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Sensory properties and cross-cultural consumer acceptability of chicken sausages formulated with lentil (*Lens culinaris*) flour (#326)**Darshika P. Pathiraja**, [Phyllis J. Shand](#)

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Introduction

Lentil flour is a rich source of starch, protein and dietary fiber, thus a potentially useful binder for meat products. However, the addition of plant ingredients in meat products might affect their sensory properties. Consumers are not willing to compromise on sensory characteristics, and this poses a challenge for the meat industry in terms of developing new products or ingredients. Moreover, some studies have shown that chemosensory perceptions tend to differ between cultures. Nowadays, markets are increasingly becoming global. Thus, producers are faced not only understanding the relationship between consumer preferences and product characteristics but also how this relationship depends on the cultural context. This emphasizes the need for understanding acceptability of relatively novel foods for export markets. Therefore, the aim of this study was to investigate the effect of the addition of lentil flour in chicken sausages on sensory properties and consumer liking in different markets.

Methods

Wiener type sausage were prepared from mechanically separated chicken meat with addition of varying levels of infrared heated (IR) whole lentil flour (NutraReady[®], 43% starch and 25% protein) with or without sodium nitrite and each formulation was standardized to 4% starch content. T1 formulation corresponded to a commercial formulation for comparison and was formulated with 1.75% isolated soy protein (ISP) and 4% modified corn starch (CS). T2 to T4 were formulated by adding IR lentil flour at 4, 6 and 8% levels to replace IPS and CS. T5 was similar to T2, but without sodium nitrite. Other formulations contained 125 ppm of sodium nitrite. All other ingredients were kept constant in the formulations except water (31.94 – 29.33%). Products were cooked to >75°C in a smokehouse. The color and texture properties were measured instrumentally as per standard practices. Sensory descriptive attributes were evaluated by a local trained panel (n=12) and liking was investigated in consumer panels with 60 Canadian consumers (Non-Asian origin) who were born and living in Canada (Group 1), 60 Sri Lankan consumers who were born in Sri Lanka but living in Canada (Group 2) and 60 Sri Lankan consumers who were born and living in Sri Lanka (Group 3). Analysis of variance using SAS (SAS Institute, 2004) was performed and Tukey method was used to compare differences among means. Significance was determined at P<0.05.

Results

The addition of lentil flour or the exclusion of curing salt had no effect on

lightness (L) of both external and internal color of the cooked sausage. The inclusion of lentil flour lowered the redness (a*) of the products. However, products formulated with 4% lentil flour and the commercial formulation (T1) had similar external a* values. The hardness, cohesiveness, springiness, chewiness and shear force of the sausages formulated with lentil flour were comparable to the commercial formulation as measured instrumentally.

The descriptive panel found significant differences for color, hardness, cohesiveness, denseness, chewiness, foreign flavor intensity, mouth coating and after taste among the treatments (Figure 1). Sausages formulated with 8% lentil flour showed significant effect on the intensity scores for the hardness, cohesiveness, chewiness and denseness compared to the commercial formulation containing ISP. Addition of lentil flour increased the after taste. The foreign flavor intensity of the sausages formulated with lentil flour except the level 4% was higher than that of the commercial formulation.

There were significant differences in the rating of the acceptability of color, texture and flavor and overall liking by consumers. Increasing level of lentil flour reduced acceptability of internal and external color (Table 1). All consumer groups gave a lower rank for the sausages formulated without sodium nitrite. None of the consumer groups were able to detect differences in the foreign flavor intensity in the sausages formulated with lentil flour compared to T1. All consumer groups rated their overall acceptability similarly. The liking for all properties of the sausages formulated with lentil flour was comparable to the commercial formulation.

Conclusion

The instrumental data showed that IR treated lentil flour can be successfully used in chicken sausages up to 8%. However, the trained panel detected small differences in the texture and flavor. Both Canadian and Sri Lankan consumers' preference ratings of the commercial formulation were not drastically different from those of lentil flour incorporated formulations. The exclusion of nitrite in the formulation reduced the color acceptability. Consequently, these results revealed that IR treated lentil flour could be successfully used in place of isolated soy protein and corn starch in chicken sausages.

