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Technical Parameters Affecting To Soursop Herbal Tea Production

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Abstract.

Soursop (*A. muricata*) is native to the warmest tropical areas in Vietnam. Soursop gives a flavor of custard when it is ripen condition. A production of instant soluble herb tea from soursop pulp was investigated by the effect of blanching, drying and storage. Optimal results were clearly realized that the best quality of soursop herbal tea would be obtained by blanching at 95^{o}C in 10 seconds, drying at 40^{o}C by heat pump dryer, keeping in PET/AL/PE bag under vaccum at 4^{o}C to maintain product shelf-life to 28 days without any significant deterioration.

Keywords: *Soursop, herbal tea, blanching, drying, vaccum, shelf-life*

I. INTRODUCTION

A. muricata is an evergreen, terrestrial, erect tree reaching 5–8 m in height and features an open, roundish canopy with large, glossy, dark green leaves. Flower has 3 dark inexperienced, ovate deltoid, leathered sepals that area unit pubescent and persistent; six loosely ovate, coriaceous, and typically inexperienced to after yellowish-green, tomentose, heartshaped base petals; Petals all ovate, inner smaller however each whorls valvate; having varied stamens in rows round the gynoecium; varied ovary, pubescent with designs formed like soft prickles (Banerjee A et al., 2018). The edible fruits of soursop tree are large, heart-shaped and green in color, and the diameter varies between 15 and 20 cm (Soheil Zorofchian Moghadamtousi et al., 2015). The fruits sometimes slightly acidic style once ripe, that's why it's referred to as soursop. Seeds area unit varied, obovoid and two dimensional, dark brown to black, hairless and shiny, embedded in firm, white, fleshy, acid-sweet, juicy pulp (Banerjee A et al., 2018).

The soursop is astringent, cholagogic and promotes digestion. It also has several medicinal uses such as in the management of diabetes and its complications (Adewole, S. O et al., 2006), also as antioxidant and antimutagenic agent (Thakkar, J.H., et al., 2011). It is usually recommended in cases of constipation, obesity, hypertension and coronary diseases. Medicinal properties of soursop could be listed out such as antimicrobial, antihypertensive, anticancer, antitumor, antiarthritic, antidiabetic, anti-inflammatory, endocrine and liver, sedative, antidiarrheal, antiparasitic, colds, diuretic, obesity, cytotoxic (Eka Prasasti Nur Rachmani et al., 2012; Elavarasan K. et al., 2014; Puran Bridgemohan et al., 2015; Arif Kusumo Rahardjo, Moch Istiadjid Eddy Santoso, 2016; Mithun Pai B.H et al., 2016; Prasetyorini Djarot, Moerfiah Badar, 2016; Sejal Patel et al., 2016; Evy Sulistyoningrum et al., 2017; Khairun Nisa Berawi et al., 2017; Lili Indrawati et al., 2017; Uno UU et al., 2017; Banerjee A. et al., 2018; Islam Rady et al., 2018).

Hardoko et al. (2015) observe the effect of brewing time and temperature towards inhibition of α-glucosidase enzyme activity and also to observe the physical, chemical and organoleptic characteristics of the brew from soursop leaves. Soursop tea mitigated the caffeine-induced toxicity on weight of epididymes, sperm motility, sperm viability, sperm count and sperm head abnormality in the mammalian models in a dose – dependent manner (Uno UU et al., 2017). A research was done to determine *in vitro* antihyperuricemic activity on soursop leaves brew which was processed into herbal green tea (Hardoko et al., 2018). Maslin Osathanunkul (2018) developed a molecular method called Bar-HRM (DNA barcoding coupled with High Resolution Melting) for authenticating A. muricata products.

There are plenty of studies mentioned to production of soursop herbal tea. Prasetyorini Djarot, Moerfiah Badar (2016) formulated granule from *Annona muricata* fruit juice as antihypertensive instant drink. Hardoko et al., (2018) utilized soursop leaves as antihyperuricemic in functional beverage 'Herbal Green Tea'. Minh N. P., Stanly J. H. (2018) produced the instant soluble herb tea from soursop pulp**.** Objective of our current research focused on the effect of blanching, drying and storage on the production of soursop herbal tea.

