International Journal of Applied
and Natural Sciences (IJANS)
ISSN (P): 2319–4014; ISSN (E): 2319–4022
Vol. 10, Issue 1, Jan–Jun 2021; 137–142

International Academy of Science,
Engineering and Technology
Connecting Researchers; Nurturing Innovations

EXTRACTION AND UTILISATION OF NATURAL FOOD COLOR FROM BASELLA ALBA L FRUITS FOR VALUE ADDITION

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ABSTRACT

Basella Alba L. is commonly cultivated for harvest of leaves as a green vegetable rich in vitamins, minerals and antioxidants. The mature fruit of Basella Alba L bearing deep red-violet color skin and flesh is a valuable source of natural pigments. The major red pigment in the mature fruit of B. alba has been identified as gomphrenin I (GPI), a betacyanin pigment. Betalains are one of the most important pigments, providing a wide range of colors in leaves, fruits, and roots, as well as being involved in plant adaption against exogenous stress. A study was conducted to develop natural food colour powder from Basella alba L, fruits by spray drying. The yield recovery was 10.9 g for 100 ml of fruit juice. Based on the organoleptic evaluation of the icing the concentration of 0.8 g (T_4) BACP was highly acceptable compare to other treatments. The sale price of 100 g of spray dried BACP was Rs.8.2 was found to be less than the market price of synthetic food colour.

KEYWORDS: *Basella Alba L Fruits, Betacyanin Pigment, Spray Drying, Basell Alba Colorant Powder (BACP), Icing*

Article History

Received: 24 Jun 2021 | Revised: 30 Jun 2021 | Accepted: 30 Jun 2021

INTRODUCTION

Natural food colours are the best alternative to synthetic food colours in many processed foods, confectionary and bakery food products. Now a day's many industries have investigated about the utilization of natural food colours in food products. Color is the main feature of any food item as it enhances the appeal and acceptability of food. Biocolorants are prepared from renewable sources and majorities are plant origin. The main food biocolorants are carotenoids, flavanoids, anthocyanidins, chlorophyll, betalain and crocin, which are extracted from several horticultural plants. In addition to food coloring, biocolorants also act as antimicrobials, antioxygens and thereby prevent several diseases and disorders in human beings (Rekha Mittal et al., 2007).

In the past, consumers did not care about the kind of pigments used in food colouring (natural or synthetic). But with reference to food colorants recently there is an aversion towards synthetic pigments owing to the belief such as "synthetic pigments are associated with several illnesses" and "natural pigments have pharmacological benefits".In many food systems, colour acts as an indicator of quality, particularly in terms of microbial safety and helps to offset the loss of colour from exposure to air, light, changes in temperature and moisture extremes. Colour is an important factor in the acceptability of the food products. Commonly in food industries, colours are used to enhance (or) restore the original appearance of food products (Reshmi et al., 2012).

Pigment in Basella Alba Fruits

Molecular Weight: 550.46 g. mol−1.

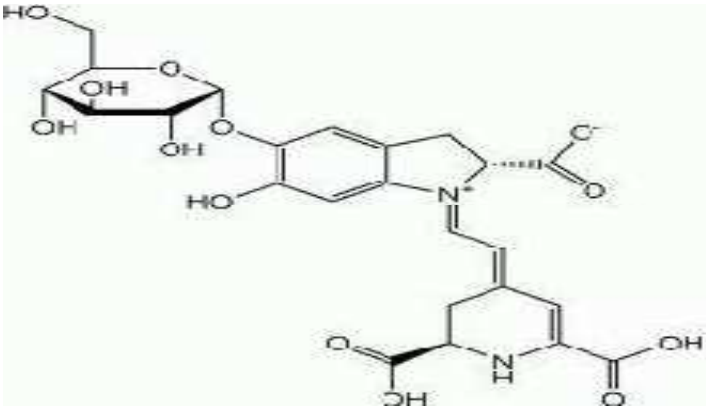

Figure 1: Betanin = Betacyanin = Betalain(Chronakis, I. S. 1998).

MATERIALS AND METHODS

Material

Raw Materials

The raw materials Basella alba fruits are utilized for the preparation of natural food colour powder. The fruits are collected from Alanganallur, Madurai, Tamil nadu, India.

Storage Materials

Aluminium foil was purchased from local market at Madurai. It was used to pack the basella alba colour powder for longer storage at refrigeration temperature.

Mixie

Mixie was used to grind the basella alba fruits uniformly.

Hand Refractometer

Hand refractometer ranging between 0 to 32˚ brix was used to measure the Total Soluble Solids (TSS) of the samples.

Spray Dryer

Spray dryer (Coma, Mumbai, India) was used to dry the liquid into a powder.

