

## Studies on Technology Development, Organoleptic Evaluation and Proximate Composition of Instant Sorghum Tortilla Mix

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**ABSTRACT:** In the present investigation, the instant sorghum tortilla mix was prepared with incorporation of soybean, bengal gram and fenugreek leaves powder. From previous study it was observed the anti-nutritional factor present in sorghum and soybean reduces nutritional value of prepared product. To overcome this problem in this study pre-treatment like malting of sorghum and soaking and roasting of soybean was done therefore the anti-nutritional factor removed and desired quality of product was obtained. The instant sorghum tortilla mix was prepared with constant base of malted sorghum flour and variation of bengal gram soybean and fenugreek leaves powder i.e. sample T<sub>1</sub> (70:23:05:02), T<sub>2</sub> (70:17:10:03), T<sub>3</sub> (70:11:15:04) and T<sub>4</sub> (70:05:20:05). The spice mix is added for enhancement of taste and flavour of product. The prepared mix was analyzed for its proximate composition such as protein, carbohydrate, fat etc. On the basis of sensory evaluation by hedonic scale, the mix prepared with incorporation of 11 per cent bengal gram flour, 15 per cent soybean flour and 4 per cent fenugreek leaves powder (sample T<sub>3</sub>) was found organoleptically accepted as compared to other samples. The proximate composition revealed that the sample T<sub>3</sub> has moisture 5.9%, fat 5.02%, protein 15.53%, carbohydrate 66.02%, crude fibre 3.46% and ash 1.59%.

**Keywords:** Instant mix, tortilla, sorghum flour, soybean flour, fenugreek leaves, chemical composition, sensory properties.

### INTRODUCTION

Now-a-days convenience food or instant mix becomes more popular and most demanding due to its ease in easy and simple preparation method. Due to urbanization and increasing working women there is need for instant mix as its name implies it should be has minimum processing time and it should provide readily available option for prepare food at home level (Mogra and Choudhary, 2014). A flat- round, unfermented bread prepared from nixtamalized maize (corn-*Zea mays*) or wheat (*Triticum aestivum*) known as "tortilla". Sometimes it prepared from full and partial substitution with sorghum (*Sorghum bicolor*) in parts of Central America. Mainly tortilla is originated in Mexico where it is prepared at daily at home level and considered as national bread (Rooney and Serena-Saldivar, 2016).

Worldwide protein malnutrition is a serious health issue may be arises due to cereal-based dietary pattern. Addition of legume such as bengal gram, green gram and soybean to cereal based food product helps to increase protein content to fulfill requirement of recommended dietary allowances of newborn, teenagers girls, pregnant and breastfeeding women, low cost supplementary food. A food with high protein-calorie by incorporating legume, vegetables and other sources may provide a good option for this problem (Venkateswari and Parameshwari, 2016).

Sorghum (*Sorghum bicolor*) is the world's fifth most important crop belonging to family poaceae after the maize (corn-*Zea mays*), rice (*Oryza sativa*) and barley (*Hordeum vulgare*). India rank second in production of sorghum in year 2000 after the United State (Kleih *et al.*, 2007). In today's world celiac disease is on rise which appeared due an immunological response to gluten intolerance. Sorghum consists of phenolic compound like flavonoids, which inhibit the growth of tumour and also beneficial to diabetes patient because of slow releasing nature of starch and sugar available in grain (Kulamarva *et al.*, 2008) therefore there is demand of gluten-free food product. Sorghum is gluten free cereal and has a potential to develop gluten free product due to presence of proteins such as kafirin, globulin, glutelin and albumin (Yun Xiong *et al.*, 2019). Soybean (*Glycine max*) belongs to family leguminosae and native to China. Soybean is inexpensive, cheap source of protein (40%) and fat (20%) therefore use widely all over the world. From ancient time soybean called as meat of field because of its protein quality equals to beef protein and milk protein with amazing amino acid balance (Jooyandeh, 2011).

