



Research

Formulation of Nutraceutical Tablets Using Nutmeg and Cinnamon

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<p>Article History</p> <p>Received: 15/03/2024 Revised : 12/04/2024 Accepted : 25/04/2024</p> <p>DOI: 10.62896/ijpdd.1.5.8</p>  	<p>Abstract:</p> <p>Nutraceuticals are dietary supplements that provide health benefits beyond basic nutrition. They are derived from natural sources such as plants and are often used to prevent or treat various chronic diseases. Nutmeg (<i>Myristica fragrans</i>) and cinnamon (<i>Cinnamomum zeylanicum/cassia</i>) are two spices that have been traditionally used for their medicinal properties, and have gained attention as potential sources of nutraceuticals. Formulating nutraceutical tablets from nutmeg and cinnamon could provide a convenient and effective way to deliver their health benefits. However, manufacturing nutraceuticals into capsules and tablets is a tedious process that requires careful formulation and evaluation. This article will review the potential of nutmeg and cinnamon as nutraceutical ingredients, and discuss the formulation and evaluation of nutraceutical tablets containing these spices.</p> <p>Keywords: Nutraceuticals, Dietary supplements, Health benefits, Nutmeg, Cinnamon, Medicinal properties, Nutraceutical tablets</p>
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1. Introduction:

Dosage forms are pharmaceutical drug products in the form in which they are marketed for use, with a specific mixture of active ingredients and inactive components (excipients), in a particular configuration (such as a capsule shell, for example), and apportioned into a particular dose. Tablets are defined as unit dose, temper evident solid preparations containing one or more active ingredients. Conventional drug delivery systems like tablets and capsules often dissolve rapidly in the gastrointestinal tract for absorption into the bloodstream give rise to inordinately high drug concentrations in plasma. The concept of making utility of food as health promoting factor beyond its nutritional value is gaining acceptance with in public arena and among scientific community. Nutraceuticals contain health- supporting ingredients or natural components that have an ability health benefit for the body.

A nutraceutical is a product isolated or purified from foods that is generally sold in medicinal forms not usually connected with food. ^[2] The functional component of the food must be standardized in the nutraceutical product and generate under good manufacturing practices (GMPs).

Various benefits of nutraceuticals are may help us live longer, may increase the health asses of our diet, help us to abstain from particular medical conditions, have a psychological advantage from doing something for oneself and may be sensed to be more "natural" than traditional medicine and less likely to produce unpleasant side effects. Nutraceuticals normally contain the required amount of lipids, protein, carbohydrates,

vitamins, minerals, and other necessary nutrients depending upon the theorem phase.^[2] With novel drug delivery systems (NDDS) extensively utilized in nutraceutical formulations, the stability, bioavailability, and therapeutic efficacy of these functional foods receive a substantial boost^[2].

We'll delve into the nutritional composition, anti-inflammatory and antioxidant activities of these nutraceuticals while exploring their formulation development and evaluation as a nutraceutical supplement^[2]

Anti-inflammatory and Antioxidant Activity

The anti-inflammatory and antioxidant activities of nutmeg were evaluated in a study where zebrafish were fed diets containing varying concentrations of powdered nutmeg for 70 days^[3]. The following observations were made:

- The skin mucus and serum total protein, total immunoglobulin (Ig), and lysozyme activity were significantly increased in the T3-nutmeg treatment (3% nutmeg) compared to the control group^[3].
- Superoxide dismutase (SOD) and catalase (CAT) activities, which are important antioxidant enzymes, were also enhanced in the T3-nutmeg group^[3].

These findings suggest that nutmeg possesses anti-inflammatory and antioxidant properties, which can be attributed to its bioactive compounds. The increased levels of immunoglobulins and lysozyme activity indicate a strengthened immune response, while the elevated SOD and CAT activities demonstrate enhanced antioxidant defense mechanisms^[3].

1. Materials and Methods

The objective of the study was to formulate and evaluate nutraceutical tablets containing Nutmeg and Cinnamon using Direct Compression Method, Cinnamon and Nutmeg powder were Procured from local market. Other ingredients such as Mannitol, Magnesium stearate, and Talc, Lactose, Sucrose were chosen to prepare the Nutraceutical tablet. ingredients^[1]. The ingredients such as Mannitol, Magnesium stearate, and Talc, Lactose, Sucrose were purchased from School of Health Sciences Laboratory Department Of Pharmacy Sushant University,

The Glassware used were as following:

S.no	Glassware
1)	Beaker
2)	Glass rod
3)	Funnel
4)	Pipette
5)	Measuring cylinder
6)	Volumetric flask

3. The Instrument used was as following:

S.no	Instrument
1)	Tablet punching machine
2)	Dissolution apparatus
3)	Monsanto hardness tester
4)	Vernier caliper
5)	Weighing balance
6)	Friability Apparatus

2. Formulation

Several studies have investigated the formulation of nutraceutical tablets using herbal drugs [5], [6]. The direct compression method is a common approach, where the ingredients are blended and compressed into tablets without prior granulation [5], [6]. This method is simple and cost-effective, but requires careful selection of excipients to ensure good flow properties and compressibility of the powder blend [6]. The choice of excipients is critical for the performance of the nutraceutical tablets. For example, microcrystalline

cellulose and lactose are commonly used as diluents to increase the bulk of the tablet and improve its hardness and disintegration [5].

