



# Optimizing the Formulation of Soybean-Peanut Beverage of Chocolate-Flavored with Acceptable Rheological Properties

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**Abstract:** This paper aims to evaluate the rheological properties for the preparation of chocolate flavored soybean-peanut beverage from the different combination of soybean, peanut and cocoa powder. A Box-Behnken design with three independent variables (soybean, peanuts and chocolate) and the dependent variables (acidity, brix and viscosity) produced 12 formulations. The optimized formulation determined from the data contained soy beans 40.76g/100g, peanuts 38.28g/100g and chocolate 5.66 g/100g. It was also observed that soy protein provides better result than soy flour and influence beverage characteristics.

**Keywords:** Response surface methodology, optimization, beverage, acidity, brix, viscosity, responses, peanuts, soybeans

## I. INTRODUCTION

Peanut also known as groundnut is an important legume and food crop produced in native to South America. In western countries the kernel of peanut is used for oil production and as a raw material in cooking dishes. It is enriching in proteins, fibre and polyphenols. It is stated by Akinyele and Adudu that peanuts have high carbohydrate content than cowpeas. The soybean (*Glycine max*) is the seed from a leguminous soybean plant. It has high protein content and an ideal source of protein supplementation of starchy foods. (Maha *et al.* 2011). The protein present in soy lowers cholesterol levels. Soybeans also contain biologically active or metabolic proteins such as enzymes, trypsin inhibitors, hemagglutinins, and cysteine protease. The proteins from the stored soy cotyledon are important for human nutrition. The isoflavones are said to have potential anticancer effects. (Venkateswari *et al* 2016). It can use as a replacement for wheat in noodles which is also a rich source lysine. Economically high priced meat protein is present in soybean and observed to be the good source of protein especially in vegetarian diet. The nutrient level of pregnant woman, nursing mother, school going and young children can be increased by high protein soya. (Pakhare *et al.* 2016). Soy milk is a rich slimy liquid with a flavor of nut prepared by soaking soybean with water to produce a nutritional drink which is found to be more

nutritionally than normal milk. The main objective of the study was to optimize the use of soybeans, peanuts and cocoa powder for the production of a chocolate-flavored, soy-peanut beverage with acceptable chemical, and physicochemical properties employing a three-component constrained.

### Analytical methods:

#### Rheological properties

The study determines the rheological properties of the chocolate flavored soy-peanuts beverage which included acidity, viscosity and brix.

#### Acidity:

AOAC method was used to determine the acidity of the product.

#### Apparent viscosity:

A Brookfield digital viscometer was used for this study

#### Brix:

Brix is used as a quality control parameter and is measured by refractometer.

## II. MATERIALS AND METHODOLGY:

### Materials

Soybeans, peanuts, soy lecithin, gum based stabilizer, cocoa powder and sugar were used.

### Experimental design:

Here in this study soy bean, peanut and chocolate is used as a dependent variables (Y), acidity(Y<sub>1</sub>), viscosity(Y<sub>2</sub>), brix level(Y<sub>3</sub>). The independent variables are soybean (A), peanuts (B), chocolate(C). 12 runs were made to optimize the response. Table 1, determines the response and variables used in the experiments,

Std	Run	Factor 1 Asoybean g/100g	Factor 2 Bpeanuts g/100g	Factor 3 Cchocolate g/100g	Response 1 titratable ac... %	Response 2 brix degree	Response 3 viscosity cp
2	1	80	20	4	0.199	7.06	81
10	2	50	60	1	0.125	7.12	84.21
9	3	50	20	1	0.145	8.01	86.01
6	4	80	40	1	0.203	8	81.35
11	5	50	20	7	0.146	7.27	82.35
5	6	20	40	1	0.248	7.31	84.31
7	7	20	40	7	0.168	7.29	83.01
4	8	80	60	4	0.178	7.65	85.32
12	9	50	60	7	0.176	7.54	86.03
8	10	80	40	7	0.203	8.03	86.14
3	11	20	60	4	0.201	8.01	81.35
1	12	20	20	4	0.199	7.95	82.45

Fig1: experimental design.