Bengal gram (*Cicer arietinum*) also called garbanzo bean or Chickpea. India is one of the bengal gram producing country with an average production of 6-38 million metric tonnes during 2006-9, accounting for

66% of global bengal gram production. Bengal gram is one of the cheap source of dietary fibre and bioactive compounds e.g. phytosterols, saponins and oligosaccharides; coupled with its low glycaemic index (GI), bengal gram may be useful for lowering the risk of CVD. Saponin present in bengal gram make them bitter and decrease its choice for intake by human and animal (Jukanti *et al.*, 2012).

*Trigonella foenum-graecum* known as fenugreek is one of the ancient medicinal plants belonging to family leguminosae. Fenugreek has been used either as herb (the leaves) or as a spice (the seed) and also used to enhance the flavor, colour and texture of the food materials, because of high fibre, protein and gum content of fenugreek, now-a-days it is used as food stabilizer, adhesive and emulsifying agent (Meghwal and Goswami, 2012).

## MATERIALS AND METHODS

### A. Materials

The raw material such as sorghum (*Sorghum bicolor*), soybean (*Glycine max*), bengal gram (*Cicer arietinum*), fenugreek (*Trigonella foenum-graecum*) leaves, salt, chilli powder, cumin seed, turmeric etc. were purchased from local market of Parbhani.

### B. Methods

**Proximate analysis:** All samples were analyzed for moisture, crude protein, crude fat, total ash, mineral and total carbohydrate contents according to their respective standard methods as described in A.O.A.C., (2005).

**Preparation of fenugreek leaves powder:** Fresh fenugreek leaves were thoroughly washed to remove foreign material. These fenugreek leaves blanched with the help of steam for 4 minute. Blanched leaves dried at 40°C for 5 hrs in cabinet dryer to reduce moisture content. Dried leaves crushed by hand to get coarse

textured powder and stored in plastic jar. The fenugreek leaves powder was prepared with slight modification according to the method given by (Kadam *et al.*, 2012).

**Preparation of malted sorghum flour:** Sorghum grains were sorted and cleaned by removing dirt, dust and stone. Cleaned grains thoroughly washed with water and allowed to steep for 12 hrs to increase moisture content. Then drain out water and steeped grains were germinated for 48 hrs at room temperature on moist cloth i.e. muslin cloth. Un-germinated grains get removed and remaining dried at 60°C for 12 hrs in cabinet tray dryer to get desired moisture content. Rootlets were got removed by brushed off manually. Malted grains milled with help of hammer mill sieved and packed in air tight container until ready to use. The malted sorghum flour was prepared with slight modification according to the method given by Bolarinwa *et al.*, (2015).

**Preparation of soybean flour:** The soybean grains were cleaned to remove extraneous material like stone, dirt, leaves, sticks etc. It thoroughly washed with water and soaked for 8 hrs. After drainage of excess water it dried at 60°C for 12 hrs in cabinet tray dryer. Before grinding of grains roasting was did which was performed at 150°C for 30 min. These grains were milled with help of hammer mill, sieved and packed in air tight container. The soybean flour was prepared with slight modification according to the method given by Husain and Bhatnagar, (2018).

**Formulation of instant sorghum tortilla mix:** The instant sorghum tortilla mix incorporated with soybean, bengal gram and fenugreek leaves powder were prepared by blending malted sorghum flour at constant rate as a base and varying quantity of soybean flour, bengal gram flour and fenugreek leaves powder at different proportion as shown in Table 1.

**Table 1: Formulation of instant sorghum tortilla mix.**

S.No.	Ingredient	Quantity				
		Control	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
1.	Malted sorghum flour	70	70	70	70	70
2.	Bengal gram flour	30	23	17	11	05
3.	Soybean flour	-	05	10	15	20
4.	Fenugreek leaves powder	-	02	03	04	05

T<sub>0</sub> (Control) – 70 % MSF + 30% BGF

T<sub>1</sub> – 70% MSF + 23% BGF + 05% SF + 02% FLP

T<sub>2</sub> – 70% MSF + 17% BGF + 10% SF + 03% FLP

T<sub>3</sub> – 70% MSF + 11% BGF + 15% SF + 04% FLP

T<sub>4</sub> – 70% MSF + 05% BGF + 20% SF + 05% FLP

MSF- Malted sorghum flour, BGF- Bengal gram flour, SF- Soybean flour, FLP- Fenugreek leaves powder.

