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"FORMULATION AND EVALUATION OF POLYHERBAL CHOCOLATE FOR HORMONAL IMBALANCE"

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Abstract:-

This study focuses on developing a healthy and delicious herbal dark chocolate specifically designed to support women's health in a natural and enjoyable way. It targets common health concerns such as menstrual cramps, hormonal imbalance, PCOS (Polycystic Ovary Syndrome), infertility, and menopause. Since many people prefer chocolate over taking traditional medicines, this innovation aims to turn a daily treat into a health-boosting supplement.

The chocolate is infused with medicinal herbs like Shatavari, Ashwagandha, Vitex agnus castus, Cinnamon, Fenugreek, Fennel, and Ginger—all known for their roles in balancing hormones, easing menstrual pain, managing stress, improving fertility, and regulating metabolism.

To enhance both nutrition and taste, the formulation includes Dark Chocolate, Honey, milk, which contribute antioxidants, minerals, fiber, and a low glycemic index, making it safe even for individuals with elevated blood sugar. These ingredients also provide anti-inflammatory and antioxidant properties, supporting overall body function and immunity.

The final herbal chocolate was tested for taste, texture, pH, appearance, moisture content, shelf life, and herbal compound release, and showed promising results in both quality and effectiveness.

This product not only offers a side-effect-free and natural alternative to supplements but also improves mood, energy levels, memory, and overall emotional well-being. Such chocolate could be especially helpful in today's fast-paced lifestyle where women often face physical and emotional stress, offering a convenient, functional food solution that supports daily health with every bite.

Keywords: Herbal Chocolate, Menstruation, Dark Compound, Hormone Balance, PCOD/PCOS.

Aim:-
To make a healthy chocolate using natural herbs that can help balance hormones and reduce problems like mood swings, irregular periods, and other hormone-related issues in women.

Objective:-

1) To make a tasty herbal chocolate that supports women's hormonal health.
2) To use natural herbs like vitex, shatavari, and cinnamon that help balance hormones.
3) To help manage issues like irregular periods, PMS, and PCOS.
4) To include cocoa, which has mood-boosting and health benefits.
5) To offer a natural and enjoyable way to care for hormonal balance.
6) To combine the power of several herbs for better results.
7) To make it easier for women to take herbal support regularly without needing pills or supplements.

Drug Profile:

- ***Vitex agnus castus:***

Figure No.2.1: Vitex agnus castus.

Botanical Name: *Vitex agnus-castus (Chaste tree).*
Common Name: *Nirgundi, Sindvar.*
Family: Verbenaceae.
Geographical Source: Southern, Europe, The Mediterranean, And Central Asia.
Chemical Constituent: Volatile Oils, Triterpenes, Diterpenes, Sesquiterpenes, Lignans, Flavones, Glycosides, Iridoid glycosides, and Stilbene derivative.

Therapeutic Uses:
- Reduces Pre Menstrual Symptoms (PMS).
- Balances Hormones Naturally.
- Regulates Irregular Periods.
- Improves Fertility.
- Helps With PCOS (Polycystic Ovary Syndrome).
- Lowers High Prolactin Levels.
- Eases Menopause Symptoms.
- Helps with Hormonal Acne.

- ***Shatavari:***

Figure No.2.2: Shatavari.

Botanical Name: *Asparagus Racemosus.*
Common Name: *Shatavari, Satvar.*
Family: Asparagaceae.
Geographical Source: Africa, Asia, and Australia.
Chemical Constituents: Polysaccharides, Polyphenols, Anthocyanins and saponins.

Therapeutic Uses:
- Keeps Periods Regular.

- Boosts Fertility.
- Helpful During Pregnancy.
- Increases Breast Milk.
- Eases Menopause Symptoms.
- Builds Immunity.
- Reduces Stress and Anxiety.
- Soothes the Stomach.
- Slows Aging and Supports Skin Health.
- Supports Men's Health Too.

- ***Ashwagandha:***

Figure No.2.3: Ashwagandha.

Botanical Name: *Withania Somnifera.*
Common Name: *Indian Ginseng, Ashwagandha, Winter Cherry.*
Family: Nightshade.
Geographical Source: India, Nepal, Middle East, and Part Of Africa.
Chemical Constituents: Withanolides A-Y, Withaferin A, Withasomniferin A, Withasomnidienone, Withasomnierose A-C, Withanone.

