FACTORS AFFECTING THE STORAGE LIFE OF FROZEN TURKEY STEAKS AND FILETS

by

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INTRODUCTION

Research has shown the feasibility of utilizing small portions of turkey as an effective means of increasing turkey consumption. Turkey steaks and filets are among the more recent additions to the growing list of poultry specialty products available in individual servings. Turkey steaks were first introduced in New York City markets in November of 1947, according to Smith (1948). Since that time they have grown in popularity until they are now available in specialty food stores throughout the United States. Turkey filets are a later innovation and are not yet widely distributed. Both items are appearing with increasing frequency on restaurant and hotel menus.

These turkey products may prove to be a practical solution of the problem facing both the poultry producer and the consumer. The producer has found that more turkeys are being raised at the present time than are needed to supply hotel, institutional, and holiday demands. The consumer's difficulty lies in the fact that with smaller families and smaller homes, a whole turkey is too large for the cooking facilities available and too large to be eaten at one time. Housewives were given an opportunity to state their viewpoints in a survey conducted by the Oregon and Washington State Turkey Growers Association in cooperation with the U.S.D.A. Bureau of Agricultural Economics. Two-thirds of those questioned would serve turkey once a month or more often

if smaller pieces were available at a price comparable to that of meat. Three out of five women preferred pieces to quartered or halved turkeys. This same survey resulted in the conclusion that the family market would not take a whole bird when meat was plentiful and reasonably priced. It was further emphasized that retailers needed to encourage the sale of cut-up turkey and that more consumer education was necessary.

Commercial comment from trade sources emphasized the need for further information on preservation and cooking methods for turkey steaks and filets since the average consumer is not familiar with these products.

The purpose of this study was to determine, if possible, the influence of freezing, holding time, varying fileting techniques, and cooking methods on the quality of turkey steaks and filets. It was hoped to establish preparation methods which would result in a desirable and palatable product.

REVIEW OF LITERATURE

There is a scarcity of literature of a technical nature concerning any aspect of the preparation of turkey steaks and filets. There is, however, considerable comment in current commercial trade journals which indicates the need for careful experimental work.

Morris (1946) prepared hand pounded turkey filets and cooked them by various methods. She found these filets to be palatable and attractive products.

In later work done on the preparation and storage of turkey steaks and filets, Goertz (1947) concurred with Morris on the acceptability of both steaks and filets. She indicated that unpounded frozen filets were acceptable after six months of frozen storage, while those processed before freezing were undesirable after three months at 0°F. Goertz found that dark meat filets were more acceptable for the first 90 days of frozen storage, but after that time they deteriorated more rapidly than did the white meat filets. She pointed out that turkey steaks were equally desirable from the standpoint of flavor and appearance while representing a far smaller investment of preparation time than the filets. The wing and shoulder required too much boning time to make them practical, but the remainder of the carcass could be boned profitably according to this study.

Sherwood and Beanblossom (1947) did the preliminary experimental work on the preparation of machine knitted filets. They found 50 to 55 minutes necessary for boning and making the filets from one drawn bird. This time was not for an experienced, skilled person, and these workers commented that undoubtedly it could be lowered with practice. The filets prepared in this work were not stored for a long period.

In a second report from the Texas Agricultural Experiment Station, Sherwood, Beanblossom, and Snyder (1947) stated that 51.8 per cent of the drawn turkey weight could be used for filet production. Of this yield, 21.6 per cent was dark meat and 31.9 per cent was light meat. This report indicated that frying was

the most commonly used cooking method for the filets but asserted that further work was necessary to establish the most satisfactory process. The turkeys used in this study were not frozen. Sherwood and his co-workers reported that future experiments were planned to investigate the influence of frozen storage on filets.

Williams and Weigert (1947) outlined the procedure by which frozen toms were sawed transversely to produce cross-cut steaks. They recommended the steaks be cut about three-fourths of an inch thick, and suggested cutting very large birds in half first. Cross sections of the entire bird were used, resulting in steaks that were a mixture of dark and of light meat. About 75 per cent of the drawn turkey can be used in this method.

Cline (1947) emphasized the economy of using large birds to obtain the maximum edible yield. His work showed that 100 pounds of 32-pound New York dressed tom turkeys yielded 52.2 pounds of roast edible meat, while 100 pounds of 18-pound New York dressed hen turkeys gave only 46.7 pounds of roast edible meat.

The viewpoint of the poultry producer was advanced by Burton (1948). He interviewed a turkey raiser who had retailed his birds which had been cut into both steaks and filets. He reported that the hotel trade had accepted uniform-size, knitted filets as an attractive menu addition, while the housewife seemed to prefer horizontally cut steaks. In his experience, the demand for dark and for light meat filets was about even.

Smith (1948) found turkey steaks, ground turkey patties, cut-up parts, frozen turkey soup and knitted filets available and

in growing demand in eastern food specialty stores. It was of interest to note that he mentioned the need for heavy seasoning in cooking and pointed out that because of the lack of fat, broiling was generally unsatisfactory unless extra fat was added.

