

THE UTILIZATION OF PORTIONS OF TURKEY AS FOOD

by

GRAYCE EDYTH GOERTZ

B. S., Kansas State College
of Agriculture and Applied Science, 1941

A THESIS

submitted in partial fulfillment of the

requirements for the degree of

MASTER OF SCIENCE

Department of Food Economics and Nutrition

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1947

LD
2668
T4
1947
G64
C.2

111203 877059

TABLE OF CONTENTS

INTRODUCTION	1
REVIEW OF LITERATURE	2
PROCEDURE	6
Storage Filets	7
Holding Filets	9
Precooked Frozen Filets	10
Turkey Steaks	10
Turkey Wings	12
Turkey a la King	13
RESULTS	16
DISCUSSION OF RESULTS	26
SUMMARY	29
ACKNOWLEDGMENT	32
LITERATURE CITED	33
APPENDIX	35

INTRODUCTION

Nearly 130 million pounds of the 41 million turkeys raised in 1946 are now in cold storage. With the increasing demobilization of the Armed Forces came the cancellations of heavy government orders for turkey. Large turkeys, which included the Broad-Breasted Bronze variety, were particularly affected by this economic situation.

There seemed to be an ever increasing trend toward serving smaller numbers of guests at one meal. That along with the smaller sized families has increased the demand for smaller sized portions of meat.

In view of these two situations, in which there is a surplus of the large turkey and a larger demand for smaller sized meat portions for the average family, there is the accompanying need for a greater variety of methods of utilizing turkey in small portions.

Large turkeys are comparatively less expensive than the smaller ones or chickens. However, the popular opinion that turkey meat develops an off-flavor and becomes rancid more quickly than chicken, presented the need for the following study.

The purpose of this study was to determine: (1) acceptable methods of preparation for each portion of turkey with regard to cost, time of preparation, and flavor; (2) the

effect of storage on frozen cooked and uncooked filets; and (3) acceptable methods for using turkey scraps in precooked frozen foods.

REVIEW OF LITERATURE

There is a paucity of literature concerning the utilization of portions of turkey. Previous to the development of the Broad-Breasted Bronze turkey, according to Smith (1940), breeders directed most of their attention to the feather appearance rather than to the meat of the bird. Since the Broad-Breasted Bronze was typically a large bird, there seemed to be a demand for a smaller type turkey. Thompson (1944) reported the development of the New Jersey New Buff, a smaller bird, which was produced to meet this demand.

Smaller turkeys, however, demanded a higher price when compared with the larger birds. The large turkey could be produced at a lower cost per actual meat weight than the smaller type birds. It has been estimated by the National Turkey Federation (1946) that approximately 50 percent more finished meat could be obtained from a Broad-Breasted Bronze turkey than from full grown birds of other breeds.

Frozen storage of turkey has demanded little attention in the literature up to this time. Asmundson and workers (1938) have indicated that an off-flavor and odor in turkey is quite noticeable when the birds are fed two to five percent

fish oil. The intensity of the fishy flavor is increased in frozen storage for as short a time as 22 days. Marble and workers (1938) found that both the fishy flavor and odor in turkey meat could be partially eliminated if the cod liver oil and white fish meal were removed from the diet eight weeks prior to the time of slaughtering the bird.

In the work on frozen poultry storage which Schreiber, Vail, Conrad and Payne (1947) reported, they stated that feeding fish oil or alfalfa one or two weeks previous to the slaughter of the chicken decreased the stability of the fat during frozen storage. Kummerow¹ has indicated the possibility of using certain types of modifications in the diet of young turkeys in order to increase the stability of the tissue fat.

The treatment of poultry before freezing has been found to be an additional factor in the frozen storage life of the meat. Wagoner, Vail and Conrad (1947) indicated that starving poultry for 16 hours previous to slaughter tended to increase the storage stability of the meat. Cook (1940) reported that as long as poultry was promptly and properly handled with respect to precooling, freezing and storage no advantage was to be gained by using rapid rates of freezing. He suggested that a storage temperature of 0° F. to -8° F. was entirely satisfactory for holding poultry for periods as long as one year. It was later reported by Wagoner, Vail and Conrad (1947)

¹ F. A. Kummerow, Kansas State College. (Confidential unpublished report). 1947.

that stability of poultry in frozen storage was decreased when dressed poultry was held at chill room temperature one day or longer before evisceration. Stewart, Hanson and Lowe (1945) observed no appreciable effect on the palatability score in eviscerated broilers that had been aged 18 hours before freezing. They also indicated that there was no significant difference in the palatability scores when broilers were frozen at -68.9° F., -113.9° F., and -154.4° F. Holding broilers 18 hours before freezing seemed to have no effect on the palatability scores even though intra-cellular freezing did not occur regardless of freezing temperature used. Koonz and Ramsbottom (1939) have reported that inter-cellular freezing was accomplished at temperatures above -15° F.

Wagoner, Vail and Conrad (1947) postulated that serious rancidity in eviscerated poultry could probably be attributed to a longer preliminary holding period rather than to an increased surface area. They indicated that the rate of development of rancidity was increased by the additional amount of surface exposed to the air by evisceration, but not to an undesirable extent if the poultry were stored for any reasonable length of time.