Therapeutic Uses:
- Keeps You Calm.
- Helps You Sleep Better.
- Boosts Your Energy.
- Improves Focus And Memory.
- Makes Your Immune System Stronger.
- Balances Your Hormones.
- Lifts Your Mood.
- Helps Men's Health.
- Supports Womwn's Hormones.
- Reduces Pain and Swelling.

- ***Cinnamon:***

Figure No.2.5: Cinnamon.

Botanical Name: *Cinnamomum Verum.* **Common Name:** *Cinnamon, Dalchini.* **Family:** Laurels.
Geographical Source: Central Hills of Sri Lanka, Kerala.
Chemical Constituents: Cinnamaldehyde, Cinnamate, Cinnamic Acid, and Numerous Essential Oils.

Therapeutic Uses:

- Keeps Your Sugar Levels Steady.
- Soothes Your Stomach.
- Fights Germs.
- Eases Pain and Swelling.
- Good for Your Heart.
- Boosts Brain Power.
- Eases Period Cramps.
- Helps with Weight Loss.
- Freshens Breath.

LITERATURE SURVEY:

1. Niroumand, M. C et al. (2018).

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.

2. Pawar, P. D et al. (2019).

Cinnamon is a potent spice. It has been used for thousands of years not just for its aroma, but for its powerful medicinal properties as well. The most important properties of cinnamon are those of its antioxidants and type 2 diabetes. It can help manage this condition by reducing blood pressure and improving insulin sensitivity. Certain compounds in cinnamon can imitate the effects of insulin and help regulate blood sugar, a function which is crucial for those with diabetes, Reduce cholesterol, Reduce inflammation low signs of aging hence We formulated the herbal chocolate nutritional supplement with three main herbs vitex used for hormonal imbalance, cinnamon used for sugar metabolism and tulsi used for stress and proper ovulation.

3. Vishal P et al. (2012).

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.

4. Ranasinghe P et al. (2017).

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 for treating medical conditions.

5. Azizah R et al. (2023).

Approximately 55% of females suffer dysmenorrhea. Dark chocolate is one food that can reduce the pain associated with menstruation. It is also known that other herbal substances such red ginger, turmeric, moringa, sambiloto, and honey might lessen pain. Nevertheless, studies on the pairing of dark chocolate with herbal components has not been studied. Consequently, the purpose of this study is to ascertain whether combining dark chocolate with herbs will lessen menstruation pain. Thirty respondents were used for this test, and they were split into three groups: dark chocolate (C), positive control group (K), and dark chocolate plus herbs (C+H).

6. Singh K et al. (2022).

Since chocolate is a favourite food among people and medicine is a hated substance, the goal of this study was to manufacture medicated chocolate, or chocolate that contains drugs, to prevent various disorders. Withania somnifera, also known as ashwagandha, is a herbal drug with several medicinal properties, including anti-stress, anti-inflammatory, and nervous system effects, and Asparagus racemosus, also known as shatavari, is a herbal drug with several medicinal properties, including preventing miscarriage, increasing lactation, removing infertility, and regulating the menstrual cycle. As a result, powdered ashwagandha and shatavari must be used to create chocolate that has the desired pharmacological effects. Finally, prepared medicated chocolate is assessed for general application.

7. Nursalam N et al. (1982).

Dysmenorrhea is primarily attributed to an imbalance of the hormone progesterone in the bloodstream. This condition is characterized by an elevated production of prostaglandins in women experiencing dysmenorrhea compared to those who do not, resulting in intensified uterine contractions and excessive intestinal activity. Additional factors contributing to dysmenorrhea may include underlying medical conditions such as endometriosis, pelvic infections, uterine tumors, appendicitis, gastrointestinal disorders, and renal complications.

Materials And Methods:

Ingredients Table:

Sr. No.	Ingredients	Equipments
1)	Vitex Agnus Castus (Chasteberry)	Double boiler
2)	Shatavari	Silicon chocolate molds
3)	Ashwagandha	Spatula
4)	Fennel	Precision Scale
5)	Cinnamon	Grinder (for fine herbal powder)
6)	Ginger	Sieve
7)	Honey (sweetner)	Refrigerator
8)	Dark Chocolate Base	Mixing Bowl
9)	Mixed Seeds Powder	Airtight Container
10)	Rosemary Oil (preservative)	

Table 1: Ingredients and Equipments Table of Polyherbal Chocolate.

