International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-8 Issue-5, June 2019

Optimization of Process Conditions for Chitosan on Apple Juice Making As a Clarifying Agent

Hemalatha.G, Elizabeth Amudhini Stephen, Ajna Alavudeen

***Abstract:** On the expansion of chitosan to the squeezed apple as a clearing up operator at various focuses (10-250 mg/ml) and differing time (30– 150 min) and temperature (20– 40 ℃) mixes. In this methodology, chitosan fixation, process time and procedure temperature are named as free factor parameters; turbidity (NTU) and shading (%T440) were settled as reaction. The Box – Benken technique was utilized to ponder the outcome of these medicines which greatly affects the turbidity and shading. From the investigation, the elucidation treatment for the ideal states of the squeezed apple illumination are 226.532 mg/100ml of chitosan focus at 35.8℃Process temperature for 30.5 min Process time according to the reaction surface procedure and the shape plots.Keyword: Response surface methodology, chitosan concentration, Clarification, Apple juice, process time, process temperature, turbidity and colour*

***Index Terms:** About four key words or phrases in alphabetical order, separated by commas.*

I. INTRODUCTION

The fame and medical advantages which make a natural product progressively worthy is the Apple fruitwho forcefully put stock in the idea of "wellbeing is riches." This organic product is loaded down with all the basic supplements, minerals in the first structure that are essential for the soundness of people. The biggest maker is the china with 48% of the world all out generation pursued with United States, Poland, Turkey, and Italy having 6 % or less. The mix of sugars, starch together with polyphenols, amides and different nitrogenous mixes, minerals and the various scope of esters which gives the juice an average smell. For averting the turbidity in the squeezed apple is important, so clarificationis used to dispose of gelatin and different sugars. For fast illumination and adjustment of squeezed apple, an improved innovation is required. For the wide acknowledgment; the essential factor was the unmistakable juice appearance, so there is a need to upgrading this property .Chitosan been utilized as an amazing coagulating specialist by causing the unit of suspended particles from juices. Aside from this numerous works have been now done the methodology of chitosan as an elucidating help for apple, grape, lemon, orange, and bayberry squeezes, wine, and green tea(Rui Carlos Castro Domingues et al. 2012).The positive ionic charge of chitosan which is adsorbed by the negative electrostatic charge enables to synthetically tie fats, lipids and bile acids (Chen, Y., and Li, C. 1996). Elucidation of squeezed apple with chitosan has been examined in squeezed apple, yet the streamlining conditions for illumination of AJ has not been performed in the writing. It was accounted for that the turbidity of AJ was diminished 73.3% by chitosan application for 90 min. Rungsardthong et al. (2006) likewise discovered that AJ cleared up with chitosan treatment at 0.7 g/L and 40 ℃ achieved most extreme clarity.The principle goals of the present work were to decide the impact of grouping of chitosan, process temperature and procedure time for AJ illumination on the turbidity and shading, and improve the elucidation of AJ with business chitosan utilizing RSM, (Box– Behnken plan) .

Manuscript published on 30 June 2019.
***** Correspondence Author (s)
Hemalatha. G*, Associate Professor, Department of Civil
Elizabeth Amudhini Stephen, Associate Professor, Department of Mathematics, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India
Ajna Alavudeen, M.Tech ,Department of Food Processing and Engineering, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

II. MATERIALS AND METHODS

2.1. Materials:

Apples (Starking variety), chitosan(Water soluble) were purchased from a local market.

2.2. Methods: (Production of clear apple juice)

2.3. Response measurement techniques:

Turbidity was established by in term of Nephelometric Turbidity Unit (NTU) utilizing a compact turbidity meter (Systronics Digital NTU-132, Ahmadabad, India) and the assurance of the shade of AJs was dissected byUV– VIS spectrophotometer at 440 nm (Çoklar&Akbulut, 2010).

2.4. Methodology:

In the plan master programming the approach to be pursued is to pick the Box – Benken technique present in the Response surface system. The autonomous factors are set as the parameters; chitosan focus which are process time, process temperature, which are to be evaluated. At that point set the turbidity and shading as the reaction action. Appoint it in the Design Expert Software of Version 11

Std	Run	Factor 1 A:concentration ... mg/100ml	Factor 2 B:process temp... degree celsius	Factor 3 C:process time min	Response 1 turbidity NTU	Response 2 color T440
9	1	130	20	30	11.77	0.998
16	2	130	30	90	319	11.87
6	3	250	30	30	38.9	23.77
2	4	250	20	90	117	13.87
5	5	10	30	30	309	6.887
13	6	130	30	90	289	18.56
3	7	10	40	90	56.7	7.47
15	8	130	30	90	69	20.98
4	9	250	40	90	186	15.11
17	10	130	30	90	267	2.435
7	11	10	30	150	143	10.87
8	12	250	30	150	77	8.964
1	13	10	20	90	122	22.33
12	14	130	40	150	310	4.675
11	15	130	20	150	149	19.76
10	16	130	40	30	261	24.98
14	17	130	30	90	80	9.565

