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Gluten-free flat bread from sorghum: Quality characteristics

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Abstract
The objective of this study was to assess the effect of the addition of different hydrocolloids and potato flour on the sorghum based flat bread quality characteristics. Gluten-free whole grain flat bread was prepared by using whole sorghum (100%) flour. Further, xanthan gum (0, 0.25, 0.50, 0.75 and 1 per cent), guar gum (0, 0.25, 0.50, 0.75 and 1 per cent) and potato flour (0, 5 and 10 per cent) were incorporated on flour weight basis for the preparation of flat bread. Specific volume, loaf height and loaf weight of flat bread were determined. Crumb firmness was decreased by guar gum and potato flour. On the basis of baking quality and sensory properties, most acceptable level of additives to be incorporated in gluten-free flat bread were xanthan gum - 0.50 percent, guar gum -0.75 percent and potato flour-5.00 per cent.

Keywords: guar gum, xanthan gum, potato flour, sorghum, flour

Introduction

In India, a large segment of population depending upon whole wheat meal (*atta*) for production of ‘*chapattis’*, whereas refined flour (*maida*) finds greater application in manufacture of bakery products, e.g. breads and biscuits. Rising income and urbanization are driving forces in the rise of wheat consumption. Wheat (*Triticum aestivum*) is a common ingredient used in many types of flat breads and breads, because of the gluten protein present in it which has unique functional properties of developing a viscoelastic matrix (Brites *et al*., 2010) [2]. However, people suffering from celiac disease are unable to consume certain gluten proteins from cereals such as wheat, rye, barley, kamut, spelt and hybrids like triticale (Sciarini *et al* 2010) [19]. Celiac disease can be stated as a specific type of food intolerance, in which upon consumption of gluten-containing foods, a series of events take place in small intestine which leads to loss of absorptive villi, such that patients cannot absorb nutrients and consequently this adversely affects the systems of the body (Ozturk and Mert, 2018) [15]. In the present scenario, the only effective treatment for celiac disease is a strict adherence to a gluten-free diet throughout the patient’s lifetime, which, in time results in clinical and mucosal recovery. For this reason, there is an increasing interest in gluten-free products. According to new Codex Alimentarious standards, ‘Gluten-free foods are dietary foods consisting of or made only from one or more ingredients which do not contain wheat (i.e., all *Triticum* species), rye, barley, oats or their cross bred varieties, and the gluten level does not exceed 20 mg/kg in total, based on the food as sold or distributed to the consumer’ (FAO 1994) [6].

Earlier, maize and rice were used in gluten-free foods, but now different starches and flours, such as rice, maize, cassava, sorghum, potato, particularly wholegrain flour are used for the production of gluten-free products which serve to provide good textural properties (Sanchez *et al* 2002) [17]. They also increase variety, nutritional quality, and palatability of gluten-free products. Improving the nutritional value of bread with whole grains has become popular due to its documented positive health effects. Food and Drug Administration (FDA 2012) [12] allows a health claim label for foods containing 51 percent whole grains by weight when the whole grains contain more than equal to 11 percent dietary fibre. The FDA defines whole grain as ‘Cereal grain that consist of the intact, ground, cracked or flaked fruit of the grains whose principle components; the starchy endosperm, germ and bran are present in the same relative proportions as present in the intact grain’ (Kahlon and Chiu 2012) [19].

Gluten-free breads show incompetence as compared to their gluten-containing counterparts in terms of both textural attributes and sensory acceptability. Sorghum (*Sorghum vulgare*) is often recommended as a safe food for celiac patients because it is more closely related to maize than wheat, rye and barley (Kasarda 2001) [10]. Sorghum has been studied in many food products, including breads, tortilla chips and noodles (Trappey *et al*., 2015). As with other cereal grains, the primary component of sorghum is starch (Rooney and Waniska 2000). Some physicochemical properties of sorghum flour negatively affect bread making performance, resulting in problems like a flat top of the bread and a large hole in the crumb. The quality of gluten-free sorghum bread can be improved by adding proteins, hydrocolloids, emulsifiers, starches, rye pentosans or sourdough starter cultures (Zannini *et al* 2012) [24]. High gelatinization temperature of sorghum may cause inadequate gelatinization during baking as is evident by undesirable white streaks and patches on the crust surface and coarse mouth feel. Starches from different botanical origin can be used to modify the quality of gluten-free sorghum bread (Schober, 2009) [18].

