

**ACCEPTABILITY OF REDFLOWER RAGLEAF
(CRASSOCEPHALUM CREPIDIOIDES) TEA INFUSED WITH
MINT (MENTHA X PIPERITA)****Caryle Jane B. Kacayon¹, Sherene B. Torio²,
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ABSTRACT

This study explored the acceptability of Redflower Ragleaf (Crassocephalum crepidioides) tea infused with mint (Mentha x piperita). The primary objectives were to evaluate the tea's acceptance based on color, aroma, taste, body, and overall acceptability. Additionally, the study aimed to identify the most preferred treatment and to establish a cost analysis ensuring a profitable return on investment. The researchers employed a quasi-experimental research design to achieve these objectives. The findings indicated that treatment 1 was the most favored, excelling in color, flavor, aroma, and overall acceptability, with moderate to high approval ratings across all parameters. For the body, treatment 2 received the highest rating, closely followed by treatment 1. The conclusions underscored treatment 1's higher acceptability; however, further improvements were recommended to enhance its characteristics. It was suggested to conduct laboratory testing to confirm the product's safety and economic feasibility and to extend the investigation into the interaction effects of the ingredients. A comprehensive feasibility study was also recommended to provide an in-depth analysis of production costs and the capital required for commercializing the tea. Additionally, further research into packaging and branding was advised to ensure the product was market-ready.

Keywords: Tea, Redflower Ragleaf (*Crassocephalum crepidioides*), Peppermint (*Mentha piperita*), product development, acceptability, treatment

1. Introduction

After water, tea is the beverage consumed the most worldwide. While other sources may claim that coffee comes second as the most consumed beverage, tea still comes into importance as it has been consumed for over four millennia. Preparing tea is as simple as boiling water and steeping tea leaves for a few minutes before consuming. Throughout the years, development in its preparations has evolved while maintaining other traditional tea preparations. Tea has long been used as a crucial fluid for patients with infectious disorders, given its reputation for being health-promoting (Weisburger, 1998). The profound medicinal attributes of tea have been recognized across civilizations and throughout history, its consumption during convalescence from flu-like ailments has been prevalent. The benefits of tea on human health can be categorized into major and minor effects. The study of Trevisanato and Kim (2000) examined the primary effects of tea consumption, mostly related to cardiovascular disease and cancer, as well as the smaller effects related to dental health, kidney health, gastrointestinal wellness, and immune function. Yet, amidst the global embrace of traditional teas, certain botanical resources remain

underutilized. Redflower ragleaf, a member of the Asteraceae family taxonomically known as *Crassocephalum crepidioides* (Cronquist, 1981), stands as an overlooked vegetable due to its inherent pungency. Despite being disparaged as a weed, it thrives abundantly in abandoned farmlands, plantations, and domestic gardens. Particularly, among the Yobura tribe in South West Nigeria, this plant is referred to as “Efo Ebolo or Ebire” (Burkill, 1995). *C. crepidioides* offers a distinctive pine-like flavor, with fleshy, somewhat mucilaginous leaves carrying a nutty undertone (Facciola, 1998). Esteemed for its unique taste, especially in southwestern Nigeria, it finds its way into soups and stews, paired with peppers, onions, tomatoes, and sometimes fish or meat.

Traditional African medicinal practices attribute antiseptic and anti-inflammatory properties to *C. crepidioides*, contributing to treatments for indigestion, stomach ailments, epilepsy, and other conditions (Small & Catling, 1999). Studies by Aniya et al. (2005) validate its potent antioxidant properties and hepatoprotective effects. Ayodele et al. (2019) further assert its bioactive elements' potential in addressing blood coagulation disorders, substantiating its diverse therapeutic prospects.

Moreover, in Philippine history, this edible weed, colloquially known as “haphappon”, played a pivotal role in sustaining many Filipinos during the Japanese occupation. Indigenous beliefs among the Itneg tribe also attribute qualities promoting healthy sleep, advocating its consumption in the afternoon or evening (Medenilla, 2021).

In parallel, mint, belonging to the Lamiaceae family, encompasses various species, including peppermint and spearmint. Mint, transcends geographical boundaries to emerge as a revered herb in culinary and medicinal realms globally. Its aromatic allure and diverse applications underscore its significance across civilizations. Culturally, mint's presence in culinary traditions spans continents, gracing dishes from the Mediterranean to Asia (Park et al., 2002). Rich in vitamins, minerals, phenolic compounds, dietary fiber, and antioxidants, mint harbors a spectrum of phytoconstituent, including iron, alkaloids, steroids, and tannins, which curtail sugar absorption and exhibit flavonoid properties (Muhammad et al., 2023).

The background study reveals several research gaps and opportunities, particularly in the Philippine setting. Despite its medicinal properties, Redflower Rag leaf has not been widely explored as a tea ingredient, presenting an underutilization gap. There is also a lack of studies comparing traditional tea ingredients with non-traditional ones like Redflower Rag leaf, which offers a comparative analysis opportunity. Additionally, limited information exists on the market acceptance and economic feasibility of Redflower Rag leaf tea, highlighting a need for market perception and economic viability research. The synergistic effects of combining Redflower Rag leaf with mint are not well studied, indicating a gap in understanding interaction effects. Furthermore, detailed scientific studies on the safety and health impacts of these novel tea blends are necessary to establish their functional properties and safety. The cultural significance of Redflower Rag leaf, especially in the Philippine context where it played a crucial role during the Japanese occupation, is not utilized in modern product development, suggesting an opportunity to integrate cultural and historical relevance into marketing strategies. Lastly, there is minimal discussion on sustainable cultivation practices for Redflower Rag leaf, presenting an opportunity to investigate sustainability and agricultural practices. Addressing these gaps could lead to innovative tea products, economic growth, and a better understanding of underutilized botanical resources in the Philippines. This study endeavors to harness the latent potential of Redflower Rag leaf and mint leaves to innovate a product.

