

Explore the Relationship between the Soaking Time and Popularity of “Tieguanyin” Tea

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Abstract: The purpose of this study was to investigate the effect of different soaking time on the quality of “Tieguanyin” tea. Through sensory evaluation and chemical analysis, we analyzed the performance of appearance, aroma and taste in different soaking time groups, as well as the changes of main chemical components such as caffeine and tea polyphenols. The results showed that the soaking time has a significant impact on the quality of “Tieguanyin” tea. The appropriate soaking time can improve the aroma and taste of the tea, but a long soaking time may lead to the increase of bitter taste. These findings are important for tea production and consumption, providing suggestions for producers to adjust the soaking time, and also providing a reference for consumers to choose the best brewing method. Further research can verify the experimental results and explore the comprehensive influence of other factors on tea quality to enrich the understanding of the formation mechanism of tea quality.

Keywords: Tieguanyin tea, Soaking time, Sensory evaluation, Chemical analysis, Tea quality

1. Introduction

As one of the traditional famous teas in China, “Tieguanyin” is famous for its unique aroma and mellow taste [1]. When tasting tea, we often use the internal quality score to scientifically and objectively reflect the popularity of tea [2]. However, there is still a lack of deep scientific research on the relationship between the soaking time and the inner quality of the tea.

The inner quality of tea includes aroma, soup color, taste and bottom of the leaves [3], which is affected by the degree of dissolution of various substances in tea. The soaking time is one of the key factors affecting the dissolution of key ingredients in “Tieguanyin” tea leaves. In the process of tea soaking, with the extension of time, the linalool, oxidized linalool, cis jasmonone, dehydrolinalool, α -pinatinol and other substances in tea are gradually released, causing complex material transfer and chemical reaction with water molecules, and then affecting the aroma, soup color, taste and leaf bottom of tea [4-7].

This work aims to explore the correlation between the soaking time of the “Tieguanyin” tea leaves and the endoplasm of the tea leaves. During the experiment, the control experiment design and systematic evaluation method will be adopted. Through the analysis and comparison of the aroma and taste of tea at different soaking times, the influence of soaking time on the taste of “Tieguanyin” tea will be revealed, and the best suggestions for the soaking time of “Tieguanyin” tea will be obtained.

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2. Experimental part

2.1 Experimental objective

This experiment aimed to explore the effect of soaking time on the quality of “Tieguanyin” tea. The relationship between tea quality and soaking time was assessed by sensory evaluation and chemical analysis of tea at different soaking time.

2.2 Experimental materials

“Tieguanyin” tea: high quality “Tieguanyin” tea purchased from regular tea suppliers.

Pure water: pure water used for brewing tea leaves.

Experimental equipment: including electronic balance, thermometer, tea set, etc.

2.3 Sample preparation

Ten volunteers with normal taste and smell were recruited in advance and trained to unify the scoring criteria. Place 55 g of “Tieguanyin” in the sample plate, and then list the 10 washed and dried review cups on the table in turn.

2.4 Sensory evaluation

Step 1: perm the cup. Before the review cup with boiling water, is conducive to the quality of tea.

Step 2: the plate and sample. Put the plate: hold the diagonal edge of the sample plate with both hands and turn the sieve, turn and mix the sample tea in the sample plate, and then slightly pat flat with the palm. Cutting sample: with the m, food, middle three fingers inserted into the middle of the tea heap, from the surface to the bottom (including the upper, middle and lower three sections of tea), cutting sample must be caught at one time, better more than less, cannot be added for many times. 5 g of tea tasting was put into 10 review cups.

Step 3: Brew. Fill ten cups with boiling water (boiling water), wipe the foam floating on the surface with the cover; rinse the foam on the concave surface of the cup cover, cover it immediately, and let the volunteers taste it at the end of the specified soaking time. The immersion time of the first experiment was 15 s, the second set was 20 s, and so on to the tenth set was one minute. After tasting, wash the review cup for the next group.

Step 4: Taste it. The volunteer took the teacup and half lifted the lid, and smelled the aroma of the cup close to the nose. Then pour out the tea soup in the review bowl, first judge the color of the soup, and then taste the taste (see the soup color at the same time or later taste, taste the taste is hot (45°C ~50°C), otherwise it is not accurate).

Step 5: Scoring. After each experiment is completed, the volunteers will score the inner quality of the tea through the following four aspects. The experiments were repeated twice to reduce the error, and each experiment was held 2 h apart and recorded as one to three. The final experimental data were averaged from the scores of each group of the three experiments.

- ① Aroma (40 points, the aroma is delightful and uplifting.)
- ② Soup color (15 points, green and clear.)
- ③ Taste (35 points, according to the tea juice to stimulate the taste of the tongue, to identify the tea soup light and strong, strength, sweet and mellow, bitter. Taste fresh alcohol, thick have more than sweet for the best.)
- ④ Leaf bottom (10 points, the bottom of the leaf thick and soft, color to uniform dark green is better, pay attention to whether there are dead green red leaves.)