Koonz and Cooley (1947) indicated the superiority of New York dressed poultry, without previous chilling and frozen immediately after being dressed, over poultry eviscerated before freezing.

It has been the opinion of some workers that the chemical changes which occur in poultry fat during storage are probably due to oxidation and hydrolysis. Cook and White (1939), in their study of free fatty acid and peroxide values of fat of stored frozen poultry, found that poultry fat was quite resistant to oxidation at storage temperatures ranging from 0° F. to 7.5° F.

In later work which was done, Schreiber, Vail, Conrad and Payne (1947) concluded that the oxidation-induction period of extracted fat did not give a reliable prediction of the stability of poultry fat during frozen storage. They indicated a correlation between the decrease in flavor score with the increase in aldehyde and peroxide content of the internal fat of poultry.

Most of the literature available concerns the treatment and handling of chickens. Even though much of this information is somewhat applicable to turkey, Kummerow¹ has indicated the increased unstability of turkey fat in comparison with chicken fat.

A short study by Nelson² indicated that turkey steaks might be successfully cut from turkey.

Morris (1946), in a preliminary investigation of different

¹ F. A. Kummerow, Kansas State College. (Confidential unpublished report). 1947.

² L. Nelson, University of Nebraska. (Private communication). 1947.

methods of preparation of turkey, suggested that turkey filets were probably one of the most acceptable products of those methods investigated.

PROCEDURE

Broad-Breasted Bronze turkeys which were obtained from the Department of Poultry Husbandry at Kansas State College, Manhattan, Kansas were used in this study. The turkeys were thoroughly chilled before they were cut into filets. An attempt was made to keep the turkey as cold as possible during the entire process of preparing the filets.

The whole turkey was cut into drumsticks, thighs, wings, shoulder and breast. Each piece was boned and in the case of the drumsticks the tendons were removed by cutting and pulling with tweezers. The boned pieces of meat were cut into filets by cutting with the grain of the flesh. An average size turkey yielded four filets per drumstick, six filets per thigh, one filet per wing, two filets per shoulder, and 20 filets per breast or a total of approximately 44 filets.

A record of the time required to cut the separate pieces from the carcass, to remove the skin from each individual piece, to bone and remove tendons from each piece as well as the amount of time to cut the filets was kept (Form 1).

Weights of the whole turkey, individual pieces, skin and bones were recorded. The bones with scraps of meat not suit-

able for filets were cooked, meat removed from the bone and weights of each recorded (Form 2). The weights of individual filets were also recorded (Form 3).

The filets were placed in moisture-vapor-proof cellophane bags. An attempt was made to exclude as much air as possible before the bag was heat sealed. The filets were frozen in a commercial home freezer at -10° F. These frozen filets were removed to Iceways Food Locker Storage, Manhattan, Kansas within one week after freezing and stored at -10° F. Labels giving identification number, date, and cut were placed in each package.

Storage Filets

The meat of the first two turkeys was cut into individual filets, wrapped and frozen. The filets of the third turkey were cut and pounded before freezing. The flesh of the fourth and fifth turkeys was cut into package-size portions and frozen in that manner. Individual filets were cut from these larger portions at the time they were removed from the freezer and had defrosted for a three hour period. In the case of the filets from the first three turkeys, an equal number of light and dark meat portions were placed in each package. The dark and white meat portions of the fourth and fifth turkeys were packaged separately.

The filets on which storage tests were run were removed

from the locker at one month intervals. The cellophane was removed from the turkey and the partially defrosted filets were separated after two hours; at the end of the next hour weights of individual filets were recorded. A total of four hours before baking was allowed for the defrosting at room temperature. Each filet was pounded a constant number of times with the same type of meat hammer. Weights were again recorded after pounding.

The filets were dipped into a flour, salt, egg and distilled water batter after which they were crumbed with a bread crumb and flour mixture. The following proportions were used for the batter and bread crumb mixture for four filets.

Batter

<u>Ingredient</u>	<u>Weight in gms.</u>	<u>Approximate measure</u>
Flour	10.3	1-1/2 T
Salt	3.0	1/2 t
Whole egg	24.0	1/2 egg
Distilled water	30.0	2 T

Bread crumb and flour mixture

<u>Ingredient</u>	<u>Weight in gms.</u>	<u>Approximate measure</u>
Flour	27.5	1/4 c
Bread crumbs	18.0	1/4 c

Weights of individual filets were again tabulated. The filets were browned for three minutes in five grams of hydrogenated vegetable shortening for each filet and heated to a definite temperature.

The frying pans used for browning were rinsed with amounts of distilled water dependent on the number of filets. Twenty-five milliliters of distilled water were allowed for

each filet. This liquid was poured over the filets. Total weights were taken.

The filets were baked in an uncovered, aluminum, eight-inch square cake pan in an electric oven at 350° F. for 35 minutes. Weights of the baked filets and meat juice were recorded.

The filets were then cut into small pieces and scored by a palatability committee consisting of five members of the Department of Food Economics and Nutrition. A grading chart adopted from a chart for cooked meat compiled by the Committee on Preparation Factors, National Cooperative Meat Investigations was used (Form 4).