By illuminating the nutritional and medicinal attributes of Redflower Rag leaf, this research aims to redefine its perception from a disregarded weed to a consumable resource brimming with health benefits. The product's introduction into the market holds promise for economic advancement, potentially even tapping into international markets if successful. Likewise, this research also provides for an avenue for the exploration of novel products that can be produced and aligns with the aims of the Hotel Management Department in producing novel products for potential commercialization. This study may contribute to the attainment of such objectives by exploring such opportunities in product development. Beyond immediate economic implications, this study also aspires to disseminate knowledge within the community and among future researchers. By shedding light on the consumable facets of redflower ragleaf, it paves the way for further exploration and product innovation. Ultimately, this research aims to serve as a stepping stone for future inquiries, facilitating a deeper understanding and wider application of these botanical resources.

2. Literature Review

Redflower Rag leaf (*Crassocephalum crepidioides*), despite being an underutilized vegetable, holds significant medicinal potential. Traditionally considered a weed due to its unappealing odor, it thrives in

wetlands, wastelands, and backyards (Zollo et al., 2000). However, in West and Central Africa, it finds application in culinary practices, featured in soups and stews while being utilized in local remedies for wounds, boils, burns, indigestion, and stomach ulcers (Adjatin A., et al., 2013; Rajesh, 2014). Rich in phytochemicals like flavonoids, phenols, and ascorbic acid, alongside essential nutrients such as crude protein and polysaccharides, this plant exhibits notable health benefits (Arawande et al., 2013). Additionally, the leaves and stems are employed to address digestive issues, functioning as a laxative and liver tonic (Fowomola et al., 2005; Ayodele, 2007). Scientific inquiries have uncovered its antioxidant properties demonstrated through its activity in linoleic acid model systems (Odukoya et al., 2007). Furthermore, its extracts have exhibited cancer chemo-preventive and anti-inflammatory actions (Chai-Chung Hou et al., 2007) and have displayed protective effects against oxidative damage to hepatic cells, exerting cancer chemo-preventive and antitumor actions (Aniya Y., et al., 2005; Chia CH., et al., 2007).

Characterized as an annual edible plant, *C. crepidioides* stands as an erect, sparingly branched herb with elliptic to ovate leaves and wind-dispersed seeds encapsulated in silky white hairs (Kostermans et al., 1987; Rajesh, 2011). Despite its invasive nature, spreading across tropical and sub-tropical regions, its extensive medicinal utility for treating various ailments remains noteworthy (Ajibesin, 2012; Aniya et al., 2005; Oyelakin & Ayodele, 2013; Sakpere et al., 2013).

Evidently a rich source of vitamins, minerals, and protein, *C. crepidioides* emerges as a potential nutraceutical agent for disease prevention and management (Smith et al. 2007; Dairo et al. 2007; Adjatin et al., 2013). Ethno pharmacological assessments have substantiated its diverse properties, exhibiting anti-helminthic, antibacterial, anti-inflammatory, antidiabetic, and acetylcholinesterase inhibitory traits (Bahar et al., 2017; Joshi, 2014; Owokomoto et al., 2012; Tomimori et al., 2012). With its proven antioxidant, cytoprotective, cancer chemoprotective, and anti-tumor activities, as well as recent revelations on its in vitro anticoagulant potential (Ayodele et al., 2019), the infusion of Redflower Ragleaf with mint leaves for tea presents a compelling avenue for exploring its medicinal benefits further.

Mentha X Piperita commonly known as peppermint, is a hybrid of spearmint (*Mentha Spicata*) and water mint (*Mentha Aquatica*). It is a perennial herb that is widely cultivated for its medicinal, culinary, and aesthetic uses. Also, it can be made as tea. Peppermint tea is made by infusing its leaves into hot water. Peppermint leaves contain several essential oils that are released when steeped in hot water, including menthol, menthone, and limonene. Collectively, these give peppermint tea its refreshing, cooling, minty taste. Peppermint tea can be made using fresh leaves, dried loose leaves, or tea bags. In teabags, peppermint may be mixed with other flavors, such as licorice or fruit. It's naturally caffeine-free, so it can be drunk anytime (Shubrook, 2023).

Fresh peppermint tea is often used to help with stomach symptoms such as nausea, bloating, and cramps. It can also help soothe a sore throat and help with bad breath (Elise, 2023).

On the other hand, tea infusion, which involves brewing tea with fruits, flowers, herbs, spices, and other botanicals in hot or cold water, has become a popular trend lately. Studies have shown that tea infusions are now being used for many medicinal purposes. In the study of Albayrak et al. (2012), they stated that most people drink tea and use senna, fennel, anise, laurel, linden, nettle, parsley, and dill as spices. Additionally, they are frequently employed in Turkish traditional medicine as a Treatment for a variety of illnesses. Plants, tea, and herbal infusions are the main food sources of phenolic chemicals. The recent surge in studies on the use of natural items in a variety of fields, including food, pharmacy, alternative medicine, and natural therapy, is partly due to the observed activities. Additionally, Oh et al. in 2013, revealed in their study that leafy herbal teas' have antioxidant and antibacterial properties.

