BRIDGE STREET FOODS

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Gluten free pan bread

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Background

Bread and other baked cereal goods are among the most important foods worldwide. Consumer interest in gluten-free (GF) baked products [for Celiac disease diets] is continuously increasing, and numerous research studies have been published on improving quality of GF products. Rotsch's study [1] on the role of starch in bread making showed that breads could be prepared from starch and gel-forming substances. Many hydrocolloids have been evaluated for increasing loaf volume of GF bread to augment structure in the absence of wheat gluten. Gluten functions as a major contributor for higher volume of wheat flour bread. Christianson, et al [2] studied wheat starch and gel-forming substances as potentially suitable for starch bread.

Introduction

Two novel ingredients came to the USA market for producing potentially gluten-free baked goods. One is wheat starch that has gluten removed and called Codex wheat starch. It has been allowed in gluten-free food in Europe for more than a decade, because numerous studies proved that it is not harmful to those who have celiac disease. However, wheat starch was not allowed in the United States until the recent finalization of the FDA rules for gluten-free foods [3]. The other is tamarind seed gum, a novel hydrocolloid, which has received GRAS status [4]. Tamarind gum is used as a food additive in Japan, and its various applications include thick sauce, ice cream, dressing and processed vegetables [5].

Xanthan gum is currently the most preferred hydrocolloid based on numerous study results for gluten-free baked goods. However, the food industry continues to look for other hydrocolloids that produces better quality GF bread and meets consumer needs. Tamarind seed gum is relatively new in the market with no research to date for bakery application. It is worth evaluating its potential application for gluten-free baked goods, compared with xanthan gum's

functionality. The present study investigates the baking functionality of tamarind gum in conjunction with Codex wheat starch in GF pan baked sandwich starch bread.

Materials

All the ingredients were commercially available and approved for food use.

Wheat starch was obtained from MGP and wheat flour with 8.5% protein and 0.5% ash from ADM. IDY yeast provided by Red Star. Tamarind gum, xanthan gum, soy milk powder, sugar, oil, and salt were locally procured

Test Methods

A simple starch bread formula (wheat starch, sugar, salt, soy milk powder, canola oil, water and yeast) was used for baking experiments. A hydrocolloid (tamarind gum or xanthan gum) was added to this simple starch formula at three levels. For comparing the effect of hydrocolloids, two other baking experiments were included. One was not to add any gum [wheat starch only]. The other was to use wheat flour instead of wheat starch/gum as control bread. The dry ingredients were added to the 5 qt Kitchen Aid mixer [K5SS] followed by the liquid ingredients. The mixer with D - paddle at low speed for 10 seconds to wet the ingredients then speed 6 for 4 minutes to complete the batter mixing. Then 530 g of dough was placed into oiled [10-inch x 3.5-inch x 4-inch] bread pan [volume of 2500 cc] followed by a mist of oil on the dough surface. Dough was proofed to a density of 0.3 g/cc at which time the dough was slightly higher than the rim of the pan. The bread was baked in a 400F oven for 30 minutes for a baked internal temperature of 204F. The batter appearance and flow characteristics were observed. The loaf was evaluated for loaf height, loaf weight, bake loss, loaf volume, loaf density, loaf appearance, air cell, grain, texture, and firmness.

A commercial loaf of sandwich bread was purchased and evaluated for loaf weight, loaf volume, loaf density, and appearance.

Results

Batter viscosities of starch bread before and after proofing

Sample	**After mixing**	**After poured into pan and proofing**
No-gum	thin pourable batter	thin liquid with visible bubbles
Wheat flour	moderate batter viscosity that developed into a dough	a dough with good pan flow

Tamarind gum	thick pourable batter to very thick flowable batter	flowable batter with good surface appearance
Xanthan gum	very thick spoonable to mucilaginous without flow	thick batter with peaks that could not be smoothed; after proofing the peaks remained as batter did not flow

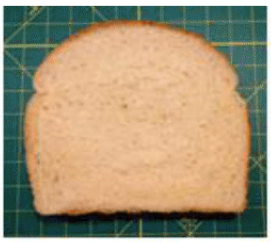
The batters were proofed to batter density of 0.30 g/cc [ranging from 0.28 to 0.35] in a span of 60 minutes at 78F.

The starch breads were baked to an internal temperature of 201F to 207F with bake yields ranged from 81.5 to 87.8%. The no gum had the lowest bake yield of 81.5%.

Bread characteristics

	No gum	Wheat flour	Tamarind gum (% addition)			Xanthan gum (% addition)		
			0.6	1.2	2.4	0.6	1.2	2.4
Loaf appearance								
Volume (cc)	1911	1686	1432	1435	1452	1240	1196	1416
Loaf density (g/cc)	0.22	0.27	0.31	0.32	0.30	0.35	0.38	0.31

The wheat flour had the best loaf appearance followed by the tamarind gum loaf.



Commercial bread

Wheat flour

Tamarind gum

The internal slice appearance was good for wheat flour and tamarind with tamarind having smaller air cells. However, the xanthan and no gum had large cells indicating coalescence. The no gum variant had poor internal strength and broke apart during handling.

The commercial sandwich bread loaf had a density of 0.279 g/cc.

Conclusion

The tamarind starch bread loaf composed of wheat starch, sugar, salt, soy milk powder, oil, water and yeast, was comparable to wheat flour bread [experimental and commercial] for loaf volume, loaf density, crumb grain, flavor and texture; however it had a less defined crown.

The no gum and the xanthan gum variant resulted in loaves with large cells, irregular loaf appearance, and poor texture.

Overall results demonstrated that tamarind gum can be applied successfully for achieving satisfactory loaf volume of GF starch bread, which enables mitigation of the major negative issues in GF bread quality.

Recommendations

Tamarind gum possesses unique properties that, when combined with wheat starch, results in a pan starch bread having many of the qualities offered by wheat flour bread. Tamarind gum offers the possibility for gluten free consumers to enjoy the eating experience like those of wheat flour bread consumers.

References

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