

# PROCESSING AND PRODUCTS

## Consumer Acceptance of Stir-Fry and Kabobs from Dark Chicken Meat and Their Packaging

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**ABSTRACT** In a study of marketing opportunities for fresh, dark chicken meat, focus group participants (n = 34) provided qualitative information concerning potential products and packaging concepts. Results of the focus groups indicated that the participants were willing to purchase new, convenient poultry products made from dark chicken meat. Specific dark meat products the participants were willing to buy included boneless, skinless thighs, kabob cubes, and stir-fry strips. Consumers desired clear packaging for the products but did not want the packaging to be microwaveable or ovenproof. Acceptance of chicken kabob chunks and

stir-fry strips of varying piece sizes (2.54, 3.81, and 5.08 cm) and seasoning concentrations (1.6, 2.1, and 2.6%) was evaluated by consumers (n = 83) using a nine-point hedonic scale. The most preferred products were a 5.08 cm (2 in) kabob with 2.6% seasoning and a stir-fry strip with 2.6% seasoning. A simulated supermarket setting test was conducted to verify findings from a mailed survey (n = 115) and actual purchase behavior by consumers (n = 121). A calculated desirability index indicated a ranked preference to be: breasts > kabobs > stir-fry > boneless, skinless thighs > bone-in, skin-on thighs.

(Key words: dark chicken meat, consumer acceptance, stir-fry, kabobs)

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### INTRODUCTION

Due to preferences and consumer perceptions of nutrition, a surplus of dark chicken meat exists in the U.S. (Massey, 1994). Therefore, the processing and marketing of products from dark chicken meat may increase its utilization. Any products introduced to the market must be in appropriate packaging to best induce the consumer to purchase them. Packaging is seen by many consumers as a direct indication of product quality and can influence the purchase decision (Balasubramaniam and Chinnan, 1997). The type of packaging can directly influence the ease of use by consumers, especially in instances in which the package can have functional properties, such as reclosability or microwave/conventional oven temperature resistance.

Raw, packaged, cut-up poultry has increased from 15% of all poultry produced in 1962 to 55% in 1992. Further processed poultry items have developed into 30% of the 1992 market from 2% in 1962 (Massey, 1994). These products, as well as the cuts sold, have concentrated on the pectoral muscles (white meat). This has

resulted in a surplus (Massey, 1994) and thus a devaluation of leg (dark) meat (W. P. Roenigk, National Broiler Council, Washington, DC, personal communication, 1994). Comparison of white and dark chicken meat at New York broiler prices shows the growing disparity between the two types (Roenigk, personal communication, 1994). In a 1991 Gallup poll, chicken breast was the most preferred part, followed by thigh and drumstick (Ahlstrand, 1991).

Package size also plays a role in the purchase of many products by consumers (Gundry *et al.*, 1988). The size of packages can also contribute to the overall price structure of the products in relation to the product lines they are in. The package itself is to be designed considering consumer end-use and also with consideration for retail display cases. Award-winning packages have failed due to lack of consideration for this aspect (O. V. Jennings, Perdue Farms, Salisbury, MD 21082, personal communication, 1994).

There is a growing trend in the U.S. for individuals to consume less fatty foods with fat reduction resulting from changes in food selection (e.g., chicken instead of beef) or method of preparation (e.g., baking instead of frying). This reduction in fat has had some impact on the methods of cooking, as well as on food choices. The popularity of different ethnic foods is an important trend in the U.S. at present, thus allowing new products

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geared toward these markets to thrive (Sloan, 1994). Stir-frying is a traditional oriental method of preparing foods quickly over high heat, with little fat. It has become a very popular means of preparation for meats and vegetables worldwide.

Another form of food and its ancient method of preparation that has once again become popular is the kabob. Kabobs are chunks of meat that have been skewered and grilled. However, baking has become a common method of preparing kabobs in the U.S.

In products to which seasoning has been added, colors will be directly influenced by the additives, as well as indirect additive effects (Yang and Chen, 1993). Colors of products have been shown to influence the perception of strength and quality of aroma and flavor in various products (Christensen, 1983; Johnson *et al.*, 1983).

In the retail setting, different lighting types can greatly influence consumer perception of the colors of the products (Calkins *et al.*, 1986), so products need to be developed with various lighting sources considered. Schutz (1983) reminds us that the attainment of an optimized product formulation does not guarantee market success.

Mailed questionnaires are among the most widely used of all research instruments for collection of consumer attitudinal data. A well-designed mailed questionnaire can allow consumers to privately express their wants and desires concerning products. Mailed surveys have been used to research opinions and habits of consumers, dealing with all areas of foods and food supplements. These surveys range from food in general (Wheat Industry Council, 1983) to specific food items such as beef (Dunkelberger *et al.*, 1991) and vitamins (Martin *et al.*, 1991).

Supermarket simulation is a technique for assessing the behavioral characteristics of consumers in relation to their purchase of specific products. Use of the simulated supermarket setting technique is not widespread in published empirical studies but was shown to give good results in previous testing (Galvez and Resurreccion, 1994).

The purpose of this study was to investigate consumer attitudes toward convenience products from dark chicken meat, to identify product attributes—including sensory attributes—important to consumers, to assess consumer responses to packaging concepts for the products, and to develop dark chicken meat products with potential for retail sale. Specific objectives were to: 1) determine the preferred size for stir-fry and kabob products; 2) determine the most acceptable level of seasoning; and 3) correlate physicochemical measurements with sensory ratings of quality. A mailed survey was conducted to quantify consumer preferences, purchase frequencies, and shopping and food preparation practices with regard to chicken. A simulated supermarket setting test was conducted to verify consumer behaviors with respect to findings of the mailed survey.

These various investigative methods were used in combination to reach unified conclusions with regard to viability of products under development.

## MATERIALS AND METHODS

### *Sub-Study 1: Focus Groups*

Focus groups are a reliable method (Galvez and Resurreccion, 1992) for obtaining information regarding consumer attitudes, perceptions, behaviors, habits, and actual practices (Chambers and Smith, 1991). This qualitative technique is a valuable tool for the determination of consumers' definitions of product quality. The focus group approach was used in the present study to qualify the perceptions of the present forms of packaging of poultry products and clarify any problems with them. Examination of consumer perceptions of dark meat poultry took place in order to find the most acceptable forms of packaging, as well as the most desirable products.

