



## Formulation and Evaluation of Anti- Hypertensive Herbal Chocolate

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Received: 10-03-2023; Revised: 20-05-2023; Accepted: 28-05-2023; Published on: 15-06-2023.

### ABSTRACT

The Chocolate is most loving food among the people. It is an easiest form to chew and absorb for every individual. The aim of the present study was to formulate chocolate that contains medicated herbal ingredients to prevent hypertension. *Ocimum sanctum* (Tulsi), *Zeylanicum cinnamomum* (Cinnamon), *Elettaria cardamomum* (Cardamom), *Camellia sinensis* (Green tea), *Moringa oleifera* are the herbs that help in treating hypertension and also contain other medicinal properties like Anxiolytic activity, Anti depressant activity, Anti diabetic activity, Anti-inflammatory and Anti-cancer activity.

**Keywords:** Herbal chocolate, Hypertension, Anxiolytic and Anti diabetic.

### QUICK RESPONSE CODE →

#### DOI:

10.47583/ijpsrr.2023.v80i02.007



DOI link: <http://dx.doi.org/10.47583/ijpsrr.2023.v80i02.007>

### INTRODUCTION

Herbal formulations means a dosage form consisting of one or more herbs or processed herbs in specified quantities to provide specific nutritional, cosmetic benefits meant for use to diagnose, treat, mitigate or alter the bodily functions. Chocolate is adaptable food that can be combined to create completely different taste and texture sensations.<sup>1</sup> Also, chocolate is an anhydrous medium that resist microbial growth and to hydrolysis of water-sensitive active agents. Chocolate abundantly contains compounds such as saturated fat, polyphenols, sterols, di and triterpenes, aliphatic alcohols, and methyl xanthines. Phenyl ethylamine that naturally occurs in the brain and it is termed as 'the love drug' which produces the feeling of well-being and contentment.<sup>2,3</sup> Phenyl ethylamine also present in chocolate that lowers blood pressure, also blood sugar level that gives the feeling of wellness. There are five basic human taste qualities i.e., sweet, sour, bitter, salty, savory. Sweet taste is one of the most pleasurable senses. Medicated chocolate is prepared by using chocolate base and the drug is incorporated into prepared chocolate base.<sup>4, 5</sup> As the drug is incorporated within the chocolate and the drug is released from the chocolate, it is called as Chocolate drug delivery system. It is a best drug delivery system specifically for children. Hypertension is a long-term medical condition in which the blood pressure in the arteries is persistently elevated. Long-term high blood pressure is a major risk factor for stroke, coronary artery disease, heart failure, atrial

fibrillation, peripheral arterial disease, vision loss, chronic kidney disease, and dementia. Hypertension is a major cause of premature death worldwide. Consuming 50 g of cocoa daily will lower blood pressure 2 to 3 mm Hg on average in adults with hypertension. Eating about 30 calories a day of dark chocolate just one tiny square was shown to help lower blood pressure after 18 weeks without weight gain or other adverse effects, according to a study published in the Journal of the American Medical Association.<sup>17-20</sup>

### MATERIALS AND METHODS

#### Materials

*Ocimum sanctum* (Tulsi), *Zeylanicum cinnamomum* (Cinnamon), *Elettaria cardamomum* (Cardamom), *Camellia sinensis* (Green tea), *Moringa oleifera*, *Theobroma cacao* (Cocoa), Butter and Vanilla essence.

**Table 1:** Formulation table -composition of chocolate

| Contents                 | F1     | F2     | F3     | F4     |
|--------------------------|--------|--------|--------|--------|
| Tulsi                    | 150 mg | 500 mg | 500 mg | 250 mg |
| Cinnamon                 | 150 mg | 500 mg | 300 mg | 150 mg |
| Cardamon                 | 150 mg | 500 mg | 150 mg | 75 mg  |
| <i>Camellia sinensis</i> | 150 mg | 500 mg | 500 mg | 300 mg |
| Moringa                  | 150 mg | 100 mg | 100 mg | 30 mg  |
| Honey                    | 2 g    | 2 g    | -      | -      |
| Flavouring agent         | 0.05ml | 0.05ml | 0.05ml | 0.05ml |
| Cocoa butter             | 3 g    | 6 g    | 5 g    | 9 g    |