3. Research Method

The researchers employed a quasi-experimental design to create a Redflower Rag leaf tea infused with mint. This design allowed for the manipulation of variables, enabling measurable and comparable results. The study used three distinct treatments and a control recipe to evaluate the tea comprehensively. The chosen design aligns with an exploratory research approach, aiming to investigate a topic that lacks thorough exploration.

Locale and Population of Data

The experiment was conducted at the HM Kitchen of MPSPC Bontoc, while the evaluation took place at MPSPC Bontoc Campus. A purposive sample strategy was employed to select participants for the consumer-type panel, comprising 50 individuals who served as key evaluators for the acceptability test. The evaluators adhered to the selection criteria and principles of purposive sampling. The panel members were chosen from a range of 18 to 60 years of age, which falls within the acceptable age range for conducting acceptability tests without requiring additional consent.

Data Gathering Tool

The researchers employed the Hedonic Scale as a tool to evaluate the acceptability of banana peel and pomelo peel as main ingredients in jam-making. Hedonic scales are typically used to assess the degree of liking for products by consumers using the following scales: like extremely (9), like very much (8), like moderately (7), like slightly (6), neither like nor dislike (5), dislike slightly (4), dislike moderately (dislike moderately (3), dislike very much (2), and dislike extremely (1).

Data Gathering Procedures

Once the experimental procedures were refined, batches of the developed products were prepared for acceptability testing. The evaluators were provided with samples of the products at the optimal temperature for assessment, ensuring that they could evaluate the products in a consistent and controlled manner. The evaluators were instructed to complete survey questionnaires assessing various aspects of the products, including their appearance, texture, taste, and overall acceptability.

Precautionary Measures for Air drying

When air-drying leaves for culinary or decorative purposes, particularly herbs, adherence to stringent food safety protocols is imperative to ensure that the dried leaves remain safe for consumption. Critical considerations must be addressed during the harvesting process. Initially, the selection of leaves is paramount; choose only fresh, undamaged leaves from robust, healthy plants, explicitly avoiding any that exhibit signs of mold, pests, or disease. This ensures the optimal level of freshness, nutrient content, and maturity. The stage of leaf development significantly influences the final product's flavor profile: younger leaves typically exhibit a less pronounced flavor and a more vegetal taste but possess higher antioxidant levels, whereas older leaves offer a more robust and developed flavor. However, excessively late harvesting can result in undesirable off-flavors.

During the cleaning phase, it is essential to rinse the leaves thoroughly in cool water to eliminate dirt and debris, followed by a gentle shake to remove excess moisture. Ensuring that the leaves are meticulously cleaned prior to drying is crucial. The drying environment should be characterized by excellent ventilation and substantial air circulation. Outdoor drying is discouraged due to potential exposure to contaminants and pests; instead, indoor air drying is recommended to enhance color and flavor retention.

For the air-drying process, leaves should be suspended downwards. This method is advocated to mitigate mold formation, as contact with surfaces or containers can lead to contamination. Leaves with elevated moisture content are particularly prone to mold if not dried expeditiously. Regular monitoring during the drying process is essential to ensure uniform drying and the absence of mold. Properly dried leaves should exhibit a crisp texture and crumble readily when pressed between the fingers (Kansas State University, 2024).

Table 1. *Ratio of Ingredients in the Different Treatments*

Control	Treatment 1	Treatment 2	Treatment 3
3 grams of Green tea	3 grams of redflower rag leaves	4.5 grams of redflower rag leaves	6 grams of redflower rag leaves
100 ml of boiling water	0.5 grams of mint leaves	0.5 grams of mint leaves	0.5 grams of mint leaves
	100 ml of boiling water	100 ml of boiling water	100 ml of boiling water

Food and Safety Control

Key aspects of proper hygiene observed included using PPE, implementing safety precautions against hazards, providing thorough instruction to group members before starting experiments, and ensuring correct equipment usage. Researchers maintained focus to avoid distractions during experimentation. This approach ensured that the standards of hygiene and safety were upheld throughout the food preparation process, in line with GHP and HACCP guidelines.

Treatment of Data

The data obtained from the acceptability testing underwent tallying and tabulation for thorough analysis. The organized collected data were employed by using descriptive statistical methods such as frequency counts and weighted means. This method provided a clear overview and summary of the gathered information. Inferential statistics was utilized in ascertaining significant differences among the samples to have a deeper insight. Among the evaluated samples this method aids in determining the

presence of statistically significant variations. Additionally, post-hoc analysis complemented these assessments, allowing further differentiation between samples that demonstrate significant differences.

Table 2. *Statistical Limits*

Statistical Limits	Descriptive Equivalent
8.05 - 8.92	Like Extremely
7.17 - 8.04	Like Very much
6.29 - 7.16	Like Moderately
5.41 - 6.28	Like Slightly
4.52 - 5.40	Neither like or Dislike
3.65 - 4.52	Dislike Slightly
2.77 - 3.64	Dislike Moderately
1.89 - 2.76	Dislike very much
1.00 - 1.88	Dislike Extremely

Ethical Considerations

The study is committed to upholding ethical standards. It ensures participant consent through an informed consent process to ascertain their willingness to participate in the research. The study does not involve the collection of sensitive data. In the scorecard questionnaire, respondents have the option to include or omit their names. Even if names are provided in the questionnaire, they will not be associated with any study results, ensuring complete anonymity.