Refrigerator

Refrigerator with a temperature range of 5-20ºC was used for this study.

METHODS

Conformation test for betacyanin

A. 2M HCL

One ml of sample extraction was added with 2ml of HCL for 5minutes at 100ºC, and the result was observed.

B. 2M NaoH

One ml of sample extraction was added with 2ml of NaoH, and results were observed.

Sample Preparation

Sound and disease free basella Alba fruits was collected and washed with tap water thoroughly. Mixie was used to crush the fruits and the sample was used for extraction of the colour.

Natural Food Colour from Basella Alba by Spray Drier

The edible portion of the basella alba fruits are crushed into pulp by adding 5 percent water in the proportion of 1:5 (basella alba: water). The pulp was kept at room temperature for 30 minutes to dissolve the pigments in the solvent. After 30 minutes, the pulp was filtered by using muslin cloth and the filtrate was kept ready for spray drying. The TSS of the extracted basella alba fruits extract was (1 °brix) noted by using hand refractometer (Rymbai H et al., 2011).

Microencapsulation of Natural Food Colour

Microencapsulation is a technique by which liquid droplets or solid particles are coated with thin film of protective materials. The droplets or particles are called “core material” and thin film coating or thin film membrane coating is called “wall system”. The protective mechanism like thin film coating or membrane coating to enclose droplets or particles (core material) are used to protect food ingredients against volatile losses or premature interaction with ingredients**.** Spray drying is the most common microencapsulating technique in food industry. Fats and oils, flavours and aroma compounds, oleoresins, vitamins, colourants and enzymes have been successfully microencapsulated by spray drying (Bo Shu, et al., 2006)

Maltodextrin

Maltodextrin is a form of starch derived either from potato, tapioca or corn. Maltodextrin is a product obtained by partial enzymatic hydrolysis of potato starch. Maltodextrin is a synthetically manufactured long chain carbohydrate and also known as a polysaccharide (many sugars). Maltodextrin is artificially created when acids or other enzymes are applied to cornstarch, which breaks the starch into medium-length chains of dextrose (glucose) molecules. Maltodextrin may be disguised on labels with different names, sometimes it is referred to as “glucose polymers” or complex carbohydrate. Maltodextrin is a very long chain of repeating glucose molecules connected together.

Application of Spray Dried BACP in Confectionary Product

The developed spray dried BACP were added at a concentration of 0.2, 0.4, 0.6,0.08 and 1.0 g in bakery food product like icing to evaluate the organoleptic attributes. Organoleptic evaluation of the product icing prepared by using spray dried BACP was done by 10 semi trained judges using 9 point Hedonic scale score card to grade the products.

Cost Analysis

Cost analysis of spray dried natural food colour powder were analysed including the fixed cost, variable cost, interest, depreciation and profit of the product. The total cost was considered as expenditure on the total production of the spray dried natural food colour powder and their unit cost was worked out by dividing the total cost of production by total production of the product and expressed as Rupees per 100g.

Parameters for the Production of Natural Food Colour Powder from the Extraction of Basella Alba Fruits

Parameters	Levels
Maltodextrin (MD)	20 %
Drying air temperature	Input temperature 158°and output temperature 68°C
Feed rate	25 ml/min

Flow Chart for the Production of Natural Food Colour from Basella Alba Fruits

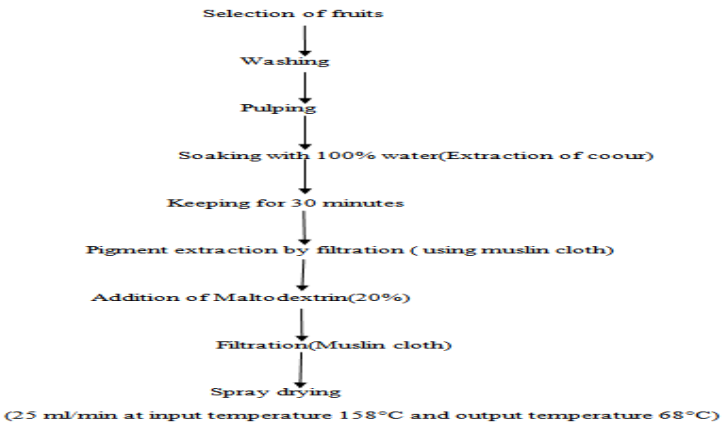

Figure 2

RESULTS AND DISCUSSIONS

Confirmation test for betacyanin

A. 2M Hcl

Basella alba betacyanin extract was unstable after adding 2M Hcl which confirm the presence of betacyanin.

