

DEVELOPMENT OF IRON RICH FLOUR USING GARDEN CRESS SEEDS

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ABSTRACT

Iron deficiency is the most common cause of anemia at world level, but other causes like acute and chronic inflammation, parasitic infections, nutritional deficiencies (including vitamin A, folate, vitamin B12 and) and inherited or acquired disorders that affect red blood cell formation, hemoglobin synthesis, or red blood cell survival can all cause anemia. The dietary intervention approach is an effective method to combat iron deficiency anemia. Garden cress belongs to Brassicaceae family. The seeds are an excellent source of iron, 100gm of seeds provide 100 mg of iron. Garden cress seed is an important medicinal crop in India. It is used to cure for asthma, dysentery, bleeding piles, menstrual disorders. The garden cress seeds *are known as important medicinal* plant, since Vedic era. Medicine and nutritional importance of garden cress seed is the most important aspect of this study. Studies were conducted on incorporation of garden cress seed powder (*Lepidium sativum*) in mathri. These used garden cress seed as 10, 20 and 30% level to prepare garden cress seed flour. On the basis of overall organoleptic acceptability, the mean score of developed mathri were 7.3, 6.3 and 5.75 respectively on the 0 days, 30 days and 60 days.

KEYWORDS: Garden Cress Seeds, Iron, Sensory Evaluation

INTRODUCTION

“Anaemia is a condition in which the number of red blood cells (RBCs), and consequently their oxygen-carrying capacity, is insufficient to meet the body’s physiological needs. The function of the RBCs is to deliver oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs. This is accomplished by using hemoglobin (Hb), a tetramer protein composed of “haemo” and globin”. Anemia results from one or more of the following reasons: defective red cell production, increased red cell destruction or blood loss, dietary inadequacy and absorptive disorders. Iron is necessary for synthesis of haemoglobin. Iron deficiency is the most common cause of anemia at world level, but other causes like acute and chronic inflammation, parasitic infections, nutritional deficiencies (including vitamin A, folate, vitamin B12 and) and inherited or acquired disorders that affect red blood cell formation, hemoglobin synthesis, or red blood cell survival can all cause anemia. Iron deficiency anemia results in impaired intellectual and skill development in children and decreased work efficiency in adults. Iron deficiency anemia also adversely affects the body’s immune response. These effects are more severe in toddlers and preschool age. During pregnancy, iron deficiency anemia results Low birth weight (LBW) babies, perinatal mortality, premature babies. According to NHRM, 2013 “iron requirements are higher for pregnant women –1.9 mg/1,000 Kcal of dietary energy in the second trimester and 2.7 mg/1,000 Kcal in the third trimester. These are followed by iron requirements in infants (1.0 mg), adolescent girls (0.8 mg)” and boys (0.6 mg), preschool and school age children (0.4 mg), Non-pregnant women (0.6 mg) and adult men (0.3 mg/ per day). India is the country with the highest prevalence of anemia, where 75 percent children (under 5 years of age), 51 percent women (15 – 49 years of age), 87 percent pregnant women are suffering from anemia. Maternal deaths from anemia per year are 22000 in India (World Bank Report, 2005). Finding of the National Family Health Survey-3 revealed that 53.1 percent of

