ISSN-0976-5638

Volume 9 | Issue 2 | December, 2018 | 60-64

■ Visit us: *www.researchjournal.co.in*

International Journal of Processing and Post Harvest Technology

RESEARCH PAPER

DOI: 10.15740/HAS/IJPPHT/9.2/60-64

Development of fried tortilla chips with defatted soy flour and sorghum flour

■ K.K. Giram

Department of Food Process Technology, College of FoodTechnology, **Ashti (M.S.) India**

Email : giramkishor05@gmail.com,kishorgiram05@gmail.com

■ **Research chronicle : Received :** 15.11.2018; **Revised :** 23.11.2018; **Accepted :** 28.11.2018

SUMMARY :

The effects of the of tortilla chips with de-fatted soy flour as and frying processes on the properties of tortilla chips were evaluated. Sensory characteristics, texture, thickness, colour, protein and oil content were evaluated. Sensory properties were evaluated using a nine point hedonic scale. Soybeans were obtain partially defatted soy flour of 0.79 per cent final oil content. Sorghum flour (SF) was replaced with 0, 10, 20 and 30 per cent and Nixtamalized corn flour (NCF) 0,5,10 and 15 per cent de-fatted soy flour (DFSF). Overall, fried tortilla chips were harder and thicker . Fried tortilla chips with DFSF with SF and NCF (100:20:10%) and DFSF with SF and NCF (100:30:15%) soy flour substitution required less force to break. Protein increased linearly in baked and fried tortilla chips where DFSF with SF and NCF (100:30:15%) resulted in the highest protein level. In fried tortilla chips, DFSF with SF and NCF (100:20:10%) had the highest sensory scores overall. DFSF with SF and NCF (100:20:10%) fortification in fried tortilla chips were the most acceptable of all. In all treatments, regardless of type of processing, panelists could not detect any "beany" flavors in any of the sample. Upto DFSF with SF and NCF (100:20:10%) would be recommended.

KEY WORDS : Soybean, Sorghum, Nixtamalized corn flour, Masa, Fried tortilla chips, Baked tortilla chips

How to cite this paper : Giram, K.K. (2018). Development of fried tortilla chips with defatted soy flour and sorghum flour. *Internat. J. Proc. & Post Harvest Technol.*, **9** (2) : 60-64. **DOI: 10.15740/HAS/IJPPHT/9.2/60-64.**

Tortilla was first created by either the Aztecs or the Zapotecs. The Zapotecs were an ancient civilization that existed near Oaxaca in the Monte Alban ruins. They created Totopochtli by roasting tortillas on a flat grill. This tortilla had a shelf life of one or two days. The fried tortilla was referred to as a tostado which improved the flavor and extended storage time. If the tostados were cut into pieces they were called Totopos. The tostados allowed them to travel large distances and still have food. Tortilla chips are baked and then fried which gives the chip a firmer texture Quintero-Fuentes (1997).

Products made out of soy are becoming very popular to increase protein content. According to the FDA, adding more soy to the diet reduces the risk of heart disease, cancer, and decreases discomfort in menopausal women. Twenty five grams of soy combined with a diet low in saturated oil and cholesterol may reduce the risk of heart disease (Lusas, 2002).

Soy protein is a subject of intense investigation and has had a increasing role in human nutrition over the last few decades (Riaz, 2001). Health benefits include: reduced blood pressure, lower cholesterol levels and improved bone health (Adelekun *et al.*,2005). Soy protein also contains all nine essential amino acids (Riaz, 1999).

Defatted soy flour is obtained from solvent extracted flakes, and contains less than 1 per cent oil. Full-fat soy flour is made from un-extracted, dehulled beans and contains about 18 per cent to 20 per cent oil. Due to its high oil content, a specialized Alpine Fine Impact Mill must be used for grinding rather than the more common hammer mill. Low-fat soy flour is made by adding back some oil to defatted soy flour. The lipid content varies according to specifications, usually between 4.5 per cent and 9 per cent. High-fat soy flour can also be produced by adding back soybean oil to defatted flour at the level of 15 per cent. Lecithinated soy flour is made by adding soybean lecithin to defatted, low-fat or high-fat soy flours to increase their dispersibility and impart emulsifying properties. The lecithin content varies upto 15 per cent.

EXPERIMENTAL METHODS

Procurment of raw material:

Soybean, sorghum, oil, nixtamalized corn flour purchased in local market Aurangabad, Maharashtra. India.

Processing equipment used:

Gas-fired three-tier oven, air impingement oven, cooker, aspirator, cabinet tray dryer, flaker, vernier caliper, mixer, colorimeter, sheeter, cracking mill, tumbler technique, soxhlet apparatus, microkjeldhal apparatus, sieve.

