



## Sensory Characteristics of Three Different Levels of Turmeric Powder on Beef Stick Product

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### Abstract

The objective of this study was to evaluate sensory characteristics of a beef stick product with three levels of turmeric powder (TP). Specifically, these three levels of TP include: 1) 0% TP; 2) 1% TP and 3) 2% TP. Each treatment was evaluated using a 9-point hedonic scale. Fifty-eight untrained participants evaluated the beef stick product for acceptability of appearance, color, texture, flavor, taste, and overall liking. With respect to overall liking, beef stick product with 1% TP was the most desirable with a score of 7.13, followed by the control treatment (6.84) and 2% TP was least desirable with a score of 6.81. Additionally, beef stick product with added turmeric received positive participant ratings with respect to acceptability and purchase intent with and without health claims. Therefore, adding TP to a beef stick product might be a marketable alternative to original beef stick product.

**Keywords:** Beef Stick Product; Turmeric Powder; Sensory Evaluation; Hedonic Scale; Untrained-Panel

### Introduction

In recent years, the meat industry has been demanded for various options to promote healthy meat products. Most consumers expect higher quality and nutrient contents of meat products linked to natural spices [1-3]. Turmeric is a spice in the ginger family (*Zingibireaceae*) that originates from India [3]. It is a rhizome used as a culinary spice and traditional medicine [4,5]. It is commonly used in foods as a color agent because of its yellow color characteristic [6,7]. In addition, turmeric can be used as a food additive in curries to enhance aroma, storage conditions, palatability, and preservation [8,9]. Turmeric consists of several bioactive compounds: tetrahydrocurcuminoids, curcumin, demethoxycurcumin and bisdemethoxycurcumin [10,11]. With of these compounds, turmeric can be used as an anticarcinogenic, antioxidative, and antimicrobial properties [12,13].

### Objective of the Study

The objective of this study was to evaluate the consumer acceptability of three levels of turmeric powder added to a beef stick product.

### Materials and Methods

Ground beef (80% lean; 20% fat) was purchased from a local market in Lake Charles, Louisiana. Samples were subjected to three levels of turmeric powder (TP): 0%, 1% and 2%. Other ingredients were included: 6.2% Worcestershire sauce (Lea and Perrins Inc., Pittsburgh, PA), 2.6% liquid smoke (The Colgin companies, Mint Way, Dallas, TX), 1.8% salt (Morton Salt, INC., Chicago, IL), 0.2% garlic powder (Bolner's Flesta Products Inc., San Antonio, Texas), 0.2% onion powder (Kroger Co Cincinnati, Ohio), and 0.1% black pepper (Kroger Co Cincinnati, Ohio) (Table 1). The samples were refrigerated (3°C) for 12 hours. All treatments were then dried in a dehydrator (Model 778SS LEMTM) at 70°C for 6h. After drying, samples were cooled to ambient temperature and placed into the vacuum packaging.

All participants were volunteers solicited through advertisements posted in the Agricultural Sciences building on the McNeese State University Campus. Using a 9-point hedonic scale, fifty-eight untrained participants (25 males and 33 females) evaluated the beef stick product for acceptability of appearance, color, texture,

flavor, taste and overall liking (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). Participants also completed an acceptability and purchase intent questionnaire. The participants were required to cleanse their palates with water between tasting the samples. The test room was illuminated with cool, natural, fluorescent lights. The participants were presented with three digit randomly coded samples. Raw data was analyzed by Proc GLM procedures [14]. The PDIF option of LSMEANS was employed to determine significance among treatments. All data are presented as means with standard deviation (SD) and a significance level of  $P < 0.05$  was used for statistical analysis of means from treatments.

Ingredient (g)	Control	1% TP	2% TP
Ground beef	88.9	87.9	86.9
Turmeric	0.0	1.0	2.0
Worcestershire sauce	6.2	6.2	6.2
Liquid smoke	2.6	2.6	2.6
Salt	1.8	1.8	1.8
Garlic powder	0.2	0.2	0.2
Onion powder	0.2	0.2	0.2
Black pepper	0.1	0.1	0.1

**Table 1:** Formula of three treatments on beef stick products.

## Results and Discussion

### Demographic Information

The two largest age groups (18 - 24 and 45 - 54 years old) accounted for 65.32% of the total. Female participants (56.9%) exceeded males (43.1%). The majority of the consumers' race and ethnicity backgrounds were Caucasian (78.9%) and African-American (21.1%). The largest group of participants had graduated college or completed some college (79.6) and the second largest group, had only high school education (20.4%). A large percentage (29.4%) of the consumers in this study had a household income under \$9,999. This fact is not surprising as most of the consumers were college-aged.

### Product information

The number/percentage of consumers who consume beef stick products is presented in table 2. Most of the consumers reported that they do consume beef stick products. In fact, 77.6% of consumers reported that they consume this product and most of them preferred additional flavor at 65.5%. According to consum-

ers responses, 43.1% indicated that taste was the most important attribute (Table 2). Color is also an important quality attribute for a beef stick product, with 20.7% of consumers choosing this option. The third most important attribute was mouthfeel of the product (17.2%).

The consumer choice of spices is also an important factor of this study (See table 2). The most preferred spice was parsley powder (29.3%). However, 24.1% of people did report that a turmeric powder would be desirable for this type of product. The rosemary and lemon grass powders were preferred by 19.0 and 12.1% of consumers, respectively. Only 3.4% of participants reported basil powder. The consumers were also asked whether or not they would purchase the product if it contains turmeric as a flavor and/or color substitution. This question was important to determine consumer perceptions before they tasted the product (Table 2). Also, they played a role in determining whether consumer perceptions and purchase intent changed after tasting the product. Interestingly enough, most 51.7% of the consumers responded that they would purchase a beef stick product contains turmeric.