Holding Filets

The filets used for this test were taken from a frozen half-turkey defrosted only enough to permit cutting. After the filets were cut, they were refrozen. These filets were treated and prepared in the same manner as described for the storage tests. They were kept hot in the top of a double boiler; the lower part of which was filled with 720 grams of water and kept at a boiling temperature. The meat juice remaining in the baking pans after the filets were cooked was poured over the filets which were in the top portion of the double boiler.

Six filets, three dark and three white, were prepared in each of the three series of holding tests. Two filets, one

dark and one white, were scored immediately after baking, two after a 30 minute holding interval and two after a 60 minute holding interval. Each group was scored by the palatability committee.

Precooked Frozen Filets

Filets which were cooked according to the same procedure as those prepared for the storage tests were allowed to remain at room temperature for two hours and weighed. These cooked filets were then wrapped in moisture-vapor-proof cellophane, labeled, heat sealed and frozen at -10° F. A total of 32 filets, 16 fresh and 16 precooked frozen, from the fourth and fifth turkeys were used in this test.

The frozen cooked filets were defrosted after 10- and 45-day intervals. After removing the cellophane, the defrosting was accomplished by placing the frozen filets in the top part of a double boiler. The bottom part of the double boiler was filled with 720 grams of water and kept at a boiling temperature. The filets were heated for one hour and 15 minutes, weighed and scored by the palatability committee.

Turkey Steaks

A sixth turkey which had been frozen was cut into steaks. The steaks were cut the entire width of the frozen bird with

an electric saw. Three different widths of steaks were cut: one-half inch, three-fourths inch, and one inch. These were cut in that succession beginning at the head end until 12 steaks had been cut from one turkey.

The frozen steaks were weighed and then wrapped with waxed locker paper. An attempt was made to exclude as much air as possible during the wrapping process. The turkey steaks were labeled and placed in a commercial home freezer at -10° F.

In preparing the steaks, they were allowed to defrost at room temperature for two hours before cooking. Weights were recorded after one hour of the defrosting period had passed. The steaks were then pounded a definite number of times, dependent upon the width, after which weights were again recorded.

In the preliminary tests, three methods of preparation of the steaks were used to determine which was the most desirable. The methods used were as follows:

Plain (enough for two steaks)

<u>Ingredient</u>	<u>Weight in gms.</u>	<u>Approximate measure</u>
Flour	55.0	1/2 c
Baking powder	1.9	1/2 t
Salt	6.0	1 t

The steaks were dipped in the flour, baking powder and salt mixture.

Marinated. The steaks were allowed to marinate in 220 grams of vegetable oil for 45 minutes. They were then dipped in the same mixture as used for the plain turkey steaks.

Crumbed. The steaks were dipped in a thin batter similar to that used for the storage filets. Then they were rolled in

a flour-bread crumb mixture which was also similar to that used for the storage filets.

Each of the three methods was repeated for each of the three different thicknesses of steaks.

The steaks were weighed just before browning. They were browned in 100 grams of hydrogenated vegetable shortening for 10 minutes. One hundred milliliters of distilled water were added to the steaks. The steaks were baked in the 10-inch aluminum frying pans in which they were browned. They were baked at 350° F. for 25 minutes after which they were weighed and scored by the palatability committee.

Since the marinated steaks were judged most desirable of the three methods in the preliminary tests, the last three steaks of varying thickness were prepared using this method.

Turkey Wings

Three pairs of turkey wings were cooked in this series. One of each pair was cooked in a four quart Mirro-matic pressure saucepan while the other matching wing was baked in the oven.

The wings were allowed to defrost at room temperature for one hour before cooking; weights were recorded after 45 minutes of defrosting. The wings were browned for nine minutes in 30 grams of hydrogenated vegetable shortening per wing. The shortening was heated to a constant temperature.

The weights of the browned wings were recorded.

Two hundred forty grams of distilled water were placed in the pressure saucepan and brought to a boil before the browned wing was placed in the pan. Three minutes elapsed between the time that the lid was placed on the pressure saucepan and the time that 10 pounds of pressure was reached. The wings were cooked at 10 pounds pressure for 23 minutes. Three minutes were allowed to elapse before the pressure gauge and the lid were removed.

Wings which were baked in the oven were placed in a covered one quart pyrex casserole. One hundred milliliters of distilled water were used to rinse the browning pan and the contents were poured over the wings in the casserole. The wings were baked in an electric oven at 350° F. for one hour.

After cooking, wings prepared in the pressure saucepan and in the oven were weighed and scored by the palatability committee.

Turkey a la King

Four series of turkey a la king were made using a recipe adopted from Practical Cookery published by the Food Economics and Nutrition Department of Kansas State College at Manhattan, Kansas.

The scraps of each turkey which had been cooked and frozen at the time of cutting the filets were defrosted by

placing the container in water, the temperature of which was slightly higher than 68° F.

The broth was separated from the scraps and diluted with distilled water to the desired amount of liquid. Four series, each including seven variations in sauces, of turkey a la king were made.

