

CONSUMER UTILIZATION AND ACCEPTABILITY OF RAW AND COOKED BLACK BEANS (*PHASEOLUS VULGARIS*) IN GUATEMALA

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To define the characteristics of acceptable quality of black beans (*Phaseolus vulgaris*), in Guatemala, 600 consumers were interviewed. Results showed that blackness and shininess were the principal quality criteria used in selecting raw beans while softness, as determined by biting a bean or cutting with a fingernail, was also important. Indicators of good quality cooked beans were split grains, thick broth and spreadability. Over 66% of the respondents used the traditional cooking method of a clay pot over a wood or charcoal fire on the floor or a clay stove. In Guatemala City, a majority of consumers cooked with gas or electricity and 50% used pressure cookers. Cooking times, ranging from 20 minutes to over 6 hours, were significantly influenced by altitude. Ethnic group, department and rural vs. urban areas influenced consumers' cooking methods, raw bean selection criteria and method of judging cooked bean quality.

KEY WORDS: Consumer survey, black beans, *Phaseolus vulgaris*, consumer acceptability, Guatemala, Indian, Ladino, altitude, cooking methods, cooking times, bean quality

INTRODUCTION

The present study was conducted to determine what consumers in Guatemala consider to be characteristics of good quality black beans (*Phaseolus vulgaris*). Black beans, along with *tortillas*,^a are the staples of the traditional diet. They are eaten daily, when available, by the majority of the population (Flores *et al.*, 1964; Bressani and Elias, 1977; Pigott and Kolasa, 1979). Current concerns are that insufficient black beans are available to feed the population throughout the year (Bressani, Flores and Elias, 1973; Araya, Flores and Arroyave, 1981) and that stored beans are prone to hardening which makes them difficult to cook (Bressani and Elias, 1980; Aguilera and Stanley, 1985; Garruti and Bourne, 1985). In the development of new varieties of beans, researchers must consider not only the agronomic qualities but also the characteristics of the raw bean and the cooked product as perceived by consumers. If the new varieties do not meet the standard of the consumers, the beans will be rejected.

Factors affecting the acceptability of food products have been studied extensively (Eppright, 1947; Randall and Sanjur, 1981; Williams, 1983; Steenkamp, 1986). Although identification of acceptability criteria has been carried out in crop improvement research, little investigation into consumers' preferences in bean quality has taken place in less developed countries where they are a dietary staple. In Cali, Colombia, van Herpen (1983) interviewed 16 housewives from low socio-

economic households to obtain preliminary information on preferences toward bean characteristics. This population rejected black beans, preferred large, round mottled or red beans, and considered freshness to be the single most important criterion of quality. Two-thirds of the respondents liked the seed coats to remain intact when cooked while the others liked the cooked beans to be broken open. They disliked an extremely pale or extremely dark broth.

A report from INCAP (1983) on the production and consumption patterns of beans included a survey on the selection and preparation of beans in 176 rural homes in northeastern Guatemala. This survey showed that all families consumed black beans and on rare occasions beans of another color or variety. Bean broth was the first food in the household diet offered to children; feeding broth began at 6 months of age. Recently harvested beans were preferred because they cooked faster. Housewives reported that in purchasing beans they bit some seeds to detect softness. Less than 7% of the families soaked beans before cooking and then only when they were to be used to make *tamales*.^b Fifty-seven percent of the housewives reported cooking times between 60 and 90 minutes.

In order that consumers' needs and preferences can be taken into account when new lines are developed or new storage methods designed, a survey was carried out with the following objectives.

To identify the practices and criteria used by consumers for the selection of raw beans.

To define the methods and criteria used by consumers for judging the quality of cooked beans.

To obtain information on the methods used for preparing and cooking beans.

To determine the effects of ethnic group, socio-economic status and location of residence on consumer criteria and practices.

To examine the effects of altitude and cooking style on cooking times used by consumers of different demographic groups.

METHODS

Conducting the Survey

A survey of 600 consumers was conducted in four administrative departments of Guatemala, Chimaltenango, Jutiapa, Escuintla, and Guatemala City in July and August of 1985. The departments selected were representative of the main ethnic groups, socio-economic levels, and lifestyles (from rural agricultural to completely urban) of the Guatemalan population as a whole. A broader sampling of the population was not possible because survey resources were limited and some areas of the country were inaccessible to the survey team.

Of the departments included in the survey, one, Chimaltenango, had a predominantly Indian population while in the other three departments, the populations were almost entirely Ladino. Consumers in Chimaltenango, Jutiapa, and Escuintla lived in towns or rural areas. The only truly urban population was in Guatemala City.

For the survey, interviews were conducted with 150 consumers from each of the four departments. In the three non-urban departments, 50 consumers from each of three districts were interviewed. Approximately half of the 50 consumers from each district lived in the main district town, and half in the surrounding rural area.

In Guatemala City three low and three medium socio-economic districts were selected, and 25 households were randomly chosen from each district. Consumers from high socio-economic districts were not included in the survey.

