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## Sensory Evaluation of Flavored Nipa (*Nypa fruticans*) Flower Tea



**Abstract:** - The main thrust of this study was to evaluate the sensory attributes of Flavored Nipa (*Nypa fruticans*) Flower Tea. Specifically, it aims to determine the acceptability level in three treatments in terms of appearance, aroma, and taste in hot and cold serving temperature. It also sought to find the significant difference among the three treatments in hot and cold serving temperature. Through this study, people will learn to utilize the availability of Nipa Flower in their locality and use this as a potential livelihood. The study made use of quantitative research employing experimental design in producing the Nipa Flower Tea in different treatments, and a descriptive survey with the aid of a self-made questionnaire in gathering the data needed. The researchers used taste sampling of the product and distributed the questionnaires to 30 respondents composed of 25 students and 5 teachers of Hinlayagan National High School, Trinidad, Bohol. The researchers introduced the study, gave an explanation, and distributed the products and questionnaires to the respondents for tasting and evaluation. The questionnaires were rated using the 4-Point Hedonic Scale. The data gathered were then tallied, tabulated and computed through percentage formula to determine the sensory attributes and a weighted mean to evaluate the acceptability level of Flavored Nipa (*Nypa fruticans*) Flower Tea in three treatments in terms of appearance, aroma, and taste in hot and cold serving temperature. A two-way ANOVA was also used to find out the significant difference in the respondent's acceptability level of the product. The interpretation followed after the computed results. Based on the findings, the researchers concluded that all the treatments in terms of appearance, aroma, and taste in hot and cold serving temperature are all acceptable. Particularly, treatment 2 was more preferred in hot serving temperature and treatment 3 in cold serving temperature, but hot serving temperature are more acceptable than cold serving temperature. The overall result implies that there is a significant difference in the serving temperature, which means that the null hypothesis is rejected. While there is no significant difference in the treatments used, thus, the null hypothesis is accepted. Lastly, the overall interaction of the serving temperature and the treatments conveys that there is no significant difference. Hence, the null hypothesis is accepted. Thus, the results indicates that the product is feasible for production and has potential to create livelihoods.

**Keywords:** Flavored, Nipa, Flower, Tea

### I. INTRODUCTION

For centuries, people across the globe have testified to the relaxing and invigorating qualities of tea (Gilbert, 2019). It plays a significant role in our lives that is beyond quenching thirst with its natural calming effects. No matter the season and reason, tea can be a good choice of drink since it can be served either hot or cold on any occasion. It can be drunk as an aid for meditation, to have a warm and soothing feelings, or to simply unwind. As a drink, tea has gained great prominence worldwide, not only for its refreshing taste but also for having a variety of positive health benefits. Tea serves as a cleaning agent to one's body and is a good remedy to relieve stress, fatigue, headaches, body aches, upset stomachs and colds. While some brews provide more health advantages than others, there's plenty of evidence that regularly drinking tea can have a lasting impact on your wellness. Currently, some of the plant sources of tea in the Philippines are ginger, turmeric, blue ternatea, pandan, lemongrass, dragon fruit, malunggay, and many more.

Nipa, scientifically known as *Nypa fruticans*, is an edible indigenous plant. It has many benefits and is fairly common component in mangrove forests in our locality. However, these are neglected by the community because not many Filipinos are familiar with their benefits and potential to produce a healthy a drink. Since tea gets most of the hype for its potentially health-boosting properties, the researchers are prompted to give proper attention to Nipa, especially its flowers, which are abundant in the Philippines and easily found in the province.

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In connection to this, the researchers came up with the decision to develop a study, particularly in the Sensory Evaluation of Flavored Nipa (*Nypa fruticans*) Flower Tea. Since this kind of indigenous plant is not just available in our locality but also contains a lot of benefits in the body, perhaps this study is a wonderful beginning for a healthy drink. This research will also help in educating the public about the health advantages of drinking Nipa flower tea and its potential to create livelihoods.

