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Nutritional Composition and Phytochemical Analysis of Ragi Microgreens

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Abstract

Ragi (*elusine coracana*) is one of the staple pseudocereal well known for his multitude of beneficial roles in promoting health and general wellbeing. Though it is one of the common millets and majorly consumed in south and north part of India, nutritional potential of ragi microgreens is yet to be explored. Considering other established microgreen's nutritional significance, possible health implications, antioxidant properties and erythropoietic activity, present study was undertaken to estimate nutritional composition, qualitative phytochemical analysis, and quantification of bioactive ingredients of lyophilized ragi microgreens. Since lyophilisation is considered superior

technique in preserving heat labile compounds, compared to other dehydration methods, it was used as the preferred sample for present study. Nutrient composition of ragi microgreens was found to be impressive with a protein content of 13.3 gm percent, crude fibre content 8 gm percent, iron mg percent vitamin C 112 mg percent and calcium are 91 gm percent. Preliminary phytochemical screening revealed presence of terpenoids, alkaloids, flavonoids, tannins, and sterols. Total chlorophyll estimation indicated that total chlorophyll content of lyophilized ragi microgreen is 623 mg/100 gm.

Keywords: Ragigrass, Microgreens, Lyophilizer, Nutraceutical, Antioxidant

Introduction

Ragi microgreen is one of the underutilized immature saplings with cotyledons of the common millet, ragi plant (*Elusine coracana*). microgreens are young seedlings of a versatile grain that's packed with nutrients and is typically harvested within 7 to 14 days after germination. In recent years, microgreens are on demand from high-end restaurant and nutritional researchers due to their potent flavours, functionality, concentrated source of vitamins, minerals, and other bioactive compounds, such as ascorbic acid, tocopherol, carotenoids, folate, tocotrienols, phylloquinones, anthocyanins, glucosinolates, etc. [1]. Microgreens are tiny superfoods have gained immense attention of health-conscious population mainly because of their ready-to-eat property and high nutraceutical potential. Wheat microgreen is renowned for its therapeutic value since ancient times. The beneficial nutrients naturally obtained from wheat microgreen helps to promote health and healing [2]. In modern era, processing of herbal ingredients using lyophilization technique has gained immense importance due to its retention of heat labile active nutrients. Lyophilization is often considered as superior compared to other emerging drying techniques. Hence a lyophilized powder developed from organically grown fresh ragi microgreens were used for present study. No chemical fertilizer and pesticide were added at growth and harvesting stage of microgreens. Frequent consumption of microgreens can help to flush out toxins from the body, reduces cholesterol and improves digestion. A nourishing and refreshing drink that best quenches thirst is suitable for both young and old. Ragi has the amazing ability to concentrate maximum nutrients from the soil. Scientists have established that microgreens the immature saplings need to be cultivated carefully and harvested at the joining stage (6 to 7 days in tropical climate) as nutrient content remains at its peak in this stage [3].

Present study focuses on exploring therapeutic and nutrient potential of ragi microgreen in terms of proximate composition, vitamin and mineral content and estimation of bioactive compound like Chlorophyll. In juice form it contains 70% chlorophyll, which is often referred to as the green blood as chlorophyll closely resembles the molecules of human red blood cells. The bioactivity of chlorophylls is attributed to their ability to act as antioxidants, antimutagens, and anticarcinogens. The unique

chemical structure allows chlorophylls to scavenge harmful free radicals, mitigate DNA damage, and modulate cellular processes involved in disease development. Furthermore, their hydrophobic side chains facilitate interactions with biological membranes, influencing cellular uptake and signaling pathways [4].

Growing ragi microgreen to about seven inches tall is optimum for its health benefits. Ragi microgreen is easy to cultivate at home level and is not so popular in India therefore to create awareness about this underutilized microgreen present study was undertaken to study nutrient composition and phytochemicals content of lyophilized ragi microgreen powder.

Materials and Methods

Methodological aspects related to present study are discussed in three phases:

Phase I: Cultivation and Processing of Ragi microgreen

Good quality ragi seeds were taken from GKVK Bangalore for experimentation and surface sterilized by using 0.1% NaOCl. Seeds used in this study was grown indoors until required for experiments. Earthen pot of 12 x12 inches and about 33 depth was filled with 1/2-inch soil. Overnight soaked ragi seeds were then evenly spread over it and further covered with 1/3rd soil. Small quantities of water were sprinkled evenly over soil and 3-4 hours indirect sunlight was allowed daily for growth of grass. On the tenth day, when grass is about 7 inches tall, it is cut ½ inches above the surface of soil and shade dried and powdered [5].

Phase II: Development of lyophilized powder

In the present study, harvested greens were subjected to extraction of juice followed by freeze drying using a Martin Christ-Lyophilization unit lyophilizer [6].

Phase III: Analysis of Proximate Principles

This phase dealt with the analysis of the nutrient composition of ragi microgreen powder. Ragi microgreen powder was subjected to the determination of moisture, total carbohydrate, ash content, crude fibers, proteins, fats, Irons, Calcium, and vitamin C [7].