4. Results and Discussion

This chapter contains the tabulation and presentation of collected data that have been subject to systematic evaluation, analysis, or interpretation to give more meaning and understanding to the study.

General Acceptability of the Redflower Rag Leaves as a Tea Infused with Mint.

The data presented in Table 5 offers an overview of the collective acceptability of redflower rag leaves as a tea infused with mint, derived from the assessment of various characteristics among the control and different Treatments.

Table 3. *The general data on the acceptability of redflower rag leaves as a tea infused with mint as perceived by consumers.*

Characteristic	Control	Treatment 1	Treatment 2	Treatment 3
Color	6.72	6.90	6.62	6.46
Aroma	6.12	6.84	6.76	6.14
Taste	5.82	7.26	6.30	6.42
Body	6.28	6.84	6.92	6.78
Overall	6.18	7.26	6.94	6.80
Acceptability				
Average (MC)	6.22	7.02	6.71	6.52
Rank	4th	1st	2nd	3rd

**MC – Mean Characteristics*

This table summarizes the average score obtained by averaging the mean characteristics of the developed samples. Treatment 1 recorded the highest average mean characteristics score of **7.02**. Treatment 2 followed closely, with an average of **6.71**, and Treatment 3 was a close second, at **6.52**. Finally, the control sample obtained an average score of 6.224 for the mean characteristics.

The analysis of the experiment revealed that Treatment 1 exhibited the most favorable average mean characteristics among all samples developed, indicating a higher level of acceptability compared to alternative treatments. Notably, Treatment 1 secured the top position for color, aroma, flavor, and overall acceptability. Although it ranked second for the participants, with Treatment 2 claiming the lead spot, the marginal difference between their scores, with only a **0.08** gap in their means, suggests a close competitive edge. Conversely, the control sample garnered relatively lower average scores across mean characteristics, implying a diminished level of overall acceptability. These findings strongly imply that the formulation and attributes of Treatment 1 were exceptionally appealing to the participants, making it the preferred choice among the tested samples.

Color Attributes of the Develop Redflower Rag Leaf as a Tea infused with Mint

The assessment of color perception among the tea infusion samples presents insights into consumer preferences and the impact of ingredients on the visual appeal of the products. The time, method, and temperature at which the tea is boiled also influence its color. However, these variables were

all controlled during the preparation of the samples to see differences.

The recorded values of the means for color perception were obtained in each Treatment. The highest mean rating of **6.9**, which is interpreted as Like Moderately, was achieved by Treatment 1. This sample is a combination of 3 grams of redflower rag leaf and 0.5 grams of mint leaves resulting in a slightly brown tea after 1 minute of steeping time. Conversely, the control sample came second with a rating of **6.72 mean** comprised of 3 grams of green tea. Followed by 6.62 which is Treatment 2 consisting of 0.5 grams of mint and 4.5 grams or *Redflower Rag leaf*. Lastly, Treatment 3 got the lowest mean of 6.46, compromising 6 grams of redflower rag leaf and 0.5 grams of mint.

Table 4. Level of acceptability of redflower rag leaf as a tea infused with mint and the significant difference in terms of color.

Treatments	Mean	Descriptive Equivalent	Computed f-value	Critical f-value
Control	6.72	Like moderately	0.690207625	2.64
Treatment 1	6.9	Like moderately		
Treatment 2	6.62	Like moderately		
Treatment 3	6.46	Like moderately		

As gleaned from Table 6, respondents expressed a moderate liking for the color of the tea across all samples, with no significant differences noted in terms of acceptability. However, Treatment 1 slightly outshone the others due to its darker brown hue, contrasting with the lighter tones of Treatments 2 and 3, and the yellow color of the control sample. This inclination towards darker colors suggests a stronger appeal to the respondents. Despite this observation, the computed f-value for color indicates that the variation in color perception among respondents is not statistically significant. Hence, it can be inferred that the respondents did not perceive a significant difference in the color of the Redflower rag leaf tea infused with mint across the different treatments.

Commercially, green tea leaves were passed through a steaming treatment during their processing. This steam gave radiant heating to the green tea leaves, which halted the process of oxidation. The treatment also made the leaves have a grassy flavor. Green tea leaves did not oxidize after rolling, and therefore they had a lighter yellow color when steeped. Using high temperatures to brew tea would give a more yellow-looking tea. According to Mishry (2019), this yellow color resulted from compounds that quickly dissolved due to the intense heat, just like how bitter taste infusing compounds dissolved.

Jia (2021) discussed green-leafed vine tea for its potential as a functional component for making tea, while red-leafed vine tea was frequently written up as waste. In their study, Jia et al. (2021) found that while being browner in color, the red-leafed vine tea had more antioxidants, which contributed to its brown color. Similarly, Oh et al. (2013) reported that herbal teas' antioxidant property values and color parameters varied more than those of green teas. These studies help corroborate the findings of this study, showing that there was a stark difference in the color of green tea and herbal teas prepared from different plants.

Aroma Attributes of the Develop Redflower Rag Leaf as a Tea infused with Mint

The assessment of aroma attributes in the developed redflower rag leaf tea samples sheds light on consumer preferences and the olfactory impact of varied ingredients.

Table 5. Level of acceptability of Redflower Rag leaf as a tea infused with mint and significant difference in terms of aroma.

