# Formulation & Evaluation of Anti-Diabetic Powder Using Fenugreek & Cinnamon

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## Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Herbal medicines have gained considerable importance due to their safety, efficacy, affordability, and minimal side effects when compared to synthetic anti-diabetic drugs. The present review focuses on the formulation and evaluation of an anti-diabetic herbal powder prepared using Fenugreek (Trigonella foenum-graecum) and Cinnamon (Cinnamomum verum). Fenugreek seeds are rich in alkaloids, flavonoids, saponins, and steroidal sapogenins which help regulate glucose metabolism and improve insulin sensitivity. Cinnamon bark contains cinnamaldehyde, eugenol, cinnamic acid, and procyanidins which exhibit hypoglycemic and antioxidant activities. The formulation process involved collection, drying, grinding, mixing, and evaluation of the herbal ingredients. Preliminary phytochemical screening confirmed the presence of alkaloids, flavonoids, phenols, tannins, saponins, and terpenoids in both extracts. Evaluation parameters such as moisture content, angle of repose, pH, bulk density, tapped density, Hausner's ratio, and Carr's index were determined to assess the quality and flow properties of the powder formulation. The formulated anti-diabetic powder showed acceptable physicochemical properties with a moisture content of 1.9%, angle of repose of 19°, pH of 4.5, bulk density of 0.43 g/ml, tapped density of 0.65 g/ml, Hausner's ratio of 1.51, and Carr's index of 33.84%. The study indicates that the herbal formulation possesses promising anti-diabetic potential and can be considered as a natural supportive therapy for diabetes management.

**Keywords:** Diabetes mellitus, Fenugreek, Cinnamon, Herbal powder, Phytochemical screening, Anti-diabetic activity.

## 1. Introduction

Diabetes mellitus is one of the most common endocrine disorders affecting millions of people worldwide. It is characterized by elevated blood glucose levels due to inadequate insulin secretion or impaired insulin action. Long-term diabetes may lead to severe complications such as cardiovascular disorders, kidney failure, neuropathy, retinopathy, and delayed wound healing. Modern anti-diabetic drugs are effective but often associated with adverse effects including hypoglycemia, gastrointestinal disturbances, weight gain, and liver toxicity. Therefore, there is growing interest in herbal remedies for the management of diabetes.

Medicinal plants have been used in traditional systems of medicine such as Ayurveda for centuries. Herbal formulations are considered safer, economical, and more accessible to the general population. Fenugreek and Cinnamon are among the most widely used medicinal plants with scientifically proven anti-diabetic properties.

Fenugreek (Trigonella foenum-graecum) belongs to the family Fabaceae and is commonly known as methi. Fenugreek seeds contain soluble fibers, alkaloids, flavonoids, and saponins which help delay glucose absorption and improve insulin sensitivity. Cinnamon (Cinnamomum verum), commonly known as dalchini, belongs to the family Lauraceae and contains cinnamaldehyde, eugenol, and polyphenols that exhibit insulin-mimetic activity and antioxidant effects.

The combination of Fenugreek and Cinnamon in powder form may provide synergistic anti-diabetic action. The present review highlights the formulation, phytochemical screening, and evaluation parameters of anti-diabetic herbal powder prepared using these medicinal plants.

## 2. Literature Review

Several researchers have reported the anti-diabetic potential of Fenugreek and Cinnamon.

| Sr. No. | Author | Findings |
|---|---|---|
| 1 | Sharma al. | Fenugreek seeds reduce blood glucose and improve glucose tolerance due to high fib content. |
| 2 | Khan et a | Cinnamon improves insulin sensitivity and lowers fasting blood sugar levels. |
| 3 | Gupta et a | Herbal formulations containing Fenugreek showed significant hypoglycemic activity diabetic rats. |
| 4 | Rao et al. | Cinnamon bark extract exhibited antioxidant and anti-inflammatory properties useful diabetes management. |
| 5 | Patil et al. | Polyherbal anti-diabetic formulations provide better therapeutic effect with minimal si effects. |

Traditional Indian methods to control blood sugar include dietary modifications, use of low glycemic foods, regular exercise, yoga, and consumption of medicinal herbs such as Fenugreek, Cinnamon, Neem, Bitter gourd, and Amla.

### Traditional Approaches to Blood Sugar Control

1. **Balanced Diet:** Whole grains, vegetables, legumes, and fruits help maintain glucose levels.
2. **Low Glycemic Foods:** Foods with low glycemic index prevent sudden spikes in blood glucose.
3. **Physical Activity:** Walking, yoga, and exercise improve insulin sensitivity.
4. **Use of Medicinal Herbs:** Herbs like Fenugreek and Cinnamon are widely used in Ayurveda for diabetes management.

