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Technical Factors Affecting the Processing of Hibiscus *Rosa sinensis* Syrup

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Hibiscus *rosa-sinensis* is a perennial ornamental shrub available throughout Vietnam. Hibiscus *Rosa sinensis* petals are a source of phytochemicals by beneficial ecological, aesthetic, culinary and medicinal values. Our research attempted to utilize Hibiscus *Rosa sinensis* petals making for syrup. By focusing on the effect of petal/sugar ratio in osmotic maceration (20/80, 25/75, 30/70, 35/65, 40/60), temperature and time in thermal extraction (100/4, 95/6, 90/8, 85/10, 80/12 ^{o}C/minutes) on physico-chemical properties of Hibiscus *Rosa sinensis* syrup, our results revealed that syrup prepared from Hibiscus *Rosa sinensis* petals would be achied by petal/sugar (30/70), heating at 95^{o}C for 6 minutes. Finding from this research proved that the available petals from Hibiscus *rosa-sinensis* could be successfully utilized to produce a syrup rich in phytochemicals and overall acceptability.

Keywords: Hibiscus rosa-sinensis, syrup, osmotic maceration, thermal extraction, phytochemical, overall acceptability

INTRODUCTION

Edible flowers are emerging as new source of nutraceuticals due to their nutritional and medicinal value (Mlcek and Rop, 2011). Hibiscus *Rosa sinensis* is cultivated extensively as an ornamental plant in the sub-tropical and tropical regions. This plant bears large flowers on the bushy hedges (Diana et al. 2015). The flowers are dark red in colour but not fragrant (Kumar, and Singh, 2012). Flowers are composed of flavonoids, diglucoside, and vitamins like thiamine, riboflavin, ascorbic acid and niacin (Diana et al. 2015). Various parts of this plant are also utilized in the preparation of jams, spices, soups, and sauces (Baranova, 2011). Flowers of Hibiscus *rosa– sinensis* can be fermented into pickle or used as a purple dye for colouring foods such as preserved fruit and cooked vegetables (Sunita, 2017). In foods and beverages, hibiscus is used as a flavouring agent. *Hibiscus* is used as a flavouring agent to improve the odour, flavour, or appearance of tea mixtures (Ali, 2015). It is used for treating loss of appetite, colds, heart and nerve diseases, upper respiratory tract pain and inflammation, stomach irritation, fluid retention and also some disorders of circulation. Its flower is used to cure ailments such as cough cold, hair loss and hair greying. It is beneficial as a mild laxative, expectorant and diuretic. It is a very good natural source of vitamin C and is used for curing syphilis and gonorrhoea also. It has been demonstrated to be advantageous in the reduction of blood pressure (Arellano, 2004). Flowers of Hibiscus *Rosa sinensis* have a wide range of pharmacological benefits. Objective of our study optimized some technical parameters such as petal/sugar ratio in osmotic maceration, temperature and time in thermal extraction during syrup production from Hibiscus *Rosa sinensis*petals.

MATERIALS AND METHODS

Material

Hibiscus *Rosa sinensis*petalswere collected from SocTrang province, Vietnam. They were subjected to washing and treatment. Crystalline table sugar was purchased from local market.

Researching method

Hibiscus *Rosa sinensis*petals were set layer by layer with sugar in glass jar by different ratios: 20/80, 25/75, 30/70, 35/65, 40/60 (petal/sugar). Maceration was last for 72 hours for pigment extraction. These samples were heated in different conditions: 100/4, 95/6, 90/8, 85/10, 80/12 (^oC/minutes). The extract was filtrated through muslin cloth. The syrup was filled in clean glass bottle ready for physico-chemical and sensory analysis.

Chemical and sensory analysis

Total soluble solid (TSS, ^{o}Brix) of fresh and dried samples was evaluated using hand-held refractometer. Total phenolic content (TPC, mg GAE/100g) was determined using Folin-Ciocalteu reagent (Hassan and Bakar, 2013). Ascorbic acid content (mg/100g) was determined as per standard method using 2, 6- dichlorophenol indophenol dye after extracting in 3% m-phosphoric acid and titrating with the dye to an end point of pink colour(Ranganna, 1986). Overall acceptance was evaluated as sensory score by a group of panelists using 9 point-Hedonic scale

Statistical analysis

The experiments were run in triplicate with three different lots of samples. The data were presented as mean±standard deviation. Statistical analysis was performed by the Statgraphics Centurion version XVI.

