

Influence of brewing conditions on taste components in Fuding white tea infusions

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Abstract

BACKGROUND: White tea has received increasing attention of late as a result of its sweet taste and health benefits. During the brewing of white tea, many factors may affect the nutritional and sensory quality of the resulting infusions. The present study aimed to investigate the effect of various infusion conditions on the taste components of Fuding white tea, including infusion time, ratio of tea and water, number of brewing steps, and temperature.

RESULTS: Brewing conditions had a strong effect on the taste compound profile and sensory characteristics. The catechin, caffeine, theanine and free amino acid contents generally increased with increasing infusion time and temperature. Conditions comprising an infusion time of 7 min, a brewing temperature of 100 °C, a tea and water ratio of 1:30 or 1:40, and a second brewing step, respectively, were shown to obtain the highest contents of most compounds. Regarding tea sensory evaluation, conditions comprising an infusion time of 3 min, a brewing temperature of 100 °C, a tea and water ratio of 1:50, and a first brewing step, resulted in the highest sensory score for comprehensive behavior of color, aroma and taste.

CONCLUSION: The results of the present study reveal differences in the contents of various taste compounds, including catechins, caffeine, theanine and free amino acids, with respect to different brewing conditions, and sensory scores also varied with brewing conditions.

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Keywords: Fuding white tea; brewing conditions; taste components; sensory characteristics

INTRODUCTION

White tea is a type of tea that has received increasing attention of late as a result of its sweet taste and health benefits. During the brewing of white tea, many factors may affect the nutritional and sensory quality of the resulting infusions. The present study aimed to investigate the effect of various infusion conditions on the taste components of Fuding white tea, including infusion time, ratio of tea and water, number of brewing steps, and temperature. Results showed that brewing conditions had a strong effect on the taste compound profile and sensory characteristics. The catechin, caffeine, theanine and free amino acid contents generally increased with increasing infusion time and temperature. Conditions comprising an infusion time of 7 min, a brewing temperature of 100 °C, a tea and water ratio of 1:30 or 1:40, and a second brewing step, respectively, were shown to obtain the highest contents of most compounds. Regarding tea sensory evaluation, conditions comprising an infusion time of 3 min, a brewing temperature of 100 °C, a tea and water ratio of 1:50, and a first brewing step, resulted in the highest sensory score for comprehensive behavior of color, aroma and taste. The results of the present study reveal differences in the contents of various taste compounds, including catechins, caffeine, theanine and free amino acids, with respect to different brewing conditions, and sensory scores also varied with brewing conditions.

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3,18,20,21
 22
 A 2 14 A 2 39
 3
 18
 3
 20
 A 70%
 (5-N-)
 18,23
 50%
 2,3
 3
 2,24
 24 et al.²⁴
 85° 3 et al.¹
 6

MATERIALS AND METHODS

Materials and chemicals

(B)
 B ()
 7.02, 100, -1
 ()
 -A ()
 ()
 A

Preparation of infusions

1
 A

Table 1.

	(l -1)	(°)	B (l)	f
1	1:30	100	5	1
2	1:40	100	5	1
3	1:50	100	5	1
4	1:60	100	5	1
5	1:50	90	5	1
6	1:50	80	5	1
7	1:50	100	3	1
8	1:50	100	4	1
9	1:50	100	6	1
10	1:50	100	7	1
11	1:50	100	5	2
12	1:50	100	5	3
13	1:50	100	5	4
14	1:50	100	5	5

Analysis of taste component content

f
 14502-2:2005.²⁵
 ()
 14502-2:2005.
 (B/ 23193-2008,)²⁶
 (B/ 5009.124-2003,)²⁷

Sensory evaluation

B/ 23776-2009.²⁸
 10
 A
 100- (90, 99= , 80, 89=
 70, 79=
 23776-2009 (A.7).²⁸

Statistical analysis

A | ±
 (A A) 20.0 B
 A | A). P < 0.05

RESULTS AND DISCUSSION

Effect of brewing conditions on individual catechin content
 7,21,24,29

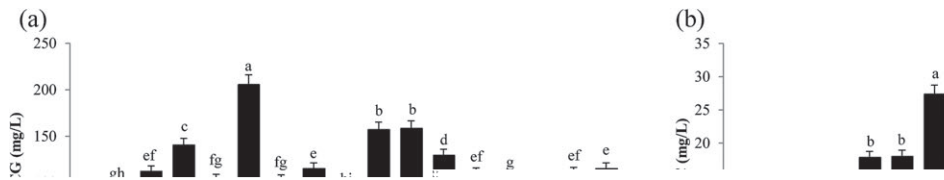


Figure 1. Effect of different treatments on XG (mg/L) in (a) and (b) treatments.