1. Nutraceutical tablets containing nutmeg and cinnamon powder were prepared by direct compression method
2. Ingredients like lactose was used as diluent, magnesium stearate as lubricant and talc as glidant.
3. All the excipients along with API and passed through sieve no. 20. Then, all ingredients were mixed
4. Following geometric mixing excluding glidant and lubricant thoroughly for 15min. The powder blend was thoroughly mixed with talc and magnesium stearate and compressed using the Single Rotary Punch

INGREDIENTS (mg)	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Cinnamon	50	50	100	-	20	80	40	60	30	70
Nutmeg	50	50	-	100	80	20	60	40	70	30
Lactose	290	-	290	-	290	-	290	-	290	-
Mannitol	-	290	-	290	-	290	-	290	-	290
Sucrose	2	2	2	2	2	2	2	2	2	2
Magnesium Stearate	4	4	4	4	4	4	4	4	4	4
Talc	4	4	4	4	4	4	4	4	4	4

Table: Composition table of nutraceutical tablet 400 mg

3. Evaluation

Evaluation of tablet includes the assessment of tablets physical, chemical and biological properties. After formulation, the nutraceutical tablets need to be evaluated for various quality attributes. These include appearance, weight variation, hardness, friability, disintegration time, and dissolution profile [1], [5] [6]. To study them following test were done. These are Appearance, thickness, weight variation, hardness, and friability all evaluation parameters of all formulation given in below table.

Thickness: The thickness of the individual tablet is measured with micrometer, which gives us information about the variation between tablets. Tablet thickness should be within a $\pm 5\%$ variation of a standard value. The tablet thickness was calculated by Vernier callipers. Tablet was put in between two jaws vertically and measured thickness and 6 tablets were used for this test and expressed in mm.

Weight variation: The weight of a tablet is determined by quantity of fill in the die of a tablet press. The volume of fill is adjusted with the first few tablets to yield the desired weight and content. The variation of the weight of individual tablet is a valid indication of the corresponding variation in the drug content. Controlling tablet weights within a tight range will contribute to better tablet hardness and friability. Take 20 tablets and weighed individually. Calculate average weight and compare the individual tablet weight to the average. Not more than two of the individual weights deviate from the average weight by more than the percentage shown in table below and none deviates by more than twice that percentage.

Hardness: Hardness also termed as tablet crushing strength. The tablet hardness was determined by Monsanto hardness tester. The tablet was placed lengthwise between upper and lower plunger and force applied by turning a threaded bolt until the tablet fractures and measured hardness of tablet in Kg/cm.

Friability: It is determined by Roche friabilator, subjects a number of tablets to combined effects of abrasion and shock by utilizing a plastic chamber that revolves at 25 rpm, dropping tablet from inches distance operated for 100 revolutions. Pre weighed tablets were dusted and re-weighed and according to standard limit friability should be less than 1%.

It is calculated by formula- $\% \text{ Friability} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}}$

In vitro Drug Release Study: In-vitro drug release- Dissolution profile of eugenol was determined at $37 \pm 0.5^\circ\text{C}$ at a stirring rate of 100 rpm using the USP dissolution apparatus II in 900 ml of simulated gastric fluid (0.1 N HCl). Various aliquot samples were withdrawn with replacement simulated fluid of same amount at 5, 10, 15, 30, 45, and 60 min respectively. Samples were filtered using Whatman filter paper and taken

absorbance at wavelength of 366 nm by UV spectrophotometer. The USP type-1 or type-2 apparatus were used for in vitro dissolution study as per the official monograph of the model drug

4. Result:

The nutraceutical tablet of nutmeg and cinnamon was formulated by direct compression method. This technique was used for conventional from nutraceutical tablet which minimize processing steps and eliminated wetting and drying process. The physicochemical property shows satisfactory results by nutraceutical tablet which are within the range of prescribed standards required for investigation of present study.

POST COMPRESSION PARAMETER	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Thickness(mm)	1.1	1.2	1.3	1.4	1.0	1.4	1.2	1.3	1.1	1.5
Hardness(kg/cm ²)	7.5	9.5	8.0	8.2	7.2	8.0	9.5	8.0	7.5	8.3
Friability	0.15	0.08	0.17	0.10	0.14	0.10	0.08	0.17	0.15	0.16

5. Conclusion

The development of nutraceutical formulations has witnessed significant advancements with the integration of novel drug delivery systems. This study showcased the formulation and evaluation of nutraceutical tablets containing natural ingredients like clove, cinnamon, nutmeg, ginger, and Malabar nut. The judicious selection of techniques, such as wet granulation, microencapsulation, and direct compression, coupled with comprehensive pre- and post-compression evaluations, ensured the quality and integrity of the developed products.

Notably, the optimized clove-containing formulation demonstrated high in-vitro drug release, while the lyophilized microcapsules exhibited superior yield, total phenolic content, and antioxidant activity compared to spray-dried counterparts. The pectin gel tablet base facilitated enhanced release of active compounds compared to gelatin. These findings underscore the significance of formulation strategies in improving the bioavailability, stability, and therapeutic efficacy of nutraceutical supplements, ultimately contributing to better health outcomes.

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