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Formulation and quality evaluation of instant *upma* mix of foxtail millet and garden cress seed

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Abstract

In the present study four formulations of instant mixes were prepared from foxtail millet semolina and garden cress semolina with spice mix and oil and were evaluated and compared for sensory characteristics and proximate composition with wheat semolina. Results of sensory evaluation showed that replacement of wheat semolina with mix prepared by foxtail millet semolina and garden cress semolina in the proportion of 75:10 was found to well accepted. The proximate composition of instant *upma* mix showed that moisture content varied from 6.15 to 7.62%, protein content 11.30 to 13.84%, fat 7.30 to 16.80%, fiber 3.90 to 4.31% ash 2.89 to 4.43%, carbohydrate content 55.16 to 64.07% and energy value 371.06 to 427.50 kcal/100g.

Keywords: Foxtail millet, garden cress seed, instant *upma* mix, sensory evaluation, proximate composition

Introduction

Convenience foods are types of food which imparts convenience to the consumer by way of little or no need of major processing or cooking before consumption. Rapid urbanization, industrialization phenomenon of “working women” recent years and consequent changes in eating habits of consumer have lead to development of instant mixes and RTE (Ready to eat foods). Instant mixes of several traditional Indian foods such as Instant *Idli* Mix, Instant *Kheer* Mix, Instant *Upma* Mix, Instant *Dhokla* Mix. Majority of the instant mixes were prepared from wheat and rice and other minor millets such as foxtail millet have remained underutilize due to lack of processing technology.

Upma is a popular breakfast of south India cooked as thick porridge from dry roasted semolina or coarse rice flour. Millet is the name applied to numerous small seeds grasses which originated in Asia and Africa (Devi *et al.*, 2011) [4]. Millet is gluten free cereal and hence an excellent, option for people suffering from celiac disease often irritated by the gluten content of wheat (Xu *et al.*, 2011) [20]. Foxtail millet (*setaria italica*) also called as *rala*, is one of the oldest cultivated cereal, with its origin in China and grown subsequently in India and most of Africa and parts of Southern United State (Liu *et al.*, 2012) [11]. Foxtail millet is a rich source of protein (12.3g/100g), dietary fiber (4.1g/100g), carbohydrate content is low (60.9g/100g), rich in minerals (3g/100g). Foxtail millet is good source of β -carotene (123-191 μ g/100g) (Goudar *et al.*, 2011) [8]. Garden cress seed (*Lepidium sativum*) is rich source of proteins, dietary fiber, omega-3 fatty acid, iron, other essential nutrient and phytochemicals. It has anti-diabetic laxative, hypocholesterolemic, diuretic, anticancer properties (Doke and Guha, 2014) [5]. Wide spread utilization of the foxtail millet and garden cress seed still limited mainly because of non-availability of variety of food products in the market. The foxtail millet semolina does not contain any gluten protein and hence there is possibility for replacement of wheat semolina with foxtail millet semolina. Which may be useful for celiac patients. Foxtail millet and garden cress seed has not been exploited so far for the preparation of semolina and its utilization in the preparation of instant *upma* mix.

Materials and methods

Foxtail millet and garden cress seeds were procured from local market and popping of foxtail millet was carried out as per the method of Srivastava and Batra (1998) [18] and popping of garden cress was carried out as per the procedure of Panwar & Guha (2014) [14]. semolina and instant *upma* mix was prepared as per following flow sheet.

