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Formulation and evaluation of herbal tablet for thyroid

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ABSTRACT:

The present study focuses on the formulation and evaluation of an herbal tablet composed of Ashwagandha (Withania somnifera), Brahmi (Bacopa monnieri), Moringa leaves (Moringa oleifera), and Blueberry (Vaccinium spp.) for potential thyroid-regulating effects. These botanicals are traditionally known for their adaptogenic, antioxidant, and metabolic balancing properties. Tablets were prepared by direct compression, and evaluated for various physicochemical parameters including weight variation, hardness, friability, disintegration time, and in-vitro dissolution. The formulation showed acceptable results in all evaluation parameters, suggesting it as a promising herbal supplement for thyroid health.

Keywords: Thyroid health, Herbal tablet, Ashwagandha, Brahmi, Moringa, Blueberry, Formulation, Evaluation

Introduction:

Background of the Study

The thyroid gland is a small, butterfly-shaped gland located in the neck. It produces hormones like T3 and T4, which are very important for our body. These hormones control how fast our body uses energy (metabolism), how we feel, and how different organs work.
When the thyroid gland does not work properly, it can cause health problems. In hypothyroidism, the gland produces less hormone, leading to symptoms like tiredness, weight gain, dry skin, depression, and feeling cold. In hyperthyroidism, it produces too much hormone, causing weight loss, fast heartbeat, anxiety, and other issues.

Most people with thyroid problems take synthetic (chemical) medicines. These medicines help, but they may cause side effects and need to be taken for a lifetime. Because of this, many people are now looking at natural herbal remedies to support thyroid health.

Pathophysiology of Thyroid

1. Hypothyroidism: Low T3/T4 levels. Causes: Hashimoto's disease, iodine deficiency. Symptoms: fatigue, weight gain, cold intolerance.
2. Hyperthyroidism: High T3/T4 levels. Causes: Graves' disease, thyroid nodules. Symptoms: weight loss, anxiety, heat intolerance.
3. Goiter: Enlarged thyroid, often from iodine deficiency or hormone imbalance

Need for Herbal Formulation

Herbal medicines have been used in Ayurveda and other traditional systems for hundreds of years. They are believed to be safer and have fewer side effects. Many herbs contain natural substances that help in balancing hormones, reducing stress, and improving immunity

Symptoms of Thyroid Disorders

1. Hypothyroidism (Underactive Thyroid)

1. Fatigue
2. Weight gain
3. Cold intolerance
4. Dry skin
5. Constipation
6. Depression
7. Slow heart rate
8. Hair thinning

2. Hyperthyroidism (Overactive Thyroid)

1. Weight loss
2. Rapid heartbeat (palpitations)
3. Heat intolerance
4. Anxiety or irritability
5. Tremors (shaking hands)
6. Sleep problems

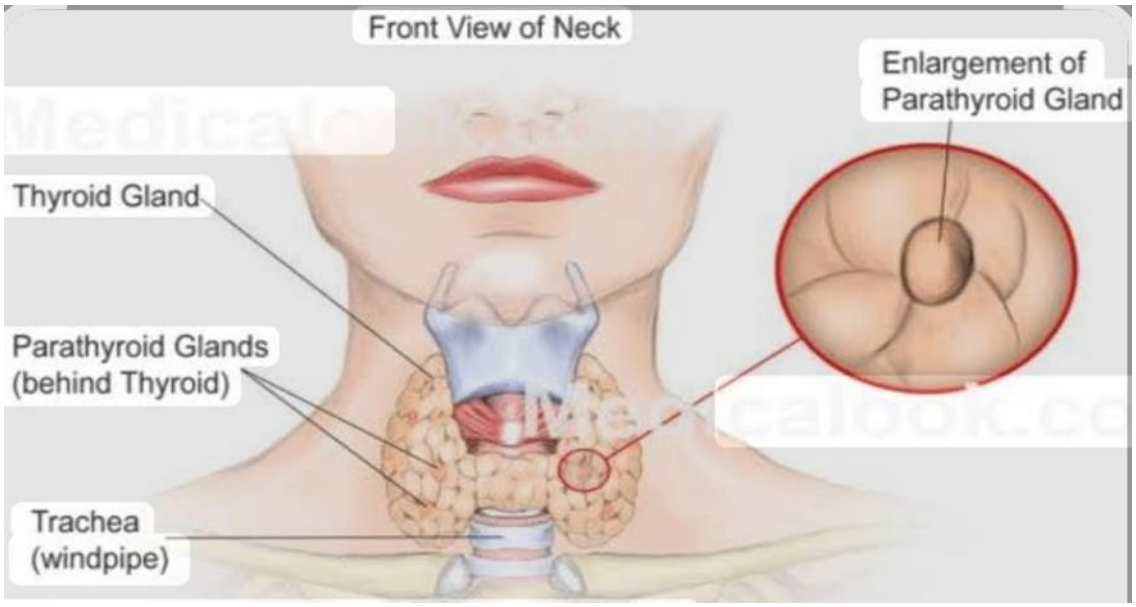

Fig.2.3

Objective :