EXPERIMENTAL PROCEDURE

The purpose of this study as previously stated was to investigate the influence of freezing, holding time, varying filleting techniques, and cooking methods on the quality of turkey steaks and fillets. As the process for preparing fresh fillets and steaks had proved satisfactory, it seemed logical to investigate the changes occurring during frozen storage. It was of definite practical importance to determine the length of time turkey steaks and fillets could be frozen and remain acceptable. The filleting techniques used in previous studies varied and it was thought that the advantages and disadvantages of the different methods should be determined. Since cooking methods had not been established definitely for these products, the acceptability of products cooked by various methods was believed to be of interest. The weight of white meat, dark meat and waste was recorded and the percentage breakdown of each bird was figured as a basis for future yield estimations.

There is considerable confusion of terminology in literature referring to individual turkey cuts. In the study here reported, two types of cuts were obtained from each bird used. The frozen breasts were sliced into cross-cut steaks, while the

remainder of the meat was fashioned into dark and light meat filets. Throughout this study, the term steak was used to refer to cuts produced by sawing the breasts transversely, and the term filet was used to designate boned meat which was formed into individual portions. Half of the filets used were mechanically processed by putting the meat through a Steak Maker cube steak machine. Filets fashioned in this manner were called machine knit filets. The remaining portions of meat were stored untreated and were pounded by hand immediately before use. These filets were designated by the term hand pounded filets.

In preparation for freezing, all samples were double wrapped. The first wrapping was cellophane and the second wrapping was light weight aluminum foil. The drug store wrap was used for both layers and each portion of turkey was wrapped individually. During the entire study, the turkeys were handled under as uniform conditions as possible.

Initial Treatment

Eight Broad Breasted Bronze turkeys were used in this experiment. The dressed and drawn birds were purchased from the Department of Poultry Husbandry at Kansas State College. The birds were fasted overnight, then killed, thoroughly bled, and drawn immediately. They were chilled for approximately 18 hours at 35°F. at which time they were delivered to the laboratory in the Department of Foods and Nutrition.

Upon receipt, the turkeys were weighed and numbered from I

to VIII for identification. The skin was removed from all of the birds except those numbered III and IV. The treatment given each turkey consisted of removing the back, wings, thighs, and legs. The whole breast was then weighed, wrapped, and frozen in a blast freezer at a temperature of approximately 0°F. The breasts were allowed to remain in the freezer for approximately 24 hours before removing to -2°F. commercial storage.

The legs, thighs and wings were boned immediately and weights were recorded before and after the process. These figures gave the amount of white meat and dark meat which could be used in making filets and the amount of waste. The percentage breakdown of the birds was computed from these figures. For the purposes of this study, all parts not used in the actual preparation of filets was designated as waste. The tendons were removed from the legs and the bones were scraped clean. During the entire process the meat was handled in small portions and kept as cold as possible. Speed of operation was emphasized at all times.

The boned meat from each turkey was weighed into 100 gram portions, 14 of light meat and 14 of dark meat. Seven portions of light meat and seven of dark meat were wrapped individually and sharp frozen in the blast freezer without additional treatment. The remaining 14 samples were shaped into machine knit filets using the Steak Maker machine at a local grocery store. These filets were then wrapped separately and sharp frozen. After approximately 24 hours, all samples were removed to -2°F.

frozen storage.

After the processing of all eight birds was completed, the frozen breasts were removed from storage and each one was sliced transversely on a band saw into seven steaks, each three-fourths of an inch thick. These steaks were sub-numbered 1 to 7 beginning at the neck end of the breast. Each steak was wrapped separately and stored in a commercial freezer locker plant at a temperature of approximately -2°F. At no time during this entire process was the breast meat allowed to thaw, and the procedure was accomplished as quickly as possible.

The two birds numbered III and IV had 10 grams of skin incorporated into the machine filets and the same amount of skin and fat packaged with the unpounded filets. The skin was left on the breasts of these two turkeys so that each steak contained fat and skin. Otherwise the procedure was the same as for the other six birds.

From the time of killing until all parts were frozen, the entire initial procedure was carried out completely with one bird before the next was begun. During the testing period the turkeys were rotated in the same order in which they were killed.

Cooking Procedure

Samples of filets and steaks were withdrawn from storage, cooked, and tested for palatability each month for seven months. The portions were thawed overnight at refrigerator temperature before cooking.

Two light meat filets, one machine knit and one hand pounded, and two dark meat filets, one machine knit and one hand pounded, and a steak were cooked from each turkey every month. The filets which were frozen unpounded were tenderized by 20 strokes with a meat tenderizer, 10 on each side, immediately before cooking. Filets and steaks from two turkeys were cooked by each of the four methods, scored, and the palatability scores averaged.

Portions from the birds numbered I and II were braised, those numbered III and IV had skin included and were also braised. Samples from turkeys numbered V and VI were fricasseed and those from birds VII and VIII were curried. Each of these four methods of cooking was chosen for a particular purpose. Birds numbered I and II, or those which were plain braised, were used as the control. It was believed that this method of cooking, without the addition or concealment of flavors, would present a true picture of the palatability changes which occurred during storage. Skin was added to samples from the turkeys numbered III and IV for two reasons. Some workers had suggested that the skin was the portion of the turkey which carried the strong turkey flavor. Also, since it was known that turkey skin became rancid quickly, it was thought advisable to check the storage life of filets with skin incorporated.