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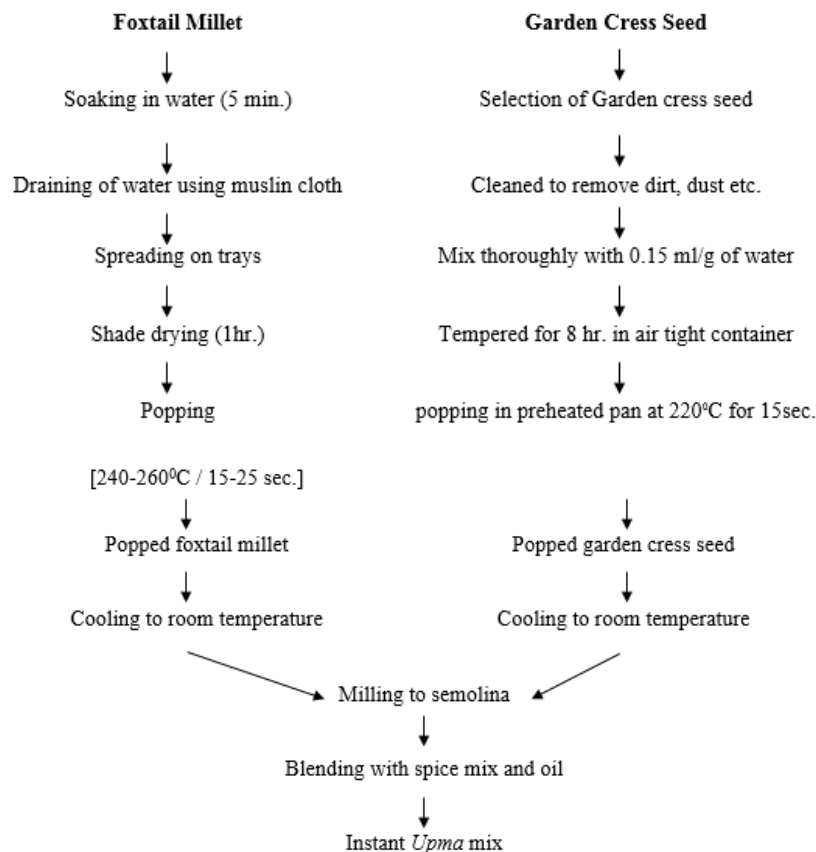


Fig 1: flow chart for preparation of instant *Upma* mix

Formulation of instant *upma* mix: Formulations of instant *upma* mix was prepared as per given in table 1.

Table 1: Formulation of instant *upma* mix

Formulations	Wheat semolina	Foxtail Millets Semolina	Garden Cress Semolina	Spice Mix
Control <i>Upma</i> mix	85	0	0	15
A	0	80	5	15
B	0	75	10	15
C	0	70	15	15
D	0	65	20	15

For preparation of spice mix: 5g oil was heated, to this 1g mustard seed, 1g cumin seed, 1g green chilli, 1g dried curry leaves, 1g dried coriander leaves, 2g of black gram splits were added and roasted and 3g of salt.

Control –Wheat semolina: spice mix (85:15).

A – foxtail millet semolina: garden cress seed semolina: spice mix (80:5:15).

B – foxtail millet semolina: garden cress seed semolina: spice mix (75:10:15).

C – foxtail millet semolina: garden cress seed semolina: spice mix (70:15:15).

D – foxtail millet semolina: garden cress seed semolina: spice mix (65:20:15).

Preparation of *Upma* from instant *Upma* mix by reconstitution

Dry mixes (100g) of instant *Upma* mix were reconstituted with measured amount of hot water (190-200 ml) and stirred on low flame until the desired consistency was attained (started to leave the pan)

Proximate composition of instant *upma* mix

The instant *upma* mix formulations and control sample were analyzed by standard method for moisture (AOAC 2007) [2], total fat, crude protein, ash and fiber (AOAC 2007) [2]. The carbohydrate content was calculated by difference.

Sensory evaluation

The Instant *Upma* mix samples were subjected to sensory evaluations by 10 semi trained panelists using 9-point Hedonic scale (from 1=extremely dislike to 9 = extremely like) was used to determine the preference in Appearance and colour, taste, texture, flavor and overall acceptability. (as per method given by Laura *et al.*, 2013) [10].

Determination of energy value

The energy values of the prepared food products were determined by computation and expressed in calories (Frary *et al.*, 2005; Gopalan *et al.*, 2000) [6,7].

Statistical analysis

The data obtained from various experiments were statistically analyzed. A complete randomized design was adopted for statistical analysis of data by following the procedure as described by Panse and Sukhatme (1963) [13]

Result and Discussion

Sensory evaluation

Sensory evaluation of *upma* prepared from different formulations of instant *upma* mixes presented in table 2.