## II. LITERATURE BACKGROUND

People must recognize the relevance of indigenous plants that can be found in the environment and their benefits. Individuals must recognize the plants and their characteristics. In the Philippines, Nipa, scientifically known as *Nypa fruticans* grow throughout the country in large areas of favorable habitats including Bohol. In fact, Nipa is one of the valued resources in the coastal municipalities in the province, particularly in Cortes, Maribojoc, Loon, Loay, Loboc, Trinidad, Buenavista, Talibon, Inabanga, and Bien Unido, where this palm is widely grown. In the study of Middeljans (2014) entitled, “The Species Composition of the Mangrove Forest along the Abatan River in Lincod, Maribojoc, Bohol, Philippines and the Mangrove Forest Structure and its Regeneration Status between Managed and Unmanaged Nipa Palm (*Nypa fruticans Wurm*)”, the Lincod in the Municipality of Maribojoc is abundant of Nipa palms and other species. It is the largest mangrove area along the Abatan River Estuary with 105 hectares of riverine mangrove forest that is located downstream and bordering the Philippines Maribojoc Bay. Among 105 hectares of mangroves, *Nypa fruticans* is the dominant species found.

More recently, Nipa palm has been identified as a potential source of renewable energy. Nipa palm flower can be infused to make an aromatic tisane or it can be brewed to make an aromatic tea. The Nipa palm flower is not usually widely used, but the efficacy of this Nipa palm flower can help us with various health problems. In the study of Janghoon (2021) entitled, “Method for Preparing Functional Tea with Bud of *Nypa fruticans Wurm* and Functional Tea by the Method” aimed to provide a functional tea having excellent antioxidant and anti-inflammatory effects by manufacturing tea using the buds of Nipa palm. As describe in the study, the functional tea according to the invention prepared has the advantage of improving the health of the drinker because of excellent antioxidant and anti-inflammatory effect. It also help improves immunity, vascular dilation, blood clot dissolution, brain function as well as fatigue recovery. In addition, the Nipa palm bud tea is good for eyesight, heal headaches, and is also suitable for people with diabetes and hypertension.

In the Philippines, the *Nypa fruticans* is widely available. Although, it is one of the valued resources in some coastal municipalities in the province of Bohol, only few Filipinos are aware of its health advantages and potential to be utilized as tea. In response, the researchers decided to make a tea out of it and improve it by adding three treatments, namely parsley leaves, rosemary leaves, and mint leaves.

## III. THE PROBLEM

The main purpose of this study is to evaluate the Sensory Attributes of Flavored Nipa (*Nypa fruticans*) Flower Tea in different treatments. This study was conducted at Hinlayagan, Trinidad, Bohol during the academic year 2022-2023. Specifically, it aims to answer the following questions:

1. What is the description of Flavored Nipa (*Nypa fruticans*) Flower Tea in terms of:
  - 1.1 ingredients and cost;
  - 1.2 tools and equipment;
  - 1.3 procedures;
  - 1.4 serving temperature;
  - 1.5 shelf life; and 1.6 packaging?
2. What is the Sensory Attributes of Flavored Nipa (*Nypa fruticans*) Flower Tea in hot and cold serving temperature in terms of:

2.1 appearance;

2.2 aroma; and

2.3 taste?

3. What is the acceptability level of Flavored Nipa (*Nypa fruticans*) Flower Tea in hot and cold serving temperature in terms of:

3.1 appearance;

3.2 aroma; and

3.3 taste?

4. Is there a significant difference in the acceptability level of Flavored Nipa (*Nypa fruticans*) Flower Tea in hot and cold serving temperature among the three treatments?

#### IV.METHODOLOGY

The researchers used experimental research design in preparing the different treatments of Flavored Nipa (*Nypa fruticans*) Flower Tea. This design is considered for the study because it involves one dependent variable and two independent variables. A descriptive survey method was used in evaluating the sensory attributes of Flavored Nipa (*Nypa fruticans*) Flower Tea in hot and cold serving temperature in terms of appearance, aroma, and taste with the aid of a questionnaire to record the sensory evaluation of the respondents in order to get the results and served as the basis for the conclusion of the study. The study was conducted at the Municipality of Trinidad in Barangay Hinlayagan where the purposively selected respondents are residing.

A purposive sampling method was used to determine the participants based on their ability to provide accurate information regarding the study. The researchers purposively selected 30 participants in Hinlayagan, Trinidad, Bohol which is composed of: 25 cookery students and 5 Technology and Livelihood Education teachers. The researchers chose this groups of participants to answer the questions in terms of appearance, aroma, and taste as what they will perceived in our product because they are more experienced in preparing and tasting food and beverages.