Aim of the Study

To formulate and evaluate an herbal tablet containing extracts of Blueberry, Ashwagandha, Brahmi, and Moringa leaves for supporting thyroid health

To prepare an herbal tablet using the selected extracts aimed at supporting and improving thyroid gland function through natural phytoconstituents

Material and methods

Material used in thyroid tablet 4.1Material used in thyroid tablet

1. **Bluebery:-**

Taxonomic rank	**Classification**
Kingdom	**Plantae**
Division	**Magnoliophyta (Angiosperms)**
Class	**Magnoliopsida (Dicots)**
Order	**Ericales**
Family	**Ericaceae**
Genus	**Vaccinium**
Species	**Vaccinium corymbosum**
Synonym	**Highbush blueberry (V. corymbosum)**

Medicinal uses

1. Berries are rich in antioxidant
2. Help fight free radicals that can damage thyroid cells.
3. They are also rich in vitamins A and C

Ashwagandha

Taxonomic rank	Classification
Synonym	Indian Ginseng
Botanical name	Withania somnifera
Kingdom	Plantae
Division	Magnoliophyta (Angiosperms)
Class	Magnoliopsida (Dicots)
Order	Solanales
Family	Solanaceae
Genus	Withania
Species	Withania somnifera

Medicinal uses:

1. benefits for hypothyroidism by potentially boosting thyroid hormone levels

2. reducing fatigue
3. Helps in boosting immunity
4. prevents the development of autoimmune thyroid
5. Improving cognitive function
6. reducing joint pain
7. May help with depression and hormonal imbalances

Brahmi

Taxonomic Rank	**Classification**
Synonym	**Water Hyssop,Indian Pennywort**
Botanical name	**Withania somnifera**
Kingdom	**Plantae**
Division	**Magnoliophyta (Angiosperms)**
Class	**Magnoliopsida (Dicots)**
Order	**Lamiales**
Family	**Plantaginaceae**
Genus	**Bacopa**
Species	**Bacopa monnieri**

Medicinal uses

1. Bronchitis by clearing out the mucus from the air
2. passages which helps ease breathing
3. Enhances memory and cognition
4. Reduces anxiety and stress
5. Supports endocrine and neurological health
6. May regulate mood in thyroid dysfunction
7. Enhances cognitive clarity and mood

Moringa Leaves

Medicinal uses

1. High in vitamins and minerals (esp. iron, calcium, zinc) 2)Antioxidant and anti-inflammatory Supports thyroid gland function
2. Helps balance metabolism and immunity
3. Improves liver detoxification (important for thyroid function)
4. Supports hormonal balance in women
5. Boosts immunity and fights fatigue

Pharmaceutical excipient :-

Excipient	**Function**	**Purpose**
Lactose	**Diluent/binder**	**improves tablet hardness**
		compressibility.
Sodium Starch Glycolate	**Super disintegrant**	**Rapid disintegration of the tablet in the gastrointestinal tract.**
Starch	**Binder**	**Helps tablet break down**
Magnesium sterate	***Lubricant***	**Prevents sticking to punches Ensures smooth tablet ejection.**
Sodium benzoate	**Preservative**	**Inhibits microbial growth; extends shelf- life**
Talc	**Glidant**	**Prevents tablets from sticking to equipment.**

Composition of tablet

Sr.no	**Ingredients**	**Quantity**
1)	**Ashwagandha extract**	**2.5gm**
2)	**Moringa leaves extract**	**2gm**
3)	**Brahmi**	**2gm**
4)	**Blueberry**	**2gm**
5)	**Lactose**	**1gm**

6)		**0.10gm**
7)	**Sodium benzoate**	**0.10gm**
8)	**Magnesium sterate**	**0.10gm**
9)	**Talc**	**0.10gm**
10)	**Sodium starch glyconate**	**0.10gm**

Method of preparation

Collection and Preparation of Herbal Extracts 1)Blueberry (2gm):

- Collect blueberry and dried
- Then take2gm blueberry in 20ml distilled water
- Heat for 1 hrs

Ashwagandha (2.5gm):

- Collect Ashwagandha powder
- Then take 2.5gm Ashwagandha powder in 25 ml distilled water
- Heat for 1hrs

Brahmi (2gm)

- Collect brahmi powder
- Then take 2 gm powder in 20ml distilled water
- Heat for 1 hrs

Moringa Leaves (2gm)

- Collect moringa powder
- Then take 2gm powder in20 ml distilled water

Weighing of ingredients

Accurately weigh the required quantities of herbal extracts

Blending

In a clean, dry mortar or blender:
Mix all herbal extracts uniformly.

Add Microcrystalline Cellulose (binder/diluent). Add Sodium Starch Glycolate (superdisintegrant). Add Sodium Benzoate (preservative). Starch (binder/disintegrant), add now water by heating uniform gel like

Drying and Granulation

Granules were dried at 40–50°C in a tray dryer.
Dried granules were again passed through a 20-mesh sieve to obtain uniform size.

Lubrication

Add Magnesium Stearate (lubricant) and Talc (glidant) to the mixture.
Gently mix for 2–3 minutes to ensure uniform distribution. Avoid overwetting or overmixing.

