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# Various Parameters Influencing to Production of Water Dropwort *(Oenanthe Javanica)* Tea

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**Abstract.**
Water dropwort (*Oenanthe javanica*) has various phytochemicals such as amino acids, carbohydrates, proteins, flavonoids, phenolic compounds, steroids and terpenoids, saponins, tannins, cardiac glycosides except alkaloids and phlobatannins.The present study focused on the effect of blanching time and temperature, $CaCl_2$ concentration in blanching; *Oenanthe javanica* leaf size and temperature in drying; and storage condition to saponin (µg/g) content in the herbal tea. The optimal results demonstrated that blanching at 95°C, 5 sesonds with 0.2% $CaCl_2$; heat pump drying at 50°C in dimension of 2.0cm; storage at 4°C in PET/AL/PE (vaccum) could maintain the saponin content in herbal tea for 6 weeks without any decomposition.

***Keywords:*** *Oenanthe javanica, herbal, blanching, drying, storage, vaccum*

## I. Introduction

*Oenanthe javanica* or water dropwort of the family Apiaceae is an aromatic perennial herb with root tubers**.** The plant grows wild in freshwater, marshes and swampy fields and along ditches, canals and streams.[1]The plant grows up to a metre in height, often forming pure stands. Leaves are variable in shape and resemble those of celery. Water dropwort has high content in ash, calcium, vitamin and free sugar with alkalinity.

Water dropwort has constituents of phenylpropanoids, flavonoids and phenolic acids, notably, persicarin and isorhamnetin. Antioxidant, anti-quorum sensing, melanogenic, anti-diabetic, anti-arrhythmic, anti-inflammatory, neuroprotective, neurogenesis, alcohol detoxification, antitoxic, anti-coagulant, hepatoprotective, anti-hepatitis B virus and memory improvement are pharmacological properties of water dropwort.[2, 3] *Oenanthe javanica* can be used as a natural product for the treatment of photodamaged skin.[4] *O. javanica* may modulate phase I enzymes and thereby affect various xenobiotic metabolism.[5] Persicarin from water dropwort (*Oenanthe javanica*) could protect primary cultured rat cortical cells from glutamate-induced neurotoxicity.[6] Extract of water dropwort (*Oenanthe javanica*) was effective in alleviating alcohol.[7]

There were little research mentioned to herbal tea production from water dropwort. Influence of pretreatments on the dehydration characteristics during vacuum drying of water dropwort (*Oenanthe javanica* DC.).[8] A study was conducted to investigate the nutrient composition of hydroponic water dropwort and the effect of blanching condition on ascorbic acid content.[9] The present study focused on the effect of blanching time and temperature, $Cacl_2$ concentration in blanching; *Oenanthe javanica* leaf size and temperature in drying; and storage condition to saponin (µg/g) content in the dried herbal tea from water dropwort.

## II. Materials And Method

### 2.1 Material

We collected water dropwort *(Oenanthe javanica)* in Ca Mau province, Vietnam. They must be cultivated following VietGAP to ensure food safety. After harvesting, they must be conveyed to laboratory within 8 hours for experiments. They were washed thoroughly under turbulent washing to remove dirt, dust and adhered unwanted material. Besides *Oenanthe javanica* we also used other materials during the research such as $CaCl_2$, PET/AL/PE bag**,** idodate. Lab utensils and equipments included HPLC-ELSD, refractometer, thermometer, steaming oven, digital timer.

**Figure 1.** *Oenanthe javanica* leaf

### 2.2 Researching procedure

***2.2.1 Effect of blanching temperature and time to vitamin K (mg/100g), saponin (µg/g) and color (sensory score) in the dried Oenanthe javanica leaf tea***

Raw *Oenanthe javanica* leaves were blanched in water solution with 0.2% $CaCl_2$ at different temperature and time (100°C, 3 second; 95°C, 5 seconds; 90°C, 7 seconds; 85°C 9 seconds). Then they were dried by heat pump at 60°C until 12% moisture. All samples were analyzed vitamin K (mg/100g), saponin (µg/g), color (sensory score) to validate the appropriate blanching condition.