**Recipe Standardization and development of instant sorghum tortilla mix:** The recipe of instant sorghum tortilla mix was standardized on the basis of sensory evaluation by varying proportion of spice mix. The desirable taste, flavour and other qualities were obtained in tortilla prepared from instant sorghum tortilla mix by using ingredients in specific proportions and these are presented in Table 2.

**Table 2: Standardized recipe for instant sorghum tortilla mix.**

Ingredient	Quantity (%)
Malted sorghum flour	70
Soybean flour	15
Bengal gram flour	11
Fenugreek leaves powder	4
Salt	3
Cumin powder	3
Chilli powder	2
Garlic paste	10
Turmeric powder	0.2
Coriander leaves	4

### Development of instant sorghum tortilla mix:

Collection of malted sorghum flour + soybean flour + bengal gram flour + fenugreek leaves powder (70: 15:11:04 proportion)



Addition of spices

(salt 3%, cumin powder 3%, chilli powder 2%, turmeric powder 0.2%)



Mixing



Packaging and Storage

The instant sorghum tortilla mix was prepared with slight modification according to the method given by (Dhumketi *et al.*, 2018). The instant sorghum tortilla mix was prepared in the laboratory. The basic ingredients used for making control sorghum tortilla mix were 70 g malted sorghum flour, 30 g bengal gram flour, 3.0 g salt, 3.0 g cumin seed powder, 2 g chilli powder and 0.2 g turmeric powder. Four different formulations of instant sorghum tortilla mix were prepared by varying level of soybean flour and fenugreek leaves powder.

**Preparation of tortilla from instant sorghum tortilla mix:** The blend of instant sorghum tortilla mix was taken in a plastic container mixed and kneaded to make dough by addition of 60 ml water for 100 g.

A small dough piece was taken and tapped on wet piece of cloth like traditional bhakri or roti after that apply edible oil and transferred to hot plate seamer with oil and bake for 4-5 min by turning its surface for uniform baking. One hole was punched to facilitate the steam to escape out.

**Statistical analysis:** The data obtained was analyzed statistically by Completely Randomized Design (CRD) as per the procedure given by Panse and Sukhatme (1967). The analysis of variance revealed at significance of  $P < 0.05$  level, S.E. and C.D. at 5% level is mentioned wherever required.

### RESULT AND DISCUSSION

#### Sensory evaluation of sorghum tortilla prepared from instant sorghum tortilla mix incorporated with soybean, bengal gram and fenugreek leaves powder

The sensory attribute of tortilla prepared from various instant sorghum tortilla were evaluated by panel of ten member using nine-point hedonic scale (1-dislike extremely, 2-dislike very much, 3-dislike moderately, 4-dislike slightly, 5-neither like nor dislike, 6-like slightly, 7-like moderately, 8-like very much and 9-like extremely). The samples were identified by code number to the panellists.

**Table 3: Sensory evaluation of sorghum tortilla prepared from instant sorghum tortilla mix.**

Samples	Appearance	Colour	Taste	Flavour	Texture	Overall Acceptability
T <sub>0</sub>	7.5	7.2	7.1	6.9	7.3	7.7
T <sub>1</sub>	7.4	7.1	6.9	7.1	7.7	7.4
T <sub>2</sub>	8.0	7.4	7.5	7.4	8.0	8.0
<b>T<sub>3</sub></b>	<b>8.5</b>	<b>8.0</b>	<b>8.2</b>	<b>7.9</b>	<b>8.3</b>	<b>8.5</b>
T <sub>4</sub>	6.8	7.0	6.9	6.8	7.1	6.9
SE±	0.17023	0.05497	0.066	0.07542	0.06394	0.12147
CD@5%	0.49929	0.16125	0.19357	0.22123	0.18755	0.35629

All the samples including control were equally rated by the panel member in terms of colour and taste. Samples with 0 to 15% soybean flour and 0-5% fenugreek leaves substitution had significant difference at 5% probability level in the all quality attribute evaluated. Sample T<sub>4</sub> revealed minimum score for all sensory attribute as substitution level exceed from 15% soybean flour and 4% fenugreek leaves powder to the tortilla. It impart bitter taste and slightly bunny flavour. The sensory evaluation also revealed that sample T<sub>3</sub> were overall acceptable with high score 8.5. By considering different sensory attributes, the sorghum tortilla prepared from sample T<sub>3</sub> was superior than other sample therefore it was selected for further studies.