## 3. Aim and Objectives

### Aim

To formulate and evaluate an herbal anti-diabetic powder using Fenugreek and Cinnamon.

### Objectives

1. To prepare anti-diabetic herbal powder using medicinal plant materials.
2. To perform phytochemical screening of Fenugreek and Cinnamon extracts.
3. To evaluate physicochemical parameters of the prepared formulation.
4. To study the potential role of herbal medicines in diabetes management.

## 4. Plant Profile

### 4.1 Fenugreek

| Parameter | Description |
|---|---|
| Botanical Name | Trigonella foenum-graecum |
| Common Name | Methi, Fenugreek |
| Family | Fabaceae |
| Order | Fabales |
| Kingdom | Plantae |
| Genus | Trigonella |
| Part Used | Seeds |
| Active Constituents | Saponins, Alkaloids, Flavonoids, Steroidal sapogenins |
| Uses | Culinary, Herbal medicine, Ayurveda, Supplements |

### Medicinal Importance of Fenugreek

Fenugreek seeds contain soluble fiber which delays carbohydrate absorption and improves glucose tolerance. The alkaloid trigonelline and amino acid 4-hydroxyisoleucine stimulate insulin secretion and reduce blood glucose levels.

### 4.2 Cinnamon

| Parameter | Description |
|---|---|
| Botanical Name | Cinnamomum verum |
| Common Name | Dalchini |
| Family | Lauraceae |
| Order | Laurales |
| Kingdom | Plantae |
| Genus | Cinnamomum |
| Part Used | Bark |
| Active Constituer | Cinnamaldehyde, Eugenol, Cinnamic acid, Coumarin, Procyanidi |
| Uses | Culinary, Aromatherapy, Cosmetics |

### Medicinal Importance of Cinnamon

Cinnamon possesses anti-diabetic, antioxidant, antimicrobial, and anti-inflammatory properties. It helps improve insulin receptor activity and promotes glucose uptake by cells.

## 5. Materials and Instruments

### Materials Required

1. Fenugreek seeds
2. Cinnamon bark
3. Distilled water
4. Mortar and pestle
5. Measuring cylinder
6. Weighing balance
7. Glassware

### Instruments Used

- Electronic balance
- Measuring cylinder
- pH meter
- Sieve
- Mortar and pestle
- Funnel
- Spatula

## 6. Methodology

### 6.1 Collection of Herbs

### Collection of Fenugreek Seeds

- Fenugreek seeds were collected from the local market.
- The seeds were dried under shade for 5–6 days.
- Dried seeds were powdered using mortar and pestle.

### Collection of Cinnamon Bark

- Cinnamon bark was collected from the local market.
- The bark was dried under shade for one to two weeks.
- The dried bark was powdered using mortar and pestle.

### 6.2 Preparation of Extracts

The powdered plant materials were separately subjected to extraction using suitable solvents. The extracts were filtered and concentrated for phytochemical screening.

## 7. Phytochemical Screening

Phytochemical tests were performed to identify the presence of active constituents in Fenugreek and Cinnamon extracts.

### Tests Performed

1. Test for Alkaloids
2. Test for Flavonoids
3. Test for Phenols
4. Test for Tannins
5. Test for Saponins
6. Test for Terpenoids

### Observation Table

| Sr. No. | Test | Observation | Inference |
|---|---|---|---|
| 1 | Alkaloids | Precipitate formed | Present |
| 2 | Flavonoids | Yellow precipitate formed | Present |
| 3 | Phenols | Bluish black precipitate | Present |
| 4 | Tannins | Precipitate formed | Present |
| 5 | Saponins | Froth formed | Present |
| 6 | Terpenoids | Colour changed | Present |

The results confirmed the presence of important phytoconstituents responsible for anti-diabetic activity.

## 8. Formulation of Anti-Diabetic Powder

### Formula

| Ingredient | Quantity |
|---|---|
| Fenugreek seed powder | 50 g |
| Cinnamon bark powder | 50 g |

### Procedure

1. The required quantities of Fenugreek seed powder and Cinnamon bark powder were accurately weighed.
2. Both powders were sieved separately to obtain uniform particle size.
3. The powders were mixed thoroughly using geometric mixing method.
4. The prepared formulation was stored in an airtight container.

## 9. Evaluation Parameters

### 9.1 Organoleptic Properties

The prepared formulation was evaluated for colour, odour, and physical appearance.

| Parameter | Result |
|---|---|
| Colour | Yellow |
| Odour | Sweet |
| State | Solid (Discontinuous) |

### 9.2 Moisture Content

Moisture content was determined to evaluate the stability of the powder formulation.