### Consumer acceptability

Using the hedonic scale, participants evaluated the beef stick product for appearance, color, texture, flavor, taste, and overall liking (Table 3). With reference to appearance, color and flavor scores were different between three treatments ( $P < 0.05$ ).

Adding 1% TP in a beef stick product had the highest score of color at 7.89 and flavor at 7.34. However, texture, taste, and overall liking, scores among all three treatments were not significantly different ( $P > 0.05$ ) (Table 3). Specifically, adding 1% TP in the beef stick product had the most overall liking score (7.13), followed by control treatment (6.84) and 2% TP (6.81) (Table 3). These results suggest that turmeric can be a viable alternative ingredient to traditional beef stick products.

### Acceptability and purchase intent

Each treatment was evaluated separately using a 2-point hedonic scale (yes/no). Using the acceptability and purchase intent questionnaire, consumers evaluated the beef stick product for acceptability, whether or not they would purchase the product and whether or not they would purchase the product if it claimed to contain turmeric which can promote health including preventing heart disease, Alzheimer's, cancer, and improve symptoms of depression and arthritis [15,16]. This includes a potent of anti-

inflammatory and antioxidant [17]. The percent (%) of positive responses for the aforementioned questions is shown in table 4. All three treatments received similar scores with respect to acceptability and purchase intent ( $P > 0.05$ ). From the acceptability, beef sticks with 1% added TP had the best score (51.72%). These results correspond directly to the mean consumer acceptance

scores, where adding 1% TP had the highest overall liking. From the purchase intent questionnaires, the control treatment scored the highest at 60.34% (Table 4). Finally, with respect to whether or not the consumers would purchase the product if it claimed to contain health promoting, both adding 1% and 2% TP in a beef stick product received similar scores at 44.83 and 41.38%.

Beef stick product	Number/Percentage	
	Yes	No
Do you normally eat beef stick product?	45/77.6	13/22.4
Do you normally eat beef stick product with additional flavor?	38/65.5	20/34.5
Have you purchased or consumed beef stick product with additional flavor?	33/56.9	25/43.1
Would you purchase beef stick product if they contain a health-promoting ingredient such as turmeric?	30/51.7	28/48.3
<b>How often do you buy beef stick product?</b>		
More than once a week		3/5.2
Once a week		10/17.2
Twice a month		7/12.1
Once a month		22/37.9
Very rare		14/24.1
Never		2/3.4
<b>What is the most important quality attribute that you want in this type of product?</b>		
Color		12/20.7
Mouthfeel		10/17.2
Taste		25/43.1
Nutrition		3/5.2
Flavor		8/13.8
<b>What are your most preferred spices in beef stick products</b>		
Celery powder		4/6.9
Parsley powder		17/29.3
Basil powder		2/3.4
Ginger powder		3/5.2
Turmeric powder		14/24.1
Lemon grass powder		7/12.1
Rosemary powder		11/19.0
<b>Which taste do you prefer most for beef stick products?</b>		
Less salt		24/41.4
Sweeter		10/17.2
Little spicy		18/31.0
Sweet and sour		6/10.3

Table 2: Consumer product questionnaires.

Properties	Control	1% TP	2% TP	SEM
Appearance	6.84 <sup>a</sup>	6.17 <sup>b</sup>	5.91 <sup>b</sup>	0.20
Color	6.11 <sup>a</sup>	7.89 <sup>b</sup>	7.02 <sup>c</sup>	0.36
Texture	7.59 <sup>a</sup>	7.09 <sup>a</sup>	6.99 <sup>a</sup>	0.27
Flavor	6.43 <sup>a</sup>	7.34 <sup>a</sup>	7.18 <sup>a</sup>	0.19
Taste	7.22 <sup>a</sup>	7.18 <sup>a</sup>	6.96 <sup>a</sup>	0.31
Overall liking	6.84 <sup>a</sup>	7.13 <sup>a</sup>	6.81 <sup>a</sup>	0.46

**Table 3:** Consumer acceptance scores for sensory attributes and overall liking of three levels of TP on beef stick products.

<sup>a,b,c</sup>: LS Means with different superscripts within a row is significantly different (P < 0.05).

	Control Number/Percentage	1% TP Number/Percentage	2% TP Number/Percentage
<b>Acceptable</b>			
Yes	37/63.79 <sup>a</sup>	30/51.72 <sup>a</sup>	29/50.00 <sup>a</sup>
No	21/36.21 <sup>a</sup>	28/48.28 <sup>a</sup>	29/50.00 <sup>a</sup>
<b>Purchase</b>			
Yes	35/60.34 <sup>a</sup>	28/48.28 <sup>a</sup>	26/44.83 <sup>a</sup>
No	23/39.66 <sup>a</sup>	30/51.72 <sup>a</sup>	32/55.17 <sup>a</sup>
<b>Purchase + health claim</b>			
Yes	31/53.45 <sup>a</sup>	26/44.83 <sup>a</sup>	24/41.38 <sup>a</sup>
No	27/46.55 <sup>a</sup>	32/55.17 <sup>a</sup>	34/58.62 <sup>a</sup>

**Table 4:** Acceptability and purchase intent questionnaire (N = 58) of three levels of TP on beef stick products.

<sup>a</sup>: Row is not significantly different (P > 0.05).

### Conclusion

The results of this study provide valuable insight into the consumer acceptance of adding turmeric to beef stick products. Specifically, participants rated 1% turmeric in beef stick products with respect to color, flavor, and overall liking as the highest score. Additionally, beef stick product with added turmeric received positive participant ratings with respect to acceptability and purchase intent with and without health claims. Therefore, adding turmeric in beef stick product might be a marketable ingredient addition to original beef stick products.

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