Preparation of flour:

Flow sheet for preparation of sorghum flour:

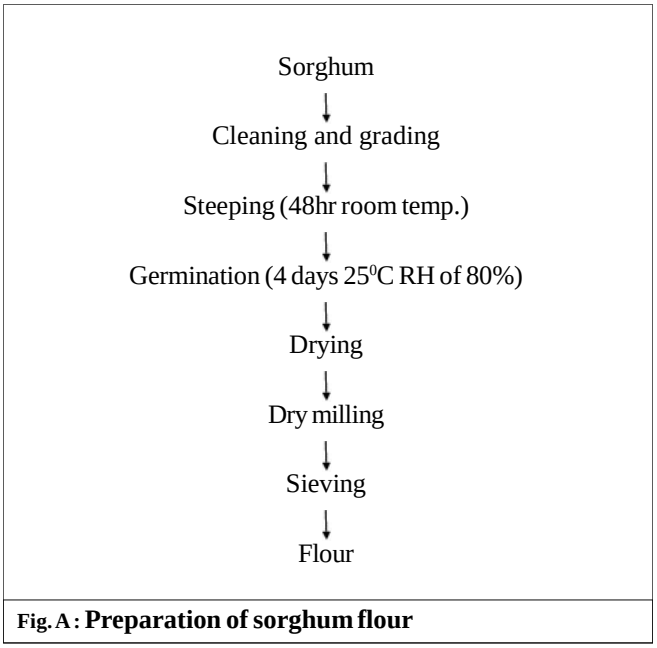

Fig. A : Preparation of sorghum flour

Flow sheet for preparation of De-fatted soy flour:

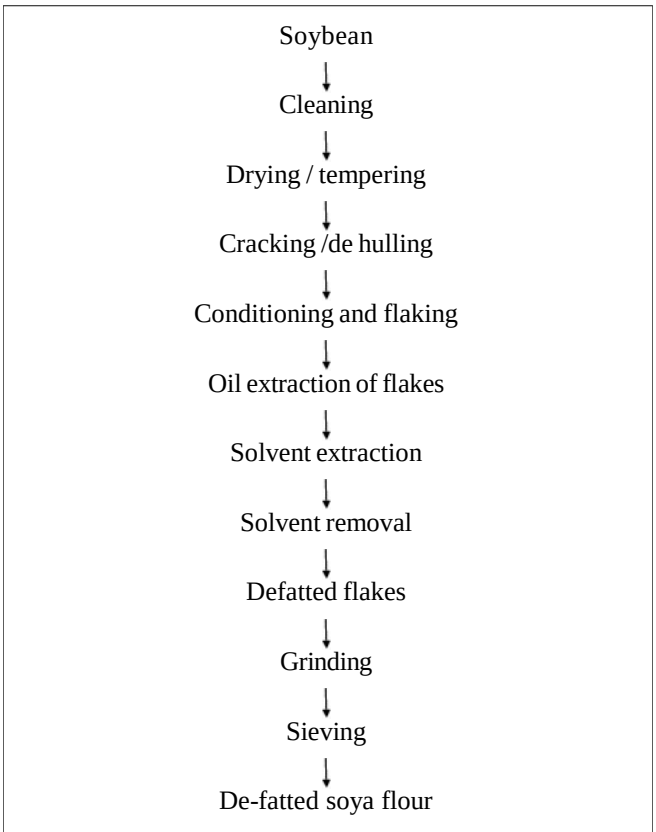

Fig. B : Preparation of de-fatted soya flour

Tortilla chip preparation:

Flow sheet for preparation of masa:

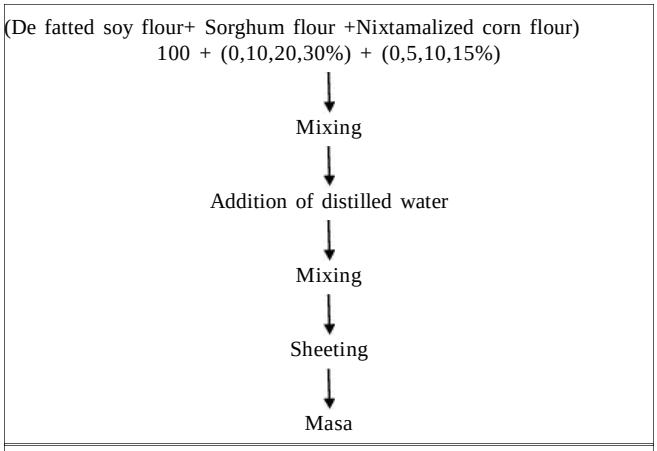

Fig. C : Preparation of masa

Flow sheet for preparation of fried tortilla chip:

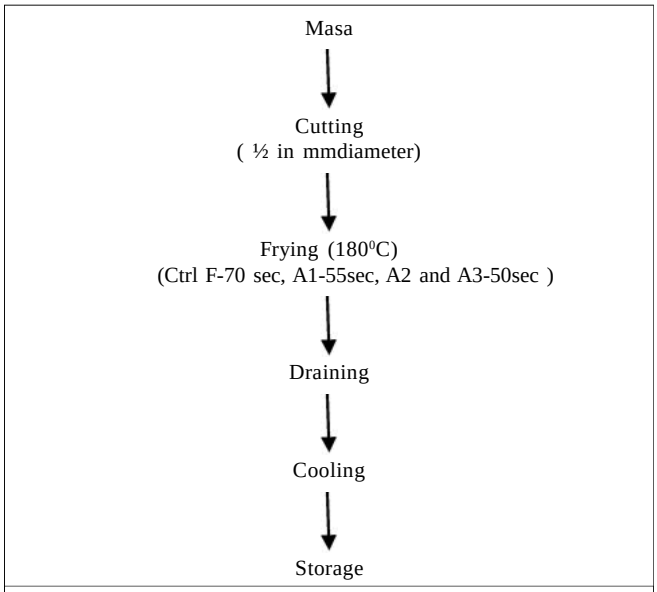

Fig. D : Preparation of fried tortilla chips

Table A : Treatment plan

Ingredients	Ctrl F frying	Sample A1	Sample A2	Sample A3
De-fatted soy flour (g)	250	250	250	250
Sorghum flour (g)	-	25	50	75
Nixtamilazed corn flour (g)	-	12.5	25	37.5
Oil	Frying	Frying	Frying	Frying
Distilled water (ml)	275	275	290	290
Salt (g)	1	1	1	1

Physico-chemical analysis

Moisture, fat, protein, ash, texture analysis, colour, breakage susceptablity, sensory evaluation, statistical analysis.

EXPERIMENTAL FINDINGS AND ANALYSIS

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Phyico-chemical analysis of fried tortilla chips:

Protein, moisture and oil per cent of fried tortilla chips:

Protein content of fried tortilla chipsranged from 8.3 to 20.8 per cent. The protein content of sample control F-8.03 per cent, A1 is 13.2 per cent, A2 is 16.9 per cent and A3 is 20.8 per cent increase the protein level because the soy is the rich source of protein content. Similar results were found that Che Man *et al.* (1992).

Oil content of fried tortilla chips ranged from 21.4 to 25.9 per cent. The oil content of sample control F-21.4 per cent, A1-21.7 per cent, A2-22.4 per cent, A3-25.9 per cent fortification had the highest level of oil Similar results were seen by Adelakun *et al.* (2005).

Moisture content of fried tortilla chip ranged from 1.8 to 2.2 per cent. The moisture content of sample ctrl F-1.96 per cent, A1-1.84 per cent and A2-1.98 per cent

Table 1: Moisture, proteinand oil% offried tortilla chips

Treatment (DFSF:SF:NSF)	Tortilla chips moisture (g/100g)	Tortilla chips protein (g/100g)	Tortilla chips oil (g/100g)
Ctrl F	1.96	8.3	21.4
A1 (100:10:5)	1.84	13.2	21.7
A2 (100:20:10)	1.98	16.9	22.4
A3 (100:30:15)	2.21	20.8	25.9

DFSF=De-fatted soy flour, SF=Sorghum flour, NCF= Nixtamalized corn flour.

Table 2 : Sensory attributes of fried tortilla chips

Sample	Composite flour (DFSF: SF:NCF %)	Friability	Crunchiness	Flavor Intensity	Flavour acceptablity	Texture	Overall acceptability
Ctrl F	Control	6.4	7.1	4.8	5.6	6.0	6.0
A1	100:10:5	6.3	6.9	5.1	6.1	6.2	6.1
A2	100:20:10	6.8	7.1	4.9	6.5	6.8	6.6
A3	100:30:15	5.9	6.5	4.5	5.1	5.5	5.2

DFSF=De-fatted soy flour, SF=Sorghum flour, NCF= Nixtamalized corn flour

and A3-2.21 per cent. Similar result were found that Cosgrove (2002).

Fried tortilla chips:

For overall acceptability, only significant differences were found between100:30:15 per cent DFSF with SF and NCF and100:20:10 per cent DFSF with SF and NCF the sample are most acceptable treatments of all Adelekun *et al.* (2005).

For flavor acceptability, there were no differences found among 100:30:15 per cent DFSF with SF and NCF and 100:20:10 per cent DFSF with SF and NCF the sample are most acceptable for flavour acceptability similar result found in Payumo *et al.* (1982).

There were no differences found in flavor intensity among treatments. Also, this attribute obtained the lowest scores inthe hedonic scale when compared to the other attributes. This indicates that no beany flavors were found when tortilla chips were fortified with soy flour. In cookies, Buck *et al.* (1987) found that 100:20:10 per cent DFSF with SF and NCF of fortification was less strong.