In conducting the study, the researchers formulated a self-made questionnaire using 4-Point Hedonic Scale to gather necessary data. The questionnaire was in three parts – the first part focused in determining the respondents' sensory evaluation of Nipa (*Nypa fruticans*) Flavored Flower Tea in three treatments in hot and cold serving temperature in terms of appearance, aroma, taste, and texture; the second part was about the acceptability level of the product; and the third part was on the acceptability of the packaging. The respondents were also asked to give comments and suggestions for the improvement of the study.

A pilot testing was also conducted by the researchers in Hinlayagan, Trinidad, Bohol for validity and reliability of the questionnaires made. In order to keep track of the treatments and determine the sensory attributes of the Flavored Nipa (*Nypa fruticans*) Flower Tea, the researchers ensured that the locals who participated in the pilot testing were not included in the final testing. In determining the shelf life, the researchers also formulated an observation guide.

#### V.Results and Discussion

Table 5.1 presents the frequency of responses to the different three treatments of Flavored Nipa (*Nypa fruticans*) Flower Tea in terms of appearance in hot and cold serving temperature. Based on the highest percentage of responses, treatment 1 got 70% in “mustard brown color” in hot serving temperature, and 97% in “light mustard brown color” in cold serving temperature. Treatment 2 got 60% in “dark mustard brown color” in hot serving temperature, and 70% in “light mustard brown color” in cold serving temperature. Treatment 3 got 67% in “dark mustard brown color” in hot serving temperature, and 87% in “light mustard brown color” in cold serving temperature.

**Table 5.1**

**Sensory Attributes of Flavored Nipa (*Nypa fruticans*) Flower Tea in Three Treatments in Terms of Appearance**

| Sensory Attributes in Terms of: | Treatment 1 (Nipa Flower Tea with Parsley Leaves) |     |      |      |     |      | Treatment 2 (Nipa Flower Tea with Rosemary Leaves) |     |      |      |     |      | Treatment 3 (Nipa Flower Tea with Mint Leaves) |     |      |      |     |      |
|---------------------------------|---|-----|------|------|-----|------|--|-----|------|------|-----|------|--|-----|------|------|-----|------|
|                                 | Hot   |     |      | Cold |     |      | Hot  |     |      | Cold |     |      | Hot  |     |      | Cold |     |      |
| Appearance                      | f   | %   | Rank | f    | %   | Rank | f  | %   | Rank | f    | %   | Rank | f  | %   | Rank | f    | %   | Rank |
| Light mustard brown color       | 6   | 20% | 2    | 29   | 97% | 1    | 1  | 3%  | 3    | 21   | 70% | 1    | 0  | 0%  | 3    | 26   | 87% | 1    |
| Mustard brown color             | 21  | 70% | 1    | 1    | 3%  | 2    | 11   | 37% | 2    | 7    | 23% | 2    | 10   | 33% | 2    | 3    | 10% | 2    |
| Dark mustard brown color        | 3   | 10% | 3    | 0    | 0%  | 3    | 18   | 60% | 1    | 2    | 7%  | 3    | 20   | 67% | 1    | 1    | 3%  | 3    |

Table 5.2 shows the frequency of responses to the different three treatments of Flavored Nipa (*Nypa fruticans*) Flower Tea in terms of aroma in hot and cold serving temperature. With relevance on the highest percentage of responses, treatment 1 got 70% and 40% in “It has an herbal scent” in hot and cold serving temperature. While treatment 2 got 60% in “It has an herbal scent” in hot serving temperature, and 37% in “It has a minty and refreshing scent” in cold serving temperature. Whereas, treatment 3 got 43% in “It has a minty and refreshing scent” in hot serving temperature, and 40% in “It has an herbal scent” in cold serving temperature.