Fricasseeing was chosen as a cooking method for the steaks and filets from turkeys V and VI because it was a typical procedure in poultry cookery. It was believed that steaming in a self-gravy would enhance the poultry flavor if any were present.

The fourth cooking process included the use of curry. Turkeys VII and VIII were cooked in this manner to determine if the period or time of acceptability could be extended by the use of a strong spice which would mask or cover any development of off flavors.

An electric range was used throughout this experiment to insure as nearly standard cooking temperatures as possible. Separate pans of heavy aluminum with close fitting covers were used for each sample.

The cooking techniques used were as follows:

Braised. Filets and steaks were floured, browned in 40 cc of cottonseed oil, and, after the addition of 60 cc of water and one-fourth teaspoon of salt, were covered and steamed in the oven for 30 minutes at 300°F.

Fricasseed. The filets and steaks were floured and browned in 40 cc of cottonseed oil. They were removed from the pan when browned and a gravy was made by mixing the following ingredients by a standard white sauce method.

Ingredient	Weight in grams	Measure
Fat	30	2 Tbsp
Salt	-	¼ tsp
Flour	14	2 Tbsp
Broth	240	1 c

The fat in which the samples were browned was used in making the gravy and one chicken bouillon cube was used with one cup of water to make the broth. After the gravy had thickened, the

steak or filet was returned to the pan, covered, and steamed for 30 minutes at 300°F.

Curried. The filets and steaks were floured and browned in 40 cc of cottonseed oil. The fat in which they were cooked was drained off and they were then covered and steamed in a sauce for 30 minutes at 300°F. The sauce was made from the following ingredients:

Ingredient	Weight in grams	Measure
Margarine	30.0	2 Tbsp
Flour	14.0	2 Tbsp
Curry powder	3.7	1½ tsp
Broth	240.0	1 c

The broth was made by dissolving one chicken bouillon cube in one cup of water.

After cooking, five small pieces were cut from each filet for scoring by a palatability panel made up of five members of the staff of the Department of Foods and Nutrition, Kansas State College. Approximately one-half of each sample was cut for use in tasting and the remainder was left intact for use in judging aroma and appearance. The score card used in judging all products is shown in Form 1.

Form 1. Grading chart for cooked turkey.

Date_____

FACTOR	PHASE	7	6	5	4	3	2	1	1	2	3	4	5	6
Aroma	Intensity	very pro.	pro.	m. pro.	s. pro.	per.	s. per.	imper.						
	Desirability	very des.	des.	m. des.	s. des.	neutral	s. undes.	undes.						
Appearance	Desirability	very des.	des.	m. des.	s. des.	neutral	s. undes.	undes.						
Flavor	Intensity	very pro.	pro.	m. pro.	s. pro.	per.	s. per.							
	Desirability	very des.	des.	m. des.	s. des.	neutral	s. undes.	undes.						
Tenderness	Intensity	very pro.	pro.		s. pro.	per.	s. per.	imper.						
Juiciness	Quantity of juice	very juicy	juicy	m. juicy	s. dry	dry	very dry	ext. dry						
						TOTAL SCORE								
Characteristic turkey flavor		very pro.	pro.	m. pro.	s. per.		s. per.	imper.						

Key to Abbreviations:

pro. - pronounced
m. - moderately
s. - slightly
imper. - imperceptible
des. - desirable
undes. - undesirable
ext. - extremely
per. - perceptible

_____
Signature of Judge

RESULTS AND DISCUSSION

The results are presented in tabular form and each palatability factor is considered separately. The results and a discussion of their significance are combined.

The data in Table 1 give the average weights and percentages of white meat, dark meat, and waste in the drawn turkeys used in this study. The waste appeared high at 31.9 per cent, however this figure included the skin, the bones, and the neck.

Table 1. Weight and percentage yield of light meat, dark meat and waste from drawn turkeys.

Number of bird	Total weight	Wt. of white*	Wt. of dark	Wt. of waste	White meat*	Dark meat	Waste
	gms	gms	gms	gms	pct	pct	pct
I	7975	3410	1811	2754	42.8	22.7	34.5
II	7336	3196	1669	2471	43.6	22.7	33.7
III	8093	3467	1773	2853	42.9	21.9	35.1
IV	6924	3151	1601	2172	45.5	23.1	31.4
V	8252	3520	2072	2660	42.7	25.1	32.2
VI	5036	2254	1334	1448	44.8	26.4	28.8
VII	7753	3430	1917	2406	44.2	24.7	31.1
VIII	4631	2182	1136	1313	47.1	24.5	28.4
Average	7000	3076	1664	2533	44.2	23.9	31.9

*Includes the weight of the breast bone.

These parts were not used in the preparation of steaks and filets but were subsequently utilized in the preparation of soup for another study. The averages of these figures indicated that approximately 68 per cent of the total drawn weight could be employed in making steaks and filets. Sherwood, Beanblossom, and Snyder (1947) reported a 51.8 per cent yield was available for the preparation of steaks from the birds used in their study. In that work the breast meat was removed from the bone, but since the breast was used for sawed steaks, that was impossible in the present experiment.