Treatments	Mean	Descriptive Equivalent	Computed f-value	Critical f-value
Control	6.12	Like Slightly	2.516458312	2.64
Treatment 1	6.84	Like moderately		
Treatment 2	6.76	Like moderately		
Treatment 3	6.14	Like Slightly		

In terms of aroma Treatment 1 has the highest mean of **6.84**, interpreted as like moderately. The Treatment 2 (4.5 grams of *Redflower Rag leaf* and 0.5 grams of mint) has a mean of **6.76**, Treatment 3 (6 grams of *Redflower Rag leaf* and 0.5 grams of mint) has **6.14** mean rating, and control (3 grams of green tea) has a mean of **6.12**, means that control and Treatment 3 have a descriptive equivalent of like slightly.

The computed f-value is 2.516458312 with a critical f-value of 2.64, resulting in no significant differences in the treatments. In this characteristic, Treatment 1 still dominated the other treatments in terms of aroma. Some of the respondents remarked that the aroma of mint in Treatment 1 is stronger compared to Treatment 2 and 3. This might be because, for Treatment 1, the ratio of mint (0.5 grams) and *Redflower Rag leaf* (3 grams) might just be right while in Treatments 2 and 3, the increased grams of the

Redflower Rag leaf may have overpowered the aroma of mint.

The researchers found that Treatment 1, with a 0.5:3 ratio of mint to *Redflower Rag leaf*, had the highest mean aroma rating among the four treatments. This may be due to the optimal balance of mint and *Redflower Rag leaf*, which allowed the mint flavor to shine through. The respondents may have perceived the aroma of mint in Treatment 1 as stronger because the ratio of mint to *Redflower Rag leaf* was just right, resulting in a harmonious and balanced flavor profile. In contrast, Treatments 2 and 3, which had a higher ratio of *Redflower Rag leaf* to mint, may have had a different flavor profile that was not as well-received by the participants. The increased amount of *Redflower Rag leaf* in these treatments may have overpowered the mint aroma, resulting in a lower mean aroma rating.

Additionally, the familiarity of the respondents with the aroma of mint may have also played a role in their perception of the aroma. Mint is a common flavoring ingredient in teas and other beverages, and many people may be familiar with its distinctive aroma. This familiarity could have influenced their perception of the aroma, making them more likely to rate Treatment 1 as having a stronger mint aroma. Overall, the results suggest that the optimal ratio of mint to *Redflower Rag leaf* in Treatment 1 contributed to its higher mean aroma rating, while the imbalance in Treatments 2 and 3 may have resulted in a less pleasant aroma experience for the participants. According to Smiechoska (2006), the aroma of tea is a very important factor in reflecting the quality of tea, this is agreed by Liu (2022) who stated that tea aromas can enhance relaxation, improve concentration, and even have therapeutic effects, contributing to a sense of calm and well-being. Furthermore, as stated by Lee (2013) aroma is perceived as a leading factor defining tea quality that influences the consumer's selection, acceptance, and digestion of the tea.

Taste Attributes of the Developed Redflower Rag Leaf as a Tea Infused with Mint

The evaluation of taste attributes among the different redflower rag leaf tea samples presents key insights into consumer perceptions and the influence of ingredient combinations on taste preferences.

Table 6. *Level of acceptability of Redflower Rag leaf as a tea infused with mint and significant difference in terms of taste.*

Treatments	Mean	Descriptive Equivalent	Computed f-value	Critical f-value
Control	5.82	Like Slightly	1.529718936	2.64
Treatment 1	7.26	Like Very Much		
Treatment 2	6.3	Like Slightly		
Treatment 3	6.42	Like Moderately		

The participants' ratings of the four treatments revealed a clear pattern of perception. The control treatment, which served as a baseline, was perceived as "like slightly" by the participants, with a mean rating of **5.82**. This suggests that the participants had a neutral or lukewarm response to the control treatment.

In contrast, Treatment 1 stood out as the clear favorite among the participants. With a mean rating of **7.26**, it was perceived as "like very much", indicating that the participants had a strong positive reaction to this treatment. The unique combination of mint and *Redflower Rag leaf* in Treatment 1 may have contributed to its popularity, as the flavors worked together to create a pleasing and enjoyable taste experience.

The other two treatments, Treatment 2 and Treatment 3, fell somewhere in between. Treatment 2 received a mean rating of **6.3**, which corresponds to "like slightly", indicating that the participants had a neutral or mildly positive response to this treatment. Treatment 3, on the other hand, achieved a mean rating of **6.42**, which is equivalent to "like moderately", suggesting that the participants had a more positive response to this treatment than to Treatment 2.

Interestingly, when it comes to taste, the data suggests that there is no significant difference among the samples. This means that while the participants may have had different preferences for certain treatments, they did not perceive significant differences in terms of taste quality. The computed f-value of 1.529718936 was lower than the critical f-value of 2.64, providing further evidence that the differences in taste ratings were not statistically significant.

According to Wilson (2019) one of the factors that affect the taste of the tea is the drying method which a critical step that not only stabilizes the tea, but can also significantly influence the final flavor, aroma, color, and its nutritional profile depending on the specific techniques used. Steeping time can also affect the taste of the tea. It also stated that steeping time has an effect on these parameters. The longer the steeping time affects the taste, color and qualities of tea beverage. In this study's case, however, the steeping time and temperature of the treatments were all controlled to determine nuances brought about by the ratios in the formulation of the different treatments.