**Table 5.2**

**Sensory Attributes of Flavored Nipa (*Nypa fruticans*) Flower Tea in Three Treatments in Terms of Aroma**

| Sensory Attributes in Terms of: | Treatment 1 (Nipa Flower Tea with Parsley Leaves) |     |      |      |     |      | Treatment 2 (Nipa Flower Tea with Rosemary Leaves) |     |      |      |     |      | Treatment 3 (Nipa Flower Tea with Mint Leaves) |     |      |      |     |      |
|---------------------------------|---|-----|------|------|-----|------|--|-----|------|------|-----|------|--|-----|------|------|-----|------|
|                                 | Hot   |     |      | Cold |     |      | Hot  |     |      | Cold |     |      | Hot  |     |      | Cold |     |      |
| Aroma                           | f   | %   | Rank | f    | %   | Rank | f  | %   | Rank | f    | %   | Rank | f  | %   | Rank | f    | %   | Rank |
| It has a woody scent            | 7   | 23% | 2    | 10   | 33% | 2    | 4  | 13% | 3    | 10   | 33% | 2    | 6  | 20% | 3    | 10   | 33% | 2    |

|                                     |    |      |   |    |      |   |    |      |   |    |      |   |    |      |   |    |      |   |
|-------------------------------------|----|------|---|----|------|---|----|------|---|----|------|---|----|------|---|----|------|---|
| It has an herbal scent              | 21 | 70 % | 1 | 12 | 40 % | 1 | 18 | 60 % | 1 | 9  | 30 % | 3 | 11 | 37 % | 2 | 12 | 40 % | 1 |
| It has a minty and refreshing scent | 2  | 7%   | 3 | 8  | 27 % | 3 | 8  | 27 % | 2 | 11 | 37 % | 1 | 13 | 43 % | 1 | 8  | 27 % | 3 |

Table 5.3

Sensory Attributes of Flavored Nipa (*Nypa fruticans*) Flower Tea in Three Treatments in Terms of Taste

| Sensory Attributes in Terms of:          | Treatment 1 (Nipa Flower Tea with Parsley Leaves) |      |      |      |      |      | Treatment 2 (Nipa Flower Tea with Rosemary Leaves) |      |      |      |      |      | Treatment 3 (Nipa Flower Tea with Mint Leaves) |      |      |      |      |      |
|--|---|------|------|------|------|------|--|------|------|------|------|------|--|------|------|------|------|------|
|  | Hot   |      |      | Cold |      |      | Hot  |      |      | Cold |      |      | Hot  |      |      | Cold |      |      |
| Taste                                    | f   | %    | Rank | f    | %    | Rank | f  | %    | Rank | f    | %    | Rank | f  | %    | Rank | f    | %    | Rank |
| It has a slightly bitter-sweet taste     | 8   | 27 % | 2    | 5    | 17 % | 3    | 6  | 20 % | 3    | 4    | 13 % | 3    | 9  | 30 % | 2    | 8    | 27 % | 3    |
| It has an herbaceous taste               | 19  | 63 % | 1    | 16   | 53 % | 1    | 17   | 57 % | 1    | 14   | 47 % | 1    | 12   | 40 % | 1    | 9    | 30 % | 2    |
| It has a minty taste and cool aftertaste | 3   | 10 % | 3    | 9    | 30 % | 2    | 7  | 23 % | 2    | 12   | 40 % | 2    | 9  | 30 % | 2    | 13   | 43 % | 1    |

Table 5.3 convey the frequency of responses to the different three treatments of Flavored Nipa (*Nypa fruticans*) Flower Tea in terms of taste in hot and cold serving temperature. According to the highest percentage of responses, treatment 1 got 63% in hot serving temperature and 53% in cold serving temperature in “it has an herbaceous taste”. Treatment 2 also got 47% in hot serving temperature and 43% in cold serving temperature in “it has an herbaceous taste”. As well as treatment 3 got 40% in “it has an herbaceous taste” in hot serving temperature. However, it got 43% in “It has a minty taste and a cool aftertaste” in cold serving temperature, which only differs in the sensory attributes of taste.

Table 5.4

Acceptability level of Flavored Nipa (*Nypa fruticans*) Flower Tea in Terms of Appearance, Aroma, and Taste N = 30

| Sensory Attributes in Terms of: | Treatment 1 (Nipa Flower Tea with Parsley Leaves) |             |               |             | Treatment 2 (Nipa Flower Tea with Rosemary Leaves) |             |               |             | Treatment 3 (Nipa Flower Tea with Mint Leaves) |             |               |             |
|---------------------------------|---|-------------|---------------|-------------|--|-------------|---------------|-------------|--|-------------|---------------|-------------|
|                                 | Hot   |             | Cold          |             | Hot  |             | Cold          |             | Hot  |             | Cold          |             |
|                                 | Weighted Mean                                     | Description | Weighted Mean | Description | Weighted Mean                                      | Description | Weighted Mean | Description | Weighted Mean                                  | Description | Weighted Mean | Description |
|                                 |   |             |               |             |  |             |               |             |  |             |               |             |