The survey was conducted using a questionnaire administered by experienced interviewers from INCAP. Answers to the majority of the questions were pre-categorized on the basis of preliminary focus group interview information (Elias, 1985), and on the basis of responses obtained during pretesting. Following each half hour interview the survey worker completed a final section of the questionnaire giving information needed in order to classify respondents by socio-economic level (low or medium) and cultural group (Indian or Ladino). Classifications were based on the standard INCAP criteria.

The survey was conducted primarily in Spanish, but for those respondents who spoke only Indian dialects, community members acted as translators. Wherever possible, the community leaders were contacted before any interviews were conducted, and the purpose of the survey was discussed.

Statistical Methods

Cross tabulations of demographic characteristics were examined, initially, in order to determine which characteristics were distributed throughout the sample and which were related to specific subgroups in the sample. Answers to several questions were combined to define subgroups using distinctive cooking styles.

Differences in distribution of characteristics among groups were determined using a Chi square test. Analysis of variance was used to determine if there were factor effects. Confidence intervals for differences in means were used to determine which particular means differed, when analysis of variance had indicated that at least one mean differed. Discriminant and principal component analyses were carried out on the survey data, but no consistent patterns were evident. Cross tabulations and statistical analyses were carried out using the SAS Statistical Software Package (SAS Institute 1983).

RESULTS

Characteristics of Consumers Surveyed

The distribution of respondents, across departments, by ethnic group, socio-economic status, and location of residence, is shown in Table I. Eighty-five percent of those taking part in the survey were of the Ladino and 15% of the Indian ethnic group. Fifty-seven percent were classified as of low socio-economic status, and

*Tortillas: Flat bread of cornflour and water patted into shape and cooked on a large flat pottery grill over an open fire.

†Tamales: Corn husks or leaves wrapped around a filling of cornmeal dough and a combination of cooked beans, meat or cheese and seasonings; steamed.

TABLE I
I. Ethnic group, socio-economic status and location of Residence of a sample of Guatemalans.

Demographic Classification	Department								Total N= 600	Percent of 600
	Chimaltenango		Jutiapa		Escuintla		Guatemala City			
	n=150		n=150		n=150		n=150			
	n	%	n	%	n	%	n	%		
ETHNIC GROUP:										
Ladino	66	44	150	100	148	99	147	98	511	85.2
Indian	84	56	0	0	2	1	3	2	89	14.8
SOCIOECONOMIC STATUS:										
Meduim (B)	56	37	84	56	42	28	75	50	257	42.8
Low (C)	94	63	66	44	108	72	75	50	343	57.2
LOCATION:										
City	0	0	0	0	0	0	150	100	150	25.0
Town	83	55	81	54	84	56	0	0	248	41.3
Rural	67	45	69	46	66	44	0	0	202	33.7

43% as of medium socio-economic status. Rural, town and city residents made up 34, 41, and 25% respectively of the survey group.

Methods and Criteria Used by Consumers for Selecting Raw Beans

Consumers were asked to describe the techniques they used in judging the quality of raw beans. Over 50% of the respondents tested beans for hardness either by biting a bean between their teeth, or by cutting a bean with their fingernail. Good quality was indicated when beans were easy to bite or cut. Twenty-five percent of the consumers surveyed breathed on the beans and observed whether this increased opaqueness (dullness), or blackness, or produced an ash grey color. The latter clearly indicated poor quality, but consumers differed in their attitudes towards the other characteristics. Good quality was indicated by increased blackness for 67% of respondents, but by increased opaqueness for 32%. Smaller numbers of consumers stated that they judged quality by observing the color of the whole bean, the cotyledon or the hilum.

Although techniques for judging the softness of raw beans were the most frequently reported methods used for quality determinations, characteristics related to appearance were given as the principle selection criteria by over 50% of respondents. Perhaps many consumers did not consider judging color as a method *per se*. The principal characteristic of good quality raw beans according to 34% of respondents, was black grain, according to 18% was shiny grain and for only 9% was given as soft grain (Figure 1a).

By contrast, Figure 1b clearly illustrates the importance of softness. In response to a question on the general characteristics of good quality, to which consumers could give up to three answers resulting in a total of 1269 responses, softness was rated almost as highly as blackness. Shininess and cleanliness were also mentioned frequently.

