ACCEPTABILITY OF BLAST AND LIQUID FROZEN TURKEY HENS AND TOMS

by

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INTRODUCTION

Freezing is a method of preservation in which food maintains many of its fresh qualities. Color, palatability and nutritive value generally are preserved during freezing and storage of poultry and meat.

Rapid freezing of food products has been known for about 120 years. A British patent on a method of freezing fish by use of an ice-salt system was granted to H. Benjamin in 1842. However, until 35 years ago little scientific thought had been given to the methods of freezing and their effect on the quality of food.

Today, the increasing popularity of frozen foods of all kinds together with rapid growth of facilities for distribution and storage is responsible for more frozen food in the retail market. Included in these foods are turkeys and other types of frozen poultry.

In purchasing ready-to-cook poultry, color is one of the quality factors that may be judged readily by the homemaker. It was noted by Van den Berg and Lentz (1958a), that the appearance (color) of the frozen turkey is influenced by the rate and method of freezing. The pinkish white color of fresh turkeys is retained by blast freezing at -20°F. Until a few years ago, most turkeys were blast frozen. In recent years, a refrigerated brine has been used for the liquid freezing of turkeys. Turkeys frozen by this method are chalk-white in appearance. There has been some reluctance by homemakers in some areas to accept the liquid frozen turkey because of the overall appearance or color. Information is needed to determine if differences in eating quality and cooking losses exist that are related to method of freezing.

The purposes of this study were to determine the effect of blast and liquid freezing on the appearance of frozen, defrosted and cooked turkeys and to determine the cooking losses, moisture content, water-holding capacity, color value, pH, and eating quality of blast and liquid frozen hens and toms.

REVIEW OF LITERATURE

Factors Affecting the Quality of Frozen Turkey

Commercial use of air blast freezing and liquid freezing has made possible rapid freezing of poultry meat. Freezing as defined by Mandeville (1937) is a gradual process by which liquids are solidified by loss of heat. It appears that freezing is a single physical process whereby pure water is removed from solution and isolated into ice crystals. Ultimate size and rate of crystal growth are dependent on temperature and thus the control of crystal size is primarily a problem of heat exchange (Merryman, 1956).

According to Fry (1962) and Benjamin et al. (1960) birds are starved 12 to 18 hours before slaughter. The birds are hung head downward in a shackle, stung with an electric shock and the jugular vein cut. The birds then move into a scalding tank that is maintained at temperatures of 140 to 145°F (sub-scald). For greater ease in removal of feathers, scald temperatures of 126 to 128°F were increased to the sub-scald of 140 to 145°F. Klose et al. (1959) working with turkeys and Pool et al. (1959) working with chickens found that increasing scald temperature from 126 to 140°F or time from 25 to 50 sec increased toughness. Pool et al. (1959) also used scalding times of 30, 60, and 180 sec in addition to 25 and 50 sec. Doubling the scalding time at a scald temperature of 140°F increased shear force values and decreased tenderness. Tripling the scalding time from 30 to 180 sec had a more marked influence on decreasing tenderness than doubling scalding time. Shannon et al. (1957) also found that increasing scald temperature or time increased toughness of chickens when 6 scalding temperatures and 6 scalding times, 120, 135, 150, 165, 180 and 195°F for 5, 10, 20, 40, 80 and 160 sec were used. Wise and Stadelman (1959) suggested that the toughening effect of high temperature, long-time scald was related to the depth to which the heat penetrated the muscle tissue.

Following scalding, the feathers are removed by a picking machine. Two common methods of picking (Benjamin et al., 1960) are holding the bird by hand and picking on a drum-type picker or picking in a completely automatic unit. Comparisons have been made as to the effect of hand picking versus machine picking on the tenderness of turkeys and chickens. Klose *et al*. (1959) observed that with larger birds, turkey hens and toms, the type of picker had less effect than with either chicken or turkey fryers. They noted that increased beating action during feather removal increased toughness. This effect was greatest immediately after slaughter. Following picking, birds are singed and eviscerated.

After the turkeys are eviscerated, they are cooled in ice slush until the internal temperature of the birds reaches 40°F or less. According to U.S.D.A. regulations (1959) for turkeys weighing 8 lb or over, the internal temperature of the birds must reach 40°F in 8 hr or less. The effect of chilling methods on the rate of tenderization of turkeys has been investigated by many workers. The tenderness of fryer-roaster turkeys, and chickens (Klose *et al*., 1960) and 6 lb fryer-roaster turkeys, 12 lb young hens and 20 lb young toms (Klose *et al*., 1961) were noted generally to be similar when frozen immediately following processing or aged in mechanically agitated ice slush for 1 to 2 hr. Turkeys of all groups were most tender when aged 20 hr.

Klose *et al*. (1961) observed that an adequate aging period was necessary regardless of the rate of chilling. The aging period that takes place during the cooling process has a marked influence on the tenderness of turkey meat.

Klose et al. (1956) reported that with turkey fryers and young hens most tenderization takes place during the first 6 hr, proceeds slowly after 6 to 12 hr, and even more slowly during the 12 to 24 hr period following slaughter. Similar results were noted by Klose et al. (1959) for fryer-roaster turkeys and Dodge and Stadelman (1959) who worked with the pectoralis major muscle of 14 wk old turkeys. The aging period was not as critical for large turkeys as for small turkeys.

Freezing poultry during the rigor period delayed tenderization according to Koonz et al. (1954). Aging did not take place during frozen storage at $0^{\circ}F$ or below but continued following defrosting. At that time, the breast muscle became more tender as aging progressed.

Methods of Freezing

Blast and liquid freezing are 2 commercial methods used for freezing turkeys. In both processes, the eviscerated, chilled birds are packaged in polyvinylidene chloride film and the bag evacuated, sealed and heat shrunk prior to freezing.

Blast Freezing. The turkeys in sealed bags, 2 to 3 hens or 2 toms per carton, are placed in telescope cartons that have side vent holes. Six to 8 cartons without lids are placed between pallets (wooden strips of lumber) and then moved into freezing tunnels that have large ceiling fans.

Moderate air velocity adjacent to the surface of the bird allows for rapid heat removal. The air stream is controlled so that it passes through the stacked cartons rather than around them. The temperature of the freezing tunnel is maintained at -25 to -50°F; -35°F is a common temperature used. The birds remain in this room for not less than 24 hr and then are transferred to still air freezers maintained at 0°F (Benjamin et al., 1960).

Van den Berg and Lentz (1958a and b) studied the effect of air temperature, air velocity, ventilation and spacing of boxes on the appearance of air blast frozen turkeys and chickens. Air temperature was held constant at -20°F while air velocities between 0 and 2,000 feet per minute (fpm) were tested. Air velocity was held constant at 450 to 550 fpm during the tests of air temperatures between +10 and -110°F. The appearance of air blast frozen turkey was affected by air velocity and temperature. Birds frozen in still air at -20°F were brown and non-uniform in color. Those frozen at air velocities between 0 to 700 fpm were light and uniform in color. When temperatures were varied, the color of the frozen birds was light brown and blotchy at +10°F and white and uniform at -110°F. Van den Berg and Lentz (1958a) observed that the color of the birds after freezing depended on the freezing time of the skin. At air velocities of 450 to 550 fpm and air temperatures of 0, -20 and -50°F the freezing times immediately below the skin of 15 to 16 lb turkeys were 110, 25 and 15 min, respectively. Initial weight of the birds did not affect the appearance of the bird or the freezing time of the skin but did affect the total freezing time. The reduction in freezing time was greatest when the air velocity was increased to 700 fpm or the air temperature was reduced to -40°F.

Birds stacked in unventilated boxes were brownish and non-uniform in color regardless of air temperature and velocity (Van den Berg and Lentz, 1958a). With increased air circulation between the boxes, which was accomplished by cutting holes in the sides of the boxes and stacking the boxes 1 in. or more apart, the birds tended to be uniform in color and similar in appearance to birds frozen on the open shelf.

Liquid Freezing. According to Stadelman (1958) immersion freezing involves the direct contact of the refrigerated liquid with the sealed bagged turkeys. The liquid solution may be propylene glycol, sodium chloride or calcium chloride. The liquid used must be non-toxic and should not impart an undesirable flavor because of the possibility of leaks in the bags and must remain liquid at the desired temperature. The temperature of the liquid is maintained between -20 to +10°F. In general, the lower the liquid temperature is the more chalk-white the appearance of the turkey.

Hulland (1958) outlined the process of liquid freezing.

The bagged turkeys are placed in a shallow tank containing propylene glycol, sodium chloride or calcium chloride and floated breast-down through the tank. The birds remain in the tank from 30 to 90 min depending on the type and temperature of the brine and the freezer facilities available. Approximately 1/3 to 1/2 of the actual freezing is done in the tank. After leaving the tank, the packaged birds are rinsed with a spray, boxed and placed in a hardening finishing room maintained at -10 to -15^{o}F with moderate air movement. Here the turkeys remain for 16 to 24 hr and then are transferred to still air freezers maintained at 0^{o}F.

The high scald temperatures of 143 to 145^{o}F produce reddish birds that darken when exposed to air. For this reason, the turkey processing industry desired a processing method in which a uniform light-colored bird could be attained. This has been accomplished by liquid freezing of turkeys. Liquid freezing crust-freezes the turkeys and produces a uniform white chalk-like color. Lentz and Van den Berg (1957) and Van den Berg and Lentz (1958a) investigated the effect of immersion freezing of turkeys and chickens on the appearance of the frozen bird. They noted that the appearance (color) of the frozen bird was affected by the freezing temperature of the liquid and the appearance and temperature of the bird prior to freezing. The color of the skin did not change during liquid freezing when an ethyl alcohol-water solution was used. The transparency of the skin did change and was dependent on the liquid temperature. The liquid temperatures studied ranged from +20 to -40°F. An optimum liquid temperature of -20°F made the skin appear opaque and gave a uniform chalk-like color. The effect of decreasing the temperature on the opacity of the skin was greatest between +10 and -10°F. At +10°F the birds had a blotchy appearance, whereas at -10°F the appearance was more uniform. Weights of 4 to 6 lb, scald temperatures of 128 and 138°F, and Cry-O-Vac packaging material had no appreciable effect on opacity or uniformity of the overall appearance (color) of the bird.

Freezing time of turkeys was influenced by the liquid temperature of the methanol and depth of freezing in the bird (Lentz and Van den Berg, 1957). Small birds, 4 to 6 lb, required a minimum of 20 min immersion at -20°F to insure retention of appearance. Larger birds, 14 to 16 lb, required a minimum immersion time of 40 min.

Blast vs Liquid Freezing. According to Stadelman (1958) liquid frozen birds deteriorate more rapidly in frozen storage than blast frozen birds. He attributed the poorer keeping quality of liquid frozen birds to a possible burning effect on the outer skin. MacNeil *et al*. (1958) studied the influence of different freezing systems and freezing temperatures on the consumer preference of turkey pieces. Salt-brine liquid frozen pieces (-43°F) were preferred over blast frozen (0, -20 and -40°F) after 1 to 2 months of storage. However, after 4 to 6 months of storage, blast frozen quarters were preferred. The lower the temperature of blast freezing the more acceptable the birds.

Marion and Stadelman (1958) and Marion (1958) reported studies on chicken fryers, fowl, turkey fryers and mature toms that were frozen by 4 different methods including liquid, plate and blast. The method of freezing did not affect significantly the thawing losses, total cooking losses or tenderness of the pectoralis major muscle.

Air blast freezing was noted by Van den Berg and Lentz (1958a), to be more flexible than liquid freezing in that a wider range of products and packaging materials could be frozen when using the same equipment. Bag breakage is less with blast than with liquid frozen turkeys (Brownlow, 1959; Stadelman, 1958). When bag breakage occurs in liquid freezing, the birds must be partially thawed, washed and rebagged. Also, dilution of the glycol may occur from the condensation of moisture in the liquid tank. The excess moisture is difficult to remove and presents a problem in keeping the glycol solution at full strength.

The advantage of liquid freezing according to Clayton (1957) is the perfect contact between the refrigeration medium and the product, thus allowing for a high rate of heat transfer. Consequently, the freezing temperature need not be as low as that for blast freezing to acquire the same end result.

EXPERIMENTAL PROCEDURE

The effect of blast versus liquid freezing on the acceptability of hens and toms was studied. Forty-eight Broad Breasted White turkeys, 24 hens (10 to 12 lb) and 24 toms, (18 to 20 lb) were obtained from Naturich Processing Company, Newton, Kansas. The birds were U.S. Grade A turkeys of similar age and from the same feed lot. Following processing half of the turkeys, 12 hens and 12 toms were blast frozen. These birds were kept for 24 hours in a freezing tunnel at -35°F with moderate air velocity. The remaining 12 hens and 12 toms were liquid frozen in a propylene glycol solution maintained at 14°F. The bagged turkeys were placed breast-down on a belt that moved through the liquid freeze machine. The turkeys remained in contact with the propylene glycol solution from 30 to 90 min. Following this treatment, they were kept for 16 to 24 hr in a finishing room that had moderate air movement and was maintained at -10 to -15°F. All turkeys were held in commercial storage at 0°F until defrosted and cooked.