|                |      |                 |      |                     |      |                 |      |            |      |                 |      |            |
|----------------|------|-----------------|------|---------------------|------|-----------------|------|------------|------|-----------------|------|------------|
| Appearance     | 3.33 | Very Acceptable | 3.03 | Acceptable          | 3.37 | Very Acceptable | 3.07 | Acceptable | 3.33 | Very Acceptable | 3.1  | Acceptable |
| Aroma          | 3.43 | Very Acceptable | 2.37 | Slightly Acceptable | 3.5  | Very Acceptable | 2.6  | Acceptable | 3.47 | Very Acceptable | 2.73 | Acceptable |
| Taste          | 3.13 | Acceptable      | 2.67 | Acceptable          | 3.3  | Very Acceptable | 2.77 | Acceptable | 2.67 | Acceptable      | 2.93 | Acceptable |
| Composite Mean | 3.3  | Very Acceptable | 2.7  | Acceptable          | 3.4  | Very Acceptable | 2.81 | Acceptable | 3.16 | Acceptable      | 2.92 | Acceptable |

**Legend:**

**Numerical Range**

**Descriptive Rating**

3.25-4.00

Very Acceptable

2.50-3.24

Acceptable

1.75-2.49

Slightly Acceptable

1.00-1.74

Not Acceptable

Table 5.4 manifests the acceptability level of Flavored Nipa (*Nypa fruticans*) Flower Tea in terms of appearance, aroma, and taste in three treatments. In terms of appearance, treatment 2 got the highest weighted mean with 3.37, described as *Very Acceptable* in hot serving temperature. The other two treatments got 3.33, which is also described as *Very Acceptable*. While treatment 3 got the highest weighted mean with 3.10 described as *Acceptable* in cold serving temperature. Followed by treatment 2 with 3.07 and treatment 1 with 3.03, which both described as *Acceptable*.

In terms of aroma, treatment 2 got the highest weighted mean of 3.50, described as *Very Acceptable* in hot serving temperature. Followed by treatment 3 with 3.47 and treatment 1 with 3.43, which are also *Very Acceptable*. Whereas treatment 3 got the highest weighted of 2.73, described as *Acceptable* in cold serving temperature. Followed by treatment 2 with 2.6 and treatment 1 with 2.37, which are both *Acceptable*.

In terms of taste, treatment 2 got the highest weighted mean of 3.30, which was described as *Very Acceptable* in hot serving temperature. Followed by treatment 1 with 3.13, then treatment 3 with 2.67 that are both *Acceptable*. While treatment 3 got the highest weighted mean of 2.93, described as *Acceptable* in cold serving temperature, and the other treatments got 2.67, which are also acceptable.

**Table 5.5**

**The difference in the Acceptability level of Flavored Nipa (*Nypa fruticans*) Flower Tea among the Three Treatments**

| Differences in Attributes | Source of Variation | Computed F-Value                | TABULA R F-Value | Description | Decision | Multiple Comparison |          |                |
|---------------------------|---------------------|---------------------------------|------------------|-------------|----------|---------------------|----------|----------------|
|                           |                     | At d=0.05 level of significance |                  |             |          | Sig.                | Decision | Interpretation |

