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Development of instant multi millet fortified Khichdi mix

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Abstract

Millets have high nutritional qualities and produce well under marginal conditions but they are not used to the extent that is possible and are rich in minerals and vitamins compared to rice and wheat. Now-a-days, younger generation also facing the problems related to heart, diabetes, obesity and chronic disease along with anemia. Noticing there is a change in the consumption pattern which is including millets in the diet to overcome these chronic diseases and to eradicate anemia in adolescents, Instant multi millet khichdi have been developed which is enriched with iron and calcium. The study undertook batch process trials for process standardization viz., T1: Control (Mixed Millet Khichdi), T2: All Millets + dried fenugreek leaves, T3: All Millets+ wheat + Toordal + green gram + Bengal gram, T4: All Millets + wheat+Toor dal+green gram+Bengal gram + dried fenugreek leaves. Among the trails, T4 was found to good with respect to nutrients particularly protein (14.79%), Iron (108.32mg/kg) and Calcium (47.66mg/kg) as compared to other treatments. Also storage study for 3 months packed in laminated pouches showed acceptable under microbial study (0.3×10^4). Overall acceptability was found to be good with respect to T4 stored in laminated pouches which showed average score of 8.41 as compared to khichdi stored in aluminum foil (8.20) and polyethylene bags (7.93).

Keywords: Millets, fortified khichdi, standardization, diabetic patient and quality evaluation

Introduction

India is transforming itself into developed country at faster rate due to inherent abilities of Indians Without good health and quality life individuals and the country cannot progress further in the desired direction and level. To keep up with changing trends and increasing demand for clean labels, consumers preferences have to be met for, not only convenient and tastier foods but with products which are nutritious and promote health and sustainability. The ready to cook foods are finding more market shelf space with a growing CAGR of over 18% (Iksha Chhabra & Avneet Kaur, 2022). The present study explores development of ready to cook foods using bio-diversified grains for more sustainability and targets LOHAS (Lifestyle of Health and Sustainability) segment.

India is attributed to three factors. Firstly the inherent genetic constitutions of Indians, we Indians have susceptible genes for cardiovascular diseases and diabetes. Secondly changing lifestyles due to globalization, competitive and un-complacent nature of jobs and working conditions. Thirdly change in food habits i.e. shift to high consumption of white rice and refined wheat flour, and junk foods prepared from these which do not contain dietary fibre, nutrients and minerals. Bad effects of third factor can be reduced to nil by adapting cultivation, production, fabrication of healthy food products and consumption of millets.

Millets are nutritious with quality protein, rich in minerals, dietary fibre, phyto-chemicals and vitamins. Consumption of millets reduces the incidence of cardio vascular diseases, diabetes mellitus, obesity, constipation, and improves the overall health of people. Millets being eco-friendly crops are suitable for fragile and vulnerable ago-ecosystems. In spite of all these advantages unfortunately, millet cultivation and consumption has diminished a lot in the last 50 years. This is due lack of processing protocols for millets and lack of awareness of the health benefits of millet consumption. As a result millet crops, millet growers and rural Livelihood and public health are in dangerous situation. Millets are rich in minerals and vitamins compared to rice and wheat; millets have the huge potential to provide security of food, nutrition, fodder, fiber, health, livelihood and ecology. In view of all these qualities those they so amazingly combine, millets only be called as Miracle Grains/ Nutria-Cereals. Inclusion of millet crops in a concerted way in cropping systems and also particularly in fragile Ecosystems, is a virtuous move towards sustainability.

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Apart from these huge advantages, value addition of millets required which can be enriched with iron and calcium so that, we can eradicate anemia in adolescents as well as bone related problems also. Hence there is a demand for increase in the instant foods which is nutritious, tastier and healthy. Keeping in mind all these factors, developed Instant multi millet khichdi mix enriched with micronutrient (Iron and calcium) by including dried fenugreek leaves the mix.

Methodology

The present investigation entitled “Development of Instant

Multi Millet Fortified Khichdi Mix” was carried out during the year 2020-2021. The raw materials were procured from the market. The instant multi millet khichdi is standardized through various proportion and compared with control i.e., All millets khichdi. The standardized millet khichdi was subjected to nutrient analysis and selected for further shelf-life study. The best millet khichdi was selected in terms of nutrient as well as sensory and taken for further study. The selected treatment was stored in three different packaging pouches and analyzed for Sensory evaluation and microbial load on monthly intervals.