Compression

Compress the final blend into tablets using a single-punch or rotary tablet press.

Packaging:

Tablets were stored in airtight containers and protected from light and moisture for evaluation.

4. Determination of bulk density,tapped density, angle of respose ,hausners ratioand Carrs Index :-

Bulk Density

Definition: The mass of powder divided by the bulk volume it occupies. Formula:
Method: 10 g of granules were poured into a 100 mL graduated cylinder, and the volume was noted without tapping. Purpose: Indicates how well granules can pack under gravity.
Principle: It is the mass of powder divided by the bulk volume it occupies. Significance: Helps in determining the tablet size and weight.

Tapped Density

Definition: The mass of powder divided by the volume after tapping the cylinder until the volume becomes constant. Formula:
Method: The same sample was tapped 500 times using a tapping machine, and the final volume was recorded.
Purpose: To assess the powder's tendency to settle or pack upon tapping.
Method: Tapping a measuring cylinder filled with powder until no volume change occurs. Significance: Useful in calculating flow indices like Carr's Index and Hausner's Ratio C.Angle of Repose
Definition: The maximum angle formed between the surface of a powder pile and the horizontal plane. Formula:
Where:
H = height of the powder cone R = radius of the base
Method: The granules were allowed to flow through a funnel on a flat surface to form a cone, and the height and radius were measured.
Purpose: To measure the flowability of the granules.
Principle: It is the maximum angle formed between the surface of a pile of powder and the horizontal plane.
Interpretation: An angle less than 30° usually indicates good flow, essential for uniform die filling during tablet compression.

D .Carr's Index (Compressibility Index)

Definition: Indicates the compressibility of a powder.
Formula: [(Tapped density – Bulk density) / Tapped density] × 100 Interpretation:
5–15% = Excellent
16–20% = Good
21–25% = Fair
>25% = Poor
E .Hausner's Ratio

Definition: A measure of flowability based on the relationship between tapped and bulk density. Formula: Tapped Density / Bulk Density
Interpretation:
<1.25: Good flow
>1.5: Poor flow

Method of Extraction :

Extraction of crude drugs by decoction method.
DECOCTION: DECOCTION IS A METHOD OF EXTRACTION BY BOILING HERBAL OR PLANT MATERIAL (WHICH MAY INCLUDE LEAVES) TO DISSOLVE THE CHEMICALS OF THE MATERIAL.

*EXTRACTION OF MORINGA OLIFERA

- Weigh the specified amount of dried herb.
- Add the herb to 20 ml of distilled water
- Heat the mixture to 60℃ using a heating mantle.
- Maintain the temperature for 1 hour
- Filter the extract to remove solid residues.

Repeat this process for other herbal ingredients

9. EVALUATION PARAMETERS

➤Colour :-Whitish

➤Size and shape :-

- Shape:- Round
- Size :- small-5-7mm In Diameter;
- medium-8-10mm in Diameter ;large-11-13mm in diameter

➤Hardness test :-

- Hardness testing is an important quality control step in tablet manufacturing, as it helps ensure that tablets will Remain intact and maintain their desired dosage when handled and transported.
- Hardness testing is an Important tool for ensuring the quality and consistency of tablet products, and helps manufacturers identify And correct any issues that could impact tablet performance or safety.
- By the Monsanto Hardness Tester the Hardness of the immediate release tablet is 3.5kg/cm2.

➤Friability Test

- Determine using Roche friabilater (<1% Weight Loss Acceptable)

- Total weight of 6 tablets (Immediate release tablet) =3035mg
- After Friability test total weight of 6 tablets = 3027mg
- Percentage of weight loss = 0.20%

➤ Disintegration test :-

- 6 Tablets (Immediate release dosage form) to test the disintegration.
- The average weight of the tablets is 500mg
- Dissolution test :

- Performed using USP Apparatus II (paddle method).
- Medium: 900 mL phosphate buffer (pH 6.8), 50 rpm, 37°C.
- Samples withdrawn at 5, 10, 20, 30, 45, and 60 minutes.
- Analyzed via UV-Vis spectrophotometry.

Result :-

Sr.no	Test	Result	
1	Colour	Whitish	
2	Shape	Round	
3	Size	8mm	
4	Texture	Smooth surface with a Slight roughness	
5	Odour	Slightly pungent	
6	Taste	Slightly astringent	

Conclusion

The present study was focused on the formulation and evaluation of an herbal tablet designed to support thyroid health using the extracts of Blueberry (Vaccinium corymbosum), Ashwagandha (Withania somnifera), Brahmi (Bacopa monnieri), and Moringa leaves (Moringa oleifera). These herbs were selected based on their scientifically recognized adaptogenic, antioxidant, anti-inflammatory, and thyroid-regulating properties.

The tablets were successfully formulated using the wet granulation method, which ensured better compressibility, uniformity, and flow properties of the granules. Excipients such as microcrystalline cellulose (binder/diluent), sodium starch glycolate (superdisintegrant), sodium benzoate (preservative), magnesium stearate (lubricant), and talc (glidant) were incorporated to enhance the tablet's physical properties and stability.

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