Formualtion Table:

Sr.No.	Ingredients	F1	F2	F3
1)	Vitex Agnus Castus	4.8gm	4.8gm	4.8gm
2)	Shatavari	48gm	15gm	15gm
3)	Ashwagandha	48gm	15gm	15gm
4)	Fennel	36gm	12gm	12gm
5)	Cinnamon	24gm	24gm	14gm
6)	Ginger	1.2gm	1.2gm	1.2gm
7)	Honey	34.2gm	33gm	30gm
8)	Dark Chocolate Base	360.9gm	480gm	480gm
9)	Mixed Seeds Powder	36gm	9gm	12gm
10)	Rosemary Oil	6gm	4 drops	5drops

Table 2: Formualtion Table of Polyherbal Chocolate.

Procedure:

1. **Prepare Herbal Blend:**
   - If using whole herbs, grind to a fine powder and sift to ensure smooth texture.
   - Sieve the all powdered herbs by using 60 mesh size sieve.
   - Mix all the powdered herbs evenly in a bowl.
2. **Melt Chocolate Base:**
   - In a double boiler, gently melt the dark chocolate.
   - Stir frequently to avoid burning.
3. **Incorporate Herbs:**
   - Once chocolate is fully melted, reduce heat.
   - Slowly add the polyherbal blend and mixed seeds powder into the chocolate while stirring continuously to ensure even distribution.
   - Add natural sweetener (honey) and mix thoroughly.
4. **Mold and Set:**
   - Pour the chocolate-herb mixture into molds.
   - Tap gently to remove air bubbles.
   - Allow to cool at room temperature or refrigerate until solidified.
5. **Demold and Store:**
   - Once solid, remove chocolates from molds.
   - Store in an airtight container in a cool, dry place away from direct sunlight.

Packaging:
Polyherbal Chocolate should be packed in a way that keeps it fresh, safe, and appealing. Each piece can be wrapped in golden foil or eco-friendly material to protect it from moisture and light. Small packs or blister packs can help keep the chocolate clean and make it easy to eat in the right amount. On the outside, a neat and natural-looking box with clear information can make it look good and help people understand its health benefits.

Storage:
Polyherbal Chocolate should be stored in refrigerator and cool dry place. Away from heat, moisture and childrens.
Protects from direct heat or sunlight. Room temperature or refrigerator is usually indicated, depending on the storage requirements of the drug and base.

Dispensing:
Dispensing polyherbal chocolate means giving it in safe and proper way. Each piece should have the right amount of herbs and dark compound. It must be packed well to stay fresh and clean, and the label should clearly show how to use it.

Evaluation Of Formulation:

1. **Organoleptic Property:**
   - Colour
   - Odour
   - Taste

2. **pH:**
   - Blooming Test
   - Fat Blooming
   - Sugar Blooming

3. **Hardness:**
4. **Stability:**
5. **Weight Variation:**
6. **Dimensions:**

1) Organoleptic Properties:

The look and feel of a chocolate product are very important. This includes how elegant it looks, its design, and its overall appearance. These factors matter because:
(i) They help make sure customers like the product;
(ii) They keep the product looking the same every time it's made;
(iii) They make the manufacturing process smoother.
To control how the chocolate looks and feels, things like color, taste, texture, smell, and how it feels in the mouth are carefully checked.

2) pH:

A digital pH meter with a glass sensor was used to check the pH level of a mixture made by dissolving 2 grams of the prepared chocolate in 100 milliliters of phosphate buffer solution.

3) The blooming test:

3.1) Fat Blooms:

A soft white layer and dull look on chocolate are caused by tiny fat crystals forming on the surface, making the chocolate look less attractive. This is called fat bloom. It usually happens either when fat from the filling moves into the chocolate layer or when the fats in the chocolate change their form. Keeping the chocolate stored at a steady temperature can help delay this problem.

3.2) Sugar Bloom:
This rough, uneven layer on the chocolate is called sugar bloom. It happens when chocolate is taken out of the fridge and moisture forms on its surface (condensation). The moisture melts the sugar in the chocolate, and when the water dries up, the sugar forms rough crystals on top, making the chocolate look less appealing.