**Panel.** Four groups of 6, 8, 12, and 8 consumers, respectively, were used to develop concepts and identify the most important attributes of convenience products and their packaging as related to chicken products. Participants were recruited by telephone from different regions surrounding the greater metropolitan Atlanta, Georgia area. Names and phone numbers of the participants were obtained from a consumer database maintained at the University of Georgia Center for Food Safety and Quality Enhancement in Griffin, GA since 1984 (Resurreccion and Heaton, 1987). Participants were required to have purchased poultry products at least twice a month and to have eaten chicken at least twice in the past 2 wk prior to the test. An incentive was given to panelists in the form of a small honorarium.

**Test Location.** Each session was held in a hotel meeting room large enough to seat 15 people comfortably. These rooms were at accessible locations in four different geographic areas surrounding Atlanta. The rooms were equipped with fluorescent light fixtures and air conditioning to maintain the comfort of the participants and were free of distractions to provide a conducive atmosphere to the studies.

**Conduct of the Tests.** Sessions were led by an experienced moderator. Participants were seated around a conference table in the meeting room, with the moderator standing at one end. Each session was recorded by two audiotape recorders placed on the table. Water was provided for the group members. Observers sat at a separate table on one side of the room so that they could take notes during the session.

The moderator, observers, and participants began each session by introducing themselves. In order to create a comfortable, informal atmosphere, each person told a little about who they were and what they did for a living. The moderator then explained to the participants the nature, operation, and rationale for focus groups to ensure

appropriate expectations and participation. Specific questions were then introduced for discussion by the group. The three major topics for discussion were on poultry selection and purchase behavior, product attributes, and product concepts. Probes were used as needed to lead the discussion toward the research problem, while allowing ready input from all group members.

After the sessions, all tapes were transcribed and analyzed for similarities and similar themes. These were then matched against notes taken by the observers to assure that emotive forces were not lost due to transcription and reporting.

## Sub-Study 2: Consumer Acceptance Test

**Experimental Design.** Size of pieces and seasoning concentrations were varied in stir-fry and kabob products from dark chicken meat. The design used was a  $3 \times 3$  factorial conducted in three replications. The first factor was the size of kabob chunks or length of stir-fry strips; the second was concentration of teriyaki seasoning added to the products. Separate tests were conducted for each product. Nine treatments of each product were presented to panelists in a random order. To avoid sensory fatigue, a secondary randomization based on the number of samples was built into the design.

**Materials.** Boneless, skinless broiler thighs (~126 g each) were obtained from a local producer<sup>2</sup> and transported to the University of Georgia meat plant. It is the business practice of this producer to hot-bone all meat. Three batches of 15 kg were designated to be used for kabobs. The major anterior (*Sartorius*, *Crureus*, and *Gluteous*) flexor and posterior *Biceps femoris* muscle groups were cut into squares of specific dimensions from the experimental design for kabobs. Excess thigh meat was used for the stir-fry product. The kabob yield averaged 78% for the thighs. Kabob chunks were cut into size specifications determined most desirable by the focus groups: 2.54 cm<sup>2</sup> (1 in), 3.81 cm<sup>2</sup> (1.5 in), and 5.08 cm<sup>2</sup> (2 in). Sizes are given as squares, not cubes, as the depth varied by thickness of the thigh (approximately 1.5 cm average).

Another three batches of boneless, skinless thighs weighing 10 kg each, and consisting of the *Vastus externus*, adductors, and anterior and posterior major muscle groups were used for stir-fry. In addition, *V. externus* and adductors trimmed from the thighs used for the kabobs were utilized. These were cut into 2.54 × 1.27 cm (1 × 0.5 in), 3.81 × 1.27 cm (1.5 × 0.5 in), and 5.08 × 2.54 cm (2 × 1 in) strips. Dimension verification was accomplished by use of a Vernier caliper, measuring the distance across the center

from side to side. The strips were measured by caliper for width and laid onto a ruler for length.

Each batch was placed in a plastic bag and agitated by hand for 3 min in 1.6, 2.1, or 2.6% (wt/wt) teriyaki marinade powder<sup>3</sup> along with 7.6% water, as per the formulation recommendations. The seasoning was chosen for its ingredient listing of powdered soy sauce, sugar, onion powder, garlic powder, sodium phosphates, salt, spice, caramel coloring, and spice extractives. Each batch was placed into 35.5 × 61 cm plastic bags<sup>4</sup> and vacuum packaged. Batches were refrigerated at 4 C overnight.

**Cooking Method for Kabobs.** Twenty minutes prior to sensory evaluation, 1.5 kg batches of kabob chunks were placed in one layer onto baking sheets sprayed with nonstick vegetable coating spray.<sup>5</sup> The order of cooking was randomized by lottery. They were then baked in an oven preheated to 160 C to an internal temperature of 74 C (Lyon *et al.*, 1984); cooking time was ~20 min. Temperature was checked using a meat thermometer.<sup>6</sup> Kabob chunks were then transferred to 15.25 × 7.62 × 7.62 cm (6 × 3 × 3 in) disposable aluminum loaf pans on a baking sheet, covered tightly with aluminum foil, and held in a 60 C oven until served; maximum holding time was 15 min. Meat temperature was occasionally monitored with a meat thermometer.<sup>6</sup>

**Cooking Method for Stir-Fry.** Twenty minutes before testing, 0.5 kg batches of strips were stir-fried in a 10-in aluminum skillet sprayed with non-stick vegetable coating spray<sup>5</sup> and preheated for 1 min at a high setting on the large burner of an electric range. The mixture was stirred constantly with a stainless steel spoon. The order of cooking was random by lottery. The strips were cooked to an internal temperature of 74 C. Temperature was checked using a meat thermometer.<sup>6</sup> Strips were then transferred to 15.25 × 7.62 × 7.62 cm (6 × 3 × 3 in) disposable aluminum loaf pans on a baking sheet, covered tightly with aluminum foil, and held in a 60 C oven until served.

**Sensory Testing Conditions.** Participants were seated in partitioned booths in a sensory evaluation laboratory lit by fluorescent lighting. Each booth was equipped with a sink with running water.

