



FORMULATION AND EVALUATION OF HERBAL HIBISCUS CHOCOLATE PROVIDING HEALTH BENEFITS & TREATING HORMONAL IMBALANCE

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ABSTRACT

The study aims to design and fabricate dried Hibiscus chocolate and to evaluate its quality. The prime focus of this study is to formulate and evaluate natural nutritious chocolate and enrich it with nutritional supplement containing women hormonal imbalance and herbal components that will lower cholesterol, blood sugar and triglyceride without any side effects. Hence, in the present investigation an attempt was made to prepare chocolate formulation of *Hibiscus rosa-sinensis*, *Vitex agnus-castus*, Cinnamon, Nuts and *Occimum sanctum* (holy basil) mixed with finely shredded coconut and dark chocolate combined by using coconut milk. This chocolate enriched with different nutrient supplements can be easily given to patients with high sugar levels. The medicated chocolate formulations were analyzed for sensory and organoleptic evaluation, blooming test, shelf life and microbial count after which the formulation which was fit for consumption was accepted.

KEYWORDS: Herbal Chocolate, Hormonal disorders, *Hibiscus rosa-sinensis*, *Vitex Agnus-castus*, Cinnamon, *Occimum sanctum*.

Chocolate is a raw or processed food produced from the seed of the tropical tree *Theobroma cocoa*. As these are ideally suited for inclusion in the food matrix of a chocolate bar, complementing the endogenous flavors, chocolate could be developed as the ideal drug delivery system, enhancing health in the form of a tasty treat (Vishal *et al.*, 2012). It may also be defined as preparation of roasted and ground cacao seeds that is made in the form of liquid paste or in a block and can also be used as a flavouring ingredient of food (Verma *et al.*, 2020). Dark chocolate is majorly beneficial in lowering cholesterol. The other health benefits of dark chocolate are that it contains antioxidant which improve endothelial function, vascular function, insulin sensitivity, increase blood flow, raise HDL (high density lipoprotein), etc. Chocolate also contains phenyl ethylamine which can raise blood pressure (Crozier *et al.*, 2020). Chocolate is well known to protect skin against sun damage, is reported to increase brain function due to production of tryptophan amino acid which is responsible for the production of serotonin, chocolate is also known to increase memory and is an anhydrous medium that can resist microbial growth and can hydrolyse water sensitive against active agents. 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 or mitigate any medically abnormal condition. Herbal formulations contain an active herbal substance, herbal preparation singly or in combination. The article aims at formulating herbal chocolate as a nutritional

supplement with *Hibiscus* which lowers blood pressure, lowers blood sugar and fat, *Ocimum scantum* (Tulsi) responsible reducing stress thus leading to proper ovulation and cinnamon which is responsible for increasing sugar -metabolism (Verma 2020).

MATERIALS AND METHODS

The formulation of chocolates constitutes Ingredients used in our herbal formulation of Chocolates:

Hibiscus Rosa-sinensis

Hibiscus plants give us more than lovely flowers to grace our gardens and the flowers, leaves, and seeds of the hibiscus can all be consumed. Some evidence points that *Hibiscus* has anti-cancer and anti-bacterial qualities. Researchers have pointed that anthocyanins are the compounds which are mostly responsible for the health benefits of *Hibiscus* as they have antioxidants properties. Some studies have shown that *Hibiscus* can improve cholesterol, blood pressure and glucose levels thus, aiding in their regulation (Puro *et al.*, 2014, Solangi *et al.*, 2017 and Singh *et al.*, 2017). A study reports that patients with high blood pressure who were not taking any medicine after drinking hibiscus tea three times a day, have reported a sharp decrease in both of their systolic and diastolic readings were lower.

Occimum sanctum

Holy basil (*Occimum sanctum*) has a history within Indian medicine it is widely used as a treatment for many conditions, from eye diseases to ring worms, from

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the leaves to the seed, holy basil is considered to be a tonic for the body, mind, and spirit. Different parts of the plant are recommended for treating different conditions and its fresh flowers are used for treating bronchitis. It also strengthens kidney by reducing kidney stress. The acetic acid present in holy basil helps in the breakdown of the kidney stones (Pandey and Madhuri 2010). The leaves and seeds of Tulsi are combined with black pepper for treating malaria. The whole plant of Tulsi is used for treating diarrhoea, nausea and vomiting. The herb is used for treating stomach ulcers and eye diseases (Verma *et al.*, 2020). An essential oil made from the leaves of the plants is used as an protectant from for insect bites. The plant leaves also contain great antioxidants and protect the skin from almost all the damages caused by free radicals. Tulsi acts a mild diuretic & detoxifying agent which helps in lowering the uric acid levels in the body.

