



REVIEW ARTICLE: FORMULATION AND EVALUATION OF NUTRACEUTICAL TABLET USING HERBAL DRUGS BY DIRECT COMPRESSION METHOD

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ABSTRACT

The goal of the current research was to create and assess nutraceutical tablets containing various combinations of herbal medications. Resources and Method: The direct compression technique was used to create the nutraceutical tablet, which contained natural medicines like cinnamon and clove as well as lactose and mannitol as diluent. Several assessment criteria, including appearance, thickness, weight variation, hardness, and friability, were applied to the compressed formulations. findings: All of the nutraceutical tablet's evaluation parameters produced findings that fell within the acceptable range. Nutraceutical tablet pre-compression studies produce satisfactory findings. The nutraceutical tablet's thickness, hardness, weight variation, and friability were all determined to be within acceptable limits. Eugenol's in-vitro drug release from a nutraceutical formulation that was optimised was determined to be 90.23%. From this study, significant findings were attained. Discussion: The current study's findings unequivocally established that nutraceuticals can be used to promote the body's health.

Keywords: Direct compression, Nutraceutical, Eugenol, In-vitro drug release.

INTRODUCTION

Due to its simplicity, patient compliance, lack of sterility restrictions, and flexible dosage form design, the oral route has been one of the most widely used drug distribution methods. Tablets are characterised as solid, unit-dose preparations with a tempered apparent presence of one or more active components. Plasma drug concentrations are abnormally high as a result of traditional drug administration methods like tablets and capsules, which frequently dissolve quickly in the gastrointestinal tract before being absorbed into the bloodstream¹. Beyond its nutritional value, the idea of using food as a health-promoting factor is becoming more and more popular among the general population and the scientific community. Nutraceuticals are products that have natural or health-supporting substances that can be beneficial to the body. A "nutraceutical" is a product that has been isolated or purified from food and is typically marketed in medicinal forms unrelated to food. A nutraceutical is intended to provide protection against chronic illness or have physiological benefits. Dr. Stephen L. De Felice, the founder and chairman of the Foundation for Innovation in Medicine in New Jersey, USA, came up with the term. Because they blur the traditional boundary between food and medicine, nutraceuticals—also known as "functional foods"—have sparked a lot of debate. ³Any non-toxic food ingredient with scientifically demonstrated health benefits, such as the treatment or prevention of illness, is referred to as a nutraceutical. The nutraceutical product's functional component of the food must be

standardised and produced in accordance with sound manufacturing practises. (GMPs). 4increased consumer demand, demographic trends, and the socioeconomic environment.conventional therapies Food's potential health advantages have been studied for millennia. In the 1980s, the modern nutraceutical business started to grow in Japan. Nutraceuticals may extend our lives, improve the nutritional quality of our diets, assist us in avoiding certain medical conditions, provide a psychological benefit from taking care of oneself, and may be perceived as more "natural" than conventional medicine and less likely to cause unpleasant side effects. 3Depending on their focus, the nutraceuticals typically contain the necessary quantity of lipids, protein, carbohydrates, vitamins, minerals, and other essential nutrients. Both conventional and unconventional meals are included in the market's supply of nutraceuticals. The body must digest and assimilate the nutrients after ingesting a supplement tablet. A wide range of goods, such as isolated nutrients, nutritional supplements, herbal products, and other processed foods, may fall under the category of nutraceuticals. 5The "Dietary Supplements Health and Education Act" (DSHEA) was created in the USA in 1994 as a result of the increasing patient disapproval of synthetic therapeutic agents and the impact of their toxicological profile. 5, 6The idea behind the nutraceutical dosage form's mode of action is to deliver functional advantages by increasing the supply of natural building blocks. It operates in two different methods. Eugenia caryophyllus blossom buds, from the Myrtraceae family, are used to make clove. After drying, the cloves take on the ideal colour of crimson or brownish-black. As a carminative, stimulant, flavouring ingredient, aromatic, and antiseptic, clove is also used in dentistry. Cinnamon is made from the inner, dried bark of the shoots of coppiced Cinnamon zeylancium Nees plants. Bark's aim is as follows:The goal of the current research was to create and assess nutraceutical tablets containing various combinations of herbal medications. Resources and Method:The direct compression technique was used to create the nutraceutical tablet, which contained natural medicines like cinnamon and clove as well as lactose and mannitol as diluent. Several assessment criteria, including appearance, thickness, weight variation, hardness, and friability, were applied to the compressed formulations. Results:The outcome of each nutraceutical tablet's assessment criteriaused as a moderate astringent, stomachic, and carminative. 6It has been employed as a demulcent and expectorant. It is additionally employed as an antispasmodic. Heart disease, cancer, hypertension, and diabetes are the main illnesses for which nutraceuticals have been linked to prevention and/or treatment.

MATERIALS AND METHOD

MATERIALS

We bought cinnamon and cloves at the neighbourhood market. All additional components, including talc, magnesium stearate, and mannitol, were bought from Central Drug House (CDH) in New Delhi, India. Every ingredient was of an analytical quality.

Ingredients(mg)	F1	F2	F3	F4
Clove	-	-	-	-
Cinnamon	-	-	-	-
Lactose	-	-	-	-
Mannitol	-	-	-	-
Sodium sachrine	-	-	-	-
Talc	-	-	-	-
Magnesium stearate	-	-	-	-

Evaluation of Nutraceutical Tablets

Pre-compressional studies of powder blend

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

Angle of repose

It is the greatest angle that can be formed between the freestanding powder heap surface and the horizontal line. By employing the fixed-funnel technique, it was determined. A predetermined quantity of powdered medication was added to the funnel while a thumb was used to block the orifice. When the powder had been removed from the tube, its angle of repose was measured and converted to 7.