... 24 ...
 ... 78.1431 ...
 ... 140.6811 ...
 ... 1:30 ...
 ... (P < 0.05) ...
 ... 115.6111 ...
 ... 17.8611 ...
 ... 31 ...
 ... 1:40 (27.381 ...
 ... (8.2731 ...
 ... 100° ...
 ... 12.2811 ... (P < 0.05) ...
 ... 71 ...
 ... : 1:40 > 1:30 > 1:50 > 1:60 ...
 ... 9.2571 ...
 ... (2) ...

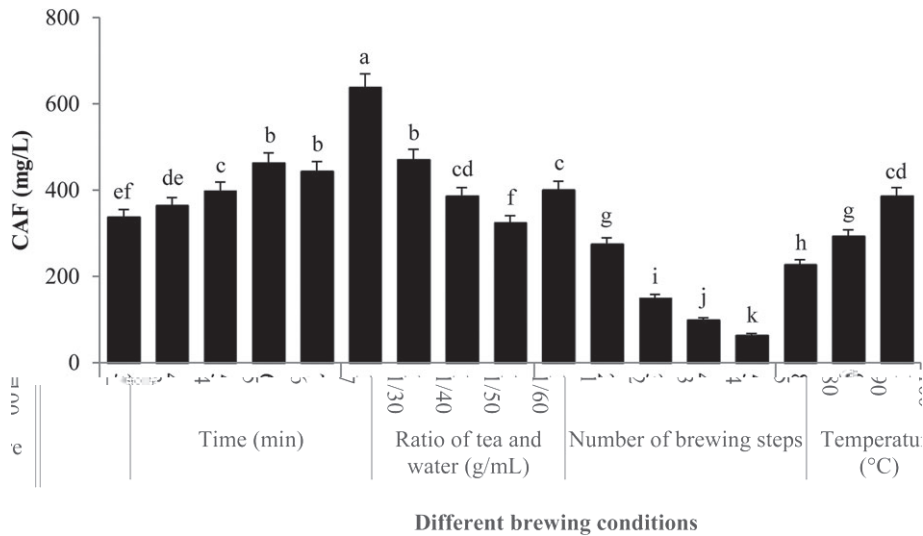


Figure 2. Effect of brewing conditions on caffeine content in tea.

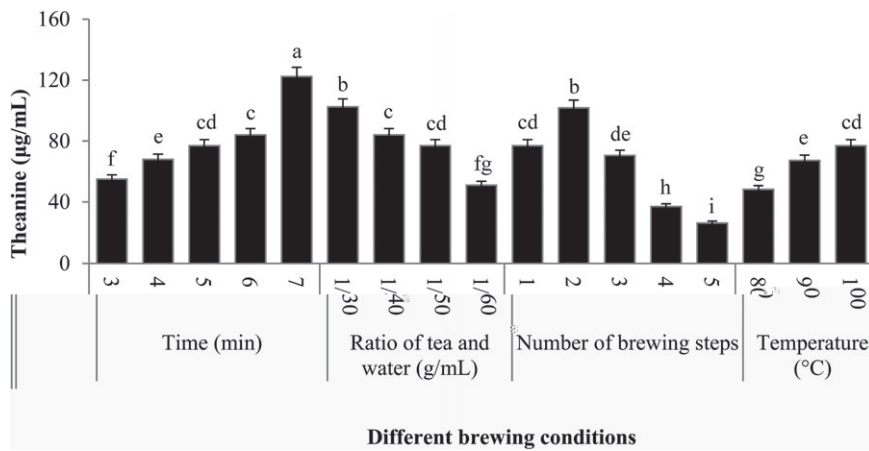


Figure 3. Effect of brewing conditions on theanine content in tea.