The yield of the dark meat at 23.9 per cent of the total drawn weight compared favorably with the 21.5 per cent cited by Sherwood, Beanblossom and Snyder (1947). The range of percentage yield was rather narrow considering the variation in the total weight. In the dark meat it varied from 21.9 per cent to 26.4 per cent and in the light meat it ranged from 42.7 per cent to 47.1 per cent of the total drawn weight.

There was little correlation between the total weight and the percentage of dark meat obtained on boning. In the percentage of light meat and of waste, however, the smallest bird, number VIII, gave the highest percentage of white meat and the lowest percentage of waste, and the largest bird, number V, gave the lowest percentage yield of white meat and was fourth in percentage waste. There appeared to be an indirect correlation between the size of the turkey and the percentage yield of light meat. Generally speaking, the larger the bird, the smaller the percent-

age of white meat.

The scores for the intensity of aroma and intensity of flavor which appeared on Form 1 are not included in the results since they did not seem to be indicative of quality change. For example, the average score for intensity of aroma in all the samples which were braised without skin after one month of storage was 6.2. After seven months of storage, the average rating had fallen to 5.6. The average score for braised samples with skin incorporated was 6.1 at one month and 6.0 at the end of the seventh month. The average rating for curried samples at one month was 5.7 and after seven months of storage it was 6.2. A sample judged to have a very pronounced intensity of aroma might be rated very desirable or very undesirable.

The same situation existed in judging samples for intensity of flavor. At one month the average score for all braised samples without skin was 5.6 and after seven months of storage it had risen to 5.9. In the curried portions, the average score at one month was judged to be 6.0, or as possessing a pronounced intensity of flavor. After seven months, the average score was still 6.0. It was impossible to relate in terms of quality the change in intensity in either aroma or flavor.

The appearance score also had little meaning as a quality factor. The machine knit filets were a more uniform shape and consistency than the hand pounded filets but all samples presented an attractive appearance after they were cooked. The method of cooking employed did much to disguise the appearance

of the samples. For example, the sauce in the curried portions and the crust on the braised steaks and filets gave all the samples an attractive appearance. The flour coating applied before browning disguised the color to some extent. From personal observation it was noted by the author, however, that the raw, dark meat filets began to have a slick feeling after two months of storage and darkening was apparent after three months of storage. The light meat filets became a little darker over the seven months' period but not so noticeably. The breastbone greyed a little, but no real darkening was observed.

The appearance ratings did not change a great deal during the storage period. The averaged scores for braised steaks and filets without skin which had been stored one month was 6.1 and after seven months of storage it was 5.4. In curried samples, the score after one month was 5.8 and after seven months' storage it was 5.9.

Data in Table 2 give the average scores for the desirability of aroma in turkey filets and steaks. The figures indicate that the judges found the dark filets to have a less desirable aroma than the white filets in nearly every case after four months of storage. This was substantiated by the individual monthly ratings and by the average for the entire testing period for each type of filet. The monthly scores showed that machine fileting frequently resulted in a lowering in the desirability of the aroma in both dark and white meat filets after storage for three months. The difference was not large or entirely consistent, and

Table 2. Average scores for the desirability of aroma in turkey steaks and filets.*

Type of cut	Time in months							Average scores
	1	2	3	4	5	6	7	
Braised								
White machine knit	6.2	6.1	6.0	5.3	4.7	5.2	5.1	5.5
White hand pounded	6.3	6.1	5.9	5.6	5.1	5.0	4.7	5.5
Dark machine knit	6.3	5.8	5.5	4.4	4.1	4.4	4.3	4.9
Dark hand pounded	6.0	6.1	5.6	4.4	4.1	3.9	4.7	4.9
Steak	5.8	5.7	5.8	5.7	5.0	5.6	4.7	5.4
Average	6.1	5.9	5.8	5.1	4.6	4.8	4.7	
Braised with skin								
White machine knit	5.8	5.8	5.1	5.5	4.5	4.7	4.2	5.0
White hand pounded	6.0	6.0	5.0	5.6	4.7	4.8	5.6	5.4
Dark machine knit	6.1	6.0	5.0	5.2	3.9	4.2	3.6	4.9
Dark hand pounded	6.1	6.0	4.3	5.1	4.3	4.3	4.5	4.9
Steak	6.0	5.9	5.6	5.3	4.7	5.3	4.0	5.3
Average	6.0	5.9	5.0	5.6	4.4	4.7	4.4	
Fricasseed								
White machine knit	6.1	5.7	5.6	5.4	4.9	5.0	5.1	5.4
White hand pounded	6.2	5.8	5.6	5.6	4.6	5.1	5.2	5.4
Dark machine knit	6.3	6.2	6.0	5.0	3.8	4.3	4.5	5.2
Dark hand pounded	6.1	6.0	5.4	5.1	4.2	5.0	4.8	5.2
Steak	6.1	6.1	5.7	5.8	4.9	5.5	5.0	5.6
Average	6.2	5.9	5.7	5.6	4.5	5.0	4.9	
Curried								
White machine knit	6.2	6.2	6.0	5.5	5.3	5.4	5.4	5.7
White hand pounded	6.1	6.3	5.6	5.5	5.7	5.5	5.6	5.8
Dark machine knit	6.2	6.1	5.2	5.0	4.7	5.1	4.8	5.3
Dark hand pounded	6.1	6.3	5.4	5.2	5.1	5.2	5.2	5.5
Steak	6.1	6.0	6.0	5.9	5.2	5.8	5.1	5.7
Average	6.2	6.2	5.6	5.4	5.3	5.7	5.3	

