

COOKING LOSSES, ACCEPTABILITY, AND EDIBLE
YIELD FOR U.S. GRADED TURKEY HENS

by

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INTRODUCTION

A price differential of three cents per pound existed between each of the U.S. grades of ready-to-cook turkeys sold in Kansas in December of 1960. Presently the U.S.D.A. grades of turkeys based on finish, fleshing, and freedom from defects are the main quality indicators to the consumer. Differences among the U.S. grades of turkeys were great enough to warrant a price differential, but there is a need for determining if such differences are undesirable in terms of eating quality, general appearance, and edible yield. The possibility that U.S. Grade A poultry might have more meat in relation to live, drawn, or eviscerated weight than poultry of lower grades was suggested by Kilpatrick and Pond (1958); however, data were not presented to verify this statement.

The present study was based upon the need for obtaining information that would aid the consumer in purchasing graded turkeys. Objectives were to investigate eating quality of U.S. Grade A turkeys and of U.S. Grade B turkeys downgraded for finish and fleshing; to determine cooking losses of U.S. Grade A, B, and C turkeys; and, to determine the general acceptability of and edible yield from U.S. Grade A turkeys, and from U.S. Grade B and C turkeys downgraded for selected factors.

REVIEW OF LITERATURE

U.S. Grades of Poultry in Market Channels

The incidence of U.S. graded poultry on the market has been reported for various sections of the United States. In Texas, information on the market quality of dressed Texas turkeys was obtained from six representative processing plants during a three year study by Mountney, Parnell, and Halpin (1954). Seventy-nine per cent of more than three-fourths million dressed turkeys were U.S. Grade A, 17 per cent were U.S. Grade B, and four per cent were U.S. Grade C.

In Maine, similar figures were reported for the quality of poultry meat available in retail stores in Portland and South Portland (Lebrun, 1954). Turkeys comprised about 13 per cent of the poultry sold. During a two month period, two samples of each class of poultry found in 90 stores were graded by an inspector from the state Agricultural Marketing Division. About 71 per cent of the poultry examined were Grade A, 24 per cent were Grade B, and five per cent were Grade C. The author did not specify whether the grades were U.S. grades or state grades. In this particular study, independent chain and national chain stores stocked more Grade A poultry than did independent stores.

In Georgia, a study was conducted by Hood and her associates (1955) to determine (1) the kind of broilers available in market channels, (2) how such broilers were sold, and (3) their U.S. grade. A survey of 30 retail stores in Atlanta revealed that

none of these stores sold broilers on the basis of U.S. grade. Most of the broilers were purchased as "processor's Grade A"; and, these then were sold either by processor's grades or by brand names. Some brand-name broilers were labeled as "extra", "fancy" or "premium", and were sold at premium prices. The demand for the higher priced brand-name broilers was greatest in stores located in high and upper-middle income areas.

In this same study (Hood et al., 1955), a sample of each lot of broilers in stock at each of the 30 retail stores was graded by a licensed Federal Production and Marketing Administration grader. Approximately 58 per cent of the broilers examined were U.S. Grade A, 38 per cent were U.S. Grade B, three per cent were U.S. Grade C, and one per cent were below grade. Eighty-two per cent of the brand-name broilers sold at premium prices were U.S. Grade A. Interestingly enough, more U.S. Grade C birds were carried by stores in the two low income areas than by those in the two upper income areas; whereas, more U.S. Grade A broilers were found in stores located in the high income areas. These workers did not note any significant differences in the grades of broilers carried by chain and independent stores; but, they did observe significant differences in the grades of broilers found in various chain stores.

Causes of Downgrading in Poultry

The primary causes of poultry downgrading have been studied by several groups of workers. In Texas, the greatest single

cause (Mountney, Parnell, and Halpin, 1954) of turkey downgrading was poor fleshing or lack of finish; but, bruises caused the greatest loss of quality during the marketing process. Skin tears also were an important cause of downgrading; however, these occurred most often during the actual processing operation. More hens than toms were downgraded because of bruising. It was explained that hens were more tender than toms, and thus bruised easier. Possibly, treading of the hens by the toms was also a reason for the increased incidence of bruising in the hens when the toms and hens were reared together. These workers suggested that better feed and management practices could have corrected the bruising and the poor finish or fleshing.

In Georgia, similar observations were reported by Hood et al. (1955) for broilers available in retail markets. They noted that poor fleshing was the most important cause of downgrading in a large number of broilers in 30 retail stores in Atlanta. Approximately one out of six broilers was downgraded for this defect. Bruising was the second most important overall cause of downgrading. Approximately one out of 10 broilers was downgraded to U.S. Grade B because of bruising, and one per hundred to U.S. Grade C. Bruising was the most important cause of downgrading of U.S. Grade C broilers.

The Georgia workers (Hood et al., 1955) discussed the origin of defects that contributed to the downgrading of broilers. They divided downgrading factors into producer defects, handler defects, and processor defects. Poor fleshing, poor conformation,

sore breasts, and breast blisters were classified as producer defects; bruising was regarded as a handler defect; and, broken bones, tears, discoloration resulting from improper bleeding, and feed-in-crop were considered as processor defects.

The factors affecting market grade and finish of turkeys also were studied by Enos, Moreng, and Whittet (1959). They noted that the market grade of toms, but not hens, increased as floor space of brooders increased. These investigators observed also that turkeys had better finish when all mash rations were fed than when pellets or grains plus concentrates were used.

Factors Affecting Consumer Purchases of Poultry

The need for the poultry industry to emphasize the relationships between consumer values and the actual qualities of poultry products was stressed by Baker (1959). In a survey of West Virginia homemakers, more than 2000 women were asked to designate what qualities they considered important when purchasing chicken (Nybroten, 1956). Plumpness, skin color, and cleanliness were the primary items named. Other qualities mentioned were odor, firmness and flesh condition, pliability of breast bone, and absence of pinfeathers. Only two of the homemakers questioned listed brand-name as a feature of first importance; and, none mentioned "grade" first. Nybroten (1956) suggested that, when selecting chicken, homemakers apparently did not consider important some of the standards that are used in grading. However, he did not delineate the grading standards used; nor, did he

discuss relationships or similarities between grading factors and characteristics listed by the homemakers.

Information (Lebrun, 1954) obtained from personal interviews with 597 Portland and South Portland, Maine, families indicated that most families who had purchased poultry meat were satisfied with their purchases. Data were obtained for 192 poultry purchases; and, included chicken broilers, fryers, roasters, mature hens, and turkeys. No attempt was made to determine reasons for satisfaction; but, poor flavor, toughness, lack of fleshing, and torn skin were mentioned as reasons for dissatisfaction. Lebrun (1954) commented that although most families apparently were satisfied with their purchases, this did not mean that all of the poultry purchased by these people was excellent or of high quality. The consumer's high degree of satisfaction might be attributed to her inability to remember characteristics of poultry purchased in the week just preceding the interview.

Factors affecting consumer purchases of New York dressed frying chickens were studied by Smith (1953). Homemakers from 203 Wilmington, Delaware, households were shown a portable exhibit of 10 New York dressed fryers. One of the birds was U.S. Grade A in all respects; each of the other nine was U.S. Grade A except for one defect. Each homemaker interviewed was asked to designate the order of preference in which she would purchase the fryers, provided they were all the same price per pound. Slightly over one-fourth of the women chose the U.S.

Grade A fryer as their first choice. Approximately one-fifth selected the bird with feed in the crop as their first choice because they thought it had a fleshier breast than the others. Most of the homemakers objected strongly to the poorly fleshed, bruised, and poorly bled chickens; but, they did not consider broken bones an important defect. Abrasions also were considered important; but the importance given to skin tears, pinfeathers, and poor finish varied. Some women objected strongly to pinfeathers; whereas, approximately one-seventh selected the chicken downgraded for pinfeathers as their first choice.

The relative importance of grading standards to the over-all quality and grade of packaged cut-up fryers was investigated by Jacobson and workers (1958). The grading standards for the cut-up birds were based on those for U.S. graded whole chickens. Cut-up fryers that varied in size and color were graded A, B, and C for bruising and were scored by a laboratory panel and by a panel of homemakers. Size, bruising, and color all were noted as highly significant factors affecting over-all quality scores. Of these factors, only bruising is included in the present U.S. grading standards for poultry.

In this same study (Jacobson et al., 1958), five groups of cut-up fryers were ranked for preference by either or both panels. Fryers graded A, B, and C for bruising; and birds graded A, B, and C for cuts and tears comprised two of the groups. The remaining groups contained Grade A fryers varying in size, Grade A fryers varying in color, and fryers varying in

the number of pinfeathers present on the breast. Choices of all of the panel members were influenced by size, skin color, general cleanliness, degree of bruising, and torn skin.

Although birds with cut or torn skin always were ranked below Grade A fryers, the importance of this defect apparently varied with individual panel members. Fryers without pinfeathers were preferred over those with pinfeathers.

Questionnaires were used to determine consumer ratings of broilers purchased in Tennessee (Raskopf, 1956). The questionnaires were distributed with packages of broilers sold in retail stores, and were returned by more than 3,600 families. The consumers were asked to make comments about the broilers they had purchased, and to rate the broilers as excellent, good, fair, or poor. Ratings were based upon 10 quality factors. None of the broilers used in the study were sold by U.S. grade; but, comments on the returned forms indicated that birds rated as excellent, good, fair, and poor might have been similar to U.S. Grade A, B, C, and below grade broilers, respectively. Downgrading factors arranged in order of decreasing frequency were: pinfeathers, presence of inedible or unwholesome material, poor fleshing, skin tears and bruises, discolorations, crooked or broken bones, unpleasant odor, and poor packaging.

Relation of U.S. Grade of Poultry to Cooking Losses

Although many workers have investigated factors affecting cooking losses, little information is available concerning the

relationship of cooking losses to poultry grade. Hood et al. (1955) reported that cooking losses from U.S. graded broilers were related significantly to U.S. grade. U.S. Grade A broilers and U.S. Grade B broilers downgraded either for pinfeathers or for bruising had smallest cooking losses; whereas, losses were intermediate for U.S. Grade B broilers downgraded for fleshing, and greatest for U.S. Grade C broilers. The basis for downgrading of the Grade C broilers was not specified.

Canadian workers (Maw et al., 1936) studied cooking losses for Barred Plymouth Rock roasters that were graded on the basis of finish and fleshing. The Canadian Grade A and Grade B birds had smaller total cooking losses than C Grade birds; although, the Grade A and B roasters had higher fat losses than the Grade C roasters. These investigators concluded that the smaller quantities of fat in the low grade carcasses resulted in greater moisture losses from the Grade C birds than from the roasters with more finish.

Relation of U.S. Grade of Poultry to Palatability Factors

Certain palatability factors of graded broilers were related significantly to U.S. grade in a study by Hood and others (1955). Significant differences attributable to U.S. grade were noted for tenderness and juiciness scores of roasted whole and cut-up broilers but were not observed for flavor scores or for fat content (chloroform extract) of the broilers.

Tenderness and juiciness scores of the broilers were highest for U.S. Grade A birds and for U.S. Grade B birds downgraded for bruising, intermediate for U.S. Grade B broilers downgraded for fleshing, and lowest for U.S. Grade C broilers.

Brunson (1958) produced broilers with fat contents varying between 11 and 48 per cent by feeding thiouracil and thyroprotein, with or without diethylstilbesterol injections. Broilers with large quantities of fat had slightly higher tenderness, juiciness, and flavor scores than those with small amounts of fat; but, these differences were not significant.

Edible Yield of Poultry

Homemakers are interested in the quantity of edible meat that can be obtained from the poultry they purchase. Food processors who use raw or cooked, boned turkey are interested in raw and cooked yields; whereas, poultry processors are more concerned with eviscerated yields of turkey, because this is an important factor in marketing costs (Essary et al., 1958).

Edible yields of poultry meat have been determined by many investigators; but, reported yields vary so greatly that it is difficult to make comparisons. The yield of edible meat from chickens apparently varies with the nutrition, sex, breed, age, and environment of the birds (Hafez, 1955). The effect of different rations on the yield of cooked turkey meat was investigated by Harkin et al. (1960). They found that the per cent yield of cooked light meat was slightly lower and the per cent

of separable fat slightly higher when eight per cent lard was added to the ration than when it was omitted. The amount of light meat, dark meat, fat, skin, and bone apparently were not affected by the source of protein (animal-vegetable or vegetable) or by the form in which vitamin A and D supplements were fed.

Kilpatrick and Pond (1958) suggested that U.S. Grade A poultry might have a greater amount of meat in relation to uncooked weight than lower grades of poultry. This tends to agree with results of an early study by Maw et al. (1936). When roasters graded on the basis of finish and fleshing were compared, Maw and his colleagues indicated that Canadian Grade A and B birds had larger yields of edible cooked meat than Grade C birds. The C Grade roasters also had the greatest total cooking losses.