**Panelists.** Participants were local residents of Athens, GA, as well as faculty, students, and staff at the University of Georgia. Eighty-three consumers participated in both tests with replications of 25, 25, or 33 panelists. The mean age of participants was 29 (± 8.2) yr.

**Test Procedure.** Prior to the tests, all of the 83 participants were asked to read and sign consent forms. Participants were assigned random three- or four-digit code numbers for subsequent identification. Each participant was provided with plastic utensils, napkins, water, unsalted crackers,<sup>7</sup> and a covered cup for expectoration. Panelists were presented with four or five samples monadically and asked to rate attributes of the samples on ballots. Samples were presented to the participants in covered one-ounce plastic sample cups. Appearance, color, piece size, texture/mouthfeel (stringiness, graininess, chewiness, softness), tenderness, juiciness, flavor,

<sup>2</sup>Wayne Farms, Continental Grain Co., Pendergrass, GA 30567.

<sup>3</sup>A. C. Legg, Inc., Birmingham, AL 35202.

<sup>4</sup>Cryovac, Duncan, SC 29334.

<sup>5</sup>Pam®, Boyle-Midway, Inc., New York, NY 10017.

<sup>6</sup>Taylor Bi-Temp, Garden City, NY 11530.

<sup>7</sup>Kroger, Cincinnati, OH 45202.

flavor intensity, overall acceptability, and purchase likelihood were evaluated. These attributes were rated on a nine-point hedonic scale, wherein 9 = like extremely, 8 = like somewhat, 7 = like, 6 = like a little, 5 = neither like nor dislike, 4 = dislike a little, 3 = dislike, 2 = dislike somewhat, and 1 = dislike extremely. After evaluating the first four or five samples, panelists had a 5- to 10-min resting period between stimulus intervals. Each sample was presented approximately 3 min after the previous sample had been completed. The panelists then evaluated the remaining five or four samples. Before leaving the sensory evaluation booths, the participants were given a questionnaire that asked demographic information on their sex, year of birth, education, present occupation, marital status, and whether they were the primary shopper in their household.

Fifty-three of the participants who identified themselves as the primary shopper in the household also volunteered to participate in a visual examination of the raw packaged products. Three 1.5-lb (0.681-kg) packages of the raw stir-fry, and three packages of the kabobs, one of each strip length or cube size, were presented on white styrofoam trays<sup>8</sup> and overwrapped with film. Packages were placed on a white table under fluorescent lighting for evaluation, as no refrigerated display case was available at the sensory evaluation laboratory. The stir-fry packages contained 2.54 × 1.27 cm (1 × 0.5 in), 3.81 × 1.27 cm (1.5 × 0.5 in), or 5.08 × 2.54 cm (2 × 1 in) strips. Kabob packages contained 2.54 cm<sup>2</sup> (1 in), 3.81 cm<sup>2</sup> (1.5 in), or 5.08 cm<sup>2</sup> (2 in) pieces. Only three treatments of each product were examined. Seasoning pouches were placed in each package, so no visual change in the product occurred. The participants also completed a questionnaire concerning their willingness to buy the product, their preferences for white meat, dark meat, or both, their comments, and pricing suggestions. Willingness to buy the product was used as a variable to relate to the purchase likelihood ratings obtained during sensory evaluation. Pricing suggestions in cost per pound were asked to assess perceived value.

**Physicochemical Measurements.** The chicken stir-fry strips and kabob chunks were prepared as described above. A 2.54-cm diameter core was removed from the kabobs and larger stir-fry strips, and testing proceeded in accordance with Smith *et al.* (1992) and Smith *et al.* (1988). Five determinations for texture were performed on 10 g samples for each of the nine treatments for each product using an Instron universal testing machine<sup>9</sup> equipped with a Kramer shear cell. Crosshead and chart speeds were set to 20 mm/min on a 20-kg load cell. Data were collected using the Instron Series IX Materials Testing System (Version 5.25).<sup>9</sup> Shear force was calculated from measurements of the force deformation curve and expressed as Newtons.

Moisture content of raw products was determined according to AOAC Method 950.46B (1990). Fat content of the raw chicken was determined as outlined in AOAC Method 960.39 (AOAC, 1990) using high boiling point petroleum ether.<sup>10</sup>

### Sub-Study 3: Mailed Survey

**Participants.** The consumers were recruited by telephone from a database maintained at the Center for Food Safety and Quality Enhancement in Griffin, GA. Participants recruited resided in different regions surrounding the greater metropolitan Atlanta area. To qualify as respondents in the survey, they were required to regularly purchase poultry products at least twice a month and to have eaten chicken at least twice in the past 2 wk prior to the test. For the survey, 115 responses were received from the 160 sent out (71.9%).

**Questionnaire Design.** The questionnaire consisted of seven sections with a total of 48 questions printed on five pages and was designed to be self-administered. The first section inquired about the individual's food shopping and preparation practices, their preferences for chicken products, and how those products should be packaged. Sections 2 through 6 inquired about their opinions of kabobs and stir-fry. Each section asked about willingness to purchase the product, preferred number of servings per package, packaging type, and whether anything else should be included in the package. In addition, size preferences for the products were asked. Section 7 asked for the three products most preferred by consumers and the price differential they would be willing to pay for these products.

Questionnaires were identified only with a code number previously assigned to each participant. Subsequently, responses were identified by code number in accordance with guidelines of the University of Georgia Institutional Review Board regarding human subjects.

**Test Method.** The survey was conducted using the Dillman (1978) method for mailed survey research. Once consumers agreed to complete the survey, the questionnaire with a stamped return envelope was mailed to them in a hand-addressed envelope. A personalized cover letter signed in blue ink, as per Dillman (1978), was included to explain the survey to the recipients. A postcard was mailed to all participants after 2 wk thanking them for sending back the questionnaire and asking them to return it if they had not yet done so. Questionnaires returned before a 1-mo cut-off deadline were included in data analysis.

### Sub-Study 4: Simulated Supermarket Setting Test

**Participants.** Participants were recruited from a database of consumers maintained at the Center for Food Safety and Quality Enhancement. Of 180 recruited for the

<sup>8</sup>S-2, Tenneco Packaging, Smyrna, GA 30080.