Interactions between starches and food gums are critical to the functionalities they impart to food products. Various studies have been conducted to improve the textural qualities of gluten-free products using hydrocolloids such as s gums, pectins, hydroxymethylcellulose, xanthan gum and guar gum (Jnawali *et al*., 2016) [8].

Potato flour is a highly versatile ingredient and has long been associated with the baking of bread. (Knorr *et al*., 1977) [11]. When used as an additive, it retains the freshness of bread and improves its toasting qualities. It also improves the interior qualities of bread, such as texture, aroma, and flavour, without significantly affecting exterior attributes (Ezekiel and Singh, 2011) [4].

Materials and Methods

Sorghum (Sudex *chari*) was obtained from National Seeds Corporation. Hydrocolloids like xanthan gum and guar gum were procured from Alliance Global, Delhi. Other materials used in the investigations like yeast (manufactured by SAF Yeast, Mumbai), salt, shortening, oxidant, calcium propionate, potassium sorbate and packaging material (Low Density Polyethylene) were obtained from local market of Ludhiana.

Preparation of Flour

The sorghum grains were stored in plastic bins at 10±2°C until used. The grain samples were thoroughly cleaned using laboratory cleaner. These were milled into flour using hammer mill.

Chemical Analyses

Moisture, crude protein, crude fat, ash and crude fibre contents of sorghum flour were determined by AACC methods (AACC, 2000) [1].

Fat

Extraction of fat from 1g of cereal grains was carried with chloroform: methanol mixture (2:1). After 24 hrs, the material was filtered through G-3 sintered glass funnel along with the same solvent washings into a container. The funnel was washed with organic solvent. The pooled solvent containing lipids was evaporated at 50-60°C (Folsch *et al*., 1957) [5].

Starch

Extraction of total sugars from 0.20g of cereal grains was carried out by refluxing with 80% ethanol, followed by complete extraction with hot 70 per cent ethanol twice. The material was filtered through Whatman filter paper No.40, collect the filterate. After precipitating proteins and heavy metals using lead acetate and potassium oxalate, the contents were then filtered. The sugar free residue is used for starch determination. The starch gets hydrolyzed to simple sugars in the presence of 52 per cent perchloric acid 20 ml water was added and centrifuged at 3000 rpm for 10min (Clegg, 1956) [3].

Preparation of flat bread

Flat bread containing whole grain will be prepared according to method standardised [12] with modification. Basic dough recipe on 100 g flour basis consisted of compressed yeast 3%, salt 1%, sugar 2.5%, shortening 10%, potassium bromate 1ppm and optimum amount of water. A straight dough process was carried out for preparing the flat bread samples. The ingredients were mixed for ≈3 minutes, and dough fermented for 30 min in a fermentation cabinet. The mixture was allowed to stand for 20 min at room temperature for batter development. This was followed by gentle mixing for 25sec after which the batter was placed into greased baking pans. Then dough was proofed at 86 º F, RH 75 percent for 15min. Bread dough loaves were baked for 6 min at 300 °C. After baking, the loaves were left for about 10 min in the oven. Analyses were carried out after the baked loaves had attained room temperature or internal crumb temperature was about 35±2°C (Sharma, 1990) [20].

Flat bread quality

The loaves were packed in polyethylene bags (LDPE) and analysed for volume, weight, specific volume and height. Loaf weights and volumes were measured 1 h after removal from the oven. Loaf was weighed using an electronic balance and loaf volume was measured using the rapeseed displacement method (Plessas *et al*., 2005). The specific volume was calculated by dividing loaf volume by loaf weight. Loaf height was measured using a ruler.

