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Formulation, Optimization and Evaluation of Polyherbal Chocolate for Hormonal Imbalances in Women

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Abstract: Achieving hormonal balance may be revolutionary, and there are plenty of natural solutions available. The medicated chocolate formulation is popular for these because it improves patient compliance. The key ingredients of the herbal chocolate were cardamom, cinnamon, and shatavari. Shatavari possesses antistress and antimenorrhagic properties. Cardamom is a weight-loss aid that contains natural anti-inflammatory and antioxidant properties. Cinnamon powder regulates the menstrual cycle. The manufactured chocolate formulations were assessed based on its general appearance- pH, stability, blooming tests, weight variation, moisture content, and phytochemical analysis. Formulation has undoubtedly a wide range of possible applications in the future for the management of hormone imbalance.

Keywords: Hormonal balance, Shatvari, Cardamom, Cinnamon, Herbal chocolate

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Introduction

Chocolate is traditionally thought to be a sophisticated flavour and a significant component. Medicated chocolate is made by combining the medication with chocolate base. The chocolate drug delivery system is the method by which the medication is absorbed by the chocolate and subsequently released from it. The current study

aims to create chocolate with unique herbal compositions that have pharmacological benefits, such as immune-stimulating, antioxidant, and anti-stress effects mostly due to hormonal imbalance in women.

Shatavari is derived from dried tuberous roots of *Asparagus racemosus* Wild and has been used to

treat conditions related to hormone imbalance such as polycystic ovarian syndrome and infertility (Pandey *et al.*, 2008). It is commonly prescribed to nourish ovary, promote production of reproductive hormones and maintain libido of women (Sharma *et al.*, 2010). According to a study, the plant increases follicle-growth-promoting hormone, which in turn improves folliculogenesis (Dunne and Slater, 2006). The Cinnamon powder is the dried inner bark of the coppiced shoots of *Cinnamomum zeylanicum* Nees, belonging to family Lauraceae (Prachal *et al.*, 2023). Menstrual cycle regulation is the primary action of cinnamon. The intensity of primary dysmenorrhoea can be mitigated by cinnamon. It is advised to use this fragrant spice to relieve primary dysmenorrhoea (Jahangirifar, 2018).

Cardamon powder consists of the dried ripe seeds of *Maton*, belonging to family Zingiberaceae. It is anti-inflammatory and hence used in low-grade systemic inflammation which contributes to the development of PCOS patients' condition (Cheshmeh *et al.*, 2022). Brain neurotransmitter levels are especially useful during premenstrual syndrome (Atabaki *et al.*, 2023). Cocoa powder also reduces changes in hormone levels and helps restore feelings of wellbeing, having the ability to elevate mood (Brillo *et al.*, 2015).

Materials and Methods

The powders of *Asparagus racemosus*, *Cinnamomum zeylanicum*, *Elettaria cardamomum*, *Theobroma cacao*, cocount oil and jiggery were purchased from local market. The coarse powder was then stored in a polythene bag and stored in a cool, dark, and dry place for further analysis.

Methods:

Preformulation Studies: Preformulation involves the investigation of the medicinal substance's physical and chemical properties, both in isolation and in conjunction with excipients. This is the first step towards developing dosage forms that are appropriate.

The organoleptic Properties: The colour, flavour, and odour of the powdered active ingredient (API) were analysed. The colour of a little amount of all API spread out on butter paper was examined in a well-lit area. A little amount of each API was tested on the tongue to assess flavour, and odour was detected using the sense of smell.

Phytochemical Screening and evaluation: The API was examined for the presence of cardiac glycosides, terpenoids, flavonoids, alkaloids, steroids, tannins, saponins, amino acids, carbohydrates, and vitamins. According to the Khandelwal (2008), the physicochemical evaluation of crude powder's loss on drying, ash value, and swelling index aids in comprehending the drug's pharmacopoeia criteria.