The varying proportions of basic ingredients used for the turkey a la king were as follows:

<u>Ingredient</u>	<u>Weight in gms.</u>	<u>Approximate measure</u>
Diced turkey	90.0	1/3 c
Shortening	6.25	1-1/2 t
Mushrooms	30.0	1/4 c
Chopped pimento	5.6	1-1/2 t
Green pepper	9.2	1 T
Salt	1.0	1/6 t
Paprika		dash
White sauce		1 c

Procedure. The mushrooms were cooked in the hydrogenated vegetable shortening. The pimento, diced green pepper, salt and paprika were added to the diced turkey. The white sauce was made next. After the white sauce had cooled slightly, it was poured over the egg yolk. The white sauce mixture was then added to the turkey mixture. The turkey a la king was reheated only in the case of white sauce number one before it was frozen.

All of the seven variations of white sauces contained 220 grams of broth and 8.4 grams of hydrogenated vegetable shortening. The variations in the thickening for the sauces were as follows:

Number	Ingredient	Weight in gms.	Approximate measure
1	Flour	7.0	1 T
	Egg yolk	12.0	2/3
2	Same as number one		
3	Amioca	5.4	2 t
	Flour	2.4	1 t
	Egg yolk	12.0	2/3
4	Amioca	5.4	2 t
	Flour	4.6	2 t
5	Pink kaffir starch	5.8	2 t
	Flour	2.4	1 t
	Egg yolk	12.0	2/3
6	Flour	9.4	4 t
7	Pink kaffir starch	5.8	2 t
	Flour	4.6	2 t

The green peppers and mushrooms were browned in hydrogenated vegetable shortening heated to a constant temperature for 10 minutes. The sauces were cooked in the top part of a double boiler for 10 minutes and then allowed to cool slightly before adding to the eggs. Other ingredients were added at this time.

The turkey a la king was placed in moisture-vapor-proof cellophane bags which were labeled and heat sealed. These packages were cooled by placing in a refrigerator for several hours after which they were frozen in a commercial home freezer at -10° F.

Members of the palatability committee scored a sample of each type of a la king before it was frozen. These samples were

prepared for scoring by heating the contents in pyrex custard cups set in water and placed in the oven. The turkey a la king was allowed to heat for 45 minutes at 300° F. before scoring.

In a preliminary investigation, it was discovered that defrosting turkey a la king in the top part of a double boiler was better than the oven, steam, or direct heat method. The turkey a la king was defrosted after a one-month-storage period. Each package was allowed to defrost for 45 minutes by using the same method as previously described for defrosting the precooked frozen filets.

The a la kings were again scored by the members of the palatability committee who made special note of fat separation and curdling which might have occurred in the sauces during freezing.

In the case of the last two series of a la king, the contents were cooked five minutes in a double boiler, according to previously described conditions, after being defrosted in the cellophane bags. The conditions of the sauces subjected to this treatment were observed and recorded.

RESULTS

The data in Table 1 give the average percentage of the weight of each portion of the turkey. The drumstick and breast account for more than one-half the weight of the turkey in

Table 1. Average weights for each portion of turkey and the average time of preparation for each filet.

Portion of bird	General weights			Number of filets	Time	
	Av. weight/ portion percent	Waste/ portion percent	Meat/ portion		Av. time in: prep./filet: min. sec.	Av. time/ filet percent
Drumstick	31.4	30.4	68.2	44	1 54	0.71
Thigh	19.3	22.6	77.2	66	0 49	0.30
Wing	7.1	72.4	27.0	5	3 45	1.41
Shoulder	13.8	85.1	13.5	11	3 20	1.25
Breast	28.4	25.2	74.0	121	0 38	0.24

that 31.4 percent and 28.4 percent of the total weight is obtained from these two portions, respectively. The thigh ranks third in total weight in that 19.3 percent of the whole bird is thigh. However, the thigh, when considered individually, has the least amount of waste; 77.2 percent of the whole is meat. The breast ranks a close second in that 74.0 percent is meat. Slightly less than one-third of the drumstick is waste. High amounts of the wing and shoulder cannot be used; only 27.0 percent and 13.5 percent, respectively, may be used for filets.

The smallest amount of average time to completely prepare a filet ready to be frozen was 38 seconds. The breast filets were prepared in this average time. Thigh filets were prepared in an average of 49 seconds a piece. Considerably longer time was required to prepare the wing and shoulder filets; the drumstick filets were prepared in an average of one minute 54 seconds.

Table 2 gives the data of the palatability scores, percentage loss in freezing and pounding and total weight loss in freezing and cooking. The filets which were frozen unpounded (turkeys 1 and 2) or in package-size portions (turkeys 4 and 5) ranked highest in appearance in all cases but one. Those cut into individual filets and frozen unpounded were scored as having the best appearance in practically all instances. The length of storage time had no effect on the appearance of the filets; those held over the longest period were scored similar-

Table 2. Average palatability scores and weight losses for unpounded, pounded and package-size filets for six storage periods.