RESULTS AND DISCUSSION

Effect of petal/sugar ratio on physico-chemical properties of Hibiscus *Rosa sinensis* syrup

Table 1 showed the influence of different ratios of Hibiscus *Rosa sinensis* petals to sugar on the physico-chemical properties of Hibiscus *Rosa sinensis* syrup. It's obviously noticed that petal/sugar ratio (30/70) gave the most desirable total soluble solid, total phenolic, ascorbic acid and overall acceptance. Our results were similar to finding by Ashwani et al. (2017). They concluded that 30:70 of rose petals to sugars, produced syrup with high overall acceptability.

Effect of thermal treatment in extraction on physico-chemical properties of Hibiscus *Rosa sinensis* syrup

Table 2 showed the influence of thermal treatment in extractionto the physico-chemical properties of Hibiscus *Rosa sinensis* syrup. Temperature and time had significant effect on total soluble solid, total phenolic, ascorbic acid and overall acceptance. By heating at 95^{o}C for 6 minutes, the highest total soluble solid, total phenolic, ascorbic acid and overall acceptance would be achieved. Thermal treatments caused soften the plant tissue and weaken the phenol-protein and phenol-polysaccharide interactions (Mokrani et al. 2016). Ascorbic acid content was decreased with increase in extraction temperature which might have been due to the oxidation of antioxidants at higher temperature. Thermal treatment at 70°C was most suitable to produce a syrup rich in phytochemicals and high overall acceptability (Ashwani et al. 2017).

Table 1: Effect of petal/sugar ratio on physico-chemical properties of Hibiscus *Rosa sinensis* syrup

Petal/sugar	20/80	25/75	30/70	35/65	40/60
Total soluble solid (^{o}Brix)	71.69±0.27^a	70.15±0.55^{ab}	68.23±0.31^b	65.01±0.27^{bc}	62.57±0.50^c
Total phenolic (mg GAE/100g)	511.30±1.23^c	579.66±2.49^{bc}	627.05±1.04^b	691.59±3.32^{ab}	768.19±1.02^a
Ascorbic acid (mg/100g)	15.71±0.11^c	17.83±0.19^{bc}	20.14±0.14^b	22.76±0.25^{ab}	24.54±0.16^a
Overal acceptance	6.83±0.01^{bc}	7.36±0.00^b	8.12±0.03^a	7.89±0.02^{ab}	6.10±0.00^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%).

Table 2: Effect of thermal treatment in extraction on physico-chemical properties of Hibiscus *Rosa sinensis* syrup

Extraction (ºC/ min)	100/4	95/6	90/8	85/10	80/12
Total soluble solid (ºBrix)	71.70±0.17^{b}	79.31±0.28^{a}	75.27±0.16^{ab}	69.30±0.30^{bc}	68.41±0.24^{c}
Total phenolic (mg GAE/100g)	406.32±1.06^{c}	692.40±1.67^{a}	601.76±1.30^{ab}	534.55±2.27^{b}	483.47±1.05^{bc}
Ascorbic acid (mg/100g)	13.79±0.06^{c}	19.21±0.13^{bc}	18.62±0.20^{b}	17.09±0.14^{ab}	15.86±0.10^{a}
Overal acceptance	8.04±0.01^{b}	8.75±0.00^{a}	8.34±0.03^{ab}	7.72±0.02^{bc}	7.17±0.00^{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%).

In another report, the natural woody syrup was prepared from maple syrup. The fluorescence of the syrup was correlated with their antioxidant activity (Poli et al.2018). Ethylacetate fraction syrup containing alkaloids from hibiscus flower optimization results are less stable during storage (Mimiek et al. 2011).

CONCLUSION

Hibiscus is one of the medicinal plants having potentials in treating diseases such as oxidative stress like hypertension and cancer. Flowers of this plant contain ascorbic acid accounted for different biological functions. In this research, we have successfully examined the effect of petal/sugar ratio in osmotic maceration, temperature and time in thermal extraction on physico-chemical properties of Hibiscus *Rosa sinensis* syrup. From this investigation, the underutilized shrub Hibiscus *rosa-sinensis*could be processed to turn into value-added product.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

Nguyen Phuoc Minh arranged the experiments and also wrote the manuscript.

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