<sup>9</sup>Model 1122, Instron Corp., Canton, MA 02021.

<sup>10</sup>60 to 110 C, J. T. Baker, Phillipsburg, NJ 08865.

TABLE 1. Package prices and weights used in retail simulation of chicken products

Products	Price		Weight per package	
	(\$/lb)	(\$/kg)	(lb)	(kg)
Control bone-in thighs with skin	\$1.39	(\$3.06)	1.44	(0.654)
Boneless, skinless thighs	\$1.58	(\$3.48)	1.27	(0.577)
Stir-fry	\$1.80	(\$3.96)	1.11	(0.504)
Kabobs	\$1.89	(\$4.16)	1.06	(0.481)
Boneless, skinless breast	\$4.00	(\$8.81)	0.50	(0.227)

test, 162 consumers participated in the simulation. Participants were given an incentive consisting of a small cash honorarium and were allowed to keep products purchased during the simulation. Products were carried to participants' homes in coolers that they were instructed to bring.

**Test Site.** A simulated supermarket was set up in the Postharvest Research Laboratory at the Georgia Experiment Station in Griffin, GA. The room was decorated with multi-colored streamers and food-oriented posters to add to the overall effect of being in a supermarket.

Consumers were greeted at a sign-in desk and were given a demographic questionnaire and consent forms to complete. The basic procedure was then explained to each shopper. A commercial display case with fluorescent lighting was stocked with the seven products. Cashiers were situated near the display case to allow the participants to pay for their purchases and for the purchases to be recorded.

**Samples.** Two new products (stir-fry, kabobs) utilizing boneless, skinless thighs were studied. These products, developed in our laboratory (Elsner, 1995), were compared against three traditionally packaged controls of boneless, skinless breasts; boneless, skinless thighs; and bone-in, skin-on thighs. The two new products were packaged in the preferred materials according to results of the mailed survey.

To determine the preference and compare the perceived value of the products, each package was weighed to give \$2.00 worth of product with packaging cost included. The prices were derived from a cost analysis of packaging materials, labor, seasonings, and expected prices. Weights and prices appear in Table 1. Participants reported that they felt the prices asked for the products in the simulation were fair (90.2%).

Participants were each given \$2.00 in cash and asked to go to the retail case to select a package of chicken. They brought their selection to a checkout counter, where payment was accepted and purchase recorded. After each purchase, consumers were given a post-shopping questionnaire asking about the product and package. Participants were asked to make four trips to the retail case, each time following the procedure described above, except that they were instructed to purchase a different product during each trip. Participants were provided with ice for their coolers to store the products while they completed the study.

The one-page, post-shopping questionnaire had seven questions. The questions were: why they bought the product instead of the other products available; why they bought the particular package of that product; whether they liked the package the product was in; what they liked or disliked about it; whether they thought the price was fair and, if not, what price they would suggest per pound; and how they planned to prepare the product. The method used resulted in a forced choice ranking of four out of five products.

### Statistical Analysis

Multiple regression optimization procedures (Schutz, 1983) were performed on the sensory ratings obtained in the consumer acceptance test. Schutz's suggestion to include the crossproduct in the analysis was used. Homogeneity of slopes was determined. Sensory ratings were analyzed using SAS® (SAS Institute, 1994) and were verified by nonparametric methods (PROC NPARIWAY and Kruskal-Wallis, SAS Institute, 1994) due to the hedonic scale used. Instrumental texture measurements were analyzed by ANOVA. Duncan's Multiple Range was the mean separation test used.

For the mailed survey, all analyses were performed on the data using SAS® (SAS Institute, 1993) for the personal computer. For questions requiring a numeric response, mean ratings were calculated. For responses for categorical data, item frequencies were tabulated. Simulated supermarket setting test results were subjected to two types of ranking analyses, which were then compared. First, Borda measurement marks (Cook and Kress, 1992) were calculated to give a basic estimate of the ranks; then, the coefficient of concordance,  $W$ , and  $\chi^2$  values were calculated (Gacula and Singh, 1984). The desirability index,  $W$ , was determined according to the Borda system described by Cook and Kress (1992) where each first place score is assigned four points, second place gets three, third gets two, and fourth place gets one point. The second analysis was transformation of the scores by Fisher-Yates values (Fisher and Yates, 1942).

## RESULTS AND DISCUSSION

### Focus Groups

Demographic characteristics of the focus group participants appear in Table 2. The focus group members were predominantly women between the ages of 25 and 54. Racially, the groups were white and black in almost even quantities. Approximately half of the participants were married. All had graduated from high school, and two-thirds had at least some college courses. Half of the group members were skilled, semi-skilled, or unskilled workers. The other half categorized themselves as executives, managers, administrators, proprietors, or clerical/sales/technician. The household incomes varied from under \$9,999 to over \$70,000 per annum, with one quarter of the participants between \$20,000 and \$29,999.

TABLE 2. Demographic characteristics of focus group participants (n = 34)

Characteristic	Percentage responding	Characteristic	Percentage responding
Age group		Education level	
Under 25 yr	15	High school	35
25 to 34 yr	32	Some college	42
35 to 44 yr	26	College	17
45 to 54 yr	24	Grad/professional school	6
55 to 64 yr	3		
Sex		Race	
Male	9	White	57
Female	91	Black	43
Marital status		Job description	
Never married	18	Exec./Proprietor (large size Co.)	3
Married	56	Mgr./Proprietor (medium size Co.)	18
Separated/Divorced/Widowed	26	Admin/Small business owner	20
		Clerical, sales, technician	9
		Skilled worker	41
		Semi-skilled worker	3
		Unskilled worker	6
Have persons living in their household:		Household Income	
under 6 yr old	19	under \$9,999	3
7 to 12 yr old	11	\$10,000 to 19,999	6
13 to 18 yr old	7	\$20,000 to 29,999	26
19 to 24 yr old	14	\$30,000 to 39,999	12
25 to 64 yr old	49	\$40,000 to 49,999	18
		\$50,000 to 59,999	15
		\$60,000 to 69,999	9
		\$70,000 and over	12

The majority (54%) of participants had incomes between \$30,000 and \$69,999 per year. Half of the participants lived with people 35 to 64 yr of age, and one-third had children under 13 yr of age in their household.