Storage, days	: 30			: 60			: 90			: 120			: 150		: 180	
Turkey number ¹	: 1 & 2	3	4 & 5	: 1 & 2	3	4 & 5	: 1 & 2	3	4 & 5	: 1 & 2	3	4 & 5	: 1 & 2	3	4 & 5	: 1 & 2
Qualities																
Appearance	6.2	5.6	6.0	5.9	5.8	5.2	6.0	5.4	6.1	5.8	5.5	5.9	6.2	5.8		
Intensity																
Aroma	5.5	5.3	5.3	5.6	5.5	5.5	5.6	5.7	5.7	5.5	5.7	5.7	5.7	5.7	5.8	
Flavor	5.5	5.2	5.7	5.3	5.7	5.6	5.7	5.7	5.9	5.8	5.8	5.9	6.0	5.9		
Desirability																
Aroma	5.8	5.8	5.9	5.9	5.6	5.5	5.5	5.4	6.1	5.6	4.5	5.5	5.9	5.1		
Flavor	5.9	5.4	5.9	5.6	5.1	5.1	5.5	4.7	6.0	5.1	4.0	5.3	5.0	4.8		
Tenderness	6.2	5.6	6.1	6.0	5.4	5.0	6.1	5.3	6.0	5.8	5.4	5.9	6.2	6.1		
Juiciness	5.1	4.9	4.7	5.2	4.8	4.8	5.0	4.5	4.6	4.8	3.9	5.0	4.4	4.5		
Turkey flavor	4.8	5.0	4.8	4.7	5.3	5.2	5.0	4.8	5.6	5.4	5.0	5.5	5.3	5.2		
Total score	45.0	42.8	44.4	44.2	43.2	41.9	44.4	41.5	46.0	38.0	39.8	44.7	44.7	43.2		
No. of filets	10	6	9	10	12	18	10	12	18	14	12	16	14	16		
Percentage wt. loss in freezing & pounding	3.5	2.6	2.2	3.0	4.4	2.1	4.1	6.2	1.7	3.7	5.2	0.8	3.4	2.0		
Percentage total wt. loss	-	13.0	13.0	12.1	10.6	5.0	13.0	16.2	15.7	17.6	18.9	13.3	15.8	14.5		

¹ Turkeys 1 and 2 filets frozen unpounded; turkey 3 filets pounded before freezing; and turkeys 4 and 5 frozen in package-size portions and cut in filets after defrosting.

ly to the fresh filets.

The intensity of both aroma and flavor increased slightly with the length of storage time. There seemed to be little difference in the three varying types of filets. The desirability of the flavor and aroma, on the other hand, decreased with the length of storage. A steady decrease in the desirability of flavor was noted in both the unpounded and pounded (turkey 3) filets. The scores of the filets cut from the package-size portions varied somewhat in the desirability of flavor in that a steady decrease was not noted. However, it may be pointed out that in all instances but one, flavor acceptability in this group ranked highest at each particular storage stage.

The pounded filets ranked lowest in each storage period except one in tenderness score. Both the unpounded filets and filets cut from package-size portions ranked high in tenderness throughout the storage tests. Slight, if any, effect was noted in the tenderness of the filets with the longer storage interval.

Juiciness decreased with the length of storage time. This was particularly evident in the filets that had been pounded before freezing. Palatability scores indicating the presence of a characteristic turkey flavor increased somewhat with the length of the storage period.

Greatest weight losses in freezing and pounding were indicated in the filets which were pounded before freezing. The

losses were more in these cases than in either of the other two general types of filets. The filets which were packed as package-size portions and cut after defrosting showed the smallest weight loss in freezing and pounding. The unpounded filets showed somewhat higher losses than those filets cut from package-size portions, but ranked below the pounded filets.

Smallest total loss in freezing, pounding and cooking was also found in the filets cut from package-size portions. Both unpounded and pounded filets showed somewhat higher total losses; the pounded filets ranking slightly more than unpounded.

Palatability scores for dark and light filets are given separately in Table 3. A higher scoring was given for the appearance of the light filets than to the dark. The dark filets ranked above the light meat in intensity of both flavor and aroma with a more decided difference in the intensity of flavor of the dark in the last two storage periods.

The desirability of the aroma and flavor of the dark was preferred in the first two storage periods. However, with the 90 day storage, the light filets became more desirable from the standpoint of aroma and flavor. A rather marked difference in the dark and light filets was noted in the longer storage time. The desirability scores for the dark filets decreased more rapidly and steadily than for the light meat.

Higher tenderness scores were given to the light than to

Table 3. Average palatability scores for dark and light unpounded filets (turkey 1 and 2) for six storage periods.

Storage, days	∴	30	∴	60	∴	90	∴	120	∴	150	∴	180	
Type of filet	:	Dark	:	Light	:	Dark	:	Light	:	Dark	:	Light	
Qualities													
Appearance		5.9	6.4	5.6	6.1	5.6	6.3	5.4	6.2	6.0	6.3	5.6	6.0
Intensity													
Aroma		5.6	5.3	5.8	5.3	5.8	5.4	5.6	5.4	5.9	5.5	5.8	5.7
Flavor		5.5	5.4	5.3	5.3	5.8	5.6	5.8	5.8	6.3	5.6	6.1	5.7
Desirability													
Aroma		5.9	5.7	6.1	5.7	5.3	5.7	5.4	5.7	5.9	5.8	4.9	5.3
Flavor		6.0	5.7	5.8	5.4	5.4	5.6	4.7	5.4	4.6	5.4	4.4	5.1
Tenderness		5.9	6.5	5.6	6.3	5.7	6.5	5.5	6.1	6.2	6.1	5.9	6.3
Juiciness		5.5	4.6	5.7	4.6	5.4	4.6	5.3	4.3	4.7	4.0	4.8	4.2
Turkey flavor		4.8	4.7	4.9	4.4	5.1	4.8	5.4	5.4	5.3	5.2	5.2	5.2
Total score		45.1	44.3	44.9	43.1	44.1	44.5	43.1	44.3	44.9	43.9	42.7	43.5
No. of filets		3	3	4	4	4	4	6	6	4	6	4	6

the dark filets. The rankings for each remained fairly constant throughout the time of storage. The dark filets were juicier according to the palatability scores than the light meat. A marked difference is noted in the rank.

