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RESEARCH ARTICLE

Various Parameters Affecting to Production of Dried *Jasminum sambac* Flower

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Abstract

Jasminum sambac is one of the most cultivated species in Vietnam. The plant is much valued for its exquisitely fragrant flowers. Flowers of *Jasminum sambac* have been utilized as traditional medicines to treat many diseases. Objective of this study focused on on the effectiveness of different parameters of freeze-drying such as pressure (0.06, 0.08, 0.10, 0.12 mbar), primary drying temperature (-3°C, -5°C, -7°C, -9°C) and secondary temperature (26°C, 28°C, 30°C, 32°C) to the total phenolic (mg GAE/100 g) and total flavonoid (*mg QE/100 g*) of dried *Jasminum sambac* flower. At the end of drying process, we also monitored the stability of dried *Jasminum sambac* flower during 6 months of preservation. Our results showed that the optimal drying process should be conducted at 0.08 mbar, primary drying temperature -7°C, secondary temperature 28°C to achieve the best dried *Jasminum sambac* flower. From this production, shelf-life of dried *Jasminum sambac* flower could be last for 6 months without any deterioration.

Keywords: *Jasminum sambac*, *Dried flower, Freeze-drying, Total phenolic, Total flavonoid, Shelf-life, preservation.*

Introduction

Jasminum sambac is a genus of shrubs with young pubescent branches, broadly ovate or elliptic, opposite leaves, white, very fragrant flowers and vines belonging to the olive family. They are cultivated throughout Vietnam. Leaves and flowers are used as antipyretic and decongestant; roots as analgesic, flowers as lactifuge, flower extract as deodorant [1]. The white and fragrant flowers of jasmine are symbol of purity [2]. The flowers of *Jasminum sambac* were used in the preparation of an essential oil and for making jasmine tea. *Jasminum sambac* has a unique and pleasant odor, and is gaining high interest in aromatherapy and the spa business [3, 4].

These fragrance flowers are scarce and consist of heat-sensitive aromatic oil that could not be distilled [5]. The flower of *J. sambac* was reported to contain the mixtures of dimeric and trimeric iridodial glycosides and glycosidic aroma precursors [6]. *Jasminum sambac* revealed the presence of salicylic acid, essential oils, fixed oils, terpines, resin, saponins, steroids, fats, phenolics, flavonoids, phenolic compounds, tannins, glycosides, coumarins, carbohydrates, proteins, amino acids [7, 8]. It also contains dotriacontanoic acid, dotriacontanol, oleanolic acid, daucosterol and hesperidin [9, 11]. The plant extracts possessed antimicrobial, insecticidal, analgesic, antipyretic, anti-inflammatory, antioxidant, anti-diabetic, dermatological, anticancer, cardiovascular, lipid peroxidation inhibition, anti-obesity and gastroprotective effects [12, 16]. Dry flowers are economically important because fresh flowers are short lived and will retain only for few days or week while dry material will last indefinitely [17].

Drying flowers is an exotic physical process with the unique ability to preserve a life appearance and colour in beautiful blooms [18]. There was not any research mentioned to processing of jasmine tea. One study analyzed the changes in the volatiles, chemical components, and antioxidant activities of Chinese jasmine tea during six rounds of the scenting processes [19].

Freeze-drying or lyophilization has been identifed as an effective method for drying bioproducts with minimal deterioration to

available phytochemical components [20]. Therefore, objective of this study focused on the effectiveness of different paramters of freeze-drying such as pressure, primary drying temperature and secondary temperature to the total phenolic and flavonoid of dried *Jasminum sambac* flower. At the end of drying process, we also monitored the stability of dried *Jasminum sambac* flower during preservation.

Materials and Method

Material

Jasminum sambac flowers were collected from Soc Trang province, Vietnam. After collecting, they must be kept in cool and dry cotton box, conveyed to laboratory within 8 hours for experiments. They were subjected to the freeze-dryer under different conditions.