Effect of brewing conditions on caffeine content

The caffeine content in tea was significantly affected by brewing conditions ($P < 0.05$). The highest caffeine content was observed in tea brewed for 7 min (440 mg/L), followed by 6 min (460 mg/L) and 5 min (400 mg/L). The caffeine content was significantly lower in tea brewed for 3 min (340 mg/L) and 4 min (370 mg/L). The caffeine content was significantly higher in tea brewed with a 1/30 ratio of tea and water (640 mg/L) compared to other ratios. The caffeine content was significantly lower in tea brewed with 1/50 and 1/60 ratios of tea and water (330 mg/L and 390 mg/L, respectively). The caffeine content was significantly lower in tea brewed with 1, 2, 3, 4, and 5 brewing steps (400 mg/L, 280 mg/L, 150 mg/L, 100 mg/L, and 70 mg/L, respectively). The caffeine content was significantly higher in tea brewed at 100°C (390 mg/L) compared to 80°C (220 mg/L) and 90°C (300 mg/L).

Effect of brewing conditions on theanine content

The theanine content in tea was significantly affected by brewing conditions ($P < 0.05$). The highest theanine content was observed in tea brewed for 7 min (120 µg/mL), followed by 6 min (82 µg/mL) and 5 min (75 µg/mL). The theanine content was significantly lower in tea brewed for 3 min (55 µg/mL) and 4 min (68 µg/mL). The theanine content was significantly higher in tea brewed with a 1/30 ratio of tea and water (105 µg/mL) compared to other ratios. The theanine content was significantly lower in tea brewed with 1/50 and 1/60 ratios of tea and water (78 µg/mL and 50 µg/mL, respectively). The theanine content was significantly lower in tea brewed with 1, 2, 3, 4, and 5 brewing steps (75 µg/mL, 100 µg/mL, 70 µg/mL, 40 µg/mL, and 25 µg/mL, respectively). The theanine content was significantly higher in tea brewed at 100°C (78 µg/mL) compared to 80°C (50 µg/mL) and 90°C (68 µg/mL).

Effect of brewing conditions on the free amino acid content

The free amino acid content in tea was significantly affected by brewing conditions ($P < 0.05$). The highest free amino acid content was observed in tea brewed for 7 min (120 µg/mL), followed by 6 min (82 µg/mL) and 5 min (75 µg/mL). The free amino acid content was significantly lower in tea brewed for 3 min (55 µg/mL) and 4 min (68 µg/mL). The free amino acid content was significantly higher in tea brewed with a 1/30 ratio of tea and water (105 µg/mL) compared to other ratios. The free amino acid content was significantly lower in tea brewed with 1/50 and 1/60 ratios of tea and water (78 µg/mL and 50 µg/mL, respectively). The free amino acid content was significantly lower in tea brewed with 1, 2, 3, 4, and 5 brewing steps (75 µg/mL, 100 µg/mL, 70 µg/mL, 40 µg/mL, and 25 µg/mL, respectively). The free amino acid content was significantly higher in tea brewed at 100°C (78 µg/mL) compared to 80°C (50 µg/mL) and 90°C (68 µg/mL).

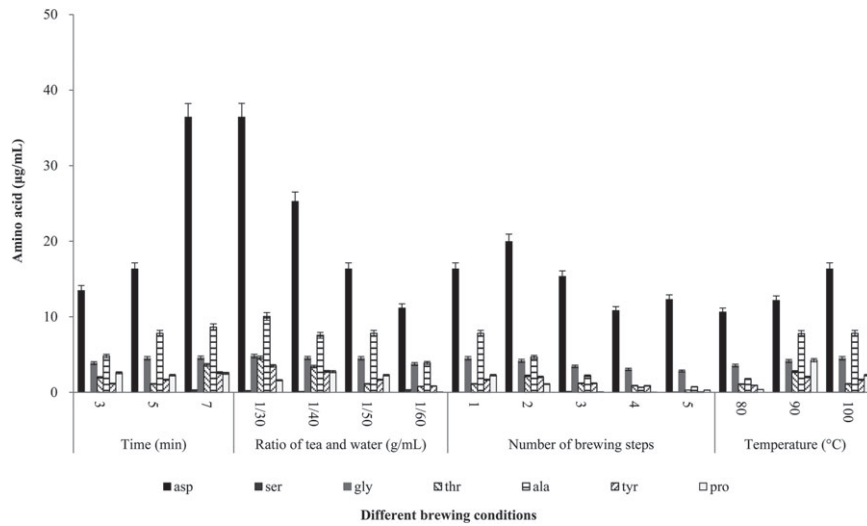


Figure 4. Effect of different brewing conditions on the concentration of amino acids in tea.