Different results than those reported by Maw and workers (1936) were obtained by Hood et al. (1955) who worked with U.S. graded broilers. Neither edible yield nor per cent of white and dark meat were related significantly to U.S. grade. These broilers were smaller birds than those used by the Canadian workers and were U.S. graded rather than Canadian graded. Maw et al. (1936) calculated the edible cooked meat as per cent of the eviscerated weight; whereas, Hood et al. (1955) calculated the edible raw meat as per cent of the eviscerated weight.

The relationship of sex to the edible meat yield of poultry apparently is a point of disagreement, as conflicting results appear in the literature. Alexander, Schopmeyer, and Marsden

(1948) reported that within each species, young female Beltsville Small White and Broad Breasted Bronze turkeys had a larger per cent of cooked muscle than young males. Female turkey broilers also had a significantly higher yield of cooked edible meat than male broilers when edible yields were determined for Broad Breasted Bronze, Empire White, Beltsville Small White, and Medium White turkeys (Orr, Hunt, and Snyder, 1956). These same workers concluded that meat yields from mature toms and hens were not significantly different.

Swickard and Harkin (1954) who worked with Beltsville Small White fryer-roaster toms, fryer-roaster hens, and young toms also found no significant differences in the edible portions of cooked meat from these turkeys.

Gilpin et al. (1960) compared meat yields from fast growing, modern breed chickens with those from slow growing, old type chickens. In both instances, males had a greater per cent of total cooked meat and slightly more dark meat than females. The females had slightly more light meat, more fat, and more drippings than males.

Several groups of workers concluded that per cent meat yields of various kinds of poultry increased as the age of the poultry increased. When calculated as per cent of live weight, the cooked meat yield of Broad Breasted Bronze, Broad Breasted White, and Beltsville Small White turkeys was greater for 24 to 26 week old birds than for 12 or 18 to 20 week old turkeys (Scott, 1956). Similar results were obtained for meat yields

of geese (Deskins and Winter, 1956) when the cooked meat yield was calculated as per cent of the eviscerated weight. Ten to 12 week, and 24 week old geese had greater per cent yields of edible meat than did eight to 10 week old birds. Winter and Clements (1957) compared cooked edible meat yields from ready-to-cook broilers, small and large turkeys, ducks, and geese. The proportion of edible meat to inedible portions for these classes of poultry decreased in the following order: large turkeys, small turkeys, broilers, geese, and ducks.

Chicken broilers or fryers, chicken roasters, ducklings, and turkey fryer-roasters were cooked by different methods (Dawson, Gilpin, and Harkin, 1960) and the edible yields were compared. The fryer-roaster turkeys had the highest edible yield and ducklings the lowest yield. The edible meat yield of the fryer-roaster turkeys was 46 per cent of the ready-to-cook weight. The amount of ready-to-cook poultry necessary to yield one pound of edible meat was 2.2 pounds for turkeys, 2.4 pounds for chickens, and 4.5 pounds for ducklings.

In another study by the same workers (Harkin, Gilpin, and Dawson, 1960) the edible yields of roasted and braised Beltsville Small White turkeys ranged from approximately 43 to 47 per cent of the ready-to-cook weight. Similar figures were reported by Swickard and Harkin (1954) who obtained yields of 46 to 48 per cent of the ready-to-cook weight of young Beltsville Small White turkeys.

Slightly higher yields were reported by Alexander, Schopmeyer, and Marsden (1948) for female Beltsville Small White turkeys. Edible meat comprised approximately 52 per cent of the ready-to-cook weight of hens and 46 per cent of toms. Broad Breasted Bronze toms had an edible yield of 44 per cent of the ready-to-cook weight and hens, 49 per cent. Differences in the degree of separation of edible meat from the inedible portions might have accounted for some of the differences in reported edible yields.

PROCEDURE

Three U.S. grades of Broad Breasted White turkey hens were used in a study that consisted of two experiments. In Experiment I, U.S. Grade A and B turkeys were evaluated for eating quality. The U.S. Grade B turkeys in this group were downgraded for finish and fleshing. In Experiment II, the general acceptability of U.S. Grade A, B, and C turkeys was determined before and after roasting. U.S. Grade B and C turkeys were downgraded for: (1) finish and fleshing, (2) bruising, (3) cuts and tears, (4) missing parts, or (5) deformities.

Turkeys from two lots raised under similar feed and management procedures were purchased from a commercial turkey processing plant at Newton, Kansas. Forty-seven U.S. Grade A, 47 U.S. Grade B, and 18 U.S. Grade C birds were obtained. During processing the birds were stunned by electric shock, bled, sub-scalded at 143°F. for 45 seconds, mechanically picked, eviscerated,

and chilled in slush ice for approximately 24 hours. The turkeys then were graded by a United States Department of Agriculture approved grader, coded, and packaged in Cry-0-Vac bags. After the birds were frozen in an airblast freezer at -40°F ., they were stored at 0°F .. Prior to roasting all turkeys in each downgrading group were removed from commercial storage and were stored in a home freezer maintained at -20°F . in the Foods Research Laboratory at Kansas State University.

The turkeys within each of the downgrading groups were roasted, four at a time, according to an incomplete block design (Table 1). Just prior to roasting, the packaged turkeys were defrosted 15 to 20 hours at room temperatures of 71° to 88°F .. The birds were not stuffed, but the openings were closed by sewing with thread to minimize drying of the body cavity. After the turkeys were trussed, and the legs and tail of each secured by tying with string, they were placed breast-up on v-shaped racks in open pans. Thermometers were inserted at the center of the right thigh muscles, midway between the medial and lateral sides, with the bulb of the thermometers at the midpoint between the dorsal and ventral sides of the thigh muscles. The internal right thigh temperatures of all birds just prior to roasting were $10.5^{\circ} \pm 1.5^{\circ}\text{C}$.

Roasting was done in a rotary hearth gas oven maintained at 325°F ., and an end point temperature of 95°C . in the right thigh was used. The right side was defined as the side on the right when the bird was in a breast-up position with the anterior

Table 1. Design for cooking.

Downgrading groups	Cooking periods	U. S. grades
Experiment I		
Finish and fleshing	1	A A A B
	2	A B B B
	3	A A B B
	4	A A B B
Experiment II		
Finish and fleshing	5	A A B B
	6	A A B B
	7	A B B B
	8	A A A B
Bruising	9	A B B B
	10	A A B B
	11	A A B B
	12	A A A B
Cuts and tears	13	A B B B
	14	A C C C
	15	A B B C
	16	A B C C
	17	A A B C
	18	A A B C
Missing parts	19	A A A B
	20	A B B C
	21	A B C C
	22	A B C C
	23	A B B C
	24	A B C C
Deformities	25	A A B B
	26	A A B C
	27	A A B C
	28	A B B B

end nearest the worker. Dripping, volatile, and total cooking losses were determined from appropriate weights taken just before and immediately after roasting. Giblets and necks were

not included in the oven-ready and cooked weights of the turkeys.

Experiment I

Eight U.S. Grade A and eight U.S. Grade B turkeys were used in Experiment I; the latter were downgraded for finish and fleshing. The birds were roasted according to the procedure described previously; and, after roasting, the palatability of the meat was evaluated. One-half inch cubes of light meat from the center of the right pectoralis major muscles, and one-half inch squares of dark meat from the right gluteus primus muscles were used for palatability samples. Samples taken at random from each muscle were presented to the judges at each tasting period. The judges scored the meat for flavor, tenderness, juiciness, and general acceptability. A seven-point scale was used, with one representing the lowest possible score and seven the highest (Form 1, Appendix). A panel of six scored light meat samples, and another panel of six scored dark meat.

Shear values for one-inch cores from the anterior end of the right pectoralis major muscle were determined in quadruplicate on the Warner-Bratzler shearing apparatus. On the day following roasting, press fluid yields were determined on samples of ground meat from the right pectoralis major muscles. Duplicate determinations were made on the Carver Laboratory Press according to the method described by Hay (1952).

Experiment II

U.S. Grade A, B, and C turkeys were used in Experiment II. The number of birds in each grade and downgrading group are shown in Table 2.

Table 2. Number of U.S. graded turkeys in each group used in Experiment II.

Downgrading groups	A	B	C
Finish and fleshing	8	8	---
Bruising	8	8	---
Cuts and tears	8	8	8
Missing parts	8	8	8
Deformities	7	7	2

The general acceptability of each turkey was judged by a panel who were asked to indicate whether or not they would purchase the uncooked birds or serve the roasted birds (Forms 2 and 3, Appendix). The general appearance of the turkeys also was scored prior to and following roasting. If the turkeys were not judged as "very desirable" (seven points), the panel members checked reasons for giving lower scores (Forms 2 and 3, Appendix).

The defrosted, unwrapped turkeys and the roasted turkeys were presented to the judges (three men and 16 women) in random order, against a neutral background, and under uniform lighting conditions. The turkeys were roasted according to the method previously described and judged just before and shortly after roasting.

A panel of three judged the uncarved turkeys for over-all doneness shortly after the birds were removed from the oven. Doneness scores were based on a seven-point scale with four representing optimum doneness, smaller numbers underdoneness, and larger numbers overdoneness.

Edible meat was stripped from each carcass and was classified as light or dark meat. The light meat then was subdivided into breast, wing, and back (from the base of the neck to the end of the ribs) as shown in Plates I and II; and, the dark meat into thigh, drumstick, and posterior portion of the back as shown in Plates II and III. The breast meat was removed without separating the pectoralis major and the pectoralis secundus muscles. Tendons were pulled from the drumsticks, and thigh meat was removed in one piece. After edible portions had been removed, the total weight of the inedible portions (bones, skin, tendons, and separable fat) was determined. The edible cooked meat then was placed in a pan, covered with aluminum foil, and refrigerated overnight.

On the day following roasting, the meat from each part of the carcass was weighed, and the number of 71-gram (two and one-half ounces) servings from each sub-division was determined (Form 4, Appendix). If the final serving from any section was 71 ± 5 grams, it was considered as one serving.

Breast and thigh meat was sliced one-eighth inch thick (12/75 setting) on a Toledo slicer, Model Number 5400. A two-inch piece was removed from the anterior end of the breast and

EXPLANATION OF PLATE I

Top. Sliced breast meat.

Bottom. Boned whole breast.

PLATE I



EXPLANATION OF PLATE II

Top. Dark meat.

Left. Meat from posterior portion of
back.

Right. Boned drumstick meat.

Bottom. Light meat.

Left. Meat from the back.

Right. Boned wing meat.