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III. RESULT AND DISCUSSION:

Effect of independent variables on acidity

The acidity is the measure of sourness (acid present) of beverage. It was measured as percent lactic acid. From the figure1, it was observed that percent acidity increases with increase in soybean and peanut concentration.

$$\text{Titrateability} (Y_1) = 0.254986 - 0.000643X_1 - 0.000410X_2 - 0.020611X_3 - 9.58333X_1X_2 + 0.000222X_1X_3 + 0.000208X_2X_3$$

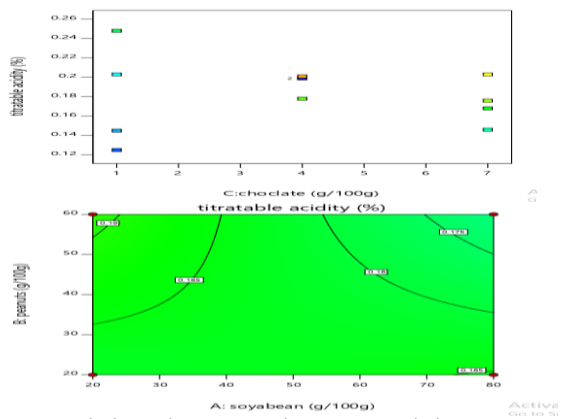
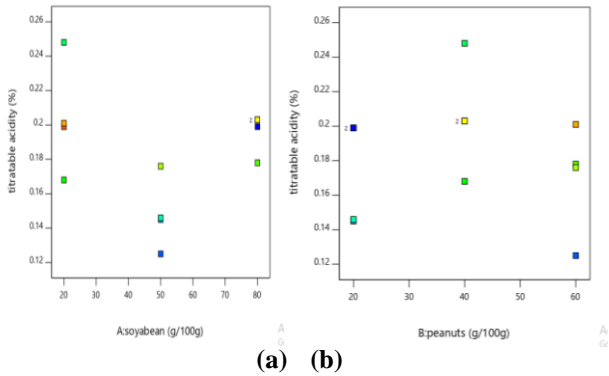


Fig2.variables on titratable acidity

Effect of independent variables on brix

Brix is the sugar content of any aqueous solution (1°C = 1g of sucrose in 100g of solution). It also states about the total solid dissolved in a given medium of soy-peanut beverage. The regression model obtained for brix is;

$$\text{Brix} (Y_2) = +8.85278 - 0.008639 X_1 - 0.030188 X_2 - 0.213194 X_3 + 0.000221 X_1X_2 + 0.000139 X_1X_3 + 0.004833 X_2X_3$$

