Formulation & Evaluation of Lantana carama & Cinnamon Combination Tablet

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❖ ABSTRACT

Aim of this study is to develop tablets of *Syzygium cumini* and *Cinnamomum zeylanicum* seed powder. It has been chosen to do so as there are no oral solid dosage forms of this two powder developed so far. There are numerous health benefits and nutrient properties of this seed powder, thus it can be used as a nutraceutical. Phytochemical screening of the Syzygium cumini and *Cinnamomum zeylanicum* seed powder has been conducted and the various phyto constituents present were detected. The formulations was developed with Syzygium cumini and *Cinnamomum zeylanicum* seed powder as the active ingredient and lactose, acacia, glucose, talc, magnesium stearate, hydroxy propyl methyl cellulose, sodium alginate, guar gum and stevia were used as excipients. Various evaluations tests were performed to check the stability of the tablets. The objective of study was to formulate and evaluate the nutraceutical tablets by the wet granulation methods and to study the effect of it on the various parameters. The granules were prepared and dried in air. Tablet was compressed. The compressed formulation were subjected to all studies such as appearance, thickness, weight variation, hardness and friability. The friability, weight variation, hardness, thickness, disintigration of tablet was found in acceptable range. These plants have bioactive compounds present in minute amounts. These compounds act against inflammation, diabetes, bacteria, fungi, other microbial infections, and obesity. These plants have antioxidant potential as well. This review report covers the impact of these plants on diabetes mellitus reported so far.

Lantana camara (L.) var. aculeate (family: Verbena- ceae) commonly known as unnicceti (Tamil), pulikampa (Telugu) and caturang (Hindi) is a significant weed commonly found throughout India. Traditionally the plant is used as diaphoretic, carminative, antispasmod- ic, tonic and useful in the treatment of tetanus, vitiated conditions of vata, epilepsy, gastropathy. A decoction of fresh roots is a good gargle for odontalgia and this is used by hill tribes for all types of dysentery. Powdered leaves are used for cuts, wounds, ulcers, and swellings. An infusion of the leaves is good for bilious fever, ec- zema and eruptions. The fruits are useful in fistula, pustules, tumours and rheumatism (Anonymous 1992; Ghisalberti 2000; Anonymous 2006; Kashyapa 2006). Different parts of the plant reported for pharmacologi

Keywords: Lantana camara , *Cinnamomum zeylanicum* , anti-diabetic activity , nutraceutical.

❖ Introduction :

Diabetes mellitus is a major disease around the world characterized by a serious, complex and chronic condition. This metabolic disorder affects approximately 4% of the population worldwide and is expected to increase by 5.4% in 2025 (Kim, Hyun, Choung, 2006). Diabetes mellitus, distinguished by hyperglycemia, is associated with disturbances in carbohydrate, protein and fat metabolism. Patients with diabetes mellitus have increased oxidative stress and impaired antioxidant defense systems, which appear to contribute to the initiation and progression of diabetes-associated complications.

Cinnamon is an evergreen tree belongs to Lauraceae family, which grows from 20 to 30 feet; the leaves are dark green on top and lighter green unde rneath. Fruits are black, pulpy, and aromatic. A flower is small, yellow.

The diverse, spicy aroma of cinnamon inner bark, Cinnamomum cassia, is the spice sold as cinnamon in the United States. Ceylon cinnamon, Cinnamomumzeylanicum, which is stated to as true or sweetcinnamon[11.12.] Established on the study of Zare, et al found, that cinnamon supplementation (500 mg capsules twice daily) can develop anthropometric considerations, glycemic indices, and lipid profile of patients with type 2 diabetes.[13] Cinnamon is generally used in the aroma and industries due to its smell, which can be combined into diverse varieties of foodstuffs, perfumes, and medicinal products. Overall, around 250 species have been recognized among the cinnamon genus, with trees being scattered all over the world [14]

Sr. No	Class Of Metabolite	Compound Identified
1.	Flavonoids	Quercetin, rutin, 3,5,7,4-tetrahydroxy flavanone
2.	Phenolic acids	Caffeic acid, ellagic acid, ferulic acid, gallic acid
3.	Tannins	HHDP-galloyl glucose, trigalloyl glucose
4.	Terpenes	Citronellol, geraniol, hotrienol, nerol, β-phenylethanol, phenylpropanal
5.	Anthocyanins	Cyanidin, delfinidin, petudinin

Table 1: Phytochemical compounds identified in Lantana camara leaf powder[15]