II. MATERIALS AND METHOD

2.1 Material

We collected soursop fruits in Mekong river delta, Vietnam. They must be cultivated following VietGAP to ensure food safety. After harvesting, they must be conveyed to laboratory within 8 hours for experiments. Fruits were washed thoroughly under turbulent washing to remove dirt, dust and adhered unwanted material. Besides soursop we also used other materials during the research such as PET/AL/PE bag, methanol, gallic acid, Quercetin, Aluminium chloride, sodium nitrate, Sodium hydroxide. Lab utensils and equipments included sonicator, steaming

oven, vaccum machine, magnetic stirrer, refrigerator, UV spectrophotometer.

Figure 1. Soursop (*A. muricata)*

2.2 Researching procedure

2.2.1 Effect of blanching temperature and time to flavonoid content (mg/g) in soursop tea

Soursop stems were treated by blannching at different temperature and interval (85 ^{o}C, 20 seconds; 90 ^{o}C, 15 seconds; 95 ^{o}C, 10 seconds and 100^{o}C, 5 seconds). All samples were then analyzed by favonoid content (mg/g) to determine the appropriate blanching.

2.2.2 Effect of heat pump drying temperature to flavonoid content (mg/g) in soursop tea

In order to verify the effect of heat pump drying temperature to flavonoid content (mg/g) in soursop tea, the favonoid content (mg/g) will be analyzed before drying (fresh) and after drying in different heat pump drying temperature (10 ^{o}C, 20 ^{o}C, 30 ^{o}C and 40 ^{o}C).

2.2.3 Effect of storage temperature to flavonoid content (mg/g) in soursop tea

The dried soursop tea was kept in PET/AL/PE bag in different 4^{o}C, 25^{o}C. The favonoid content (mg/g) will be analyzed in 7 day interval for 4 weeks.

2.3 Phytochemical determination

Flavonoid determination: All soursop were homogenized separately in distilled water by using sonicator and then extracted by using magnetic stirrer equipped with heater set at 95 ^{o}C for 4 hours. The extracts obtained were then filtered with Whatman filter paper No.42 and then stored in refrigerator set at 2-8 ^{o}C for further use. 1 g of gallic acid was dissolved in 100 ml of methanol to get 1% solution of gallic acid (10 mg/ml) termed as standard 1 solution. Similarly 1g of Quercetin was dissolved in 100 ml of methanol separately to get 1% solution of quercetin (10 mg/ml) termed as standard 2 solution. Aluminium chloride complex forming assay was used to determine the total flavonoid content of the extracts. Quercetin was used as standard and flavonoid content was determined as quercetin equivalent. A calibration curve for quercetin was drawn for this purpose. From the standard 2 quercetin solution the dilutions of (0.1, 0.5, 1.0, 2.5 and 5 mg/ml) concentrations were prepared in methanol. 100 µl of each of the quercetin dilution was mixed with 500 µl of distilled water and then with 100 µl of 5% sodium nitrate and allowed to stand for 6 minutes. Then 150 µl of 10% aluminium chloride solution was added and allowed to stand for 5 minutes after which 200 µl solution of 1M Sodium hydroxide was added sequentially. The absorbance of this reaction mixture was recorded at 510 nm on UV spectrophotometer. The same procedure was repeated with the pure hot water extracts of soursop and total flavonoid content was calculated as quercetin equivalents (mgQE/g). All the procedures were performed in triplicate (Ovais Ullah Shirazi et al, 2014).

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 Nutritional composition in soursop pulp

René G. Degnon et al., (2003) found that the moisture content was ranged from 18.33 to 24.53%. The pH was between 4.1 and 4.8 with a mean acidity of 1.75%. The soursop pulps are rich in nutrients such as carbohydrates (23.05%), proteins (7.41%), ash (2.22%) and fiber (24.73%).