PLATE II

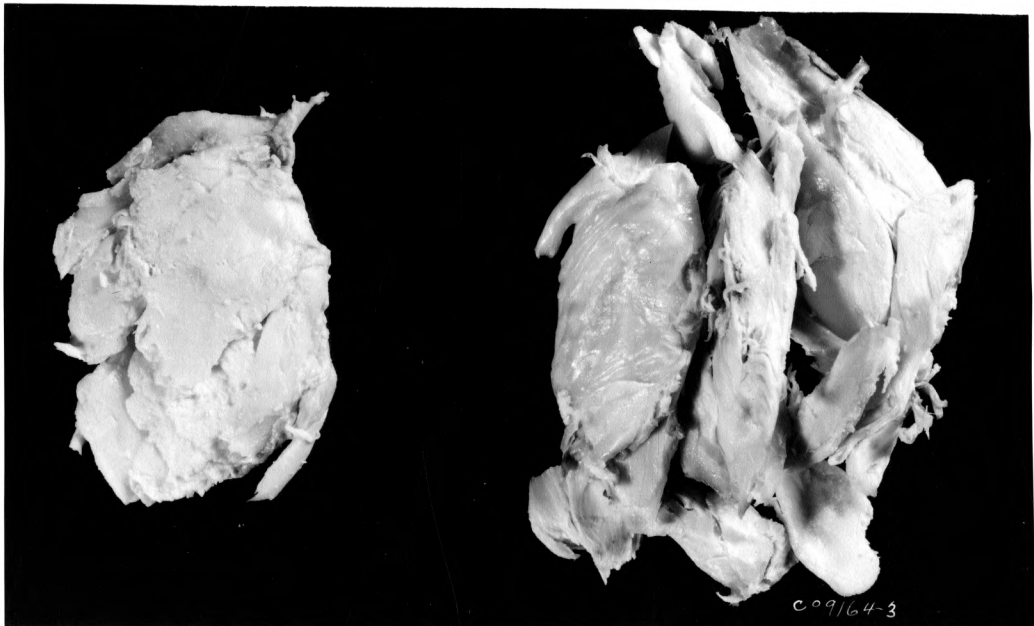
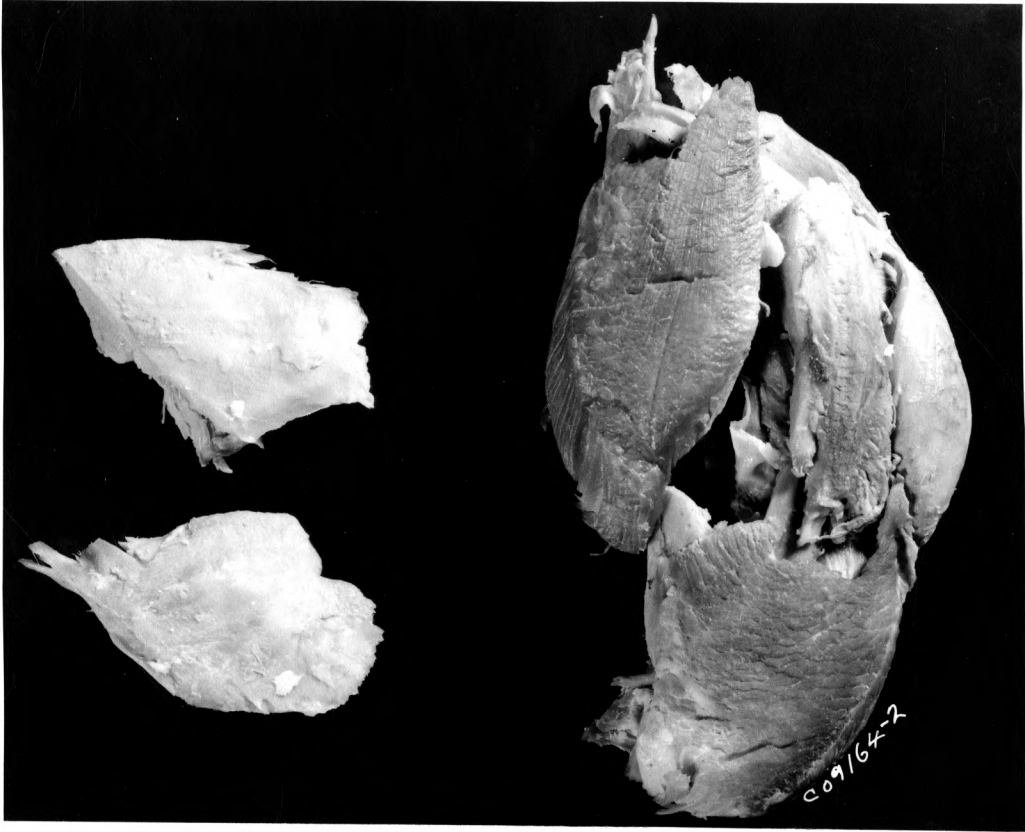
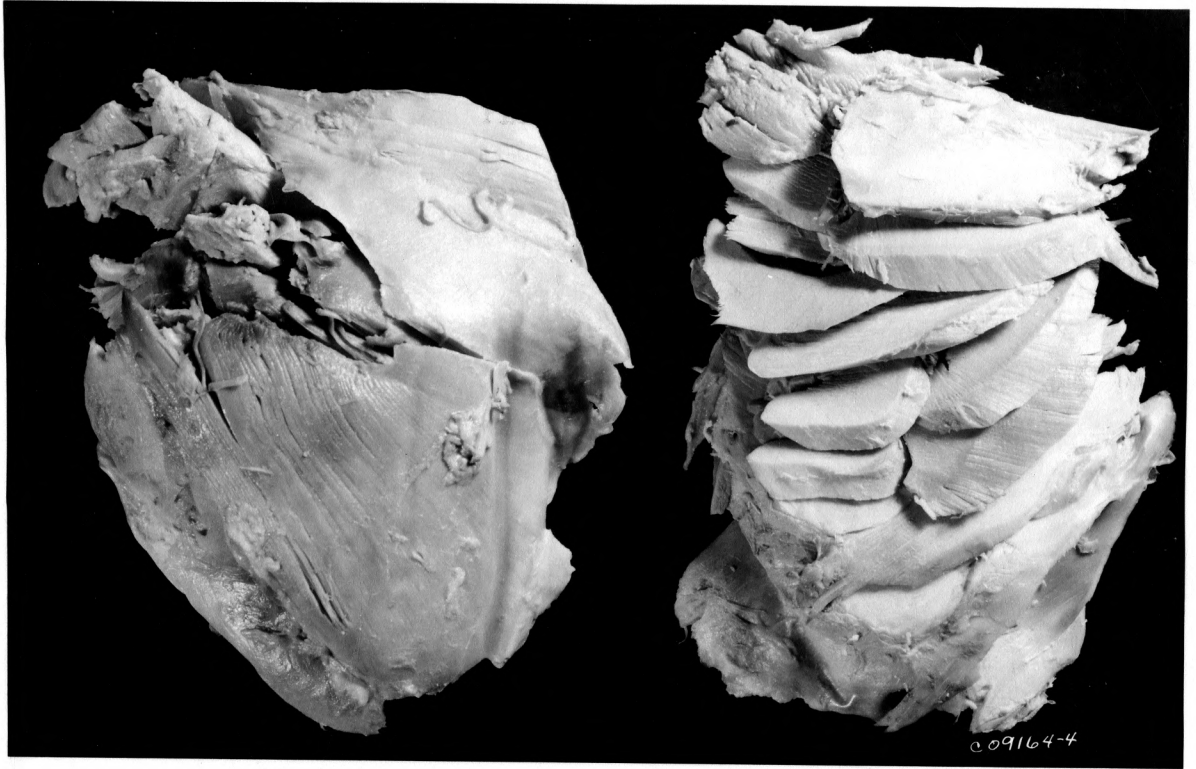


PLATE III



was sliced with the grain. The remaining triangular-shaped piece was sliced beginning at the keel bone edge of the triangle. The thigh meat was sliced with the grain of the gluteus primus muscle.

The weights of the edible cooked meat from each subdivision of the carcass and the weights of the total light meat, the total dark meat, and the total cooked, boned meat were calculated as the percentages of oven-ready and of cooked turkey. The number of 71-gram servings of edible cooked meat per pound of oven-ready and of cooked turkey also was determined.

Statistical Analyses

The t-test and analyses of variance were used to determine differences attributable to U.S. grade. Data were analyzed within each downgrading group. The t-test was used to analyze data for groups containing only two U.S. grades of turkeys. Analyses of variance were run on data for those groups containing U.S. Grade A, B, and C birds. Least significant differences were calculated, when appropriate, for data from groups in which all three U.S. grades of turkeys were represented.

Experiment I. The t-test was used to determine if differences attributable to U.S. grade existed for press fluid yields, shear values, palatability scores, cooking losses, and cooking time in minutes per pound. Palatability scores included flavor, juiciness, tenderness, and general acceptability scores for light meat (pectoralis major) and for dark meat (gluteus primus).

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Experiment I. The t-test was used to determine if differences attributable to U.S. grade existed for press fluid yields, shear values, palatability scores, cooking losses, and cooking time in minutes per pound. Palatability scores included flavor, juiciness, tenderness, and general acceptability scores for light meat (pectoralis major) and for dark meat (gluteus primus).

These data for light and dark meat were analyzed separately. Data for cooking losses and cooking time were combined with those for the finish and fleshing group in Experiment II.

Correlation coefficients (r values) were computed for shear values for the pectoralis major and tenderness scores for light meat, press fluid yields for the pectoralis major and juiciness scores for light meat, press fluid yields for the pectoralis major and dripping losses, press fluid yields for the pectoralis major and total cooking losses, juiciness scores for light meat and dripping losses, and juiciness scores for light meat and total cooking losses.

Experiment II. Analyses of variance or the t-test were run for volatile losses, dripping losses, total cooking losses, cooking time in minutes per pound, doneness scores, general appearance scores before and after roasting, percentages of edible meat calculated as per cent of oven-ready and of cooked turkey, and the number of 71-gram servings per pound of oven-ready and of cooked turkey. Least significant differences were calculated when appropriate.

Correlation coefficients (r values) for cooking time in minutes per pound and doneness scores were determined for each U.S. grade of turkeys within each downgrading group. Correlation coefficients also were calculated for cooking time in minutes per pound and doneness scores for each U.S. grade of turkeys. Data for all groups except those in the finish and fleshing group were pooled for these calculations. Lastly, data for all turkeys,

except for those in the finish and fleshing group, from all U.S. grades were regarded as one group, and the r value again was computed for cooking time in minutes per pound and doneness scores.

RESULTS AND DISCUSSION

Various subjective and objective measurements were obtained for U.S. Grade A, B, and C turkeys. The latter two U.S. grades included birds that were downgraded for finish and fleshing, bruising, cuts and tears, missing parts, or deformities. Minimum requirements and maximum defects permitted for each U.S. grade of ready-to-cook turkeys were described by Kilpatrick and Pond (1958) and by Johndrew et al. (1959).

Values for palatability, doneness, and general appearance scores that appear in the tables in this section are averages of mean scores for all turkeys in each downgrading group.

Experiment I

Palatability scores, shear values, press fluid yields, cooking time in minutes per pound, and cooking losses were determined for U.S. Grade A turkeys and for U.S. Grade B turkeys downgraded on the basis of finish and fleshing. Light meat samples were from the pectoralis major muscles, and dark meat samples from the gluteus primus muscles.

Data for cooking times and volatile, dripping, and total cooking losses for turkeys in this experiment were combined with

those for birds in the finish and fleshing group of Experiment II. Cooking losses are discussed in Experiment I and cooking times in Experiment II.

Palatability Scores. Flavor, juiciness, tenderness, and general acceptability scores for light and dark meat were unrelated to U.S. grade (Table 3). Tenderness and general acceptability scores were similar for light and dark meat for both U.S. Grade A and U.S. Grade B turkeys.

Table 3. Mean palatability scores¹, shear values, and press fluid yields for U.S. graded turkey hens in Experiment I.

Measurement	A (8)	B (8)
Light meat (pectoralis major)		
Flavor scores	5.6	5.8
Juiciness scores	4.6	4.8
Tenderness scores	5.7	5.6
General acceptability scores	5.3	5.4
Shear values, lbs.	11.1	9.2
Press fluid yields, ml.	7.3	7.4
Dark meat (gluteus primus)		
Flavor scores	5.4	5.6
Juiciness scores	5.2	5.4
Tenderness scores	5.6	5.8
General acceptability scores	5.4	5.4

¹Possible score of 7 points.
Numbers in parentheses indicate the total number of birds in each U.S. grade.

Different results were reported by Hood et al. (1955) who noted that U.S. Grade A broilers had greater tenderness and juiciness scores than did U.S. Grade B broilers downgraded for fleshing.

Shear Values, Press Fluid Yields, and Cooking Losses.

Shear values for one-inch cores from the pectoralis major muscle and press fluid yields from the same muscle were not related to U.S. grade (Table 3). Differences attributable to U.S. grade were noted for total and volatile cooking losses (Table 4). U.S. Grade B turkeys had greater volatile ($P < .01$) and total ($P < .05$) cooking losses than U.S. Grade A birds. The U.S. Grade A birds had greater dripping losses than the U.S. Grade B turkeys, but this difference was not significant.

Hood et al. (1955), working with broilers rather than turkeys, noted that cooking losses for U.S. Grade A broilers were similar to those for U.S. Grade B broilers that were downgraded for fleshing. Differences in the results of subjective and objective tests conducted during the two studies might be attributed to differences in the type, breed, age, and size of poultry.

Few significant correlation coefficients were obtained when relationships between objective and subjective tests were analyzed (Table 20, Appendix). Although cooking losses were combined with those for birds from the finish and fleshing group in Experiment II for other analyses, only data from Experiment I were included when r values were determined. Correlation coefficients for press fluid yields for the pectoralis major and juiciness scores of light meat, dripping losses, or total cooking losses were nonsignificant for both U.S. Grade A and U.S. Grade B turkeys.

Table 4. Mean cooking losses, cooking time, doneness¹ and general appearance² scores, per cent edible cooked meat, and other data for U.S. graded turkeys in the finish and fleshing group, Experiment II.

Measurements	A (8)		B (8)
Cooking losses ³ , per cent			
Total	18.9	*	22.1
Volatile	14.0	**	17.3
Dripping	4.8	ns	4.3
Cooking time, min./lb.	18.4	**	21.6
Doneness scores	4.1	***	5.0
General appearance scores			
Before roasting	6.4	**	5.2
After roasting	6.1	**	4.4
Number of turkeys the majority of judges would purchase	8		6
Number of turkeys the majority of judges would serve	8		7
Factors checked ⁴ when general appearance of turkeys was scored less than 7, before roasting			
Finish and fleshing	10		50
Discoloration	12		34
Torn or missing skin	4		40
Shape	8		36
Factors checked ⁴ when general appearance of turkeys was scored less than 7, after roasting			
Color	18		80
Finish and fleshing	24		49
Discoloration	8		24
Edible cooked meat calculated as per cent of oven-ready turkey			
Light meat	23.2	*	21.1
Dark meat	14.7	**	13.3
Total meat	37.9	*	34.4
Servings (71-g. edible cooked meat) per pound of oven-ready turkey	2.0	ns	1.8

¹Doneness scores based on a 7-point scale with 4 representing optimum doneness, smaller numbers underdoneness, and larger numbers overdoneness.

²Possible score of 7 points.

³Cooking losses and cooking time data also include those for Experiment I.

⁴Represents the total number of times each factor was checked.

Numbers in parentheses indicate the total number of birds in each U.S. grade.

ns Nonsignificant.

* Significant at the 5% level.