Experimental Design and Analyses

Frozen whole turkeys were evaluated at 4 periods with 12 blast frozen hens scored subjectively at the first period, 12 liquid frozen hens at a second, 12 liquid frozen toms at a third, and 12 blast frozen toms at a fourth period. At each of these 4 periods turkeys were assigned numbers in random order.

A paired comparison design was used to evaluate defrosted half turkeys, cooked half turkeys, and light and dark meat (Table 1).

Table 1. Paired comparison design for evaluation of defrosted half turkeys, cooked half turkeys, and light and dark meat of turkeys.

Cooking periods	Hens I	Hens II	Cooking periods	Toms I	Toms II
1	Liquid	Blast	13	Liquid	Blast
2	Blast	Liquid	14	Liquid	Blast
3	Blast	Liquid	15	Blast	Liquid
4	Blast	Liquid	16	Blast	Liquid
5	Liquid	Blast	17	Liquid	Blast
6	Blast	Liquid	18	Liquid	Blast
7	Blast	Liquid	19	Blast	Liquid
8	Liquid	Blast	20	Blast	Liquid
9	Liquid	Blast	21	Blast	Liquid
10	Liquid	Blast	22	Liquid	Blast
11	Blast	Liquid	23	Liquid	Blast
12	Blast	Liquid	24	Liquid	Blast

There were 12 replications of each treatment with 1 blast and 1 liquid frozen turkey hen or tom studied at each period. The left half turkeys were scored before and the right half turkeys after cooking. In addition, the palatability of the light and dark meat of the right half turkeys was determined. For palatability scoring, light meat of turkey I was coded as sample 1, light meat of turkey II as 2, dark meat of turkey I as 3, and dark meat of turkey II as 4.

The "t" test was employed to determine differences between freezing methods for each subjective and objective measurements made on all birds. Correlation coefficients were determined for certain quality factors: (1) moisture content of raw meat and juiciness, (2) moisture content and water-holding capacity of raw meat, (3) water-holding capacity of cooked meat and juiciness scores, (4) water-holding capacity of cooked meat and tenderness score based on chews, (5) initial tenderness score and tenderness score based on chews, (6) shear value of raw and of cooked meat, (7) pH of raw meat and flavor score, (8) redness value of frozen skin and subjective color score of frozen whole turkey, (9) general acceptability score of frozen whole turkey and of light and dark meat pooled, (10) fleshing score of frozen whole turkey and fleshing score of defrosted half turkey. Factors 1 through 7 were evaluated for light and for dark meat of hens and of toms with freezing methods pooled. Factors 8 to 10 were determined for blast and for liquid frozen hens and for blast and for liquid frozen toms.

Subjective Evaluation

Frozen whole, defrosted half and cooked half turkeys were judged subjectively. In addition, the palatability of light meat from the center of the right pectoralis major and dark meat from the right gluteus primus muscles was evaluated.

Frozen Whole Turkeys. Frozen whole turkeys were evaluated for color, fleshing and general acceptability by an experienced panel of 10 to 12 judges. A 7-point scale with 7, most desirable and 1, least desirable was used to score the frozen turkeys (Form 1, Appendix).

Defrosted Half Turkeys and Cooked Half Turkeys. Turkey hens were defrosted at room temperature, 78-80°F, for 18 hr and toms for 21 hr. Thermograph records of the temperature of the laboratory were kept for each of the defrosting periods.

In preparation for roasting, 1 blast and 1 liquid frozen hen or tom was sawed into 2 pieces and a right half of each turkey was cooked at each cooking period. The right half was designated as the side on the right when the anterior portion of the turkey was in the breast-up position facing the worker. The right half of each of the birds was placed cut-side-down on racks in numbered pans. Prior to roasting, a thermometer was placed in the mid-portion of the pectoralis major muscle of each half turkey and the initial temperature of the birds was $10^{\circ} \pm 1^{\circ}C$ (Plate I). All half birds were cooked in a rotary hearth gas oven preheated and maintained at $325^{\circ}F$. The half turkeys were cooked to an end point temperature of $90^{\circ}C$ in the right breast as recommended by Watson (1960).

The left half of each turkey was designated as the defrosted half. It was used for subjective evaluation of each defrosted half turkey and for all raw meat samples.

Defrosted half birds and cooked half birds were scored for color, fleshing and general acceptability on a 7-point scale by a panel of 6 to 10 experienced judges. Also, judges were asked to indicate their preference for color, fleshing, and general acceptability of blast and of liquid frozen turkeys. Preference ratings were coded on a 3-point scale, 1 most preferred, 1.5 no preference, and 2 for least preferred (Form 2, Appendix).

Palatability of Light and Dark Meat Samples. Meat samples 1/2 x 1/2 x 1/4 in. from the pectoralis major muscle and from the gluteus primus muscle for each treatment were scored by a panel of 6 to 8 experienced judges. Flavor, juiciness, tenderness (initial score and score based on chews) and general acceptability was scored on a 7-point scale. Initial tenderness scores were based on the judge's first impression of tenderness, whereas scores for the second evaluation were based on the number of chews required to masticate completely the sample (Form 3, Appendix). Light meat of turkey I was designated as sample 1, light meat of

EXPLANATION OF PLATE I

Cooked half turkey with thermometer in breast

PLATE I

turkey II, as sample 2, dark meat of turkey I, sample 3, and dark meat of turkey II, sample 4 (Table 1). The judges ranked light and dark meat samples separately as to preference.

Objective Tests

Color of frozen, defrosted and cooked skin was measured. In addition, color, percent moisture and pH measurements were made on raw and cooked ground samples of light meat from the pectoralis major muscle and of dark meat from a composite of the semitendinosus, semimembranosus, gluteus medius and sartorius muscles (Plate II). The meat samples were ground directly into pliofilm bags by use of a Universal #3 food grinder equipped with a medium knife. The water-holding capacity was determined for raw and cooked meat samples from the anterior portion of the pectoralis major muscle and the proximal portion of the gluteus primus muscle. Dripping, volatile and total cooking losses were determined for each of the cooked half turkeys (Form 4, Appendix).

Color Measurements. Color of skin and meat samples was measured with a Gardner color difference meter. The instrument was standardized with various satin-finish ceramic tiles of appropriate color. The reflectance and chromaticity of the tiles used as standards for skin and meat samples are indicated in Table 2.

In preparation for color measurements, the skin was removed from the turkey and placed between plexiglass plates

EXPLANATION OF PLATE II

Muscles used

1. Pectoralis major
2. Gluteus primus
3. Semitendinosus
4. Sartorius
5. Semimembranosus
6. Gluteus medius

PLATE II

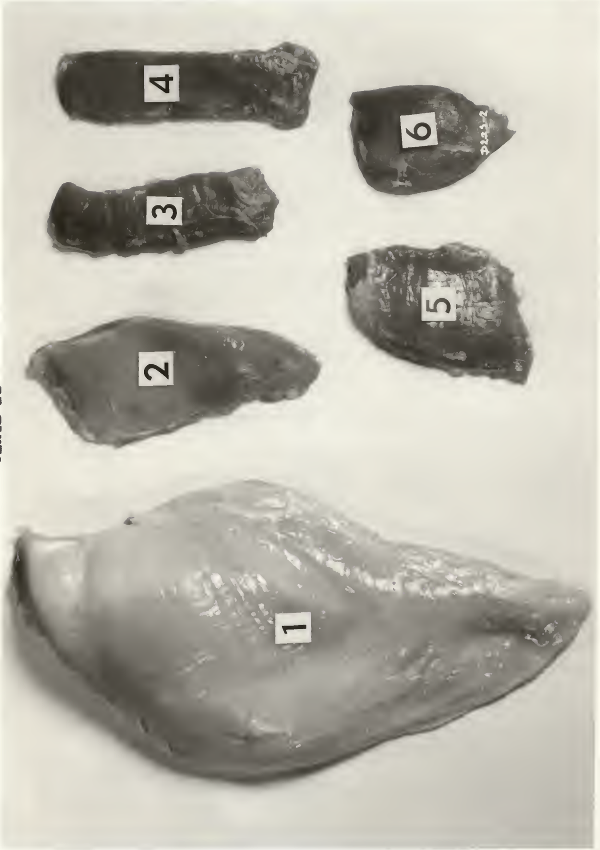

Table 2. "Rd", "a+", and "b+" values for tiles used to standardize the Gardner color difference meter.

Samples	Tile used	"Rd"	"a+"	"b+"
Frozen skin; Defrosted skin from breast and leg area	light pink "3A"	57.30	5.07	11.69
Cooked skin from breast and leg area; Raw and cooked dark meat	brown "6B"	15.53	9.33	13.10
Raw light meat	deep pink "5A"	38.12	5.45	13.85
Cooked light meat	sand "5A"	52.20	6.42	14.68

"Rd" refers to color reflectance

"a+" refers to redness

"b+" refers to yellowness

(4 1/4-in. sq and 3/8 in. thick). The frozen skin(3-in. sq) was removed from an area next to the keel bone on the left side of each turkey. Defrosted and cooked skin samples (3-in. sq) were removed from the area just under the wing and from the proximal portion of the drumstick (Plate III) and these were placed between 2 plexiglass plates (Plate IV). Four pieces of cooked skin were placed between 8 plexiglass plates, stacked and put on the Carver laboratory press for approximately 3 hr to flatten the pieces of skin. The stacked plates on the press were raised until they were in direct contact with the top of the press. No measurable

EXPLANATION OF PLATE III

Cooked half turkey with areas of skin removed for color measurements

PLATE III

EXPLANATION OF PLATE IV

Left. Cooked skin between plexiglass plates

Right. Raw skin between plexiglass plates

PLATE IV

pressure was applied to the press. The above procedure was carried out because the cooked skin tended to contract and curl on cooling.

Ground raw and cooked meat samples of the pectoralis major muscle and of a composite of the gluteus medius, sartorius, semimembranosus and semitendinosus muscles were used for determination of color measurements. Approximately 25 to 30 g of each sample was placed in an absorption cell with clear glass bottom and plastic sides (Magnuson Engineers Inc.).

Two color readings of each sample of skin and meat were determined for 1 position on the Gardner color difference meter. The cell or plate was rotated 90^o and a second set of readings taken.

Moisture Content. Percent moisture of raw and cooked light and dark ground meat samples was determined using the C. W. Brabender rapid moisture tester. Duplicate 10 g samples of meat were spread evenly into calibrated aluminum dishes. Raw and cooked meat samples were dried at 121^oC for 135 and 60 min, respectively.

Shear Values. 1-in. cores were removed from the anterior end of the raw left and of the cooked right pectoralis major muscle. Shear values were determined for each core in quadruplicate on the Warner-Bratzler shearing apparatus with a 50-lb dynamometer.

pH Measurement. The pH of a homogenate of ground meat of raw and of cooked, light and dark meat was measured using a Beckman expanded scale pH meter model 76. The homogenate samples of 5 g meat to 50 ml of distilled water, a 1:10 dilution, were blended for 2 min at high speed in a Waring Blendor model PB-5. All pH readings were taken at room temperature, 25°C, using a standard buffer of pH 6.86.

Water-holding Capacity Measurement. Raw and cooked meat samples were taken from the anterior portion of the pectoralis major and the proximal portion of the gluteus primus muscles and were used for the determination of the water-holding capacity of the meat. Water-holding capacity was determined by modifying the method of Grau and Hamm as described by Hamm (1960). One 300 mg meat sample was placed on a 6-in. sq of Whatman #1 filter paper and the grain of the paper was kept the same for all samples. Three 300 mg meat samples on 3 pieces of filter paper were placed between 4 plexiglass plates. This unit then was subjected to 10,000 lb pressure for 5 min on a Carver laboratory press. Immediately following the release of the pressure, the circumference of the meat and of the spread of the juice was traced. Following this, the pressed meat was removed. The filter paper samples were air dried. Later, a compensating polar planimeter (4236M) was used to measure the area of the meat and of the meat plus the spread of the juice (Plate V). From these 2 readings the area of the spread of the juice was calculated. Water-holding capacity was reported as a ratio of meat area

EXPLANATION OF PLATE V

Compensating polar planimeter used for measurement of surface area spreadability of juice of turkey meat on filter paper

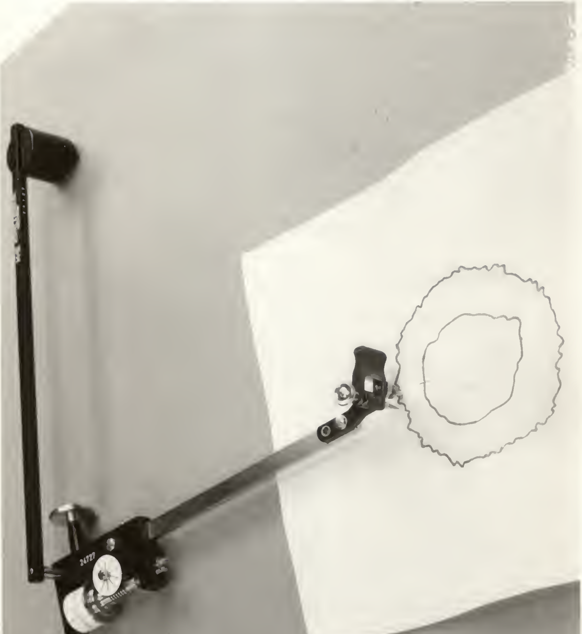

PLATE V

to spread of juice area. High values indicated a high water-holding capacity.