3.2 Effect of blanching temperature and time to flavonoid content (mg/g) in soursop tea

Soursop was blannched at different temperature and interval (85 ^{o}C, 20 seconds; 90 ^{o}C, 10 seconds; 95 ^{o}C, 10 seconds and 100^{o}C, 5 seconds). All samples were then analyzed by favonoid content (mg/g) to determine the appropriate blanching. Results are depicted in table 2. From table 2, soursop pulp should be blanched at 95^{o}C in 10 seconds to maintain the flavonoid content.

Table 1. Major nutrient compositions in pulp of soursop (*Annona muricata*)

Parameter	Moisture (g/100g)	Protein (g/100g)	Total soluble solid (^{o}Brix)	Fibre (g/100g)	Flavonoid (mg/g)	Vitamin C (mg/100g)
Value	23.96±0.01	7.22±0.02	8.36±0.02	23.49±0.03	12.06±0.02	20.17±0.01

Table 2. Effect of blanching temperature and time to flavonoid content (mg/g) in soursop tea

Blanching	Before blanching	85 ^{o}C, 20 seconds	90 ^{o}C, 10 seconds	95 ^{o}C, 10 seconds	100^{o}C, 5 seconds
Flavonoid (mg/g)	44.84±0.01^{a}	36.12±0.02^{d}	39.77±0.02^{c}	40.43±0.00^{b}	40.06±0.03^{bc}

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 heat pump drying temperature to flavonoid content (mg/g) in soursop tea

Parameter	Fresh soursop before drying	Dried soursop by the effect of heat pump at drying temperature (^{o}C)				
		10	20	30	40	50
Flavonoid (mg/g)	40.43±0.00^{a}	35.22±0.02^{d}	38.76±0.01^{bc}	39.04±0.03^{b}	39.47±0.02^{ab}	37.12±0.02^{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 4. Effect of packaging to flavonoid of soursop tea

Storage time (days)	Dried soursop by the storage temperature (^oC) kept in PET/AL/PE (zipper top)		Dried soursop by the storage temperature (^oC) kept in PET/AL/PE (vaccum)	
	4 ^oC	25 ^oC	4 ^oC	25 ^oC
0	39.47±0.02^{ab}	39.47±0.02^{ab}	39.47±0.02^{a}	39.47±0.02^{a}
7	39.18±0.01^{ab}	39.13±0.03^{ab}	39.31±0.01^{ab}	39.20±0.00^{ab}
14	39.02±0.03^{ab}	38.79±0.01^{ab}	39.24±0.03^{ab}	39.04±0.03^{b}
21	38.48±0.02^{ab}	38.34±0.03^{ab}	39.05±0.00^{ab}	38.83±0.01^{bc}
28	38.10±0.01^{ab}	37.79±0.00^{ab}	38.67±0.00^{ab}	38.04±0.04^{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%).

Minh N. P., Stanly J. H. (2018) produced the instant soluble herb tea from soursop pulp**.** Their results showed that raw soursop pulp should be chopped and freeze-dried to 10% moisture; solvent for extraction of soursop herb tea should be 30% ethanol: 1% acetic acid; ratio of solvent to material should be 10:1 in 24 hours at 70^{o}C by deep soaking.

3.3 Effect of heat pump drying temperature to flavonoid content (mg/g) in soursop tea

The free radicals produced as a result of various metabolic processes taking place in the body are one of the important causes of diseases. Flavonoid in soursop could be an effective therapy to prevent the non-communicable diseases.

In order to verify the effect of heat pump drying temperature to flavonoid content in dried soursop, the flavonoid content will be analyzed before drying (fresh soursop) and after drying in different heat pump drying temperature (10 ^{o}C, 20 ^{o}C, 30 ^{o}C, 40^{o}C, 50^{o}C).