Responses of the groups to questions pertaining to the importance of convenience appear in Table 3. The average focus group member spent about 1 h/d preparing their evening meal, but would like to spend only 30 min (Question 1). Many of the participants, however, were willing to pay only a small amount more to save time (Question 2). Product attribute questions also appear in Table 3. In this table are summaries of the specific products and product attributes the participants perceived as most important. Many of the consumers felt the prices for minimally value-added products, such as deboned chicken breast, were overly inflated. However, most of these consumers still purchased such items. Boneless, skinless breasts were the most commonly purchased convenience item, followed by chicken "fingers" and wings (Question 3). These findings for breast meat agree with those of Ahlstrand (1991).

There were two reasons why all groups preferred home-seasoned products over pre-seasoned products (Question 4): first, many of the pre-seasoned products do not have the taste that the consumer wants or expects, and second, many distrust the pre-seasoned products as being lower quality products disguised by seasoning. The same reasons were cited when asked whether convenience products should be pre-seasoned or contain all of the necessary components and be assembled by the consumer (Question 6). The issue of price vs convenience was unresolved, as price and convenience were both seen to be

very important, and are circumstantial as to which is more important (Question 5).

When asked the forms in which focus group participants would purchase dark meat, they were willing to purchase several products suggested to them. These suggested products included boneless, skinless thighs, kabobs, and stir-fry. Participants agreed that kabobs should be marketed as fresh, 2-in cubes (Question 7) and stir-fry as fresh strips (Question 8); however, the length of strips was not resolved.

Responses pertaining to packaging and product concepts are also reported in Table 3. Consumers expressed that they would like packaging for kabobs and stir-fry to allow a clear view of the meat (Question 9). They also complained that the styrofoam trays currently used aid in deceiving the consumer. They felt that too often these trays hid blemishes or portions of fat or skin under the visible meat. They asked for clear packaging with as few obstructions as possible, facilitating the inspection of the product by the consumer. Participants did not feel that the containers in which kabobs and stir-fry were marketed should be microwaveable or ovenproof (Question 10).

### Consumer Acceptance Test

**Sensory Evaluation of Cooked Products.** Mean sensory ratings for kabobs are presented in Table 4, and results of General Linear Models are shown in Table 5. Seasoning concentration was a significant influence on the attributes of appearance, juiciness, texture, and overall acceptability. The juiciness and textural variation could conceivably be caused by the presence of phosphates in

TABLE 3. Focus group responses to questions on purchase behavior, product attributes, and packaging concepts for chicken products

Question	Group 1 (n = 6)	Group 2 (n = 8)	Group 3 (n = 12)	Group 4 (n = 8)	Summary
1. How much time do you spend preparing lunch and supper?	30 min lunch 1 h supper	10 min 1 h	15 min > 1 h	about 1 h	15 min 1 h
How much time would you like to spend preparing lunch and supper?	15 min 30 min	5 to 10 min 30 min	5 to 10 min <1 h	30 min	10 min 30 min
2. How important is it that the poultry product saves you time in preparation?	not very	fairly	not	split	not
Would you pay extra for this convenience?	no	. . .	. . .	. . .	. . .
How much extra?	. . .	>\$0.50/lb	few cents	\$0.05-\$0.25/lb	few cents
3. What are some of the convenience poultry items that you purchase now?	boneless skinless wings fingers	IQF <sup>1</sup> wings	cut up parts boneless, skinless breasts	fingers boneless, skinless breasts	breasts fingers wings cut up parts
What do you like about these products?	easy	. . .	. . .	. . .	. . .
4. Which tastes better, preseasoned ready-to-cook poultry that you buy in a grocery store or poultry that you season and cook at home?	home	home	home	home	home
Why?	intensity	intensity	intensity	intensity	intensity
Which do you feel is more economical?	home	home	home	home	home
5. Which is more important to you, convenience or lower price?	price	convenience	price	convenience	price or convenience
Why?	value	time	. . .	. . .	. . .
6. Would you like these convenience items to be preseasoned or would you like to have all the ingredients included in the package so that you could assemble it yourself?	seasoning included, assemble self	seasoning included	assemble self	assemble self	assemble self
Why?	cleanliness	taste	cleanliness	trust	cleanliness
7. Would you like kabobs made from dark poultry meat?	yes	yes	yes	yes	yes
Cubes or strips?	cubes	cubes	cubes	cubes	cubes
What size?	. . .	2 inches	2 inches	. . .	2 inches
Fresh or frozen?	fresh	fresh	fresh	frozen	fresh
What else should be included?	nothing	. . .	. . .	. . .	. . .
How many portions per pkg.?	. . .	. . .	. . .	4	. . .
8. Would you like stir-fry made from dark poultry meat?	yes	yes	yes	maybe	yes
Cubes or strips?	strips	strips	strips	. . .	strips
What size?	1/2 in	1.5 in	1 in	. . .	. . .
Fresh or frozen?	fresh	fresh	fresh	. . .	fresh
What else should be included?	nothing	separate vegetables	sauce	. . .	. . .
How many portions per package?	. . .	. . .	. . .	. . .	. . .
9. How should the kabobs be packaged?	. . .	. . .	vacuum pack	. . .	. . .
Stir-fry?	clear	clear box	vacuum pack	vacuum pack	clear
10. Should the container be microwaveable and/or ovenproof?	no	yes	yes	no	no
For kabobs?	either	. . .	oven	. . .	. . .
For stir-fry?	no	microwave	no	no	no
Would you pay extra for this convenience?	no	no	no	no	no

<sup>1</sup>IQF = individually quick frozen.

the seasoning mixture or by the psychological factor of presupposition caused by the color change of the product due to the seasoning. Appearance, color, size, tenderness, overall acceptability, and purchase likelihood were all significantly influenced by chunk size. All sensory ratings were significantly related to the interactions of piece size times seasoning concentration.

Table 5 shows the increased preference for the appearance, color, size, tenderness, and purchase likelihood of the 3.81 cm (1.5 in) and 5.08 cm (2 in) products

over the 2.54 cm (1 in) chunk size. There was no significant difference between the 3.81 cm (1.5 in) and 5.08 cm (2 in) samples for any of the above mentioned attributes.