*The highest possible score is 7.

in the average for the whole testing period, the scores were generally the same for machine and for hand pounded filets. After seven months of storage the dark machine knit filets had the lowest score in every case, while the white hand pounded filets received the highest rating in every case except one. A possible explanation for this may lie in the fact that the light meat of turkey has 4.6 per cent fat while the dark meat has 9.4 per cent fat. Since it is the fat which causes rancidity, it might well follow that the dark meat, with a higher fat content would deteriorate more rapidly and to a greater extent than would white meat.

The method of cooking appeared to have little effect on the desirability of the aroma during the early months of the testing period, but after the filets had been stored for five months, the judges preferred the curried filets to any other type. This was rather to be expected since the curried products had a strong distinctive odor which would tend to cover any rancidity taint.

The steaks were generally rated higher on the basis of aroma than were the filets after the third month of storage. This persisted until the final rating period, at which time the scores dropped sharply.

As a whole, aroma ratings were much higher than those for flavor. Over the seven months' storage period there was a smaller decline in desirability and at no time during the judging was any sample rated undesirable in aroma.

The average scores for the desirability of flavor are given

in Table 3 and show a wide variation after the second month of storage. The scores range from 3.7 to 6.2. The judges found the dark filets to be less desirable in flavor than the light filets. This general preference persisted through the final scoring period. This is evident in both the monthly scores, and in the average ratings for the entire period. In the average scores the dark filets were rated lower than the white in every case.

Machine knitting of filets appeared to be a factor in flavor deterioration in turkey filets. The machine knitted filets were rated lower in most cases than were hand pounded filets of the same color. In the average scores for the entire testing period, this was true in all cases, regardless of cooking method used. This might be explained by the fact that during mechanical filleting there is a rather general breakdown of fiber structure with a resulting increased surface area. This would allow oxidation and bacterial growth to occur more rapidly.

After the fifth month of storage the curried filets and steaks were rated higher in every case than those cooked by any other method. The results showed that the braised samples, both with and without skin, deteriorated in flavor steadily after the third testing period. The curried samples, on the other hand, showed fairly constant scores for the same period, with only a slight lowering in flavor desirability. The steaks and filets with skin incorporated were, on the whole, less desirable in flavor than those portions stored without skin, but there were enough exceptions so that when averages were considered, the difference was not marked.

Table 3. Average scores for desirability of flavor in turkey steaks and filets.*

Type of cut	Time in months							Average scores
	1	2	3	4	5	6	7	
Braised								
White machine knit	6.0	5.8	5.6	4.7	4.7	3.7	3.1	4.8
White hand pounded	6.1	6.0	5.6	5.3	3.8	4.6	3.6	5.0
Dark machine knit	5.5	5.2	5.0	3.5	2.8	2.8	2.0	3.8
Dark hand pounded	5.8	5.5	4.3	3.7	2.7	2.7	3.2	4.0
Steak	6.0	5.7	5.2	5.2	5.0	5.8	3.3	5.2
Average	5.9	5.6	5.1	4.5	3.8	3.9	3.0	
Braised with skin								
White machine knit	5.7	4.9	4.2	3.9	2.9	3.6	3.2	4.1
White hand pounded	5.7	5.6	4.2	5.1	3.6	4.2	5.1	4.8
Dark machine knit	5.6	5.6	3.8	3.3	2.8	1.9	2.2	3.6
Dark hand pounded	6.0	5.4	3.7	3.6	3.5	3.0	3.6	4.1
Steak	5.6	5.3	5.0	4.3	4.5	4.6	1.5	4.4
Average	5.7	5.4	4.2	4.0	3.5	3.5	3.1	
Fricasseed								
White machine knit	6.1	5.8	5.0	4.8	4.0	4.4	3.6	4.8
White hand pounded	6.2	5.2	5.2	4.9	3.3	5.2	4.5	4.9
Dark machine knit	5.4	5.5	4.6	4.1	2.4	2.7	2.3	3.9
Dark hand pounded	5.3	5.3	4.3	4.7	3.3	3.7	3.5	4.3
Steak	6.1	6.1	6.0	5.1	4.4	4.9	3.8	5.2
Average	5.8	5.6	5.0	4.7	3.5	4.2	3.5	
Curried								
White machine knit	5.7	5.4	5.6	4.8	4.1	3.9	4.6	4.9
White hand pounded	5.7	5.7	5.1	4.9	4.9	4.6	5.2	5.2
Dark machine knit	5.6	5.8	5.2	4.0	3.0	2.8	3.0	4.2
Dark hand pounded	5.7	4.6	5.1	4.5	4.0	4.3	4.4	4.7
Steak	6.2	5.2	6.2	5.0	5.2	5.4	4.5	5.4
Average	5.8	5.3	5.4	4.6	4.2	4.2	4.3	

*The highest possible score is 7.