Formulation of herbal chocolate: All of the materials were precisely weighed, and a grinder was used to reduce their size to the appropriate shape. After that, a sieve was used to ensure powder homogeneity, promote lump-free flow, and avoid settling. All blended ingredients were added to the properly prepared jaggery solution, thoroughly mixed, and stirred until a thick consistency was achieved. Before making preparations, oil was used to lubricate the mould and keep it from sticking. Placed the prepared solution inside the mould and refrigerated until the chocolate solidified, around 30 min. The chocolate was taken out of the mould and rapped in gold foil. In this study 8 formulations (F1-F8) were prepared (Table 1).

Results and Discussion

The main objectives of this study was to formulate and evaluate the herbal chocolate using natural ingredients which help to regulate hormonal imbalance in women. The *Asparagus racemosus*, *Cinnamomum zeylanicum*, *Elettaria cardamomum*, and *Theobroma cacao* were the materials chosen for this purpose. To determine the standard and purity of the conformation, a physicochemical examination and phytochemical analysis of every drug was performed as shown in Tables 2 and 3.

Table 1: Formulation of herbal chocolate

Ingredients	Batches							
	F1	F2	F3	F4	F5	F6	F7	F8
Shatavari powder (mg)	60	60	60	60	60	60	60	40
Cinnamon powder (mg)	60	60	60	60	60	60	60	40
Cardamom powder (mg)	10	10	10	10	10	10	10	20
Cocount oil (mg)	50	55	60	60	45	50	50	40
Jaggery (mg)	150	150	200	200	220	220	220	250
Choco Powder (mg)	100	120	150	200	220	240	250	250
Total (mg)	430	455	540	590	615	640	650	640

Table 2: Physiochemical analysis of the powders

API	Ash value % w/w	Water soluble ash value % w/w	Acid insoluble ash value % w/w	Loss on drying %w/w	Foreign matter %w/w
Shatavari	4.9	3.4	0.8	3.02	Nil
Cinnamon	3.1	2.9	0.9	3.41	Nil
Cardamom	2.4	5.4	1.1	2.94	Nil
Cocoa	1.2	1.3	1.3	3.12	Nil

Table 3: Phytochemical screening of powder

API	Alkaloids	Glycosides	Tannins	Saponins Steroids	Flavonoids	Terpenoids
Shatavari	+	+	+	+	+	-
Cinnamon	+	+	+	+	+	+
Cardamom	+	+	+	+	+	+

Table 4: Evaluation of formulations

Parameter	F1	F2	F3	F4	F5	F6	F7	F8
Colour	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Odour	Sweet, floral, Cocoa	Sweet, floral, Cocoa	Sweet, floral, Cocoa	Sweet, floral, Cocoa	Sweet, floral, Cocoa	Sweet, floral, Cocoa	Sweet, floral, Cocoa	Sweet, floral, Cocoa
Texture	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
pH	6.066	6.71	5.99	6.21	6.63	6.65	6.64	6.67
Hardness kg/m ²	6.1	7.2	6.3	7.4	7.1	7.6	6.7	5.4
Weight Variation (g)	5.791	5.956	5.412	5.914	5.467	5.345	5.812	5.623
Fat Bloom Test	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Moisture Content	1%	1.1%	0.9%	1%	1.2%	1.1%	1%	1%

We had optimise the F8 formulation and evaluated for various properties. The chocolates acceptable weight variation range (7.5%). The chocolate was discovered to have hardness between 5.4kg/cm² and 4.6 kg/cm². The prepared chocolates were sufficiently hard and had high mechanical strength (Zhao *et al.*, 2008). The findings of a multi-parameter evaluation of herbal chocolate are shown in Table 4.

Conclusion

Shatavari, cinnamon, cardamom, and cocoa powder were combined to make a herbal chocolate that is meant to be taken as a booster to balance hormones. We draw the conclusion from the study that the results obtained from the manufacturing of herbal chocolate were adequate and acceptable. It was discovered that affordably produced herbal chocolate may improve side effect reduction, boost positive benefits on women's bodies, and improve patient compliance.

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