Overall acceptability ratings were significantly influenced by both chunk size and seasoning concentration ( $P > 0.05$ , Table 4). Table 5 shows that consumers preferred the 5.08 cm (2 in) chunk size over the 2.54 cm (1 in) chunk size.

Mean sensory ratings for the stir-fry products are presented in Table 6. Size was the only attribute

TABLE 4. Mean sensory ratings (n = 83) and findings of regression analysis for dark chicken meat kabobs of varying size and seasoning concentrations

Seasoning concentration (%)	Product size (cm)	Appearance	Color	Size	Tender-ness	Juiciness	Texture	Flavor	Flavor intensity	Overall acceptability	Purchase likelihood
1.6	2.54	5.8	5.8	5.9	6.7	6.4	6.6	5.9	5.9	5.8	5.4
2.1	2.54	5.6	5.6	5.6	6.7	6.7	6.5	6.6	6.4	6.4	5.8
2.6	2.54	6.1	6.1	5.7	6.6	6.4	6.7	6.2	5.8	5.9	5.5
1.6	3.81	6.4	6.4	6.8	7.1	6.6	6.9	6.4	6.2	6.3	5.9
2.1	3.81	6.3	6.6	6.7	6.6	6.4	6.2	6.0	5.7	5.9	5.4
2.6	3.81	6.0	6.2	6.7	7.3	7.3	7.2	6.7	6.5	6.7	6.4
1.6	5.08	6.5	6.5	6.8	6.8	6.4	5.7	6.2	6.2	6.2	5.8
2.1	5.08	6.4	6.5	6.8	6.9	6.9	6.9	6.6	6.4	6.6	6.0
2.6	5.08	6.1	6.3	6.8	7.3	6.8	7.1	6.9	6.5	6.9	6.2
<i>P</i> > <i>F</i>											
Chunk size		0.0016	0.0001	0.0001	0.0057	NS <sup>1</sup>	NS	NS	NS	0.0024	0.0290
Seasoning concentration		0.0248	NS	NS	NS	0.0387	0.0166	NS	NS	0.0195	NS
Crossproduct		0.0089	0.0011	0.0001	0.0036	0.0082	0.0069	0.0026	0.0034	0.0145	0.0001

significantly influenced by strip length. Ratings for size increased with strip length. All mean ratings were high, with most averaging 6.3 to 6.5. None of the other sensory attributes were significantly influenced by strip length, seasoning concentration, or their interaction. The mean price for kabobs suggested by panelists after evaluating the cooked product was  $\$1.88 \pm \$0.74/\text{lb}$  ( $\$4.14 \pm \$1.63/\text{kg}$ ). For the stir-fry, the panelists suggested  $\$1.75 \pm \$0.53/\text{lb}$  ( $\$3.85 \pm \$1.17/\text{kg}$ ).

#### Consumer Evaluation of Raw Packaged Products.

The average price per pound suggested for the raw, packaged kabobs was  $\$2.16$  for the 5.08 cm (2 in) size,  $\$1.98$  for 3.81 cm (1.5 in), and  $\$1.79$  for the 2.54 cm (1 in) chunk size. For the stir-fry, the means were  $\$2.09$  for the 3.81 cm (1.5 in) strip length,  $\$1.89$  for the 5.08 (2 in) length, and  $\$1.72$  for the 2.54 (1 in) length. These were an increase over the amounts proposed during the sensory evaluation and may be due to the effect of the packaging in making the product more familiar, and less of an abstraction.

Sixty-six percent of the individuals who observed the packaged products stated that they were willing to buy the 5.08 cm (2 in) kabob chunks, 61% said they would buy the 3.81 cm (1.5 in) kabobs, and 38% would buy the 2.54 cm (1 in) kabob products. Sixty-six percent of the panelists stated they would be willing to buy the 3.81 cm (1.5 in) stir-fry. Fewer consumers would buy the 5.08 cm (2 in) strips (58%) and the 2.54 cm (1 in) strips (41%).

**Physicochemical Measurements.** The results of the Instron measurement appear in Table 7. For the kabobs, the 5.08 cm products required significantly more energy to reach the break point and to shear than the 2.54- or 3.81-cm products at all seasoning concentrations. For stir-fry strips at the 1.6% seasoning concentration, the 2.54 cm strips required significantly more force to shear than the 5.08 cm product. No significant differences were found between stir-fry products at the 2.1 and 2.6% seasoning levels. The 5.08 cm strips required significantly more energy to achieve the break point (area under the curve) than the other two strip sizes. In addition, the 3.81 cm product at the 2.1% seasoning level required significantly less energy to break than the 2.54 cm strips due to outliers.

Moisture content of the raw products was determined to be 56.6% ( $\pm 0.3\%$ ). Moisture content was lower than that typically found in the literature for fresh chicken thigh (Hamm *et al.*, 1980) and more similar to that found in stored chicken (Craig *et al.*, 1991). Lipid content of the raw chicken was determined to be 16.3% ( $\pm 2.7\%$ ), which was similar to findings by other researchers (Hamm *et al.*, 1980; Craig *et al.*, 1991; Decker and Cantor, 1992).

#### Mailed Survey

**Food Shopping Practices and Preferences for Chicken Products.** Demographic characteristics of the

TABLE 5. Mean ratings (n = 83) and findings of multiple comparison testing for dark chicken meat kabobs of varying size

Chunk size (cm)	Appearance	Color	Size	Tenderness	Juiciness	Texture	Flavor	Flavor intensity	Overall acceptability	Purchase likelihood
2.54	5.8 <sup>b</sup>	5.8 <sup>b</sup>	5.7 <sup>b</sup>	6.7 <sup>b</sup>	NS	NS	NS	NS	6.1 <sup>b</sup>	5.5 <sup>b</sup>
3.81	6.2 <sup>a</sup>	6.4 <sup>a</sup>	6.7 <sup>a</sup>	7.1 <sup>a</sup>	NS	NS	NS	NS	6.3 <sup>ab</sup>	5.9 <sup>a</sup>
5.08	6.3 <sup>a</sup>	6.5 <sup>a</sup>	6.8 <sup>a</sup>	7.0 <sup>a</sup>	NS	NS	NS	NS	6.6 <sup>a</sup>	6.0 <sup>a</sup>

<sup>a,b</sup>Means for each chunk size with no common superscript differ significantly as determined by Duncan's Multiple Range test at  $\alpha \leq 0.05$ .