Table 2: Chemical composition of cinnamon from different parts of plant[16]

Plant Parts	**Compounds**
Fruit	Caryophyllene 9-14% and trans-Cinnamyl acetate 42-50 %
Bark	Eugenol 5-10% and Cinnamaldehyde 65-80 %
C. zeylanicum buds	Oxygenated terpenoids 9%, alpha- Bergamotene 27.38%, Terpene hydrocarbons 78%, alpha-Copaene 23.05%
Leaves	Eugenol 70-95 % and Cinnamaldehyde 1-5 %
Root bark	Camphor 60%

- **Aim :-**

Aim of this study is to develop tablets of *Lantana* camara leaf and *Cinnamomum zeylanicum* powder.

- **Objective :-**

The ultimate aim of the study is to formulate and evaluate the herbal tablet of two plants having antidiabetic and importance in Ayurveda , namely *Lantana* camara leaf and *Cinnamomum zeylanicum*

Plan Of Work :-

1) Literature Survey
2) Drug Content Profile
3) Material and Method
4) Evaluation of tablet
5) Pre Formulation Study

a) Angle Of Repose
b) Tapped Density
c) Bulk Density
d) Cars Index
e) Hausner Ratio

6) Quality Controll Test For Tablet
   a) Weight Variation
   b) Hardness Test
   c) Friability Test
   d) Thickness Test
   e) Disintigration Test

7) Result and Discussion
   Drug content profile :-

- **Contents of tablet :-**

1. Lantana :-

Fig no.1 Lantana leaf

- **Classification :-**

Kingdom: Plantae

Division: Spermtophyta

Class: Magnoliopsida

Family - Verbenaceae

Genus: Lantana

Species: Lantana camara

- **Botanical name :-** Lantana camara

- **Biological source :-** Lantana camara is an attractive ornamental shrub native to the Americas and Africa that grows readily in tropical and sub tropical habitats .it contains various toxic pentacyclic triterpenes , the most abundant of which are lantadene A, lantadene C, and icterogenin although metabolites may also be toxic .

- **Family :- Verbenaceae**

- **Parts used** :- Leaf

- **Constituents** :- The chemical composition of the essential oil of the leaves of Lantana montevidensis was β- cartophyllene (34.96%),germacrene D (25.49%), and bicyclogermacrene (9.48%) , while in the study by Sousa ital .it was β-(caryophyllene(31.5%), germacrene D(27.5%), and bicyclerecyroreno (13.9%) .

- **Medicinal properties of Lantana** :- studies conducted in India have found that Lantana leaves can display anti microbial, fungicidal and insecticieal property's . L. Camara as also ben used in traditional herbal medicines for treating varity of ailments including cancer , Antidibeties.

- **Uses :-** Lantana has several uses, both culinary and medicinal:

1. The treatment of diabetes mellitus to control glucose levels in the blood.

2. most of thre drugs are administered orali, except for a few of them,such as insuline,exenatide, and pramlintide

3. Our data mainly shoed that LC extract exerted glucose lowering activity that code be ecploted in the strigul against diabetes but also harbored toxic side effects with in pancreas that was in fine corrected apon GSSE treatment

4. The plant is used as a traditional medicine for snakebite. the plant is also used as atalisman agaist evil spirits ,a good – luck talisman for hunter's , and atalisman for the well- being of windows. In the traditional medicine of India ,the Joush of crush ouret Lanta root is used for jaundice therapy

2. Cinnamon

Fig 2 Cinnamon

- **Classification :-**

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Laurales

Family: Lauraceae

Genus: Cinnamomum

Species: Cinnamomum verum

- **Botanical name :-** *Cinnamomum zeylanicum*
- **Biological source :-** The biological source of cinnamon is the dried inner bark of trees belonging to the genus Cinnamomum, primarily Cinnamomum verum (Ceylon cinnamon) and Cinnamomum cassia (Cassia cinnamon).
- **Family :-** Lauracae
- **Parts used :-** Inner bark
- **Constituents:-** Cinnamaldehyde, Eugenol, Cinnamic Acid, Polyphenols, Proanthocyanidins, Terpenoids, Volatile Oils.
- **Medicinal properties of cinnaomon:-**

Antioxidant Properties: Cinnamon is rich in polyphenol antioxidants, which help protect the body against oxidative stress and damage caused by free radicals. These antioxidants may help reduce the risk of chronic diseases such as heart disease and cancer.