RESULTS AND DISCUSSION

Various subjective evaluations and objective measurements were obtained for U. S. Grade A turkey hens and toms frozen by blast and liquid methods. Subjective evaluations were determined on the whole and half birds and on meat samples from the pectoralis major and gluteus primus muscles. All subjective evaluations were determined by an experienced panel of judges. Objective measurements were taken on the raw and cooked pectoralis major, gluteus primus, and a composite of gluteus medius, sartorius, semimembranosus and semitendinosus muscles. The "t" test was used to determine the effect of freezing method as measured by subjective and objective tests. Data presented in tables are average of mean values. Detailed data for subjective and objective tests with appropriate "t" values may be found in Tables 10 through 38, Appendix. Comparisons of hens versus toms, light versus dark or raw versus cooked were not made by statistical analyses.

Color

Color was determined for blast and liquid frozen hens and toms. The Gardner color difference meter was used for objective measurements for color reflectance ("Rd"), redness ("a+") and yellowness ("b+") of meat and skin sample (Table 3). The redness values of the cooked dark meat of hens and toms were affected by method of freezing. Blast frozen hens and toms showed greater redness values (P=.05, P=.01, respectively) than liquid frozen hens or toms. Freezing method did not influence the reflectance, redness or yellowness values for light raw or dark raw meat. Turkey meat of hens tended to have higher reflectance and yellowness values than that of toms. This difference might be attributed to the higher fat content of hens than of toms. Harshaw et al. (1943) using 4 types of turkeys found that the percentage of fat in the breast muscle was slightly higher but not significantly greater for hens than toms. The leg muscle of hens had significantly greater fat than that of toms. In the study reported here, differences in yellowness related to sex were greater for dark than for light meat.

Cooked meat exhibited higher reflectance and yellowness values than the raw meat. The higher reflectance values of the cooked indicated that light was diffused more readily through the cooked than the raw meat and that the raw meat absorbed more light. However, the raw had higher redness values than the cooked meat. Similar results were noted by Goertz and Hooper (1963) who worked with pectoralis major pieces cooked to various internal temperatures. On cooking, the muscle pigments undergo color changes (Lowe, 1955 p. 220). Above a temperature of 50°C the bright red color changes gradually to a lighter color, and after a sufficiently high

Table 3. Gardner color difference meter values for meat and skin samples.

Factors	"Rd" Blast	Liquid	"a+" Blast	Liquid	"b+" Blast	Liquid
Meat samples						
Light, raw						
Hens	20.46	20.74	7.25	6.76	9.42	9.50
Toms	19.13	18.63	6.86	7.33	9.05	9.12
Dark, raw						
Hens	11.74	12.29	10.54	10.64	10.02	10.19
Toms	10.05	10.86	10.71	11.12	8.95	9.15
Light, cooked						
Hens	44.00	43.76	-1.02	-2.49	13.59	13.50
Toms	44.44	43.50	1.71	0.72	13.80	13.60
Dark, cooked						
Hens	24.64	24.98	5.86*	4.84	14.33	14.38
Toms	21.10	22.37	7.64**	6.38	13.82	14.12
Skin samples						
Frozen whole turkey						
Breast area						
Hens	25.59	25.44	9.80	9.80	3.10	3.42
Toms	25.63	26.18	9.06	9.80	4.12	3.99
Defrosted half turkey						
Breast area						
Hens	26.69	28.01	6.05	7.45	6.32	6.04
Toms	27.27	26.79	1.98	4.71	6.26	6.44

Table 3 (concl.)

Factors	"Rd" Blast	"Rd" Liquid	"a+" Blast	"a+" Liquid	"b+" Blast	"b+" Liquid
Leg area						
Hens	24.53	25.43	3.92	5.38	6.11	6.11
Toms	24.86	24.96	3.62	0.90	7.60	7.82
Cooked half turkey						
Breast area						
Hens	6.85	8.75	9.74	8.52	6.86	6.44
Toms	6.67	6.43	7.37	9.08	8.93**	7.17
Leg area						
Hens	4.57	5.13	9.30	6.67	6.50	7.77
Toms	4.93	5.46	6.29	6.91	8.50	8.12

"Rd" - reflectance, "a+" - redness, "b+" - yellowness

* P= .05

** P= .01

temperature is reached it turns to brown or grey. On heating a denatured globin nicotinamide hemichrome, the heme pigment in cooked meat, is produced from myoglobin (A.M.I.F., 1960 p. 93).

Light meat had higher reflectance values than the dark but dark meat exhibited greater redness values than the light meat. This is attributed to the greater myoglobin content in the dark than the light meat as noted by Lawrie (1950), who indicated that the leg muscle of poultry contained about 10 times more myoglobin than the breast muscle.

Freezing method affected the yellowness value of the cooked skin from the breast area of toms in that values were higher (P=.01) for blast than for liquid frozen toms. All other objective skin color measurements of frozen whole, defrosted half and cooked half turkeys were not influenced by freezing method. However, reflectance values tended to be slightly higher for toms than for hens, but redness values generally were higher for hens than for toms. A comparison of the skin samples from the breast of frozen whole, defrosted half and cooked half turkeys tended to show that the defrosted skin had higher reflectance values than the frozen or cooked skin samples. The frozen skin had greater redness values than the defrosted or cooked skin and the cooked, higher yellowness values than the defrosted or frozen skin. The browning during roasting probably accounts in part for the high yellowness values of the cooked skin.

Subjective color evaluations are presented in Table 4. Freezing method affected the color of the frozen whole toms (P=.01) but not that of frozen whole hens, defrosted or cooked hens or toms. Color scores of frozen turkeys were significantly (P=.01) higher for liquid frozen than for blast frozen toms. A similar trend was noted for hens but the differences were not significant.

Blast frozen whole hens scored slightly higher for color than toms but no difference attributable to sex was observed for liquid frozen birds. Also, no difference was

Table 4. Color, fleshing and general acceptability scores.[a]

Factors	Hens Blast	Hens Liquid	Toms Blast	Toms Liquid
Color				
Frozen whole turkey	5.8	6.0	5.4**	6.0
Defrosted half turkey	5.6	5.7	5.9	5.8
Cooked half turkey	5.7	5.6	5.7	5.8
Fleshing				
Frozen whole turkey	5.7	6.0	5.9	6.1
Defrosted half turkey	6.0	5.7	5.9	6.0
Cooked half turkey	6.0	5.7	5.8	6.0
General acceptability				
Frozen whole turkey	5.8	6.0	5.5*	5.9
Defrosted half turkey	5.9	5.8	5.9	5.8
Cooked half turkey	5.8	5.7	5.8	5.9
Meat samples, cooked				
Light meat	5.4	5.5	5.8	5.7
Dark meat	5.8	5.9	5.8	5.9

[a]Possible score 7-points

* Significant at the 5% level of probability

** Significant at the 1% level of probability

noted in the color scores for defrosted blast and liquid frozen hens or toms. Cooked blast frozen hens and toms had slimilar color scores, whereas the cooked liquid frozen toms had slightly higher color scores than the hens.

Possible relationships of the redness values for the frozen skin and color scores for the frozen whole turkeys were investigated. These were determined for blast frozen hens and toms, and liquid frozen hens and toms. The data are presented in Table 5. The objective color "a+" value of the frozen skin was not related significantly to the subjective color scores of frozen whole turkeys.

Fleshing and General Acceptability

Fleshing and general acceptability of frozen whole, defrosted and cooked half turkeys were evaluated subjectively. Cooked samples of light and dark meat also were scored for general acceptability (Table 4).

Fleshing scores for frozen whole, defrosted half or cooked half turkeys were not influenced by freezing method but frozen whole toms scored slightly higher than hens. For defrosted half and cooked half blast frozen turkeys fleshing scores were slightly higher for hens than toms but fleshing scores for liquid frozen toms were higher than hens.

Correlation coefficients for fleshing scores for frozen whole and for defrosted half turkeys are presented in Table 5. These correlations were determined for blast

Table 5. Summary of correlation coefficients.

Factors	D/F	Hens	Toms
Moisture content (raw) vs juiciness (cooked)			
Light	22	0.3476	-0.4363*
Dark	22	0.1963	-0.0868
Moisture content (raw) vs water-holding capacity (raw)			
Light	22	0.0251	-0.0228
Dark	22	0.0062	0.4652*
Water-holding capacity (cooked) vs tenderness based on chews (cooked)			
Light	22	-0.0828	-0.1126
Dark	22	-0.2304	0.0081
Water-holding capacity (cooked) vs juiciness (cooked)			
Light	22	-0.0641	-0.2178
Dark	22	-0.2076	-0.0217
Initial tenderness (cooked) vs tenderness score based on chews (cooked)			
Light	22	0.8913***	0.8713***
Dark	22	0.8875***	0.7383***

Table 5 (concl.)

Factors	D/F	Hens	Toms
Shear values (raw) vs shear values (cooked)			
Light	22	-0.1388	0.0591
pH (raw) vs flavor (cooked)			
Light	22	0.4172*	-0.1297
Dark	22	0.0499	-0.2155
Color frozen skin ("a+") vs color frozen whole turkey			
Blast	10	-0.3046	-0.0245
Liquid	10	0	-0.3915
General acceptability of frozen turkey vs general acceptability of dark and light meat samples pooled			
Blast	10	-0.1253	-0.0182
Liquid	10	-0.3535	0.1759
Fleshing frozen turkey vs fleshing defrosted turkey			
Blast	10	0.3893	0.7681**
Liquid	10	0.3807	0.2028

* Significant at 5% level of probability

** Significant at 1% level of probability

*** Significant at .1% level of probability frozen hens and toms and for liquid frozen hens and toms. There was a significant correlation ($r=0.7681$, $P=.01$) between fleshing scores for blast frozen whole toms and fleshing scores for defrosted half toms. The fleshing scores for blast frozen toms were an indication of the fleshing of the defrosted bird. However, fleshing scores of liquid frozen toms were not evidence of the fleshing of the defrosted bird. This is in agreement with commercial claims, that liquid freezing appears to produce greater fleshing in the frozen bird than is observed in the defrosted bird. The relationship between fleshing of blast frozen whole and defrosted turkeys may have been observed more readily in toms than hens because of the larger surface area of the toms.

General acceptability scores for liquid frozen whole toms were higher ($P=.05$) than those for blast frozen toms (Table 4). The general acceptability scores for frozen whole hens were slightly higher than for toms. For defrosted half and cooked half turkeys, general acceptability scores were similar for hens and toms.

Freezing method did not affect the general acceptability of the light or dark meat. The light meat of toms scored higher than that of hens, whereas there was no difference in the general acceptability of the dark meat of hens or toms. No significant relationship was found between general acceptability of frozen whole turkey and palatability of light and dark meat (Table 5).

Factors Related to Tenderness

Initial tenderness scores and tenderness scores based on chews were determined for light and dark meat. Shear force values for light, raw and cooked cores of meat from the anterior end of the pectoralis major muscle also were determined. These data are presented in Table 6.

Table 6. Tenderness scores[a], initial and scores based on chews, and shear values.

Factors	Hens Blast	Hens Liquid	Toms Blast	Toms Liquid
Tenderness scores[a]				
Initial				
Light meat	5.4	5.6	6.1	6.0
Dark meat	6.0	6.1	6.2	6.2
Based on chews				
Light meat	5.6	5.7	6.1	6.0
Dark meat	6.0	6.0	6.1	6.1
Shear values, lb				
Light, raw	9.7	9.2	12.0	12.1
Light, cooked	17.4	16.9	11.2	11.1

[a]Possible score 7-points

Freezing method did not influence the tenderness scores (initial or scores based on chews) for light or dark meat of hens or toms. The dark meat scored higher than the light for both hens and toms. The tenderness of meat of toms tended to be higher than that of hens. Goertz et al. (1955) also observed that the meat of toms was more tender than that of hens.

Initial tenderness scores were similar to scores for tenderness based on chews. Correlation coefficients for these 2 factors were 0.8913 (P=.001) and 0.8875 (P=.001) for light and for dark meat of hens and 0.8713 (P=.001) and 0.7383 (P=.001) for light and for dark meat of toms (Table 5). Therefore, initial tenderness scores were an indication of tenderness based on chews. Cover (1959) working with beef indicated that tenderness, softness, was scored according to sensations from tongue and cheek and by the ease with which the teeth sank into the meat at the first bite. In the study reported here, this was referred to as initial tenderness. Tenderness score based on chews referred to the overall tenderness.

Shear force values of light, raw and cooked cores of hens and toms were not affected by freezing method (Table 6). Marion (1958) compared blast, liquid and plate freezing and noted that freezing method did not influence the tenderness of the cooked pectoralis major as measured on the Kramer-Shear press. In the study reported here, Warner-Bratzler shear values were similar for cooked light meat of blast and liquid frozen turkeys. Cores of cooked meat of hens had higher shear force values than those of the raw meat but the opposite was true for the toms. Raw meat cores of toms tended to have higher shear force values than those of hens. However after cooking, the toms had lower shear values than hens; thus, the cooked meat of toms tended to be more tender than hens. Goertz et al. (1955) also found that toms tended to have lower shear values than hens.

When correlation coefficients were determined, shear values of raw meat were not significantly related to those of cooked meat. The r values for these 2 factors were low and non-significant (Table 5).