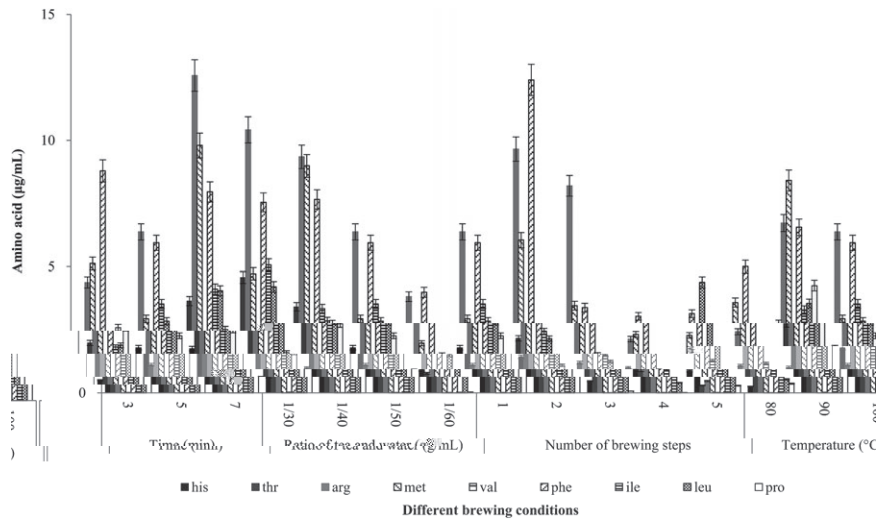


Figure 5. Effect of different brewing conditions on the concentration of amino acids in tea.

... 90° ... A ... (P < 0.05), ... A ... (4.6), ... A ... f 71 ... f 1:50 ... f 51 ... f 1:30. ... (4.5). ... A ... (36.41 µ l⁻¹) ... f 1:40 (8.99 ... 7.66 µ l⁻¹). ... **Sensory analysis** ...

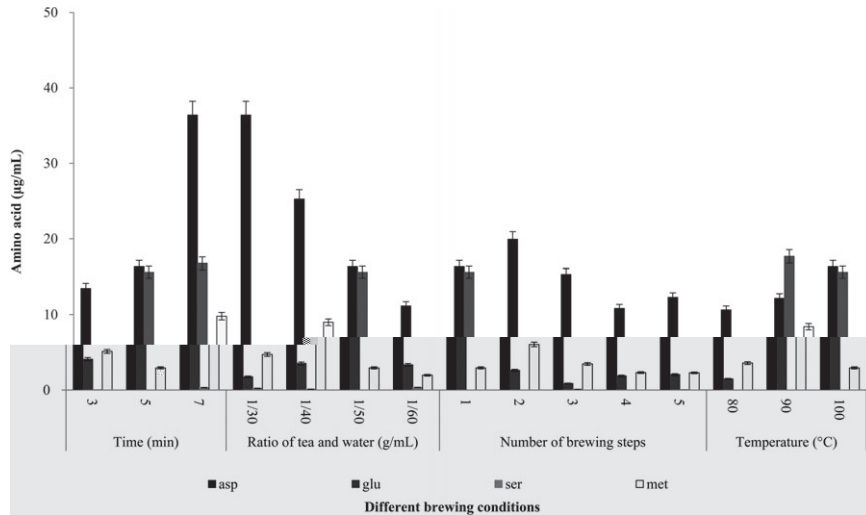


Figure 6. The effect of different brewing conditions on the concentration of amino acids in brewed tea.