This study's result in the acceptability of the panel in terms of the taste of the different tea

treatments corroborates the findings of Nupo et al. (2013). Nupo et al.'s (2013) study revealed that when *Crassocephalum crepidioides* or the redflower ragleaf are processed, they have high acceptability considering that they even have a foreign taste, which makes them underutilized. Likewise, Treatment 1 was rated as very much by the respondents, maybe because of the infusion of mint, which made the blend subtler, and slightly sweet because of the peppermint. The mint also adds a cooling effect and calming sensation to the tea, which can be particularly soothing and rejuvenating. Thus, this finding helps us understand that while *Redflower Ragleaf* may stand alone as a tea drink, the infusion of other ingredients such as mint may help enhance its natural flavor.

Body Attributes of the Developed Redflower Rag Leaf as a Tea Infused with Mint

The following discussions reveal insights into the consumer acceptability of the developed *Redflower Rag leaf* tea on their body attributes.

Table 7. Level of acceptability of Redflower Rag leaf as a tea infused with mint and significant difference in terms of body.

Treatments	Mean	Descriptive Equivalent	Computed f-value	Critical f-value
Control	6.28	Like Slightly		
Treatment 1	6.84	Like Moderately	1.541585677	2.64
Treatment 2	6.92	Like Moderately		
Treatment 3	6.78	Like Moderately		

In terms of body Treatment 2 got the highest mean rating of 6.92 interpreted as like moderately. As such this was preferred by the respondents because it has a fresh soothing texture and balanced astringency and sweetness. Second Treatment 1 got the second highest mean rating of **6.84** which is like moderately. On the other hand, **6.78** is the mean rating of Treatment 3 which has a descriptive equivalent of moderately. Lastly, the control treatment got the lowest mean rating of **6.28**, interpreted as like slightly by the respondents.

According to Covey (2018), texture in tea is crucial during tasting, especially post-sip. After swallowing, focus on the mouthfeel, noting dryness, creaminess, or if the tea vanishes swiftly. Texture is sometimes confused with flavor, notably astringency often misinterpreted as bitterness. Cooling tea can clarify textures, while a delicate brewing approach unveils textures without overpowering flavors.

Texture is not an abstract concept. It is the actual physical feeling on the tongue and in the throat experienced while drinking tea. What makes the taste even more astounding is that the infinite flavor combinations can be further modified by the concurrent sensation of texture (Duckler 2012). Tea has a mouthfeel that is created by the polyphenols reacting with the saliva and the mucus membrane on our tongues. This means that different teas have different mouthfeels (Mouthfeel of Tea 2017).

The preference for Treatment 2 is consistent with Covey's (2018) findings about the significance of texture in tea tasting. Texture, particularly in the post-sip stage, is crucial to the whole sensory experience of tea, according to Covey. Especially after swallowing, pay attention to the texture and note any feelings that you experience—such as dryness, creaminess, or the tea quickly vanishing. Covey adds that flavor and texture can occasionally be mistaken for one another, especially when astringency is mistaken for bitterness. Tea's complex textures can be brought to light without dominating the flavors using a deliberate brewing method that lets the tea cool. Duckler (2012) provides additional support for this claim by defining texture as a palpable physical sensation experienced by the tongue and throat that greatly improves the taste experience. The various sensory profiles of different teas are influenced by the mouthfeel, which is produced by polyphenols interacting with saliva and the mucous membrane on the tongue (Mouthfeel of Tea, 2017). This scientific foundation explains why the respondents preferred Treatment 2, which had a well-balanced texture and flavor profile.

According to the study's findings, which are in line with accepted theories of tea tasting, Treatment 2's superior acceptability can be attributed to its ideal texture and flavor balance. The fact that the respondents preferred a tea with a calming texture and a harmonious mix of sweetness and astringency highlights how crucial these elements are to tea's general appeal. The higher ratings for Treatment 2 in the study provide as evidence of the crucial function texture plays in augmenting the sensory experience and consumer preference.

Preferred Treatment as Perceived by the Respondents

The following discussions reveal the most accepted Treatment of the developed *Redflower Rag leaf* tea perceived by the respondents.

Table 9. Most Preferred Treatment Perceived by Respondents.

Samples	Frequency	Percentage
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Control	4	8%
Treatment 1	27	54%
Treatment 2	13	26%
Treatment 3	6	12%
Total	50	100%

The results of the study suggest that the addition of *Redflower Rag leaves* to the infusion of mint was a successful combination, as 54% of the respondents preferred Treatment 1, which contained this unique blend. The control sample, which did not contain the added ingredients, received the lowest rating, indicating that the respondents valued the distinct characteristics of the tea with Redflower Rag leaves and mint.

The respondents' comments provided insight into their preferences, suggesting that they had considered the sensory experience of the different treatments and had based their ratings on these experiences. The high ratings for flavor, body, and aroma indicate that the tea's overall acceptability was enhanced by the addition of *Redflower Rag leaves* to the infusion of mint. The robust aroma of mint likely played a significant role in this increased acceptability, providing a refreshing and comforting sensory experience for the respondents.

The study's findings highlight the importance of carefully selected ingredients in tea production to enhance the sensory appeal and consumer acceptability of tea drinks. The addition of *Redflower Rag leaves* and mint to the tea was a successful strategy in achieving this goal, as it created a pleasing and well-balanced beverage that appealed to a majority of the respondents.