TABLE 6. Mean sensory ratings (n = 83) and findings of regression analysis for dark chicken stir-fry strips of varying length and seasoning concentrations

Seasoning concentration (%)	Length (cm)	Appearance	Color	Size	Tender-ness	Juiciness	Texture	Flavor	Flavor intensity	Overall acceptability	Purchase likelihood
1.6	2.54	6.2	6.4	6.0	7.1	6.6	6.8	6.5	6.2	6.2	5.7
2.1	2.54	6.0	6.3	6.1	6.9	6.6	6.5	6.3	6.1	6.2	5.8
2.6	2.54	5.9	6.4	6.1	7.1	6.7	6.6	6.2	6.1	6.2	5.7
1.6	3.81	6.1	6.3	6.3	7.0	6.4	6.7	6.3	6.0	6.2	5.8
2.1	3.81	6.3	6.6	6.2	6.9	6.8	6.8	6.6	6.2	6.4	6.0
2.6	3.81	6.0	6.2	6.0	7.0	6.5	6.6	6.3	6.1	6.1	5.6
1.6	5.08	6.2	6.5	6.5	6.7	6.3	6.5	6.3	6.2	6.2	5.9
2.1	5.08	6.3	6.6	6.3	6.7	6.3	6.6	5.9	5.9	6.1	5.6
2.6	5.08	6.5	6.7	6.7	6.8	6.6	6.6	6.5	6.3	6.4	6.1
<i>P &gt; F</i>											
Strip length		NS	NS	0.0176	NS	NS	NS	NS	NS	NS	NS
Seasoning concentration		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Crossproduct		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

mailed survey participants are shown in Table 8. The participants bought 4.1 ± 2.2 lb of chicken at a time. They shopped approximately once a week. When asked the maximum number of days the consumers would keep raw chicken in their refrigerators, the mean response was 2.9 ± 3.0 d (data not presented).

Boneless, skinless thighs was the form most consumers were most willing to buy among the dark meat products (54.8%). Of the 112 participants, 50.9% were willing to buy stir-fry and 38.9%, kabobs (Table 9). Questions were asked concerning size preferences for the stir-fry and kabobs. Respondents wanted kabob chunks to be about 3.81 cm<sup>2</sup> (1.5 in) and stir-fry strips to be 3.81 × 1.27 cm (1.5 × 0.5 in) with four servings per package (data not presented).

Comparisons of responses to questions pertaining to attributes of packaged dark chicken meat products appear in Table 9 (not all data presented). After presenting consumers with several choices, they indicated a desire to have other menu items included in the package with the

chicken. For the kabobs, respondents said that they would like vegetables (54.8%), skewers (39.1%), a sauce (24.3%), rice (13.9%), and 7.8% wanted other items included in the packages, but did not specify what they were. In the stir-fry packages, 69.9% wanted vegetables, a sauce (41.9%), and rice (29.5%).

The survey participants were asked their preference for the kind of package that should be used for the different products (Table 9). For the kabobs, 34.1% responded that an overwrapped clear tray would be most preferable, followed by a clear plastic container (25.9%), vacuum packaging (18.8%), overwrapped styrofoam trays (11.8%), and trays with dividers (9.4%). The responses for the stir-fry showed a preference for overwrapped styrofoam trays (31.5%), overwrapped clear trays (28.3%), clear plastic containers (21.7%), and vacuum packaging (18.5%).

Results revealed that there is great interest in clear packages although the styrofoam tray continues to be the most commonly used package type by the poultry

TABLE 7. Instron measurements for dark chicken meat kabobs and stir-fry strips of varying size and seasoning concentrations (n = 6)

Sample size <sup>f</sup> (cm)	Seasoning concentration (%)	Kabobs		Stir-fry	
		Energy to break point (J)	Shear (N)	Energy to break point (J)	Shear (N <sup>2</sup> )
2.54	1.6	0.91 <sup>b</sup>	39.38 <sup>b</sup>	1.46 <sup>b</sup>	81.18 <sup>a</sup>
3.81	1.6	0.95 <sup>b</sup>	36.23 <sup>b</sup>	2.17 <sup>b</sup>	59.76 <sup>ab</sup>
5.08	1.6	3.53 <sup>a</sup>	100.75 <sup>a</sup>	5.44 <sup>a</sup>	38.80 <sup>b</sup>
2.54	2.1	0.87 <sup>b</sup>	35.88 <sup>b</sup>	1.52 <sup>b</sup>	79.92
3.81	2.1	1.01 <sup>b</sup>	39.63 <sup>b</sup>	0.58 <sup>c</sup>	60.70
5.08	2.1	3.10 <sup>a</sup>	68.67 <sup>a</sup>	4.74 <sup>a</sup>	82.83
2.54	2.6	0.83 <sup>b</sup>	33.38 <sup>b</sup>	1.52 <sup>b</sup>	79.75
3.81	2.6	0.95 <sup>b</sup>	34.16 <sup>b</sup>	1.20 <sup>b</sup>	68.42
5.08	2.6	2.68 <sup>a</sup>	65.59 <sup>a</sup>	7.26 <sup>a</sup>	68.04

<sup>a-c</sup>Means for each product size not followed by the same letter are significantly different as determined by Duncan's multiple range test at α ≤ 0.05.

<sup>f</sup>Kabob sizes were 2.54 cm<sup>2</sup>, 3.81 cm<sup>2</sup>, and 5.08 cm<sup>2</sup>. Stir-fry strips were 2.54 × 1.27 cm, 3.81 × 1.27 cm, and 5.08 × 2.54 cm.

