the samples had significant differences due to the different main focus of attributes for each energy drink.

Figure 1 shows the level of sensory evaluation result acceptance for three energy drinks: Agarbomb, ReFeul, and Isotonic Energy. Agarbomb represented the blue line, ReFeul represented the orange line, and lastly, the grey

line was represented by the Isotonic Energy drink.

Based on the results, ReFeul conquered the most attributes: aroma, taste, and overall acceptability. Agarbomb attained high colour and viscosity attributes, while Isotonic Energy was the lowest. Figure 1 of the spider web sensory evaluation acceptance test result, Agarbomb has been compared with two other sample products, ReFuel and Isotonic Energy. The mentioned attributes include colour, aroma, taste, viscosity, and overall acceptability of the panellists as measured by a 7-point hedonic scale evaluation (Chonpracha *et al.* 2019). ReFeul scored the highest attributes for aroma, taste, and overall acceptability, while Agarbomb scored in colour and viscosity. This makes Isotonic Energy the lowest of all.

The panellist might favour the aroma of ReFeul more than others because of the total mean of 5.64±1.60. This product has a strong and sweet aroma, allowing the brain cells to activate more positively (Al-Shawyeh 2019) and hype the

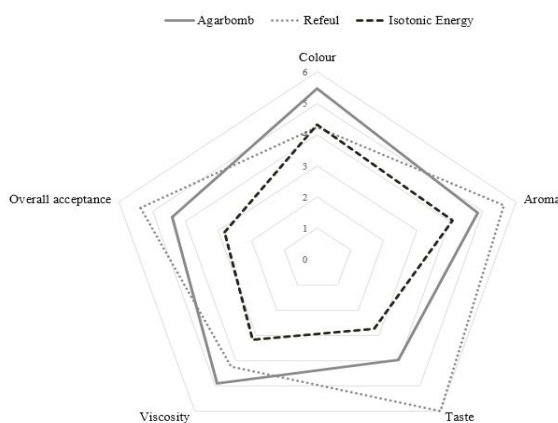


Figure 1. Sensory evaluation acceptance test result

panellist to choose ReFeul as the most favoured aroma choice among the three. In Figure 1, the aroma attribute shows that each product has a significant difference because the spider webs of each product do not overlap.

As for taste, ReFeul proves that it tastes better than the other two, with a mean of 6.00 ± 1.38 . The panellist is most likely to pick the sweetest taste of all. Moreover, refuel shows a big difference in taste from other products. Refuel's spider web is near the attribute in Figure 1.

Next, Agarbomb lead in attributes of colour with 5.48 ± 1.09 , which is acceptable because, among all the sample products, Agarbomb has the most attractive appearance and shows significant differences compared to Refuel and Isotonic Energy products in Figure 1. Both refuel and isotonic energy products have no significant difference as the spider web of Refuel and isotonic energy overlap each other. The berry-like colour of the liquid makes the panellist fascinated with choosing Agarbomb over others.

Besides, Agarbomb also attained the highest viscosity with a total mean of 4.92 ± 1.15 , proving that Agarbomb has the most stable fluid resistance. Agarbomb also shows the nearest viscosity attribute through the spiderweb, addressing a significant difference between Agarbomb, Refuel, and Isotonic Energy. Agarbomb have an average middle viscosity level that is highly likeable among all.

Moreover, the overall acceptance attribute chosen from the mean result of panellists is ReFeul with a reading of 5.36 ± 1.38 . This is understandable due to three out of five attributes the ReFeul energy drink attained. All the products significantly differ in acceptance, with Refuel leading, followed by Agarbomb and isotonic drink.

Agarbomb is recommended to improve aroma, taste, and overall acceptance attributes. This product aims to attract more consumers and increase market demand (Seninde & Chambers 2020). According to Mostafa (2022), adding caffeine (up to 320 mg/L) improved the taste and scent but had a detrimental effect on the colour. Throughout this research, consumers are more attracted to the aroma of energy drinks with mild original berries instead of plain or nearly non-aroma as Akubor and Obasi (2019) mentioned that to attract the taste of energy drinks using flavoured fruit formulations which served as

the study's base is preferable for enriching the beverage. The potential consumer might refer to energy drinks as delicious and tasteful with a compact taste and benefits in a small packet.

CONCLUSION

This study was carried out to measure the nutrient content in Agarbomb and to determine consumers' acceptability through a 7-point sensory hedonic evaluation. The guarana-based energy drink's nutritional research has shed important light on its makeup. The presence of important macronutrients, such as carbs, proteins, and lipids, as well as the amount of moisture and ash, were identified by proximate analysis. The analysis' findings help better understand the energy drink's nutritional composition and give consumers, medical experts, and regulatory bodies crucial information.

Additional investigation is required to examine additional bioactive substances and micronutrients in the energy drink and confirm the labelling data's veracity. Future studies should investigate the effects of context, cultural variations, and repeated exposure on consumer acceptability to further advance our understanding of sensory appeal. As a result, efforts to develop an energy drink that complies with consumers' taste preferences and expectations were guided by the insights provided by the sensory hedonic evaluation. In the next research study, it is highly recommended that the correlation between physical activities and different percentages of guarana as caffeine in energy drinks be determined.

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DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflict of interest.

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