Sensory evaluation

Sensory evaluation for appearance, crust colour, aroma, taste and overall acceptability was carried out the next day as by a panel of minimum six semi-trained judges on nine point hedonic scale, where 9=like extremely; 8=like very much; 7=like moderately; 6=like slightly; 5=neither like nor dislike; 4=dislike slightly; 3=dislike moderately; 2=dislike very much; 1=dislike extremely (Larmond *et al*., 1970)

Texture analysis

The hardness of flat bread was analysed by stable microsystem texture analyser model (TA-H di England) using settings given in Table 1. The texture analyzer has two basic components-hardware (load cell with sample platform to hold the sample and a moving head for holding the probe) and the software (Texture expert) for recording and interpreting the results for the particular texture parameter. Before the test was conducted on the sample, the machine was calibrated for load and distance. After calibrating the machine, the sample was placed on the sample platform and the command 'RUN TEST' was given. In accordance with the user manual provided with the apparatus, the settings used for test are given in Table 1.

Table 1: Settings of stable micro system texture analyser used to measure the texture of flat bread

Parameter	Flat bread
Test	TPA
Probe	75 mm Compression platen
Pre-test speed	2mm/s
Test speed	1 mm/s
Post-test speed	2mm/s
Distance	50% Strain
Acquisition rate	200 points per second
Force	453g

Statistical Analyses
All statistical procedures were performed using SPSS (version 20.0) SPSS Inc (Chicago, USA). A one-way analysis of variance (ANOVA) was carried out using completely randomized design and the means were compared using Duncan's Multiple Range Test at P≤0.05. The results are presented as means±S.D. (standard deviation) of triplicate analyses.

Results and Discussion
Physico-chemical characteristics of raw material
Chemical properties (moisture, protein, fat, ash, starch and crude fibre) of sorghum flour are presented in Table 2.

The mean values of chemical composition of raw materials used in the present study are given in Table 1. Moisture content of sorghum flour was 7.81 per cent. Fat content in sorghum was 2.25 per cent. Ash content in sorghum flour was 1.25 per cent. Starch content in sorghum flour was 69.42 per cent. Yousif *et al*. (2012) [23] reported the composition of sorghum flour to be 11.61 per cent protein, 1.69 per cent fat and 1.22 per cent ash content.

Crude fibre in sorghum flour was found to be 2.40 percent. Udachan *et al*. (2012) [22] reported that crude fibre in different sorghum varieties ranged from 1.40 per cent to 2.70 per cent.

Table 2: Physico- chemical characteristics of Sorghum

Characteristics \ Grains	Sorghum (Sudex *chari*)
Moisture (%)	7.81
Protein (%)	10.85
Fat (%)	2.25
Ash (%)	1.25
Starch (%)	69.42
Crude fibre (%)	2.40

*Each value is mean of three observations.
*All the results are expressed at 14% Moisture content.

Effect of incorporation of hydrocolloids and potato flour on baking quality of gluten-free flat bread prepared from whole sorghum (100 per cent) flour.
In gluten-free flat bread prepared from whole sorghum (100 per cent) flour, bake absorption for control was 84.17 per cent. Significant variations (p≤0.05) were observed on bake absorption for flat breads incorporated with xanthan gum, guar gum and potato flour (Table 3 and Fig 3). Bake absorption significantly (p≤0.05) increased to 90.33 per cent at 1 per cent level of xanthan gum, 91.33 per cent at 1 per cent level of guar gum and 94.67 per cent at 10 per cent level of potato flour incorporation. Increased level of hydrocolloids led to increased baking absorption which is in accordance to that reported by Lazaridou *et al*. (2007) [12]. Increased baking absorption due to increased level of potato flour is in accordance to that reported by Misra and and Kulshrestha (2003) [13]. Loaf height increased from 0.50 cm for control to 0.54 cm at 1 per cent xanthan gum and to 0.65 cm at 1 per cent level of guar gum concentration. With the incorporation of potato flour, loaf height increased to 0.75 cm at 10 per cent level of incorporation. Loaf weight for control sample was 50.33 g. With incorporation of potato flour, loaf weight increased to 59.67 g at 10 per cent level. Loaf weight of flat bread incorporated with hydrocolloids increased to 57.17 g at 1 per cent level of xanthan gum and 1 per cent level of guar gum incorporation. The increased loaf weight could have been due to increased water absorption.

Loaf height for control was 0.50 cm. With the incorporation of hydrocolloids at 0.25, 0.50, 0.75 and 1 per cent in whole sorghum (100 per cent) flour for flat bread making, loaf height increased to 0.54 cm at 1 per cent level of xanthan gum and 0.65 cm at 1 per cent level of guar gum incorporation. With the incorporation of potato flour, loaf height increased to 0.75 cm at 10 per cent level of incorporation.

