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Investigation of Herbal Tea Production from *Centella Asiatica* Leaf

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Abstract.

Centella asiatica is a perennial herb with creeping stem, rooting at the nodes and with simple, reniform, long arachnoid petioled leaves. *Centella asiatica* is used in a wide range of pharmacological activity. Objective of this study focused on the effect of blanching temperature and time; heat pump drying temperature and storage condition to vitamin C (mg/100g), flavonoid (mg/g) and sensory score of the dried *Centella asiatica* leaf tea. Results showed that *Centella asiatica* leaves should be blanched in hot water 95^{o}C at 5 seconds in the present of citric acid 1% and then beeing dried by heat pump dryer at 55^{o}C until 10% moisture. The final herbal tea could be preserved under vacuum in PET/AL/PE bag at 4^{o}C to maintain flavonoid content for 12 months. From this investigation, farmers could enhance the added value of this vegetable in commerce. Moreover, consumers would have a better chance to use one kind of healthy drink.

Keywords: *Centella asiatica, herbal tea, blanching, drying, vaccum, vitamin C, flavonoid*

I. Introduction

Centella asiatica, a plant of the family Umbelliferae, is a weakly scented species.[1] *C. asiatica* is creeping, perennial herb with up to 2m long slender and tender horizontal reddish prostrate stolons, characterized by long rooting internodes.[2] Leaves of *C. asiatica* (L) are a rich source of valuable primary and secondary metabolites such as carbohydrates, tannins, steroids, terpenoids, alkaloids, flavanoids, cardiac glycosides, saponins.[3] *Centella asiatica* accumulates large quantities of pentacyclic triterpenoid saponins, collectively known as centelloids.[4] The essential oil was dominated by sesquiterpene hydrocarbons.[5] *Centella* is also rich in Vitamin C, Vitamin B1, Vitamin B2, niacin, carotene and Vitamin A.[6] *C. asiatica* reported to possess various pharmacological activities: antimicrobial activity, anticancer activity, wound healing activity, neuroprotechtive activity, immunomodulatory activity, anti-inflammatory activity, hepatoprotective activity, insecticidal activity, and antioxidant activity. *Centella asiatica* plant possesses potential thrombolytic and antioxidant effect.[7] *C. asiatica* is also rich in flavonoids and terpenoids compounds among them asiatic acid, asiaticoside, madecassoside is well characterized for its pharmacological value.[8] Utilization of *Centella asiatica* have been known for many years in treating all kind of diseases such as gastrointestinal disease, gastric ulcer, asthma, wound healing and eczema.[9]

Microwave blanching and drying characteristics of *Centella asiatica* (L.) urban leaves using tray and heat pump-assisted dehumidified drying was examined.[10] Effects of blanching and drying treatment on extraction of soluble components from dried *Centella asiatica*.[11] Effects of pretreatment and drying methods on molecular structure, functional properties and thermal stability of fibre powder exhibiting colour from *Centella asiatica* L. were investigated.[12] The effect of different drying methods on the degradation of flavonoids in *Centella asiatica* was evaluated.[13]

Objective of this study focused on the effect of blanching temperature and time; heat pump drying temperature and storage condition to vitamin C (mg/100g), flavonoid (mg/g) and sensory score of the dried *Centella asiatica* leaf tea.

II. Materials And Method

2.1 Material

Centella asiatica leaves were collected in Soc Trang province, Vietnam. They must be cultivated following VietGAP to ensure food safety. After collecting, they must be conveyed to laboratory within 4 hours for experiments. They were washed under tap water to remove foreign matters. Besides *Centella asiatica* leaves another material was also used during the research such as citric acid. Lab utensils and equipments included digital weight balance, cooker, heat pump dryer.

Figure 1. *Centella asiatica* leaves

2.2 Researching procedure

2.2.1 Effect of blanching temperature and time to vitamin C (mg/100g), flavonoid (mg/g) and color (sensory score) in the dried Centella asiatica leaf tea

Raw *Centella asiatica* leaves were blanched in water solution with 1% citric acid at different temperature and time (100^{o}C, 3 second; 95^{o}C, 5 seconds; 90^{o}C, 7 seconds; 85^{o}C 9 seconds). Then they were dried by heat pump at

60°C until 10% moisture. All samples were analyzed vitamin C (mg/100g), flavonoid (mg/g), color (sensory score) to validate the appropriate blanching condition.

2.2.2 Effect of drying temperature to vitamin C (mg/100g), flavonoid (mg/g) and color (sensory score) in the dried Centella asiatica leaf tea

Raw *Centella asiatica* leaves were blanched in water solution with 1% citric acid at 95°C in 5 seconds. Then these samples would be dried under heat pump dryer at different temperature (40°C, 45°C, 50°C, 55°C, 60°C, 65°C) until 10% moisture. All samples were analyzed vitamin C (mg/100g), flavonoid (mg/g), color (sensory score) to validate the appropriate drying temperature.

