

Effects of composition upon ground beef palatability

Z. L. CARPENTER and G. T. KING

Meat Laboratory, Animal Science Department, Texas A & M University
U. S. A.

INTRODUCTION

Ground beef accounts for over 30 percent of the total quantity of beef consumed in the U.S.A. (U.S.D.A., 1955). Ground beef is, therefore, one of the most popular forms of meat and ranks second only to chicken in the number of times it was suggested for various meals (Woods and Nettles, 1962). Ground beef, which is available at the consumer level, varies considerably in level of fatness, source of lean, type and amount of extenders or binders and subsequent cooking qualities (Clover, 1964 and Cole *et al.*, 1960). Since fat level affects consumer acceptance and palatability (Law *et al.*, 1965), it is necessary to determine the most desirable acceptance level. It has been suggested that rice flour and soy protein concentrates may reduce shrinkage, moisture loss and fat drippings, from beef patties during cookery. It was the purpose of this study to compare the cooking and organoleptic properties of ground beef differing in fat content and in amount of rice and soybean product additives.

MATERIALS AND METHODS

The first phase of the study involved comparisons of ground beef containing 5, 10, 15, 20, 25 and 30 percent fat as determined by solvent extraction. Patties which were 9 mm in thickness and weighed 114 g. were formed by utilization of a Hollymatic patty machine. Patties were frozen prior to subsequent testing. Prior to cooking, samples were observed by a 10 member panel for acceptance, based upon visual appearance. All patties were oven-broiled at 163° C to an internal temperature of 70° C. Drip losses and volatile losses were recorded. An 18 member taste panel rated each sample for juiciness, flavor, texture and overall satisfaction on the basis of a nine-point hedonic scale (1—extremely undesirable and 9 — extremely desirable). Seven replicates of each sample were presented to the panel members over a two month period.

The second phase of the study involved comparisons of ground beef samples containing 20 percent fat with 3 and 6 percent added soybean flour and rice flour. Therefore, the comparisons included the following five preparations: (1) 20 % fat; (2) 20 % fat + 3 % rice flour (3) 20 % fat + 6 % rice flour (4) 20 % fat + 3 % soybean flour and (5) 20 % fat + 6 % soybean flour. Samples were prepared and evaluated in a manner similar to that previously described for the study of acceptance of ground beef containing various levels of fat.

RESULTS AND DISCUSSION

1. Fat level

Law *et al.* (1965) indicated a family panel preference for ground beef containing the lowest fat level, which was 15 percent fat in that study. However, these workers reported that there was little variation in the eating quality of ground beef containing 15, 25 and 35 percent fat.

Data, indicating length of heat treatment at 163° C to attain the desired internal temperature and the associated shrinkage for samples varying in fat composition, are summarized in Table 1. These data emphasize the influence of composition upon the time required to achieve a certain degree of doneness. Samples with higher levels of fat were cooked much more rapidly. Also it is interesting to note that the increase in time required to increase internal temperature from 65° C to 70° C was almost equal to the time required to initially reach 65° C. Volatile weight losses during cookery were relatively constant while total weight loss was significantly greater for samples containing 25 and 30 percent fat as compared to the other samples. Samples were rated in the uncooked state for general appearance. This is important from the standpoint of consumer selection of meats at the retail meat counter. The samples with lower amounts of visible fat were generally preferred as indicated in Table 2. Palatability scores, as assigned by the taste panel, are presented in Table 3. These data indicated a high flavor rating for samples containing 15 percent fat and a low rating for samples at the lowest fat level. These data support previous findings that indicate the fats contain the distinctive flavor compounds, while lean tissue provides the general meaty flavor. Juiciness scores were influenced to a large extent by level of fatness. The liquid nature of the melted fat provides the juiciness sensation. Based upon overall satisfaction ratings, the samples containing 20 percent fat were preferred.