For texture and crunchiness acceptability the only significant differences were found between 100:30:15 per cent DFSF with SF and NCF and100:20:10 per cent DFSF with SF and NCF sample is more acceptable in texture and crunchiness acceptability.

Thickness of fried tortilla chips:

Thickness of fried tortilla chips ranged from 1.2-1.7 mm. The thickness of control F-1.7, A1-1.6 and A2-1.4 and A3-1.5mm.

Thickness of baked tortilla chips ranged from1.1-1.2 mm. The moisture content of control B-1.2, B1-1.2 and B2-1.2 and B3-1.1 mm.

Texture of fried tortilla chips:

The force comparison between fried and baked tortilla chips show Fig. 1. Overall, fried tortilla chips had higher force and work than baked tortilla chips.These results were expected since fried tortilla chips were thicker than baked tortilla chips.The thicker the tortilla chip, the more force and work it will take to break it. An interaction was seen between processing method vs. DFSF with SF and NCF. Differences in texture were mainly caused byfrying and/or baking more so than the DFSF with SF and NCF fortification.

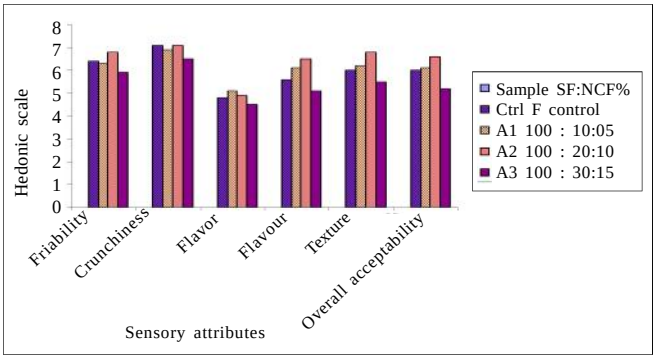

Fig. 1 : Sensory attributes infried tortilla chips

Soy caused expansion in both products. There was more natural expansion in the fried product than in the baked product. This result was expected because when water is “trapped” under extreme heat, it tries to quickly

Table 3 : Thickness of fried tortilla chips

Treatment (DFSF:SF:NCF)	Tortilla chips (mm)
Control F	1.7
A1 (100:10:5)	1.6
A2 (100:20:10)	1.4
A3 (100:30:15)	1.5

Table 4 : Correlation between force and thickness offried tortilla chips

Sample	Force (N)
Ctrl F	20
A1	18
A2	13
A3	15

escape and so it form schannels and creates more expansion. DFSF with SF and NCF created more air cells and, therefore, more expansion. Soy behaves in this way in most products by creating a more foamy structure in products that have been fortified with soy flour. Soy should be softer and easier to break in both processes (McDonough 2006).

LITERATURE CITED

Adelekun, O.E., Adejuyitan, J. A., Olajide, J. O. and Alabi, B.K. (2005). Effect of soybean substitution on some physical compositional and sensory propertiesof *kokoro* (a local maize snack). *European Food Res. Tech.*, **220** :79-82.

Buck, J.S., Walker, C.E. and Watson, K.S. (1987). Incorporation of corn glutenmeal and soy into various cereal-based foods and resulting product functional, sensory and protein quality. *Cereal Chem.*, **64** (4): 264-269.

Che Man, Y. B., Abdul Karim, M. N. B. and Kun, T.T. (1992). Evaluation of fourhigh-protein rice-soy snack formulations. *Internat. J. Food Sci. Tech.*, **27** : 715-719.

Cosgrove, J. (2002). Pure quality taking strides to influence the quality of soybeans. *Stagnito's New Prod. Mag.*, **31**:10-16.

Liu, K.S. (1999). *Soybeans chemistry, technology and utilization*. Aspen Publishing, Gaithersburg, MD.

Lusas, E. (2002). Soybean at the right time and place. Personal communication,Seminar. Department of Soil and Crop Sciences, Texas A&M University,College Station, TX.

McDonough, C.M. (2006). Personal communication. Department of Soil and Crop Sciences, Texas A&M University, College Station, TX.

Payumo, E.M., Corpuz, B.S., Llagan, A.P. and Openiano, O.G. (1982). Development of soy-supplemented extruded snack products. *NSTA Tech. J.*,**7** : 77-83.

Quintero-Fuentes, X. (1997). A method to determine ingredient functionality inbaked tortilla chips. M.S. Thesis, Texas A&M University: College Station, TX.

Riaz, M. N. (1999). Healthy baking with soy ingredients.*Cereal Foods World.*, **44**:136-139.

Riaz, M. N. (2001). Extrusion-expelling of soybeans for texturized soy protein, pp. 171-175 in : World Conference on Oilseed Processing and Utilization.R. F. Wilson, ed. AOCS Press. Champaign IL.