Cinnamon

Cinnamon is a spice, sprinkled on toast and lattes but extracts from the bark as well as leaves, flowers, fruits, and roots of the cinnamon tree have also been used in traditional medicine around the world for thousands of years (Ranasinghe *et al.*; 2013) for treating medical conditions. One of the most important active ingredients in cinnamon is cinnamaldehyde, some researches show that cinnamon may be good for people with diabetes. One review suggests that cinnamon might help with obesity and weight loss and is sometimes used for treating irritable bowel syndrome, stomach or intestinal problems. It's been suggested that cinnamon might also help to treat Heart disease, Alzheimer's disease, Cancer, HIV, Infection, Tooth decay, Allergies.

Coconut Milk

Coconut milk is extracted from coconut palm which is known as *Cocos nucifera*, coconut milk is a white substance extracted from grated mature coconut flesh. It is known to increase stamina, boost immunity however, it is also known to contain medium chain triglyceride which aid in weight loss, it preserves high temperature and induces impairment (Haully *et al.*, 2021). It contains antioxidant to prevent heart health and can increase LDL, there are evidences which suggest that coconut milk can lower bad cholesterol in body (Karunasiri *et al.*, 2020).

Chocolate

Chocolate is typically sweet usually brown, food preparation of Theobroma cacao seeds, roasted and ground, often flavoured with vanilla. It is used in form of liquid, paste or in block or as a flavouring ingredient in other sweet foods. It is known to have many health benefits as it alleviates cardiovascular diseases, protects

against heart diseases, prevents stroke, regulates blood sugar, reduces cancer risk, slows aging, increases immunity, DNA repair and alopecia (Haritha *et al.*, 2014). Chocolate is known to contain cocoa and flavan-3-ols which reduce the chances of cardiovascular diseases (Hooper *et al.*, 2012).

Linum usitatissimum (Flax Seeds/Alsai)

Flax seeds are small oil seeds containing omega 3 fatty acid, fibre and other plant compounds. It may help to improve digestion and reduce the risk of heart disease, type II diabetes and cancer. It is rich in omega 3 fatty acids (Blondeau *et al.*, 2015). has anti cancer properties, lowers the risk of breast cancer (Calado 2018) and is also rich in fibre, it contains soluble and insoluble fibre and also helps to lower cholesterol (Navnamm *et al.*, 2020), It is also known to control and stabilize blood sugar level (Sartang *et al.*, 2018).

Nuts

These include cashew nut (*Anacardium occidentale*), raisin (*Vitis vinifera*) and Walnut (*Juglans regia*), they have immense benefits which include polyphenol and can combat oxidative stress by neutralizing free radicals unstable molecules which can cause cell damage and can decrease risk (Rahman, 2017), It also aids in weight loss (Abazaford *et al.*, 2014). It is known to lower cholesterol, triglycerides and reduces inflammation, it is also known to provide high fibre in diet (Grosso and Estruch, 2015).

Method of Preparation of Herbal Chocolates: Herbal chocolate was prepared in the following manner-

- a) All the ingredients were weight accurately.
- b) Dark chocolate was melted in double boiler and to this melted chocolate, plain salt less butter and coconut milk was added.
- c) On, the other hand a powder of *Ocimum scantum*, cinnamon, Hibiscus, nuts and flex seeds was prepared.
- d) The powder was then added to the melted dark chocolate and was mixed properly.
- e) Fresh Hibiscus petal were roasted for few seconds and were added to the melted chocolate containing herbal powder.
- f) To, this mixture drops of extract prepared from Strawberry were added as flavouring agent.
- g) Then the prepared chocolate can be poured in moulds and can be set in freezers for setting.
- h) After, getting set the chocolates are decorated with white milk powder or roasted Hibiscus petals.

- i) Total 5 formulations were prepared by using different concentration of herbal drugs to observe for the best combination (Figure 1).



