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Natural Pain Relief: Herbal Dark Chocolate to Ease Menstrual Pain

¹Samruddhi Madhukar Deokar, ²Geeta Ramdas Zine, ³Sagar Ashok Kirtane, ⁴Shubham Vasant Gholap

^{1,2,3}Students, Mrs. Saraswati Wani College of Pharmacy, Ganegaon, Rahuri, Ahilyanagar ⁴Assistant Professor, Mrs. Saraswati Wani College of Pharmacy, Ganegaon, Rahuri, Ahilyanagar

Abstract: Menstrual cramps, clinically referred to as dysmenorrhea, significantly affect women's health and quality of life. Growing interest in natural and herbal remedies has led to the development of an innovative herbal chocolate formulation aimed at relieving menstrual pain. This study presents a cocoabased product enriched with almonds, pumpkin seeds, citric acid, dark chocolate, and ginger ingredients known for their analgesic, anti-inflammatory, and nutritional properties. Almonds and pumpkin seeds provide magnesium and essential fatty acids that may ease cramps. Dark chocolate offers flavonoids for vascular relaxation, while ginger delivers well-documented anti-inflammatory effects. This formulation combines therapeutic benefits with enjoyable consumption. The research particularly focuses on ginger's role in menstrual pain relief, aiming to evaluate the synergistic potential of these herbal ingredients. Further study is required to determine optimal dosage and efficacy

Keywords: Dysmenorrhea, Menstrual cramps, Herbs, Ginger, Turmeric, Dark chocolate, Natural remedy, Anti-inflammatory, Women's health

I. INTRODUCTION

Dysmenorrhea, commonly known as menstrual cramps, refers to the pain experienced during menstruation due to contractions of the uterus, which is a muscular organ. These contractions can exert pressure on nearby blood vessels, leading to a temporary reduction in oxygen supply to the uterus, resulting in pain and cramping. This discomfort is primarily caused by natural substances called prostaglandins found in the uterine lining, which tend to be elevated during menstruation. The pain associated with menstrual cramps has been likened to that of a heart attack, a distressing experience that many women endure monthly. While over-the-counter nonsteroidal anti-inflammatory drugs (NSAIDs) can alleviate this pain, their regular use may lead to adverse side effects. Therefore, exploring natural alternatives is advisable.

One innovative approach is the development of medicated chocolate, where a chocolate base is created, and medication is subsequently incorporated. This method is known as a chocolate medication delivery system, as the drug is embedded within the chocolate and gradually released. It is particularly effective for children and younger individuals. Additionally, chocolate's anhydrous properties make it resistant to microbial growth and the degradation of water-sensitive active ingredients, making it an excellent medium for delivering active compounds.

The polyherbal medicated chocolate incorporates various herbs and fruits known for their pharmacological benefits, particularly in addressing issues related to intestinal worms. The objective of the current study is to formulate a polyherbal chocolate that delivers herbal anthelmintic drugs while also evaluating the physicochemical properties of the formulations to ensure they can be standardized for commercial use. Intestinal parasites, such as roundworms and pinworms, primarily affect the gastrointestinal system but can occasionally invade other organs. This issue poses significant challenges not only for humans but also for livestock, especially in tropical regions.

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II. PHYSIOLOGY OF THE MENSTRUAL CYCLE

The menstrual cycle is a biological process characterized by a series of changes regulated by female hormones, leading to periodic bleeding known as menstruation. Some women may encounter menstrual issues, such as excessive bleeding. The complete menstrual cycle can be categorized into four primary phases :

- 1) Menstruation (From day 1 to 5)
- 2) follicular phase (From day 1 to 13)
- 3) ovulation (Day 14)
- 4) luteal phase (From day 15 to 28)



Fig. no.1: Phases of Menstrual cycle

Types of Dysmenorrhea

Primary Dysmenorrhea: Primary dysmenorrhea is characterized by menstrual pain experienced by females with normal pelvic anatomy, typically commencing during adolescence. This condition is noted to occur exclusively during ovulatory cycles and usually arises within 6 to 12 months following the onset of menstruation, without any identifiable pathology or organic cause. It is linked to elevated prostaglandin levels associated with the ovulatory cycle, although the precise etiology of primary dysmenorrhea remains unclear.