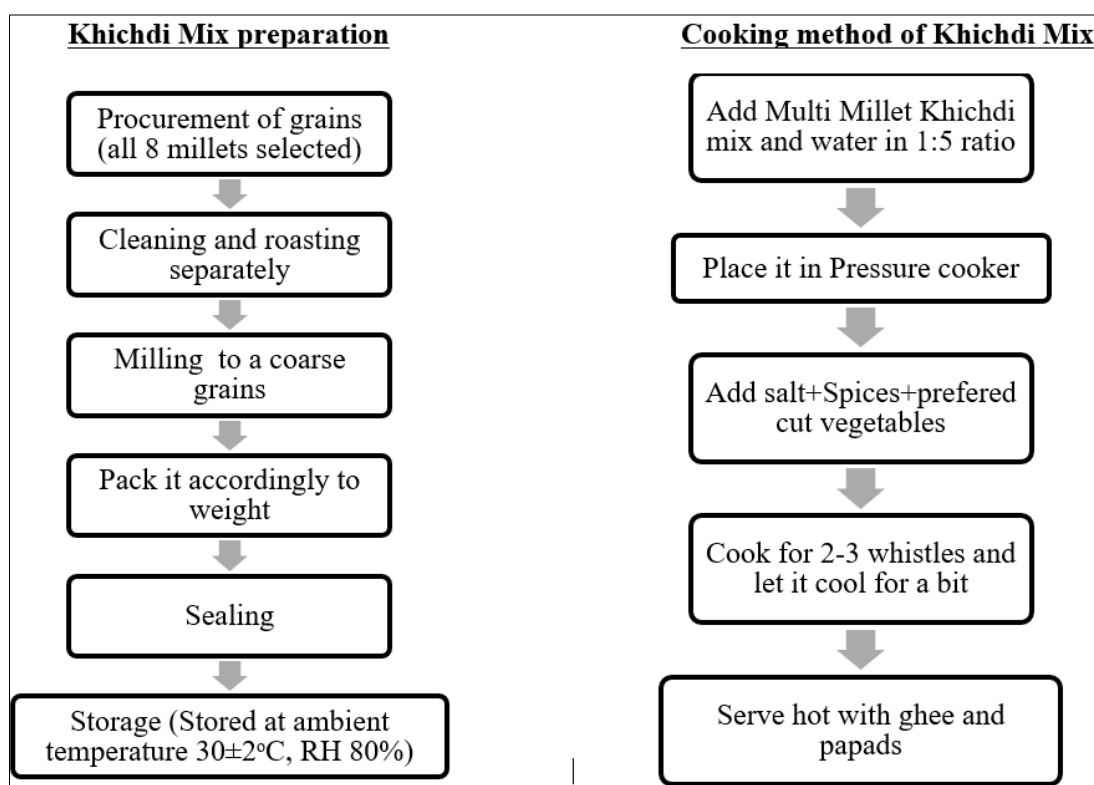


Fig 1: Flow chart for preparation of Multi Millets Fortified Khichdi

Nutrient analysis

The nutrients were analyzed by AOAC, 2003 method. Microbial analysis were carried out by serial dilution and plate count method.

Sensory evaluation

This was carried out by using Nine point hedonic scale under expert panel and average score was analyzed.

Results

Nutrient composition: Table 1 depicted, among the standardized khichdi samples, T4 showed higher percent of protein and fiber content having 14.79 and 3.52 respectively. Whereas, other three treatments were on par with each other. Carbohydrates was found to be higher in control i.e., T1 (79.74%) and on par with T2 (78.93%).