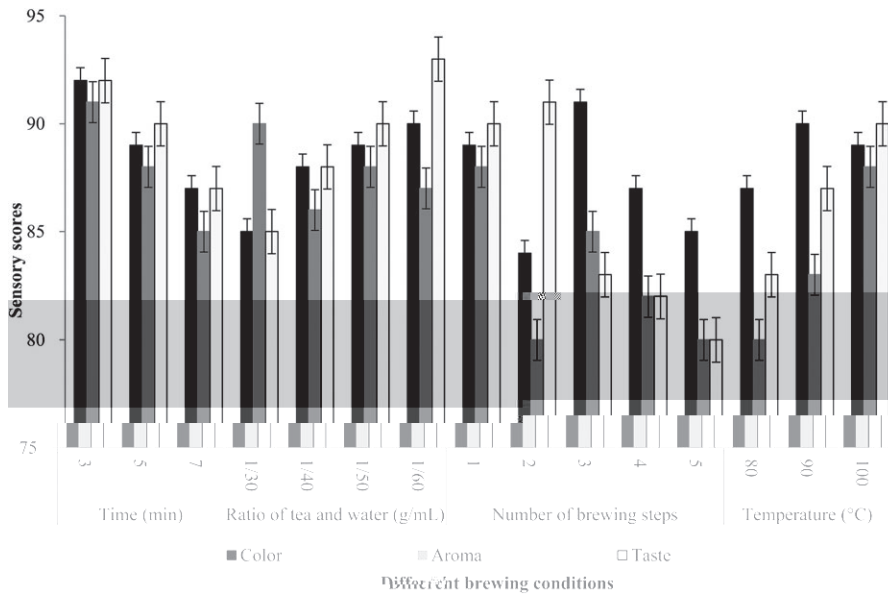
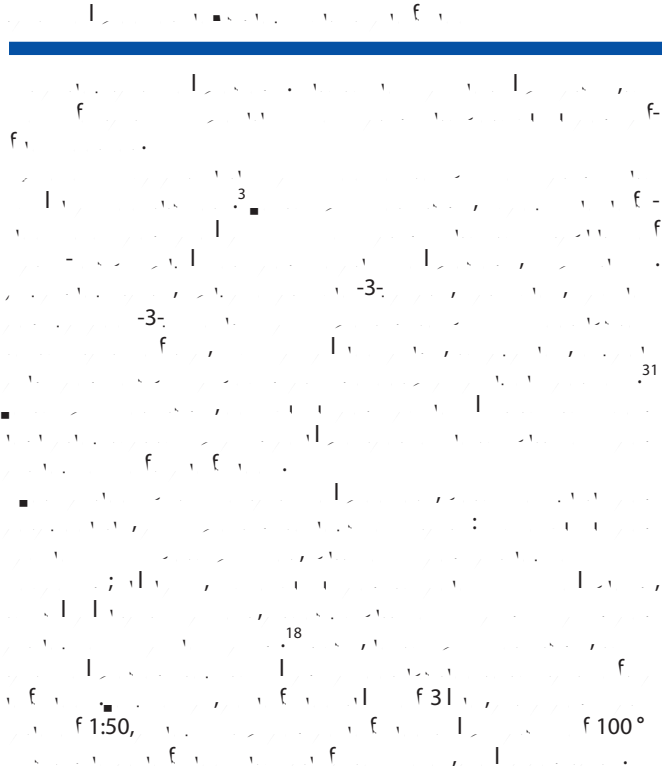


Figure 7. The effect of different brewing conditions on the sensory attributes of brewed tea.

... (4.7). ...
 ... A ...
 ...
 ... 3.51 ...
 ... 24 ...
 ... 51 ...

... (4.7). ...
 ...
 ... 1:30, ...
 ...
 ... A ... f80° ...
 ... 90° ...
 ... 100° ...
 ... B ...



CONCLUSIONS

The present study investigated the effect of different processing methods on the chemical composition and antioxidant activity of Camellia sinensis extracts. The results showed that the extracts obtained from different processing methods had different chemical compositions and antioxidant activities. The extracts obtained from the traditional method had the highest total polyphenol content and antioxidant activity. The extracts obtained from the microwave method had the highest total flavonoid content and antioxidant activity. The extracts obtained from the steam method had the highest total catechin content and antioxidant activity. The results also showed that the extracts obtained from different processing methods had different chemical compositions and antioxidant activities. The extracts obtained from the traditional method had the highest total polyphenol content and antioxidant activity. The extracts obtained from the microwave method had the highest total flavonoid content and antioxidant activity. The extracts obtained from the steam method had the highest total catechin content and antioxidant activity.

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