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Studies on effect of flaxseed addition on nutritional and sensorial quality of niger seed chutney

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Abstract

The research intended to explore the proximate composition and sensory evaluation of niger-flaxseed composite chutney powder. Niger seed chutney powder, a palatable functional food adjunct was prepared by mixing roasted and powdered niger seeds with roasted and powdered flaxseeds with other selected spice ingredients. Standardization of chutney was done by replacing niger seed by flaxseed in various blends such as 10%, 20%, 30%, 40% and 50%. Prepared chutney samples were evaluated for sensory analysis. Chutney prepared with 60% niger seed and 40% flaxseed found to be most acceptable with respect to the all sensory attributes. Prepared chutney samples were analyzed for nutritional characteristics.

Keywords: Chutney powder, flaxseed powder, Niger seed, standardization etc

Introduction

Niger (*Guizotia abyssinica* Cass.) seed is an important oilseed belonging to the family *Asteraceae* (*compositae*) a crop of commercial importance has grown recently (Bhagya and Sastry, 2003; Ramadan and Moersel, 2003b)^[7, 31]. Niger is native to Africa, from Ethiopia to Malawi, and was probably domesticated in Ethiopia, where Ethiopia and India are the chief niger seed producing countries of the world (Getinet and Sharma, 1996; Bhagya and Sastry, 2003b)^[16, 7].

In Ethiopia, niger seed provides about 50–60% of the country's edible oil while in India it accounts for about 2% of total oil seeds produced (Getinet and Sharma, 1996; Quinn and Myers, 2002)^[16, 30]. The annual production is about 0.2 MMT. The genus *Guizotia* comprises six species of which *G. abyssinica* is the only cultivated one (Ramadan and Moersel, 2003)^[31]. Niger seed contains fat 31.0±0.3g/100 g, proteins 24.0±0.4 g/100 g, carbohydrates 17.1 g/100 g, crude fiber 16.9±0.2 g/100 g, moisture 4.5±0.2 g/100 g, ash 3.1±0.1g/100 g, iron 56.7 mg/100 g. The mineral, protein, fatty acid and amino acid compositions depend on the environmental factors, location and varieties (Baramhe and Varde, 1977; Nasirullah *et al.*, 1982; Dasthagiriah *et al.*, 1993; Datta *et al.*, 1994; Venkata Rao *et al.*, 1996)^[5, 22, 11, 12, 33].

Niger seed (*Guizotia abyssinica*) is a type of oilseed crop which is reported to be containing very high amount of iron (56.7 mg/100 g) in plant based foods and may be of immense help in improving the iron status of vulnerable population group (Gopalan *et al.*, 2000)^[17].

In India, a variety of chutneys and pickles in large volumes based on vegetables, pulses and spices. Literature is available on development and standardization of several food adjuncts namely traditional chutneys instant chutneys and chutney powders based on the various raw materials available during different seasons (Balaswamy *et al.*, 2005; Satyanarayana *et al.*, 2001; Balaswamy *et al.*, 2004; Prabhakara *et al.*, 2005; Jyothirmayi *et al.*, 2006; Narsing *et al.*, 2008)^[3, 32, 5, 29, 18, 21]. Flaxseed (*Linum usitatissimum*) is the richest source of n-3 fatty acid. It also contains other components like dietary fiber, lignins which render it potentially beneficial for maintaining good health and reducing incidence of various diseases (Oomah and Mazza, 1998; Connor, 1999 and 2001)^[23, 9, 10]. However the health benefits of flaxseed are not fully utilized. In view of same, an investigation was undertaken to incorporate flax seed in niger seed chutney.

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Materials and Methods

Table 1: Raw materials (in gram)

Samples	Niger	flax	cumin	chilli	garlic	salt
T ₀	100	-	2.0	5	2.0	8
T ₁	90	10	2.0	5	2.0	8
T ₂	80	20	2.0	5	2.0	8
T ₃	70	30	2.0	5	2.0	8
T ₄	60	40	2.0	5	2.0	8
T ₅	50	50	2.0	5	2.0	8

Raw materials like niger seed, flaxseed, cumin, chilli powder, garlic, salt required for the product preparation were procured from local market of Parbhani and chemicals for analysis were made available from different Departments of Collage of Food Technology, V.N.M.K.V., Parbhani.