2.2.3 Effect of storage condition to flavonoid (mg/g) in the dried leaf tea

After completion of drying treatment, the dried *Centella asiatica* leaves were subjected to storage. They were kept in PET/AL/PE (zipper top), PET/AL/PE (vaccum) bag at different 4°C, 28°C. The flavonoid content (mg/g) will be analyzed in 3 months interval for 12 months.

2.3 Physico-chemical and sensory analysis

The vitamin C (mg/100g) content of the *Centella asiatica* leaves was determined by redox titration using iodate solution. Flavonoid (mg/g) was determined.[14] Color (sensory score) of *Centella asiatica* leaves was assessed by a group of panelist. They were required to evaluate the odour, colour, taste, sweetness and overall acceptance using the 9-point hedonic scale (1 = dislike extremely, 9 = like extremely).

2.4 Statistical analysis

The experiments were run in triplicate with three different lots of samples. Data were subjected to analysis of variance (ANOVA) and mean comparison was carried out using Duncan's multiple range test (DMRT). Statistical analysis was performed by the Statgraphics Centurion XVI.

III. RESULT & DISCUSSION

3.1 Effect of blanching temperature to vitamin C (mg/100g), flavonoid (mg/g) and color (sensory score) in the dried *Centella asiatica* leaf tea

Raw *Centella asiatica* leaves were blanched in water solution with 1% citric acid at different temperature and time (100°C, 3 second; 95°C, 5 seconds; 90°C, 7 seconds; 85°C, 9 seconds). All samples were analyzed vitamin C (mg/100g), flavonoid (mg/g), color (sensory score) to validate the appropriate blanching condition. Results were mentioned in table 1. From table 1, the *Centella asiatica* leaves should be blanched at 95°C in 5 seconds to maintain the most vitamin C (mg/100g), flavonoid (mg/g) and sensory score in the dried *Centella asiatica* leaf tea.

Microwave blanching and drying characteristics of *Centella asiatica* (L.) urban leaves using tray and heat pump-assisted dehumidified drying was examined. Microwave blanching for 30 s retained the highest total phenolics and the microwave blanching for 30 s and 45 s retained the highest % inhibition.[10] Fresh *Centella asiatica* leaves were blanched in water at temperature of 85 °C in 30s to obtain green chlorophyll color and to minimize losing soluble component.`[11] Effects of pretreatment and drying methods on molecular structure, functional properties and thermal stability of fibre powder exhibiting colour from *Centella asiatica* L. were investigated. Steaming and combined steaming and alkaline soaking resulted in the powder with more greenness and higher chlorophylls contents, while combined steaming and acid soaking yielded dark yellow powder with lower chlorophylls contents. Chemical soaking led to the powder with decreased water holding capacity and solubility.[12]

3.2 Effect of drying temperature by heat pump to vitamin C (mg/100g), flavonoid (mg/g) and color (sensory score) in the dried *Centella asiatica* leaf tea

Raw *Centella asiatica* leaves were blanched in water solution with 1% citric acid at 95°C in 5 seconds. Then these samples would be dried under heat pump dryer at different temperature (40°C, 45°C, 50°C, 55°C, 60°C, 65°C). All samples were analyzed vitamin C (mg/100g), flavonoid (mg/g), color (sensory score) to validate the appropriate drying temperature. Results were mentioned in table 2. From table 2, the *Centella asiatica* leaves should be dried at 55°C to maintain the most vitamin C (mg/100g), flavonoid (mg/g) and sensory score in the dried *Centella asiatica* leaf tea.

Table 1. Effect of blanching temperature to vitamin C (mg/100g), flavonoid (mg/g) and color (sensory score) in the dried *Centella asiatica* leaf tea

Blanching	Vitamin C (mg/100g)	Flavonoid (mg/g)	Sensory score
100°C, 3 seconds	20.44±0.01^{b}	0.58±0.01^{bc}	6.41±0.01^{c}
95°C, 5 seconds	22.38±0.00^{a}	0.63±0.01^{a}	7.35±0.02^{a}
90°C, 7 seconds	17.55±0.02^{c}	0.60±0.02^{b}	7.07±0.01^{b}
85°C, 9 seconds	14.67±0.01^{d}	0.52±0.00^{c}	6.11±0.02^{d}

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Table 2. Effect of drying temperature by heat pump to vitamin C (mg/100g), flavonoid (mg/g) and color (sensory score) in the dried *Centella asiatica* leaf tea

Drying temperature	Vitamin C (mg/100g)	Flavonoid (mg/ml)	Sensory score
40°C	22.40±0.02^{a}	0.65±0.01^{a}	7.04±0.03^{c}
45°C	22.40±0.00^{a}	0.64±0.03^{ab}	7.10±0.01^{bc}
50°C	22.38±0.00^{ab}	0.63±0.01^{ab}	7.35±0.02^{b}
55°C	22.35±0.00^{ab}	0.61±0.00^{ab}	7.36±0.02^{ab}
60°C	21.44±0.02^{b}	0.55±0.01^{b}	7.38±0.01^{ab}
65°C	20.12±0.01^{c}	0.41±0.02^{c}	7.40±0.00^{a}