***2.2.2 Effect of $CaCl_2$ concentration in blanching to vitamin K (mg/100g), saponin (µg/g) and color (sensory score) in the dried Oenanthe javanica leaf tea***

Raw *Oenanthe javanica* leaves were blanched in water solution with different $CaCl_2$ concentration (0.05%, 0.10%, 0.15%, 0.20%, 0.25%) at 95°C, 5 seconds. Then they were dried by heat pump at 60°C until 12% moisture. All samples were analyzed vitamin K (mg/100g), saponin (µg/g), color (sensory score) to validate the appropriate blanching condition.

***2.2.3 Effect of Oenanthe javanica leaf size during drying to vitamin K (mg/100g), saponin (µg/g) and color (sensory score) in the dried Oenanthe javanica leaf tea***

Raw *Oenanthe javanica* leaves were blanched in water solution with 0.2% $CaCl_2$ at 95°C, 5 seconds. Then they were dried at different size (0.5 cm, 1.0 cm, 1.5 cm, 2.0 cm,

2.5 cm) by heat pump at 60°C until 12% moisture. All samples were analyzed vitamin K (mg/100g), saponin (µg/g), color (sensory score) to validate the appropriate blanching condition.

***2.2.4 Effect of drying temperature to vitamin K (mg/100g), saponin (µg/g) and color (sensory score) in the dried Oenanthe javanica leaf tea***

Raw *Oenanthe javanica* leaves were blanched in water solution with 0.2% $CaCl_2$ at 95°C in 5 seconds. Then these samples would be dried in 1.5 cm of size under heat pump dryer at different temperature (35°C, 40°C, 45°C, 50°C, 55°C, 60°C) until 12% moisture. All samples were analyzed vitamin K (mg/100g), saponin (µg/g), color (sensory score) to validate the appropriate drying temperature.

***2.2.5 Effect of storage condition to saponin (µg/g) in the dried leaf tea***

After completion of drying treatment, the dried *Oenanthe javanica* leaves were subjected to storage. They were kept in PET/AL/PE (vaccum) bag at different 4°C, 28°C. The saponin (µg/g) will be analyzed in 1 week interval for 6 weeks.

**2.3 Physico-chemical and biological analysis**

The vitamin K (mg/100g) content of the *Oenanthe javanica* leaves was determined by redox titration. Saponin (µg/g) was determined by HPLC-ELSD. Total phenolic (TP, mg GAE/g fw) contents were measured according to the method of Singleton and Rossi (1965) with slight modifications.[10] Total soluble solids (TSS, %) were measured by refractometry method. Color (sensory score) of *Oenanthe javanica* 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 Phytochemical composition in *Oenanthe javanica* leaves**

Phytochemical composition in *Oenanthe javanica* leaves was primarily analyzed. Results were depicted in table 1.

From table 1, we clearly noticed that *Oenanthe javanica* leaves had high amount of saponin which was suitable for herbal tea production. In another research, water dropwort (*Oenanthe javanica)* had total phenolic contents (31.8 mg gallic acid equivalent per gram), $TEAC_{DPPH}$ (185.9 µmol Trolox equivalent per gram), $TEAC_{FRAP}$ (199.96 µmol Trolox equivalent per gram).[11]

**3.2 Effect of blanching temperature and time to vitamin K (mg/100g), saponin (µg/g) and color (sensory score) in the dried *Oenanthe javanica* leaf tea**

Raw *Oenanthe javanica* leaves were blanched in water solution with 0.2% $CaCl_2$ at different temperature and time (100°C, 3 seconds; 95°C, 5 seconds; 90°C, 7 seconds; 85°C 9 seconds). Then they were dried by heat pump at 60°C until 12% moisture. All samples were analyzed vitamin K (mg/100g), saponin (µg/g), color (sensory score) to validate the appropriate blanching condition. Results were depicted in table 2. From table 2, the best blanching condition was noted at 95°C, 5 seconds.