** Significant at the 1% level.

*** Significant at the 0.1% level.

U.S. Grade A turkeys had a significant ($P < .05$) r value ($r = -.728$) for juiciness scores for light meat and dripping losses; but, the correlation coefficient ($r = -.584$) for juiciness scores for light meat and total cooking losses was non-significant. Conversely, the correlation coefficient ($r = -.711$) for juiciness scores for light meat and total cooking losses for U.S. Grade B turkeys was significant at the five per cent level; whereas, dripping losses were unrelated to juiciness scores for light meat ($r = -.358$).

Correlation coefficients for tenderness scores for light meat and shear values for the pectoralis major were nonsignificant for both U.S. grades.

Experiment II

U.S. graded turkeys from five downgrading groups were scored for general appearance before and after roasting and also for doneness. The per cent of edible cooked meat calculated on the basis of oven-ready turkey, and the number of 71-gram servings of edible cooked meat per pound of oven-ready turkey also were determined.

Numbers that appear in the tables under "factors checked for scoring less than seven points" are tabulations of the number of times each was checked. Only those factors checked most frequently are included in the tables.

Finish and Fleshing Group. Most data that were analyzed statistically for turkeys in the finish and fleshing group were

related to U.S. grade (Table 4). The relationships of cooking losses to U.S. grade for turkeys in this group and in Experiment I were discussed previously. Significant differences in cooking losses attributable to U.S. grade were obtained only for turkeys in this group. It is possible that cooking losses for U.S. graded turkeys in each of the downgrading groups were related more to cooking time in minutes per pound than to U.S. grade. Correlation coefficients for these data were not determined, but cooking losses tended to increase as cooking time in minutes per pound increased.

The cooking time in minutes per pound was significantly longer ($P < .01$) for U.S. Grade B than for U.S. Grade A turkeys, even though the end point temperatures were the same. A significant difference in doneness also existed between the two grades of turkeys. Higher ($P < .001$) doneness scores were noted for U.S. Grade B than for U.S. Grade A birds. Doneness scores were based on a seven-point scale with four representing optimum doneness, smaller numbers underdoneness, and larger numbers overdone. The U.S. Grade B turkeys had a mean doneness score of 5.0 and were considered slightly overdone. Doneness scores increased as cooking times increased; however, r values for these data for both U.S. Grade A and U.S. Grade B turkeys were nonsignificant (Table 20, Appendix).

General appearance scores were significantly higher ($P < .01$) for the U.S. Grade A than for the U.S. Grade B turkeys. Although general appearance scores decreased with roasting for both U.S.

grades, a greater difference was noted between the before and after roasting scores for the U.S. Grade B than for the U.S. Grade A birds. This difference might be related to the greater degree of doneness, greater total cooking losses, and longer cooking time for the U.S. Grade B turkeys that were discussed previously.

A more desirable general appearance was noted by Marsden et al. (1952) for turkeys with more finish than for those with smaller amounts of finish. Broad Breasted Bronze, Beltsville Small White, White Holland, and Standardbred Bronze turkeys were used by Marsden and co-workers (1952).

Finish and fleshing apparently was the most important factor affecting the general appearance scores before roasting, as it was checked the greatest number of times. Color of the U.S. Grade B turkeys was the primary factor checked as a reason for scoring the general appearance of the roasted birds as less than seven. Several judges commented that they objected to the dark brown color of the skin over the breast cavities of the turkeys. The importance placed upon color might be attributed to the overdone appearance of the U.S. Grade B turkeys. The majority of judges indicated that they would purchase and serve all of the U.S. Grade A turkeys and three-fourths or more of the U.S. Grade B turkeys.

The per cent of edible cooked meat was significantly greater for light meat ($P < .05$), dark meat ($P < .01$) and total meat ($P < .05$) from U.S. Grade A turkeys than from U.S. Grade B turkeys.

The number of servings per pound were similar for both U.S. grades. These results are similar to those reported by Maw et al. (1936) who compared meat yields from Canadian Grade A, B, and C roasters that were graded on the basis of finish and fleshing. These workers noted that the per cent of edible, cooked meat was greatest for Grade A roasters, intermediate for Grade B roasters, and least for Grade C roasters.

Bruising Group. Bruising is associated with discolorations of the skin and flesh, and was unrelated to cooking losses, cooking time, doneness, per cent of edible cooked meat, and number of servings per pound (Table 5). Cooking time and doneness scores for U.S. Grade B turkeys were correlated positively, and the r value ($r = .771$) for these data was significant. The correlation coefficient ($r = .648$) for cooking time and doneness scores for U.S. Grade A turkeys was nonsignificant.

Roasting apparently obscured some of the differences between U.S. grades of turkeys as general appearance scores for U.S. Grade A birds decreased with roasting and those for U.S. Grade B turkeys increased. General appearance scores for the U.S. Grade A turkeys were greater than those for the U.S. Grade B turkeys, both before ($P < .001$) and after ($P < .05$) roasting.

Discoloration was checked most often as a reason for scoring the general appearance of the U.S. Grade B turkeys as less than optimum (seven points). This was true both before and after roasting. Color was an important factor affecting the after roasting scores of both U.S. grades of turkeys. The majority

Table 5. Mean cooking losses, cooking time, doneness¹ and general appearance² scores, per cent edible cooked meat, and other data for U.S. graded turkeys in the bruising group, Experiment II.

Measurements	: A		B
	: (8)		(8)
Cooking losses, per cent			
Total	18.0	ns	18.8
Volatile	12.9	ns	13.3
Dripping	4.9	ns	5.3
Cooking time, min./lb.	17.1	ns	16.6
Doneness scores	4.1	ns	4.2
General appearance scores			
Before roasting	6.4	***	4.9
After roasting	6.0	*	5.3
Number of turkeys the majority of judges would purchase	8		7
Number of turkeys the majority of judges would serve	8		7
Factors checked ³ when general appearance of turkeys was scored less than 7, before roasting			
Finish and fleshing	18		19
Missing parts	37		13
Discoloration	24		78
Torn or missing skin	1		40
Factors checked ³ when general appearance of turkeys was scored less than 7, after roasting			
Color	37		45
Finish and fleshing	25		16
Missing parts	27		8
Discoloration	10		58
Torn or missing skin	0		30
Edible cooked meat calculated as per cent of oven-ready turkey			
Light meat	23.7	ns	23.5
Dark meat	14.9	ns	14.3
Total meat	38.6	ns	37.8
Servings (71-g. edible cooked meat) per pound of oven-ready turkey	2.1	ns	2.1

¹Doneness scores based on a 7-point scale with 4 representing optimum doneness, smaller numbers underdoneness, and larger numbers overdoneness.

²Possible score of 7 points.

³Represents the total number of times each factor was checked.

Numbers in parentheses indicate the total number of birds in each U.S. grade.

ns Nonsignificant.

* Significant at the 5% level.

*** Significant at the 0.1% level.

of judges indicated that they would purchase and serve all of the U.S. Grade A turkeys and all but one of the U.S. Grade B turkeys.

Cuts and Tears Group. Cooking losses, cooking time, doneness, per cent of edible cooked meat, and number of servings per pound were similar for the three U.S. grades of turkeys in the cuts and tears group (Table 6). Doneness scores were correlated positively with cooking time in minutes per pound for U.S. Grade B ($r = .938$) and C ($r = .708$) turkeys. The correlation coefficients for these data were significant ($P < .05$) for U.S. Grade B and C birds; but, a low nonsignificant r value ($r = .031$) was obtained for these two factors for U.S. Grade A turkeys.

General appearance scores were related ($P < .001$) to U.S. grade, both before and after roasting; and, these scores decreased ($P < .05$) as the U.S. grade of turkeys decreased in quality. The mean general appearance scores for U.S. Grade B and C birds improved slightly with roasting; whereas, the mean score for the U.S. Grade A turkeys decreased slightly. Torn or missing skin was the factor checked most often when the general appearance before and after roasting was not considered as "very desirable" (seven points). The majority of judges would purchase and serve all of the U.S. Grade A and B turkeys. They would purchase less than one-half of the U.S. Grade C turkeys; although, they indicated that they would serve all but one of these birds.

Missing Parts Group. Few data for turkeys in this group were related to U.S. grade (Table 7). Nonsignificant F values

Table 6. Mean cooking losses, cooking time, doneness¹ and general appearance² scores, per cent edible cooked meat, and other data for U.S. graded turkeys in the cuts and tears group, Experiment II.

Measurements	:Significance:		A (8)	B (8)	C (8)
	:of F value	: Lsd ³ :			
Cooking losses, per cent					
Total	ns	---	24.0	21.1	23.8
Volatile	ns	---	18.0	16.1	18.9
Dripping	ns	---	5.8	4.7	4.7
Cooking time, min./lb.	ns	---	21.5	20.4	21.4
Doneness scores	ns	---	4.5	4.3	4.5
General appearance scores					
Before roasting	***	0.4	6.6	5.4	3.7
After roasting	***	0.5	6.2	5.6	4.1
Number of turkeys the majority of judges would purchase			8	8	3
Number of turkeys the majority of judges would serve			8	8	7
Factors checked ⁴ when the general appearance of turkeys was scored less than 7, before roasting					
Finish and fleshing			19	22	40
Torn or missing skin			1	93	118
Factors checked ⁴ when the general appearance of turkeys was scored less than 7, after roasting					
Color			30	22	23
Finish and fleshing			17	26	37
Discoloration			19	19	21
Torn or missing skin			12	50	90
Edible cooked meat calculated as per cent of oven-ready turkey					
Light meat	ns	---	22.2	22.5	21.6
Dark meat	ns	---	13.9	14.1	13.8
Total meat	ns	---	36.1	36.5	35.4
Servings (71-g. edible cooked meat) per pound of oven-ready turkey	ns	---	1.9	1.9	1.8

¹Doneness scores based on a 7-point scale with 4 representing optimum doneness, smaller numbers underdoneness, and larger numbers overdoneness.

²Possible score of 7 points.

³Least significant difference at the 5% level.

⁴Represents the total number of times each factor was checked.

Numbers in parentheses indicate the total number of birds in each U.S. grade.

ns Nonsignificant.

*** Significant at the 0.1% level.

Table 7. Mean cooking losses, cooking time, doneness¹ and general appearance² scores, per cent edible cooked meat, and other data for U.S. graded turkeys in the missing parts group, Experiment II.

Measurements	:Significance: :of F value	: Lsd ³ :	A (8)	B (8)	C (8)
Cooking losses, per cent					
Total	ns	---	21.6	19.9	21.0
Volatile	ns	---	15.6	14.9	16.5
Dripping	ns	---	5.8	4.8	4.3
Cooking time, min./lb.	ns	---	18.9	18.6	19.8
Doneness scores	ns	---	4.1	3.8	4.0
General appearance scores					
Before roasting	***	0.5	6.2	5.0	3.9
After roasting	***	0.5	6.1	5.2	4.2
Number of turkeys the majority of judges would purchase			8	8	6
Number of turkeys the majority of judges would serve			8	8	7
Factors checked ⁴ when general appearance of turkeys was scored less than 7, before roasting					
Finish and fleshing			14	14	42
Missing parts			31	106	110
Torn or missing skin			1	16	33
Factors checked ⁴ when general appearance of turkeys was scored less than 7, after roasting					
Finish and fleshing			20	23	36
Missing parts			24	72	88
Edible cooked meat calculated as per cent of oven-ready turkey					
Light meat	ns	---	22.6	23.0	22.8
Dark meat	*	1.2	13.9	14.8	15.7
Total meat	ns	---	36.4	37.8	38.4
Servings (71-g. edible cooked meat) per pound of oven-ready turkey	ns	---	2.0	2.1	2.0

¹Doneness scores based on a 7-point scale with 4 representing optimum doneness, smaller numbers underdoneness, and larger numbers overdoneness.

²Possible score of 7 points.

³Least significant difference at the 5% level.

⁴Represents the total number of times each factor was checked.

Numbers in parentheses indicate the total number of birds in each U.S. grade.

ns Nonsignificant.

* Significant at the 5% level.

*** Significant at the 0.1% level.

were obtained for cooking losses, cooking time, doneness scores, per cent light meat, per cent total meat, and number of servings per pound. Low nonsignificant correlation coefficients were noted for cooking time and doneness scores for the three U.S. grades of turkeys (Table 20, Appendix).

Mean general appearance scores were highest for U.S. Grade A turkeys, both before and after roasting. Scores were intermediate for the U.S. Grade B turkeys, and lowest for the U.S. Grade C birds. F values for these scores were very highly significant. The majority of judges indicated that they would purchase and serve all of the U.S. Grade A and B turkeys in this group. They would purchase three-fourths of the U.S. Grade C turkeys and serve all but one.

Missing parts was the primary reason for giving lower scores when the general appearance before and after roasting was considered as less than "very desirable" (seven points). Finish and fleshing, and torn or missing skin also affected the general appearance scores. These might have been associated with the missing parts; as, some turkeys had torn skin around the missing areas; and, in others, part of the breast muscle was cut away with the wing.