The influence of department and of ethnic group was evident when frequency

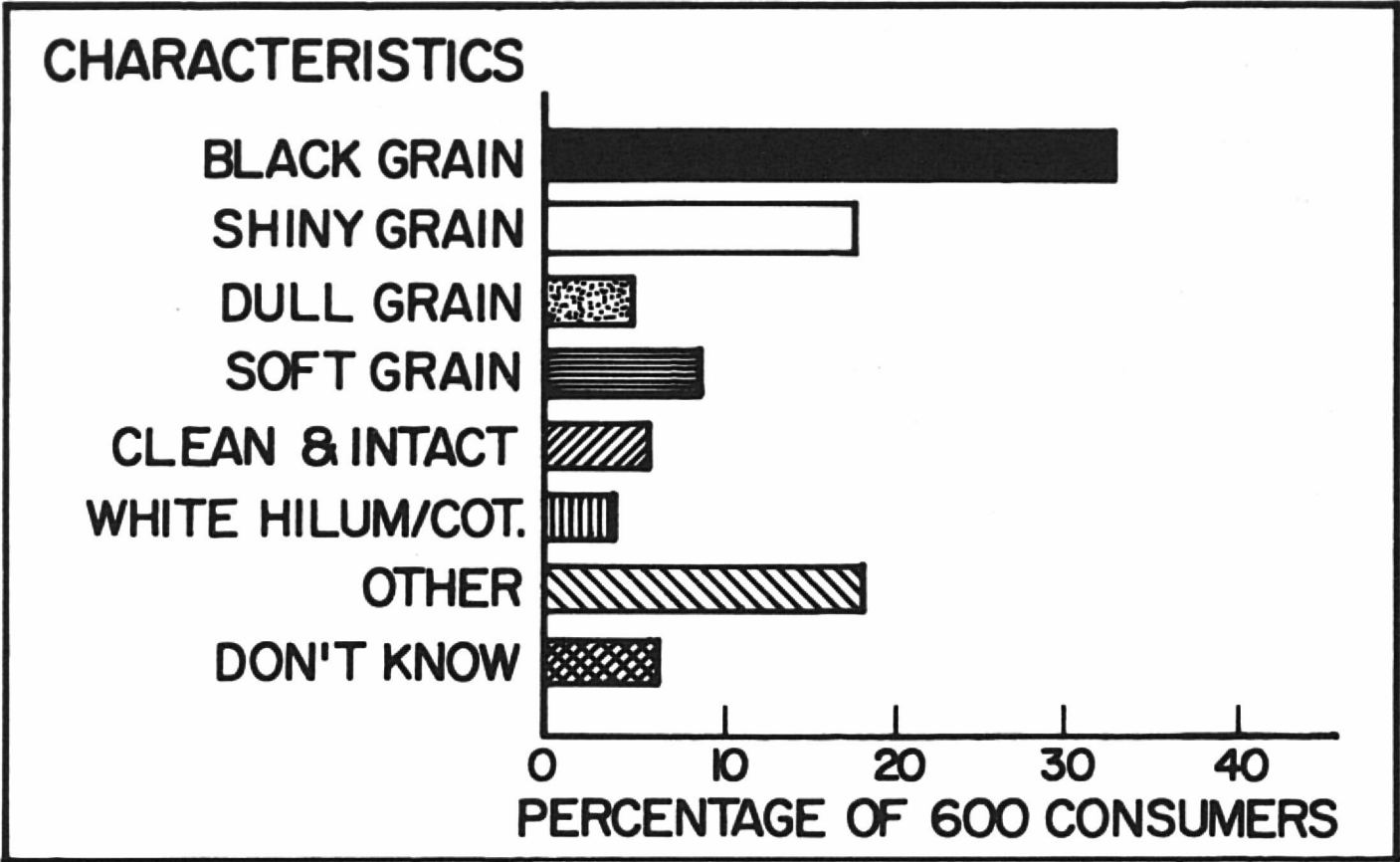


FIGURE 1a Principal characteristic of good quality raw beans. (Percentage of 600 Guatemalan consumers.)

