BEST: International Journal of Humanities, Arts,
Medicine and Sciences (BEST: IJHAMS)
ISSN (P): 2348-0521, ISSN (E): 2454-4728
Vol. 5, Issue 12, Dec 2017, 33-36

TULIP PETAL AS A NOVEL NATURAL FOOD COLORANT SOURCE: PARAMETERS OPTIMIZATION

GOKULARAMAN. S[1], STALIN CRUZ. A[2] & S. ELIZABETH AMUDHINI STEPHEN[3]

[1 & 2] M. Tech Food Processing & Engineering, Department of Biosciences & Technology, Karunya University, Coimbatore, Tamil Nadu, India

[3]Associate Professor, Mathematics, Karunya University, Coimbatore, Tamil Nadu, India

ABSTRACT

Production of food ingredients from natural sources has attracted a great attention since people tend to consume foods prepared with natural additives. The present study talks about optimization of various parameters involved in the extraction of anthocyanin from tulip metals, and comparing the obtained results with the already used optimization model to determine the best optimization model. Response surface methodology was used and maximum anthocyanin extract was found at 40°C for 75 minutes.

KEYWORDS: Anthocyanin, Optimization, Food Product & Extraction Chemical

INTRODUCTION

Color is a significant factor in the acceptability of the food product and food quality is judged based on its color. The color of food affects the perception of flavor. Food manufacturers therefore add food colors to their products to stimulate or enhance a color that is perceived by consumers as natural, to mask variations in food colors, to offset color loss due to light, extremes of temperature, moisture and storage conditions. Synthetic colorants are chemically manufactured and are commonly used dyes in food industries. Synthetic colorants possess an intensive coloring strength, good solubility, high stability and can be processed easily compared to natural food colorants. At present, food industries habitually use food colorants for making food and beverages more attractive and appealing. Some artificial food colorants are toxic to aquatic organisms and have on cogenic effect i.e. decreased in body weight, hemoglobin concentration and red blood cell count. Anthocyanins are included in the class of flavonoids, which are responsible for coloring of many plants (Davies et al., 2012). Anthocyanins give shiny orange, pink, red, violet and blue colors to many flowers and fruits (Casta˜neda-Ovando et al., 2009). Moreover, anthocyanins have drawn significant attention, due to their antioxidant activities, which can prevent or reduce the risk of neuronal and cardiovascular illnesses, cancer and diabetes.

In order to increase the anthocyanin content parameters have to be optimized. The extraction process parameters such as temperature, time, pH etc. should be also optimized for increasing the yield (Karaman et al., 2014; Ozturk et al., 2014). This optimization is especially required for the extraction of anthocyanins since they are very instable com-pounds; therefore, the extraction conditions should be optimized. The color characteristics and stability of anthocyanins are influenced by several factors, such as structure and concentration of the pigment, pH, temperature, light intensity and quality and the presence of co-pigments (Cevallos-Casals and Cisneros-Zevallos, 2004). Response surface optimization could provide information about extraction temperature and time ranges. However, in the literature there are no studies related with extraction optimization of anthocyanins from the tulip petals, as a novel food colorant source.

METHODOLOGY

Process Optimization

Process optimization was carried out using response surface methodology (RSM) for acquiring maximum amount of anthocyanin. The design is composed of two factors, namely temperature and time of extraction process between 25 and 55°C and 30–120 min, respectively. Two-factor-3-level User Defined Design including 3 center points were performed in the present study to optimize extraction process. Total anthocyanin content (mg/L) was selected to be a response of the corresponding established model. Eleven experimental points set by the use of the Design Expert software are presented in table 1.

Table 1: Anthocyanin Contents of the Extracts Obtained from Dried Tulips under Different Conditions Determined by Response Surface Methodology

Points	Temperature (°C)	Time (Mins)	Anthocyanin Concn (Ppm)
1.	25	30	351
2.	25	75	519
3.	25	120	616
4.	40	30	360
5.	40	75	524
6.	40	75	540
7.	40	75	548
8.	40	120	642
9.	55	30	393
10	55	75	587

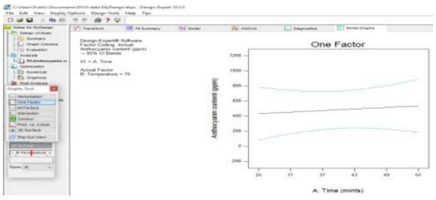
Backward elimination regression was used to remove insignificant factors from the established model. Model acceptability was evaluated based on the R^2values. All experiments were conducted in triplicate.