According to U.S.D.A. quality standards for ready-to-cook turkeys (Johndrew et al., 1959), A Quality turkeys may have missing wing tips; B Quality turkeys may have missing second wing joints and missing tails; and, C Quality turkeys may have missing wings and tails. Throughout the present study several judges

objected to the missing wing tips in the U.S. Grade A turkeys. They indicated that this characteristic detracted from the general appearance of the birds and might cause difficulty when trussing the birds. Many of the judges objected to the U.S. Grade B and C turkeys in this group for the same reasons. It is possible that the judges became accustomed to the missing wing tips in the U.S. Grade A birds as this factor was checked less frequently during the latter part of the study than at the first. Also, some judges commented that they did not object so strongly to the missing wing tips after a period of time as they did at the beginning of the study.

The per cent edible yield of dark meat was related to U.S. grade ($P < .05$); however, differences in the per cent of total edible meat were nonsignificant. U.S. Grade A and B turkeys had similar amounts of dark meat; but, U.S. Grade C turkeys had significantly more dark meat than the U.S. Grade A birds. Occasionally wings were missing from the U.S. Grade C turkeys in this group. This might account for the difference in proportion of dark to light meat, as wing meat was classified as light meat. In this group, as in the cuts and tears group, the number of servings per pound was similar for all three U.S. grades of birds.

Deformities Group. Differences attributable to U.S. grade for turkeys in this downgrading group were significant only for general appearance scores before roasting, and for edible yields of dark meat and of total meat (Table 8). Because only two U.S.

Table 8. Mean cooking losses, cooking time, doneness¹ and general appearance² scores, per cent edible cooked meat, and other data for U.S. graded turkeys in the deformities group, Experiment II.

Measurements	: Signifi- : cance of : F value	: Lsd ³ : (7,2)	: A : (7)	B (7)	C (2)
Cooking losses, per cent					
Total			22.0	ns	19.4
Volatile			16.3	ns	15.3
Dripping			5.5	ns	4.0
Cooking time, min./lb.			19.3	ns	18.3
Doneness scores			4.0	ns	4.1
General appearance scores					
Before roasting			6.5	***	5.2
After roasting			6.1	ns	5.8
Number of turkeys the majority of judges would purchase			7		6 0
Number of turkeys the majority of judges would serve			7		7 1
Factors checked ⁴ when general appearance of turkeys was scored less than 7, before roasting					
Shape			11		49 23
Finish and fleshing			14		15 17
Missing parts			11		31 4
Factors checked ⁴ when general appearance of turkeys was scored less than 7, after roasting					
Color			21		23 8
Shape			11		33 17
Finish and fleshing			23		26 14
Edible cooked meat calculated as per cent of oven-ready turkey					
Light meat	---	---	23.4		24.1 21.6
Dark meat	*	1.6	14.9		15.1 12.8
Total meat	*	3.5	38.3		39.1 34.5
Servings (71-g. edible cooked meat) per pound of oven-ready turkey	---	---	2.1		2.1 1.8

¹Doneness scores based on a 7-point scale with 4 representing optimum doneness, smaller numbers underdoneness, and larger numbers overdoneness.

²Possible score of 7 points.

³Least significant difference at the 5% level.

⁴Represents the total number of times each factor was checked.

Numbers in parentheses indicate the total number of birds in each U.S. grade.

ns Nonsignificant.

*** Significant at the 0.1% level.

Grade C turkeys were included in this group, data for these birds were omitted when cooking losses, cooking time, doneness scores, and general appearance scores were compared. Correlation coefficients for cooking time and doneness scores were non-significant (Table 20, Appendix).

General appearance scores before roasting were greater ($P < .001$) for U.S. Grade A turkeys than for U.S. Grade B turkeys; but, general appearance scores after roasting were not appreciably different. This differed from previous results as after roasting scores were related to U.S. grade in all other downgrading groups. Shape was checked most often as a reason for scoring the general appearance of U.S. Grade B and C turkeys as less than seven. The majority of the panel members indicated that they would purchase all U.S. Grade A turkeys and all but one U.S. Grade B bird; and, they would serve all of these turkeys. The judges would not purchase either of the U.S. Grade C turkeys, but would serve one of the birds. The U.S. Grade A and B turkeys had greater amounts ($P < .05$) of dark meat and total meat than the U.S. Grade C turkeys; but, differences in the number of servings per pound were nonsignificant.

Cooking Time vs. Doneness Scores. Most correlation coefficients for cooking time and doneness scores for each U.S. grade of turkeys within each downgrading group were nonsignificant (Table 20, Appendix). When correlation coefficients for cooking time in minutes per pound and doneness scores were determined for each U.S. grade of turkeys, the r value was significant for

U.S. Grade A turkeys ($r = .408$), highly significant for U.S. Grade B turkeys ($r = .471$), and nonsignificant for U.S. Grade C turkeys ($r = .448$). This indicated that increased cooking times for U.S. Grade A and B turkeys resulted in a greater degree of doneness even though end point temperatures were the same. Data for turkeys in the finish and fleshing group were not included when cooking times and doneness scores were pooled. A significant ($P < .001$) r value ($r = .453$) also was obtained when data for all turkeys, except for those in the finish and fleshing group, from all U.S. grades were regarded as one group. It was noted that these correlation coefficient values were low and of little practical importance, even though significant.

Edible Yield and Servings Per Pound. The edible yields for turkeys in all downgrading groups ranged from 21.1 to 24.1 per cent, 12.8 to 15.7 per cent, and 34.4 to 39.1 per cent of the oven-ready weight for light meat, dark meat, and total meat, respectively (Tables 4-8). Light meat comprised approximately 60 per cent, and dark meat approximately 40 per cent of the total edible meat. Approximately 2.6 to 3.0 pounds of oven-ready turkey were needed to yield one pound of edible cooked meat.

U.S. Grade A turkeys in the finish and fleshing group had significantly more light, dark, and total meat than did U.S. Grade B turkeys in the same group. This might be attributed to the greater cooking losses for the U.S. Grade B than for the U.S. Grade A birds. U.S. Grade C turkeys in the missing parts

group had a greater per cent yield of dark meat than U.S. Grade A turkeys. A possible explanation for this difference was discussed previously. The per cent yields of edible meat were similar for U.S. Grade A and B turkeys in the deformities group; but, the U.S. Grade A turkeys had significantly more dark meat and total meat than the U.S. Grade C birds. The small sample size of the U.S. Grade C turkeys (two birds) might account for this difference.

The number of servings were unrelated to U.S. grade. The number of 71-gram (two and one-half ounces) servings of edible cooked meat per pound of oven-ready turkey for birds in all downgrading groups ranged from 1.8 to 2.1 servings. Only slices or portions of slices that made attractive servings were used for these calculations; although, small pieces of meat were left that could be used for other purposes than sliced roast turkey.

SUMMARY

Three U.S. grades of Broad Breasted White turkey hens were used in a study that consisted of two experiments. In Experiment I, U.S. Grade A and B turkeys were evaluated for eating quality. The U.S. Grade B turkeys in this group were downgraded for finish and fleshing. In Experiment II, the general acceptability of U.S. Grade A, B, and C turkeys was determined before and after roasting. U.S. Grade B and C turkeys in this experiment were downgraded for (1) finish and fleshing, (2) bruising, (3) cuts and tears, (4) missing parts, or (5) deformities.

Flavor, juiciness, tenderness, and general acceptability scores for light and dark meat of U.S. Grade A and B turkeys in Experiment I were unrelated to U.S. grade. Shear values and press fluid yields for light meat were similar for both U.S. grades of turkeys in this experiment.

Greater volatile and total cooking losses, higher doneness scores, and smaller per cent yields of light, dark, and total meat were noted for U.S. Grade B than for U.S. Grade A turkeys in the finish and fleshing group. Although end point temperatures were the same, unexplainable differences in cooking times in minutes per pound were noted for these two U.S. grades of turkeys; and, differences in cooking losses and per cent edible yield were attributed to the longer cooking time in minutes per pound for the U.S. Grade B than for the U.S. Grade A turkeys. Cooking losses, cooking time in minutes per pound, and doneness scores for U.S. graded turkeys in the bruising, cuts and tears, missing parts, and deformities groups were unrelated to the U.S. grade.

General appearance scores for oven-ready and roasted turkeys were related significantly to U.S. grade in all comparisons but one. Differences attributable to U.S. grade were greater when the turkeys were scored before roasting than after roasting. This indicated that some of the differences among the graded turkeys might have been obscured by roasting. The judges preferred the U.S. Grade A turkeys to either the U.S. Grade B or C turkeys both before and after roasting. The primary cause for

downgrading generally was the factor that received the greatest number of checks when reasons for considering a bird as less than "very desirable" (seven points) were determined. Color of the roasted turkeys apparently was an important factor in determining the general appearance scores of the roasted turkeys. In most instances, the majority of judges would purchase and serve most of the downgraded turkeys even though they were aware of the defects that were present.

The yields of total edible meat for turkeys in all downgrading groups ranged from 34.4 to 39.1 per cent of the oven-ready weight. Light meat comprised approximately 60 per cent of the edible meat, and dark meat approximately 40 per cent. The number of 71-gram servings of edible cooked meat per pound of oven-ready turkey was similar for all U.S. grades of birds in each of the five downgrading groups, and ranged from 1.8 to 2.1 servings per pound.

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APPENDIX

Form 1. Score card for turkey.

Light meat

Dark meat

Name _____

Date _____

Eating quality

Sample	Flavor	Juiciness	Tenderness	General acceptability
1				
2				
3				
4				

Descriptive terms for flavor, juiciness, and tenderness:

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

Comments:

Form 2. Score card for turkey.

General appearance - before roasting

Name _____

Date _____

	Sample number			
	1	2	3	4
General appearance				
Would you purchase this turkey?*				
Yes				
No				
Check reasons for not scoring very desirable or for not purchasing the turkey:				
Color				
Shape				
Finish and fleshing				
Missing parts				
Discoloration				
Torn or missing skin				
Other (list)				

Descriptive terms for scoring
general appearance:

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

* Consider ONLY the
general appearance

Comments:

Form 3. Score card for turkey

General appearance - after roasting

Name _____

Date _____

	Sample number			
	1	2	3	4
General appearance				
Would you serve this turkey at a meal?*				
Yes				
No				
Check reasons for not scoring very desirable or for not serving the turkey:				
Color				
Shape				
Finish and fleshing				
Missing parts				
Discoloration				
Torn or missing skin				
Other (list)				

Descriptive terms for scoring general appearance:

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

*Consider ONLY the general appearance

Comments:

Form 5. Weight losses of roasted whole turkeys before and after cooking.

I. Losses by weight - grams.

A. Weights before roasting.

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

B. Weights after roasting.

1. Weight of pan, rack, thermometer, bird, and drippings.
2. Weight of pan, rack, thermometer, and drippings.
3. Volatile loss (A3 - B1).
4. Dripping loss (B2 - A2).
5. Weight of bird and platter.
6. Weight of platter.
7. Weight of roasted bird (B5 - B6).
8. Total cooking loss (A1 - B7).

II. Losses as per cent of weight - per cent.

- A. Volatile loss (B3/A1).
- B. Dripping loss (B4/A1).
- C. Total cooking loss (B8/A1).

Factors Analyzed by Either T-Tests or Analyses of Variance,
and Relationships Tested for Correlation Coefficients

Experiment I

A. Differences between U.S. Grade A and Grade B turkeys
(t-test)

1. Shear values
2. Total press fluid yields
3. Flavor scores, pectoralis major
4. Juiciness scores, pectoralis major
5. Tenderness scores, pectoralis major
6. General acceptability scores, pectoralis major
7. Flavor scores, gluteus primus
8. Juiciness scores, gluteus primus
9. Tenderness scores, gluteus primus
10. General acceptability scores, gluteus primus
11. Volatile losses, per cent (Expt. I and Expt. II
A 1 combined)
12. Dripping losses, per cent (Expt. I and Expt. II
A 1 combined)
13. Total cooking losses, per cent (Expt. I and
Expt. II A 1 combined)
14. Cooking time, min./lb. (Expt. I and Expt. II
A 1 combined)

B. Correlation coefficients for U.S. Grade A and Grade B
turkeys

1. Shear values vs. tenderness scores, pectoralis
major
2. Press fluid yields vs. juiciness scores,
pectoralis major
3. Press fluid yields vs. dripping losses
4. Press fluid yields vs. total cooking losses
5. Juiciness scores, pectoralis major, vs. dripping
losses
6. Juiciness scores, pectoralis major, vs. total
cooking losses

Experiment II

A. Differences attributable to U.S. grade within each of
the following groups:

1. Finish and fleshing (Grades A and B, t-test)
 - a. Before roasting, general appearance scores
 - b. After roasting, general appearance scores
 - c. Edible cooked meat, per cent of cooked turkey