Factors Related to Juiciness

Subjective evaluations were made for the juiciness of light and dark meat samples. Objective evaluations related to juiciness included water-holding capacity and moisture content of light and dark, raw and cooked meat. Cooking losses, initial weights and cooking times of half turkeys also were determined.

Juiciness scores were not affected by method of freezing and were similar for hens and toms. The dark was slightly juicier than the light meat.

Water-holding Capacity Measurement. Water-holding capacity was reported as a ratio of meat area to spread of juice area. High values indicated a high water-holding capacity. Freezing method affected the water-holding capacity of dark meat of hens but not that of the light, raw or cooked, or dark, cooked meat of hens or toms or the dark raw meat of toms (Table 7). Dark raw meat of blast frozen hens had a higher (P=.05) water-holding capacity than liquid frozen hens. The meat of blast frozen hens tended to have slightly

Table 7. Juiciness scores[a], water-holding capacity measurements and moisture content.

Factors	Hens Blast	Hens Liquid	Toms Blast	Toms Liquid
Juiciness scores[a]				
Light meat	4.7	4.8	5.0	4.9
Dark meat	5.2	5.4	5.4	5.5
Water-holding capacity[b]				
Light, raw	0.84	0.81	0.94	0.98
Dark, raw	0.76*	0.60	0.80	0.85
Light, cooked	0.34	0.30	0.35	0.41
Dark, cooked	0.54	0.46	0.59	0.54
Moisture content, %				
Light, raw	74.56	74.44	74.64	74.74
Dark, raw	75.70	76.05	76.23	76.59
Light, cooked	65.45	65.91	64.97	65.56
Dark, cooked	64.57	64.80	62.91**	63.92

[a]Possible score 7-points

[b]Water-holding capacity is reported as a ratio of meat area to spread of juice area. High values indicate a high water-holding capacity

* Significant at the 5% level of probability

** Significant at the 1% level of probability

higher water-holding capacity than that of liquid frozen hens, whereas for toms meat from liquid frozen birds had higher water-holding capacity values than blast frozen except for the dark cooked meat. Toms tended to have higher water-holding capacity values than the hens and the raw meat higher values than the cooked meat. Similar results were noted by Goertz and Hooper (1963) who determined the water-holding capacity of raw pectoralis major muscle pieces of toms and hens and of pieces roasted to 35°, 45°, 55°, 65°, 75°, 85°, 90° and 95°C. The dark cooked meat, in the study reported here, had a higher water-holding capacity than the light cooked, but within sex, the light raw had a higher water-holding capacity value than the dark raw meat. Hamm (1960) reported that as the pH of meat increased the water-holding capacity also increased. In the study reported here, dark and cooked meat had higher pH values than the light and raw meat, respectively. The water-holding capacity value was higher for the dark cooked meat than the light cooked meat, whereas the light raw had a higher value than the dark raw meat. Cooked meat had lower water-holding capacity values than the raw meat even though the pH values were higher.

Moisture Content. Freezing method influenced the moisture content in that the dark cooked meat of liquid frozen toms had greater (P=.01) percent moisture than that of blast frozen toms (Table 7). Raw meat samples of toms had slightly higher percent moisture than the raw meat of hens but the cooked meat of toms had less moisture than that of hens. Raw meat contained more moisture than the cooked meat. Goertz and Hooper (1963) also found similar results for pectoralis major muscle pieces. In the study reported here, dark, raw meat had more moisture than the light raw meat, whereas the dark cooked had slightly less moisture than the light cooked meat. Generally, this is in agreement with Swanson _et al_. (1962) who reported that the dark, raw meat contained significantly more moisture than the light, raw but found no significant difference in the moisture content of light and dark, cooked meat. Their samples were dried under vacuum for 4 hr at 70°C, whereas for the study reported here, the samples were dried in a C. W. Brabender rapid moisture tester maintained at 121°C for 135 and 60 min for raw and cooked meat, respectively.

Weight, Cooking Time and Cooking Losses. All hens, 10 to 12 lb, and toms, 18 to 20 lb, were within the same weight class for their sex. Initial weights of the half turkey hens were greater (P=.01) for blast frozen than the liquid frozen hens (Table 8). This difference might be attributed to a greater variation about the mean for hens than toms. Also, dripping losses were greater (P=.05) for blast frozen than for liquid frozen hens. The significant difference in dripping losses might have been influenced by the difference in the initial weight of the hens. Freezing method did not affect the cooking time nor total cooking losses of hens or toms. This is in agreement with the work reported by Marion (1958)

Table 8. Initial weights, cooking times and cooking losses.

Factors	Hens Blast	Hens Liquid	Toms Blast	Toms Liquid
Initial weights, lb	5.2**	4.8	8.9	9.0
Cooking time, min/lb	30.0	29.8	23.2	23.0
Volatile loss, %	26.0	25.2	26.2	25.8
Dripping loss, %	7.0*	5.7	7.2	7.5
Total cooking losses, %	33.3	31.4	33.6	33.6

* Significant at the 5% level of probability

** Significant at the 1% level of probability

and Marion and Stadelman (1958), who observed that the total cooking losses of the pectoralis major muscle were not affected by freezing methods that included blast, liquid and plate. Half turkey toms had an initial weight greater than that of the hens and the cooking time in min per lb was less. Larger birds require a longer total cooking time but a shorter time in min per lb (Lowe, 1955 p. 250).

<u>Correlations for Moisture Content, Water-holding Capacity and Juiciness</u>. Possible relationships between moisture content and juiciness, moisture content and water-holding capacity, water-holding capacity and juiciness of light and dark meat of hens and toms were investigated. These data are recorded in Table 5.

In this study, water-holding capacity of the cooked, light and dark meat and juiciness scores were not significantly related. Bouton et al. (1958) in a comparison of water-holding capacity of raw meat and juiciness found no significant correlation coefficients. However, moisture content and water-holding capacity for the dark raw meat of toms was significantly correlated (r=0.4652, P=.05). No other significant r values for these 2 factors were found. Hamm (1960) also reported that water-holding capacity was not related to the total moisture of meat. In the study reported here, the moisture content of the light, cooked meat of toms and the juiciness of the light meat were significantly correlated (r=0.4363, P=.05). All other correlation coefficients were not significant. Water-holding capacity of cooked light and dark meat was not significantly related to tenderness.

Factors Related to Flavor

Flavor of light and dark meat samples was evaluated subjectively. Flavor scores and pH measurements of blast and liquid frozen hens and toms are presented in Table 9.

Flavor scores were not affected by freezing method and also were similar for light and dark meat and for hens and toms. This is in agreement with Carlson et al. (1962) who observed that sex did not consistently affect the scores given by the taste panel for flavor. Swanson et al. (1962) also observed that flavor scores were similar for breast and thigh muscles of turkeys.

Freezing method affected the pH of the light, cooked

Table 9. Flavor scores[a] and pH measurements.

Factors	Hens Blast	Hens Liquid	Toms Blast	Toms Liquid
Flavor scores[a]				
Light meat	5.8	5.8	6.0	5.8
Dark meat	6.0	6.0	5.9	6.0
pH measurements				
Light, raw	5.85	5.86	5.88	5.90
Dark, raw	6.18	6.21	6.28	6.29
Light, cooked	6.03	6.04	6.05*	6.09
Dark, cooked	6.42	6.43	6.47	6.49

[a]Possible score, 7-points

* Significant at the 5% level of probability

meat of toms. The liquid frozen toms had higher (P=.05) pH values than the blast frozen toms and a similar trend was noted for hens. The pH values for hens and toms were slightly acidic (pH 5.85 - 6.48) and were lower for raw than cooked meat of both hens and toms. Goertz and Hooper (1963) also found that the pH values of pectoralis major pieces increased with cooking. In the study reported here, the dark meat had a higher pH value than light meat and toms tended to have slightly higher pH values than hens.

A significant correlation coefficient (r=0.4172, P=.05, Table 5) was found between pH of the light, raw meat and the flavor of the light cooked meat of hens. Significant relationships were not observed between pH of light or dark meat of toms and the flavor of the light or dark meat.

SUMMARY

The acceptability of 24 blast and 24 liquid frozen Broad Breasted White turkey hens and toms was studied. Frozen whole turkeys were scored at 4 periods. A paired comparison design was used to evaluate defrosted half and cooked half turkeys and light and dark meat. There were 12 replications of each treatment with 1 blast and 1 liquid frozen turkey hen or tom studied at each period. The "t" test was employed to determine differences between freezing methods for each subjective and objective measurement.

Prior to cooking the frozen whole birds were defrosted at room temperature. The left half of each turkey was scored subjectively as the defrosted half and used for objective tests of the raw meat. The right half of each bird was cooked to an end point temperature of 90°C in the breast muscle in a rotary hearth gas oven maintained at 325°F. Later these halves were scored as the cooked turkeys and used for palatability and objective tests. Measurements for moisture, pH, water-holding capacity and color were included as the objective tests. Color values also were determined for frozen, defrosted and cooked skin samples.

When frozen whole, defrosted half and cooked half turkeys

were evaluated subjectively, liquid frozen toms had higher ($P=.05$) general acceptability scores than blast frozen whole toms, but fleshing scores were similar. A significant correlation coefficient ($r=0.7681$, $P=.01$) was noted for fleshing of blast frozen whole and that of defrosted half toms, but not for fleshing of liquid frozen whole and defrosted half toms. The general acceptability scores of frozen whole turkeys were not significantly related to the palatability of the meat.

Freezing method affected the subjective color score of the frozen whole birds but not that of the defrosted or cooked half turkeys. Color scores of the liquid frozen whole were higher ($P=.01$) than of blast frozen toms. Gardner color difference meter values indicated that the cooked dark meat of blast frozen hens and toms showed greater redness values ($P=.05$, $P=.01$, respectively) than liquid frozen whole hens or toms. Cooked skin from the breast area of blast frozen toms had a significantly ($P=.01$) higher yellowness value than liquid frozen toms.

Initial weights and dripping losses were greater ($P=.01$) and $P=.05$, respectively) for blast than for liquid frozen hens, however freezing method did not affect the cooking time in min/lb or total cooking losses. Total moisture content of dark cooked meat of liquid frozen toms was higher ($P=.01$) than that of blast frozen toms, but the dark raw meat of blast frozen hens had greater ($P=.05$)

water-holding capacity values than liquid frozen hens. Raw had more moisture and higher water-holding capacity values, than cooked meat and dark raw more moisture than light raw meat.

Flavor, juiciness and tenderness scores and shear values were similar for blast and liquid frozen turkeys. In general, toms scored higher for tenderness and had lower shear values than hens but flavor and juiciness scores were similar for hens and toms. Initial tenderness scores were significantly correlated (P=.001) to those based on chews but shear values of raw were not significantly related to those of cooked meat. Juiciness and flavor scores and pH values of dark were higher than those of light meat. Cooked had higher pH values than raw meat and the pH of light raw was correlated (P=.05) with the flavor of light cooked meat of hens. Also, liquid frozen light, cooked meat had higher (P=.05) pH values than blast frozen toms.

According to the findings of this study, fleshing of defrosted blast frozen toms could be predicted by observing the fleshing of frozen turkeys, but this was not true for liquid frozen birds. Freezing method had no significant effect on total cooking losses, shear values and flavor, juiciness and tenderness scores. For hens, flavor scores generally increased as the pH increased.

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APPENDIX

Explanation of Terms and Abbreviations for Appendix Tables

Codes for treatments

B refers to blast
L refers to liquid

Scoring range for color, fleshing, general acceptability, flavor, juiciness and tenderness is 7 to 1.

Ranking for preference for color, fleshing and general acceptability is 1 to 2. 1 indicated highest rank, 1.5 no preference and 2 lowest rank.

Subjective measurements for flavor, juiciness, tenderness and general acceptability

light meat was from the pectoralis major muscle
dark meat was from the gluteus primus muscle

Objective measurements for color, moisture, pH and water-holding capacity were averaged from duplicate determinations.

"Rd" refers to color reflectance
"a+" refers to redness
"b+" refers to yellowness

light meat was from the pectoralis major muscle
dark meat was from the composite of semitendinosus, semimembranosus, sartorius, gluteus medius muscles for color, moisture, and pH measurements
dark meat was from the proximal portion of gluteus primus muscle for water-holding capacity

Water-holding capacity was reported as a ratio of meat area to spread of juice area. High values indicated a high water-holding capacity.

Significance of statistical data

* significant at the 5% level of probability

** significant at the 1% level of probability

Form 1. Score card for frozen turkeys
(blast vs liquid frozen)

Name______________________________ Date____________

Sample No.	Color	Fleshing	General Acceptability
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			

Descriptive terms for scoring color, fleshing and general acceptability:

7 - very desirable
6 - desirable
5 - moderately desirable
4 - sl. desirable
3 - sl. undesirable
2 - moderately undesirable
1 - undesirable

Comments:

Form 2. Score card for turkey

Defrosted Name________________

Cooked Date________________

Sample	Color		Fleshing		General Acceptability	
number	Preference	Score	Preference	Score	Preference	Score
1						
2						

Please score the sample for the qualities given. Also indicate your preference ( ) if one sample is better than the other in a specific quality.