women aged 15 to 49 years are anemic in Rajasthan. Besides, moderate anemia increases the risk of maternal deaths by 1.35 times and severe anemia by 3.5 times. Throughout human history, plants have played a key role in treating human diseases. In thousands of years of trials, many plants have been identified as preventing and relieving serious health problems like cancer, diabetes, and atherosclerosis etc. (Rana, *et al.* 2011). Certain leafy vegetables like leaves of garden cress, amaranth, betal, cauliflower greens, cow pea and oilseeds like garden cress, rajkeera are rich plant source of iron (Khimji, 2012). Garden cress (*Lepidium sativum* Linn.) is an annual herb, belonging to Brassicaceae family. Ethiopia is the origin of this. About 150 species are found in the temperate and sub temperate area. It can grow in any climate and soil condition. The climatic condition of India is much favourable for the cultivation (Wadhwa *et al.*, 2012). In India, it is mainly cultivated in UP, Rajasthan, Gujrat, Maharashtra and Madhya Pradesh (Agarwal, 2013). *Asalia* or *chandrasoor* is the local name of garden cress seeds. Seeds are brownish red in color and oval in shape. Morphologically, these seeds seem like an oil seed with the dicotyledonous endosperm (80–85). The percent nutrient content of seed has been reported protein (25%), lipids (14-24%), carbohydrates (33- 54 %) and crude fiber (8%) (Datta, 2011). The seeds contain alkaloids, cynogenic glycosides (traces), flavonoids, tannins, glucosinolates, sterols and triterpens (Sharma, 2011).

Traditionally, seeds are used as fodder for animals as they tend to enhance milk output. It has been found to contain significant amounts of calcium, besides it is also beneficial in treating, curing certain diseases (Agarwal, 2013). Garden cress seed is an important medicinal crop in India (Tiwari & Kulmi, 2004). It is used to cure asthma, dysentery, bleeding piles and menstrual disorders. The seeds have been reported to be a remedy of uterine. It also has a good anti – cancer potential (Sharma and Agarwal, 2011). Garden cress seeds have been known to be effective against a plethora of diseases ranging from diabetes mellitus, hypertension, kidney stones, inflammation, bronchitis, rheumatism and muscular pain. It is also a good anti cancer potential (Sharma, 2011).

Looking for the health benefits of garden cress seed, the study has been planned to develop iron rich flour using Garden Cress Seed, so that it can be used in daily diets by the people.

Medicinal Uses of Garden Cress Seeds

Lepidium sativum has been considered as important medicinal plant since Vedic era. In many parts of the world, seedlings of *Lepidium sativum* are used in salads, because of their pungent taste. *Lepidium sativum* is a fast growing annual herb. Whole fruits or seeds are used, fresh or dried, as a seasoning with a peppery flavor. Boiled seeds are consumed in drinks by Arabs, either ground in honey or as an infusion in hot milk. The seed oil can be used for illumination and soap making. In Ethiopia, the seed and its oil are primarily used medicinally, but also as a condiment and in baking (Sharma and Agarwal, 2011).

According to *Ayurveda*, garden cress seeds are described as bitter, hot, galactogogue, aphrodisiac and claimed to destroy *vata* (air) and *kapha* (phlegm). Seeds are thermogenic, depurative, galactogogue, emmengogue and aphrodisiac. They act as a tonic against diarrhoea, dyspepsia, eye disease, leucorrhoea, scurvy, asthma, cough, cold and seminal weakness. The seeds also possess significant anti –inflammatory activities. One part of seeds added to 20 parts of boiling water or 10 parts of cold water and consumed orally for dysentery, diarrhoea and skin disease.

Nutritional Composition of Garden Cress Seeds

Seeds of the plant mainly contain alkaloids such as lepidine, glucotropaeolin, N, N'-dibenzyl urea, N, N'- dibenzylthiourea, sinapic acid and its choline ester (sinapin); also contains carotene, cellulose, calcium, phosphorus,

iron, thiamine, riboflavin, niacin, uric acid. Seed oil is known to contain palmitic, stearic, oleic, linoleic, arachidic, behenic, lignoceric acids, benzyl isothiocyanate, benzyl cyanide, sterol and sitosterol. The leaf contains proteins, fat, carbohydrates, minerals - calcium and phosphorus, trace elements such as iron, nickel, cobalt and iodine, also contains various vitamins such as vitamin A, thiamine, riboflavin, niacin and ascorbic acid (Wadhwa *et al.* 2012).