- (1) Breast
 - (2) Wing
 - (3) Other light meat
 - (4) Total light meat
 - (5) Drumstick
 - (6) Thigh
 - (7) Other dark meat
 - (8) Total dark meat
 - (9) Total cooked boned meat
- d. Edible cooked meat, per cent of oven-ready turkey
Same factors as for A 1 c, (1) through (9)
 - e. Number of 71-gram servings of edible cooked meat per pound of cooked turkey
Same factors as for A 1 c, (1) through (9)
 - f. Number of 71-gram servings of edible cooked meat per pound of oven-ready turkey
Same factors as for A 1 c, (1) through (9)
2. Bruising (Grades A and B, t-test)
- a. Volatile losses, per cent
 - b. Dripping losses, per cent
 - c. Total cooking losses, per cent
 - d. Cooking time, min./lb.
 - e. Before roasting, general appearance scores
 - f. After roasting, general appearance scores
 - g. Doneness scores
 - h. Edible cooked meat, per cent of cooked turkey
Same factors as for A 1 c, (1) through (9)
 - i. Edible cooked meat, per cent of oven-ready turkey
Same factors as for A 1 c, (1) through (9)
 - j. Number of 71-gram servings of edible cooked meat per pound of cooked turkey
Same factors as for A 1 c, (1) through (9)
 - k. Number of 71-gram servings of edible cooked meat per pound of oven-ready turkey
Same factors as for A 1 c, (1) through (9)
3. Cuts and tears (Grades A, B, and C; analyses of variance)
- a. Volatile losses, per cent
 - b. Dripping losses, per cent
 - c. Total cooking losses, per cent
 - d. Cooking time, min./lb.
 - e. Before roasting, general appearance scores
 - f. After roasting, general appearance scores

- g. Doneness scores
 - h. Edible cooked meat, per cent of cooked turkey
Same factors as for A 1 c, (1) through (9)
 - i. Edible cooked meat, per cent of oven-ready turkey
Same factors as for A 1 c, (1) through (9)
 - j. Number of 71-gram servings of edible cooked meat per pound of cooked turkey
Same factors as for A 1 c, (1) through (9)
 - k. Number of 71-gram servings of edible cooked meat per pound of oven-ready turkey
Same factors as for A 1 c, (1) through (9)
4. Missing parts (Grades A, B, and C; analyses of variance)
- a. Volatile losses, per cent
 - b. Dripping losses, per cent
 - c. Total cooking losses, per cent
 - d. Cooking time, min./lb.
 - e. Before roasting, general appearance scores
 - f. After roasting, general appearance scores
 - g. Doneness scores
 - h. Edible cooked meat, per cent of cooked turkey
Same factors as for A 1 c, (1) through (9)
 - i. Edible cooked meat, per cent of oven-ready turkey
Same factors as for A 1 c, (1) through (9)
 - j. Number of 71-gram servings of edible cooked meat per pound of cooked turkey
Same factors as for A 1 c, (1) through (9)
 - k. Number of 71-gram servings of edible cooked meat per pound of oven-ready turkey
Same factors as for A 1 c, (1) through (9)
5. Deformities (Grades A, B, and C; analyses of variance)
- a. Volatile losses, per cent
 - b. Dripping losses, per cent
 - c. Total cooking losses, per cent
 - d. Cooking time, min./lb.
 - e. Before roasting, general appearance scores
 - f. After roasting, general appearance scores
 - g. Doneness scores
 - h. Edible cooked meat, per cent of cooked turkey
Same factors as for A 1 c, (1) through (9)
 - i. Edible cooked meat, per cent of oven-ready turkey
Same factors as for A 1 c, (1) through (9)

- j. Number of 71-gram servings of edible cooked meat per pound of cooked turkey
Same factors as for A 1 c, (1) through (9)
 - k. Number of 71-gram servings of edible cooked meat per pound of oven-ready turkey
Same factors as for A 1 c, (1) through (9)
- B. Correlation coefficients for U.S. Grade A, B and C turkeys in each of the following groups:
- 1. Finish and fleshing--cooking time, min./lb. vs. doneness scores
 - 2. Bruising--cooking time, min./lb. vs. doneness scores
 - 3. Cuts and tears--cooking time, min./lb. vs. doneness scores
 - 4. Missing parts--cooking time, min./lb. vs. doneness scores
 - 5. Deformities--cooking time, min./lb. vs. doneness scores

Table 9. Plan of statistical analysis used for determination of F values.

Source of variation	D/F
U.S. grade	2
Error	21
Total	23

Table 10. Mean palatability scores¹, shear values, and press fluid yields for U.S. Grade A and U.S. Grade B² turkeys in Experiment I.

Light meat (pectoralis major)																							
Flavor		Juiciness		Tenderness		General acceptability		Shear values		Press fluid yields													
A	B	A	B	A	B	A	B	A	B	A	B												
6.0	6.3	5.3	5.5	6.2	5.8	5.8	6.0	9.1	10.1	7.6	7.8												
5.2	5.7	4.5	4.2	5.7	5.0	5.3	4.8	13.4	9.1	7.3	7.5												
5.8	5.8	4.5	4.0	5.5	5.7	5.3	5.0	12.5	5.9	7.2	7.0												
5.8	5.8	6.0	4.7	4.0	5.7	4.8	5.2	15.4	7.6	6.6	7.5												
5.8	6.0	4.8	5.3	6.0	5.5	5.8	6.0	13.1	10.2	7.4	7.7												
5.8	5.3	4.8	6.3	6.5	5.3	6.0	5.7	10.1	9.5	7.9	7.8												
5.3	5.5	3.5	4.3	5.8	6.5	5.2	5.5	8.2	7.9	6.8	7.6												
5.3	5.7	3.5	3.8	6.2	5.3	4.5	5.0	7.0	13.3	7.8	6.3												
Avg. 5.62		5.76		4.61		4.76		5.74		5.60		5.34		5.40		11.10		9.20		7.32		7.40	
t-values -0.921		0.351		0.444		-0.243		1.468		-0.330													

¹Possible score of 7 points.

²Grade B turkeys were downgraded for finish and fleshing.

Table 11. Mean palatability scores¹ for U.S. Grade A and U.S. Grade B² turkeys in Experiment I.

Dark meat (<i>gluteus primus</i>)									
Flavor		Juiciness		Tenderness		General acceptability			
A	B	A	B	A	B	A	B		
5.5	5.3	5.5	5.5	5.8	5.2	5.7	5.5		
5.5	6.2	5.8	5.8	5.7	5.6	5.3	5.8		
5.2	6.6	5.2	5.4	5.3	5.8	5.3	6.2		
6.2	5.8	5.2	5.4	5.4	6.0	5.4	5.6		
5.7	6.2	5.3	5.8	6.3	6.2	5.7	6.0		
5.7	6.2	5.7	6.0	5.3	6.3	5.5	6.0		
4.7	3.7	4.0	4.3	5.3	5.7	4.5	3.5		
5.0	4.7	4.7	4.7	5.7	5.7	5.5	5.0		
Avg. 5.44	5.59	5.18	5.36	5.60	5.81	5.36	5.45		
t values	-0.393	-0.616		-1.195		0.268			

¹Possible score of 7 points.

²Grade B turkeys were downgraded for finish and fleshing.

Table 12. Cooking losses and cooking time for U.S. Grade A and U.S. Grade B¹ turkeys in Experiment I and in the finish and fleshing group, Experiment II.

Volatile		Cooking losses, per cent						Cooking time, min./lb.	
A	B	Dripping		Total		A	B		
		A	B	A	B				
13.4	13.1	4.2	2.7	17.8	16.0	17.4	21.4		
13.6	17.6	4.2	3.8	18.0	21.6	20.3	20.4		
15.6	16.2	5.9	3.4	21.9	19.7	20.9	18.8		
15.6	13.0	3.9	1.3	19.7	14.4	18.2	17.4		
12.5	12.7	2.2	3.2	14.9	16.2	15.1	16.9		
13.9	13.4	4.9	3.2	19.0	16.8	17.2	17.2		
14.1	17.4	11.0	3.8	25.5	21.4	18.1	24.1		
14.7	18.0	6.9	4.1	21.7	22.5	19.6	26.1		
15.6	18.6	6.4	4.9	22.2	23.7	22.2	23.2		
13.7	25.3	4.2	1.6	17.9	33.0	18.1	29.5		
13.2	23.3	2.9	4.8	15.1	28.3	19.6	26.0		
19.5	21.4	4.5	7.3	24.2	28.5	22.6	24.0		
10.4	14.5	3.1	12.4	13.6	26.9	16.0	18.9		
13.0	15.5	4.2	6.2	17.4	21.9	16.5	19.6		
11.6	15.5	4.6	3.0	16.3	18.6	16.2	19.8		
13.3	21.2	3.4	3.5	16.8	24.8	16.9	22.4		
Avg. 13.98	17.29	4.78	4.32	18.88	22.14	18.43	21.61		
t values	-3.040**	0.538		-2.089*		-2.971**			

¹Grade B turkeys were downgraded for finish and fleshing.
 * Significant at the 5% level.
 ** Significant at the 1% level.

Table 13. Cooking losses in per cent for U.S. graded turkeys in Experiment II.

Bruising						Deformities																																
Volatile		Dripping		Total		Volatile			Dripping			Total																										
A	B	A	B	A	B	A	B	C	A	B	C	A	B	C																								
10.1	8.7	4.5	9.0	14.8	17.9	16.4	14.5	23.3	6.5	3.1	3.4	23.0	17.8	26.8																								
12.1	10.0	2.5	5.0	15.3	15.2	11.0	20.8	22.4	3.3	8.3	3.0	14.4	29.3	25.5																								
13.5	18.1	1.7	5.8	15.1	24.1	16.8	13.0	--	4.2	4.1	--	21.2	17.2	--																								
13.4	14.6	4.0	1.9	17.6	16.8	17.8	16.9	--	4.8	4.7	--	22.7	21.8	--																								
12.8	14.5	7.5	3.9	20.5	18.7	18.3	11.7	--	7.6	2.8	--	26.0	14.7	--																								
13.3	15.2	6.0	2.6	19.6	18.0	20.9	15.0	--	7.9	3.0	--	28.9	18.1	--																								
18.4	12.2	9.2	9.1	27.7	21.5	13.0	15.4	--	4.4	1.8	--	17.5	17.2	--																								
9.8	13.2	3.8	5.0	13.8	18.4	--	--	--	--	--	--	--	--	--																								
Avg. 12.92		13.31		4.90		5.29		18.05		18.82		16.31			15.33			22.85			5.53			3.97			3.20			21.96			19.44			26.15		
t values -0.276				-0.301				-0.407				0.584						1.483						0.970														

Table 14. Cooking losses in per cent for U.S. graded turkeys in Experiment II.

Volatile			Cuts and tears			Total		
A	B	C	A	B	C	A	B	C
11.0	12.6	18.1	8.0	2.8	4.9	19.1	15.6	23.2
26.4	12.3	23.9	8.4	3.5	8.2	35.0	16.0	32.2
20.3	18.2	16.3	7.4	9.8	2.1	28.0	28.2	18.6
17.3	13.2	20.0	8.0	5.8	4.8	25.5	19.4	24.9
13.4	14.9	18.2	3.4	5.5	3.9	16.1	20.8	22.3
11.7	16.8	17.7	2.1	5.5	5.2	14.1	22.2	23.1
23.2	21.2	24.4	2.2	1.7	5.9	25.6	23.1	30.6
21.1	19.9	12.7	7.1	3.2	2.3	28.3	23.3	15.3
Avg. 18.05	16.14	18.91	5.82	4.72	4.66	23.96	21.08	23.78
F values	0.83			0.57			0.64	

Table 15. Cooking losses in per cent for U.S. graded turkeys in Experiment II.

Volatile			Missing parts			Total		
A	B	C	Dripping			A	B	C
			A	B	C			
15.4	17.5	16.7	2.2	5.0	3.4	17.9	22.7	20.4
14.0	11.0	16.8	5.0	7.0	5.4	19.2	18.2	22.3
18.1	13.9	15.4	7.1	6.3	3.6	25.4	20.5	19.1
14.6	18.9	10.7	12.8	1.7	1.6	27.3	20.8	12.4
14.1	12.9	21.3	4.1	5.1	2.9	18.5	18.1	24.4
16.9	19.3	24.9	4.9	3.3	7.1	22.0	22.9	32.1
11.0	16.1	13.9	6.5	6.6	5.1	17.5	22.8	19.3
20.4	9.8	12.2	4.2	3.4	5.2	24.6	13.4	17.6
Avg. 15.56	14.92	16.49	5.85	4.80	4.29	21.55	19.92	20.95
F values	0.34			0.92			0.28	

Table 16. Cooking time in minutes per pound for U.S. graded turkeys in Experiment II.

Bruising		Cuts and tears			Missing parts			Deformities		
A	B	A	B	C	A	B	C	A	B	C
14.3	11.5	16.1	18.9	19.5	21.5	21.4	21.3	21.7	20.0	23.7
18.2	14.4	26.6	17.0	23.6	21.1	15.2	20.3	17.0	22.2	25.0
17.9	18.4	22.3	22.8	21.2	22.1	17.5	20.9	19.1	17.6	--
17.9	18.9	21.5	18.4	22.5	19.2	21.3	14.8	20.4	20.7	--
15.5	18.8	18.4	20.8	21.3	19.0	15.9	23.6	22.8	13.5	--
18.5	18.0	16.7	20.8	21.1	17.9	24.6	24.6	18.2	16.8	--
19.5	15.7	25.2	21.7	22.6	16.3	17.7	17.5	16.2	17.3	--
15.3	16.7	25.1	22.8	19.1	14.0	15.0	15.6	--	--	--
Avg. 17.14	16.55	21.49	20.40	21.36	18.89	18.58	19.82	19.34	18.30	24.35
t values	0.525							0.727		
F values		0.37				0.31				

Table 17. Mean doneness scores¹ for U.S. graded turkeys in Experiment II.