Descriptive terms for scoring color, fleshing and general acceptability:

7 - very desirable
6 - desirable
5 - moderately desirable
4 - slightly desirable
3 - slightly undesirable
2 - moderately undesirable
1 - undesirable

Comments:

Form 3. Score card for turkey

Light

Dark

Judge ____________________

Date ____________________

Sample number	Flavor	Juiciness	Tenderness: Initial	Tenderness: Chews No.	Tenderness: Chews Score	General acceptability	Comments
1							
2							
3							
4							

Descriptive terms for scoring flavor, juiciness and general acceptability:

7 - very desirable
6 - desirable
5 - moderately desirable
4 - slightly desirable
3 - slightly undesirable
2 - moderately undesirable
1 - undesirable

Preference: Please rank all samples in order of your preference. If some, or all, are equally desirable, it is permissible to give them the same rank.

Light Dark

____________ most desirable

____

____

____________ least desirable

Form 4. Weight losses of cooked half turkeys before and after cooking.

I. Losses by weight

A. Before cooking — Grams

1. Weight of bird
2. Weight of pan, rack, and thermometer
3. Weight of pan, rack, thermometer and bird

B. After cooking

1. Weight of pan, rack, thermometer, bird and drippings
2. Weight of pan, rack, thermometer, and drippings
3. Volatile loss (A3 - B1)
4. Weight of bird and platter
5. Weight of platter
6. Cooked weight of bird (B4 - B5)
7. Total cooking loss (A1 - B6)
8. Dripping loss (B7 - B3)

II. Losses as percent of weight — Percent

A. Volatile loss (B3/A1)
B. Total cooking loss (B7/A1)
C. Dripping loss (B8/A1)

Table 10. Gardner color difference meter values of raw meat samples of turkey hens.[a]

Cooking periods	Light "Rd" B	L	Light "a+" B	L	Light "b+" B	L	Dark "Rd" B	L	Dark "a+" B	L	Dark "b+" B	L
1	20.48	18.48	7.11	6.72	9.99	8.94	12.02	11.90	13.36	12.90	10.33	10.40
2	29.74	22.13	5.89	4.22	9.01	8.78	12.90	12.87	11.80	12.42	10.02	8.96
3	20.43	20.52	6.26	6.52	9.15	9.36	10.34	11.06	12.52	11.70	9.52	9.61
4	18.28	21.16	6.62	5.74	8.88	8.89	10.80	10.94	11.21	12.71	9.81	9.10
5	19.95	21.68	6.76	4.86	9.35	9.19	11.36	12.41	11.71	10.70	9.87	10.63
6	17.79	18.76	7.07	6.74	9.24	10.10	11.53	10.70	12.74	13.56	9.54	9.88
7	20.90	19.80	13.69	13.63	9.55	10.42	9.66	11.35	13.08	12.22	9.81	10.28
8	21.19	20.24	5.16	6.89	9.90	9.26	11.11	11.70	12.82	12.39	9.97	10.00
9	15.32	24.24	8.72	6.14	8.88	10.20	10.54	12.67	13.08	14.04	8.63	10.78
10	21.34	20.50	6.38	5.94	9.82	9.50	12.68	12.00	11.16	11.30	11.01	10.54
11	20.92	21.26	5.86	6.25	9.84	9.95	10.06	9.80	12.76	13.57	9.44	9.79
12	19.20	20.10	7.50	7.52	9.38	9.44	17.87	20.06	-9.80	-9.80	12.30	12.34
Av	20.46	20.74	7.25	6.76	9.42	9.50	11.74	12.29	10.54	10.64	10.02	10.19
t values	0.276		1.463		0.450		1.838		0.441		0.737	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 11. Gardner color difference meter values of raw meat samples of turkey toms.[a]

Cooking periods	Light "Rd" B	Light "Rd" L	Light "a+" B	Light "a+" L	Light "b+" B	Light "b+" L	Dark "Rd" B	Dark "Rd" L	Dark "a+" B	Dark "a+" L	Dark "b+" B	Dark "b+" L
13	17.86	19.01	8.07	7.66	8.84	8.68	7.96	10.87	10.44	12.14	8.43	9.07
14	18.97	16.13	7.14	7.50	8.02	8.80	7.82	9.36	12.05	12.84	8.38	9.06
15	18.98	18.65	7.51	7.30	8.88	9.71	9.64	8.67	14.73	13.42	7.64	8.41
16	8.75	9.14	12.08	14.24	9.51	9.60	19.23	18.59	8.03	7.20	9.25	8.69
17	21.62	21.37	4.14	6.80	10.07	9.53	10.92	10.10	9.52	9.66	9.88	9.72
18	18.63	19.02	7.49	6.02	8.34	8.92	8.60	10.50	10.20	12.47	7.54	9.32
19	21.43	20.28	6.36	6.20	8.97	9.82	8.76	11.49	11.60	11.66	9.02	10.22
20	22.06	21.70	5.52	5.30	9.73	9.48	10.04	12.94	12.06	11.59	9.18	10.30
21	20.57	18.17	7.10	7.94	8.69	8.88	9.28	7.92	9.64	11.40	9.08	7.90
22	19.21	18.75	5.47	5.22	8.70	8.60	9.29	10.70	9.47	9.49	9.26	8.19
23	22.00	18.80	5.68	8.58	9.71	8.47	9.16	9.46	11.29	11.64	9.90	9.75
24	19.46	22.52	5.72	5.25	9.14	8.91	9.92	9.75	9.49	9.89	9.84	9.19
Av	19.13	18.63	6.86	7.33	9.05	9.12	10.05	10.86	10.71	11.12	8.95	9.15
t values	0.987		1.198		0.368		1.748		1.311		0.727	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 12. Gardner color difference meter values of cooked meat samples of turkey hens.[a]

Cooking periods	Light "Rd" B	Light "Rd" L	Light "a+" B	Light "a+" L	Light "b+" B	Light "b+" L	Dark "Rd" B	Dark "Rd" L	Dark "a+" B	Dark "a+" L	Dark "b+" B	Dark "b+" L
1	47.95	47.31	9.80	-9.88	13.96	13.66	24.79	24.67	4.86	4.56	14.09	14.46
2	42.92	45.05	0.77	4.92	13.88	13.92	23.24	27.34	4.92	4.50	14.24	15.09
3	47.48	42.00	0.25	9.80	13.99	13.48	24.22	25.59	5.56	4.67	14.67	15.12
4	43.60	46.02	-4.86	-9.80	11.98	12.53	24.85	25.79	5.10	4.48	14.40	14.73
5	40.33	42.84	-9.80	-4.92	13.45	12.65	24.21	23.57	5.31	4.32	14.45	14.08
6	45.19	42.20	-5.73	-9.80	14.05	14.04	25.98	25.40	5.35	4.98	13.55	13.88
7	43.44	45.61	1.08	4.92	14.12	14.18	22.72	23.35	8.88	5.36	14.18	14.43
8	44.94	43.27	0.98	-9.80	13.98	13.89	28.89	25.12	5.06	4.82	15.43	14.70
9	43.59	42.97	2.26	2.07	12.97	13.27	25.00	28.90	5.99	5.18	14.26	15.02
10	42.66	41.17	1.89	1.10	13.44	13.43	24.61	22.93	7.60	3.91	14.34	12.97
11	42.27	45.51	-9.80	-9.80	13.48	13.47	24.16	23.64	5.75	6.38	14.40	13.59
12	43.59	41.18	0.85	1.33	13.79	13.47	22.87	23.48	5.95	4.96	13.94	14.44
Av	44.00	43.76	-1.02	-2.49	13.59	13.50	24.64	24.98	5.86	4.84	14.33	14.38
t values	0.300		0.651		0.891		0.553		2.738*		0.232	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 13. Gardner color difference meter values of cooked meat samples of turkey toms.[a]

Cooking periods	Light "Rd" B	Light "Rd" L	Light "a+" B	Light "a+" L	Light "b+" B	Light "b+" L	Dark "Rd" B	Dark "Rd" L	Dark "a+" B	Dark "a+" L	Dark "b+" B	Dark "b+" L
13	43.95	40.27	1.25	1.70	13.29	13.27	21.04	24.36	7.36	7.16	13.79	14.73
14	41.56	44.80	2.04	-9.80	13.31	13.66	19.44	20.42	7.56	6.28	13.57	13.46
15	45.23	44.33	2.22	1.72	14.24	13.10	22.10	22.89	9.68	6.59	14.31	14.44
16	42.38	42.68	2.10	2.32	14.12	13.72	20.81	21.48	8.22	6.19	13.78	14.08
17	46.58	43.32	1.35	1.35	13.94	12.62	22.51	20.10	9.60	9.60	13.78	12.66
18	44.90	43.29	2.19	2.15	13.24	13.24	21.16	24.55	6.98	5.87	13.49	14.24
19	46.48	45.67	1.59	1.34	14.20	13.63	22.46	25.78	9.09	5.48	13.95	14.80
20	43.44	44.80	2.05	1.95	14.30	14.35	20.66	22.20	6.30	5.73	13.80	14.01
21	40.82	41.10	2.08	1.62	13.86	13.61	21.84	19.96	6.12	5.62	13.99	13.30
22	42.58	43.44	1.25	1.32	13.76	15.03	17.82	21.93	9.85	6.82	12.98	14.81
23	49.34	41.09	1.49	1.74	13.64	12.68	20.84	23.54	4.98	5.13	14.31	15.03
24	45.96	47.25	0.96	1.28	13.72	14.25	22.56	21.22	5.88	6.14	14.14	13.93
Av	44.44	43.50	1.71	0.72	13.80	13.60	21.10	22.37	7.64	6.38	13.82	14.12
t values	1.066		1.000		0.959		1.978		3.160**		1.313	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 14. Gardner color difference meter values of frozen skin.[a]

Cooking periods	Hens "Rd" B	Hens "Rd" L	Hens "a+" B	Hens "a+" L	Hens "b+" B	Hens "b+" L	Cooking periods	Toms "Rd" B	Toms "Rd" L	Toms "a+" B	Toms "a+" L	Toms "b+" B	Toms "b+" L
1	28.31	28.07	9.80	9.80	3.59	3.64	13	24.73	29.17	9.80	9.80	4.42	5.85
2	25.91	27.98	9.81	9.80	5.49	3.22	14	26.14	24.44	9.80	9.80	1.94	2.64
3	27.81	25.33	9.80	9.80	4.14	3.12	15	27.70	24.72	0.90	9.82	6.00	3.29
4	25.68	27.38	9.80	9.80	1.59	3.12	16	26.51	26.80	9.80	9.80	3.80	5.68
5	25.15	24.02	9.80	9.80	7.56	9.04	17	26.14	27.12	9.80	9.80	2.95	3.11
6	23.29	25.10	9.80	9.80	3.06	2.22	18	27.37	25.44	9.80	9.80	5.10	4.42
7	26.12	23.44	9.80	9.80	2.06	3.02	19	23.85	27.63	9.80	9.80	0.68	2.44
8	25.43	26.12	9.80	9.80	1.50	4.78	20	23.42	23.32	9.80	9.80	9.84	0.79
9	23.23	23.74	9.80	9.80	4.13	2.01	21	22.97	26.17	9.80	9.80	1.26	9.84
10	25.34	26.92	9.80	9.80	1.20	4.20	22	27.46	26.84	9.80	9.80	5.08	3.43
11	24.40	22.40	9.80	9.80	1.22	2.24	23	24.78	27.86	9.80	9.80	6.20	4.24
12	26.45	24.82	9.80	9.80	1.65	0.41	24	26.47	24.64	9.80	9.80	2.19	2.14
Av	25.59	25.44	9.80	9.80	3.10	3.42	Av	25.63	26.18	9.06	9.80	4.12	3.99
t values	0.292		1.000		0.595		t values	0.754		1.000		0.114	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 15. Gardner color difference meter values of defrosted skin of turkey hens.[a]

Cooking periods	Breast "Rd" B	Breast "Rd" L	Breast "a+" B	Breast "a+" L	Breast "b+" B	Breast "b+" L	Leg "Rd" B	Leg "Rd" L	Leg "a+" B	Leg "a+" L	Leg "b+" B	Leg "b+" L
1	27.35	29.30	9.80	9.80	6.45	6.18	25.69	29.59	0.01	9.80	5.66	5.86
2	27.89	23.30	9.80	9.82	6.78	6.41	25.56	24.80	0.08	9.80	6.68	4.99
3	29.58	25.70	9.80	9.84	4.63	6.62	27.26	24.35	0	0	5.05	6.42
4	25.35	31.85	1.68	9.80	6.65	5.49	26.49	27.35	2.50	-9.80	6.87	8.49
5	25.88	26.51	1.30	1.00	6.21	6.31	22.81	26.00	1.63	0.64	7.34	8.31
6	27.70	30.84	5.06	9.80	6.22	6.90	24.42	25.27	0.25	9.87	6.70	6.69
7	27.32	31.76	9.93	9.80	7.45	4.87	23.14	26.04	9.80	0.	5.42	6.39
8	21.56	27.31	1.80	-9.82	6.75	5.83	21.26	26.62	9.81	9.80	4.72	5.69
9	23.31	25.52	1.92	9.88	6.36	6.57	24.86	24.04	1.44	9.80	7.23	1.23
10	29.59	26.72	9.80	9.85	5.20	5.20	22.67	24.06	9.80	4.91	4.02	6.83
11	28.16	27.91	9.84	9.80	6.40	6.05	24.86	23.00	9.88	9.88	6.27	7.36
12	26.62	29.41	1.88	9.80	6.76	6.10	25.32	24.06	1.91	9.80	7.33	5.06
Av	26.69	28.01	6.05	7.45	6.32	6.04	24.53	25.43	3.92	5.38	6.11	6.11
t values	1.256		0.888		0.879		1.233		0.647		0.004	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 16. Gardner color difference meter values of defrosted skin of turkey toms.[a]