Figure 2: Box-Behnken design for clarification of AJ with Chitosan

2.5. Experimental Design

With the assistance of Stat-Ease programming (Design Expert variant 7.1.6 2009)experimental structure and measurable investigation were performed. In the present research, a 3-level factors second request Box-Bhenken Design with quadratic model (Myers 1971; Khuri and Cornell 1989) was utilized. The elements (free factors) were centralization of chitosan (X1), process time (X2) and procedure temperature (X3) of illumination treatment. In each examination, Y1,Y2,Y3 were resolved as the reactions (subordinate factors). The total plan comprised of 17 of free factors. Every one of the tests were done in arbitrary request (Table 1). The reaction work is the elements of autonomous factors which are communicated separately by the dependant factors. The Second request polynomial is utilized as a capacity for the change were gotten to for each factor and they are isolated into straight, quadratic and intuitive segments and they are communicated as pursues;

$Y = b0 + b1x1 + b1x1 + b2x2 + b3x3 + b11x12 + b22x22 + b33x32 + b12x1x2 + b13x1x3 + b23x2x3$

The coefficients of the polynomial were spoken to by b0 (consistent term) b1, b2 and b3 (direct impacts), b11, b22 and b33 (quadratic impacts) and b12, b13 and b23 (collaboration effects)M.K. SitiMazlina et al. (2008).

III. RESULTS AND DISCUSSIONS

3.1. STATISTICAL ANALYSIS

The exploratory qualities and ANOVA are acquired for turbidity and shading that is the two reaction factors under fluctuating treatment conditions. The acquired reaction surface factors from the Response surface model are described to be satisfactory, having no conspicuous absence of fit. For every one of the reactions having an agreeable estimation of R2.The estimations of R2 for turbidity and shading were 0.3512 and 0.6331 individually. In the model, the conduct variety ought to be less clarified having less significant dependant factors when the estimation of R2 is littler. The genuine information is fitted by the exact model when the R2 esteem is nearer to that of solidarity (Little and Hills, 1978; Mendenhall, 1975).

Turbidity

$Y_1 = 129.563 - 51.741X_1 + 7.291X_2 + 33.575X_3 - 51.741X_1X_2 + 51.025X_1X_3 - 22.057X_2X_3 - 60.671X_1^2 - 21.7036\ X_2^2 - 0.1537X_3^2$

Colour

$Y_2 = 13.123 + 1.769X_1 - 0.590X_2 - 1.546\ X_3 + 4.025X_1X_2 - 4.69X_1X_3 - 9.67X_2X_3$

Where X_1, $X_2$and X_3be the chitosan concentration, process temperature and time respectively.

3.1.1. Turbidity

In preparation of fruit juices, pectin cause the major problem i.e.; haziness. Pectin can be associated with plant polymers and the cell wall debris which are fibrous molecular structures that principally consist of cellulose and protein with small amount of hemicelluloses and hydroxyproline-rich protein (Smock and Neubert 1950).

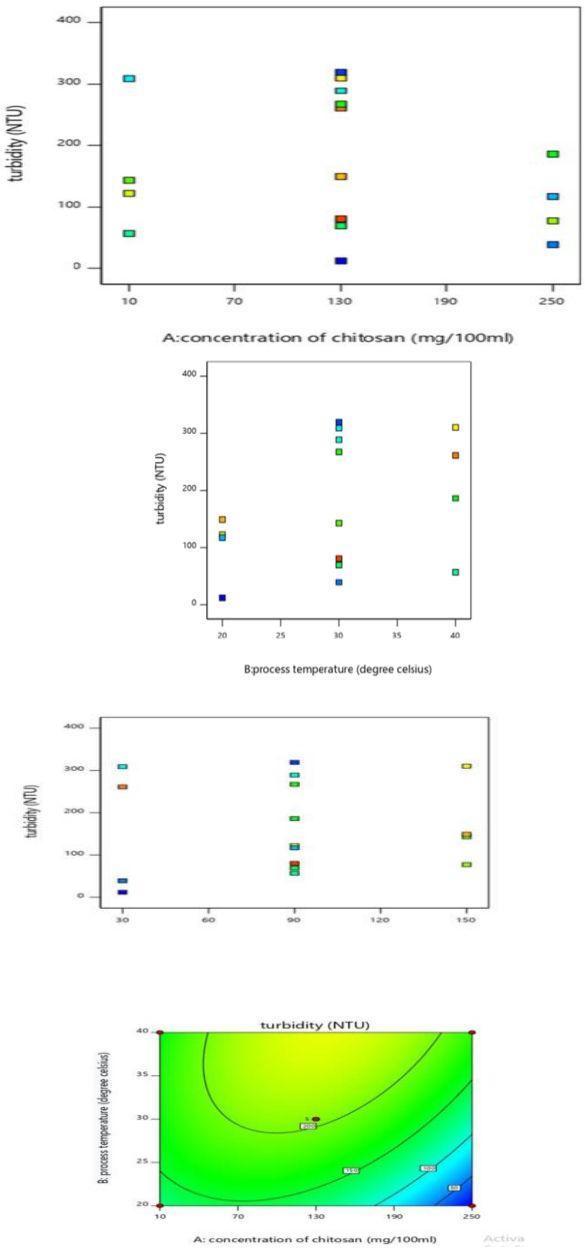
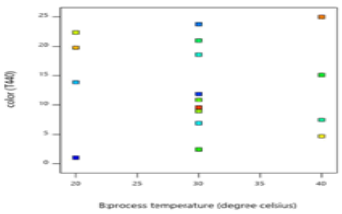