#### Proximate analysis of instant sorghum tortilla mix:

Sample T<sub>3</sub> with incorporation of 15% soybean flour, 11% bengal gram flour and 4% fenugreek leaves powder were selected on the basis of sensory evaluation and consider for further studies. The sample T<sub>3</sub> analyzed for parameter like moisture, fat, protein, carbohydrate, crude fibre and ash results were tabulated in Table 4. The prepared instant sorghum tortilla mix contained 5.9 per cent moisture. These results were comparable with (Bolarinwa *et al.*, 2015) who observed that the moisture content of 100 % malted sorghum flour 6.76 per cent was decreased as increasing substitution of soyflour up to 40 % had moisture content 5.66 per cent. The fat content of instant

sorghum tortilla mix increases with increase in substitution of soybean flour and fenugreek leaves powder which had 5.02 per cent fat. The result for fat was in line with fat content of composite flour for missi roti/ chapatti observed by (Kadam *et al.*, 2012). The instant sorghum tortilla mix prepared with 15 per cent soybean flour and 4 per cent fenugreek leaves powder had 66.02 per cent carbohydrate content.

**Table 4: Proximate analysis of instant sorghum tortilla mix.**

Sr. No.	Parameter (%)	Content
1.	Moisture	5.9
2.	Fat	5.02
3.	Protein	15.53
4.	Carbohydrate	66.02
5.	Crude fibre	3.46
6.	Ash	1.59

\*Each value represents the average of three determinations.

The carbohydrate content reduced with increment in the proportion of soybean flour and fenugreek leaves powder in the prepared mix. This result cleared that



## CONCLUSION

From present investigation, it may be concluded that sorghum provide good option for reducing protein malnutrition problem with a soybean as active source of protein. Fenugreek leaves provide fibre which aid to maintain blood sugar level. Sample T<sub>3</sub> comprises moisture 5.9, fat 5.02, protein 15.53, carbohydrate 66.02, crude fibre 3.46 and ash 1.59 per cent respectively. Nutritionally rich and organoleptically acceptable sorghum tortilla can be successfully prepared by incorporation of 15 per cent soybean flour, 11 per cent bengal gram flour and 4 per cent fenugreek leaves powder.

## FUTURE SCOPE

There is need to increase utilization of sorghum and soybean to prepare instant mix because both have good nutritional profile and soybean is a cheap source of protein which helps to reduce malnutrition problem.

soybean was not good source of carbohydrate compared to other legume (Salunkhen *et al.*, 1992). The result resolved from this study was equivalent to findings of Okoye *et al.*, (2008). The protein content of instant sorghum tortilla mix was 15.53 per cent. As increase in substitution of soyflour, protein content increased (Basman & Koksel, 2008). The similar results were reported for high protein content in wheat soy plantain bread (Olaoye *et al.*, 2006). The fibre content of prepared instant sorghum tortilla mix was 3.46 per cent. This might be due to high fibre content of soybean and fenugreek leaves. These results were line with (Kadam *et al.*, 2012) for composite flour for Missi roti/ chapatti who observed the fibre content increased from 1.2 to 2.05 per cent. There was observed that ash content of prepared instant sorghum tortilla mix was increased. It may be due to incorporation of soybean flour. Soybean had high content of mineral. The ash content of prepared instant sorghum tortilla mix was 1.59 per cent. The result for ash content was comparable with composite flour prepared from maize-soy flour outlined by (Edema *et al.*, 2005) and concluded ash content of composite flour was 2.9 per cent.

Kafirin present in sorghum has potential to prepared gluten free food product which is beneficial to people with celiac disease.

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**Conflict of Interest.** Nil.

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