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Table 3. Flavonoid content (mg/g) in dried *Centella asiatica* leaves by the effect of packaging material and storage temperature

Storage time (month)	Dried *Centella asiatica* leaves by the storage temperature (^oC) kept in PET/AL/PE (zipper top)		Dried *Centella asiatica* leaves by the storage temperature (^oC) kept in PET/AL/PE (vaccum)	
	4 ^oC	28 ^oC	4 ^oC	28 ^oC
0	0.61 ± 0.01^{a}	0.61 ± 0.01^{a}	0.61 ± 0.01^{a}	0.61 ± 0.01^{a}
3	0.59 ± 0.01^{ab}	0.58 ± 0.03^{ab}	0.60 ± 0.01^{a}	0.59 ± 0.01^{ab}
6	0.57 ± 0.01^{b}	0.55 ± 0.00^{b}	0.58 ± 0.00^{ab}	0.56 ± 0.02^{b}
9	0.54 ± 0.02^{bc}	0.53 ± 0.01^{bc}	0.56 ± 0.02^{ab}	0.54 ± 0.01^{bc}
12	0.52 ± 0.00^{c}	0.50 ± 0.02^{c}	0.55 ± 0.01^{b}	0.51 ± 0.01^{c}

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Microwave blanching and drying characteristics of *Centella asiatica* (L.) urban leaves using tray and heat pump-assisted dehumidified drying was examined. The heat pump-assited dehumidified drying incorporated by the microwave blanching could reduce the drying time at 40 °C by 31.2 % and increase % inhibition by 6.1 %. Quality evaluation by total phenolics, % inhibition and rehydration ratio showed the best quality for C. asiatica leaves pretreated by microwave blanching and dried at 40 °C in heat pump-assisted dehumidified dryer.[10] The optimized drying conditions of blanched *Centella asiatica* leaves are: temperature of 75.5 oC and time of 3.47h, with highest content of soluble component of 34.27% (absoluble dry component) by extracting in water at 90 oC; and dry product contained with content of vitamin C 0.91mg% and asiaticose of 0.684%.[11] The effect of different drying methods on the degradation of flavonoids in *Centella asiatica* was evaluated. *C. asiatica* leaf, root and petiole were dried using air-oven, vacuum oven and freeze drier. Air-oven treatment resulted in the highest total flavonoids degradation followed by vacuum oven and freeze dried with percent degradation of 97%, 87.6% and 73%, respectively. Catechin and rutin were found to be the most stable flavonoids with percent degradation up to 35%, 66% and 76% for freeze dried, vacuum oven and air oven, respectively.[13]

Effects of pretreatment and drying methods on molecular structure, functional properties and thermal stability of fibre powder exhibiting colour from *Centella asiatica* L. were investigated. Vacuum-drying reduced chlorophylls degradation, hence retention of the greenness of the powder. Increased particle size resulted in decreased lightness of the powder, but in increased lightness of the solutions; water and oil holding capacities of the powder increased with the particle size. Colour of the solutions changed only slightly upon heating at 80 and 180 °C for 1 h.[12]

3.3 Effect of storage condition to flavonoid (mg/g) in the dried *Centella asiatica* leaf tea

After completion of drying treatment, the dried *Centella asiatica* leaves were subjected to storage. They were kept in PET/AL/PE (zipper top), PET/AL/PE (vaccum) bag at different 4^{o}C, 28^{o}C. The flavonoid (mg/g) will be analyzed in 3 months interval for 12 months. Dried *Centella asiatica* leaves should be stored under vacuum in PET/AL/PE bag at 4^{o}C to maintain flavonoid content for 12 months.

Most of herbal drug products used are group of constituents. Herbal medicinal products are of different nature thermolabile to volatile. Stability testing of herbal products is a complicated issue because the entire herb or herbal product is regarded as the active substance, regardless of whether constituents with defined therapeutic activity are known. The stability testing of herbal products check the quality of herbal products which varies with the time under the influence of environmental factors, such as temperature, humidity, light, oxygen, moisture, other ingredient or excipient in the dosage form, particle size of drug, microbial contamination, trace metal contamination, leaching from the container, etc. and also provide statistics for the determination of shelf lives.[15]

IV. CONCLUSION

Centella asiatica is well known for its traditional uses and medicinal properties for the treatment of many diseases. *Centella asiatica* L. is important herbal medicinal plant used for various applications. In the dried *Centella asiatica* leaf production, the blanching and drying has been obviously affected to product quality. Fresh leaves of *Centella asiatica* can be blanched and dried for purpose of making dry product that can be preserved long time to make product for healthy as: dry-leave tea or soluble powder drinks from extracting of dry product.

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