The length of time that the filets could be stored and remain desirable from the standpoint of flavor varied with the color of the meat and the type of fileting treatment. The white filets were considered slightly desirable at the end of the fourth month of storage, except in the case of those samples having skin incorporated. These white filets became only slightly desirable at the end of the third month of storage. The dark filets were considered neutral in flavor by the fourth scoring period in the braised samples, and by the fifth scoring period in fricasseed and curried portions. These results are lower than the finding of Goertz (1947). In her study white filets stored without pounding were acceptable after being frozen for 180 days. The average palatability score for the white filets at 180 days was 5.1 in her study as compared with 4.6 in this study.

In the study by Goertz, the average score for desirability of flavor in dark unpounded filets which had been stored for 180 days was 4.4. In the present study, the average rating of dark unpounded filets cooked by four different methods was 5.4.

This difference in scoring may be explained partially by the fact that the judges had a wider experience with turkey filets at the time of the present experiment and were consequently more critical in their tastes.

Goertz (1947), in her study of turkey filets, stated that for the first 90 days of storage the dark filets were more desirable than the light meat filets. This contention was not borne out by the figures given in Table 3. This was true in only one

instance, during the second month of storage in the fricasseed samples. It was only after 60 days of storage, however, that there was a real difference in the desirability of the light and dark meat filets.

The steaks generally maintained their desirability until the end of the sixth month of storage, and were frequently rated higher than the filets stored a corresponding length of time. At the final scoring period the quality of the steaks fell sharply with all cooking methods, and were scored lower than the white unpounded filets.

The average scores for tenderness are given in Table 4. A study of the figures showed that the machine knit filets were rated more tender in most cases than those which were hand pounded. The difference was not large, but it was particularly evident in the dark meat filets. This seemed logical since the meat tissues were broken down more extensively during the process of machine fileting.

The cooking technique had no appreciable influence on the tenderness of either the turkey steaks or filets. This no doubt was due to the fact that in every cooking method used the filets were steamed for the same length of time.

The dark meat filets did not appear to be more tender than the white samples. The steaks appeared to be slightly more tender than the filets in the judges' opinions, but the difference was not great.

The tenderness of the steaks and the filets did not change to

Table 4. Average scores for tenderness in turkey steaks and filets.*

Type of cut	Time in months							Average score
	1	2	3	4	5	6	7	
Braised								
White machine knit	6.3	5.6	6.0	6.1	6.0	6.1	6.2	6.0
White hand pounded	5.8	5.6	5.9	6.4	5.5	6.5	6.0	6.0
Dark machine knit	6.2	5.0	5.5	7.0	6.3	5.9	6.1	6.1
Dark hand pounded	6.0	5.8	5.5	5.7	5.3	6.0	5.8	5.7
Steak	6.5	6.3	6.1	6.2	5.6	6.4	6.8	6.3
Average	6.1	5.9	5.8	6.3	5.7	6.1	6.1	
Braised with skin								
White machine knit	6.3	5.7	6.0	5.8	5.8	5.9	6.1	5.9
White hand pounded	5.7	5.5	5.8	6.0	5.8	6.0	6.5	5.9
Dark machine knit	6.2	6.2	6.0	5.9	5.9	6.0	5.7	6.0
Dark hand pounded	5.6	5.5	5.5	5.7	6.0	5.7	6.0	5.7
Steak	5.7	5.8	6.0	5.9	5.4	5.9	5.1	5.7
Average	5.9	5.7	5.9	5.9	5.8	5.9	5.9	
Fricasseed								
White machine knit	6.1	5.7	6.2	5.6	5.9	6.2	6.3	6.0
White hand pounded	5.8	5.4	6.0	6.0	5.8	6.1	6.1	5.9
Dark machine knit	6.6	6.0	6.3	5.9	6.0	6.3	6.2	6.2
Dark hand pounded	5.7	5.8	5.8	5.3	5.4	6.1	5.1	5.6
Steak	6.4	6.3	5.7	6.0	5.9	6.3	6.2	6.1
Average	6.1	5.8	6.0	5.8	5.8	6.2	6.0	
Curried								
White machine knit	6.1	5.3	5.8	6.5	5.6	6.0	6.2	5.9
White hand pounded	6.1	5.5	5.4	6.7	5.5	5.3	5.4	5.7
Dark machine knit	6.1	5.7	5.4	6.0	5.6	5.9	5.8	5.8
Dark hand pounded	6.1	5.5	5.4	6.0	5.7	5.7	5.6	5.7
Steak	6.1	6.0	5.8	5.9	6.1	6.3	6.5	6.1
Average	6.1	5.6	5.6	6.2	5.7	5.8	5.9	

*The highest possible score is 7.

any great extent during the seven months of storage, and the scores never fell below the desirable level. Usually they were rated higher. This would indicate that tenderizing would never be a serious problem in the preparation of turkey steaks and filets.