During the first three storage periods, the dark filets were considered to have a more characteristic turkey flavor than the light meat. However, with the 120 day and succeeding storage intervals the turkey flavor of the light and dark meat were considered very similar.

The data in Table 4 include the palatability scores for the holding filets, precooked frozen filets, wings and steaks. The filets which were held 60 minutes scored somewhat higher than those held for a 30 minute period. The appearance and intensity of flavor rankings were lower for the 30 minute period when compared with the 60 minute hold. Flavor rated slightly higher in desirability in 30 minutes than in the 60 minute time. However, the 60 minute desirability of flavor score ranked favorably with the fresh filets.

Precooked frozen filets received a slightly higher scoring at the end of a 10 day storage period than the fresh rating. Higher values were given in appearance, intensity and desirability of aroma, tenderness and characteristic turkey flavor.

When precooked frozen filets were stored 45 days, a lower rank was given them in comparison with the fresh filets. The precooked frozen filets were ranked lower in appearance, de-

Table 4. Average palatability scores for holding filets, precooked frozen filets, braised wings and turkey steaks.

Type of test	Holding filets			Precooked frozen filets				Braised wings	Turkey steaks						
	:0 min.	30 min.	60 min.	:Fresh:	:Frozen : 10 days:	:Frozen : 45 days:	Pressure:		Plain, crumbed & marinated:			Marinated			
Description of test							saucepan:	Oven:	1/2 inch	3/4 inch	1 inch:	1/2 inch	3/4 inch	1 inch	
Qualities															
Appearance	5.8	5.4	5.7	5.2	5.5	6.0	5.3	5.8	5.8	5.8	6.0	5.9	5.8	6.2	6.7
Intensity															
Aroma	5.4	5.4	5.6	5.5	5.9	5.5	5.5	5.7	5.7	5.9	6.0	5.6	6.2	6.1	6.4
Flavor	5.5	5.2	5.5	5.6	5.5	5.6	5.6	5.5	5.5	5.8	5.7	5.7	6.0	5.7	6.3
Desirability															
Aroma	5.7	5.6	5.7	5.5	5.6	6.0	5.1	5.3	5.0	5.9	5.9	5.9	5.8	6.0	6.8
Flavor	5.1	5.3	5.0	5.0	5.3	5.8	5.0	5.5	5.3	5.9	5.9	5.7	5.9	6.0	6.5
Tenderness	5.7	5.2	5.8	5.0	5.4	5.8	5.2	5.1	4.8	6.1	6.0	6.1	6.2	6.1	6.7
Juiciness	4.4	4.6	4.6	4.7	4.5	4.8	4.4	4.2	4.7	5.0	5.1	5.4	5.1	5.2	5.6
Turkey flavor	5.1	5.3	5.2	5.1	5.3	4.6	5.1	4.9	5.2	5.4	5.4	5.2	5.3	5.1	5.8
Total score	42.7	42.0	43.1	41.6	43.0	44.1	41.2	42.0	42.0	45.8	46.0	45.4	46.3	46.4	50.8
No. tested	6	6	6	8	8	8	8	3	3	3	3	3	2	2	2
Percentage total wt. loss in freezing and cooking	-	-	-	-	-	-	-	21.6	17.8	16.9	19.2	10.0	16.7	21.6	20.7

sirability of flavor and aroma, tenderness and juiciness.

The wings cooked in the pressure saucepan had a 3.8 percent higher total weight loss in freezing and cooking than those prepared in the oven. The oven wings were preferred from the standpoint of juiciness and turkey flavor. Higher scores for aroma and flavor desirability and tenderness were given to the wings braised in the pressure saucepan.

The three-fourth inch steak was ranked slightly higher than either the one-half inch or one inch steak when three variations of cooking methods were considered. No large preference was noted in any one criterion of the scoring.

In the case of the marinated steaks, a preference for the one inch steak was evident. Higher values in the palatability score were given to the one inch steak for each item on the rating sheet. In both series of steaks, the largest total weight loss was noted in the three-fourth inch steaks.

The only decided difference in scoring of the seven variations of turkey a la king was noted in the appearance. The appearance ratings were highest when uncooked egg and flour, amioca and flour, amioca, flour and egg yolk, and flour were used as thickening agents. Intensity and desirability of aroma and flavor were scored slightly lower in most instances after the sauce had been frozen. The rankings for the varying turkey a la kings were similar in tenderness, juiciness and turkey flavor. Tenderness and juiciness scorings also ranked lower after the sauces had been frozen but characteristic

turkey flavor scores seemed to increase with freezing and defrosting.