Phase IV: Analysis of Phytochemicals and Chlorophyll

Phytochemical analysis for major phytoconstituents like steroids, glycosides, terpenoids, saponins, tannins and flavonoids were undertaken. Fresh *Elusine coracana* grass was subjected to qualitative tests by standard methods as described by Zin (2006) for preliminary phytochemical analysis [8]. The chlorophylls are the essential components for photo synthesis, and occur in chloroplasts as green pigments in all photosynthetic plant tissues [9]. They are bound loosely to proteins but are readily extracted in organic solvents such as acetone or ether. Chlorophyll is extracted in 80 per cent acetone and the absorption is read in a spectrophotometer as described by Arnon [10].

Results and Discussion

The results obtained from the present investigation have been discussed in the following subheads:

Processing of Ragi microgreen (*Elusine coracana*)

178 g Ragi microgreen Powder, obtained from 1 kg of fresh Ragi microgreen, Ragi microgreen Powder is high in dietary fiber and thus helps maintain blood sugar level, cholesterol level and prevents constipation. The super energy, enzymes, and fresh juice of ragi microgreen is a high-quality nutrition, health and energy boost. Ragi microgreen is one of the so-called green foods that are valued by health-conscious

individuals as a great natural source of nutrients.

Nutritional Composition of Ragi microgreen Powder

Nutrition composition of ragi microgreen powder is presented in Table 1 and results revealed that moisture content of ragi microgreen powder was 1.2gm percentage, Protein content of Ragi microgreen powder was 15.3 gm percentage. Fat content of ragi microgreen powder is 0.9 gm which may contain essential fatty acids: Linolenic Acid and Linoleic Acid. Carbohydrate content was calculated by different method results showed that it contains about 33.02 gm. Fiber content is high (7.45 gm percentage). Vitamin C content was 206 mg. Most of the Vitamin C is lost during the drying process of green grass powder but since the sample was lyophilized, retention of vitamin C is expected to be more. It is also a good source of total mineral (4.80 mg). Mineral composition of ragi microgreen powder indicated that calcium and iron found to be and mg respectively per 100 gm of ragi microgreen powder. Ragi microgreen is an excellent source for all major and minor minerals. It is especially high in calcium, magnesium, manganese, phosphorus, and potassium, as well as trace minerals such as zinc and selenium. Ragi microgreen is a good source of crude fiber, protein and vitamin c which are essential factors for maintenance of good health.

Table 1: Nutrient Composition of Ragi microgreen Powder

S. No	Nutrient composition	Per 100 gm
1	Moisture (gm)	1.2±0.48
2	Protein (gm)	15.3±0.34
3	Fat (gm)	0.90±0.05
4	Carbohydrates(gm)	33.02±1.05
5	Mineral Ash (gm)	4.80±0.13
6	Fiber (gm)	7.45±0.24
7	Vitamin C(mg)	206±10.05
8	Calcium mg)	91.80±7.85
9	Iron (ppm)	2417±17.08

Table 2: Preliminary Phytochemical Analysis of Ragi microgreen

S. No	Phytochemicals	Presence
1	Terpenoids	+ve
2	Sterols	+ve
3	Tanins	+ve
4	Saponins	-ve
5	Glycoside	-ve
6	Flavonoids	-ve

Table 3: Chlorophyll Composition in Ragi microgreen powder

Phytochemical	Per 100 gm
Cholorophyll	546.7 mg

Phytochemical Composition of Ragi microgreen Powder

Phytochemicals are nutritive plant chemicals that contain protective and disease preventing compounds. They are often lumped together under the term "Phytochemicals" - "Phyto" from the greek word for plant, denoting their plant origins. Pharmacologically active plant phytochemicals include flavonoids, saponins, lignans and tannins [11]. Preliminary phytochemical analysis of ragi microgreen powder showed that terpenoids, steroids and tannins were detected and whereas rest of the phytochemicals like saponins, glycosides and flavonoids were not found. The amount of chlorophyll was 546.7 mg/ 100g. This establishes that ragi microgreen is a healer, blood regenerator also helpful in reverse mutagenic activity [12].

Chlorophyll found in ragi microgreen can prevent the growth of harmful bacteria. A number of studies have shown the ability of chlorophyll to retard the growth of bacteria in wounds, as well as confirming its anti-inflammatory properties.

Conclusion

Present study clearly indicates that the use of ragi microgreen could be immense helpful in improving quality of life and general health. Although therapeutic use of ragi microgreen juice well established due to its anticancer, immunity booster, green blood properties, medicinal application of unconventional microgreens like ragi microgreen is not widespread. Ragi microgreen powder is a potent supplement for prevention of public health disorders like anaemia, osteoporosis, or any other bone related disorders. The amount of chlorophyll in ragi grass is quite high indicating its role in hemopoiesis, antioxidant activity. Hence awareness among people about availability, nutritional and therapeutic values of ragi microgreen can be achieved by using lyophilized powder as an active ingredient in development of value-added products like cookies, papad, cake etc.

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