

DEVELOPMENT AND EVALUATION OF NUTRIENT POWDER FOR PREGNANT AND
LACTATING WOMAN

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ABSTRACT

The purpose of the study was to formulate a nutrient powder from black dates, Halim seeds and Gond Katira for pregnant and lactating women. Nutrient requirement is enhanced during this period. Iron deficit anemia and micronutrient deficiency are commonly encountered during pregnancy and lactation. This deficiency can be recovered by the use of this nutrient powder. From phytochemical screening it was observed that these ingredients are powerhouse of energy and micronutrients like proteins, iron, calcium, sodium, magnesium etc. These ingredients are traditional used during pregnancy and lactation but in today's rapid world it would be more convenient to formulate these ingredients into powder or tablets which can improve the patient acceptance and convenience to administration. Also studies showed that during formulation moisture content in controlled within limit which can enhance shelf life of product as compared to traditional food products.

KEYWORDS: Nutrient powder, pregnancy and lactation, halim seeds, black dates, gond katira.

1. INTRODUCTION

During pregnancy, women undergo a number of physiological changes in order to achieve the normal development and health of the fetus. These changes also prepare the mother and baby for delivery. A woman's nutritional status during pregnancy and breastfeeding is not only critical for her health, but also for that of future generations. Nutritional requirements during pregnancy differ considerably from those of non-pregnant women.^[1] Pregnancy requires a healthy diet that includes an adequate supply of energy, protein, vitamins, and minerals to meet the increased needs of the mother and the fetus.^[2-3] Thus, a personalized approach to nutritional advice is recommended. However, for many pregnant women, dietary intake of fruits, vegetables, meat, and dairy products is often insufficient to meet these needs and can lead to micronutrient deficiencies which need increased nutritional demand like protein, calcium, iron etc. in women.^[4-5]

The main minerals present in garden cress are potassium and phosphorus. Manganese is present low content. It is important source of calcium, magnesium, and iron. Calcium (377 mg/100 g) and magnesium (430 mg/100 g) contents of garden cress help in the correct contraction of muscle for healthy limb and heart motions. Anemia in adolescents may be treated with the seed's high iron content (100 mg/100 g). Phosphorus (723 mg/100 g) is essential for the body's normal metabolic functions.^[6]

The Halim seeds or the garden cress seeds are the richest sources of iron, which is easily absorbable in the small intestine also aids in the increase of the hemoglobin levels in the blood. Additionally, the bioavailability of the content of iron present in the Halim seeds can be a beneficial for treating and eliminating anemia, if its consumption is made on a day to day basis.^[7-8]

Dates are well known as a nutrient-rich food with a healthy combination of essential dietary components. They are a primary source of carbohydrates (around 60–70 %) and contain appreciable amounts of vitamins B complex, vitamin C, electrolytic minerals (especially potassium) and dietary fibre.^[9-10] Dates are also rich in folic acid, vitamin K, iron, and magnesium.^[11] Kuran et al concluded that the consumption of date fruit in the last 4 weeks before labour significantly reduced the need for induction and augmentation of labour, and produced a more favorable, but non-significant, delivery outcome.^[12]

Gond Katira contains various minerals, including calcium, potassium, magnesium, and iron. These minerals play crucial roles in maintaining bone health, supporting nerve and muscle function, regulating blood pressure, and oxygen transport in the body.^[13,14,15]

2. MATERIALS AND METHODS

2.1 Materials

Superior quality dates (*Phoenix dactylifera* L.), halim seeds or Garden cress seeds (*Lepidium sativum*) and Gond Katira (*Astragalus gummifer*) were procured from local market of Pune. All materials were dried at 70° C to remove excess moisture content.

2.2 Methods

2.2.1 Preparation of powder

All the ingredients were first blended in a mechanical mixer separately. Powdered materials were passed through 120 mesh to get smooth and fine powders. The mixing process was carried out by combining the powders in ascending order of quantity to ensure uniformity and even distribution of particles. This fine powder can be reconstituted with water or milk at the time of administration.

Table no. 1: Composition of Nutrient powder.

Sr. no.	Ingredient	Quantity (g)
1.	Black date powder	12
2.	Halim seed powder	05
3.	Gond katira powder	03

2.2.2 Evaluation of powder

2.2.2.1 Organoleptic properties: Nutrient powder was examined for physical appearance, color, odor, taste and texture.

2.2.2.2 Micromeritics: Particle size of powder was determined by sieving method. Flow properties were evaluated by angle of repose. Bulk and tapped densities

were determined and Carr's compressibility index and Hausner's ratio was calculated.^[16]

2.2.2.3 Loss on drying: Powder sample of 2g (W1) was placed in petri dishes (pre-heated and pre-weighed). The glass petri dishes were dried then using hot-air oven at 130°C for 2 hr or until a uniform weight is reached. After drying, the samples were transferred to the desiccator to cool, and then the petri dishes were Weighed again (W2). The difference between the pre-dried and post-dried weight is expressed as the percentage loss on drying or % moisture content. It is calculated by using following formula.^[17]

$$\text{Moisture content(\%)} = \frac{W1 - W2}{W1} * 100$$

2.2.2.4 Ash value: Ash value is calculated to determine the inorganic contents which are characteristic for an herb. About 2 gm of powder drug was taken in silicon dish previously ignited and weighed. Temperature was increased by gradually increasing the heat not exceeding to red color. After complete burning, ash is cooled and weighed.^[18,19]