Figure 1: Hibiscus Chocolates

Table 1: Composition Formulations

Content	F ₁	F ₂	F ₃	F ₄	F ₅
<i>Ocimum scatum</i> (mg)	250	150	350	200	150
Cinnamon (mg)	450	850	500	650	600
Coconut Milk (ml)	10	10	20	15	20
Dark Chocolate (gm)	10	10	8	10	10
Flax Seed (mg)	30	30	50	30	30
Cocoa Butter (gm)	3	2	5	3	3
Hibiscus Flower	5-8 petals	5-8 petals	8-10 petals	5-8 petals	5-8 petals
Nuts (gm)	10	10	10	10	10
Strawberry Flavor (ml)	0.005	0.005	0.005	0.005	0.005

Sensory and Organoleptic Evaluation

Sensory and organoleptic evaluation was done is one of the most important parameters for testing any product (Table 2 and 3). The sensory evaluation was done after getting the product tasted from group of 25 panellist

RESULTS

The above ingredients were used to prepare five different concentrations which are designated as F₁, F₂, F₃, F₄ and F₅ respectively (Table1). Sensory or organoleptic evaluation was carried to find the best formulation. For, sensory or organoleptic evaluation 25 different semi trained panel members were selected from Vikram University, Ujjain. The formulation which obtained the best score in sensory evaluation was subjected to microbial analysis Blooming Test and Shell Life.

and the result obtained were compared with the standard scoring procedure and quality category was determined in dependence of scores (Mirkovi and Radulovi 2018, Jonnalagadda, 2001)

Table 2: Sensory/ Organoleptic Evaluation Parameter

Parameter	F ₁	F ₂	F ₃	F ₄	F ₅
Appearance	Deviation from form, low quality	Insignificant deviation from	Appropriate form, irreproachable color, smooth, bright surface	Deviation from form, low quality.	Distorted Form, surface grey
Aroma	Appropriate, rounded, sourish	Appropriate, poorly rounded	Rounded, aromatic	Appropriate, poorly rounded	Appropriate, poorly rounded
Texture	Break uneven, air bubble	Break uneven, air bubble	Break straight, homogenous	Break uneven, air bubble	Break uneven, air bubble
Odor	Poor Rounded	Poor Rounded	Rounded	Poor Rounded	Poor Rounded
Taste	On a bitter side	Saurish as	Slightly on sweet taste	Bitter side	Bitter side

Table 3: Mean and Standard Deviation of different Formulations

	Appearance	Aroma	Texture	Odor	Taste
F1	2.24+-0.925	2.40+-0.489	2.64+-0.932	2.48+-0.399	2.88+-0.815
F2	2.08+-0.974	2.08+-0.934	2.96+-0.527	2.76+-0.991	2.64+-0.889
F3	3.92+-0.653	4.16+-0.647	3.96+-0.662	3.88+-0.815	4.20+-0.742
F4	2.24+-0.512	2.80+-0.565	2.96+-0.527	2.20+-0.080	2.80+-0.692
F5	2.40+-0.489	2.24+-0.649	2.52+-0.765	3.12+-0.587	2.56+-0.637

Blooming Test: Bloom is a test to measure chocolate's strength, the test actually analysis the weight which is required by a specified plunger to depress chocolate surface without breaking it at a particular temperature.

Shell Life or Stability: The shell is another important criteria for the analysis of the product and Formulation 3 was found to have the best shell life and was subject to further analysis.

Microbial Analysis: The microbial analysis was done by Standard Plate Count Method and no microbial growth or contamination was reported and the product was found to be safe for consumption from microbial point of view.

DISCUSSION

Various batches were prepared from F₁-F₅ and the batches of chocolates were tested for organoleptic and sensory properties (colour, odour, taste, appearance and texture), glossiness and fat bloom. A panel of 25 trained professionals from Vikram University were referred for sensory evaluation, after which the best formulation was subject to further analysis like blooming test, stability test, shell life and microbial analysis. Out of the five formulations made F₃ scored highest points according to the scoring chart for sensory evaluation method (Mirkovi and Radulovi 2018). According, to the grading scale quality category of chocolate was determined and the chocolate which scored less than 2.5 points were, considered to be unsatisfactory, chocolate scoring between 2.5-3.5 were found to be of good quality, chocolates scoring between 3.5-4.5 points were reported to be of very good quality and those with more than 4.5 points were known to have excellent properties. Formulation F₃ continuously scored between 3.5-4.5 points as per scoring chart was reported to be of very good quality. Formulation F₃ is reported to contain optimum amount of chocolate, with optimum variety of nuts, coconut milk and herbs like Tulsi, Cinnamon and *Hibiscus* and was reported to be fit for consumption. Earlier reports show that chocolate has a significant beneficial role in improving health of a person (Baron *et al.*, 1999, Hooper *et al.*, 2012 and Fisher and Hollenberg 2005). There are strong evidences that cocoa and flavan-3-ols are associated with prevention of cardiovascular