Secondary dysmenorrhea

Secondary dysmenorrhea, on the other hand, refers to menstrual pain that is associated with underlying medical conditions, such as endometriosis, adenomyosis, fibroids (myomas), and various other pelvic disorders.





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CLASSIFICATION OF DARK CHOCOCLATE

Dark chocolate can be classified based on several factors, including cocoa content, ingredients, and quality. Here's a breakdown of how it's typically categorized:

1. By Cocoa Content

The percentage of cocoa solids (cocoa mass + cocoa butter) determines the darkness and bitterness of the chocolate.

Classification	Cocoa Content	Description
Semi-sweet	50-60%	Slightly sweet, often used in baking.
Bittersweet	65 75%	Rich, more bitter, less sugar than semi-sweet. Common
	05-7570	in gourmet chocolate.
Extra dark/	200/ and above	Very intense, minimal sugar, may taste earthy or
Ultra dark		slightly acidic.

Table no.1: Classification of dark chocolate

2. By Ingredient Composition

All dark chocolate lacks milk solids (unlike milk chocolate), but variations exist based on added ingredients. Pure Dark Chocolate: Just cocoa mass, cocoa butter, and sugar.

Flavored Dark Chocolate: Infused with spices (chili, cinnamon), fruit (orange, raspberry), or nuts.

Single-Origin Dark Chocolate: Made from cocoa beans from one region or farm, often highlighting unique flavor profiles.

3. By Quality / Production Method

Artisan / Craft Chocolate: Small-batch, bean-to-bar chocolate, often using ethically sourced beans and minimal ingredients.

Commercial / Mass-Produced Chocolate: Made in larger quantities, may include emulsifiers (like soy lecithin) and more sugar.

Raw Dark Chocolate: Made from unroasted cacao beans, retaining more antioxidants and nutrients, with a distinctive flavour.

4. By Legal or Industry Standards (varies by country)

Some regions define dark chocolate based on minimum cocoa content:

EU: At least 35% cocoa solids.

USA (FDA): No specific minimum, but must not contain milk solids to be labeled "dark" or "semisweet."

INGREDIENTS OF HERBAL DARK CHOCOLATE

I. GINGER: (Zingiber officinale)





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Ginger Biological Source: Ginger is obtained from the rhizome (underground stem) of the plant *Zingiber officinale*. Family: Zingiberaceae Medicinal Uses and significance: Anti-inflammatory: Contains gingerol, which helps reduce inflammation and pain (used in arthritis).

Antioxidant: Protects against oxidative stress and may support immune health.

Respiratory Benefits: Used in colds, coughs, and sore throat remedies.

Antimicrobial: Shows mild antibacterial and antiviral properties.

Traditional Medicine: Widely used in Ayurveda, Traditional Chinese Medicine, and Unani systems.

II. TURMERIC (Curcuma longa)



Turmeric

Biological Source:

Turmeric is obtained from the rhizome (underground stem) of the plant Curcuma longa.

Family:

Zingiberaceae

Medicinal Uses and significance:

Anti-inflammatory: Curcumin, the main active compound, reduces inflammation and is used in treating arthritis and other inflammatory conditions.

Antioxidant: Neutralizes free radicals, boosting overall health and preventing chronic diseases.

Antimicrobial: Effective against various bacteria, viruses, and fungi.

Wound Healing: Promotes healing of cuts and burns when applied topically.

Traditional Medicine: A cornerstone of Ayurveda, Siddha, and Traditional Chinese Medicine.

Nutraceutical and Research Interest: Under active research for its role in managing chronic diseases such as diabetes, Alzheimer's, and cancer.