2. Added Ingredients

Based upon the first phase of the study in which samples with 20 percent fat were preferred, this level of fatness was selected as the control sample for a comparison of ground beef patties containing added amounts of soybean

flour and rice flour (3 and 6 percent). Samples containing 3 percent added soyflour and rice flour sustained approximately 5 percent less shrinkage than the control sample, while the samples containing the 6 percent levels of these ingredients sustained significantly less cooking shrinkage than samples at the 3 percent level.

All samples received similar ratings when evaluated in the fresh form. The palatability of the cooked samples varied considerably as indicated in Table 4. Samples containing 6 percent rice flour received significantly lower ratings for flavor, juiciness and overall satisfaction score. Samples containing 3 percent levels of soy and rice flour were not significantly different from the control sample in overall palatability.

Table 1. *Cookery characteristics of ground beef patties*

<i>Sample Identification</i>	<i>Solvent Extractable Fat (Raw) %</i>	<i>Cooking time to 65° C Minutes</i>	<i>Cooking time to 70° C Minutes</i>	<i>Fat Content (Cooked Sample)%</i>	<i>Total Cooking Loss %</i>	<i>Drip Loss %</i>	<i>Volatile Loss %</i>
5 ^a	5.36	38	67	5.84	25.87	1.61	24.26
10 ^a	9.03	28	55	10.07	20.46	2.57	17.89
15 ^a	12.93	24	49	14.82	23.70	4.90	18.80
20 ^a	19.78	23	45	18.53	24.79	6.11	18.68
25 ^a	25.29	14	24	20.50	35.12	14.12	21.00
30 ^a	28.88	10	15	23.23	40.10	18.72	21.38

^aRefers to estimated fat content at time of processing.

Table 2. *Acceptance of fresh ground beef differing in fat composition*

<i>Sample Identification</i>	<i>Color Rating (Rank)</i>	<i>Overall Acceptance Rating (rank)</i>
5	3	2
10	1	1
15	2	3
20	4	4
25	5	5
30	6	6

Table 3. *Palatability of ground beef differing in fat composition*

<i>Sample Identification</i>	<i>Flavor Score</i>	<i>Juiciness Score</i>	<i>Texture Score</i>	<i>Overall Satisfaction Score</i>
5 ^a	5.4	5.1	5.0	5.2
10 ^a	6.0	5.6	5.6	5.4
15 ^a	6.6	5.7	5.7	6.0
20 ^a	6.4	5.7	6.4	6.3
25 ^a	6.3	6.0	6.1	6.1
30 ^a	6.1	6.3	5.6	6.1

^aRefers to estimated fat content at time of processing.

Table 4. *Palatability of ground beef with certain additives*

<i>Sample Identification</i>	<i>Flavor Score</i>	<i>Juiciness Score</i>	<i>Texture Score</i>	<i>Overall Satisfaction Score</i>
20 % Fat	6.4	5.6	6.3	6.2
20 % Fat + 3 % rice flour	6.2	5.7	5.9	6.0
20 % Fat + 6 % rice flour	5.0	5.1	5.9	5.2
20 % Fat + 3 % soy flour	6.3	5.8	6.1	6.3
20 % Fat + 6 % soy flour	5.2	5.5	6.0	5.6

LITERATURE CITED

- Cole, J. W., C. B. Ramsey and L. O. Odom. 1960. What effect does fat content have on palatability of broiled ground beef? Tenn. Agr. Exp. Sta. Prog. Rpt. 36.
- Glover, Robert S. 1964. Consumer preferences for ground beef and implications for cattle producers and beef distributors. Ph. D. Dissertation, Texas A & M University, College Station, Texas, U. S. A.
- Law, Helen M., Marianne S. Beeson, Alma Beth Clark, Auttis M. Mullins and Gene E. Murra. 1965. Consumer acceptance studies. II. Ground beef of varying fat composition. Louisiana State University Agr. Exp. Sta. Bull. 597.
- U. S. D. A. 1956. Food consumption of households in the United States. Household Food Consumption Survey, U. S. Department of Agriculture Rpt. No. 1.
- Woods, Betty L. and Ganato jo Nettles. 1962. The status of meats as interpreted from projective meal situations. Louisiana State University Agr. Exp. Sta. Bull. 557.