## Method

All ingredients are finely powdered, sieved for uniform particle sizes through mesh size 60. All the ingredients were weighed accurately and mixed thoroughly in a dish or beaker. Butter has melted in a porcelain dish in a double boiler having temperature above 50°C (113-122°C). The melted butter was added to the mixture with continuous stirring, then vanilla as a flavoring agent was added before going to set in moulds. The prepared chocolate was poured in silicon moulds and refrigerates them until they form solid approximately 3-6 hours at 27°C.<sup>6-9</sup>

## EVALUATION:<sup>10-13</sup>

### 1. Organoleptic characters.

### 2. Phytochemical analysis.

### 3. Hardness

Hardness of chocolate was measured by Monsanto Hardness Tester.

### 4. Blooming test

**Fat Bloom** - When the thin layer of fat crystals form on the surface of chocolate formulation. This will cause the chocolate to lose its gloss and a soft white layer will appear, giving the finished article an unappetizing look. Fat bloom is caused by the recrystallization of fat and/or a migration of a filling fat to the chocolate layer. Storage at a constant temperature will delay the appearance of fat bloom.

**Sugar Bloom** – This is rough and irregular layer on top of chocolate formulation. This is caused by condensation (when chocolate is taken out of the refrigerator). This moisture will dissolve the sugar in the chocolate. When the water evaporates, sugar recrystallizes into rough, irregular crystals on surface. This results into unpleasant look.

Test sample of chocolate was subjected to treatment cycles at 30°C for 11 hours Shifting of temperature for 1 hour to 18 °C for 11 hours shifting of temperature for 1 hour. Observed the test sample of chocolate whether blooming has taken place or not.

### 5. Physical stability

To check the physical stability, sample of chocolate was kept in closed container for 1 month at 28°C after one month interval, Test sample of chocolate was observed for physical appearance and drug degradation.

### 6. Protein content

Protein content was determined by Kjeldahl method as described by Horwitz (1980). Accurately weighed sample (0.25 g) was transferred into 400 ml digestion flask. To this 125ml of concentrated Sulphuric acid and 5g digestion mixture (consisting of copper and potassium sulphate, 1: 10 w/w) was added and preceded for digestion. The mixture was digested over flame till it became transparent. Mixture was allowed to cool, diluted with 100ml distilled water and neutralized with approximately 40ml of 50%

w/v sodium hydroxide solution. The mixture was distilled and the distillate collected in a conical flask containing 50 ml of saturated boric acid solution and 1 drop of mixed indicator (equal volume of saturated solution of methyl red in ethanol and 0.1% solution of methyl blue in ethanol). About 75 ml of the distillate was collected and then titrated against 0.1 N sulphuric acid.

Calculation of protein content:

$$\text{Total nitrogen (\% w/w)} = V / W \times 0.14$$

Where,

V = Volume of 0.1 N H<sub>2</sub>SO<sub>4</sub> required for titration

W = Weight in g of the sample

$$\text{Protein (\% w/w)} = \text{Total nitrogen (\%)} \times 6.25$$

### 7. Moisture content

The moisture content is defined as the amount of water present in food sample. For determining the moisture content in the sample, dry empty petri dish is weighed and then 2 g of sample is added to it and it is kept in hot air oven at 110° C for 2-3 hours. After the given time the petri dish are kept in the desicator to cool down and the weight is taken using weighing balance. Calculation is done by the formula:

$$\text{Moisture Content (\%)} = W_2 - W_3 / W \times 100$$

Where,

W = weight of sample (g)

W<sub>2</sub> = weight of empty petri dish (g) + sample (g)

W<sub>3</sub> = weight of the petri dish after drying (g)