A study was conducted to investigate the nutrient composition of hydroponic water dropwort and the effect of blanching condition on ascorbic acid content. The nutrients content of leaves were significantly higher in ash and ascorbic acid and lower in moisture, crude fat and crude fiber than those of stems and petioles. Shorter blanching time and addition of 0.5% NaCl to the blanching water are better for higher ascorbic acid retention of hydroponic water drowort.[9]

**3.3 Effect of $CaCl_2$ concentration in blanching to vitamin K (mg/100g), saponin (µg/g) and color (sensory score) in the dried *Oenanthe javanica* leaf tea**

Raw *Oenanthe javanica* leaves were blanched in water solution with different $CaCl_2$ concentration (0.05%, 0.1%, 0.15%, 0.20%, 0.25%) at 95°C in 5 seconds. Then they were dried by heat pump at 60°C until 12% moisture. All samples were analyzed vitamin K (mg/100g), saponin (µg/g), color (sensory score) to validate the appropriate blanching condition. Results were depicted in table 3. From table 3, the optimal $CaCl_2$ concentration in blanching should be 0.2%.

Two pretreatments (blanching and 1% KMS dipping) were applied to the water dropwort, which were dried in the ranges of 50–70C of drying air temperature. The blanched samples had shorter drying time than the control and 1% KMS treated samples. The color characteristics of dried water dropwort were also significantly influenced by the pretreatments.[8]

**3.4 Effect of *Oenanthe javanica* leaf size during drying to vitamin K (mg/100g), saponin (µg/g) and color (sensory score) in the dried *Oenanthe javanica* leaf tea**

Raw *Oenanthe javanica* leaves were blanched in water solution with 0.2% $CaCl_2$ at 95°C, 5 seconds. Then they were dried at different size (0.5 cm, 1.0 cm, 1.5 cm, 2.0 cm, 2.5 cm) by heat pump at 60°C until 12% moisture. All samples were analyzed vitamin K (mg/100g), saponin (µg/g), color (sensory score) to validate the appropriate blanching condition. Results were depicted in table 4. From table 4, the optimal *Oenanthe javanica* leaf size should be 2.0 cm.

**Table 1. Phytochemical composition in *Oenanthe javanica* leaves**

| Parameter | Vitamin K (mg/100g) | Saponin (µg/g) | Total phenolic (TP, mg GAE/g fw) | Total soluble soid (%) |
|---|---|---|---|---|
| **Value** | 34.79±0.01 | 34.38±0.00 | 30.14±0.03 | 9.23±0.02 |

*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 blanching temperature and time**

| Blanching condition | Vitamin K (mg/100g) | Saponin (µg/g) | Color (sensory score) |
|---|---|---|---|
| 100°C, 3 seconds | 31.11±0.01[b] | 30.11±0.02[b] | 5.49±0.02[b] |
| **95°C, 5 seconds** | **32.19±0.01[a]** | **31.25±0.01[a]** | **6.54±0.01[a]** |
| 90°C, 7 seconds | 30.34±0.01[c] | 29.19±0.01[c] | 4.75±0.01[c] |
| 85°C 9 seconds | 28.15±0.02[d] | 28.40±0.02[d] | 3.31±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 3. Effect of $CaCl_2$ concentration in blanching**

| $CaCl_2$ concentration | Vitamin K (mg/100g) | Saponin (µg/g) | Color (sensory score) |
|---|---|---|---|
| 0.05% | 29.13±0.00[c] | 29.55±0.01[c] | 5.49±0.01[c] |
| 0.10% | 30.48±0.03[b] | 30.04±0.00[b] | 6.04±0.01[bc] |
| 0.15% | 31.34±0.01[ab] | 30.41±0.03[ab] | 6.27±0.03[b] |
| **0.20%** | **32.19±0.01[a]** | **31.25±0.01[a]** | **6.54±0.01[a]** |
| 0.25% | 32.21±0.02[a] | 32.30±0.00[a] | 6.38±0.02[ab] |

*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 4. Effect of *Oenanthe javanica* leaf size during drying**

| *Oenanthe javanica* leaf size | Vitamin K (mg/100g) | Saponin (µg/g) | Color (sensory score) |
|---|---|---|---|
| 0.5 cm | 30.89±0.00[c] | 26.37±0.03[c] | 5.74±0.01[c] |
| 1.0 cm | 31.20±0.03[bc] | 28.84±0.01[bc] | 6.24±0.03[bc] |
| 1.5 cm | 32.19±0.01[b] | 31.25±0.01[b] | 6.54±0.01[b] |
| **2.0 cm** | **32.25±0.01[ab]** | **31.30±0.03[ab]** | **7.28±0.01[a]** |
| 2.5 cm | 32.28±0.00[a] | 31.32±0.02[a] | 7.02±0.00[ab] |