Anti-inflammatory Effects: Compounds found in cinnamon, such as cinnamaldehyde and eugenol, have been shown to have anti-inflammatory properties. Cinnamon may help reduce inflammation in the body, potentially alleviating symptoms of conditions like arthritis and inflammatory bowel disease.

Antimicrobial Activity: Cinnamon contains compounds with antimicrobial properties, which may help inhibit the growth of bacteria, fungi, and viruses. It has been traditionally used to prevent infections and treat respiratory illnesses, digestive issues, and skin infections.

Blood Sugar Regulation: Some studies suggest that cinnamon may help improve insulin sensitivity and lower blood sugar levels, making it beneficial for people with diabetes or insulin resistance. Cinnamon may also help reduce fasting blood glucose levels and improve insulin signaling in cells.

- **Uses :-**

Blood Sugar Regulation: Cinnamon may help improve insulin sensitivity and lower blood sugar levels, making it beneficial for people with diabetes or insulin resistance.

Anti-inflammatory Effects: Compounds in cinnamon have anti-inflammatory properties, which may help reduce inflammation in conditions like arthritis and inflammatory bowel disease.

Antimicrobial Activity: Cinnamon contains compounds with antimicrobial properties that may help inhibit the growth of bacteria, fungi, and viruses, aiding in the treatment of infections.

Heart Health: Cinnamon may help lower cholesterol levels, reduce blood pressure, and improve blood circulation, potentially reducing the risk of heart disease and stroke.

Digestive Support: Cinnamon can aid digestion and alleviate symptoms of gastrointestinal disorders such as indigestion, bloating, and gas.

❖ MATERIAL AND METHODS :

➢ Material :

Lantana leaf powder and Cinnamon powder was purchased from local market. Lactose, acacia, glucose, talc, magnesium stearate, Hydroxy Propyl Methyl Cellulose (HPMC), this all the excipients are collected from college chemical lab. All ingredients used were of analytical grade. [17]

➢ Methods

➢ Phytochemical Screening:

The leaf powder was subjected to phytochemical analysis by performing tests for alkaloids, cardiac glycosides, flavonoids, steroids/triterpenoids, tannins and phenols and saponins.

➢ Formulation of tablet :

Nutracuetical tablet containing the Lantana leaf powder and cinnamon powder were prepared by wet granulation method. The both powders was evaluated for angle of repose, bulk density, tapped density and Carr's index.

❖ EVALUATION OF TABLETS

➢ Pre-compressional studies

In development of new dosage form, preformulation study is the most important step in the potential drug development. It is investigation step in the drug development to obtained information on the known properties of compound and the proposed development schedule. So, this preformulation investigation confirm that there are no significant barriers to compound development. Pre-compressional parameters were studied like angle of repose, bulk density, tapped density, compressibility indices etc.

1) Angle of repose

Angle of repose is the maximum angle that can be obtained between the freestanding surface of powder heap and the horizontal plane. Fixed funnel method were used for determination of angle of repose. Specified amount of granules were placed in the funnel keeping the orifice of the funnel blocked by thumb. When power were cleared from funnel then angle of repose is measured.

$$\text{Angle of repose} = \tan^{-1} h/r[7]$$

2) Bulk density

The ratio of mass of granules to the bulk volume of granules is called bulk density. It is used to find out homogenecity.

$$\text{Bulk density} = M/Vb$$

Where, M is mass of granules,Vb is bulk volume.

3) Tapped density

Tapped density is the ratio of mass of granules to the minimum volume occupied in measuring cylinder. Tapped density is determined by placing known mass of granules in graduated cylinder on a mechanical tapper apparatus which is operated at fixed no. of taps (1000) until the powder bed reached a minimum volume.

Tapped density=M/Vt

Where, M is mass of granules, Vt minimum volume occupied by cylinder.

Compressibility indices

4) Carr's index

The percentage compressibility of the granules was determined based on the apparent bulk density and the tapped density, by following formula.

Carr‟s index= Tapped density- Bulk density x100/ Tapped density

5) Hausner's ratio

Hausner‟s ratio is an indirect index of ease of measuring of granules flow. If the hausner‟s ratio is lower than 1.25(1.25).

Hausner‟s ratio= Tapped density/ Bulk density.

❖ **QUALITY CONTROL TESTS FOR TABLETS:**

➢ **Weight variation:**

Weight variation test is done by weighing 20 tablets individually. The average tablet weight was calculated and compared with the individual weigh. This procedure has been followed as per USP.