Mohammed (2012), reported that “Garden cress seeds contain 25% of protein, 14- 24% of lipids, 33-54% of carbohydrates and 8% of crude fiber. The carbohydrates of the garden cress seeds comprise 90.0% non-starch polysaccharides and 10% of starch. The seed bran has high dietary fiber content and also, it has high water holding capacity”. Garden cress bran can be used as a rich source of dietary fiber. Garden cress seed contains the major fatty acid in it and is alpha linolenic acid (32-34%). The low level of moisture content is an index of stability, quality and increased shelf life of seeds.

Keeping all these benefits in mind, the present study was planned with the following **objectives**:

- To prepare garden cress iron rich powder.
- To assess the organoleptic acceptability of the developed product.
- To determine the shelf life of developed products.

MATERIALS AND METHODS

The present study was carried out in the Department of Foods and Nutrition, College of Home Science, Maharana Pratap University of Agriculture and Technology, Udaipur.

METHODOLOGY

The procedure is followed to achieve the objectives and has been described under the following headings:

Procurement of Raw Materials

Garden cress seed was procured from the local market of Udaipur.

Preparation of Sample

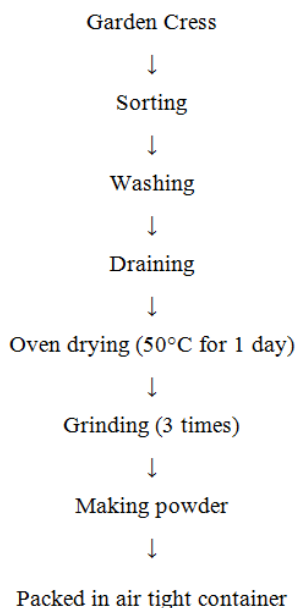
The sample was cleaned and removed from dust and other foreign materials, and then were cleaned and soaked for 12 hours. After soaking, they were oven dried and ground. The powder then obtained was stored in an air-tight container.

Equipments

The following equipments were used in the preparation of sample and products:

- Steel Pan
- Grinder
- Stirrer-stainless steel ladle
- Weighing balance
- Measuring spoon/cups

Flow Chart of the Preparation of Garden Cress Powder



DEVELOPMENT OF PRODUCTS

Mathri

Mathri is a famous traditional tea time snack. Mathris are resemblance of salted crisp crackers. Traditionally, mathris are a very popular afternoon snack.

- **Garden Cress Powder Fortified Mathri**
- **Preparation Time: 20-25 minute, serving: 4**

Method

- Mix garden cress seeds, wheat flour, pearl millet flour, rice flakes flour, carom seeds and cumin seeds except the water.
- Add little water and oil to prepare firm dough.
- Keep the dough aside for 10 minutes or more.
- Take one part of the dough and make a flat ball shape.
- Prick each mathri with a fork in 5 to 6 places, *so the mathris do not puff, when frying.*
- Heat frying pan with oil on medium heat
- The frying pan should have at least 1 1/2 inch of oil. To check if the oil is ready, put a small piece of dough in the oil. The dough should make the oil sizzle and come up slowly.
- Fry a few mathris at a time. Make sure to place a just enough mathris to cover the frying oil.
- Fry the mathris until both sides are a light golden-brown.

Table 1: Recipe for Garden Cress Powder Fortified Mathri

Ingredients	Amount (In G)			
	Control	T ₁ (10% Fortification)	T ₂ (20% Fortification)	T ₃ (30% Fortification)
Wheat Flour	100	60	60	60
Garden Cress powder	-	10	20	30
Pearl millet flour	-	15	15	5
Rice flakes flour	-	15	10	5
Carom seeds (ajwain)	1.5	1.5	1.5	1.5
Cumin seeds	1.5	1.5	1.5	1.5
Salt and spices	To taste	To taste	To taste	To taste
Oil	Kneading and frying	Kneading and frying	Kneading and frying	Kneading and frying
Kasoori methi	¼ tsp	¼ tsp	¼ tsp	¼ tsp

Table 2: Nutritional Value of Fortified Mathries

Nutrients	Value (1 Serving)
Protein	12.43
Energy	356.04
Fat	4.35
Iron	17.24

SENSORY EVALUATION OF DEVELOPED PRODUCTS

Sensory evaluation of the mathri was also done using 9- point hedonic scale. The acceptability of iron rich powder fortified mathri was evaluated by a panel of 4 judges using 9-point Hedonic Scale (Ranganna, 1986) to test the liking or disliking of products. Semi-trained panel did the evaluation. The panelist asked to record the level of liking or disliking by giving marks for various characteristics of the products.