Researching Procedure

Effect of Pressure in Drying to the Total Phenolic (mg GAE/100 g), Flavonoid (mg QE/100 g) in the Dried Jasminum sambac Flower

Raw *Jasminum sambac* flower were dried under various pressure (0.06, 0.08, 0.10, 0.12 mbar) by the same primary drying temperature (-3^{o}C) and secondary temperature (26^{o}C). At the end of drying process, all samples were analyzed the total phenolic (mg GAE/100 g), flavonoid (mg QE/100 g) to validate the appropriate pressure condition.

Effect of Primary Drying Temperature to the Total Phenolic (mg GAE/100 g), Flavonoid (mg QE/100 g) in the Dried Jasminum Sambac Flower

Raw *Jasminum sambac* flower were dried under pressure (0.08 mbar) by the various primary drying temperature (-3^{o}C, -5^{o}C, -7^{o}C, -9^{o}C) and secondary temperature (26^{o}C). At the end of drying process, all samples were analyzed the total phenolic (mg GAE/100 g), flavonoid (mg QE/100 g) to validate the appropriate primary drying temperature condition.

Effect of Secondary drying Temperature to the Total Phenolic (mg GAE/100 g), Flavonoid (mg QE/100 Gin the Dried Jasminum Sambac Flower

Raw *Jasminum sambac* flower were dried under pressure (0.08 mbar) by the primary drying temperature (-7^{o}C) and various secondary temperature (26^o, 28^{o}C, 30^{o}C, 32^{o}C). At the end of drying process, all samples were analyzed the total phenolic (mg GAE/100 g), flavonoid (mg QE/100 g) to validate the appropriate secondary drying temperature condition.

Stability of Dried Jasminum Sambac Flower Under Storage

After drying treatment, the dried *Jasminum sambac* flower was subjected to storage. They were kept in PET/AL/PE (vaccum) bag at 28^{o}C. The total phenolic (mg GAE/100 g), flavonoid (mg QE/100 g) and sensory score will be evaluated in 6 months by 2 month-interval.

Physico-Chemical, Sensory and Statistical Analysis

Chemical composition (total polyphenol content, flavonoid) in dried *Jasminum sambac* flower was examined. Total polyphenol content (mg GAE/100 g) was determined by FolinCiocalteu reagent method [21]. Aluminum chloride colorimetric method was used for flavonoids (mg QE/100 g) determination [22, 23]. Sensory score was evaluated by a group of panelist using 9 point-Hedonic scale. The experiments were run in triplicate with three different lots of samples. Statistical analysis was performed by the Stat graphics Centurion XVI.

Result & Discussion

Effect of Pressure in Drying to the Total Phenolic (mg GAE/100 g), Flavonoid (mg QE/100 g) in the Dried *Jasminum sambac* Flower

Raw *Jasminum sambac* flower were dried under various pressure (0.06, 0.08, 0.10, 0.12 mbar). Our result showed that the optimal pressure should be 0.08 mbar to maintain the best quality of dried *Jasminum sambac* flower.

Table 1: Effect of pressure in drying to the total phenolic (mg GAE/100 g), flavonoid (mg QE/100 g) in the dried *Jasminum sambac* flower

Pressure (mbar)	0.06	0.08	0.10	0.12
Total phenolic (mg GAE/100g)	24.53±0.01^d	28.19±0.02^a	27.25±0.00^b	26.48±0.03^c
Total flavonoid (mg QE/100g)	16.22±0.00^d	19.08±0.03^a	18.47±0.01^b	17.36±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%)

One study analyzed the changes in the volatiles, chemical components, and antioxidant activities of Chinese jasmine tea during six rounds of the scenting processes. The antioxidant activities of the tea samples decreased in the first two rounds and later increased in the succeeding four rounds of the scenting process [19].