➢ **Tablet hardness:**

The resistance of tablets to break under conditions of storage, transportation and handling before usage depends on tablet's hardness. The hardness of each batch was tested by randomly testing the tablets (how many per batch) using Monsanto hardness tester (Make: Pharma Chem Machineries). The hardness was measured in terms of Kg/cm2.

➢ **Operating Procedure :-**

1) Place the sample tablet in the vertically holding edges of the anvil of Monsanto Hardness

Tester.

2) Adjust the pointer at zero position on the scale by rotating the screw in forward direction.

3) Now rotate the screw till break point of the tester.

4) The breakage of tablet shows hardness on the scale.

5) Repeat the procedure 5-6 times for average reading. Record the observation.

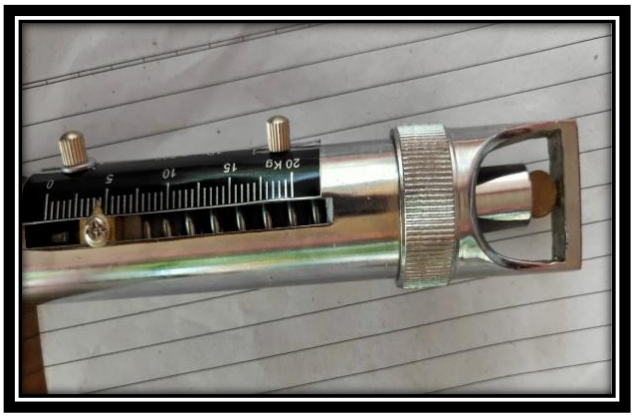

Fig 3.Monsanto Hardness Tester

- **Thickness :-**

Micrometer was used to measure the thickness of the tablet a done in case of conventional tablets 10 tablets were aimlessly selected to perform the process .

Thickness was measure by Vernier-calliper scale in triplicate manner.

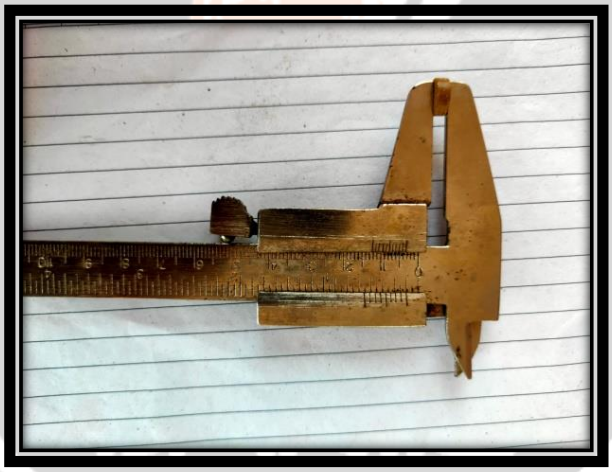

Fig 4. Vernier Calliper

- **Friability:**

The device subjects the tablets to abrasion and shock by utilizing a plastic chamber that revolved at 25 rpm. Sample of 10 tablets, whose weight is measured previously, were dropped in the friabilator from a distance of 6 inches which was then operated for 100 revolutions and the tablets were dusted and reweighed. According to USP, to pass the test, the tablet should not lose more than 1% of their weight.

% friability = [(W1-W2)/W1]

*100 Where W1= Weight of tablets before test , W2= Weight of tablets after test

Fig 5. Friability Test Appratus

- **Disintegration Test:**

Disintegration test was conducted by using USP II Disintegration test apparatus. One tablet is placed in each tube and the basket rack was positioned in a 1-litre beaker of water at 37±20C. A standard motor-driven device is used to move the basket assembly containing the tablets up and down through a distance of 5 to 6 cm at a frequency of 28 to 32 cycles per minutes. The time taken for the tablet to disintegrate completely was recorded.

Fig 6. Disintigration Test Appratus

- **RESULTS AND DISCUSSION:**
  - **Phytochemical Screening:**

Phytochemical screening of Syzygium cumini seed powder and Cinnamon Phyto constituents like alkaloids, cardiac glycosides, flavonoids, steroids, tannins ,phenols and saponin were studied.