B. 2M NaoH

Basella alba betacyanin extract changes the color to yellow after adding 2M NaoH which confirm the presence of betacyanin.

Extraction of Colour from Basella Alba Fruits

The colour was extracted from basella alba fruits using water solvent for 5 percent water in the proportion of 1:5 (basella alba: water w/v) (Adiyaman.P.2009).

Figure 3: Basella Alba Fruits and Extracted Fruits Juice.

Effect of Drying Temperature; Feed Rate and Maltodextrin (MD) on Spray Dried Basella Alba Fruits Powder

The spray dried basella alba fruits powder was prepared by spray drying method. 108.6 grams of powders was derived from one litre of basella Alba fruit juice. The powder recovery was obtained from input temperature 158°C and output temperature 68°C with the feed rate of 25 ml / min and 20 per cent maltodextrin. Hence, these parameters were selected for drying basella alba fruits extract in spray drying (Fu-Long et al.,2016).

Figure 4: Spray Dried Basella Alba Colourant Powder.

Organoleptic Evaluation of Icing with BACP

Table 5 presents the organoleptic characteristics of cake icing with BACP. The treatment (T_1) had minimum score for all attributes compare to treatment (T_2) and treatment (T_3). Attributes such as flavour, and taste of the samples (T_4 and T_5) secured the maximum score (8.4, 8.2 & 8.4, 8.2). The icing with 0.8 g (T_4) had highest overall acceptability score followed by T_4 (0.8 g) and T_5 (0.6 g).

BACP Added Level

T_1-0.2 g

T_2-0.4 g

T_3-0.6 g

T_4-0.8 g

T_5-1.0 g

Figure 5: Icing with Basella Alba Colourant Powder.

Table 2

Quality Attributes	Treatments				
	T_1	T_2	T_3	T_4	T_5
Colour	6.0	7.0	7.7	8.5	8.7
Appearance	6.2	7.4	8.0	8.7	8.7
Flavour	6.0	6.8	8.1	8.4	8.0
Taste	6.2	7.0	7.8	8.2	8.0
Overall acceptability	6.8	7.2	7.7	8.4	8.2

Cost Analysis

The production cost of spray dried BACP was comparatively lesser than the market price. Spray dried BACP cost is Rs.8.2/100 g for 1 kg is Rs. 82.00.

CONCLUSIONS

From the results it can be concluded that water was used for the extraction of colour. Powder recovery at input temperature 158°C and output temperature 68°C, 25 ml / min feed rate and 20 per cent maltodextrin in spray dryer. (108.6 g of powder recovery from 1 litre of Basella laba fruit juice). The unit cost of spray dried natural food colour powder was Rs. 8.2 per 100 g and 82.00 per kg. The production cost of spray dried BACP was comparatively lesser than the market price.

ACKNOWLEDGMENTS

We are grateful thanks to the Department Food Science and Nutrition, Community Science College and Research Institute, Madurai and Krishi Vigyan Kendra, Vellore for completion of this investigation.

REFERENCES

1. *Adiyaman.P.2009. Extraction, stabilization and utilization of natural food colours. Department of Food Science and Nutrition. Home Science College and Research Institute, TNAU, Madurai*
2. *Bo Shu, Wenli Yu, Yaping Zhao and Xiaoyong Liu. 2006. Study on microencapsulation of lycopene by spray – drying. Journal of Food Engineering.75: 664-669.*
3. *Chronakis, I. S. 1998. On the molecular, characteristics compositional properties and structural functional mechanisms of maltodextrin: a review, Critical Review Food Science and Nutrition. 38 (7): 599-637.*
4. *Fu-Long Huang, Robin Y.-Y. Chiou, Wei-Cheng Chen, Huey-Jiun Ko,Li-Jung Lai & Shu-Mei Lin.2016.Dehydrated Basella alba Fruit Juice as a Novel Natural Colorant: Pigment Stability, In Vivo Food Safety Evaluation and Anti-Inflammatory Mechanism Characterization.Plant Foods Hum Nutr 71:322–329.*
5. *Rekha Mittal, Arti Sharma and Gian Singh. 2007. Food colours from plants: Patenting Scenario. Journal of Indian Food Industry. 26 (3): 52-57.*
6. *Reshmi SK, Aravindhan KM, P Suganya Devi.2012. Antioxidant analysis of betacyanin extracted from Basella alba fruit. International Journal of Pharm. Tech. Research,(b); 4: 900-913.*
7. *Rymbai H*, R.R. Sharma, Manish Srivastav 2011-A Reviw of Biocolorants and its implications in Health and Food Industry - A. International Journal of PharmTech Research CODEN (USA): IJPRIF ISSN : 0974-4304 Vol.3, No.4, pp 2228-2244*