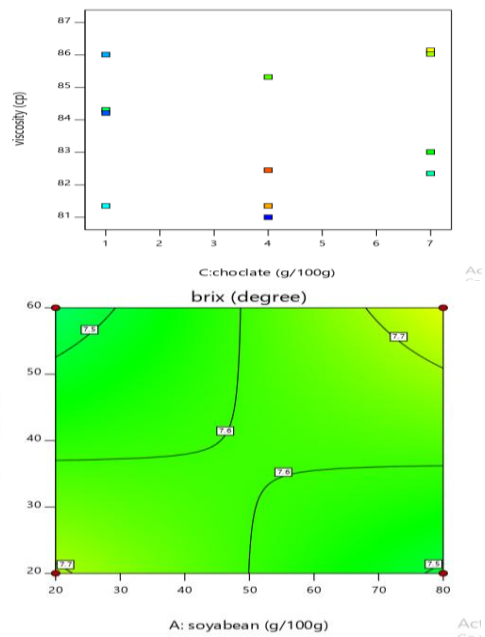
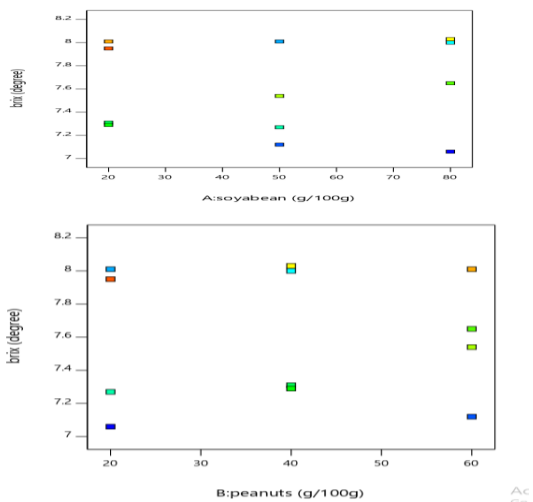
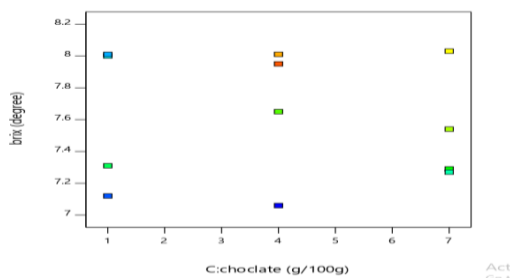
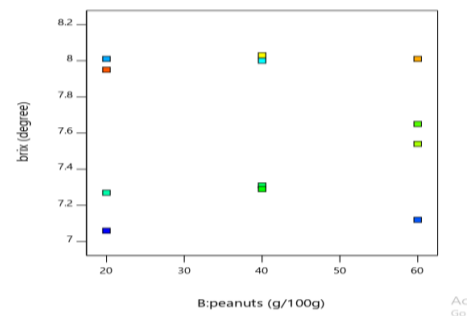
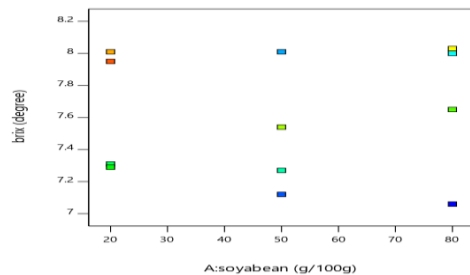


Fig3.Effect of independent variables on viscosity

Effect of independent variables on viscosity:

Viscosity of the product can be determined by Ostwald viscometer. The viscosity of the beverage varies for each trails. Viscosity increases with increase in peanut concentration and decreases with soybean concentration. The regression model obtained for the viscosity of the product:

$$\text{Viscosity} (Y_3) = 93.07042 - 0.146792X_1 - 0.172375X_2 - 1.69042X_3 + 0.002258 X_1X_2 + 0.016917X_1X_3 + 0.022833X_2X_3$$



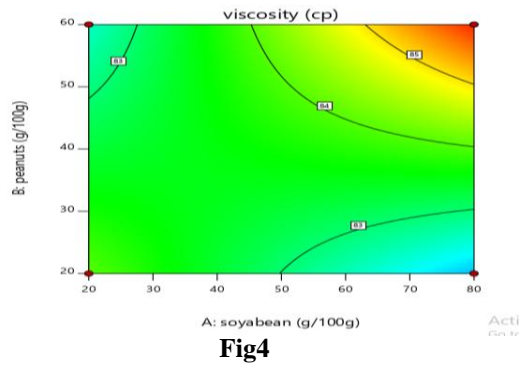


Fig4

#### IV. CONCLUSION:

The study defines the optimization of the product with standard level of rheological properties using box behnken design. The optimised end product contain acidity ranging between 0.178%-0.299%, brix 7.56°-8.90° and viscosity 83.29-87.80 cp. By using the optimized procedure, the product can be produced in industrial level. Overall acceptability and sensory score of soy-peanut chocolate-flavoured milk beverage in the Indian market are the further research work.

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