Table No 3 . Phytochemical screening of Syzygium cumini seed powder

Sr No.	Test	Result
1.	Detection of alkaloids: 1) Mayer's Test 2) Dragendroff's test 3) Wagner's Test 4) Hager's Test	+ + + + +
2.	Detection of Cardiac glycosides: 1) Kedde's test 2) Baljet's test	 + +
3.	Detection of flavonoids: 1) Shinoda Test	 +
4.	Detection of saponins: 1) Froth Formation test	 -
5.	Detection of steroids/ Triterpenoids: 1) Salkowski test 2) Sulphur powder test 3) Liebermann bucchard test	 + + +
6.	Detection of tannins	+
7.	Detection of Phenols	+

Table No.4 Phytochemical screening of Cinnamon powder

Sr No.	Test	Result
1.	Detection of alkaloids: 1) Dragendroff's test 2) Wagner's Test 3) Hager's Test	 + + +
2.	Detection of flavonoids: 1)Lead acetate 2)Ferric acid	 + +
3.	Detection of Phenols : 1) Ferric chloride test 2) Lead acetate test 3) Dilute KMnO4	 + + +
4.	Detection of Terpenoids : 1) Salkowaski Test	 +
5.	Detection of Glycocide : 1) Legal's test 2) Keller Killani	 - -

❖ **Preparation and evaluation of tablets:**

Nutracuetical tablet containing the Lantana camara leaf powder and cinnamon were prepared by wet granulation method. The composition of these tablets is shown in table 5. Lactose was used as a diluent to increase the bulk of the powder mixture. Acacia acts as a binding agent which holds the powder material together by adhesion or cohesion. Talc was incorporated as a glidant and magnesium stearate was used as a lubricant. Dump Mass was formed and sieved through sieve no.44.

Granules were dried in air.Weight variation, hardness, friability, thickness and disintegration time were evaluated and the data are presented in table 4. The physical appearance of the tablets was smooth and uniform with no cracks and with a diameter of 1 cm. To ensure each tablet contains desired amount of seed powder, weight variation test was conducted. The tablets met the USP specifications that not more than 2 tablets are outside the percentage limit which is ±5%. All the tablets were within ±10% variation from the average weight of the formulation. Friability is generally referred to loss in weight of tablet in the containers due to removal of fines from the tablets surface.

Friability generally reflects poor cohesion of tablets ingredients. Friability test was performed with 10 tablets of each formulation. The average weight loss of the tablets following friability testing was with 1% of the average weight of the formulation indicating the physical stability of the tablets when exposed to mechanical shock and attrition. Hardness test was performed to provide a measure of the tablet's strength as the tablets need to be hard enough for packing and moving. The hardness ranged from 3.0 to 3.5 kg/cm2. Thickness of the tablets was found to be from 0.40 to 0.42 cm. The disintegration time of the tablets ranged from 22 to 25 min.

All the pre-formulation evaluation test parameters have been tested and the flow was infered to be excellent. Tablets were formulated as the powder blend had excellent flow properties.

S. No	Evaluation test	Test values
1.	Bulk density	0.112 gm/ml
2.	Tapped density	0.117 gm/ml
3.	Angle of repose	29.4
4.	Hausner's ratio	1:11
5.	Car's index	12.5

Table 5: Flow Properties of formulation for tablets (F3)

Ingrident	F1 (mg)	F2 (mg)	F3 (mg)
Lantana leaf powder	200	200	200
Cinnamon powder	200	200	200

Acacia	-	50	100
Magnesium Stearate	05	05	05
Talc	05	05	05
Total weight	410	460	510

Table No. 6. Formulation Table

Figure 7: Tablets Lantana camara leaf and Cinnamon powder

Parameter	F1	F2	F3
Weight Variation	280	310	370
Hardness (kg/cm)	2.6	3.0	3.5
Friability (%)	-	-	Pass
Thickness (cm)	0.40	0.40	0.42
Disintigration Time (min)	2	8	22
Diameter (cm)	1	1	1

Table 7. Evaluation of tablets

- **Conclusion:-**

The formulation and evaluation of Lantana carama and Cinnamon combination tablets represent a promising approach for antidiabetic therapy. Our study demonstrates that the combination of these two natural agents in

tablet form has the potential to effectively manage blood sugar levels and improve the overall health of individuals with diabetes. The tablets showed favorable properties in terms of stability, dissolution, and bioavailability, suggesting their potential for practical application. Further clinical studies are warranted to validate these findings and assess the long-term efficacy and safety of this novel antidiabetic therapy."

This conclusion highlights the potential benefits of combining Lantana camara and cinnamon in tablet form for antidiabetic therapy and suggests the need for further research to confirm these findings.

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