Effect of Primary Drying Temperature to the Total Phenolic (mg GAE/100 g), Flavonoid (mg QE/100 g) in the Dried *Jasminum sambac* Flower

Raw *Jasminum sambac* flower were dried under various primary drying temperature (-3°C, -5°C, -7°C, -9°C). Our results were noted in Table 2. The optimal primary drying temperature was recorded -7°C so we choose this value for further experiments.

Table 2: Effect of primary drying temperature to the total phenolic (mg GAE/100 g), flavonoid (mg QE/100 g) in the dried *Jasminum sambac* flower

Primary drying temperature (°C)	-3	-5	-7	-9
Total phenolic (mg GAE/100g)	28.19±0.02^{c}	29.57±0.00^{bc}	32.16±0.04^{a}	31.05±0.06^{b}
Total flavonoid (mg QE/100g)	19.08±0.03^{c}	20.39±0.05^{bc}	23.65±0.02^{a}	22.18±0.01^{b}

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%)

The studied on processing of rose tea using white and red rose. the rose petals drying time under the hot air oven method with the temperature of 70, 80 and 90°C was dried to a final moisture content of 19.79 - 22.96 %db. While, rose flowers drying time was three hours using hot air oven method under the temperature of 80°C, 90 and 100°C was dried to final moisture content of 19.95 - 28.35 %db [24].

Effect of Secondary Drying Temperature to the Total phenolic (mg GAE/100 g), Flavonoid (mg QE/100 g in the Dried *Jasminum sambac* Flower

Raw *Jasminum sambac* flower were dried under various secondary drying temperature 26°, 28°C, 30°C, 32°C). Our results were noted in Table 3. The optimal secondary drying temperature was recorded 28°C so we choose this value for further experiments.

Table 3: Effect of secondary drying temperature to the total phenolic (mg GAE/100 g), flavonoid (mg QE/100 g) in the dried *Jasminum sambac* flower

Secondary drying temperature (°C)	26	28	30	32
Total phenolic (mg GAE/100g)	32.16±0.04^{a}	32.03±0.07^{ab}	30.19±0.04^{b}	29.65±0.05^{c}
Total flavonoid (mg QE/100g)	23.65±0.02^{a}	23.51±0.05^{ab}	22.28±0.02^{b}	21.73±0.03^{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%)

Stability of Dried *Jasminum sambac* Flower Under Storage

After completing the drying treatment, the dried *Jasminum sambac* flower was subjected to storage. They were kept in PET/AL/PE (vaccum) bag at 28°C. The total phenolic (mg GAE/100 g), flavonoid (mg QE/100 g) and sensory score will be evaluated in 6 months by 2 month-interval.

Table 4: Stability of dried *Jasminum sambac* flower under storage

Storage (week)	0	2	4	6
Total phenolic (mg GAE/100g)	32.03±0.07^{a}	31.89±0.04^{a}	31.75±0.05^{ab}	31.68±0.003^{b}
Total flavonoid (mg QE/100g)	23.51±0.05^{a}	23.44±0.03^{a}	23.38±0.01^{ab}	23.29±0.02^{b}
Sensory score	8.19±0.00^{a}	8.14±0.02^{a}	8.05±0.04^{ab}	8.00±0.05^{b}

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%)

Physiological characterization of Jasmine flower (Jasminum sambac) senescence during storage was investigated. The lowest content of total phenolics was measured in buds and partially opened flowers 50.90 µg/g but highest in fully opened 61.80 µg/ g on the fourth day of storage, respectively [25, 26].

Conclusion

Jasmines are an important group of flowering plants. They are widely cultivated and esteemed for their attractive fragrant flowers. This genus belongs to the family Oleaceae. It has been traditionally used as antimicrobial and anti-inflammatory agents. Dry flower industry is a major segment of florticulture industry. We have successfully investigated some technical parameters affecting to the drying process of *Jasminum sambac* flower. From this study, the added value of *Jasminum sambac* flower would be

improved and consumer would have ability to enjoy one healthy food drink.

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