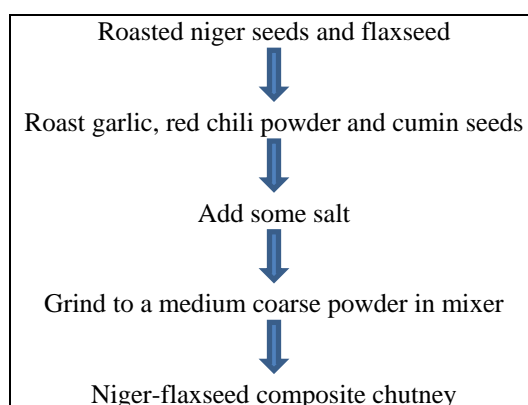


Fig 1: Recipe for the preparation of niger-flaxseed composite chutney

Statistical analysis

Suitable statistical tests were used to find out the difference between different variables. The analysis of variance was followed for interpreting the differences between the different variations for individual sensory characters (Panse and Sukhatme, 1985) [26].

Results and Discussion

Proximate composition of niger seed and flaxseed

Table 2: Proximate composition of niger seed and flaxseed

Constituents	Niger seed	Roasted flaxseed
Moisture	4.40	4.10
Fat	39.30	31.02
Protein	23.97	24.40
Ash	4.50	3.27
Crude Fiber	11.04	9.73
Carbohydrate	16.79	27.48

*Each value is the mean of three replications

Proximate composition of whole niger seed was found as moisture (4.4%), protein (23.97%), Fat (39.30%), ash (4.50%), carbohydrate (16.79%) and crude fiber content (11.04%). From table it was noticed that the niger seed act as a nutritional oil seed having unique properties (Bhagya and Sastry, 2003) [7] observed similar results for whole niger seeds.

From the Table proximate composition of roasted flaxseed was found as moisture (4.10%), Fat (31.02%), protein (24.40%), ash (3.27%), crude fiber content (9.73%) and carbohydrate (27.48%). This suggests that the flaxseed is a

Sample preparation

Cleaning

The niger seed and flaxseed were cleaned by hand picking to remove extraneous matter such as the stalks, broken grains, stones and pebbles other foreign seeds and weed seeds.

Roasting of Niger seed and flaxseed

Niger seed and flaxseed were roasted to golden brown color.

Process for preparation of niger-flaxseed composite chutney

Niger seeds, flaxseed and other ingredient were roasted on a frying pan for a 5 min. to remove raw flavor. After allowing niger seed and other ingredient were separately ground in a mixer to get a powder. Chutney was prepared according to the procedure given by the Pamidighantam *et al.* (2013) [25].

rich source of the nutrient. Similar results are in line with Azharand Saini (2016) [2].

Sensory evaluation of the niger-flaxseed composite chutney

Table 3: Sensory evaluation of the niger-flaxseed composite chutney

Sample	Sensory attributes				
	Appearance	Color	Flavor	Taste	Overall
T ₀	7.6	7.8	8.0	8.0	7.8
T ₁	7.8	7.9	8.0	8.0	7.9
T ₂	7.9	8.0	8.1	8.6	8.1
T ₃	8.1	8.5	8.6	8.8	8.2
T ₄	8.3	8.7	8.8	9.0	8.5
T ₅	8.2	8.6	8.9	8.9	8.3
S.E(±)	0.053	0.055	0.064	0.063	0.056
CD at 5%	0.178	0.181	0.202	0.195	0.182

*Each value is the mean of three replications.

Where,

T₀-chutney without addition of flaxseed,

T₁-chutney with addition of 10% flaxseed, T₂- chutney with addition of 20% flaxseed, T₃-chutney with addition of 30% flaxseed, T₄- chutney with addition of 40% flaxseed, T₅ - chutney with addition of 50% flaxseed

The scores for the appearance of the chutney were varied between 7.6 to 8.3. The score for appearance increased with increase in substitution of flaxseed from 10 to 50% to the chutney. The highest score was obtained for the 60% niger seed chutney and the lowest score for control sample.