*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 5. Effect of drying temperature**

| Drying temperature | Vitamin K (mg/100g) | Saponin (µg/g) | Color (sensory score) |
|---|---|---|---|
| 35°C | 32.35±0.00[a] | 31.34±0.02[a] | 7.27±0.01[c] |
| 40°C | 32.35±0.01[a] | 31.34±0.01[a] | 7.43±0.03[b] |
| 45°C | 32.34±0.04[a] | 31.33±0.02[ab] | 7.61±0.00[ab] |
| **50°C** | **32.30±0.03[ab]** | **31.32±0.01[ab]** | **8.24±0.00[a]** |
| 55°C | 32.28±0.01[ab] | 31.31±0.02[b] | 7.33±0.01[bc] |
| 60°C | 32.25±0.01[b] | 31.30±0.03[b] | 7.28±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%).*

### 3.5 Effect of drying temperature to vitamin K (mg/100g), saponin (µg/g) and color (sensory score) in the dried *Oenanthe javanica* leaf tea

Raw *Oenanthe javanica* leaves were blanched in water solution with 0.2% $CaCl_2$ at 95°C in 5 seconds. Then these samples would be dried in 2.0 cm of size under heat pump dryer at different temperature (35°C, 40°C, 45°C, 50°C, 55°C, 60°C) until 12% moisture. All samples were analyzed vitamin C (mg/100g), saponin (µg/g), color (sensory score) to validate the appropriate drying temperature. Results were depicted in table 5. From table 5, the optimal drying temperature should be 40°C.

The thin-layer drying behavior of water dropwort in a laboratory scale vacuum dryer was examined. Two pretreatments (blanching and 1% KMS dipping) were applied to the water dropwort, which were dried in the ranges of 50–70°C of drying air temperature. The drying air temperature and pretreatment had significant effects on the moisture content of the water dropwort samples. The drying rate decreases continuously with decreasing moisture content or increasing drying time.[8]

### 3.6 Effect of storage condition to saponin (µg/g) in the dried leaf tea

After completion of drying treatment, the dried *Oenanthe javanica* leaves were subjected to storage. They were kept in PET/AL/PE (vaccum) bag at different 4°C, 28°C. The saponin (µg/g) will be analyzed in 1 week interval for 6 weeks. Results were depicted in table 6. From table 6, the *Oenanthe javanica* dried leaf tea was still stable under the vaccum at 4°C for 6 weeks.

**Table 6. Effect of storage condition**

| Storage duration (week) | Saponin (µg/g) | |
|---|---|---|
| | Storage temperature 4°C | Storage temperature 28°C |
| 0 | 31.32±0.01[a] | 31.32±0.01[a] |
| 1 | 31.30±0.02[ab] | 31.29±0.01[ab] |
| 2 | 31.27±0.02[b] | 31.23±0.00[b] |
| 3 | 31.19±0.03[bc] | 31.16±0.03[bc] |
| 4 | 31.15±0.01[c] | 31.07±0.02[c] |
| 5 | 31.09±0.01[cd] | 31.02±0.01[cd] |
| 6 | 31.01±0.01[d] | 30.94±0.01[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%).*

## IV. CONCLUSION

*Oenanthe javanica* is an aromatic medicinal herb having pharmacological properties such as antioxidant, anti-quorum sensing, anticoagulant, antitoxic, hepatoprotective, anti-hepatitis B virus and memory improvement. Drying characteristics of water dropwort as influenced by pretreatments may provide a practical method for the preservation of water dropwort and improvement on the quality of dried products We have successfully optimized the effect of blanching time and temperature, $Cacl_2$ concentration in blanching; *Oenanthe javanica* leaf size and temperature in drying; and storage condition to saponin (µg/g) content in the herbal tea from water dropwort.

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