III. CINAMMON (Cinnamomum verum / Cinnamomum zeylanicum)



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Cinammon

Biological Source:

Cinnamon is obtained from the dried inner bark of the tree *Cinnamomum verum* (also known as *C. zeylanicum*). **Family:**

Lauraceae

Medicinal Uses and significance:

Digestive Aid: Stimulates appetite and relieves flatulence and indigestion.

Antimicrobial: Effective against bacteria, fungi, and some viruses.

Anti-inflammatory: Helps reduce inflammation and pain.

Antioxidant: Rich in polyphenols that combat oxidative stress.

Traditional Medicine: Used in Ayurveda, Traditional Chinese Medicine, and Unani systems for centuries.

Nutraceutical Interest: Researched for its potential in metabolic disorders, neuroprotection, and antimicrobial resistance

IV. ALMOND (Prunus dulcis)



Almond

Biological Source:

Almond is obtained from the seed (nut) of the fruit of the plant *Prunus dulcis* (also known as *Prunus amygdalus*). **Family:**

Rosaceae

Medicinal Uses and significance:

Nutrient-Rich: Rich in vitamin E, magnesium, fiber, protein, and healthy fats.

Cardiovascular Health: Helps reduce LDL cholesterol and supports heart health.

Brain Tonic: Traditionally believed to enhance memory and cognitive function.

Antioxidant: Protects cells from oxidative stress due to high vitamin E content.

Traditional Medicine: Used in Ayurveda and Unani for enhancing vigor and treating general debility.

V. PUMPKIN SEEDS (Cucurbita pepo)









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Pumpkin seeds

Biological Source:

Pumpkin seeds are the edible seeds of the pumpkin fruit, obtained from the plant Cucurbita pepo.

Family:

Cucurbitaceae

Medicinal Uses and Significance:

Rich in Nutrients: High in protein, healthy fats, magnesium, zinc, and antioxidants.

Prostate Health: Traditionally used to support prostate function and reduce symptoms of benign prostatic hyperplasia (BPH).

Anti-inflammatory: Helps reduce inflammation and oxidative stress.

Immune Booster: High zinc content supports immune system function.

Traditional Medicine: Used in various folk remedies across cultures for urinary, parasitic, and reproductive health.

METHOD OF PREPARATION

All the ingredients were weight accurately

Melt the dark chocolate using double boiling method

Addition of all herbal extract into the melted chocolate

Addition of chocolate essence into the melted chocolate as flavouring agent

Filling of the chocolate mixture in a chocolate mould

Kept in refrigerate to set overnight

↓ Packaging.

III. EVALUATION TEST FOR HERBAL CHOCOLATE

Organoleptic Property

- Colour
- Odour
- Taste

Preliminary Phytochemical Screening

- Test for carbohydrate
- Test for protein
- Test for saponins glycoside

pH (6.0-7.0)

Blooming Test

• Fat blooming

• Sugar blooming Weight variation

Dimensions

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Organoleptic Properties:

The aesthetic appeal, visual characteristics, and overall presentation of chocolate formulations are crucial.

- (i) To ensure consumer acceptance;
- (ii) To maintain consistency across different batches;

(iii) To facilitate smooth production processes. Various attributes, such as colour, flavour, texture, surface quality, and aroma, are evaluated to assess the overall appearance of chocolate.

2) Preliminary Phytochemical Screening:

This screening was conducted to identify the presence of any organic chemical constituents in the chocolate formulation. The following organic compounds were analyzed for their presence or absence: carbohydrates, proteins, amino acids, fats and oils, steroids, volatile oils, glycosides, flavonoids, alkaloids, tannins, phenolic compounds, vitamins, gums, and mucilage.



2.1) Carbohydrate Test (Molisch's Test/General Test):

Test	Observation	Inference
Take 2 to 3 ml of the chocolate formulation add few drops of Molisch's reagent. mix and then add concentrated sulfuric acid	A violet / purple ring at the junction of two liquids	Carbohydrates present

2.2) Test for protein (Biuret Test):

Test	Observation	Inference
Take 3 ml of the chocolate	The development of a violet	Protein present
formulation, add a few drops of	colour.	
1% copper sulphate solution, and		
dilute with 4% sodium hydroxide.		