Notes

Table 1. Mean liking rating of sensory attributes of sausages tested in Canada and Sri Lanka

Consumer group	Sample	External color	Internal color	Texture	Juiciness ^{NS}	Flavor Acceptability	Foreign flavor intensity	Overall acceptability
Group 1	T1	4.9 ^{abcd}	4.7 ^{ab}	4.5 ^{abc}	4.7	4.5 ^{ab}	4.4	4.3 ^{bc}
	T2	5.3 ^{ab}	4.7 ^{ab}	4.4 ^{abc}	4.7	4.4 ^{ab}	4.6	4.5 ^{abc}
	T3	5.1 ^{abc}	4.8 ^{ab}	4.8 ^{abc}	4.9	4.7 ^{ab}	4.4	4.6 ^{abc}
	T4	5.2 ^{abc}	4.6 ^{ab}	4.6 ^{abc}	4.4	4.5 ^{ab}	4.3	4.4 ^{abc}
	T5	4.2 ^{cd}	2.8 ^c	4.2 ^{bc}	4.5	4.2 ^{ab}	4.2	4.0 ^c
Group 2	T1	5.3 ^a	5.1 ^{ab}	4.7 ^{abc}	4.6	4.7 ^{ab}	4.4	4.8 ^{ab}
	T2	5.2 ^{abc}	5.2 ^a	5.0 ^a	4.9	5.0 ^a	4.5	5.1 ^a
	T3	5.1 ^{abc}	5.0 ^{ab}	5.0 ^a	5.0	5.0 ^a	4.4	5.0 ^{ab}
	T4	4.6 ^{cde}	4.5 ^b	4.6 ^{bc}	4.7	4.8 ^{ab}	4.1	4.5 ^{abc}
	T5	3.7 ^d	3.3 ^c	4.2 ^c	4.5	4.3 ^b	4.1	3.9 ^c
Group 3	T1	5.1 ^{abc}	5.2 ^{ab}	4.8 ^{abc}	4.6	4.9 ^{ab}	4.8	4.9 ^{ab}
	T2	4.8 ^{abcde}	5.1 ^{ab}	4.8 ^{abc}	4.7	4.8 ^{ab}	4.1	4.8 ^{ab}
	T3	4.4 ^{bcd}	4.7 ^{ab}	4.5 ^{abc}	4.7	4.8 ^{ab}	4.8	4.5 ^{abc}
	T4	4.4 ^{de}	4.6 ^{ab}	4.9 ^{ab}	5.0	5.0 ^a	4.8	4.8 ^{ab}
	T5	2.5 ^e	2.9 ^c	4.3 ^{bc}	4.6	4.5 ^{ab}	4.1	4.0 ^c
SEM ¹		0.13	0.13	0.13	0.14	0.12	0.17	0.13

¹Standard error of mean, Means with the different superscripts in the same column are significantly different (P<0.05)

^{NS}Not significantly different, Scale: 6: Like very much, 1 Dislike very much

Consumer Liking Ratings of Sausages

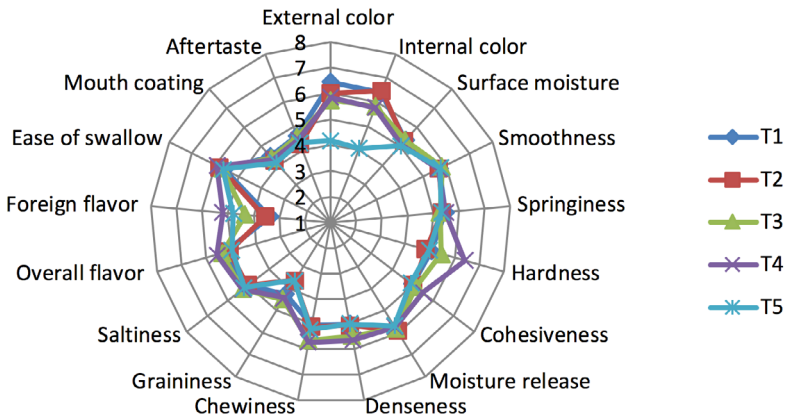


Figure 1. Mean intensity ratings of sensory attributes (using 8 point scale)

Sensory Intensity Ratings of Sausages

Notes