Cooking periods	Breast "Rd" B	Breast "Rd" L	Breast "a+" B	Breast "a+" L	Breast "b+" B	Breast "b+" L	Leg "Rd" B	Leg "Rd" L	Leg "a+" B	Leg "a+" L	Leg "b+" B	Leg "b+" L
13	26.18	28.91	1.83	1.13	6.86	6.98	25.42	27.19	3.35	1.26	6.68	7.60
14	29.35	26.14	0.94	3.46	5.26	4.96	21.99	24.04	5.33	4.88	8.04	7.78
15	24.76	21.90	1.89	2.50	5.30	7.28	21.12	23.60	5.47	3.37	8.10	8.41
16	26.60	23.68	6.12	3.68	6.68	5.34	24.64	22.69	3.02	3.20	7.52	7.91
17	28.06	28.60	-9.80	9.80	6.21	5.36	26.18	26.85	-9.80	-9.80	7.58	7.56
18	21.60	26.04	3.22	1.80	5.72	6.00	25.80	22.02	1.80	1.20	6.78	5.72
19	28.90	27.10	9.80	1.12	6.16	5.38	24.62	25.73	2.01	1.74	8.24	6.72
20	24.02	28.83	-9.86	9.82	9.00	10.43	24.64	25.46	9.80	9.89	9.08	10.50
21	28.58	24.73	9.80	9.98	5.90	6.07	23.46	22.93	9.89	2.24	6.91	7.00
22	31.10	28.08	9.80	1.35	6.30	6.80	27.47	24.52	1.27	1.35	6.57	9.87
23	27.81	26.04	-9.83	2.11	7.28	7.36	25.67	25.27	5.78	1.40	7.80	6.41
24	30.24	31.39	9.80	9.80	4.47	5.31	27.28	29.24	5.55	-9.90	7.87	8.40
Av	27.27	26.79	1.98	4.71	6.26	6.44	24.86	24.96	3.62	0.90	7.60	7.82
t values	0.534		1.001		0.649		0.175		2.030		0.593	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 17. Gardner color difference meter values of cooked skin of turkey hens.[a]

Cooking periods	Breast "Rd" B	L	Breast "a+" B	L	Breast "b+" B	L	Leg "Rd" B	L	Leg "a+" B	L	Leg "b+" B	L
1	9.70	8.27	9.80	9.80	5.21	6.55	5.47	6.08	9.80	9.80	6.54	7.36
2	10.38	8.06	9.80	9.80	6.00	6.21	5.82	5.59	9.80	9.80	4.46	6.87
3	6.49	9.94	9.80	9.80	6.26	3.12	4.21	5.20	6.02	5.90	6.45	8.54
4	9.33	5.42	9.80	9.80	6.92	3.44	3.26	5.52	9.80	9.80	7.48	6.29
5	5.72	7.70	9.80	9.80	5.06	5.42	5.59	4.07	9.80	9.80	5.74	7.52
6	5.71	6.74	9.80	9.81	8.05	5.96	3.56	5.53	9.80	-9.85	5.44	9.26
7	5.17	7.24	9.80	9.80	7.02	8.50	4.76	4.14	9.80	9.87	8.64	8.61
8	5.44	12.96	9.52	0.38	7.41	7.14	4.25	3.22	9.80	1.21	6.68	7.62
9	6.39	11.54	9.80	3.84	9.45	11.36	5.53	5.46	9.80	9.81	8.08	9.70
10	5.32	14.12	9.35	9.80	8.58	8.16	2.11	6.67	7.62	4.33	4.85	10.54
11	6.57	6.85	9.80	9.80	6.77	4.70	6.03	6.10	9.80	9.80	6.80	4.02
12	5.94	6.17	9.80	9.80	5.64	6.72	4.24	3.95	9.80	9.80	6.83	6.88
Av	6.85	8.75	9.74	8.52	6.86	6.44	4.57	5.13	9.30	6.67	6.50	7.77
t values	1.724		1.392		0.794		1.147		1.535		1.977	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 18. Gardner color difference meter values of cooked skin of turkey toms.[a]

Cooking periods	Breast "Rd" B	Breast "Rd" L	Breast "a+" B	Breast "a+" L	Breast "b+" B	Breast "b+" L	Leg "Rd" B	Leg "Rd" L	Leg "a+" B	Leg "a+" L	Leg "b+" B	Leg "b+" L
13	11.05	4.56	3.30	9.80	10.46	7.28	4.18	5.25	5.90	9.80	7.52	7.88
14	4.58	7.84	3.86	9.80	8.13	6.68	5.90	5.68	7.77	9.80	9.23	9.14
15	5.73	6.81	9.45	9.80	8.76	9.39	3.58	8.98	-9.80	-9.80	8.40	10.67
16	6.71	7.38	4.08	9.80	6.92	6.34	4.60	4.92	9.80	9.80	8.12	8.65
17	7.20	7.28	8.29	9.80	10.86	8.87	5.10	4.48	9.80	9.80	6.24	7.14
18	5.56	5.29	6.28	9.80	6.58	4.02	3.10	5.74	9.80	9.80	7.06	6.76
19	7.74	7.42	9.80	9.80	8.42	4.86	5.02	5.18	9.80	9.80	8.43	6.64
20	4.78	4.52	9.80	9.80	10.36	6.14	4.10	3.59	9.89	1.93	8.69	8.00
21	3.53	7.84	5.54	1.10	5.74	4.50	2.85	5.87	4.36	2.52	6.25	7.29
22	7.30	4.66	9.85	9.80	11.38	8.54	5.66	4.85	5.76	9.80	9.77	6.09
23	9.81	6.30	8.40	9.80	10.26	9.37	7.92	4.56	9.82	9.88	11.60	9.63
24	6.02	7.29	9.80	9.80	9.29	10.06	7.20	6.42	2.57	9.80	10.72	9.56
Av	6.67	6.43	7.37	9.08	8.93	7.17	4.93	5.46	6.29	6.91	8.50	8.12
t values	0.279		1.851		3.834**		0.804		0.583		0.825	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 19. Color scores.[a]

	Hens							Toms					
	Frozen whole		Defrosted half		Cooked half			Frozen whole		Defrosted half		Cooked half	
Cooking periods	B	L	B	L	B	L	Cooking periods	B	L	B	L	B	L
1	6.0	6.1	5.4	5.8	6.0	5.9	13	5.1	5.3	5.9	5.9	5.6	5.0
2	5.4	6.4	5.5	6.2	6.2	5.8	14	5.1	5.5	5.9	5.8	5.4	6.0
3	5.9	6.3	5.8	5.7	5.7	5.6	15	5.4	5.4	6.2	4.9	5.9	5.2
4	6.1	6.3	5.8	6.4	5.2	6.7	16	5.9	6.0	6.0	5.8	6.0	5.8
5	5.8	5.8	6.0	5.6	6.2	5.7	17	5.8	6.3	6.2	6.1	5.7	6.0
6	5.9	5.8	6.1	5.1	6.3	5.0	18	5.5	5.6	5.9	6.2	6.1	6.5
7	5.8	6.0	5.3	5.6	5.5	5.2	19	5.2	6.0	5.8	6.3	6.3	6.1
8	6.2	6.3	5.6	6.1	6.0	5.6	20	5.0	6.5	5.4	6.1	5.6	5.8
9	5.4	5.8	6.1	6.2	5.2	5.8	21	5.6	6.2	5.9	5.9	5.4	6.0
10	6.3	5.8	5.1	5.3	4.0	5.7	22	5.6	6.4	6.0	5.4	5.4	5.5
11	5.0	5.2	5.3	5.2	6.0	5.4	23	4.4	5.8	5.2	5.5	6.1	6.0
12	5.6	6.2	5.8	5.6	6.3	5.5	24	5.8	6.4	6.0	5.7	5.0	6.4
Av	5.8	6.0	5.6	5.7	5.7	5.6	Av	5.4	6.0	5.9	5.8	5.7	5.8
t values	2.021		0.601		0.225		t values	4.158**		0.438		0.902	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 20. Fleshing scores.[a]

Cooking periods	Hens Frozen whole B	L	Defrosted half B	L	Cooked half B	L	Cooking periods	Toms Frozen whole B	L	Defrosted half B	L	Cooked half B	L
1	6.4	5.6	6.1	5.3	5.9	5.1	13	5.8	5.7	6.3	5.8	5.7	5.7
2	5.1	6.0	5.8	5.9	5.6	6.2	14	5.3	6.0	5.6	6.3	6.1	6.3
3	5.1	6.8	5.5	6.2	6.4	5.4	15	6.0	5.5	6.1	5.4	6.4	5.6
4	6.7	5.9	6.1	5.9	5.8	5.8	16	5.9	5.9	5.8	6.2	5.9	6.2
5	5.3	5.5	6.0	6.0	6.0	6.2	17	5.9	6.3	6.0	6.4	6.1	5.9
6	5.4	6.1	6.2	6.0	6.4	5.6	18	6.2	6.1	6.2	6.1	5.7	6.5
7	5.7	5.7	6.4	5.2	6.1	5.6	19	5.9	6.3	6.1	5.6	5.5	6.2
8	6.1	6.0	6.2	6.0	6.1	6.1	20	6.0	6.3	5.6	5.9	5.7	6.4
9	5.8	5.6	6.3	5.6	6.2	5.2	21	5.7	6.4	5.7	6.2	5.6	6.0
10	6.4	5.9	6.1	5.0	5.2	5.8	22	6.2	6.4	6.2	5.6	6.0	5.6
11	5.2	5.7	5.3	6.0	5.5	5.4	23	5.4	5.9	5.3	6.2	6.2	6.0
12	5.3	6.8	6.5	5.8	6.3	5.8	24	6.4	6.2	6.4	5.7	5.4	6.2
Av	5.7	6.0	6.0	5.7	6.0	5.7	Av	5.9	6.1	5.9	6.0	5.8	6.0
t values	1.083		1.662		1.655		t values	1.770		0.049		1.274	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 21. General acceptability scores of turkey hens.[a]

Cooking periods	Frozen whole		Defrosted half		Cooked half		Meat Samples Light		Meat Samples Dark	
	B	L	B	L	B	L	B	L	B	L
1	6.3	5.9	5.9	5.3	6.2	5.6	5.8	5.9	5.7	6.0
2	5.3	6.2	5.8	6.1	5.9	5.9	5.0	5.8	5.8	5.8
3	5.4	6.7	6.0	6.3	6.1	5.4	5.3	5.5	6.0	6.3
4	6.1	6.2	6.1	6.3	5.5	6.5	5.5	5.2	5.8	5.6
5	5.6	5.6	5.9	5.8	5.8	6.0	4.9	5.6	5.2	6.4
6	5.6	5.9	6.2	5.7	6.5	5.1	6.1	5.8	6.2	5.8
7	5.9	5.8	5.8	5.5	5.9	5.4	5.8	5.6	6.2	6.0
8	6.2	6.3	5.9	6.0	6.0	5.8	5.4	4.8	5.4	5.6
9	5.7	5.7	6.3	5.8	5.8	5.5	5.8	5.2	5.7	5.7
10	6.2	5.8	5.0	5.1	4.2	5.9	4.7	5.3	5.4	5.9
11	5.1	5.2	5.6	5.8	5.9	5.5	5.5	5.8	5.9	6.0
12	5.8	6.5	6.1	5.7	6.2	5.5	5.2	5.2	6.0	5.7
Av	5.8	6.0	5.9	5.8	5.8	5.7	5.4	5.5	5.8	5.9
t values	1.468		1.015		0.666		0.421		1.001	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 22. General acceptability scores of turkey toms.[a]

Cooking periods	Frozen whole B	Frozen whole L	Defrosted half B	Defrosted half L	Cooked half B	Cooked half L	Meat Samples Light B	Meat Samples Light L	Meat Samples Dark B	Meat Samples Dark L
13	5.4	5.4	6.0	5.8	5.6	5.1	5.7	5.8	5.4	5.6
14	5.0	5.5	5.7	6.0	5.7	6.0	5.9	6.0	6.1	6.2
15	5.7	5.2	6.3	5.2	6.1	5.3	5.9	5.2	5.6	5.4
16	5.7	5.6	5.8	5.9	5.8	5.9	5.8	5.5	6.2	5.8
17	5.8	6.1	6.0	6.1	6.1	5.8	6.0	6.0	6.0	6.0
18	5.7	5.8	6.0	6.2	6.0	6.6	5.8	5.9	6.0	6.2
19	5.2	6.2	6.0	5.8	5.9	6.1	5.9	5.6	6.0	6.1
20	5.4	6.2	5.6	5.9	5.7	6.0	5.4	5.6	5.6	5.7
21	5.4	6.3	6.0	6.0	5.6	6.0	5.7	5.3	5.8	5.8
22	5.7	6.1	6.1	5.7	5.7	5.5	5.3	5.8	5.4	5.6
23	4.3	5.8	5.0	5.7	5.9	6.1	5.9	6.0	5.6	6.0
24	6.1	6.2	6.2	5.5	5.4	6.2	5.8	5.6	5.8	6.1
Av	5.5	5.9	5.9	5.8	5.8	5.9	5.8	5.7	5.8	5.9
t values	2.598*		0.534		0.687		0.716		1.331	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 23. Preference color scores.[a]