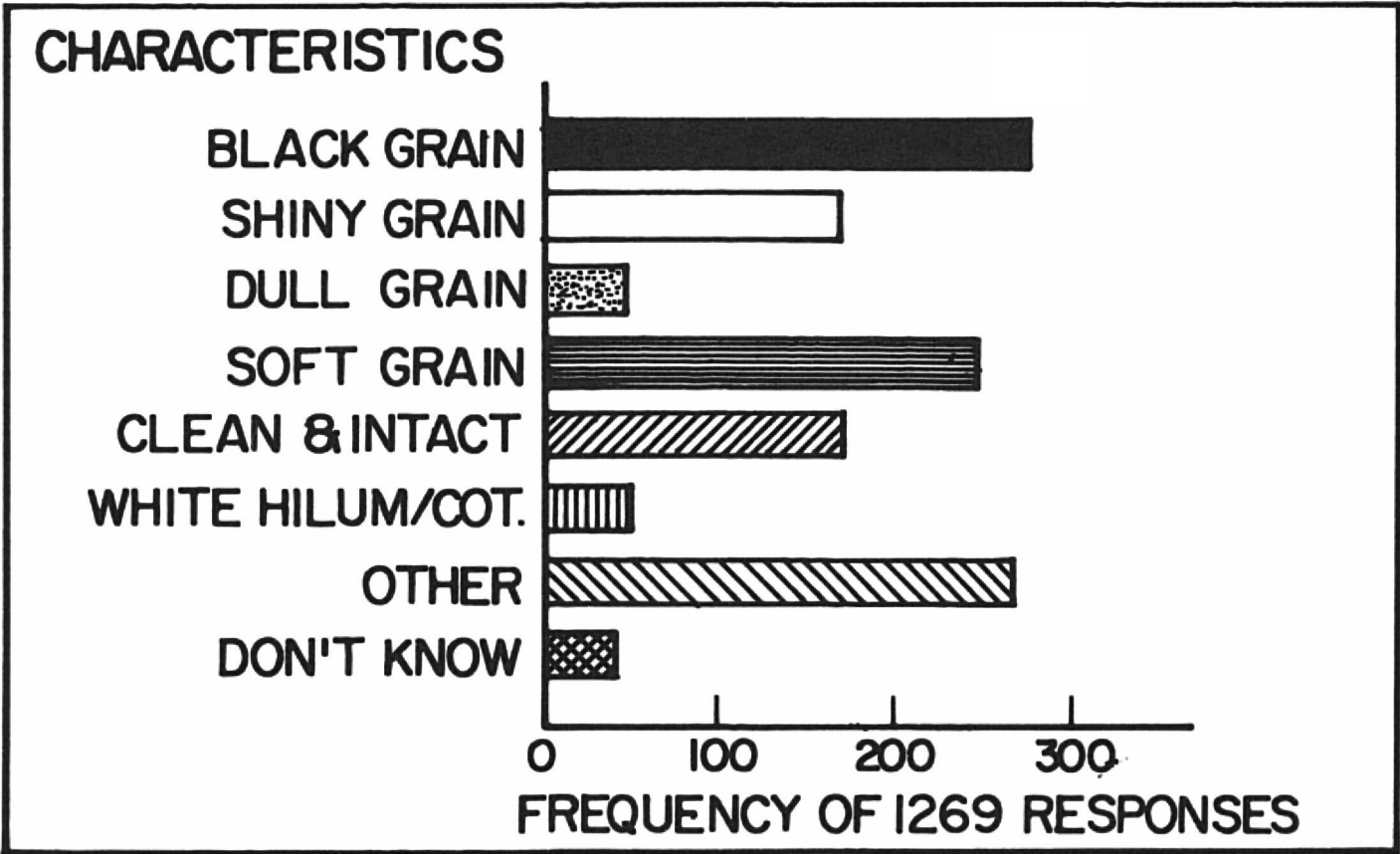


FIGURE 1b Characteristics of good quality raw beans. (Frequency of being mentioned in 1269 responses.)

distributions of the principal selection characteristics were compared. In Chimaltenango, the blackness of the grain, mentioned by over half of the respondents, was the most desired characteristic. In the other three departments, blackness was selected by about 25% of the consumers and in Jutiapa and Escuintla, shininess by 25%. When data for the two ethnic groups were compared, it was evident that Indian

consumers placed greater importance on black color than Ladino consumers. Fifty percent of the Indian and 30% of the Ladino group gave black grain color as the principal characteristic. Shininess and softness were of minor importance to the Indian consumers while 20% of the Ladinos selected shininess and 9.4% softness as principal characteristics.

Preparation and Cooking Methods

The traditional method of cooking black beans in Guatemala is in a round-bottomed clay pot supported over a wood fire by three stones on the floor, or placed over a wood fire on a clay stove. Modern methods include the use of metal pots, more convenient fuels, electric, gas or kerosene stoves and pressure cookers. In the mountainous, largely Indian department of Chimaltenango, use of the traditional method predominated, whereas in Guatemala City the more modern methods prevailed. Jutiapa and Escuintla were largely traditional but showed some signs of modern influence.

The clay pot was used by most consumers in Chimaltenango, Jutiapa and Escuintla. Enamel and aluminium pots were used somewhat more often in Escuintla than in Jutiapa or Chimaltenango. In Guatemala City, the pressure cooker was most widely used, followed by enamel and clay. In Chimaltenango, the clay stove and floor type cooking were used almost exclusively. In Jutiapa and Escuintla most of the cooking was done on clay stoves and, in Guatemala City, gas and electric stoves were most common but clay stoves were used by about 25% of the respondents. In the three non-urban departments, wood was by far the most common fuel, being used almost exclusively in Chimaltenango. In Guatemala City gas was most widely used but wood was used more than electricity.

A classification of cooking styles was developed by combining the types of pot, fuel and stove used by each respondent to form the classifications of traditional, mixed, modern, pressure cooker and other. Consumers using a clay pot, a clay or floor stove, with wood or charcoal as fuel were considered to be using a traditional cooking style. Those using enamel or metal pots, clay or floor stoves with wood or charcoal as fuel were placed in the mixed category. Respondents using enamel or metal pots, gas, electric or kerosene stove, and gas, electricity or kerosene fuel were placed in the modern cooking style group. Those using pressure cookers, regardless of stove or fuel type were placed in the pressure cooker category. Combinations not included above were considered as other ($n=51$). Over 60% (362) of the respondents used the traditional style of cooking beans, 11% (66) used the mixed style, 5% (31) used the modern style and 15% (90) used pressure cookers.

The distribution of cooking styles within each of the four departments showed that in Chimaltenango, Jutiapa and Escuintla the percentages of respondents using the traditional method were approximately 85%, 75% and 60% respectively. In Chimaltenango the modern cooking style was not used at all and very few consumers used pressure cookers. Escuintla had the highest use of the mixed style at just under 20%. Figure 2 shows the distribution of cooking styles for city, town and rural locations. In Guatemala City the pressure cooker was used by more than 50% of respondents while 10-15% used the traditional, modern or mixed methods. In towns and rural areas, the traditional style was used by over 75% of the respondents and the mixed style by just over 10%. The distribution of cooking styles for the towns and rural areas were essentially the same.