The score for color of chutney varied between 7.8 to 8.7. The score for color increased with increase in substitution of flaxseed from 10 to 50% to niger seed chutney. The highest score was obtained for the sample containing 60% niger seed and 40% flaxseed. The color was acceptable up to incorporation of 50% flaxseed in niger seed chutney. The color of the chutney changed from dark black to the light brown with increase in level of flaxseed substitution (Azhar and Saini 2016) [2].

The score for the flavor of the chutney varied between 8.0 to 8.9. Also, maximum score of chutney was found in the chutney containing 50% niger seed and 50% flaxseed it was observed that the flavor of chutney increased with increase incorporation level of roasted flaxseed (Ozdemir and Devres, 2000 and Pittia *et al.*, 2001). Taste score varied between 8.0 to 9.0. Maximum score of chutney was found in chutney containing 60% niger seed and 40% flaxseed. While minimum score of chutney was found in control chutney. The score for overall acceptability varied between 7.8 to 8.5 for different chutney. Maximum score of chutney was found in chutney with 60% niger seed and 40% flaxseed. The score of overall acceptability of chutney increased with increase in the level of flaxseed in chutney.

Based on sensory analysis results that the chutney prepared by mixing of 60% niger seeds and 40% flaxseed was found to be best for the preparation of good quality niger seed chutney. Generally, these data agree well with (Byadagi and Geetha, 2012) who indicated that the chutney powder was developed by substituting the major ingredients in the recipe by niger seed kernel was best accepted at 60% level of incorporation.

Table 4: Proximate composition of niger-flaxseed composite chutney

Sample	Proximate composition (%)					
	Moisture	Fat	Protein	Ash	Fiber	CHO
T ₀	6.94	34.24	21.85	4.23	11.82	20.92
T ₁	5.40	33.79	21.87	4.02	10.91	24.01
T ₂	5.37	32.56	21.90	3.95	10.72	25.50
T ₃	5.32	32.50	21.97	3.83	10.59	25.79
T ₄	5.24	31.75	22.02	3.75	10.42	26.82
T ₅	5.12	30.92	22.04	3.59	10.24	28.09
S.E(±)	0.113	0.633	0.473	0.092	0.141	0.201
CD at 5%	0.352	1.973	0.362	0.286	0.439	0.627

*Each value is the mean of three replications

The moisture content of the chutney significantly decreased with flaxseed substitution by the range of 6.94 to 5.12%.

Fat content of the chutney was varied between the 34.24 to 30.92% as the substitution of niger seed with flaxseed increased. It was reported that the major fatty acid in the flax oil was α -linolenic acid, comprising 58.3% of total fatty acids (Berrin and Feral, 2008) [6].

Protein content of the chutney was ranged between the 21.85 to 22.04% as the level of flaxseed incorporation increased from 10 to 50%. Ash content of chutney was significantly decreased as the level of substitution by flaxseed increased. The ash content of the niger seed chutney was varied between the 4.23 to 3.59%. Crude fiber content of the chutney showed a significant decrease in the range of 11.82 to 10.24%. This may be due to the decrease in the quantity of niger seed as it a rich source of fiber (Bhagya and Sastry, 2003) [7].

Carbohydrate content of the chutney was significantly increased as the level of incorporation by the flaxseed increased. The Carbohydrate content varies between 20.92 to 28.09%. Increase in the carbohydrate content may be due to

the decrease in fat, ash and fiber content as the level of flaxseed was increased.

Conclusion

The studies revealed that the preparation of niger-flaxseed composite chutney powder can be used as a functional food adjunct. It can be concluded that the addition of 40% flaxseed in Niger seed chutney found to be acceptable with respect to all sensorial and nutritional qualities. The addition of 40% flaxseed in niger seed chutney decreases moisture, fat, ash and fiber content while increases protein content of prepared niger-flaxseed composite chutney powder.

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