	Hens					Toms			
	Defrosted half		Cooked half			Defrosted half		Cooked half	
Cooking periods	B	L	B	L	Cooking periods	B	L	B	L
1	1.7	1.3	1.4	1.6	13	1.5	1.5	1.2	1.8
2	1.9	1.1	1.3	1.7	14	1.4	1.6	1.8	1.2
3	1.5	1.5	1.4	1.6	15	1.0	2.0	1.2	1.8
4	1.8	1.2	2.0	1.0	16	1.4	1.6	1.6	1.4
5	1.3	1.7	1.2	1.8	17	1.4	1.6	1.6	1.4
6	1.0	2.0	1.1	1.9	18	1.7	1.3	1.6	1.4
7	1.7	1.3	1.3	1.7	19	1.7	1.3	1.4	1.6
8	1.6	1.4	1.2	1.8	20	1.8	1.2	1.7	1.3
9	1.5	1.5	1.8	1.2	21	1.5	1.5	1.8	1.2
10	1.6	1.4	1.8	1.2	22	1.2	1.8	1.4	1.6
11	1.4	1.6	1.7	1.3	23	1.8	1.2	1.4	1.6
12	1.4	1.6	1.1	1.9	24	1.3	1.7	2.0	1.0
Av	1.5	1.5	1.4	1.6	Av	1.5	1.5	1.6	1.4
t values	0.476		0.661		t values	0.353		0.819	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 24. Preference fleshing scores.[a]

	Hens					Toms			
	Defrosted half		Cooked half			Defrosted half		Cooked half	
Cooking periods	B	L	B	L	Cooking periods	B	L	B	L
1	1.2	1.8	1.0	2.0	13	1.1	1.9	1.5	1.5
2	1.8	1.2	1.6	1.4	14	1.7	1.3	1.6	1.4
3	1.8	1.2	1.1	1.9	15	1.2	1.8	1.1	1.9
4	1.4	1.6	1.6	1.4	16	1.7	1.3	1.7	1.3
5	1.4	1.6	1.6	1.4	17	1.7	1.3	1.4	1.6
6	1.3	1.7	1.1	1.9	18	1.5	1.5	1.8	1.2
7	1.0	2.0	1.2	1.8	19	1.3	1.7	1.8	1.2
8	1.4	1.6	1.4	1.6	20	1.7	1.3	1.8	1.2
9	1.1	1.9	1.0	2.0	21	1.7	1.3	1.8	1.2
10	1.0	2.0	1.5	1.5	22	1.0	2.0	1.2	1.8
11	1.9	1.1	1.6	1.4	23	1.9	1.1	1.3	1.7
12	1.2	1.8	1.2	1.8	24	1.0	2.0	1.9	1.1
Av	1.4	1.6	1.3	1.7	Av	1.5	1.5	1.6	1.4
t values	1.393		2.433*		t values	0.450		0.962	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 25. Preference general acceptability scores.[a]

Cooking periods	Hens: Defrosted half B	Hens: Defrosted half L	Hens: Cooked half B	Hens: Cooked half L	Cooking periods	Toms: Defrosted half B	Toms: Defrosted half L	Toms: Cooked half B	Toms: Cooked half L
1	1.3	1.7	1.3	1.7	13	1.3	1.7	1.3	1.7
2	1.8	1.2	1.5	1.5	14	1.6	1.4	1.6	1.4
3	1.5	1.5	1.1	1.9	15	1.0	2.0	1.1	1.9
4	1.4	1.6	2.0	1.0	16	1.5	1.5	1.7	1.3
5	1.4	1.6	1.6	1.4	17	1.6	1.4	1.4	1.6
6	1.2	1.8	1.0	2.0	18	1.6	1.4	1.8	1.2
7	1.4	1.6	1.0	2.0	19	1.4	1.6	1.6	1.4
8	1.5	1.5	1.4	1.6	20	1.7	1.3	1.8	1.2
9	1.1	1.9	1.2	1.8	21	1.6	1.4	1.8	1.2
10	1.4	1.6	1.9	1.1	22	1.1	1.9	1.4	1.6
11	1.8	1.2	1.3	1.7	23	1.7	1.3	1.4	1.6
12	1.3	1.7	1.2	1.8	24	1.1	1.9	2.0	1.0
Av	1.4	1.6	1.4	1.6	Av	1.4	1.6	1.6	1.4
t values	1.241		1.332		t values	0.924		1.000	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 26. Preference general acceptability scores of meat samples.[a]

Cooking periods	Hens				Cooking periods	Toms			
	Light		Dark			Light		Dark	
	B	L	B	L		B	L	B	L
1	1.5	1.5	1.5	1.5	13	1.4	1.6	1.4	1.6
2	1.7	1.3	1.7	1.3	14	1.6	1.4	1.6	1.4
3	1.6	1.4	1.7	1.3	15	1.2	1.8	1.4	1.6
4	1.4	1.6	1.3	1.7	16	1.2	1.8	1.4	1.6
5	1.9	1.1	1.5	1.5	17	1.4	1.6	1.7	1.3
6	1.4	1.6	1.3	1.7	18	1.5	1.5	1.6	1.4
7	1.4	1.6	1.3	1.7	19	1.3	1.7	1.4	1.6
8	1.5	1.5	1.7	1.3	20	1.6	1.4	1.7	1.3
9	1.1	1.9	1.4	1.6	21	1.3	1.7	1.4	1.6
10	1.8	1.2	1.8	1.2	22	1.1	1.9	1.4	1.6
11	1.5	1.5	1.8	1.2	23	1.3	1.7	1.4	1.6
12	1.3	1.7	1.2	1.8	24	1.7	1.3	1.6	1.4
Av	1.5	1.5	1.5	1.5	Av	1.4	1.6	1.5	1.5
t values	0.132		0.266		t values	2.184		0	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 27. Tenderness scores and shear values of turkey hens.[a]

Cooking periods	Tenderness: Initial Light B	L	Initial Dark B	L	Chews Light B	L	Chews Dark B	L	Shear values, lb: Raw B	L	Cooked B	L
1	6.1	6.4	6.1	6.3	6.3	6.3	6.1	6.0	8.9	9.2	15.4	6.8
2	4.2	6.0	6.2	6.0	4.5	6.1	6.2	6.0	11.2	12.0	17.8	14.3
3	6.0	5.8	6.5	6.3	6.3	5.8	6.7	6.5	8.2	8.5	10.6	15.3
4	5.8	5.3	5.8	5.7	6.0	5.6	5.8	5.6	11.5	9.4	10.1	19.8
5	4.3	5.3	5.5	6.7	5.2	5.8	5.7	6.5	8.4	9.4	21.5	15.7
6	6.1	5.6	6.4	6.0	6.0	5.7	6.4	6.0	10.6	9.2	10.7	18.3
7	6.2	6.5	6.3	6.0	6.2	6.5	6.2	5.8	9.2	7.3	15.1	10.7
8	5.5	5.0	5.5	5.8	5.8	4.7	5.2	5.5	10.2	6.7	13.2	21.9
9	6.0	5.2	5.5	6.0	6.1	5.5	5.8	6.0	8.9	8.2	10.3	25.6
10	4.6	5.2	5.6	6.0	4.2	5.2	5.6	6.0	7.2	7.7	30.4	21.1
11	5.2	5.5	6.0	6.0	5.5	6.0	5.8	6.0	11.1	11.7	36.4	14.1
12	5.4	5.4	6.2	6.2	5.4	5.2	6.2	6.2	11.5	11.6	17.8	18.9
Av	5.4	5.6	6.0	6.1	5.6	5.7	6.0	6.0	9.7	9.2	17.4	16.9
t values	0.702		0.913		0.343		0.322		1.220		0.188	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 28. Tenderness scores and shear values of turkey toms.[a]

Cooking periods	Tenderness								Shear values, lb			
	Initial				Chews							
	Light		Dark		Light		Dark		Raw		Cooked	
	B	L	B	L	B	L	B	L	B	L	B	L
13	6.5	6.6	6.3	5.9	6.5	6.5	6.2	6.0	13.4	15.8	11.5	8.0
14	6.1	6.0	6.2	6.1	6.4	6.2	6.2	6.2	14.1	14.3	10.1	11.7
15	6.2	6.1	6.0	6.2	6.2	6.1	5.9	6.1	15.3	12.3	9.8	11.5
16	6.0	5.7	6.3	6.1	5.8	5.5	6.2	6.0	11.7	13.4	14.1	12.9
17	6.1	6.7	6.6	6.3	6.1	6.7	6.3	6.3	12.7	11.9	12.3	11.7
18	5.6	5.8	6.3	6.0	5.8	5.7	5.8	6.3	11.4	11.8	11.4	10.7
19	6.3	6.2	6.4	6.4	6.1	6.3	6.3	6.2	10.9	9.5	9.6	11.0
20	6.2	6.0	6.3	6.4	6.2	6.2	6.1	6.2	10.1	9.6	9.8	12.6
21	6.0	5.6	6.3	6.2	6.0	5.4	6.2	6.1	11.0	14.4	9.7	13.3
22	5.6	6.1	5.6	5.9	5.7	5.7	5.6	5.7	12.9	12.7	14.6	9.5
23	6.3	6.2	6.3	6.2	6.2	6.3	6.1	6.1	10.0	8.4	8.1	8.9
24	6.5	6.0	6.4	6.5	6.4	5.8	6.3	6.3	10.0	10.9	13.4	11.1
Av	6.1	6.0	6.2	6.2	6.1	6.0	6.1	6.1	11.9	12.1	11.2	11.1
t values	0.345		1.076		0.875		0.453		0.262		0.164	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 29. Juiciness scores.[a]

Cooking periods	Hens				Cooking periods	Toms			
	Light		Dark			Light		Dark	
	B	L	B	L		B	L	B	L
1	5.3	5.6	5.4	5.6	13	4.8	4.7	5.2	5.2
2	4.2	5.3	5.5	5.5	14	5.1	5.3	6.0	6.0
3	3.3	3.8	4.7	5.0	15	4.9	4.6	5.1	5.3
4	4.5	4.7	4.8	5.2	16	4.7	4.5	5.8	5.3
5	4.7	4.8	4.8	5.5	17	5.7	5.4	5.8	6.3
6	4.7	5.0	5.1	5.0	18	5.8	4.9	5.1	4.9
7	5.0	4.3	5.5	5.2	19	6.3	5.5	6.0	5.6
8	4.8	4.7	5.2	5.5	20	4.0	4.8	5.1	5.5
9	4.7	4.8	5.5	5.7	21	5.0	4.9	5.4	5.8
10	5.1	4.6	5.4	5.8	22	4.6	4.6	5.1	4.8
11	5.2	5.5	5.2	5.8	23	4.7	5.1	5.1	5.5
12	4.6	4.2	5.8	5.2	24	4.1	4.4	5.0	5.5
Av	4.7	4.8	5.2	5.4	Av	5.0	4.9	5.4	5.5
t values	0.716		1.632		t values	0.601		0.787	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 30. Percent moisture content of turkey hens.[a]

Cooking periods	Light				Dark			
	Raw		Cooked		Raw		Cooked	
	Blast	Liquid	Blast	Liquid	Blast	Liquid	Blast	Liquid
1	74.68	74.45	65.63	65.85	77.12	75.60	65.72	64.42
2	74.37	73.65	65.85	67.57	74.90	75.82	64.77	66.32
3	73.90	73.50	65.32	65.65	75.80	75.12	62.85	66.35
4	74.28	74.85	64.72	66.48	75.18	75.70	64.52	64.62
5	74.30	74.70	64.83	67.80	75.85	76.20	65.70	65.80
6	74.35	73.47	66.40	64.35	75.70	74.90	64.65	63.08
7	74.45	74.50	65.28	65.35	75.58	76.58	64.35	64.38
8	75.78	74.80	66.22	65.33	74.15	75.95	65.52	64.10
9	73.97	75.32	66.52	66.62	75.80	76.72	63.75	64.15
10	74.57	74.50	64.15	64.82	76.95	76.58	63.25	63.48
11	74.32	75.05	64.60	66.85	76.12	77.25	65.75	67.42
12	73.92	74.45	65.85	64.25	75.22	76.22	64.05	63.50
Av	74.56	74.44	65.45	65.91	75.70	76.05	64.57	64.80
t values	0.565		1.051		1.234		0.541	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 31. Percent moisture content of turkey toms.[a]