TABLE 8. Demographic characteristics of survey participants (n = 115)

Characteristic	Percentage responding	Characteristic	Percentage responding
Age group		Education level	
Under 25	18.6	>7 yr of school	0.9
25 to 34	25.4	Junior high	6.0
35 to 44	27.1	Some high school	9.5
45 to 54	8.5	High school	20.7
55 to 64	11.0	Some college	35.3
Over 64	9.3	College	17.2
		Grad/professional school	10.3
Sex		Race	
Male	28.6	White	86.6
Female	71.4	Black	11.8
		Other	1.7
Marital status		Job classification	
Never married	19.5	Exec./Proprietor (large size Co.)	31.6
Married	66.9	Mgr./Proprietor (medium size Co.)	23.1
Separated/Divorced/Widowed	13.5	Admin./Small business owner	20.5
		Clerical, sales, technician	9.4
		Skilled worker	9.4
		Semi-skilled worker	3.4
		Unskilled worker	2.6
Age group of persons in household:		Household income	
Under 6 yr old	29.6	Under \$9,999	2.8
7 to 12 yr old	37.0	\$10,000 to 19,999	5.6
13 to 18 yr old	35.1	\$20,000 to 29,999	7.4
19 to 24 yr old	27.0	\$30,000 to 39,999	10.2
25 to 64 yr old	87.6	\$40,000 to 49,999	15.7
Over 64	15.2	\$50,000 to 59,999	13.0
		\$60,000 to 69,999	14.8
		\$70,000 and over	30.6

industry. These findings are in agreement with findings of a consumer ranking study on poultry packaging that found a preference for clear packaging. The ranking study, however, found the most favored packaging choice to be resealable pouches (Elsner, 1995).

Asked whether packages for raw chicken products should be microwaveable, ovenproof, both, or neither, a majority of the respondents said neither for all products (Table 9). Microwaveable packaging for raw chicken products is not a high priority for consumers. Only 18.4%

wanted microwaveable packaging for the kabobs and 19.6% for the stir-fry.

After consideration of all of the products, the participants were asked how much extra they would be willing to pay for the convenience of these products (data not presented). Some respondents (39.8%) stated that they were only willing to pay the same price for these products as they do for those that already exist, whereas 38.8% were willing to pay 1 to 5% more, and 12.6% were willing to pay an additional 6 to 10%.

TABLE 9. Consumer preferences for attributes of packaged dark chicken meat products<sup>1</sup>

Question	Percentage responding	
	Kabobs	Stir-fry
Would you buy this product? (Yes or no)	Yes (38.9%)	Yes (50.9%)
What else included? <sup>2</sup>	Vegetables (54.8%)	Vegetables (69.9%)
How should the product be packaged? <sup>2</sup>	Clear tray (34.1%)	Styrofoam (31.5%)
Should the container be microwaveable or ovenproof? <sup>2</sup>	Neither (35.6%)	Neither (37.0%)
	Microwaveable (18.4%)	Microwaveable (19.6%)

<sup>1</sup>Observations: n = 112.

<sup>2</sup>Only the choice with the highest frequency is reported under each product category.

**TABLE 10. Frequency of selection of chicken products by consumers participating in the simulated supermarket setting test**

Product	First choice	Second choice	Third choice	Fourth choice	Overall frequency <sup>1</sup>	Desirability index <sup>2</sup>
Breasts	67	28	10	9	114	381
Kabobs	13	19	27.5	29	88.5	193
Stir-fry	8	26	25.5	23	82.5	184
Boneless, skinless thighs	6	19	24	22	71	151
Bone-in, skin-on thighs	6	8	13	17	44	91

<sup>1</sup>Sum of first, second, third, and fourth choice frequencies (some data not included). n = 121.

<sup>2</sup>Desirability index is defined as:  $Z = \sum Wv$  where W is the inverse weight of the rank and v is the frequency of occurrence at that rank. From Cook, W. D. and M. Kress, 1992. Ordinal Information and Preference Structures: Decision Models and Applications. Prentice Hall, Englewood Cliffs, NJ.

### Supermarket Simulation

Frequency of selection and desirability index of chicken products appear in Table 10. The desirability index for the products was as follows: breasts > kabobs > stir-fry > boneless, skinless thighs > bone-in, skin-on thighs. By determination of significance using  $\chi^2$ , it was concluded that breasts were significantly preferred to all other products. Comparable scores as determined by Fisher-Yates transformation and ANOVA by standard procedures showed significance between the products ( $P > 0.001$ ). Using this method of analysis, breasts were significantly preferred over all other products. No significance was found between the dark chicken meat products.

Both methods indicated that there was a significant difference between the breasts and the dark meat products. By calculating the desirability index and using the  $\chi^2$  method, we were also able to determine that the control bone-in, skin-on thighs were significantly less preferred than the other dark meat products. Clarity or visibility of the products and size were the top two reasons participants chose a particular package of a product (46.4 and 37.4%, respectively).

### SUMMARY AND CONCLUSIONS

This study utilized four distinct methodologies to ensure thoroughness and validity of the market potential of dark chicken meat products. In the focus groups, attitudes toward convenience products from dark chicken meat, important product attributes, and packaging concepts for these products were studied. The participants expressed willingness to purchase new, convenient poultry products made from dark chicken meat. Specific dark chicken meat products the participants were willing to buy included boneless, skinless thighs, kabob chunks, and stir-fry strips. Consumers desired clear packaging for the products but did not want the packaging to be microwaveable or ovenproof.

Results of consumer acceptance tests showed the preferred products to be: 1) a 5.08-cm (2-in) kabob with 2.6% seasoning concentration and 2) a stir-fry strip with 2.6% seasoning concentration. The prices per pound for raw products that the consumers were willing to pay

were \$2.16 and \$2.09, respectively. Processors are recommended to market these products at these sizes and to include or recommend use of seasoning at these levels. At these seasoning concentrations, the products attained the highest hedonic ratings, indicating the most acceptable products. In the interest of economies of production, producers should process the two products simultaneously to maximize profitability.

Results of this study show that the potential of the new products is very hopeful. Many companies are shifting toward value-added products (Wildes, 1988), and the value-added products discussed here are prime examples of simple, healthy, and profitable ones that serve the interests of producers and consumers alike. The term value-added must be used with the understanding that there are more determinants of value for products than simply the time-saving associations with convenience (McCormick, 1981). New packaging types to meet the needs of consumers are an appreciated and appreciable concern for the poultry industry. Styrofoam trays, long the standard, will serve well for the immediate future, but as consumers become more discriminating, clear packaging may replace styrofoam in the industry. Our findings indicate that it is possible to provide the consumer with high quality and more convenient products, while increasing the sales and profitability for producers.

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