Finish and		Bruising		Cuts and tears			Missing parts			Deformities			
fleshing	:	A	B	A	B	C	A	B	C	A	B	C	
--	--	3.0	3.3	--	--	4.0	4.0	3.3	4.0	4.0	4.3	4.0	
--	--	4.0	4.0	4.3	--	5.0	4.0	4.0	4.0	3.7	4.7	5.5	
4.0	4.7	4.5	5.0	5.0	--	5.0	4.3	4.0	4.0	4.0	3.5	--	
4.0	4.7	4.0	4.5	5.0	3.7	4.3	3.7	4.0	4.3	4.0	4.5	--	
4.0	5.3	3.7	4.0	4.7	4.3	5.0	4.0	3.7	4.3	4.5	4.0	--	
4.7	5.0	5.3	4.3	4.0	4.0	4.3	4.7	4.3	4.0	4.0	4.0	--	
4.0	5.7	4.0	4.3	4.0	4.7	4.7	4.0	3.3	3.7	4.0	4.0	--	
4.0	4.7	4.0	4.3	4.7	5.0	3.7	4.0	3.7	3.7	--	--	--	
Avg.	4.12	5.02	4.06	4.21	4.53	4.34	4.50	4.09	3.79	4.00	4.03	4.14	4.75
t values	-4.397***		-0.521								0.632		
F values							0.25			2.15			

¹Doneness scores based on a 7-point scale with 4 representing optimum doneness, smaller numbers underdoneness, and larger numbers overdoneness.

*** Significant at the 0.1% level.

Table 18. Mean general appearance scores¹ (before roasting) for U.S. graded turkeys in Experiment II.

Finish and fleshing		Bruising		Cuts and tears			Missing parts			Deformities			
A	B	A	B	A	B	C	A	B	C	A	B	C	
6.4	5.7	6.2	5.1	6.6	5.2	3.3	6.9	5.1	3.6	6.8	5.4	3.7	
6.2	3.8	6.3	5.4	6.5	4.8	3.5	6.3	5.1	4.2	6.2	6.1	4.0	
6.7	5.2	6.4	5.3	6.6	5.9	2.8	6.9	4.6	4.1	6.3	5.5	--	
5.7	6.4	6.4	4.7	6.6	5.3	4.2	6.2	4.5	3.7	6.8	4.1	--	
6.9	6.2	6.8	4.7	6.7	5.6	3.9	6.0	5.3	3.9	6.7	4.8	--	
6.2	4.8	6.3	3.4	6.6	5.9	3.8	5.6	4.9	4.0	6.2	5.5	--	
6.6	5.4	6.5	5.8	6.2	5.3	4.4	6.6	5.5	3.5	6.4	5.0	--	
6.6	4.1	6.3	4.9	6.8	5.5	4.0	5.0	4.6	4.4	--	--	--	
Avg. 6.41		5.20	6.40	4.89	6.58	5.44	3.74	6.19	4.95	3.92	6.48	5.20	3.85
t values		3.410**		5.746***						4.880***			
F values				112.20***			47.04***						

¹Possible score of 7 points.

** Significant at the 1% level.

*** Significant at the 0.1% level.

Table 19. Mean general appearance scores¹ (after roasting) for U.S. graded turkeys in Experiment II.

Finish and fleshing		Bruising		Cuts and tears			Missing parts			Deformities									
A	B	A	B	A	B	C	A	B	C	A	B	C							
6.3	4.1	6.1	5.8	6.7	5.2	3.6	6.1	5.2	5.2	5.6	6.2	4.4							
6.1	2.1	6.3	5.9	6.1	5.0	3.6	6.2	4.6	4.3	5.9	5.8	2.5							
5.6	4.9	6.0	5.2	5.5	5.9	3.4	6.4	5.8	4.2	6.4	5.6	--							
5.7	5.8	5.8	5.4	6.8	5.7	5.1	6.1	5.0	3.3	6.1	6.2	--							
6.4	4.9	6.5	5.0	5.2	5.7	4.2	6.2	5.3	3.9	5.4	5.6	--							
5.8	5.4	5.0	3.8	6.4	5.8	4.1	5.5	4.7	4.2	6.7	5.5	--							
6.4	4.2	6.4	5.9	6.3	5.6	4.9	6.0	6.1	3.9	6.6	5.7	--							
6.5	4.0	6.1	5.1	6.3	5.6	4.2	6.3	4.8	4.5	--	--	--							
Avg. 6.10		4.42		6.02		5.26		6.16		5.56		4.14		6.10		5.80		3.45	
t values		3.992**		2.566*								1.382							
F values						33.31***				33.44***									

¹Possible score of 7 points.

* Significant at the 5% level.

** Significant at the 1% level.

*** Significant at the 0.1% level.

Table 20. Correlation coefficients (r values) for data from U. S. graded turkeys in Experiments I and II.

Factors	A	B	C
Tenderness of light meat vs.			
Shear values	0.099	-0.105	---
Press fluid yields vs.			
Juiciness, light meat	0.404	0.473	---
Dripping losses	-0.239	-0.405	---
Total cooking losses	-0.352	-0.611	---
Juiciness of light meat vs.			
Dripping losses	-0.728*	-0.353	---
Total cooking losses	-0.584	-0.711*	---
Cooking time in min./lb. vs.			
Doneness for graded turkeys in the following downgrading groups:			
Finish and fleshing	-0.274	-0.749	---
Bruising	0.648	0.771*	---
Cuts and tears	-0.013	0.938*	0.708*
Missing parts	0.031	0.267	0.281
Deformities	0.707	0.695	---

* Significant at the 5% level.

Table 21. Data for U.S. graded turkeys in the finish and fleshing group, Experiment II.

	: Before roasting		: After roasting	
	: A	B	: A	B
Number of turkeys the majority of judges would purchase or serve	8	6	8	7
Number of turkeys the majority of judges would not purchase or serve	0	2	0	1
Factors checked ¹ when general appearance of turkeys was scored less than 7				
Color	3	12	18	80
Shape	8	36	2	13
Finish and fleshing	10	50	24	49
Missing parts	30	1	19	1
Discoloration	12	34	8	24
Torn or missing skin	4	40	0	2
Other	5	12	15	20
Factors checked ¹ when judges would not purchase or serve turkeys				
Color	0	6	0	28
Shape	0	15	0	9
Finish and fleshing	1	23	0	24
Missing parts	1	0	0	1
Discoloration	2	21	0	12
Torn or missing skin	0	6	0	1
Other	0	4	0	9

¹Numbers indicate the total number of times each factor was checked.

Table 22. Data for U. S. graded turkeys in the bruising group, Experiment II.

	: Before roasting		: After roasting	
	: A	B	: A	B
Number of turkeys the majority of judges would purchase or serve	8	7	8	7
Number of turkeys the majority of judges would not purchase or serve	0	1	0	1
Factors checked ¹ when general appearance of turkeys was scored less than 7				
Color	4	8	37	45
Shape	11	14	8	7
Finish and fleshing	18	19	25	16
Missing parts	37	13	27	8
Discoloration	24	78	10	58
Torn or missing skin	1	40	0	30
Other	4	4	4	2
Factors checked ¹ when judges would not purchase or serve the turkeys				
Color	1	3	3	8
Shape	1	6	1	3
Finish and fleshing	1	6	1	3
Missing parts	0	9	0	2
Discoloration	0	34	0	14
Torn or missing skin	0	13	0	5
Other	0	2	0	0

¹Numbers indicate the total number of times each factor was checked.

Table 23. Data for U.S. graded turkeys in the cuts and tears group, Experiment II.

	: Before roasting :			: After roasting :		
	: A	B	C	: A	B	C
Number of turkeys the majority of judges would purchase or serve	8	8	3	8	8	7
Number of turkeys the majority of judges would not purchase or serve	0	0	5	0	0	1
Factors checked ¹ when general appearance of turkeys was scored less than 7						
Color	1	1	1	30	22	23
Shape	8	14	22	8	13	16
Finish and fleshing	19	22	40	17	26	37
Missing parts	5	12	23	3	7	11
Discoloration	15	3	28	19	19	21
Torn or missing skin	1	93	118	12	50	90
Other	1	1	5	3	2	2
Factors checked ¹ when judges would not purchase or serve the turkeys						
Color	0	0	1	2	0	9
Shape	0	5	19	1	0	10
Finish and fleshing	1	5	22	2	1	17
Missing parts	0	2	14	1	0	4
Discoloration	1	0	21	1	2	4
Torn or missing skin	0	22	80	2	6	37
Other	0	0	2	0	0	1

¹Numbers indicate the total number of times each factor was checked.

Table 24. Data for U.S. graded turkeys in the missing parts group, Experiment II.

	: Before roasting			: After roasting		
	: A	B	C	: A	B	C
Number of turkeys the majority of judges would purchase or serve	8	8	6	8	8	7
Number of turkeys the majority of judges would not purchase or serve	0	0	2	0	0	1
Factors checked ¹ when general appearance of turkeys was scored less than 7						
Color	0	1	0	20	18	11
Shape	7	12	22	6	7	14
Finish and fleshing	14	14	42	20	23	36
Missing parts	31	106	110	24	72	88
Discoloration	16	17	7	6	7	8
Torn or missing skin	1	16	33	0	16	19
Other	12	2	0	4	2	4
Factors checked ¹ when judges would not purchase or serve the turkeys						
Color	0	0	0	0	4	4
Shape	0	3	15	0	4	11
Finish and fleshing	0	5	20	0	6	17
Missing parts	2	31	56	1	18	40
Discoloration	2	8	3	0	1	6
Torn or missing skin	0	5	19	0	5	6
Other	2	0	0	0	0	1

¹Numbers indicate the total number of times each factor was checked.

Table 25. Data for U.S. graded turkeys in the deformities group, Experiment II.

	: Before roasting :			: After roasting :		
	A	B	C	A	B	C
Number of turkeys the majority of judges would purchase or serve	7	6	0	7	7	1
Number of turkeys the majority of judges would not purchase or serve	0	1	2	0	0	1
Factors checked ¹ when general appearance of turkeys was scored less than 7						
Color	2	5	0	21	23	8
Shape	11	49	23	11	33	17
Finish and fleshing	14	15	17	23	26	14
Missing parts	11	31	4	14	9	3
Discoloration	6	17	0	1	0	2
Torn or missing skin	0	5	0	0	1	2
Other	6	11	2	1	1	3
Factors checked ¹ when judges would not purchase or serve the turkeys						
Color	0	3	0	0	0	4
Shape	0	10	16	2	2	10
Finish and fleshing	0	1	10	1	1	9
Missing parts	0	3	2	1	0	0
Discoloration	0	6	0	1	0	2
Torn or missing skin	0	2	0	0	1	1
Other	1	5	1	0	0	3

¹Numbers indicate the total number of times each factor was checked.

Table 26. Mean percentages for edible cooked meat calculated as per cent of U.S. graded oven-ready turkey¹, average number of 71-gram servings of edible cooked meat per pound of oven-ready turkey, and t values.

Edible portion	Finish and fleshing					
	Per cent edible yield			Average number of servings		
	A	t value	B	A	t value	B
Light meat						
Breast	19.2	2.075	17.6	1.0	1.095	1.0
Wing	2.8	2.709*	2.3	0.2	1.485	0.1
Other	1.3	0.288	1.2	0.0	-----	0.0
Total	23.2	2.185*	21.1	1.2	1.562	1.1
Dark meat						
Drumstick	5.3	3.411**	4.6	0.3	1.471	0.2
Thigh	8.5	0.857	8.1	0.5	1.222	0.4
Other	1.0	1.940	0.6	0.0	-----	---
Total	14.7	2.977**	13.3	0.8	1.912	0.7
Total edible cooked meat	37.9	2.783*	34.4	2.0	1.821	1.8

¹Giblets and necks were not included in the oven-ready weights.

* Significant at the 5% level.

** Significant at the 1% level.

Table 27. Mean percentages for edible cooked meat calculated as per cent of U.S. graded oven-ready turkey¹, average number of 71-gram servings of edible cooked meat per pound of oven-ready turkey, and t values.

Edible portion	Bruising					
	Per cent edible yield			Average number of servings		
	A	t value	B	A	t value	B
Light meat						
Breast	19.7	-0.196	19.8	1.2	-0.222	1.2
Wing	2.9	2.080	2.5	0.1	0.917	0.1
Other	1.2	-0.682	1.2	0.0	-----	0.0
Total	23.7	0.365	23.5	1.3	0.000	1.3
Dark meat						
Drumstick	5.1	0.485	5.0	0.3	-0.498	0.3
Thigh	8.6	-0.026	8.6	0.5	0.000	0.5
Other	1.2	2.542*	0.8	0.0	-----	---
Total	14.9	1.041	14.3	0.8	0.594	0.8
Total edible cooked meat	38.6	1.083	37.8	2.1	0.426	2.1

¹Giblets and necks were not included in the oven-ready weights.