ASSESSMENT OF SHELF-LIFE BY ACID VALUE TEST

The shelf-life of the biscuits was assessed by the acid value test.

Acid Value Test

The acid value is the number of mg of potassium hydroxide required to neutralize the free fatty acids in 1 g of the fat.

Principle

The Solution of a known quantity of the fat is to be analyzed in a mixture of ethanol and diethyl ether, followed by titration of the free fatty acids present with an ethanolic solution of potassium hydroxide.

Apparatus

Burette, Conical flasks- 3 and Funnel

Reagents

- Solvent mixture 1/1 (V/V) of 95 per cent (V/V) ethanol and petroleum ether
- Potassium hydroxide (0.1 N)
- Phenolphthalein indicator

Procedure

- Accurately weigh about 10 g of the substance into a 250-ml flask.
- Add 50 ml of a mixture of equal volumes of ethanol and petroleum ether.
- Add 1 ml of phenolphthalein.
- Heat, if necessary, until the substance has completely dissolved, cool.
- Titrate with potassium hydroxide (0.1 mol/l), constantly shaking the contents of the flask until a pink colour, which persists for 15 seconds, is obtained.
- Note the number of ml required (a).
- Calculate the acid value from the following formula:

$$\text{Acid value (mg KOH/g)} = \frac{\text{Titrate value} \times \text{normality of KOH} \times 56.1}{\text{weight of sample in (g)}}$$

RESULTS

The present study was undertaken to develop and evaluate the garden cress fortified mathri. The findings of the study are presented in the following tables:

Sensory Evaluation

Mathris were served to the panel members for sensory evaluation and the results were obtained-

Table 3: Mean Score of Organoleptic Acceptability of Developed Iron Rich Mathri

S. No	Parameters	0 Day	After 30 Day	After 60 Day
1.	Color	7.3	6.35	5.5
2.	Flavor	7.5	6.27	5.3
3.	Appearance	7.3	6.25	5.42
4.	Texture	7.3	6.32	5.67
5.	Mouth feel or Taste	7.3	6.3	5.87
6.	Overall Acceptability	7.3	6.3	5.75

The table shows the mean score of overall acceptability obtained by organoleptic evaluation developed sample. The table shows that on overall organoleptic acceptability the mean score of developed mathri were 7.3, 6.3 and 5.75 respectively on the 0 days, 30 days and 60 days.

Shelf-Life Evaluation

The shelf-life of the developed mathri was evaluated by Acid value test and the mean scores are presented in the table.

Mean Score of Acid Value of the Developed Iron Rich Mathri

Fatty Acid Value- 8.25 (After 30 Days)

CONCLUSIONS

The results of the present project entitled “**Development of Iron Rich Flour using Garden Cress Seeds**” show that the overall acceptability of the garden cress fortified mathri was higher at zero day evaluation at the 10% fortification level. The developed fortified mathri was liked moderately by the panel members after evaluating the mathri using 9- point Hedonic Scale. It shows that fortification with garden cress was found good in all attributes, that is color, flavor, appearance, texture, taste and overall acceptability. It may be concluded that more palatable dishes like Kheer, Halwa and bakery products can be obtained with garden cress seeds fortification. Further, projects can also be planned and tried out with garden cress which is an under-utilized species in India for development of different recipes that can be used as nutritious snacks for the people as a healthy replacement to traditional snacks and foods.

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