Table 5 gives the average scores for juiciness in turkey steaks and filets. The dark filets generally were rated slightly more juicy by the judges than the white filets. This was also the case in the study done by Goertz in 1947. The treatment prior to freezing appeared to have little effect on the juiciness, and the machine filets did not prove to be more moist than those stored unpounded.

The steaks and filets became somewhat less juicy during storage. An examination of the scores indicated that the samples were never scored higher than moderately desirable, even during the first months of storage.

The method of cooking, and the employment of sauces seemed to have no effect on the juiciness of either the dark or the white meat filets. In the case of the steaks, however, currying and fricasseeing produced definitely more moist products. The steaks that were braised with skin were considered drier than those cooked by any other method.

The average scores for characteristic turkey flavor, Table 6, show that in the opinion of the judges, none of the turkey steaks and filets tested had a pronounced turkey flavor. It was least evident in the samples which were curried as was expected

Table 5. Average scores for juiciness in turkey steaks and filets.*

Type of cut	Time in months							Average scores
	1	2	3	4	5	6	7	
Braised								
White machine knit	4.9	4.8	4.9	4.4	4.4	4.7	4.5	4.6
White hand pounded	5.2	4.7	5.4	4.8	4.7	4.8	3.7	4.7
Dark machine knit	5.0	5.1	5.0	5.3	4.6	5.1	4.6	5.0
Dark hand pounded	5.3	5.3	5.0	5.5	4.6	5.0	4.8	5.1
Steak	5.1	5.2	5.1	4.3	3.9	4.7	3.1	4.5
Average	5.1	5.0	5.1	4.9	4.4	4.9	4.1	
Braised with skin								
White machine knit	5.3	4.9	5.1	4.7	5.0	4.7	4.1	4.8
White hand pounded	5.0	5.2	5.0	4.1	4.6	4.2	3.8	4.6
Dark machine knit	5.2	5.3	5.1	4.3	4.9	4.5	4.1	4.8
Dark hand pounded	5.8	5.1	5.0	4.4	4.8	4.7	4.5	4.9
Steak	4.6	4.5	4.5	4.2	3.3	4.2	2.6	4.0
Average	5.2	5.0	4.9	4.3	4.5	4.5	3.8	
Fricasseed								
White machine knit	5.1	4.7	4.5	4.6	4.3	4.3	4.3	4.6
White hand pounded	5.0	4.8	4.7	4.7	4.4	3.8	4.5	4.6
Dark machine knit	5.3	5.2	5.3	4.5	4.8	4.8	4.0	4.8
Dark hand pounded	5.2	5.4	5.0	4.5	4.6	4.7	4.5	4.8
Steak	5.1	5.6	5.5	4.9	4.7	5.1	3.3	4.9
Average	5.1	5.1	5.0	4.6	4.6	4.5	4.1	
Curried								
White machine knit	5.1	4.8	4.8	4.5	4.5	4.6	4.2	4.6
White hand pounded	5.1	4.7	5.0	4.6	4.8	4.1	4.2	4.6
Dark machine knit	5.3	5.2	5.0	4.8	4.3	4.1	3.8	4.6
Dark hand pounded	5.5	5.4	4.9	4.9	4.5	4.4	4.6	4.9
Steak	5.0	5.3	5.5	4.9	4.8	5.1	4.1	5.0
Average	5.2	5.1	5.0	4.7	4.6	4.5	4.2	

*The highest possible score is 7.

Table 6. Average scores for characteristic turkey flavor in turkey steaks and filets.*

Type of cut	Time in months							Average scores
	1	2	3	4	5	6	7	
Braised								
White machine knit	5.0	4.3	4.7	3.5	3.8	3.7	4.2	4.2
White hand pounded	5.1	3.7	4.6	3.5	4.2	4.4	4.1	4.2
Dark machine knit	5.6	4.1	4.6	4.0	3.6	4.3	4.1	4.3
Dark hand pounded	5.1	4.6	4.6	4.0	3.9	4.2	4.2	4.4
Steak	4.6	4.9	5.0	4.1	4.3	3.9	3.0	4.3
Average	5.1	4.3	4.7	3.8	4.0	4.1	3.9	
Braised with skin								
White machine knit	5.1	4.3	4.9	4.2	3.5	3.5	3.5	4.1
White hand pounded	5.0	5.0	4.5	4.1	3.8	3.8	3.8	4.3
Dark machine knit	5.3	4.5	4.6	4.2	3.7	3.5	3.5	4.2
Dark hand pounded	5.2	4.7	4.1	4.0	3.9	3.6	4.2	4.2
Steak	5.2	5.0	4.5	3.8	4.1	3.7	2.7	4.1
Average	5.2	4.7	4.5	4.1	3.8	3.6	3.5	
Fricasseed								
White machine knit	4.2	4.0	4.6	4.5	3.0	4.2	4.2	4.1
White hand pounded	4.4	4.2	4.9	5.2	3.1	4.7	4.2	4.4
Dark machine knit	4.2	4.9	5.3	4.2	3.0	4.2	4.0	4.3
Dark hand pounded	4.1	4.6	4.7	4.1	3.4	4.5	4.2	4.2
Steak	4.1	5.1	3.8	3.9	3.6	4.6	3.1	4.0
Average	4.2	4.6	4.7	4.4	3.2	4.4	3.9	
Curried								
White machine knit	2.8	3.1	4.2	4.1	3.4	3.6	3.2	3.5
White hand pounded	3.0	3.2	4.2	3.6	3.2	3.8	3.2	3.5
Dark machine knit	3.1	3.4	4.1	4.1	3.3	3.8	3.4	3.6
Dark hand pounded	3.2	3.4	4.0	4.5	3.4	3.8	3.6	3.7
Steak	2.8	4.5	3.2	3.5	3.2	3.6	3.0	3.4
Average	3.0	3.5	3.9	4.0	3.3	3.7	3.3	