Procedures used by most consumers in preparing beans for cooking included washing and picking out extraneous matter. Only 89 (15%) of the 600 soaked the

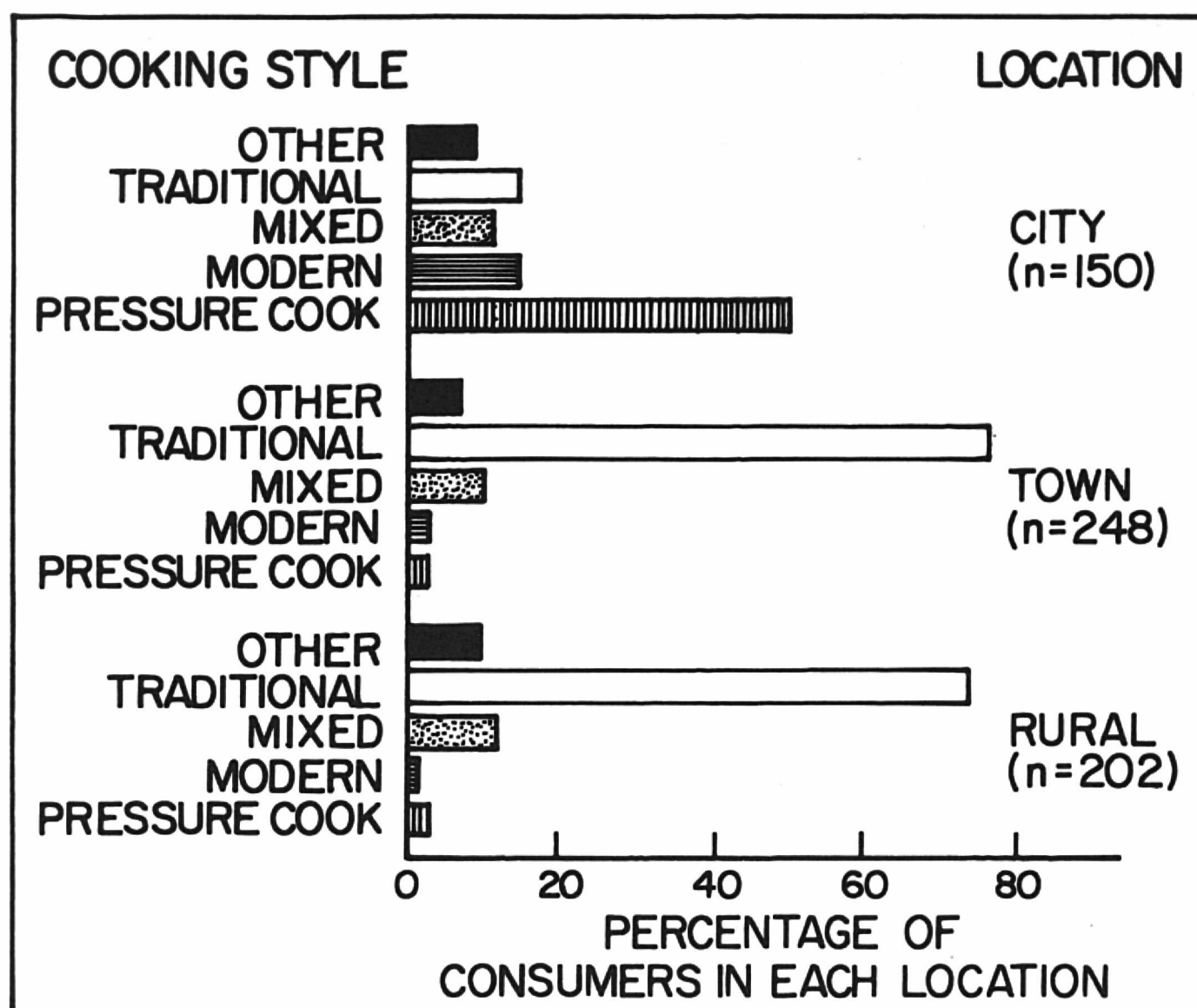


FIGURE 2 Cooking style used by Guatemala consumers in city, town and rural locations.)

beans before cooking, although soaking has been reported to shorten cooking time (Silva, Bates and Deng, 1981). This finding confirms the report from INCAP (1983) but is contrary to previous information that soaking beans in water for periods up to 18 hours is a common practice in Latin America (Bressani and Elias, 1980). The major reason given for not soaking was that it was "not the custom". Reasons for this may be due to poor water quality or to hard water which might hinder the softening process. Those who soaked beans were mainly in the urban areas and they gave softening the beans as the major reason for doing so. It is interesting to note that, of the 89 respondents who soaked beans, 33 cooked them in pressure cookers.

Effects of Altitude and Cooking Style on Cooking Time

The influence of demographic factors on cooking times used by consumers could not be examined directly because of the great variation in altitude of the regions surveyed. Cooking style, which, as has been shown, was influenced by consumers' ethnic group and location of residence, was another confounding factor in the analysis. It was therefore decided that the effects of altitude, and altitude and cooking style should be examined for the entire survey group and a selected group only.