DISCUSSION OF RESULTS

The results of the time and weight records indicated that the breast, thigh and drumstick were the three portions of the turkey that could be advisably cut into filets. The breast and thigh could be cut into filets quite easily. The removing of the tendons from the drumstick involved considerably more time. However, when the average was computed, it could still be considered as advisable to use the drumsticks for filets.

Too much time was needed in the preparation of filets from the wing and shoulder when the yield of filets was considered with the amount of time and cost. More advisable methods in the use of the wings and shoulders were considered.

The storage tests indicated that even though the palatability ranking for the desirability of flavor fell somewhat in the 180 day interval, both the unpounded and the filets cut from package-size portions were quite acceptable at the end of the storage period. The pounded filets were considered as being unacceptable at the time of 120 days of storage.

It should be noted that the decrease in palatability scores might be attributed somewhat to a slightly increased sensitivity of the members of the palatability committee to

the turkey flavor over a period of time.

Characteristic turkey flavor scores increased while the desirability of the flavor and aroma decreased. This factor may be accounted for, partially, by the fact that often a rancidity or old rather than a fresh flavor is actually associated with a characteristic flavor of a food. Weight losses were highest in the pounded filets, which corresponded somewhat with the lower ratings given to the juiciness of these filets. Weight losses were smallest in those filets frozen in the package-size portions. Less surface area was available for evaporation to take place in these filets. Total weight losses varied somewhat.

Dark filets which were juicier and had a more pronounced flavor were preferred during the first 90 days of storage. However, as the time of storage increased, the desirability of the flavor of the dark meat decreased decidedly more than it did in the light filets.

The appearance of the light filets was better in practically all cases. The dark meat, particularly the drumsticks, contained tendons and more connective tissue than the light meat. This made them more difficult to cut and shape. The lighter color of the crumbed crust was preferred in the light filets to the darker color of the crust on the dark meat.

The results of both the holding and precooked frozen filets indicated that they might be successfully used in institutional food service. The 60 minute holding period did not have a

negative effect on the desirability and appearance of the cooked filets. Filets were quite acceptable at the end of the 60 minute holding period.

The precooked frozen filets could be successfully frozen, defrosted and heated to be quite acceptable. A frozen storage period of 10 days did not affect the desirability and general acceptance value of the filets. The precooked frozen filets were not considered too acceptable at the end of the 45 day storage period.

Braising wings was considered as a method of utilizing that portion of the turkey. It was found to be more practical than the filets from the standpoint of time, flavor, cost and general appearance. Both the oven and the pressure saucepan were found quite acceptable as mediums for preparing the braised wings. Less time was used when the wings were prepared in the pressure saucepan. A correlation between the juiciness rating and total weight loss was indicated in the results. The braised wings prepared in the pressure saucepan received a lower score for juiciness.

In a preliminary test in which three methods of preparing turkey steaks were used, those which were marinated before cooking received the highest average scores. In a second group of the marinated steaks, the one inch steaks were considered more desirable than those which were one-half or three-fourths inch thick. Much less actual preparation time was involved in cutting the frozen steaks when a comparison was made of the

steaks with the filets.

Cooked scraps of meat, particularly from the shoulder, were utilized in the turkey a la king. Since many sauces curdle upon being subjected to freezing and defrosting, an attempt was made to prepare the variations of the turkey a la king with that in mind. The thickening agent of the sauce was chosen as the variable. The results indicated that amioca, a modified starch made from waxy corn, held up particularly well. Sauces containing uncooked egg yolk held up better than those which had been cooked after the addition of the egg yolk.

SUMMARY

This study was made to determine acceptable methods of preparation for each portion of turkey with regard to cost, time of preparation and flavor, the effect of storage on frozen cooked and uncooked filets and acceptable methods for using turkey scraps in precooked frozen foods.

Five Broad-Breasted Bronze turkeys were cut into filets by cutting with the grain of the meat. They were packaged in moisture-vapor-proof cellophane, heat sealed, frozen and stored at -10° F. for storage periods ranging from 30 to 180 days. The filets were prepared for freezing in three general ways. One group was cut into filets and frozen unpounded; the second group was cut into filets and pounded before

freezing. The last group was cut into package-size portions, frozen and then cut into filets after defrosting.

Filets cut from package-size portions and unpounded filets were found to be acceptable at the end of 120 day and 180 day storage periods, respectively. Those filets which were pounded before freezing were still acceptable at the end of a 90 day period but had a low desirability in flavor at the end of a 120 day interval.

The dark filets were more acceptable than the light filets during the first 90 days of storage. With the succeeding storage time, the flavor of the dark filets deteriorated more rapidly than the light filets.

Weight losses in freezing and pounding were highest in the pounded filets. Filets cut from package-size portions had the smallest weight loss while the unpounded filets ranked in the middle group.

The results of both the holding and precooked frozen filets indicated that they might be successfully used in institutional food service. Cooked filets were successfully kept for a 60 minute holding period. A 10 day storage period for precooked frozen filets did not affect its acceptance value.

Turkey steaks which were cut one inch thick and marinated before cooking yielded a very acceptable product.

Amioca, a modified starch made from waxy corn, held up well as the thickening agent in the frozen turkey a la king

when it was subjected to defrosting and heating.

The breast, thigh and drumstick could be used for filets from the standpoint of time and flavor. Wings could be used to better advantage by braising. The shoulder was successfully used in turkey a la king, a precooked frozen food.