To check for sugar bloom, each sample went through a cycle:
1. Kept at 30°C for 11 hours,
2. Temperature changed for 1 hour,
3. Kept at 18°C for 11 hours,
4. Another 1 hour of temperature change.

After this process, the chocolate was checked to see if sugar bloom had appeared.

4) Hardness:

Chocolate needs to have a certain level of hardness so it can snap cleanly when broken. This hardness shows how strong the chocolate is. A device called the Monsanto Hardness Tester was used to measure it, and the results were given in units of kg/cm².

5) Stability:

A medicine is considered stable if it can keep its physical look, chemical makeup, safety, and effectiveness while stored in a certain container. In simple terms, stability means the drug doesn't break down or go bad. Usually, a medicine should keep at least 90% of its original strength to still be considered effective. If it starts to break down—chemically, physically, or through bacteria—it may not work as well or could even become unsafe to use.

6) Weight Variation:

Six chocolate samples were weighed one by one and also all together. The average weight was found by dividing the total weight by the number of chocolates. Each chocolate's weight was then compared to this average. The difference in weight shouldn't be more than the allowed limit. To find how much each chocolate's weight varies from the average, this formula was used:

$$\% \text{ Deviation} = \frac{(\text{Individual weight} - \text{Average weight})}{\text{Average weight}}$$

7) Dimensions:

It was measured using Vernier calipers, a tool that helps measure size accurately.

Result and Discussion:

1.1) Organoleptic Properties:

Table displays the protection of prepared chocolate formulation in terms of taste, texture, and mouthfeel.

Sr. No.	Parameters	Observation
1)	Colour	Dark Brown
2)	Odour	Chocolate
3)	Taste	Slightly Bitter
4)	Mouthfeel	Smooth and Pleasant
5)	Appearance	Glossy, Even Shine, No Streaks, Dots, Crack

Table 1.1: Result of Organoleptic Properties.

1.2) pH:

Using pH meter, the pH of the chocolate formulation was determined to be pH = 5.89.

1.3) Blooming Test:

Sr. No.	Test	Result
1)	Fat Bloom	No
2)	Sugar Bloom	No

Table 1.3: Result of blooming test.

1.4) Hardness:

The Monsanto Hardness Tester was used to determine the hardness of chocolate formation. The observed results are shown in table 1.3.

Sr. No.	Initial reading	After breakage of chocolate	Hardness present in the chocolate
1)	0	2	2kg/cm^2

Table 1.4: Result of hardness test.

1.5) Stability test:

The organoleptic characteristics of the formulation were examined at the conclusion of the month. The observed results are listed in the table.

Sr. No.	Parameter	Storage Condition	At the time of preparation	After the one month
1)	Colour	28^0C (Regulated)	Brown	Nothing modified
2)	Odour		Delicious chocolate	
3)	Taste		Slight Bitter	
4)	Mouth feel	25^0C	Smooth and pleasant	Nothing modified
5)	Appearance		Even, Shine, No Streaks, Dot, Cracks.	

Table 1.5: Result of stability test.

1.6) Weight variation determination:

Average weight of 3 formulations calculated to be = **W1+W2+W3**

5

= 5.10+4.80+6.30 5

= 3.24

1.7) Dimensions:

It was measured by Vernier's calipers.

Sr. No.	Parameters	Result
1)	Height	1.4 + 0.2
2)	Diameter	2.2 + 0.1

Table 1.7: Result of dimensions study.

Conclusion:

This study explored making healthy chocolate by adding herbal ingredients like Vitex, Cinnamon, Ashwagandha, Shatavari, Fennel, and Ginger. These herbs are known for supporting hormone balance, reducing stress, improving sugar metabolism, and easing menstrual discomfort.

The chocolates were tested for taste, texture, appearance, stability, and safety. Among all the samples, Formulation 2 (F2) performed the best. It had a pleasant sweet taste, stable pH, good shelf life, and was safe for consumption without side effects.

The chocolate had a smooth, creamy texture and did a great job masking the bitter taste of some herbal powders. Overall, this natural chocolate could serve as a nutritious, tasty, and safe way to deliver herbal medicines, especially for women's health issues like hormonal imbalance, high cholesterol, and blood sugar—while also reducing menstrual cramps.

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