Communities surveyed were classified by altitude into the five altitude categories

shown in Table II. Mean cooking times were calculated for each altitude category with the pressure cooking data included and also without the pressure cooking data. At the highest altitude, represented by communities in Chimaltenango, the mean cooking time reported was 290 min (almost 5 hours). Since boiling temperature is lowered approximately 1°C for every 300m rise in altitude, the boiling temperature of water at the altitude of the surveyed communities in Chimaltenango would be approximately 93°C. Only two respondents in this altitude category used pressure cookers, and inclusion of their reported cooking times did not change the mean time. The high altitude category included respondents living in Guatemala City at an altitude of 1500m. The mean cooking time at this altitude for all cooking styles was 97 min. More than fifty percent of the consumers living in Guatemala City cooked with pressure cookers, and when these data were excluded, the mean cooking time rose to 151 min. For the mid altitude category (approximately 1000m) which was composed of the communities of Quezada and El Progreso in Jutiapa, mean cooking times were 121 and 122 min with and without the pressure cooker data. For communities close to the 500m level, categorized as low, cooking times averaged 101 and 104 min for the pressure cooker included and excluded data sets. At the lowest altitude, 100m at Masagua in Escuintla, the mean cooking time was 102 min and none of the respondents used pressure cookers. Cooking

TABLE II
Mean cooking times for Guatemalan Black Beans by altitude categories calculated with and without pressure cooking data¹

Altitude Category	Altitude	Mean Cooking Times			
		With Pressure Cooking Data (n=600)		Without Pressure Cooking Data (n=510)	
		No. of Consumers	Mean Time (min.)	No. of Consumers	Mean Time (min.)
Highest	> 2000m	150	290	148	290 ^a
High	1500m	150	97	74	151 ^b
Mid	approx. 1000m	100	121	96	122 ^{bc}
Low	approx. 500m	150	101	142	104 ^{cd}
Lowest	100m	50	102	50	102 ^{bd}

¹Values with different superscripts are significantly different at the 0.05 level.

time for the highest altitude category was significantly longer than for the other altitude categories, when means were compared using the appropriate confidence limits, and exclusive of pressure cooker data. The high altitude mean cooking time was also significantly longer than the low altitude mean cooking time. Although the difference between the mean cooking times used at high and lowest altitudes was greater (49 min) the difference was not significant, a result of having limited data (n=50) for the lowest altitude category. Mean cooking times increased dramatically at the higher altitudes.

A Chi square test for the effect of altitude category on cooking time was performed on data for Ladino respondents only, as the Indian group was seen to be quite uniform in using the traditional cooking style and living in the highest altitude areas. The consumers using pressure cookers were also excluded, reducing the

sample size to 423. Cooking time distributions were significantly influenced by altitude ($p \leq 0.001$).

The effect of cooking style on mean cooking times for each altitude category is shown in Figure 3. None of the respondents in the lowest or highest altitude categories cooked with a pressure cooker, while none of the respondents in the mid or highest altitude categories used the modern cooking style.

For those using a pressure cooker, mean cooking times were less than 50 min for all three altitude categories. Mean cooking times for the other methods, over the three altitude categories, were modern, 115 min; mixed, 128 min; other, 142 min; and traditional, 184 min.

As shown in Figure 3, at all altitudes except the lowest, the longest cooking times were reported by those using the traditional cooking style. At the highest altitude those using traditional cooking style cooked for over 300 min, and those using mixed or other styles cooked for approximately 220 min. Generally, those using a mixed cooking style cooked longer than those using a modern cooking style. Use of pressure cookers reduced mean cooking style. Use of pressure cookers reduced mean cooking time by three or four times those of the mixed and modern styles in the three altitude categories.

Statistical data for factorial analysis of variance indicated that the effect of altitude on cooking time was highly significant ($p < 0.01$), both with and without the pressure cooker data, however the effect of cooking style was significant ($p < 0.01$) only when the pressure cooker data were included. Interaction between altitude category and cooking style was not significant.