RESULTS AND DISCUSSIONS

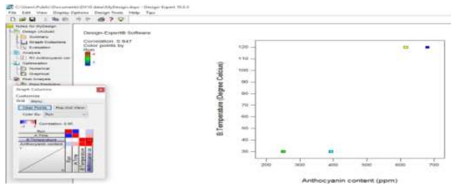
Determination of optimum solvent response surface methodology was performed to increase yield of the anthocyanin extracted from tulips. Temperature (25and 55◦C) and time (30 and 120 min) were selected as factors. Experimental design points of the model are tabulated in Table 2. Anthocyanin contents of the samples extracted under different conditions were found to range between 351 and 680 ppm. As it can be seen, extraction temperature and time significantly influenced the anthocyanin yield (Pedro et al., 2016). When the table was examined, it could be concluded that, increasing extraction temperature and time increased the extracted anthocyanin yield. However, extraction rate decreased after extraction time of 75 min despite increasing extracted compound amount. The findings highlighted that the extraction temperature and time combination should be carefully adjusted to increase extracted yield since above 60◦C, decrease in anthocyanin (Cacace and Mazza (2003)) was observed possibly due to the thermo sensibility of anthocyanins. In other words, the following equation could be adequately predictanthocyanin content of the extracts based on independent parameter levels, namely temperature and time.

Y= 76.0000+3.43333**t**+3.62222 **T** where, **Y=** Anthocyanin Concentration

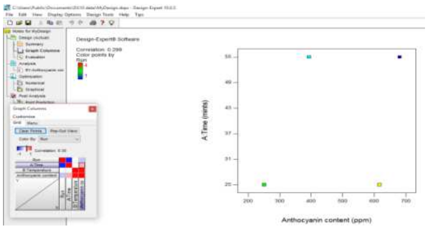
t= Time **T=** Temperature



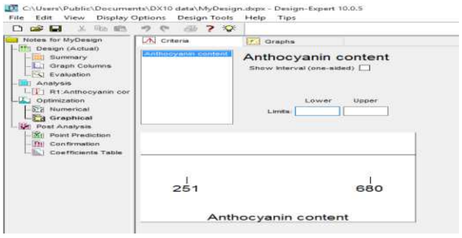
(a)



(b)



(c)



(d)

Figure a and b, shows the relationship between anthocyanin concentration. Figure c shows the relationship between time and anthocyanin concentration. Figure d shows the anthocyanin range in ppm.

CONCLUSIONS

Color in food industries is, if not an important sensory attribute, an extremely important parameter of quality. When considering the fact that people tend to consume food products prepared with natural additives due to the understanding of the strong relation between health and diet, it is important for the food industry to find novel sources which could be used for the production of the food additives. The optimization method, central composite design type was better than the User defined type which is studied in this paper. High yield of anthocyanin concentration and optimum conditions were properly optimized with central composite design type. Therefore, central composite design type was the best among the two optimization methods.

REFERENCES

1. Davies, K. M., Albert, N. W., Schwinn, K. E., 2012. From landing lights to mimicry: themolecular regulation of flower colouration and mechanisms for pigmentationpatterning. Funct. Plant Biol. 39 (8), 619–638.

2. Castaneda-Ovando, A., Pacheco-Hernández, M. d. L., Páez-Hernández, M. E., Rodríguez, J. A., Galán-Vidal, C. A., 2009. Chemical studies of anthocyanins: areview. Food Chem. 113 (4), 859–871.

3. Karaman, S., Toker, O. S., C¸ am, M., Hayta, M., Doˇgan, M., Kayacier, A., 2014. Bio-active and physicochemical properties of persimmon as affected by drying methods. Dry. Technol. 32 (3), 258–267.

4. Ozturk, I., Karaman, S., Baslar, M., Cam, M., Caliskan, O., Sagdic, O., Yalcin, H., 2014. Aroma, sugar and anthocyanin profile of fruit and seed of mahlab (Prunusmahaleb L.): optimization of bioactive compounds extraction by simplex lattice mixture design. Food Anal. Methods 7 (4), 761–773.

5. Cevallos-Casals, B. v. A., Cisneros-Zevallos, L., 2004. Stability of anthocyanin-based aqueous extracts of Andean purple corn and red-fleshed sweet potato compared to synthetic and natural colorants. Food Chem. 86 (1), 69–77.

6. Cisse, M., Vaillant, F., Acosta, O., Dhuique-Mayer, C., Dornier, M., 2009. Thermal degradation kinetics of anthocyanins from blood orange, blackberry, and Roselle using the Arrhenius, eyring, and ball models. J. Agric. Food Chem. 57 (14), 6285–6291.

7. Pedro, A. C., Granato, D., Rosso, N. D., 2016. Extraction of anthocyanins and polyphenols from black rice (Oryza sativa L.) by modeling and assessing their reversibility and stability. Food Chem. 191, 12–20.

8. Cacace, J. E., Mazza, G., 2003. Optimization of extraction of anthocyanins from blackcurrants with aqueous ethanol. J. Food Sci. 68 (1), 240–248.