2.5 Sensory data analysis

Table 1. Soak time and scoring data obtained from the three experiments.

Soak time (s)	Experiment score	Experiment 2 score	Experiment 3 score	Average experimental scores
15	81	80	79	80
20	83	81	82	82
25	85	84	83	84
30	86	85	84	85
35	86	87	85	87
40	89	90	88	89
45	92	91	90	91
50	90	91	89	90
55	84	85	86	85
60	77	78	79	78

The soaking time in Table 1 was extracted against the mean scores of the three experiments to obtain Figure 1.

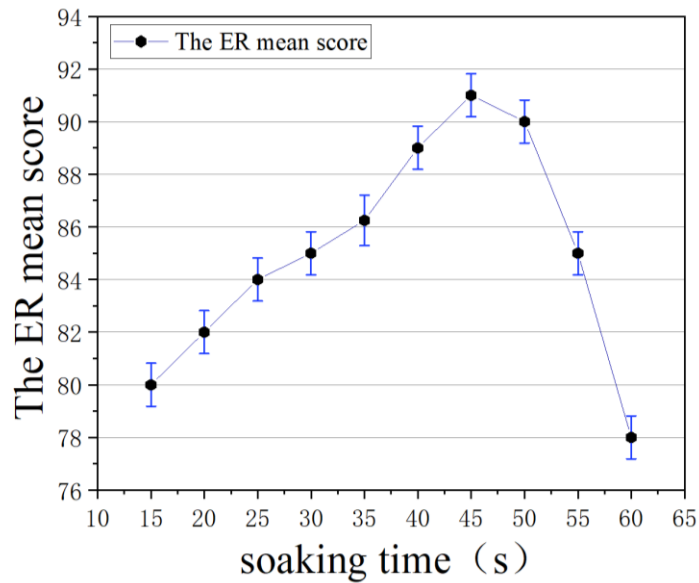


Figure 1. Linear plot of the soaking time and the ER mean score.

As shown, the ER mean score also increased significantly when the soaking time increased, reaching a maximum at a soaking time of 45 s. The ER mean score decreased significantly with increasing soaking time after 45 s.

2.6 Chemical analysis

Step 1: Quantitative analysis of the chemical composition in tea by high-performance liquid chromatography (HPLC),

Step 2: Collect the tea samples at different soaking times and extract the corresponding chemical composition.

Step 3: Use the HPLC instrument to analyze the main chemical components in the tea samples, such as caffeine and tea polyphenols.

Step 4: Record the results of chemical analysis, compare and analyze them with the results of sensory evaluation.

2.7 Chemical analysis of data processing

Quantitative results of HPLC analysis were calculated to obtain the content of each chemical component in the tea samples.

3. Results and discussion

3.1 Analysis of Sensory Evaluation Results

Based on the statistical analysis of the experimental data, we obtained the effect of different soaking times on the quality of “Tieguanyin” tea.

The sensory evaluation results showed that the appearance, aroma, taste and sweetness of tea varied under different soaking times. Specifically, with increasing soaking time, the tea in the partial soaking time group was evaluated to have a stronger aroma and richer taste, while other groups may show different degrees of bitterness or insipid.

Using analysis of variance (ANOVA), we found significant differences in sensory evaluation between different immersion time groups. Further multiple comparison analysis showed that the difference between 45 and 60 seconds was most significant in the soaking time group, indicating that the soaking time had a clear effect on the quality of “Tieguanyin” tea. By measuring the tea polyphenol concentration in three experiments and taking the average, Figure 2 was obtained.

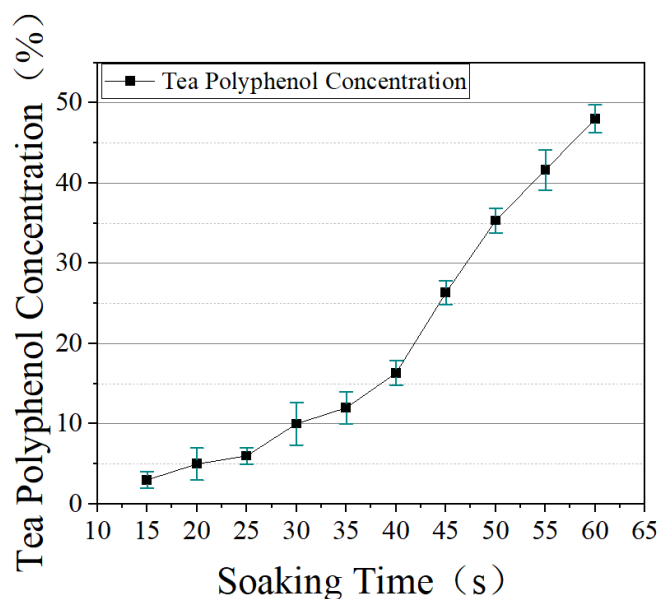


Figure 2. Linear plot of the soaking time and tea polyphenol concentration at 90°C water temperature.