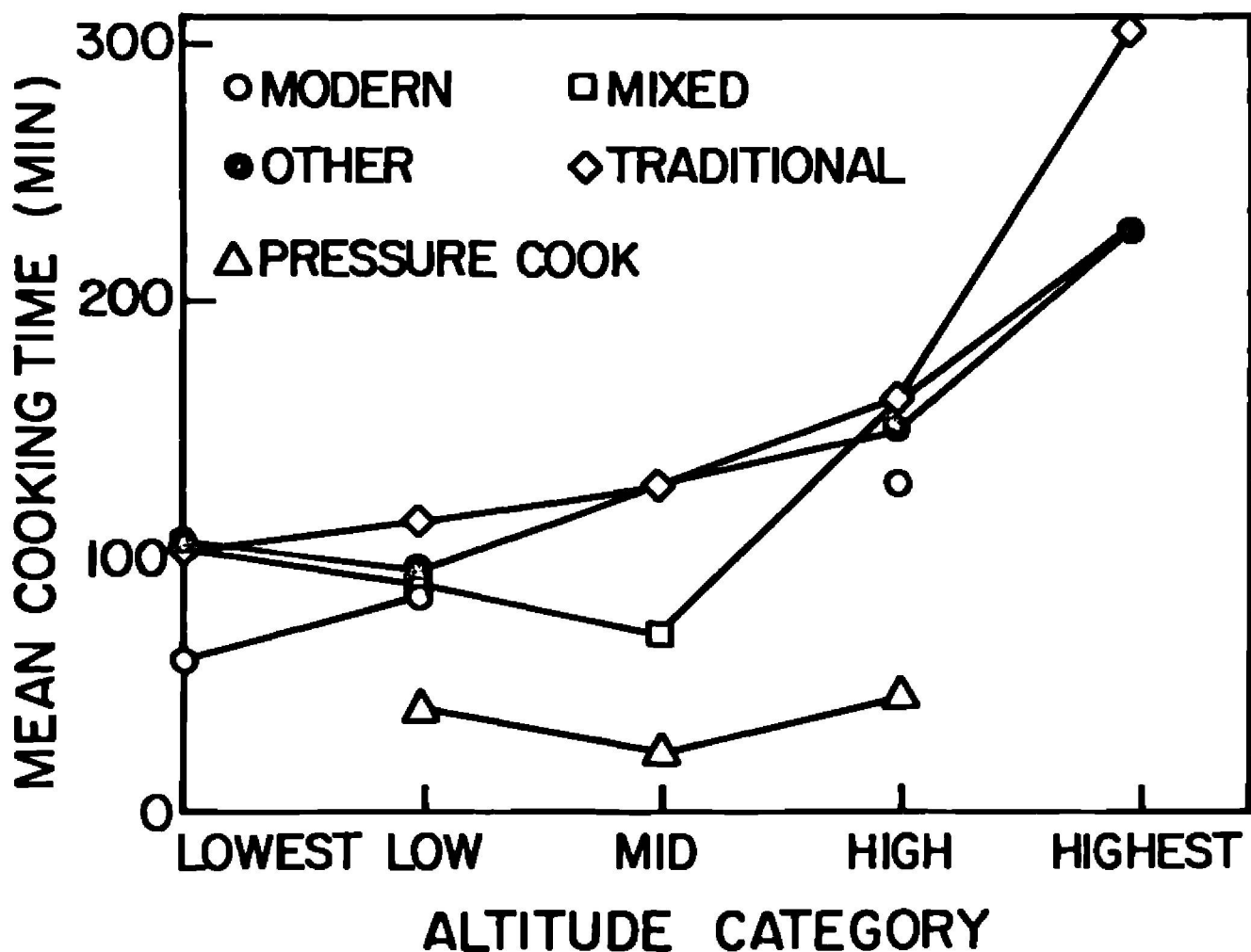


FIGURE 3 Effect of cooking style and altitude on cooking time of black beans.

Criteria for Judging Doneness of Beans

Nearly fifty percent of respondents reported that the principal method they used to judge when beans were cooked was to squeeze the beans between the fingers, apparently to feel the texture of the cotyledon. Over 18% observed the beans (looking for split skins) and over 17% measured the time. Since 13.6% of the respondents used pressure cookers and most of these timed the beans, a very small proportion of the remaining sample relied on timing. Figure 4a illustrates the percentage of respondents using the various methods.

The more general question on methods used to judge doneness resulted in 940 responses. The frequencies of the responses are shown in Figure 4b. The techniques of squeezing between the fingers and observing the split skins were each mentioned more than 360 times. Measuring the time and tasting were each mentioned slightly less than 100 times.