## RESULTS AND DISCUSSION

### General appearance<sup>14-17</sup>

Colour - Dark Brown

Odour - Chocolate with no brunt, no smoky smell

Taste - Slight sweet

Texture - Smooth and even



Figure 1: Formulated Chocolate

**Table 2:** Phytochemical analysis

| Test   | Observation  | Inference |
|--|--|-----------|
| <b>1. TEST FOR ALKALOIDS:</b>  |  |           |
| <b>A. Mayer's test:</b>  |  |           |
| Add few drops of Mayers reagent (Potassium mercuric iodide solution) along the sides of the test tube.   | White or creamy precipitate is formed  | +         |
| <b>B. Wagner's test:</b>   |  |           |
| Add few drops of wagners reagent (iodine Potassium iodide solution)  | Reddish brown precipitate is formed  | +++       |
| <b>2. TEST FOR CARBOHYDRATES:</b>  |  |           |
| <b>A. Molisch test:</b>  |  |           |
| Add 2 drops of alcoholic solution of alpha-naphthol and 1ml of conc. sulphuric acid slowly along the sides of test tube.                             | Purple to violet colour ring is formed   | +++       |
| <b>B. Fehling's test:</b>  |  |           |
| 1ml of sample was boiled on a water bath with 1ml each of feelings solutions A and B.  | Brick red precipitate  | +++       |
| <b>3. TEST FOR GLYCOSIDES:</b>   |  |           |
| <b>A. Bontrager's test:</b>  |  |           |
| To 2ml of sample solution, 3ml of chloroform was added and shaken chloroform layer was separated and 10% ammonia hydroxide solution was added to it. | Pink colour is formed indicating the presence of anthroquinone glycosides          | +         |
| <b>4. TEST FOR PHYTOSTEROLS AND TRITERPENOID:</b>  |  |           |
| <b>A. Libermann Burchard test:</b>   |  |           |
| The extract was dissolved in acetic anhydrous, boiled, cooled and 1ml of conc. sulphuric acid is added along the side of the test tube.              | Red, pink or violet colour at the junction of liquid indicates glycosides presence | +++       |
| <b>5. TEST FOR PHENOLS AND TANNINS:</b>  |  |           |
| <b>A. Ferric chloride test:</b>  |  |           |
| Add few drops of 5% ferric chloride solution.  | Formation of blue, green and violet colour   | +++       |
| <b>6. TEST FOR FLAVANOIDS:</b>   |  |           |
| <b>A. Alkaline reagent test:</b>   |  |           |
| An aqueous extract was treated with 10% ammonium hydroxide solution.   | Yellow fluorescence indicates flavonoids presence                                  | ++        |

**Phytochemical analysis:** Entire procedure was described in the Table 2.

#### Hardness

$$F 4 - 0.3 \text{ Kg/cm}^2$$

**Bloom test:** Chocolate is stable when exposed to various temperatures.

**Physical stability** – No degradation was observed.

$$\begin{aligned} \text{Moisture Content (\%)} &= \frac{W_2 - W_3}{W} \times 100 \\ &= \frac{44 - 43.5}{42} \times 100 \\ &= 15\% \end{aligned}$$

$$\begin{aligned} \text{Protein content (\%)} &= \text{Total nitrogen (\%)} \times 6.25 \\ &= 0.088 \times 6.25 \\ &= 0.55\% \end{aligned}$$

#### CONCLUSION

In the present study, we formulated herbal chocolate having anti hypertensive activity with natural ingredients. This chocolate was formulated with herbal ingredients like cocoa, Tulsi, Cinnamon, Cardamon, Moringa and Green tea and contain the active Constituents of Glycosides, Carbohydrates, Alkaloids, Phytosterols, Tri terpenoids, Phenols, Tannins and Flavonoids. They are used to treat hypertension, Diabetes, Inflammation, Cancer, Irritable bowl syndrome, Constipation and Intestinal spasms etc..



These chocolates are easily chewable and palatable. The evaluation studies were satisfactory, out of four formulations; F4 formulation has shown better results when compared with other 3 formulations.

#### Acknowledgements:

We are thankful to College Management for supporting us to carry out the work.

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**Source of Support:** The author(s) received no financial support for the research, authorship, and/or publication of this article.

**Conflict of Interest:** The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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