Angle of repose (θ) = $\tan^{-1}h/r$

Bulk density

It is the proportion of the powder's bulk mass to its bulk volume. It is indicated by b . To determine homogeneity, use bulk density.

Bulk density (ρ_b) = M/V_b

Where, M is the mass of the sample, V_b bulk volume

Tapped density

It is the ratio of the powder's weight to the cylinder's minimal volume of occupied space. In order to ascertain the tapped density, a graduated cylinder, a known mass of medication or formulation placed on a mechanical tapper apparatus that was run at a set number of taps (1000) until the powder bed achieved a minimal volume.

Tapped density (ρ_t) = weight of powder blend / Minimum volume occupied by cylinder.

Compressibility Indices

a.) Carr's index

The following method was used to calculate the percentage compressibility of the powder mixture based on the apparent bulk density and the tapped density.

Carr's index = $\frac{\text{Tapped density} - \text{Bulk density}}{\text{Tapped Density}} \times 100$

b.) Hausner's ratio

It is a proximate indicator of how simple it is to measure powder movement. Better flow properties are indicated by a lower Hausner's ratio (1.25) than by a larger one (>1.25).

Hausner's ratio = $\frac{\text{Tapped density}}{\text{Bulk density}}$

Post-compressional studies of prepared nutraceutical tablets

After taking into account the preformulation to prevent mistakes during the manufacture of the formulation, the nutraceutical tablets were assessed for a number of criteria. Such characteristics include hardness, friability, weight fluctuation, thickness, and appearance.

Physical appearance

Shape, color, texture, and odour of the tablet's overall appearance were studied visually.

Thickness

The tablet thickness was estimated by Vernier callipers. Tablet was positioned in between two jaws vertically and measured thickness and 6 tablets were utilised for this test and expressed in mm.

Weight variation

The weight variation test is carried out by weighing each of the 20 tablets individually, determining the average weight, and comparing the average weight to the weight of each tablet. The weight variation test would provide a reliable way to assess the homogeneity of tablet medication content.

Hardness

Tablet-crushing strength is another name for hardness. The Monsanto hardness tester was used to measure the tablet's hardness. The tablet was positioned between the top and lower plungers lengthwise, and force was exerted by rotating a threaded bolt until the tablet broke. The hardness of the tablet was then measured in Kg/cm² 7, 8.

Friability

It is established that the Roche friabilator uses a plastic chamber that rotates at 25 revolutions per minute while dropping tablets from an inch away and operating for 100 revolutions to submit several tablets to the combined effects of abrasion and shock. Tablets that had already been weighed were dusted and reweighed; the standard limit for friability is less than 1%. It's calculated using the formula:

$$\% \text{ Friability} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}}$$

RESULTS AND DISCUSSION

Clove and cinnamon nutraceutical tablets were created using the direct compression method. This method was used to standard nutraceutical tablets to reduce processing steps and do away with wetting and drying. The physiochemical results from the nutraceutical pill are satisfactory and are within the range of the required standards for the research of the current study.

Pre- compression studies of powder blend

Angle of repose, bulk density, tapped density, Carr's index, and Hausner's ratio were all determined to be between 21.12±0.11 to 27.46±0.12 (°), 0.4071±0.21 to 0.4741±0.32 g/ml, 0.4132±0.17 to 0.4965±0.028 g/ml, 11.00±0.12 to 14.17±0.39, 1.11±0.012 to 1.17±0.13

respectively. After evaluating the preformulation parameters, it was determined that there is no moisture in the powder and that the powder blend 11 is consistent. After researching flow rates, it was discovered that there is an ideal powder blend ratio that results in the highest flow rate. The outcome therefore demonstrated that the powder has good flow characteristics, which have no impact on the tablet punching process. 7, 10

Hausner's ratio	Flow ability
< 1.25	Good
> 1.25	Poor

Post-compression study

The active pharmaceutical components, filler, glidant, and lubricant are enough to give the tablet volume while reducing risk during punching. The nutraceutical tablet's thickness, hardness, weight fluctuation, and friability were found to be within acceptable bounds. Due to their hardness being within the prescribed range, it demonstrates that herbal medications including nutraceutical pills have a suitable disintegration profile.12

Physical appearance

The tablet was discovered to be spherical in shape, brown in color, smooth in texture, and odourless overall.

Thickness

The thickness of clove and cinnamon containing nutraceutical tablet was found to be 1.2± 0.1cm. It is depends upon the size of die and punches or a function of die fill and compression force. 3, 1

Weight variation

The weight of 20 tablets was measured and it was found to be 0.397±0.012 to 0.399±0.034 for all formulations respectively. All the nutraceutical tablet containing clove and cinnamon passed weight variation test as the average percentage weight variation was within the USP limits of ±5%.

Friability

Friability of all formulations was found to be 0.14±0.045 to 0.31±0.012 %. The friability of a pill containing cinnamon and cloves was found to be less than 1%, which is within acceptable limits. The pills don't have a capping issue, therefore they could be used commercially. It did not suffer any losses while shipping.

CONCLUSION

According to the aforementioned study, the direct compression method was used to create the nutraceutical tablets, and the results were satisfactory and acceptable. Because the nutraceutical pill is directly compressed, it releases the medicine instantly. Due to the presence of eugenol, the formulation containing clove can be more advantageous as an analgesic than a pill containing cinnamon. The aforementioned research led to the conclusion that herbal nutraceutical tablets should be made in a cost-effective tablet form to reduce patient compliance with relation to reducing adverse effects and improving beneficial effects on the body.

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