Upon increase in xanthan gum concentration from 0 to 1 per cent, loaf volume decreased from 137.07 cc to 131.33 cc. Schober *et al* (2005) found decrease in loaf volume of gluten-free breads from sorghum with increased level of xanthan gum. While increased level of guar gum did not show significant (p≤0.05) increase in loaf volume of flat bread prepared from whole sorghum (100 percent) flour. Potato flour increased loaf volume slightly to 134.67 cc at 5 per cent and 139.33cc at 10 per cent level of incorporation.

Significant variations (p≤0.05) were found in specific volume for flat bread added with different level of hydrocolloids and potato flour. Specific volume decreased with the increased level of incorporation of hydrocolloids and potato flour. Maximum specific volume was observed for control (2.59 cc/g) which decreased to 2.54 cc/g at 1 per cent level of xanthan gum and 2.36 cc/g at 1 per cent level of guar gum incorporation. With the incorporation of potato flour, specific volume decreased to 2.34 cc/g at 10 per cent level.

On the basis of baking quality of flat breads, best level of additives to be incorporated in gluten-free flat bread prepared from whole sorghum (100%) flour combination were xanthan gum - 0.50 percent, guar gum -0.75 percent and potato flour- 5.00 per cent.

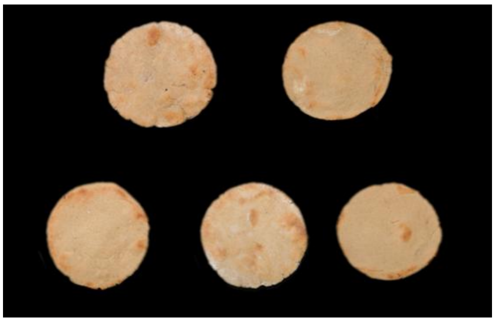

Fig 1: Effect of incorporation of xanthan gum on gluten-free flat bread prepared from whole sorghum (100%) flour
1- control; 2-0.25% xanthan gum; 3-0.50% xanthan gum; 4-0.75% xanthan gum; 5- 1.00% xanthan gum

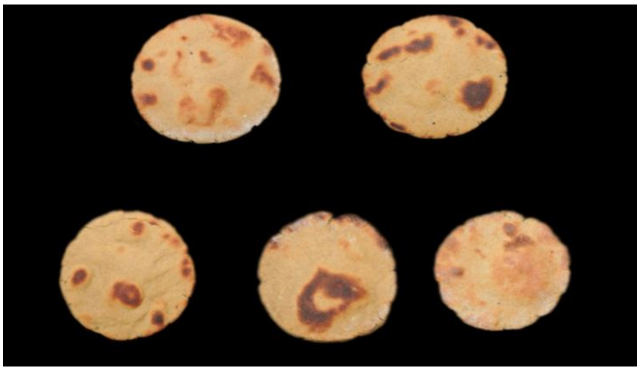

Fig 2: Effect of incorporation of guar gum on gluten-free flat bread prepared from whole sorghum (100%) flour 1- control; 2-0.25% guar gum; 3-0.50% guar gum; 4-0.75% guar gum; 5- 1.00% guar gum

Table 3: Effect of incorporation of hydrocolloids and potato flour on baking quality of gluten-free flat bread prepared from whole sorghum (100 per cent) flour