ACKNOWLEDGMENT

Appreciation is expressed to Dr. Gladys E. Vail, Head of the Food Economics and Nutrition Department, for valuable guidance in the organization and development of this study and to Miss Gwendolyn Tinklin, Instructor in Food Economics and Nutrition, for sincere interest in the completion of this study.

LITERATURE CITED

- Asmundson, V. S., T. H. Jukes, H. M. Fyler and M. L. Maxwell.
The effect of certain fish meals and fish oils in the
ration on the flavor of turkey. Poultry Sci. 17: 147-
151. 1938.
- Cook, W. H.
Studies of precooling, freezing and storage of dressed
poultry. Amer. Egg & Poultry Rev. 1: 194, 196-198.
1940.
- Cook, W. H. and W. H. White.
Frozen storage of poultry. III. Peroxide oxygen and free
fatty acid formation. Food Res. 4: 433-440. 1939.
- Koonz, C. H. and L. P. Cooley.
Evisceration of frozen, defrosted, dressed poultry. Food
Res. 12(1): 1-3. 1947.
- Koonz, C. H. and J. M. Ramsbottom.
A method for studying the histological structure of
frozen products. I. Poultry. Food Res. 4: 117-128.
1939.
- Marble, Dr. R., J. E. Hunter, H. C. Knandel and R. A. Dutcher.
Fishy flavor and odor in turkey meat. Poultry Sci. 17:
49-53. 1938.
- Morris, Eula.
Cookery methods used for cut-up turkey. (Unpublished
problem in foods). 1946.
- Schreiber, M. L., G. E. Vail, R. M. Conrad and L. F. Payne.
The effect of tissue fat stability on deterioration of
frozen poultry. Poultry Sci. 26(1): 14-19. 1947.
- Smith, E. Y.
Where does the Broad-Breasted Bronze fit into the
poultry picture. U. S. Egg & Poultry Mag. 46: 744-746.
1940.
- Stewart, G. F., H. L. Hanson and B. Lowe.
Effects of aging, freezing rate, and storage period on
palatability of broilers. Food Res. 10: 16-27. 1945.

Thompson, W. C.

New Jersey New Buff turkey meets demand for smaller size. Amer. Egg & Poultry Rev. 5: 714. 1944.

Turkey (National Turkey Federation).

Amer. Dietet. Assoc. Jour. 22: 282. 1946.

Wagoner, C. E., G. E. Vail and R. M. Conrad.

The effect of premortal fast on deterioration of frozen poultry. Poultry Sci. 26(2): 167-169. 1947.

Wagoner, C. E., G. E. Vail and R. M. Conrad.

The influence of preliminary holding conditions on deterioration of frozen poultry. Poultry Sci. 26(2): 170-172. 1947.

Wagoner, C. E., G. E. Vail and R. M. Conrad.

The effect of degree of surface exposure on deterioration of frozen poultry. Poultry Sci. 26(2): 173-175. 1947.

10 DEERFIELD BOND

CITY OF CHICAGO
MAY 1900

APPENDIX

Form 1. Time chart.

:	:	:	:	Total time			
Date:	: Identifi- : cation :	: Disjointing of bird: : (not included in : number ; average time)	: Portion: : of bird:	: To remove: : skin	: To remove: : bones	: To remove: : tendons	: To remove skin, : bones & tendons

Cutting filets			: Average time to remove
No. of filets:	Total time to cut :	Average time/ filet	: skin, bones, tendons
			: and cutting per filet

Form 2. General weight chart.

		Waste weight			
		Fresh		Cooked	
: Identifi-	: Whole bird	: Bones, tendons:	: Total:	: Bone por-:	: Scraps:
Date:	Portion:	Weight:	Skin:	and meat	waste:
: number	: of bird:	grams:			grams

Form 3. Individual filet chart.

:Identifi-:		Weights in grams							
Date:	cation	:Portion:	Filet	:Before	:After	:After	:Before	:After	:After
:	number	:of bird:	number:	freezing:	freezing:	pounding:	browning:	browning:	baking

Form 4. Grading chart for cooked turkey.

Date _____

Factor : Phase : 7 : 6 : 5 : 4 : 3 : 2 : 1 : 1 : 2 : 3 : 4 : 5 : 6 :

Aroma	Inten- sity	very pro.		m. pro.	s. pro.		s. per.		imper.
	Desira- bility	very des.	des.	m. des.	s. des.	neutral	undes.	undes.	
Appear- ance	Desira- bility	very des.	des.	m. des.	s. des.	neutral	undes.	undes.	
	Inten- sity	very pro.	pro.	m. pro.	s. pro.	per.	s. per.	imper.	
Flavor	Desira- bility	very des.	des.	m. des.	s. des.	neutral	undes.	undes.	
	Tender- ness	Inten- sity	very tender	ten- der	m. ten- der	s. tough	very tough	ext. tough	
Juici- ness	Quanti- ty of juice	very juicy	juicy	m. juicy	s. dry	very dry	ext. dry		

Total score

Characteristic turkey flavor	very pro.		m. pro.	s. pro.		s. per.		imper.
---------------------------------	--------------	--	------------	------------	--	------------	--	--------

Key to abbreviations

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

Signature of judge _____