|                   |                     |        |        |               |                            |                                |     |        |       |
|-------------------|---------------------|--------|--------|---------------|----------------------------|--------------------------------|-----|--------|-------|
| <b>Appearance</b> | Temperature Serving | 7.967  | 3.895  | Significant   | Reject the null hypothesis | Hot>Cold                       |     |        |       |
|                   | Treatments          | 0.051  | 3.048  | Insignificant | Accept the null hypothesis | T1=T2=T3                       |     |        |       |
|                   | Interaction         | 0.051  | 3.048  | Insignificant | Accept the null hypothesis | Temperature Serving=Treatments |     |        |       |
| <b>Aroma</b>      | Temperature Serving | 63.191 | 3.895  | Significant   | Reject the null hypothesis | Hot>Cold                       |     |        |       |
|                   | Treatments          | 1.127  | 3.048  | Insignificant | Accept the null hypothesis | T1=T2=T3                       |     |        |       |
|                   | Interaction         | 0.722  | 3.048  | Insignificant | Accept the null hypothesis | Temperature Serving=Treatments |     |        |       |
| <b>Taste</b>      | Temperature Serving | 3.382  | 3.895  | Insignificant | Accept the null hypothesis | Hot=Cold                       |     |        |       |
|                   | Treatments          | 1.034  | 3.048  | Insignificant | Accept the null hypothesis | T1=T2=T3                       |     |        |       |
|                   | Interaction         | 3.718  | 3.048  | Significant   | Reject the null hypothesis | T1                             | 0.6 | Insig. | T1=T2 |
|                   |                     |        |        |               |                            | V                              | 21  |        |       |
| T2                |                     |        |        |               |                            |                                |     |        |       |
|                   | T1                  | 0.9    | Insig. | T1=T3         |                            |                                |     |        |       |
|                   | V                   | 38     |        |               |                            |                                |     |        |       |
|                   | T3                  |        |        |               |                            |                                |     |        |       |
|                   | T2                  | 0.8    | Insig. | T2=T3         |                            |                                |     |        |       |
|                   | V                   | 26     |        |               |                            |                                |     |        |       |
|                   | T3                  |        |        |               |                            |                                |     |        |       |
| <b>Overall</b>    | Temperature Serving | 26.612 | 3.895  | Significant   | Reject the null hypothesis | Hot>Cold                       |     |        |       |
|                   | Treatments          | 0.444  | 3.048  | Insignificant | Accept the null hypothesis | T1=T2=T3                       |     |        |       |
|                   | Interaction         | 1.578  | 3.048  | Insignificant | Accept the null hypothesis | Temperature Serving=Treatments |     |        |       |

|  |  |  |  |  |    |  |
|--|--|--|--|--|----|--|
|  |  |  |  |  | is |  |
|--|--|--|--|--|----|--|

Table 5.5 presents the difference in the Acceptability level of Flavored Nipa (*Nypa fruticans*) Flower Tea in the three treatments in hot and cold serving temperature in terms of appearance, aroma, and taste. The result of the two-way ANOVA manifests that there is no significant difference in the interaction of the serving temperature and treatments in terms of appearance and aroma, thus, the decision is to accept the null hypothesis. However, in terms of taste, the interaction of the serving temperature and treatments is significant which means the null hypothesis is rejected. In connection, the overall interaction of the serving temperature and the treatments conveys that there is no significant difference. Therefore, the decision is to accept the null hypothesis.

## VI.CONCLUSION

With relevance on the findings, the researchers concluded that there is no significant difference in the interaction of the serving temperature and treatments of Flavored Nipa (*Nypa fruticans*) Flower tea in terms of appearance and aroma, thus, the decision is to accept the null hypothesis. However, in terms of taste, the interaction of the serving temperature and treatments is significant which means the null hypothesis is rejected. In connection, the overall interaction of the serving temperature and the treatments conveys that there is no significant difference. Thus, the decision is to accept the null hypothesis. Therefore, the product is feasible for production and has potential to create livelihoods.

## Recommendations

Based on the findings and conclusion drawn from the study, the researchers recommended the following:

1. Locals, particularly the farmers, tea makers, and entrepreneurs may utilize and recognize Nipa Flower for tea production and livelihoods. They may also cultivate rosemary to have an available supply in the locality.
2. Future researchers may steep the Nipa Flower tea in a small amount of hot water to extract its flavor, color, and aroma first before adding cold water or ice cubes. They may also try to use organic sweeteners and make new treatments of Nipa (*Nypa fruticans*) Flower Tea.
3. The consumers may preferably use hot serving temperature in preparing the tea. They may also have treatment 2 in hot serving temperature and treatment 3 in cold serving temperature.
4. Bohol Island State University – Main Campus may promote the use of Nipa Flower tea in the community through the university’s extension program. The administration may support the commercialization of the product.
5. The researchers suggest that the consumers may preferably use hot serving temperature in preparing the tea and may try to use organic sweeteners. Future researchers may also steep the Nipa Flower tea in a small amount of hot water to extract its flavor, color, and aroma first before adding cold water or ice cubes to improve its appearance, aroma, and taste in cold temperature serving.

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