Additives	Level of additives (%)	Baking absorption (%)	Loaf weight (gm)	Loaf volume (cc)	Loaf height (cm)	Specific volume (cc/g)
Control	0	84.17±0.10[a]	50.33±0.15[a]	137.07±0.11[a]	0.5±0.09[a]	2.59±0.08[ab]
Xanthan gum	0.25	86.17±0.15[b]	52.33±0.30[b]	136.17±0.16[b]	0.52±0.03[a]	2.51±0.04[bc]
	0.50	87.83±0.35[c]	54.07±0.16[c]	134.67±0.18[c]	0.52±0.01[a]	2.47±0.03[c]
	0.75	89.1±0.36[d]	55.5±0.45[d]	133.33±0.10[d]	0.54±0.02[a]	2.61±0.04[a]
	1.00	90.33±0.07[e]	57.17±0.22[e]	131.33±0.15[e]	0.54±0.01[a]	2.54±0.04[abc]
	0	84.17±0.10[a]	50.33±0.15[a]	137.07±0.11[a]	0.5±0.09[a]	2.59±0.08[a]
Guar gum	0.25	86.33±0.06[b]	52.17±1.01[b]	131.17±0.21[b]	0.52±0.01[a]	2.51±0.03[ab]
	0.50	88.33±0.36[c]	54.33±0.32[c]	132.17±0.76[c]	0.55±0.03[a]	2.43±0.08[bc]
	0.75	89.83±0.03[d]	56.17±0.21[d]	133.33±0.16[d]	0.59±0.02[ab]	2.37±0.03[c]
	1.00	91.33±0.15[e]	57.17±0.15[e]	134.83±0.15[e]	0.65±0.04[b]	2.36±0.03[c]
Potatoflour	0	84.17±0.10[a]	50.33±0.15[a]	137.07±0.11[a]	0.5±0.09[a]	2.59±0.08[a]
	5.00	89.67±0.10[b]	54.33±0.32[b]	134.67±0.21[b]	0.71±0.01[b]	2.48±0.08[a]
	10.00	94.67±0.10[c]	59.67±0.08[c]	139.33±0.49[c]	0.75±0.07[b]	2.34±0.04[b]

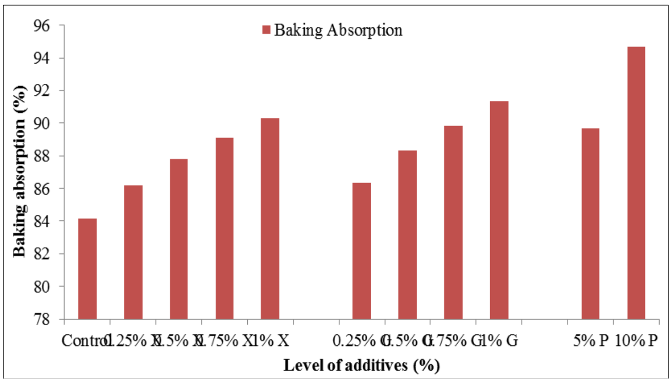

Fig 3: Effect of incorporation of hydrocolloids and potato flour on baking absorption (%) of gluten-free flat bread prepared from whole sorghum (100 per cent) flour

Effect of incorporation of hydrocolloids and potato flour on mean sensory panel scores (Max 9) of gluten-free flat bread prepared from whole sorghum (100 per cent) flour

Non-significant (p>0.05) variations were observed with regard to appearance, colour, aroma, texture and taste for gluten-free flat bread prepared from whole sorghum (100 per cent) flour after incorporation of hydrocolloids (0.25, 0.50, 0.75 and 1 per cent) as shown in Table 15 and Fig 10.

Scores given for the appearance varied non-significantly (p>0.05) from 7.07 for control, 7.07 at 0.25 per cent, 7.13 at 0.50 per cent, 7.30 at 0.75 per cent and 7.30 at 1 per cent level of xanthan gum incorporation. Scores for the appearance of the flat bread prepared from whole sorghum (100 per cent) flour added with 0.25, 0.50, 0.75 and 1 per cent guar gum were 7.13, 7.27, 7.47 and 7.03, respectively. Significant variation (p≤0.05) was found when compared with control (7.07).

Scores for colour of flat bread prepared after incorporation of 0.25 per cent, 0.50 per cent, 0.75 per cent and 1 per cent xanthan gum were 5.60, 5.67, 5.5 and 5.67, respectively which were found to be at par with control (5.50). Scores for colour of flat bread prepared after incorporation of 0.25 per cent, 0.50 per cent, 0.75 per cent and 1 per cent guar gum were 5.50, 5.50, 5.60 and 5.67, respectively. Scores for aroma of flat bread prepared after incorporation of 0.25 per cent, 0.50 per cent, 0.75 per cent and 1 per cent level of xanthan gum, varied non-significantly (p>0.05) from 7.03 for control to 7.07, 7.07, 7.07 and 7.00 at 0.25 per cent, 0.50 per cent, 0.75 per cent and 1 per cent level of xanthan gum incorporation, respectively. Scores for aroma of flat bread prepared after incorporation of 0.25 per cent, 0.5 per cent, 0.75 per cent and 1 per cent guar gum varied non-significantly (p>0.05) from 7.03 for control to 7.03, 7.20, 7.43 and 7.07, respectively at 0.25 per cent, 0.50 per cent, 0.75 per cent and 1 per cent level of guar gum incorporation, respectively.