2.2.2.5 Acid insoluble ash: Acid insoluble ash was calculated by boiling above obtained ash with 25 ml dil. HCl for 5min, insoluble matter was collected in gooch crucible, washed with hot water, ignited and weighed.^[20]

2.2.2.1 Phytochemical testing: Prepared nutrient powder was analyzed for the presence of carbohydrates, proteins, fats, glycosides, tannins, polyphenol, alkaloids, flavonoids and different mineral ions like iron, sodium, potassium, magnesium using standard procedures.^[21,22,23]

Table no. 2: Phytochemical screening of nutrient powder.

Sr. no.	Name of test	Procedure	Observation
1.	Test for carbohydrates	1-2 drops of dilute iodine + 1-2 ml of sample	red or brown color
2.	Test for alkaloids – Dragondroff's test	2-3 ml sample + few drops of Dragendorff's reagent solution	Orange brown ppt
3.	Test for flavonoids	Small amount of sample mixed with lead acetate solution	yellow ppt
4.	Test for tannins and phenolic compounds	Small amount of sample + acetic acid	red color
5.	Test for proteins	2-3 ml of sample + 2 ml of biuret reagent then mix vigorously solution	purple color
6.	Test for fat	Take a small amount of sample on a piece of filter paper, dry the paper in sunlight, observe the paper	an oily patch on the paper
7.	Test for calcium ions	Sample + sodium hydroxide	white precipitate
8.	Test for ferric ions	Sample + excess sodium hydroxide	reddish brown precipitate
9.	Test for magnesium ion	Sample + aq. Ammonia solution	white ppt
10.	Flame test for potassium ions	Put sample just above burner and switch on the burner slowly	pale violet color flame
11.	Flame Test for sodium ions	Put sample just above burner and switch on the burner slowly	yellow color flame

3. RESULT AND DISCUSSION

3.1 Organoleptic properties: The nutrient powder sample was observed for physical appearance, color, odor, taste and texture at room temperature. Observations were as shown in table no. 3.

Table no. 3: Organoleptic properties of Nutrient powder.

Sr. no.	Parameter	Observation
1.	Appearance	Granular powder
2.	Color	Light brown
3.	Odor	Pleasant
4.	Taste	Sweet
5.	Texture	Slightly granular

3.2 Micromeritics: Particle size of the nutrient powders affects the release of constituents. Smaller particle size enables faster release of constituents and provides instant energy. The flow properties of the nutrient powders are of importance in processing of powder like flow from hopper, compression into tablets or packing as bulk powders.^[24] These were determined by Angle of repose, Carr's index and the Hausner ratio. All the powders passed the test well, in terms of Carr's index, Hausner ratio and Angle of repose with values ranging as given in table no. 4

3.4 Phytochemical testing

Table no. 6: Results of Phytochemical screening.

Sr. no.	Phytoconstituent	Result
1.	Carbohydrates	+
2.	Alkaloids	+
3.	Flavonoids	+
4.	Tannins and phenolic compounds	+
5.	Proteins	+
6.	Fat	-
7.	Calcium ions	+
8.	Ferric ions	+
9.	Magnesium ion	+
10.	Potassium ions	+
11.	Sodium ions	+

4. CONCLUSION

Present study has been performed to understand the nutritional value of powder mixture of dates, gond katira and halim. From phytochemical screening it was observed that formulated nutrient powder contains Carbohydrates, proteins and minerals like Calcium and iron which are required for pregnant women and lactating mothers. In addition to this it also contains Magnesium, Potassium and Sodium ions which are required in maintaining bone health, nerve and muscle function, regulating blood pressure and oxygen transport in the body. Further this powder was assessed for micromeretic properties which showed it has good flowability and compressibility. So powder can be easily compressed into tablets or filled into capsules which will serve as better dosage form. The moisture content of the nutrient powder was found to be 8.5% which is under the

Table no. 4: Particle size and flow properties of nutrient powder.

Sr. No.	Parameter	Observation
1.	Particle size	231.5 μm
2.	Bulk density	0.72 g/cm^2
3.	Tapped density	0.84 g/cm^2
4.	Carr's index	15.48
5.	Hausner's ratio	1.18
6.	Angle of repose	29°
7.	Type of flow	Good

3.3 Loss on drying: Determination of % LOD or moisture content and ash content in the nutritional analysis of herbal powders is necessary because it directly affects the nutritional content, the shelf-life and quality and storage conditions etc.^[25] The ash value and % LOD of nutrient powder are given in table no. 5

Table no. 5: LOD and ash values of nutrient powder.

Sr. No.	Parameter	Observation
1.	% moisture content or Loss on Drying	8.5%
2.	Total ash value	4.4%
3.	Acid insoluble ash value	0.6%

permitted range and indicates the ability to inhibit the growth of microorganisms.

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