Minh N. P., Stanly J. H. (2018) produced the instant soluble herb tea from soursop pulp**.** Spray drying conditions to get herb tea powder should be 7% maltodextrin as carrier; 130^{o}C as drying temperature; 300 ml/h as volumn of input feeding for spraying, 8% of isomalt as supplementation.

3.4 Effect of storage condition to stability or shelf life of dried soursop tea

In order to preserve the dried soursop tea, different storage conditions were examined. In each sample, flavonoid (mg/g) content was measured in the dried soursop tea. From table 4, the dried soursop tea should be kept in vaccum under 4^{o}C by PET/AL/PE bag.

Naithani, V et al., (2006) found a decline in antioxidant capacity of herbal teas during storage and its relation to phenolic content.

IV. CONCLUSION

A. muricata is now made into a tea due to the promising anti-cancer and anti-tumor activity. There is inevitable adulteration when the demand and prices increase and thus, reliable quality control methods for medicinal plant materials become necessary. Over the last several years, Vietnamese local farmers have escapsed poverty by switching to soursop cultivation. In order to improve the added value of this fruit, we investigated a production of one functional instant soluble herb tea from soursop pulp. We have successfully optimized different conditions for production of soursop herbal tea such as the effect of blanching, drying and storage. By this approach, the added value of soursop could be enhanced as an instant healthy food drink.

REFERENCES

1. Adewole, S. O., Caxton-Martins, E. A. & Ojewole, J. A. O. (2006). *Histochemical and biochemical effects of melatonin on pancreatic β-cells on sreptozocin treated diabetic rats. Pharmacology-Online* 2: 1-21.
2. Arif Kusumo Rahardjo, Moch Istiadjid Eddy Santoso (2016). Effect of soursop leaf and royal jelly on brain neuronal edema and apoptosis in rat cerebral contusion model mediated by bdnf/il-1β ratio. *Journal of Dental and Medical Sciences* 15(8): 1-11.
3. Banerjee A, Das D, Maji BK and Mukherjee S (2018). Anticancer effects of Annona muricata with its acetogenins as bioactive compound. *Cytology & Histology International Journal* 2(1): 1-6.
4. Eka Prasasti Nur Rachmani, Tuti Sri Suhesti, Retno Widiastuti Aditiyono (2012). The breast of anticancer from leaf extract of annona muricata againts cell line in T47D. *International Journal of Applied Science and Technology* 2(1): 157-164.
5. Elavarasan K., Govindhappa M., Soundararajan and Stephen Samuel D. (2014). Medicinal properties and uses of soursop (*Annona muricata* L.). *Rashtriyakrishi* 9(2): 73-75.
6. Evy Sulistyoningrum, Eka Prasasti Nur Rachmani, Hanif Nasiatul Baroroh, Lantip Rujito (2017). *Annona muricata* leaves extract reduce proliferative indexes and improve histological changes in rat's breast cancer. *Journal of Applied Pharmaceutical Science* 7(01): 149-155.
7. Hardoko, Yuniwaty Halim, StevellaVerena Wijoyo (2015). In vitro antidiabetic activity of "green tea" soursop leaves brew through α-glucosidase inhibition. *International Journal of PharmTech Research* 8(1): 30-37.
8. Hardoko, Tanudjaja, Y., Mastuti. T.S. and Halim, Y (2018). Utilization of soursop leaves as antihyperuricemic in functional beverage 'Herbal Green Tea'. *International Food Research Journal* 25(1): 321-328.
9. Islam Rady, Melissa B. Bloch, Roxane-Cherille N. Chamcheu, Sergette Banang Mbeumi, Md Rafi Anwar, Hadir Mohamed, Abiola S. Babatunde, Jules-Roger Kuiate, Felicite K. Noubissi, Khalid A. El Sayed, G. Kerr Whitfield, and Jean Christopher Chamcheu (2018). *Oxidative Medicine and Cellular Longevity* Volume 2018, Article ID 1826170, 39 pages.
10. Khairun Nisa Berawi, Liana Shidarti, Samsu U. Nurdin, Nur Indrawati Lipoeto, Irza Wahid, Jamsari and Endang Nurcahyani (2017). Comparison effectiveness of antidiabetic activity extract herbal mixture of soursop leaves *(Annona Muricata)*, bay leaves *(Syzygium Polyanthum)* and pegagan leaves *(Centella Asiatica)*. *Biomedical & Pharmacology Journal* 10(3): 1481-1488
11. Lili Indrawati, Suwijiyo Pramono, Purwantyastuti Ascobat, Budiman Bela, Murdani Abdullah, Ingrid S. Surono (2017). Cytotoxic activity of soursop "*Annona muricata*" leaves extracts and their phytochemical contents. *Journal of Global Pharma Technology* 02(9): 35-40.
12. Maslin Osathanunkul (2018). Bar-HRM for authenticating soursop (*Annona muricata*) tea. *Scientific Reports* 8:1-6.
13. Minh N. P., Stanly J. H. (2018). Production of instant soluble herb tea from soursop pulp. *International Journal of Applied Engineering Research* 13(2): 1313-1317.