5. Conclusions and Implications

Based on the findings of the study, the researchers conclude that,

1. Treatment 1 has moderate acceptability to like very much in terms of color, aroma, flavor, and overall acceptability. While Treatment 2 comes first in terms of the body, Treatment 1 comes second in rank with a very small difference (0.08 difference in mean).
2. Treatment 1 emerged as the most accepted/preferred Treatment as it came first for acceptability, in terms of color, aroma, flavor, and overall acceptability. While it comes second on the body, it still has more attributes that are preferred by the respondents making it superior among the Treatment.
3. According to the cost calculation and the suggested retail price, the developed product can be sold at a retail price of Php56.69 per pack with a markup cost of Php.13.07, resulting in a profitable return investment, given the material, cost, labor, overhead, and buffer against unforeseen costs.

Implications

Based on the findings and conclusion arrived at, the researchers recommend the following:

1. Although Treatment 1 was considered to be the superior Treatment for developing tea, it is recommended that more exploration. Its development should be carried out in order to improve its characteristics such as further refinement, look into the interaction effects of the ingredients used, and conduct laboratory tests to look into the microbial, physicochemical, nutritive, and shelf-life of the product for its safety and commercial viability.
2. To expand the findings and conclusions derived from the product's pricing, a feasibility study on the feasibility of the cost of producing the product is recommended. This will allow for a more detailed analysis of the costs and investments required to set up a business undertaking for the developed product.
3. For further packaging and branding can also be explored, before the products are presented in the market.

References

Journal

- Adjatin, A., Dansi, A., Badoussi, E., et al. (2013). Phytochemical screening and toxicity studies of *Crassocephalum rubens* (Juss. Ex Jacq) S. Moore and *Crassocephalum crepidioides* (Benth) S. Moore consumed vegetables in Benin. *Journal of Chemical and Pharmaceutical Research*, 5(6), 160-167.
- Albayrak, S., Aksoy, A., Sagdic, O., & Albayrak, S. (2012). Antioxidant and antimicrobial activities of different extracts of some medicinal herbs consumed as tea and spices in Turkey. *Journal of Food Biochemistry*, 36(5), 547-554.
- Aniya, Y., Koyama, T., Miyagi, C., et al. (2005). Free radical scavenging and hepatoprotective actions of herb, *Crassocephalum crepidioides* from the Okinawa Islands. *Biological & Pharmaceutical*

- Bulletin, 28(1), 19-23.
- Chaturvedula, V. S. P., & Prakash, I. (2011). The aroma, taste, color, and bioactive constituents. *Journal of Medicinal Plants Research*, 5(2110-2124).
- Guo, X. Y., Ho, C. T., Schwab, W., & Wan, X. C. (2021). Aroma profiles of green tea made with fresh tea leaves plucked in summer. *Food Chemistry*, 363(130328).
- Jia, C., Li, J., Zhang, M., Ma, W., Zhao, S., Liu, R., ... & Li, X. (2021). Antioxidant properties of the extracts of vine tea (*Ampelopsis grossedentata*) with different color characteristics and inhibition of rapeseed and sunflower oil oxidation. *LWT*, 136(110292).
- Lee, J., Chambers, D. H., Chambers, E., Adhikari, K., & Yoon, Y. (2013). Volatile aroma compounds in various brewed green teas. *Molecules*, 18(10024–10041).
- Nupo, S. S., Onigbogi, I. O., Akinlotan, J. V., & Ilori, O. A. (2013). Effect of different processing methods on the nutrients and antinutrient composition of *Senecio biafrae*, *Crassocephalum crepidioides*, and *Solanum nigrum* consumed in southwest Nigeria. *American Journal of Food and Nutrition*, 3(3), 147-154.
- Oh, J., Jo, H., Cho, A. R., Kim, S. J., & Han, J. (2013). Antioxidant and antimicrobial activities of various leafy herbal teas. *Food Control*, 31(2), 403-409.
- Rajesh, K. J. (2011). Terpene composition of *Crassocephalum crepidioides* from Western Ghats region of India. *International Journal of Natural Products Research*, 1(2), 19-22.
- Sakpere, A. M. A., Adeji, O., & Folashade, et al. (2013). Flowers on post-pollination development and propagation of Ebolo (*Crassocephalum crepidioides* (Benth) S. Moore) in Ile-Ife, Nigeria. *Journal of Science and Technology*, 33(2), 37-49.
- Smith, F. I., & Ezyaguirre, P. (2007). African leafy vegetables: Their role in the World Health Organization global fruit and vegetable initiative. *African Journal of Food, Agriculture, Nutrition and Development*, 7(3).
- Trevisanto, S., & Kim, Y. I. (2000). Tea and health. *Nutrition Reviews*, 58(1)
- Zollo, P. H. A., Kauate, J. R., Menut, C., & Bassiere, J. M. (2000). Aromatic plants of Central Africa: Chemical composition of essential oils from seven Cameroonian *Crassocephalum* species. *Journal of Essential Oil Research*, 12(533-536).

