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RESEARCH ARTICLE

Extraction Optimization and Characterization of Pigment from Floral Bracts of *Bougainvillea spectabilis*

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ABSTRACT:
As of late, normal colors and shades acquire significance in nourishment and material ventures as a result of their nontoxic and eco-accommodating qualities. *Bougainvillea spectabilis* flower are wealthy in betalanin shades which can be utilized as a color in sharpened sun-oriented cells, restorative and nourishment applications. The point of this examination was to advance the common shade extraction from the botanical blossom by reaction surface philosophy. Central Composite Design (CCD) of Response Surface Method (RSM) was connected to assess the ideal states of three process factors to be specific mass of botanical blossom (g), time (t) and temperature (ºC) learned at levels. Mass of blossom furthermore, time were found measurably noteworthy simultaneously and connection coefficient (R2) estimation of 0.96 demonstrated that model was all around fitted with the trial esteems. The ideal procedure conditions were observed to be mass of botanical bracts: 2g, contact time: 205mins and extraction temperature: 30ºC with most extreme absorbance. Reaction Surface Method (RSM) was performed well to recognize the ideal levels of extraction process factors and the approval of anticipated model was fitted 98.06% with the exploratory outcomes led at the ideal conditions. Fourier Transform Infrared Spectroscopy was likewise affirmed the nearness of betalanin color by distinguishing the major useful gatherings.

INTRODUCTION:
Bougainvillea spectabilis is a class of prickly elaborate vines, shrubberies, and trees with blossom like spring leaves close to its blooms. Distinctive creators acknowledge somewhere in the range of 4 and 18 species in the family. The vine species develop somewhere in the range of 1 to 12m (3 to 40 ft.) tall, scrambling over different plants with their spiky thistles.

The thistles are tipped with a dark, waxy substance. They are evergreen where precipitation happens all year, or deciduous if there is a dry season. The leaves are exchange, basic praise sharpen, 4– 13cm long and 2– 6 cm wide. The genuine blossom of the plant is little and by and large white, yet each bunch of three blooms is encompassed by three or six bracts with the brilliant hues related with the plant, including pink, fuchsia, purple, red, orange, white, or yellow colour is some of the time alluded to as "paper blossom" in light of the fact that the bracts are thin and papery. The organic product is a tight five-lobed achene. *Bougainvillea spectabilis* are generally bother free plants, however they might be defense less to worms, snails and aphids.[1]

Family : Nyctaginaceae
Order   : Caryophyllales
Genus   : Bougainvillea
Species : B.spectabilis

Table No: 2 Central Composite Design Represented in Experimental results

Std Order	Run Order	PT Type	Blocks	Mass	Time	Temp	Exp. value
1	1	1	1	1	120	20	1.165
2	2	1	1	3	120	20	3.361
3	3	1	1	1	300	20	2.145
4	4	1	1	3	300	20	3.075
5	5	1	1	1	120	40	1.748
6	6	1	1	3	120	40	3.267
7	7	1	1	1	300	40	2.519
8	8	1	1	3	300	40	3.447
9	9	-1	1	0.318207	210	30	1.439
10	10	-1	1	3.681793	210	30	3.344
11	11	-1	1	2	58.63865	30	3.143
12	12	-1	1	2	361.3614	30	3.223
13	13	-1	1	2	210	13.18207	3.359
14	14	-1	1	2	210	46.81793	3.322
15	15	0	1	2	210	30	3.627
16	16	0	1	2	210	30	3.346
17	17	0	1	2	210	30	3.222
18	18	0	1	2	210	30	4.000
19	19	0	1	2	210	30	4.000
20	20	0	1	2	210	30	4.000

RESULT AND DISCUSSION:

Optimization by Response Surface Methodology:
Central Composite Design (CCD) of RSM was used to design the experiment programming and Twenty experiments were carried out according to the variables given in the design table and results are given (Table 1). The optimization experiments were conducted by performing 20 sets of experiments using Central Composite Design (CCD)

Regression analysis and model fitting:
The reaction shade Optical Density was changed from 1.165 to 4.00 in the trial runs. The watched trial results in each run were exposed to various relapse investigation to ascertain the regression coefficients of the demonstrate. Determined regression coefficients of the model. Determined relapse coefficients were substituted in to get a model for the extraction of dissolvable colors from the bracts.[4]

The results are relapse examination organized in (Table 3) clarified that direct impact of temperature (°C), Cooperation impact of temperature with mass, time and temperature. The way connection impact of Mass*mass, Time, Mass*Temperture and Time*Temperature. Then square impact of mass*mass, time*time, temperature*temperature were observed to be extraction process. [5][6]

Surface plots and Contour plots:
The two-dimensional contour and three-dimensional surface plot were used to investigate the effect of the individual variable and interaction for the predicted response on the optimization of flower sample. The 3 surface plot spoke to in Fig 1, 2, 3 were utilized to think about the connection among the factors simultaneously (Bas and Boyaci, 2007) [3]. Fig1 demonstrate Surface Plot speaking to the connection between the Mass and Time fixation. The hold value was Temperature 30ºc. The clarified the shade absorbance expanded as the time increments and stays steady with mass of botanical bracts. [7] Fig2 demonstrates the Surface Plot speaking to the association between the Mass and Temperature focus. The hold value was Time 210mins. The impact of mass of flower bracts and temperature. The expanded from the low to abnormal state of botanical bracts of mass and consistent with temperature. Fig 3 demonstrates the surface plot speaking to the association between the Time and Temperature fixation. The hold value was Mass 2g. The saw when time and temperature were kept up. [8,9]

The point forecast device of the Minitab programming was utilized to distinguish the ideal estimations of the picked procedure factors [10]. Ideal estimations of Floral Bracts Mass (A), Time (B), Temperature (C) were observed to be 2g, 205mins, 30ºC separately with the greatest predicted reaction 4.00.