Micronutrient composition

The millet khichdi samples were analysed for nutrient composition and table 2 revealed that, khichdi prepared with millets, cereals and dried leafy vegetable constituted higher micronutrient particularly iron (47.66mg/kg) and calcium (108.32 mg/kg) as compared other khichdi prepared with only

millets. This increases the hemoglobin content in the body as well as calcium level and reduces the bone related problem and percent of anemic symptoms. It could be stored in polyethylene and laminated bags for 90 days at ambient temperature without any nutritional losses. Similar trend have been found by Kulkarni and Naik (2000) ^[7], Islam (2012) ^[4] and Ahmad *et al.* (2013) ^[11].

Shelf life studies

The T4 sample was stored for three months in three different packaging pouches *viz.*, polyethylene, laminated and aluminum pouches and analyzed for sensory evaluation for 30, 60 and 90 days. The obtained results are showed in table 3, fortified khichdi mix stored in laminated pouches was found acceptable with respect to sensory evaluation (average mean of 8.41) Minimum score (7.93) was found in khichdi (T4) after 90 days of storage in polyethylene pouches. Overall acceptability of supplemented fortified khichdi was decreased with increase in the storage period but packaging materials did not affect reasonably to overall acceptability of fortified khichdi. These findings are in agreement with the results of Khanam *et al.* (2011) ^[6] in supplementation of food formulation.

Microbial study

Table 4 depicts the microbial load of the T4 fortified Khichdi stored for 30, 60 and 90 days in 3 different packaging material. It was not detected in the first 30 days of storage in differently package khichdi. But the microbial load increased as the storage period increased. Though the khichdi stored for

the period of three months the growth of microbes remained in the acceptable level in all the differently packed fortified khichdi mix without affecting the quality attributes also organoleptic ally. However, such incremental trend in bacterial count upon storage for two months was observed by Priyanka *et al.*, (2018)^[8] and Geeta *et al.*, (2019)^[5].

Table 1: Qualitative attributes of Millets Khichdi

Treatments	Proximate parameters (%)				
	Protein	Fat	Ash	Carbohydrates	Fiber
T1: Control (Mixed Millet Khichdi)	12.09	3.27	1.26	79.74	2.48
T2: All Millets + dried fenugreek leaves	12.33	3.75	1.34	78.93	3.11
T3: All Millets + wheat + Toordal + green gram + Bengal gram	13.45	3.14	1.48	75.28	2.95
T4: All Millets + wheat + Toor dal + green gram+ Bengal gram + dried fenugreek leaves	14.79	3.49	1.60	73.99	3.52

Table 2: Mineral content of Millets Khichdi

Treatments		Minerals (mg/kg)	
		Calcium	Iron
Control (Mixed Millet Khichdi)	T1	43.67	48.53
All Millets + dried fenugreek leaves	T2	44.24	54.73
All Millets + wheat + Toordal + green gram + Bengal gram	T3	96.83	42.32
All Millets + wheat + Toor dal + green gram+ Bengal gram + dried fenugreek leaves	T4	108.32	47.66

Table 3: Effect of storability on the acceptability of packed Millets khichdi (T4)

Packaging material	Period of storage (Days)				Average Mean
	0	30	60	90	
Polyethylene pouches	8.43	8.15	7.79	7.37	7.93
Laminated pouches	8.43	8.42	8.40	8.39	8.41
Aluminum pouches	8.43	8.21	8.15	8.03	8.20

Table 4: Microbial analysis of the stored (T4) khichdi

Packaging material	Total plate count (cfu×df)			Standard	Acceptability
	30	60	90		
Polyethylene bags	ND	0.52×10 ²	0.83×10 ⁴	<10 ⁶	Acceptable
Laminated pouches	ND	0.1×10 ²	0.3×10 ⁴	<10 ⁶	Acceptable
Aluminum pouches	ND	0.2×10 ²	0.61×10 ⁴	<10 ⁶	Acceptable

ND: Not detected

Conclusion

The khichdi prepared using all millets and enriched with cereals and dried leafy vegetables increases the nutrient level and can be very useful in metropolitan cities as people will be searching for instant, healthy, nutritious, tastier food. This instant multi millet khichdi acquired all the quality parameters which is necessary in today's generation. Hence, it is easy to cook, easy to store which is highly nutritious food. Efforts should also be made to suggestion for transfer this technique to hospitals and Anganawadi Kendras. Fortified khichdi beneficial for those patients suffer from diabetes and anemic people in India.

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