Cooking periods	Light				Dark			
	Raw		Cooked		Raw		Cooked	
	B	L	B	L	B	L	B	L
13	74.35	74.55	65.22	65.50	75.42	75.58	62.42	61.35
14	74.62	73.50	66.05	66.92	75.93	76.78	62.60	64.50
15	75.40	74.45	67.18	65.73	76.85	75.75	63.35	63.82
16	74.62	75.68	63.65	65.20	76.55	77.70	62.73	64.22
17	74.62	74.58	64.65	66.42	77.12	76.42	63.82	64.20
18	73.40	73.98	65.42	65.12	75.18	76.58	62.38	64.35
19	73.63	75.43	63.33	63.45	76.18	76.15	65.43	65.30
20	74.57	75.25	65.45	65.00	76.25	76.80	62.45	64.38
21	75.05	74.75	65.23	66.68	75.45	76.50	63.45	64.75
22	75.52	76.35	64.62	65.07	76.82	78.05	61.00	63.07
23	75.12	74.05	65.00	65.62	75.52	77.22	63.00	64.18
24	74.80	74.27	63.80	65.60	77.53	75.53	62.30	62.93
Av	74.64	74.74	64.97	65.56	76.23	76.59	62.91	63.92
t values	0.355		2.109		1.089		3.584**	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 32. Water-holding capacity measurements of turkey hens.[a]

Cooking periods	Light				Dark			
	Raw		Cooked		Raw		Cooked	
	B	L	B	L	B	L	B	L
1	1.03	0.88	0.26	0.11	0.31	0.31	0.39	0.30
2	0.84	0.41	0.16	0.14	0.83	0.60	0.48	0.18
3	0.11	0.56	0.32	0.32	0.98	0.11	0.51	0.50
4	1.07	0.97	0.43	0.37	0.83	0.73	0.41	0.62
5	0.75	0.84	0.40	0.36	0.88	0.67	0.54	0.45
6	0.75	1.23	0.34	0.28	0.61	0.76	0.47	0.67
7	0.89	0.69	0.38	0.26	0.72	0.62	0.49	0.42
8	1.10	0.73	0.39	0.39	0.72	0.51	0.51	0.48
9	1.22	0.69	0.35	0.41	0.74	0.82	0.59	0.52
10	0.88	0.62	0.43	0.29	0.95	0.69	0.75	0.44
11	0.92	1.09	0.34	0.29	0.87	0.72	0.83	0.48
12	0.57	1.03	0.31	0.36	0.74	0.72	0.52	0.53
Av	0.84	0.81	0.34	0.30	0.76	0.60	0.54	0.46
t values	0.30		0		2.28*		1.60	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 33. Water-holding capacity measurements of turkey toms.[a]

Cooking periods	Light				Dark			
	Raw		Cooked		Raw		Cooked	
	B	L	B	L	B	L	B	L
13	1.05	0.80	0.25	0.42	0.80	0.64	0.52	0.47
14	0.80	0.88	0.33	0.34	0.73	0.92	0.33	0.63
15	0.80	1.18	0.41	0.42	0.84	0.93	0.63	0.41
16	0.95	1.08	0.34	0.37	1.01	1.02	0.59	0.48
17	0.79	0.99	0.38	0.29	0.93	0.80	0.62	0.55
18	1.00	0.89	0.30	0.37	0.70	0.82	0.54	0.41
19	1.25	1.32	0.33	0.37	0.72	0.71	0.61	0.87
20	1.15	0.61	0.31	0.28	1.04	0.75	0.49	0.48
21	0.84	0.91	0.43	0.30	0.83	0.79	0.91	0.62
22	0.84	1.11	0.38	0.35	0.69	1.00	0.60	0.69
23	1.23	1.09	0.37	0.60	0.65	0.98	0.43	0.45
24	0.55	0.87	0.39	0.82	0.72	0.87	0.86	0.46
Av	0.94	0.98	0.35	0.41	0.80	0.85	0.59	0.54
t values	0.57		1.50		1.00		0.83	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 34. Initial weights, cooking times and cooking losses of turkey hens.[a]

Cooking periods	Initial weights, lb B	L	Cooking times, min/lb B	L	Cooking losses, % Volatile B	L	Dripping B	L	Total B	L
1	4.6	4.6	30.9	31.2	24.0	25.0	6.4	5.6	30.5	30.8
2	5.1	4.5	30.6	30.3	21.0	23.8	6.9	4.1	28.1	27.8
3	6.2	5.0	28.0	29.3	40.2	25.2	6.1	4.9	46.4	30.3
4	5.0	4.7	29.4	28.1	23.4	22.9	8.8	7.8	32.6	30.9
5	5.0	4.9	30.4	30.1	24.2	24.2	5.7	5.2	30.3	29.8
6	5.2	4.9	30.0	31.0	26.1	25.0	5.8	7.7	32.2	32.9
7	5.1	4.9	32.9	32.8	26.5	29.8	8.1	3.8	34.9	33.7
8	5.1	4.8	28.8	28.5	24.7	25.2	7.8	8.0	32.8	33.4
9	5.2	4.7	31.2	30.4	25.4	24.4	6.0	4.3	31.6	32.3
10	5.1	4.7	38.2	31.7	32.2	27.8	4.7	5.0	37.0	33.1
11	5.3	5.0	25.5	28.0	22.1	25.0	9.3	4.4	31.8	29.2
12	5.6	5.2	24.1	26.0	22.1	24.2	8.6	8.0	31.0	32.4
Av	5.2	4.8	30.0	29.8	26.0	25.2	7.0	5.7	33.3	31.4
t values	4.368**		0.330		0.545		2.306*		1.378	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 35. Initial weights, cooking times and cooking losses of turkey toms.[a]

Cooking periods	Initial weights, lb B	Initial weights, lb L	Cooking times, min/lb B	Cooking times, min/lb L	Cooking losses, % Volatile B	Volatile L	Dripping B	Dripping L	Total B	Total L
13	8.9	8.7	20.8	25.3	24.2	42.0	10.3	6.5	34.8	48.6
14	8.5	8.6	23.2	21.2	26.8	22.9	6.2	6.2	33.2	29.5
15	8.7	8.8	25.9	24.2	28.6	25.4	4.5	7.4	33.3	33.0
16	8.7	9.0	25.1	26.2	24.3	27.8	10.2	6.8	34.6	34.8
17	8.8	8.8	21.1	21.1	24.1	21.3	7.5	9.5	32.1	31.5
18	8.9	8.6	23.1	22.7	26.0	24.3	5.7	6.1	31.8	30.7
19	8.8	9.0	22.2	20.7	26.9	22.6	6.0	8.6	33.0	31.2
20	8.9	9.1	23.1	21.5	27.2	22.0	8.0	10.7	35.3	33.4
21	9.0	9.1	22.8	20.3	27.2	19.8	6.8	10.0	34.2	29.9
22	9.4	9.1	25.3	26.9	28.3	31.7	5.6	3.9	34.1	35.7
23	9.0	9.0	21.9	23.9	23.6	27.2	7.8	4.7	31.6	32.0
24	9.2	9.7	23.5	21.7	27.8	22.6	7.6	9.6	35.6	32.4
Av	8.9	9.0	23.2	23.0	26.2	25.8	7.2	7.5	33.6	33.6
t values	0.845		0.302		0.228		0.412		0.055	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 36. Flavor scores.[a]

Cooking periods	Hens Light B	Hens Light L	Hens Dark B	Hens Dark L	Cooking periods	Toms Light B	Toms Light L	Toms Dark B	Toms Dark L
1	6.0	6.3	5.8	6.0	13	5.9	6.0	5.7	5.8
2	5.8	6.2	6.0	6.3	14	6.2	6.2	5.8	6.2
3	6.2	6.2	6.2	6.2	15	5.8	5.0	5.8	5.3
4	6.0	6.0	6.2	5.8	16	6.0	5.8	6.2	6.0
5	5.6	6.2	5.7	6.2	17	6.1	6.1	5.7	5.7
6	6.3	5.8	6.3	6.0	18	6.0	6.0	6.1	6.3
7	5.8	5.7	6.2	6.2	19	6.1	5.8	6.1	6.2
8	5.3	5.2	5.8	5.8	20	5.9	5.9	5.7	6.0
9	6.2	5.7	6.3	6.3	21	5.8	5.6	5.8	5.8
10	5.2	5.2	5.6	5.9	22	5.6	5.8	5.9	5.8
11	5.5	5.5	5.5	5.8	23	6.0	5.9	5.8	6.3
12	5.4	5.0	6.0	5.8	24	6.0	6.1	6.0	6.2
Av	5.8	5.8	6.0	6.0	Av	6.0	5.8	5.9	6.0
t values	0.254		0.745		t values	1.318		1.058	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 37. pH measurements of turkey hens.[a]

Cooking periods	Light				Dark			
	Raw		Cooked		Raw		Cooked	
	B	L	B	L	B	L	B	L
1	5.95	5.95	6.05	6.10	6.15	6.20	6.50	6.40
2	5.95	5.85	5.95	6.05	6.15	6.20	6.42	6.45
3	5.82	5.80	6.10	6.05	6.15	6.10	6.60	6.38
4	5.95	5.95	6.10	6.05	6.20	6.20	6.40	6.40
5	5.85	5.85	5.95	6.00	6.15	6.20	6.40	6.35
6	5.90	5.85	6.10	5.95	6.25	6.15	6.45	6.40
7	5.75	5.95	6.00	6.15	6.23	6.25	6.45	6.45
8	5.75	5.85	5.95	6.05	6.15	6.25	6.35	6.45
9	5.90	5.80	6.05	6.00	6.20	6.15	6.35	6.45
10	5.85	5.85	6.05	6.05	6.10	6.25	6.35	6.45
11	5.70	5.85	6.05	6.05	6.20	6.35	6.35	6.65
12	5.80	5.80	6.00	6.00	6.20	6.20	6.40	6.35
Av	5.85	5.86	6.03	6.04	6.18	6.21	6.42	6.43
t values	0.566		0.523		1.372		0.356	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

Table 38. pH measurements of turkey toms.[a]

Cooking periods	Light				Dark			
	Raw		Cooked		Raw		Cooked	
	B	L	B	L	B	L	B	L
13	5.90	5.95	6.05	6.15	6.25	6.30	6.50	6.55
14	5.90	5.92	6.05	6.15	6.35	6.30	6.40	6.55
15	6.00	5.95	6.08	6.10	6.25	6.35	6.50	6.55
16	5.85	5.90	6.05	6.10	6.25	6.35	6.60	6.55
17	5.86	5.94	6.06	6.16	6.26	6.26	6.51	6.52
18	5.85	6.00	6.06	6.16	6.36	6.26	6.51	6.51
19	5.86	5.96	6.06	6.09	6.30	6.25	6.51	6.50
20	5.86	5.86	6.06	6.08	6.31	6.28	6.51	6.51
21	5.86	5.86	6.06	6.06	6.37	6.36	6.41	6.41
22	5.85	5.85	6.02	6.02	6.22	6.22	6.40	6.32
23	5.85	5.85	5.95	6.00	6.22	6.22	6.42	6.45
24	5.90	5.85	6.08	6.00	6.28	6.30	6.40	6.48
Av	5.88	5.90	6.05	6.09	6.28	6.29	6.47	6.49
t values	1.698		2.582*		0.146		1.110	

[a]See p. 57 for explanation of terms and abbreviations used in this table.

ACCEPTABILITY OF BLAST AND
LIQUID FROZEN TURKEY HENS AND TOMS

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The acceptability of 24 blast and 24 liquid frozen Broad Breasted White turkey hens and toms was studied. Frozen whole turkeys were scored at 4 periods. A paired comparison design was used to evaluate defrosted half and cooked half turkeys and light and dark meat. There were 12 replications of each treatment with 1 blast and 1 liquid frozen turkey hen or tom studied at each period. The "t" test was employed to determine differences between freezing methods for each subjective and objective measurement.

Prior to cooking the frozen whole birds were defrosted at room temperature. The left half of each turkey was scored subjectively as the defrosted half and used for objective tests of the raw meat. The right half of each bird was cooked to an end point temperature of 90°C in the breast muscle in a rotary hearth gas oven maintained at 325°F. Later these halves were scored as the cooked turkeys and used for palatability and objective tests. Measurements for moisture, pH, water-holding capacity and color were included as the objective tests. Color values also were determined for frozen, defrosted and cooked skin samples.

When frozen whole, defrosted half and cooked half turkeys were evaluated subjectively, liquid frozen toms had higher ($P=.05$) general acceptability scores than blast frozen whole toms, but fleshing scores were similar. A significant correlation coefficient ($r=0.7681$, $P=.01$) was noted for fleshing of blast frozen whole and that of defrosted half toms, but not for fleshing of liquid frozen whole and defrosted half toms. The general acceptability scores of frozen whole turkeys were not significantly related to the palatability of the meat.

Freezing method affected the subjective color score of the frozen whole birds but not that of the defrosted or cooked half turkeys. Color scores of the liquid frozen whole were higher (P=.01) than of blast frozen toms. Gardner color difference meter values indicated that the cooked dark meat of blast frozen hens and toms showed greater redness values (P=.05, P=.01, respectively) than liquid frozen whole hens or toms. Cooked skin from the breast area of blast frozen toms had significantly (P=.01) higher yellowness values than liquid frozen toms.

Initial weights and dripping losses were greater (P=.01 and P=.05, respectively) for blast than for liquid frozen hens, however freezing method did not affect the cooking time in min/lb or total cooking losses. Total moisture content of dark cooked meat of liquid frozen toms was higher (P=.01) than that of blast frozen toms, but the dark raw meat of blast frozen hens had greater (P=.05) water-holding capacity values than liquid frozen hens. Raw had more moisture and higher water-holding capacity values than cooked meat and dark raw more moisture than light raw meat.

Flavor, juiciness and tenderness scores and shear values were similar for blast and liquid frozen turkeys. In