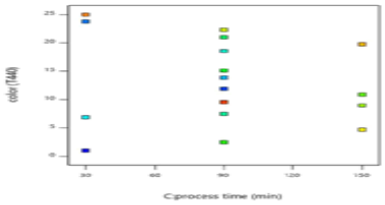
Fig (a) , (b) and (c) Shows the Relationship of turbidity with that of the Physical Characteristics and (d) Shows the Relationship of turbidity with that of chitosan Concentration and process temperature.

3.1.2. Colour

The effect on colour was mainly due to the chitosan concentration and the process temperature



Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)



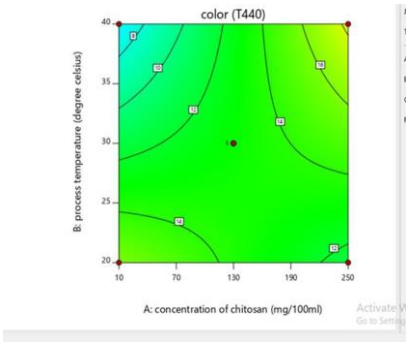


Figure (a), and (b) Shows the relationship of colour with that of the Physical Characteristics and (c) Shows the relationship of colour with that of chitosan Concentration and process time

3.2. OPTIMIZATION

For illumination process, the ideal conditions were gotten. To get this ideal condition the variable can be utilized in different blends. For the elucidation the ideal conditions for the squeezed apple illumination are 226.532 mg/100ml centralization of chitosan, 35.8℃ Process temperature and 30.5 min Process time.

IV. CONCLUSIONS

The trial structure of this investigation was appeared to be extremely valuable for the grouping of chitosan for the illumination of squeezed apple. The various conditions (Convergence of the chitosan, process time, process temperature) for elucidation treatment uncovered that every one of these factors extraordinarily influenced the diverse physical parameters (turbidity and shading). The prescribed illumination for chitosan fixation was 226.532 mg/100ml convergence of chitosan at 35.8℃ Process temperature for 30.5 min Process time.

REFERENCES

1. Araya-Farias,M.,Mondor,M.,Lamarche,F.,Tajchakavit,S.,&Makhlouf, J.(2008).Clarification of apple juice by electro flotation. Innovative Food Science and Emerging Technologies, 9, 320–327.
2. Alvarez, S., Alvarez, R., Riera, F. A., & Coca, J. (1998). Influence of deleptonization on apple juice ultrafiltration. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 138, 377–382.
3. Bradford, M. (1976).A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. Analytical Biochemistry, 72, 248–254.
4. Cemerog˘lu, B. (2010). Food Analysis. Publications of Food Technology Association, No.34, 657 p., Ankara.
5. Chatterjee, S., Chatterjee, S., Chatterjee, B. P., &Guha, A. K. (2004).Clarification of fruit juice with chitosan. Process Biochemistry, 39, 2229–2232.
6. Chen, Y., & Li, C. (1996).Studies on the application of chitosan to clarification of grape fruit juice. Food Science Taiwan, 23, 617–628.
7. Çoklar, H., &Akbulut, M. (2010). Effect on phenolics, HMF, and some physicochemical properties of apple juice concentrate of activated carbon applied at the different temperatures. Journal of Food Process Engineering, 33, 370–383.
8. Dey, T. B., & Banerjee, R. (2014).Application of decolourized and partially purified polygalacturonase and a-amylase in apple juice clarification. Brazilian Journal of Microbiology, 45(1), 97–104.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)