Online Document

- Ajibesin, K. K. (2012). Ethnobotanical survey of plants used for skin diseases and related ailments in Akwa Ibom State, Nigeria. *Ethnobotany Research & Applications*. <https://doi.org/10.463-522>.
- Ayodele, O., Onojabi, F., et al. (2019). In vitro anticoagulant effect of *Crassocephalum crepidioides* leaf methanol extract and fractions on human blood. *Journal of Experimental Pharmacology*, 11(99-107). <https://doi.org/10.2147/JEP.S218261>.
- Bahar, E., Akter, K. M., Lee, G. H., et al. (2017). B-cell protection and antidiabetic activities of *Crassocephalum crepidioides* (Asteraceae) Benth S. Moore extract against alloxan-induced oxidative stress via regulation of apoptosis and reactive oxygen species (ROS). *BMC Complementary and Alternative Medicine*, 17(179). <https://doi.org/10.1186/s12906-017-1697-0>.
- Chai, C. H., Chen, Y. P., Wu, J. H., et al. (2007). A galactolipid possesses novel cancer chemopreventive effects by suppressing inflammatory mediators and mouse B16 melanoma. *Cancer Research*, 67(6907-6915). <https://doi.org/10.1158/0008-5472.CAN-07-0158>.
- Liu, B., Zhang, J., & Zhou, X., et al. (2022). Research progress on the health benefits of scented tea. Chapter Metrics Overview. <https://doi:10.5772/intechopen.106605>
- Joshi, R. (2014). Study on essential oil composition of the roots of *Crassocephalum crepidioides* (Benth) S. Moore. *Scientia Chilena*, 59(1). <https://doi.org/10.4067/S0717-97072014000100025>
- Odukoya, et al. (2007). Antioxidant activity of selected Nigerian green leafy vegetables. *ResearchGate*, 2(3). <https://doi.org/10.3923/ajft.2007.169.175>
- Owokomoto, I. A., & Ekandayo, O., et al. (2012). Analysis of the essential oils of leaves and stems of *Crassocephalum crepidioides* growing in southwestern Nigeria. *International Journal of Chemistry*, 4(2). <https://doi.org/10.5539/ijc.v4n2p34>
- Muhammad, A., Ishrat, A., Waheed, A., et al. (2023). Mint (*Mentha*): A herb used as a functional ingredient. *Scholars International Journal of Traditional and Complementary Medicine*, 6(3), 38-52. <https://doi.org/10.36348/sijtcm.2023.v06i03.003>.
- Weisburger, J. (1997). Tea and health: A historical perspective. *Cancer Letters*, 114(1-2), 315-317. [https://doi.org/10.1016/S0304-3835\(97\)04691-0](https://doi.org/10.1016/S0304-3835(97)04691-0)
- Weisburger, J. (1998). *Experimental biology and medicine*. Sage Journals, 218(2). <https://doi.org/10.3181/00379727-218-44272>
- Park, K., Vohnikova, Z., & Brod, F. (2002). Evaluation of drying parameters and desorption isotherms of garden mint leaves (*Mentha crispa* L.). *Journal of Food Engineering*, 51(3), 193-199. [https://doi.org/10.1016/S0260-8774\(01\)00055-3](https://doi.org/10.1016/S0260-8774(01)00055-3)

- Smiechowska, M., & Dmowski, P. (2006). Food chem. 94, 366-368. doi: 10.1016/j.foodchem.2004.11.026
- Tomimori, K., Nakama, S., Kimura, R., et al. (2012). Antitumor activity and macrophage nitric oxide producing action of medicinal herb, *Crassocephalum crepidioides*. BMC Complementary and Alternative Medicine, 12(78). <https://doi.org/10.1186/1472-6882-12-78>

Website

- Covey, A. (2018, November 6). How to write tasting notes: Aroma, flavor, and texture. Red Blossom Blog. <https://redblossomtea.com/blogs/red-blossom-blog/how-to-write-tasting-notes-aroma-flavor-and-texture>
- Elise, N. (2023, June 27). Ice cold peppermint tea. Frugal Farm Wife. <https://www.frugalfarmwife.com/article/cold-peppermint-tea/>
- Facciola, S. (1998). *Cornucopia II*. Kampong Publications, California. ISBN: 0-9628087-2-5. <https://pfaf.org/User/cmspage.aspx?pagedid=174>.
- Kansas State University. (2024). Drying herbs. <https://www.rrc.k-state.edu/preservation/drying.html>
- Shubrook, N. (2023, June 16). Top 5 health benefits of peppermint tea. GoodFood. <https://www.bbcgoodfood.com/howto/guide/health-benefits-peppermint-tea>
- Tea Ingredients/Aroma Compounds. (2023, January 8). Far East Company. <https://fareastcompany.com/blogs/fareastclub/tea-ingredients-aroma-compounds>
- Toshi, N. (2024, May 20). 15 health benefits of mint leaves that you should know! PharmEasy. <https://pharmany.in/blog/benefits-of-mint-leaves/>

Books

- Burkill, H. M. (1995). *The useful plants of West Tropical Africa* (2nd ed.). London: Royal Botanical Garden, Kew.
- Cronquist, A. (1981). *An integrated system of classification of flowering plants*. Columbus University Press, NY.
- Dario, F. A. S., & Adanlawo, I. G. (2007). Nutritional quality of *Crassocephalum crepidioides* and *Senecio biafrae*. *Pakistan Journal of Nutrition*, 6(1),
- Fowomola, M. A., & Akindahunsi, A. A. (2005). Protein quality indices of sand box (*Hura crepitans*) seed. *Journal of Food, Agriculture & Environment*,
- Kostermans, A. J. G. H., Wirjaharda, S., & Dekker, R. J. (1987). *The weeds: Description, ecology and control. Weeds of rice in Indonesia* [edited by Soerjani, M. Tjitrosoepomo, G.], Jakarta, Indonesia, Balai Pakistan.
- Love, J. (1994). Product acceptability evaluation. In *Quality attributes and their measurement in meat, poultry, and fish products* (pp. 337-358). Boston, MA: Springer US.
- Small, E., & Catling, P. M. (1999). *Canadian medicinal crops*. NRC Research Press, Ottawa, Ontario, Canada.