Scores for the texture of flat bread prepared from hydrocolloids varied non-significantly (p>0.05). Scores for texture after incorporation of xanthan gum at 0.25, 0.50, 0.75 and 1 per cent were 6.47, 7.20, 7.30 and 6.67, respectively and those prepared from guar gum at 0.25, 0.50, 0.75 and 1 per cent were 6.50, 7.03, 8.13 and 8.13, respectively as compared to control (6.13).

Scores for taste of flat bread prepared after incorporation of xanthan gum at 0.25, 0.50, 0.75 and 1 per cent varied non-significantly (p>0.05), which were found to be 7.03, 7.23, 7.37 and 7.07, respectively and those incorporated with guar gum at 0.25, 0.50, 0.75 and 1 per cent, were found to be 7.03, 7.13, 7.43 and 7.07, respectively which were found to be at par with control (7.03). Scores for the overall acceptability of flat bread prepared after incorporation of 0.25 per cent, 0.50

per cent, 0.75 per cent and 1 per cent xanthan gum were 6.94, 6.86, 6.91 and 6.74, respectively and those prepared from 0.25 per cent, 0.50 per cent, 0.75 per cent and 1 per cent guar gum were 6.97, 7.15, 7.52 and 7.29, respectively as compared to control, which was 6.87.

Fig 4: Effect of incorporation of potato flour on gluten-free flat bread prepared from whole sorghum (100%) flour
1- Control; 2-5.00% potato flour; 3-10.00% potato flour

All the sensory characteristics except appearance and aroma varied significantly ($p \leq 0.05$) after incorporation of potato flour. Scores given for appearance of flat bread increased significantly ($p \leq 0.05$) from 7.07 for control to 7.05 at 10 per cent level of potato flour incorporation. Scores given for colour varied significantly ($p \leq 0.05$) from 5.50 for control to 7.03 at 5 per cent and 7.05 at 10 per cent level of potato flour incorporation. Scores for taste increased from 7.03 for control followed by 7.03 for flat bread that contained 5 per cent and 7.05 at 10 per cent level of potato flour incorporation. Similarly, aroma scores varied from 7.03 for control to 7.03 for flat bread that contained 5 per cent level of potato flour and 7.05 for that contained 10 per cent level of potato flour incorporation. Since potato flour increased water absorption capacity of dough, it therefore produced flat bread with softer crumb. Therefore, scores for texture varied from 6.13 for control to 7.03 for flat bread that contained 5 per cent potato flour and 7.05 for that contained 10 per cent level of potato flour incorporation. Overall acceptability of flat bread, varied significantly ($p \leq 0.05$) from 6.87 for control to 7.03 at 5 per cent and 7.05 at 10 per cent level of potato flour incorporation.

On the basis of organoleptic quality, best level of additives to be incorporated in gluten-free flat bread prepared from sorghum (100%) flour combination were xanthan gum - 0.50 percent, guar gum -0.75 percent and potato flour-5.00 per cent.

Table 4: Effect of incorporation of hydrocolloids and potato flour on mean sensory panel scores (Max 9) of gluten-free flat bread prepared from whole sorghum (100 per cent) flour