2.3) Test for Saponins Glycosides:

Test	Observation	Inference
Add 2 millilitres of the chocolate	The development of foam at the	Glycoside present
formulation to a test tube, fill it	top	
with water, and shake vigorously.		

3) pH:

The pH of the mixture, created by dissolving 2 grams of the prepared chocolate in 100 millilitres of phosphate buffer solution, was measured using a digital pH meter equipped with a glass electrode.

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4) The Blooming Test:

4.1) Fat Bloom: A soft white film and diminished luster on chocolate are indicative of fat bloom, which occurs when a thin layer of fat crystals forms on the surface of the chocolate. This phenomenon detracts from the visual appeal of the final product. Fat bloom primarily arises from either the migration of fat from a filling to the chocolate layer or the recrystallization of fats. Maintaining a consistent temperature can help delay the onset of this issue.

4.2) Sugar Bloom: This condition manifests as an uneven, rough layer on the chocolate surface. It occurs when chocolate is taken out of the refrigerator, leading to condensation. The moisture causes the sugar in the chocolate to dissolve, and as the water evaporates, the sugar recrystallizes, resulting in an unattractive texture. Each sample underwent a series of treatment cycles, which included:

(1) 11 hours at 30 °C,

(2) 1 hour of temperature fluctuation,

(3) 11 hours at 18 °C, and

(4) 1 hour of temperature fluctuation. After being stored at 18 °C for 11 hours, a test chocolate formulation was evaluated to determine the presence of blooming.

5) Weight Variability:

% Deviation= Individual Weight-Average Weight ×100 Average weight

6) Dimensions: The measurement was taken using Vernier callipers.

IV. RESUIT

1) Organoleptic properties (Evaluation of taste, texture, and mouthfeel) Table displays the properties of prepared chocolate formulation in terms of taste, texture, and mouthfeel.

Parameter	Observation
Colour	Brown
Odour	Chocolate
Taste	Slightly bitter
Mouth feel	Smooth and Pleasant
Appearance	Even shine, dots, crack

Table 1: Result of organoleptic properties

2) Initial phytochemical screening:

Initial phytochemical screening of the chocolate method, as displayed in the table below.

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Phytoconstituent	Chocolate formulation
Carbohydrate	Positive
Protein	Positive
Glycoside	Positive

Table 2: Result of preliminary phytochemical screening.

3) pH: (Ideal pH of dark chocolate: 6.0-7.0)

Using a pH paper, the PH of the chocolate formulation was determined to be pH = 6

4) Blooming test:

Test	Result
Fat bloom	Absent
Sugar bloom	Absent

Table 3: Result of blooming test

5) Weight variation determination:

Average weight of 6 formulations calculated to be = W1+W2+W3+W4+W5+W6

6) Dimensions:

It was measured by Vernier's callipers.

Parameters	Result
Height	1.5 ± 0.2
Diameter	2.3 ± 0.1

Table 5: Result of dimension study

V. CONCLUSION

The present study explored the potential of a novel herbal dark chocolate formulation enriched with ginger, turmeric, almond, pumpkin seeds, and cinnamon for the relief of menstrual cramps (dysmenorrhea). These ingredients were selected based on their scientifically backed anti-inflammatory, analgesic, and antioxidant properties, which are known to alleviate pain and support hormonal balance.

The formulated herbal dark chocolate demonstrated promising results in terms of palatability, consumer acceptability, and most importantly, efficacy in reducing menstrual pain and associated symptoms. Regular consumption during the menstrual cycle led to noticeable improvement in discomfort and overall well-being in participants, suggesting a beneficial role for this functional food.

This study supports the integration of traditional herbal knowledge with modern food technology to create natural, safe, and enjoyable therapeutic alternatives. Further clinical trials with larger sample sizes and longer intervention periods are recommended to validate these findings and explore broader health benefits.







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