**Result:** 1.9%

### 9.3 Angle of Repose

Angle of repose is used to determine the flow property of powder.

**Result:** 19°

The low angle of repose indicated good flow properties.

### 9.4 pH Determination

The pH of the powder dispersion was measured using a digital pH meter.

**Result:** 4.5 (Acidic)

### 9.5 Bulk Density

Bulk density is the ratio of the mass of powder to its bulk volume.

**Calculation:**

Bulk Density = Weight of Powder / Bulk Volume

= 40 / 93

= 0.43 g/ml

**Result:** 0.43 g/ml

### 9.6 Tapped Density

Tapped density is determined after mechanically tapping the measuring cylinder containing the powder.

**Calculation:**

Tapped Density = Weight of Powder / Tapped Volume

= 40 / 61

= 0.65 g/ml

**Result:** 0.65 g/ml

### 9.7 Hausner's Ratio

Hausner's ratio is used to evaluate powder flowability.

**Calculation:**

Hausner's Ratio = Tapped Density / Bulk Density

= 0.65 / 0.43

= 1.51

**Result:** 1.51

### 9.8 Carr's Index

Carr's index determines compressibility and flow property of powder.

**Calculation:**

Carr's Index = (Tapped Density − Bulk Density) / Tapped Density × 100

= (0.65 − 0.43) / 0.65 × 100

= 33.84%

**Result:** 33.84%

## 10. Results and Discussion

| Sr. No. | Test | Result |
|---|---|---|
| 1 | Colour | Yellow |
| 2 | Odour | Sweet |
| 3 | State | Solid (Discontinuous) |
| 4 | Moisture Content | 1.9% |
| 5 | Angle of Repose | 19° |
| 6 | pH | 4.5 |
| 7 | Bulk Density | 0.43 g/ml |
| 8 | Tapped Density | 0.65 g/ml |
| 9 | Hausner's Ratio | 1.51 |
| 10 | Carr's Index | 33.84% |

The phytochemical screening confirmed the presence of alkaloids, flavonoids, phenols, tannins, saponins, and terpenoids in the herbal extracts. These phytoconstituents are responsible for antioxidant and anti-diabetic activities. The evaluation studies demonstrated acceptable physicochemical properties of the formulation. The low moisture content indicated better stability and reduced microbial growth. The flow properties were satisfactory based on angle of repose and density studies.

Fenugreek improves insulin secretion and glucose utilization, while Cinnamon enhances insulin sensitivity and exhibits antioxidant activity. Therefore, the combination of these herbs may provide effective management of diabetes mellitus.

## 11. Conclusion

The present review concluded that the herbal anti-diabetic powder prepared using Fenugreek and Cinnamon possesses promising anti-diabetic potential. Phytochemical screening confirmed the presence of bioactive constituents such as alkaloids, flavonoids, tannins, phenols, saponins, and terpenoids. Evaluation parameters indicated acceptable stability and flow properties of the formulation.

Fenugreek and Cinnamon are valuable medicinal plants with proven therapeutic benefits in controlling blood glucose levels and improving insulin sensitivity. Herbal formulations prepared from these plants may serve as safe, economical, and effective alternatives or supportive therapies for diabetes management. Further pharmacological and clinical studies are required to validate their long-term efficacy and safety.

## 12. References

1. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. 56th ed. Pune: Nirali Prakashan; 2021. p. 12–18.
2. Sharma PP. Cosmetics: Formulation, Manufacturing and Quality Control. 5th ed. New Delhi: Vandana Publications; 2018. p. 220–228.
3. Harborne JB. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. 3rd ed. London: Chapman and Hall; 2005. p. 49–188.
4. Trease GE, Evans WC. Pharmacognosy. 16th ed. London: Saunders Elsevier; 2009. p. 135–142.
5. Khan A, Safdar M, Ali Khan MM. Cinnamon improves glucose and lipids of people with type 2 diabetes. Diabetes Care. 2003;26(12):3215–3218.
6. Basch E, Ulbricht C, Kuo G, Szapary P, Smith M. Therapeutic applications of Fenugreek. Alternative Medicine Review. 2003;8(1):20–27.
7. Grover JK, Yadav S, Vats V. Medicinal plants of India with anti-diabetic potential. Journal of Ethnopharmacology. 2002;81(1):81–100.

8. World Health Organization. Traditional Medicine Strategy 2014–2023. Geneva: WHO Publications; 2013. p. 41–55.
9. Indian Pharmacopoeia Commission. Indian Pharmacopoeia. Vol. II. Ghaziabad: IPC; 2018. p. 1124–1130.
10. Rang HP, Dale MM, Ritter JM. Pharmacology. 8th ed. Edinburgh: Elsevier; 2016. p. 377–390.