Additives	Level of additives (%)	Parameters					
		Appearance	Colour	Texture	Aroma	Taste	Overall acceptability
Control	0	7.07±0.06[a]	5.5±0.21[a]	6.13±0.15[a]	7.03±0.07[a]	7.03±0.21[a]	6.55±0.13[a]
Xanthan gum	0.25	7.07±0.16[a]	5.6±0.17[a]	6.47±0.17[ab]	7.07±0.06[a]	7.03±0.11[a]	6.65±0.07[a]
	0.5	7.13±0.21[a]	5.67±0.30[a]	7.2±0.30[bc]	7.07±0.15[a]	7.23±0.28[a]	6.86±0.36[a]
	0.75	7.30±0.13[a]	5.5±0.70[a]	7.3±0.70[c]	7.07±1.11[a]	7.37±0.73[a]	6.91±1.92[a]
	1	7.30±0.33[a]	5.67±1.34[a]	6.67±1.34[abc]	7.00±0.95[a]	7.07±0.16[a]	6.74±0.22[a]
Guar gum	0	7.07±0.06[a]	5.5±0.21[a]	6.13±0.15[a]	7.03±0.07[a]	7.03±0.21[a]	6.55±0.13[a]
	0.25	7.13±0.18[a]	5.5±0.44[a]	6.5±0.66[ab]	7.03±0.05[a]	7.03±0.55[a]	6.64±0.16[a]
	0.50	7.27±0.35[a]	5.5±0.44[a]	7.03±0.05[b]	7.2±0.53[a]	7.13±0.41[a]	6.83±0.06[a]
	0.75	7.47±0.50[a]	5.6±0.36[a]	8.13±0.33[c]	7.43±0.40[a]	7.43±0.20[a]	7.21±0.34[a]
	1.00	7.03±0.25[a]	5.6±0.66[a]	8.13±0.33[c]	7.07±0.16[a]	7.07±0.61[a]	6.98±0.98[a]
Potato flour	0	7.07±0.06[a]	5.5±0.21[a]	6.13±0.15[a]	7.03±0.07[a]	7.03±0.21[a]	6.55±0.13[a]
	5.00	7.03±1.05[a]	7.03±0.55[b]	7.03±0.25[b]	7.03±0.96[a]	$7.00±0.87_a$	6.50±0.50[a]
	10.00	7.05±1.27[a]	7.05±1.07[b]	7.00±0.17[b]	8.00±0.12[a]	8.12±0.11[b]	7.11±0.3[a]

CD= Critical Difference
NS=Non-significant

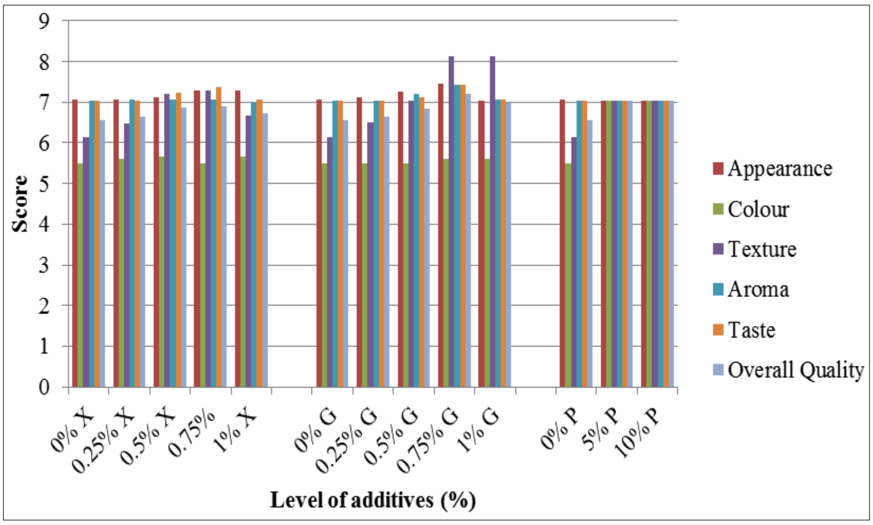

Fig 5: Effect of incorporation of hydrocolloids and potato flour on mean sensory panel scores (Max 9) of gluten-free flat bread prepared from whole sorghum (100 per cent) flour

Conclusion

In the baking industry, hydrocolloids are of increasing importance as bread making improvers. Usually, the addition of hydrocolloids and potato flour to dough improves its stability and quality criteria such as increased water absorption, specific loaf volume and the viscoelastic properties. These compounds also affected sensory properties of final products in different ways. On the basis of baking quality and sensory properties, most acceptable level of additives to be incorporated in gluten-free flat bread were xanthan gum - 0.50 percent, guar gum -0.75 percent and potato flour-5.00 per cent.

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