3.2 Analysis of chemical analysis results:

Using high-performance liquid chromatography (HPLC)[8], we analyzed the chemical composition of the “Tieguanyin” tea samples from different soaking time groups. The results showed that the main chemical components in tea leaves such as caffeine and tea polyphenols changed with the soaking time. In particular, the caffeine content of tea may decrease, while the content of tea polyphenols may increase [9]. Structures for some phenolic compounds are given in Figure 3.

3.3 Comprehensive analysis and discussion of the results

Based on the results of sensory evaluation and chemical analysis, we can conclude that the appropriate soaking time can improve the quality of “Tieguanyin” tea and make it have a richer aroma

and taste [10]. However, a long soaking time may lead to excessive extraction of tea, producing a bitter taste and may reduce the caffeine content.

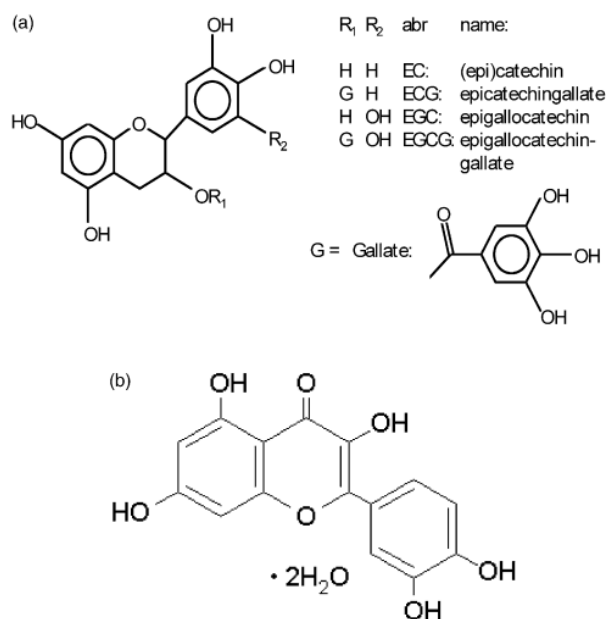


Figure 3. Structures for some of the phenolic compounds discussed in this work: (a) structures of catechins; (b) structures of quercetin [9].

These experimental results are of certain guiding significance for tea production and consumption. The manufacturer can determine the best soaking time range according to different needs to provide more consumer taste products. Consumers can also choose the appropriate soaking time according to their personal taste preferences to obtain the best quality experience [11].

It should be pointed out that although the influence of the soaking time on the quality of “Tieguanyin” tea was explored, there are still other factors that may affect the quality of tea leaves, such as tea varieties and processing technology. Future studies can further explore the comprehensive impact of these factors on tea quality to provide a more comprehensive understanding of the formation mechanism of tea quality [12].

On the basis of the experimental results, we suggest to conduct more kinds of experiments to further confirm the influence of soaking time on the quality of “Tieguanyin” tea, and expand the scope of research to explore more research issues related to tea quality.

4. Conclusion

In summary, this study has provided valuable insights into the relationship between the soaking time of “Tieguanyin” tea and its quality, as perceived through sensory evaluation and chemical analysis. The findings have demonstrated that the soaking time significantly influences the tea's aroma, taste, and overall popularity among consumers. An optimal soaking time was identified, beyond which the tea's quality begins to deteriorate, particularly in terms of increased bitterness and potential reduction in caffeine content.

The results of this research are not only beneficial for tea producers, who can now fine-tune their brewing recommendations to enhance the consumer experience, but also for consumers themselves, who can make informed decisions on the ideal brewing time to suit their personal preferences. This study has also highlighted the importance of considering other factors, such as tea variety and processing techniques, which may further affect the quality of “Tieguanyin” tea.

It is recommended that future research should continue to explore the multifaceted nature of tea quality, taking into account a broader range of variables. This could involve examining the interaction between different brewing times and various water temperatures, as well as the impact of storage conditions on the tea's flavor profile over time.

The findings of this study contribute to a deeper understanding of the intricate relationship between the preparation process and the resulting quality of “Tieguanyin” tea. By continuing to investigate these factors, the tea industry can move towards a more nuanced and sophisticated approach to tea production and consumption, ensuring that this traditional Chinese beverage continues to delight and enrich the lives of tea lovers around the world.

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Conflicts of Interest: The authors declare no conflict of interest.

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