* Significant at the 5% level.

Table 28. Mean percentages for edible cooked meat calculated as per cent of U.S. graded oven-ready turkey¹, average number of 71-gram servings of edible cooked meat per pound of oven-ready turkey, and F values.

Edible portion	Cuts and tears							
	Per cent edible yield				Average number of servings			
	F value	A	B	C	F value	A	B	C
Light meat								
Breast	0.65	18.6	19.0	18.2	1.38	1.1	1.1	1.0
Wing	0.65	2.5	2.6	2.3	0.40	0.1	0.1	0.1
Other	1.57	1.1	0.9	1.1	----	0.0	---	---
Total	0.92	22.2	22.5	21.6	1.63	1.2	1.2	1.1
Dark meat								
Drumstick	1.20	5.0	5.1	4.6	1.42	0.3	0.3	0.2
Thigh	1.53	7.9	8.0	8.6	1.32	0.4	0.4	0.5
Other	0.80	1.0	0.9	0.7	----	---	---	---
Total	0.08	13.9	14.1	13.8	0.04	0.7	0.7	0.7
Total edible cooked meat	0.66	36.1	36.5	35.4	0.63	1.9	1.9	1.8

¹Giblets and necks were not included in the oven-ready weights.

Table 29. Mean percentages for edible cooked meat calculated as per cent of U.S. graded oven-ready turkey¹, average number of 71-gram servings of edible cooked meat per pound of oven-ready turkey, least significant differences, and F values.

Edible portion :	Per cent edible yield					Missing parts				
	Per cent edible yield					Average number of servings				
	F value	Lsd ²	A	B	C	F value	Lsd ²	A	B	C
Light meat										
Breast	0.75	---	18.9	19.6	20.2	0.52	---	1.1	1.2	1.2
Wing	4.80*	0.72	2.7	2.2	1.6	0.67	---	0.1	0.1	0.0
Other	0.08	---	1.0	1.1	1.0	---	---	---	0.0	---
Total	0.05	---	22.6	23.0	22.8	0.74	---	1.2	1.3	1.2
Dark meat										
Drumstick	2.49	---	5.1	5.4	5.7	0.40*	0.04	0.3	0.3	0.3
Thigh	2.15	---	8.0	8.6	9.1	0.41	---	0.5	0.5	0.5
Other	0.81	---	0.8	0.9	1.0	---	---	---	---	---
Total	4.84*	1.21	13.9	14.8	15.7	1.63	---	0.8	0.8	0.8
Total edible cooked meat	0.70	---	36.4	37.8	38.4	0.26	---	2.0	2.1	2.0

¹Giblets and necks were not included in the oven-ready weights.

²Least significant difference at the 5% level.

* Significant at the 5% level.

Table 30. Mean percentages for edible cooked meat calculated as per cent of U.S. graded oven-ready turkey¹, average number of 71-gram servings of edible cooked meat per pound of oven-ready turkey, least significant differences, and F values.

Edible portion	Deformities									
	Per cent edible yield						Average number of servings			
	F value	Lsd ²		A	B	C	F value	A	B	C
	(7,7)	(7,2)	(7)	(7)	(2)					
Light meat										
Breast	1.29	---	---	19.3	19.8	17.9	1.56	1.2	1.2	1.0
Wing	0.13	---	---	2.9	3.0	2.8	0.31	0.1	0.2	0.1
Other	3.66	---	---	1.2	1.2	0.9	---	0.0	---	---
Total	1.40	---	---	23.4	24.1	21.6	1.05	1.3	1.3	1.1
Dark meat										
Drumstick	3.47	---	---	5.3	5.6	4.8	1.33	0.3	0.3	0.2
Thigh	3.15	---	---	8.4	8.4	7.3	0.42	0.5	0.5	0.4
Other	0.88	---	---	1.2	1.1	0.8	---	0.0	---	---
Total	5.09*	1.03	1.55	14.9	15.1	12.8	1.66	0.8	0.8	0.7
Total edible cooked meat	3.99*	2.35	3.53	38.3	39.1	34.5	2.81	2.1	2.1	1.8

¹Giblets and necks were not included in the oven-ready weights.

²Least significant difference at the 5% level.

Numbers in parentheses indicate the total number of birds in each U.S. grade.

* Significant at the 5% level.

Table 31. Mean percentages for edible cooked meat calculated as per cent of U.S. graded cooked turkey¹, average number of 71-gram servings of edible cooked meat per pound of cooked turkey, and t values.

Edible portion	Finish and fleshing					
	Per cent edible yield			Average number of servings		
	A	t value	B	A	t value	B
Light meat						
Breast	23.4	-0.010	23.5	1.3	-0.400	1.3
Wing	3.4	1.783	3.0	0.2	0.885	0.2
Other	1.5	-0.527	1.7	0.0	-----	0.0
Total	28.2	0.043	28.2	1.5	0.449	1.4
Dark meat						
Drumstick	6.5	1.331	6.1	0.4	0.560	0.3
Thigh	10.4	-0.843	10.8	0.6	0.433	0.6
Other	1.3	2.039	0.9	0.0	-----	---
Total	18.0	0.502	17.7	0.9	0.703	0.9
Total edible cooked meat	46.2	0.219	45.9	2.4	0.583	2.3

¹Giblets and necks were not included in the cooked weights.

Table 32. Mean percentages for edible cooked meat calculated as per cent of U.S. graded cooked turkey¹, average number of 71-gram servings of edible cooked meat per pound of cooked turkey, and t values.

Edible portion	Bruising					
	Per cent edible yield			Average number of servings		
	A	t value	B	A	t value	B
Light meat						
Breast	24.1	-0.335	24.4	1.4	-0.022	1.4
Wing	3.5	1.986	3.1	0.2	1.186	0.1
Other	1.4	-1.026	1.5	0.0	-----	0.0
Total	29.1	0.073	29.0	1.6	-0.128	1.6
Dark meat						
Drumstick	6.2	0.322	6.1	0.3	-0.800	0.4
Thigh	10.5	-0.256	10.6	0.6	0.000	0.6
Other	1.5	2.759*	0.9	0.0	-----	---
Total	18.2	0.932	17.6	1.0	0.512	1.0
Total edible cooked meat	47.3	0.631	46.6	2.6	0.253	2.5

¹Giblets and necks were not included in the cooked weights.

* Significant at the 5% level.

Table 33. Mean percentages for edible cooked meat calculated as per cent of U.S. graded cooked turkey¹, average number of 71-gram servings of edible cooked meat per pound of cooked turkey, and F values.

Edible portion	Cuts and tears							
	Per cent edible yield				Average number of servings			
	F value	A	B	C	F value	A	B	C
Light meat								
Breast	0.21	24.5	24.0	23.9	0.96	1.4	1.4	1.4
Wing	0.43	3.3	3.3	3.0	1.00	0.2	0.1	0.1
Other	1.69	1.5	1.2	1.5	---	0.0	---	---
Total	0.38	29.2	28.5	28.4	1.59	1.6	1.5	1.5
Dark meat								
Drumstick	0.71	6.6	6.4	6.0	1.55	0.4	0.3	0.3
Thigh	2.13	10.5	10.2	11.2	1.54	0.6	0.6	0.6
Other	0.72	1.3	1.2	0.9	---	---	---	---
Total	0.27	17.6	17.8	18.2	0.36	0.9	0.9	0.9
Total edible cooked meat	0.39	47.6	46.3	46.6	0.59	2.5	2.4	2.4

¹Giblets and necks were not included in the cooked weights.

Table 34. Mean percentages for edible cooked meat calculated as per cent of U.S. graded cooked turkey¹, average number of 71-gram servings of edible cooked meat per pound of cooked turkey, least significant differences, and F values.

Edible portion :	Missing parts									
	Per cent of edible yield					Average number of servings				
	F value	Lsd ²	A	B	C	F value	Lsd ²	A	B	C
Light meat										
Breast	0.61	---	24.1	24.6	25.6	0.27	---	1.4	1.5	1.5
Wing	5.05*	0.9	3.4	2.8	2.0	0.60	---	0.1	0.1	0.0
Other	0.16	---	1.3	1.4	1.2	---	---	---	0.0	0.0
Total	0.00	---	28.8	28.8	28.8	0.57	---	1.6	1.7	1.5
Dark meat										
Drumstick	1.75	---	6.5	6.7	7.2	3.57*	0.06	0.4	0.3	0.4
Thigh	1.57	---	10.2	10.8	11.5	0.45	---	0.6	0.6	0.6
Other	0.64	---	1.0	1.1	1.2	---	---	---	---	---
Total	3.34	---	17.7	18.6	19.9	1.70	---	1.0	0.9	1.0
Total edible cooked meat	0.46	---	46.5	47.4	48.7	0.11	---	2.5	2.6	2.6

¹Giblets and necks were not included in the cooked weights.

²Least significant difference at the 5% level.

* Significant at the 5% level.

Table 35. Mean percentages for edible cooked meat calculated as per cent of U.S. graded cooked turkey¹, average number of 71-gram servings per pound of edible cooked turkey, and F values.

Edible portion	Deformities							
	Per cent edible yield				Average number of servings			
	F value	A	B	C	F value	A	B	C
Light meat								
Breast	0.07	24.8	24.6	24.2	0.53	1.5	1.4	1.4
Wing	0.15	3.7	3.7	3.8	0.30	0.2	0.2	0.2
Other	2.17	1.5	1.5	1.2	---	0.0	---	---
Total	0.08	30.0	29.9	29.3	0.42	1.7	1.6	1.5
Dark meat								
Drumstick	1.18	6.8	7.0	6.4	0.22	0.4	0.4	0.3
Thigh	0.98	10.8	10.5	9.8	0.54	0.6	0.6	0.6
Other	0.65	1.5	1.3	1.2	---	0.0	---	---
Total	1.31	19.1	18.8	17.4	0.75	1.0	1.0	0.9
Total edible cooked meat	0.61	49.1	48.6	46.7	1.33	2.7	2.6	2.5

¹Giblets and necks were not included in the cooked weights.

COOKING LOSSES, ACCEPTABILITY, AND EDIBLE
YIELD FOR U.S. GRADED TURKEY HENS

by

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Three U.S. grades of Broad Breasted White turkey hens were used in a study that consisted of two experiments. In Experiment I, U.S. Grade A and B turkeys were evaluated for eating quality. The U.S. Grade B turkeys in this group were downgraded for finish and fleshing. In Experiment II, the general acceptability of U.S. Grade A, B, and C turkeys was determined before and after roasting. U.S. Grade B and C turkeys in this experiment were downgraded for (1) finish and fleshing, (2) bruising, (3) cuts and tears, (4) missing parts, or (5) deformities.

Flavor, juiciness, tenderness, and general acceptability scores for light and dark meat for U.S. Grade A and B turkeys in Experiment I were unrelated to U.S. grade. Shear values and press fluid yields for light meat were similar for both U.S. grades of turkeys in this experiment.

Greater volatile and total cooking losses, higher doneness scores, and smaller per cent yields of light, dark, and total meat were noted for U.S. Grade B than for U.S. Grade A turkeys in the finish and fleshing group. Although end point temperatures were the same, unexplainable differences in cooking times in minutes per pound were noted for these two U.S. grades of turkeys; and, differences in cooking losses and per cent edible yield were attributed to the longer cooking time in minutes per pound for the U.S. Grade B than for the U.S. Grade A turkeys. Cooking losses, cooking time in minutes per pound, and doneness scores for U.S. graded turkeys in the bruising, cuts and tears,

missing parts, and deformities groups were unrelated to the U.S. grade.

General appearance scores for oven-ready and roasted turkeys were related significantly to U.S. grade in all comparisons but one. Differences attributable to U.S. grade were greater when the turkeys were scored before roasting than after roasting. This indicated that some of the differences among the graded turkeys might have been obscured by roasting. The judges preferred the U.S. Grade A turkeys to either the U.S. Grade B or U.S. Grade C turkeys both before and after roasting. The primary cause for downgrading generally was the factor that received the greatest number of checks when reasons for considering a bird as less than "very desirable" (seven points) were determined. Color of the roasted turkeys apparently was an important factor in determining the general appearance scores of the roasted turkeys. In most instances, the majority of judges would purchase and serve most of the downgraded turkeys even though they were aware of the defects that were present.

The yields of total edible meat for turkeys in all downgrading groups ranged from 34.4 to 39.1 per cent of the oven-ready weight. Light meat comprised approximately 60 per cent of the edible meat, and dark meat approximately 40 per cent. The number of 71-gram servings of edible cooked meat per pound of oven-ready turkey was similar for all U.S. grades of birds in each of the five downgrading groups, and ranged from 1.8 to 2.1 servings per pound.