*The highest possible score is 7.

since they had a strong individual flavor of their own. During the last two months of the storage period, all the samples with skin incorporated gave a lower average score for typical turkey flavor than any others except those which were curried. This was contrary to expectations, since it had been anticipated that the inclusion of skin would result in a much more characteristic flavor. The steaks and filets appeared to have about the same degree of turkey flavor until the final testing period. At that time the steaks were noticeably low. There were numerous comments from the palatability committee in which the flavor of the steaks and filets was compared to that of veal.

The characteristic turkey flavor decreased markedly during storage in the samples which were braised, both with and without skin. This was not the case in the fricasseed and curried samples, in which there was very little decline in typical turkey flavor.

The palatability scores for turkey steaks and filets showed a gradual decrease for all factors, with the possible exception of tenderness, over the seven months of storage. The lowest scores recorded were for the desirability of flavor with an average decrease of 2.4 points for all cooking methods during the storage period.

The averages showed that no samples were considered undesirable, regardless of cooking method; however, individual scores revealed ratings as low as 1.5. The greatest change for all factors occurred in the last three months of storage.

It should be emphasized that during the early months of storage all of the samples prepared were highly presentable and palatable. The criterion of the judges in scoring this turkey was abnormally high, and this fact may have resulted in a somewhat biased picture of the acceptability of these turkey steaks and filets. From the remarks of the individuals not trained in palatability testing, who also tasted these products, it would appear that even in the last months of storage, they would be received without adverse comment on the average home or restaurant menu.

SUMMARY

Filets and steaks were prepared from eight Broad Breasted Bronze turkeys. One-half of the filets prepared was machine knitted before freezing and the other half was frozen untreated. Light meat and dark meat filets were processed in equal numbers. Skin was incorporated into the portions prepared from two birds, while the skin was removed from the other six turkeys. Steaks were made by sawing the frozen breasts transversely. The steaks and filets were wrapped first in cellophane and then in aluminum foil and frozen in a blast freezer for 24 hours prior to storage in a commercial locker at -2°F. Samples of steaks and of light meat and dark meat filets prepared by the two methods were removed from storage at monthly intervals over a period of seven months. These portions were thawed in the refrigerator, then cooked by four different methods, utilizing the steaks and filets from two birds for each method. The cooking procedures used were

braising (water added) with and without the incorporation of skin, fricasseeing (brown sauce added), and currying. After being cooked, the samples were tested for palatability factors of flavor, aroma, tenderness, juiciness, and typical turkey flavor by a panel of five judges.

The results of this study seem to show that turkey filets are not particularly well adapted to frozen storage for long periods of time. The white meat filets remained moderately desirable until the end of the fourth month of storage while the dark filets were scored only slightly desirable at that time. This work showed that white meat filets may be frozen more successfully than dark meat filets. However, it indicated a definite time limit for holding which would prove to be an obstacle in commercial production.

There was no noticeable difference in the quality of the machine knit and the hand pounded filets during the first three months of storage. After that time the machine knit filets deteriorated more rapidly than did those frozen untreated. This was particularly evident in the dark meat filets. As a result of this work it would seem more satisfactory in the preparation of filets to freeze the boned meat and then to prepare the filets, either machine knit or hand pounded immediately before cooking.

The incorporation of skin was not desirable from the standpoint of flavor and did not increase the characteristic turkey flavor to any extent. Since the inclusion of skin also lowered the keeping quality, its use would not be recommended.

All of the cooking procedures used resulted in attractive and palatable products for the first few months of frozen storage. When the flavor deteriorated, the employment of a strong flavor such as curry did much to mask the off-flavors of the meat.

All of the samples tested were moderately tender and this factor was not influenced by the methods of cooking used. None of the filets and steaks was judged to have a very characteristic turkey flavor.

The turkey steaks appeared to be slightly drier than the filets, but it was believed that dryness was characteristic of the breast meat. The steaks withstood frozen storage more successfully than did the filets, and remained moderately desirable until the end of the fifth month except in the samples from which the skin had not been removed. After six months of storage the desirability score of the steaks fell sharply. Considering the better keeping qualities in frozen storage and the fact that much less time was required for preparation, turkey steaks were considered more practical than filets.

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