14. Mithun Pai B.H., Gururagavendra Rajesh, Ramya Shenoy, and Ashwini Rao (2016). Anti-microbial efficacy of soursop leaf extract (*annona muricata*) on oral pathogens: an in-vitro study. *J Clin Diagn Res*. 10(11): 1–4.
15. Naithani, V; Nair, S; Kakkar, P., (2006). Decline in antioxidant capacity of Indian herbal teas during storage and its relation to phenolic content. *Food Research International* 39 (2): 181-190.
16. Ovais Ullah Shirazi, Muhammad Muzaffar Ali Khan Khattak, Nor Azwani Mohd Shukri, Mohd Nur Nasyriq. A. (2014). Determination of total phenolic, flavonoid content and free radical scavenging activities of common herbs and spices. *Journal of Pharmacognosy and Phytochemistry* 3(3): 104-108
17. Prasetyorini Djarot, Moerfiah Badar (2016). Formulation and production of granule from annona muricata fruit juice as antihypertensive instant drink. *International Journal of Pharmacy and Pharmaceutical Sciences* 9(5): 18-22.
18. Puran Bridgemohan, Aphzal Mohammed, and Ronell S. H. Bridgemohan (2015). Caribbean soursop (*Annona muricata*) varieties II: Annonaceous acetogenin properties. *International Journal of Phytocosmetics and Natural Ingredients* 2: 1-17.
19. René G. Degnon, Euloge S. Adjou, Jean-Pierre Noudogbessi, Grâce Metome, Fortuné Boko, Edwige Dahouenon-Ahoussi, Mohamed Soumanou, Dominique C.K. Sohounhloue (2013). Investigation on nutritional potential of soursop (*Annona muricata* L.) from Benin for its use as food supplement against protein-energy deficiency. *International Journal of Biosciences* 3(6): 135-144.
20. Sejal Patel, Jayvadan K Patel (2016). A review on a miracle fruits of *Annona muricata*.*Journal of Pharmacognosy and Phytochemistry* 5(1): 137-148.
21. Soheil Zorofchian Moghadamtousi, Mehran Fadaeinasab, Sonia Nikzad, Gokula Mohan, Hapipah Mohd Ali and Habsah Abdul Kadir (2015). *Annona muricata* (Annonaceae): A review of its traditional uses, isolated acetogenins and biological activities. *International Journal of Molecular Sciences* 16: 15625-15658.
22. Thakkar, J.H., Solanki, H.K., Tripathi, P., Patel N. J., and Jani, G. K. (2011). Evaluation of antimutagenic potential of Annona squamosa leaf extract. *Elixir Human Physiology* 31: 1960-1965.
23. Uno UU, Ogbe HO, Okolo CM, Ekaluo UB, Akwa BU (2017). Effect of soursop (*Annona muricata* L.) Leaf extract on sperm toxicity induced by caffeine in albino rats. *The Pharmaceutical and Chemical Journal* 4(1): 82-87.