Table 2: Sensory evaluation of *upma* prepared from instant *upma* mix

Formulations	Appearance and Colour	Taste	Texture	Flavor	Overall acceptability
Control	8.2	8.1	7.8	8.3	8.1
A	7.5	7.3	7.5	7.4	7.4
B	7.8	7.9	7.8	7.7	7.8
C	7.2	7.3	7.4	6.9	7.2
D	7.06	7.0	7.2	6.8	7.0
SE±	0.067	0.088	0.050	0.069	0.074
CD at 5%	0.212	0.278	0.160	0.219	0.235

Each value is the mean of three replications semolina, 10% popped garden cress semolina scored highest scores for all the sensory characters *viz.*, appearance and colour (7.8), taste (7.9), texture (7.8), flavor (7.7), and overall acceptability (7.8) as compared to other four formulations. This might be due to addition of fine popped foxtail millet semolina and popped garden cress semolina in appropriate combination resulting good colour, taste and fine texture of *upma*. Similar results were reported by, Itagi *et al.*, (2012)^[9]; Srivastava *et al.*, (2014)^[19]; Adegunwa *et al.* (2014)^[1] reported the acceptable level of foxtail millet flour at 80%, 50% and 100% with regards to readymade foxtail millet mix for diabetics, multigrain semolina blend for *upma* and composite millet-wheat *chinchin* respectively, and similarly Garden cress incorporating value added instant *dhokla* mix was developed by Lohekar and Arya (2014)^[12]. The instant mix which contained 5 per cent of garden cress attained highest scores for colour, texture, taste, flavour and overall acceptability.

Proximate composition of instant *upma* mix

Proximate composition of instant *upma* mix presented in table 3 showed that different formulations of *upma* mix contains

Indicates that the *upma* formulation (B) prepared from 75% popped foxtail millet.

moisture from 6.15 to 7.62 percent, protein 11.30 to 13.84 percent, fat 7.30 to 16.80 percent, carbohydrate 55.16 to 64.07, ash 2.89 to 4.43 percent, fiber 3.90 to 4.31 percent, and energy value 371.06 to 427.50 Kcal/100 g.

Similar findings were reported by Poongodi *et al.* (2010)^[15] with regard to millet flour blend. Nutritional evaluation of the selected fiber rich food items revealed that the fiber rich product has good nutritional value and found to be a good source of minerals (Bora and Kulshrestha, 2014)^[3]. The fat content was increased with increased supplementation of garden cress seed semolina. While going through the proximate composition of *upma* mix the decreased level of carbohydrate as compared to control was noticed as the carbohydrate content of foxtail millet semolina was lower than wheat semolina. Similar results were reported by Srivastava *et al.* (2014)^[19] with regards to composite flours (foxtail, barnyard, finger millet with wheat flour) and multigrain semolina blend respectively. The overall nutritional quality of instant *upma* mix with substitutions of foxtail millet semolina was higher than control sample. Similar results were reported by Sambavi *et al.*, (2015)^[17] and Punia *et al.*, (2003)^[16].

Table 3: Proximate composition of instant *upma* mix

Formulations	Moisture (%)	Protein (%)	Fat (%)	Carbohydrates (%)	Ash (%)	Fiber (%)	Energy value (Kcal/100g)
Control	7.62	12.27	7.30	64.07	4.43	4.31	371.06
A	6.16	11.30	11.93	63.51	3.20	3.90	405.61
B	6.15	12.20	13.63	60.77	3.18	4.07	414.55
C	6.29	12.73	15.40	58.15	3.15	4.28	422.12
D	7.22	13.84	16.80	55.16	2.89	4.09	427.50
SE±	0.005	0.005	0.044	0.007	0.028	0.007	0.020
CD at 5%	0.018	0.018	0.140	0.023	0.089	0.023	0.063

*Each value is the mean of three replications

Conclusion

It can be concluded that utilization of popped foxtail millet semolina and popped garden cress seed semolina improved the quality of instant *upma* mix related to sensory and nutritional attributes. On the basis of sensory quality, replacement of wheat semolina with 75% popped foxtail millet semolina and 10% garden cress semolina was found overall acceptable as compared to other formulations which contains 12.20% protein with energy value of 414.55 Kcal/100g. This could be new product development from foxtail millet and garden cress seed which contributes health benefits for diabetes and celiac patients.

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