Table No:3 Analysis of Variance (ANOVA)

SOURCE	DF	ADJSS	ADJMS	F-VALUE	P-VALUE
MODEL	9	11.0931	1.23257	56.21	0
LINEAR	3	6.0006	2.00019	91.22	0
MASS	1	5.7954	5.79544	264.3	0
TIME	1	0.1842	0.18419	8.4	0.016
TEMP	1	0.0209	0.02094	0.95	0.352
SQUARE	3	4.6273	1.54243	70.34	0
MASS*MASS	1	3.97	3.97002	181.05	0
TIME*TIME	1	0.9339	0.93394	42.59	0
TEMP*TEMP	1	0.2615	0.26154	11.93	0.006
2-WAYINTERACTION	3	0.4653	0.15509	7.07	0.008
MASS*TIME	1	0.401	0.40096	18.29	0.002
MASS*TEMP	1	0.025	0.02498	1.14	0.311
TIME*TEMP	1	0.0393	0.03934	1.79	0.21
ERROR	10	0.2193	0.02193		
LACK-OF-FIT	5	0.1141	0.02283	1.09	0.465
PUREERROR	5	0.1051	0.02103		
TOTAL	19	11.3124			

MODEL SUMMARY:

Table No: 4 Model Summary

S	R-sq.	R-sq.(adj)	R-sq.(pred)
0.148079	98.06%	96.32%	91.02%

R^2 value was found to be 98.06% and the Adjusted R^2 value was found to be 96.32% and both the values were found to be in good agreement with each other.

Model Validation:

Two grams of floral bract was taken in the 250 ml of conical flask containing 50ml of the solvent (Ethanol: Water:12.5: 37.5). The conical flask was kept at 30ºC for 205mins and the optical density of the extracted pigment was taken at 538nm. The optical density was found to be 4.00 which proved the model to be 98.06% when compared with the predicted optical density of 4.000. The results are explained with the predicted values are good results. [11,12].

Figure No: 1,2,3 Surface Plots of Response

1. Surface Plot representing the interaction between the Mass(g) and Time(mins) concentration. The hold value was Temperature 30ºC.
2. Surface Plot representing the interaction between the Mass(g) and Temperature (°C) concentration. The hold value was Time 210mins.
3. Surface Plot representing the interaction between the Time(mins) and Temperature (°C) concentration. The hold value was Mass 2g.

FTIR Analysis:

The Fourier change infrared phantom examination was done to distinguish the major utilitarian gatherings present in the extricated shade (DeSouza et al; 2003). FTIR range spoke to in Fig.4 indicates unmistakable. [13,14] 3282.84, 2918.30, 2850.79, 1635.64, 1323.17, 1259.52, 1151.50, 1022.27, 947.05, 856.39, 756.10, 572.86, 468.70, 420.48 separately [15].

The expansive and solid band at 3282.84cm recommends (O-H) vibrating mode and band at 2918.30 and 2850.79 demonstrates (C_H) symmetry in streching mode. The wave number 1635.64 demonstrates (C=O) and 1323.17 shows nitro and (C=C) . The wave number 1259.52 demonstrates non-sweet-smelling amines and 1151.50 to 756.10 shows alkyl halide.

CONCLUSION:

This investigation clarified the usage of *Bougainvillea spectabilis* botanical flower for fruitful extraction of common shade [16]. Nowadays, the pigment (Anthocyanin) play a role in the colors of ripening fruit, food colouring etc.The species also use them as food plants [17]. Mass of the botanical flower and time
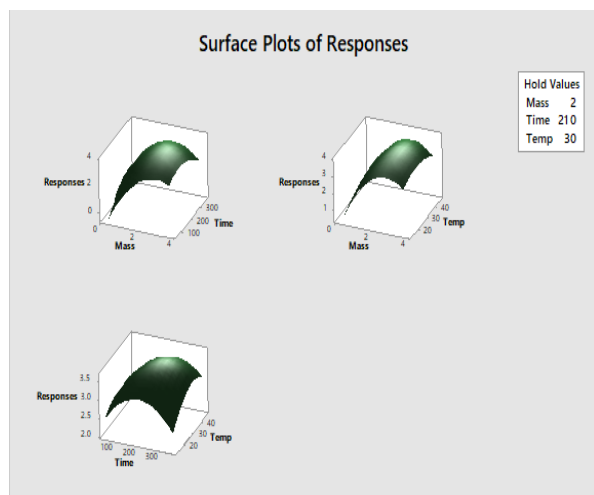
assume an essential job to build the proficiency of shade extraction at larger amounts [19,20] Exploratory outcomes uncovered that the extraction of colour was exceedingly supported at low than at hoisted levels .The ideal procedure conditions were observed to be mass of botanical blossom: 2g, time: 205mins and temperature 30ºC with most extreme optical density 4.000. Approval of the anticipated model was fitted with 98.06% the trial results directed at the ideal conditions.

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