diseases (Hooper 2012). There are also reports that dark chocolate is known to reduce the risk of atherosclerosis by thickening and hardening of arteries, retaining their flexibility and preventing their sticking to blood vessel walls. It is believed that flavonoid may induce reduction in the level of oxidation stress thus enhancing, endothelial function (Fisher and Hollenberg 2005 and Mink *et al.*, 2007) and flavonoid is also known to prevent cardio metabolic disorders (Lopez *et al.*, 2011). Researches also suggest the presence of a primary alkaloid theobromine in chocolate which is a CNS stimulant and is known to increase energy and reduce lethargy (Mumford *et al.*, 1994). At, the same time dark chocolate is also reported to reduce blood sugar and protect from type II diabetes, the flavonoid in dark chocolate help to reduce insulin resistance and help cell to function properly (Grassi *et al.*, 2005). Dark chocolate is known to increase blood flow to brain and heart and can play an important role to improve cognitive function as it possesses several chemical compounds which can change mood and creates positive environment (Tomasso *et al.*, 1996). On, the other hand the chocolate also contains *Hibiscus* extract and petals which are capable of reducing oxidative stress and increasing levels of sugar in blood (Soto *et al.*, 2016). In one study it is reported that, both men and women who took *Hibiscus* extract had lower cholesterol readings at two and four weeks (Puro *et al.*, 2014). Another study showed improved readings in patients with diabetes, who often struggle with high cholesterol. Hibiscus lowered blood pressure in a study of people with mild hypertension (Soto *et al.*, 2016), apart from this it is also reported to lower blood glucose level and blood fat thus, aiding in weight loss (Singh *et al.*, 2017 and Eliis *et al.*, 2022). Chocolate also contains cinnamon which is found to contain loads of medicinal benefits as it pocesses compound cinnamaldehyde which affects health and metabolism (Zuo *et al.*, 2017). It is a natural antioxidant with loads of anti-inflammatory properties, is known to provide protection against heart diseases and also lowers blood sugar (Schink *et al.*, 2018, Hardy *et al.*, 2020, Ercan and Nehir 2020). The chocolate is also known to contain Flax seeds which are rich in its medicinal properties as it contains omega 3 fatty acids (Blondeau *et al.*, 2015). It possesses anti-cancer properties lowering the

risk of breast cancer (Calado 2018). It is also rich in fibre as it contains soluble and insoluble fibre which works to reduce cholesterol (Navnamm *et al.*, 2020) and thus, aids to control and stabilize blood sugar level (Sartang *et al.*, 2018). At, the same time different nuts like cashew nut (*Anacardium occidentale*), raisin (*Vitis vinifera*) and Walnut (*Juglans regia*) are also added in the chocolate as they have immense benefits like they contain polyphenol and can combat oxidative stress by neutralizing free radicals and unstable molecules which can cause cell damage and can decrease risk (Rahman, 2017). It also aids in weight loss (Abazaford *et al.*, 2014) and lowers cholesterol, triglycerides and reduces inflammation, it is also known to provide high fibre in diet (Grosso and Estruch, 2015).

CONCLUSION

Chocolate is high calorie, high fat food naturally rich in flavonoid and many other compounds with different therapeutic activities, it is mainly beneficial in treating cardiovascular related disorders. The current study aimed to formulate and evaluate natural nutritious chocolate and enrich it with nutritional supplement which can be used for treating medicated conditions such as women hormonal imbalance and high cholesterol, blood sugar and triglyceride without any side effects. The medicated chocolate formulations were analyzed for sensory and organoleptic evaluation, blooming test, shelf life and microbial count after which Formulation 3(F₃) was found to be the best for consumption which can also aid in treating certain medicated conditions.

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