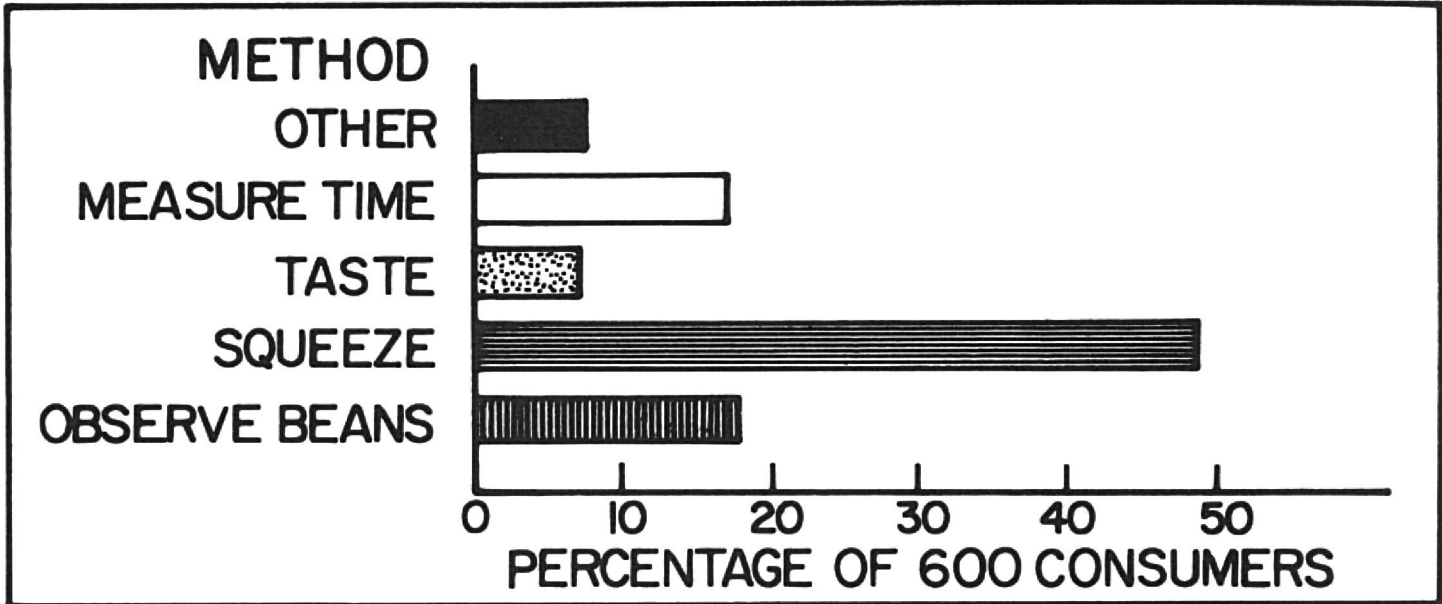


FIGURE 4a Principal methods of determining when beans are adequately cooked. (Percentage of 600 Guatamalan consumers.)

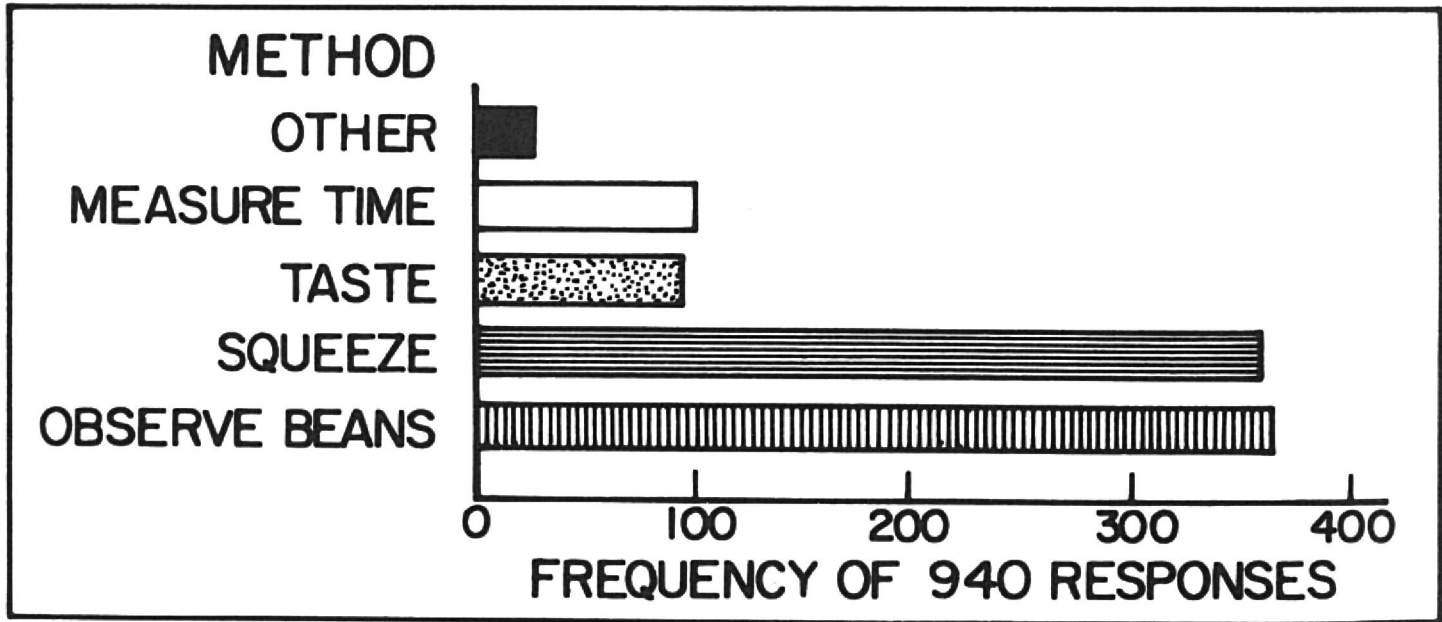


FIGURE 4b Methods of determining when beans are cooked. (Frequency of being mentioned in 940 responses.)

In all categories of cooking style except pressure cooking, 50-60% of the respondents judged doneness by squeezing the beans. In the largest cooking style category, the traditional, 24% observed the beans for splitting.

Characteristics of Good Quality Cooked Beans

Identifying cooked bean quality characteristics of importance to consumer acceptability was an essential focus of the survey. When respondents were asked to name the principal characteristic of good quality cooked beans, the highest percentage of respondents (24%) answered with "splitting across the middle of the beans" with none mentioning intact beans. By contrast, van Herpen (1983) found that the majority of her subjects preferred the cooked beans to be intact. In the present study, 21% stated that "thick broth" and 19% that "spreadability" (spreads easily) were the principal characteristics. Other characteristics in decreasing order of percent of the responses were soft grains, spongy or doughy, and black broth.

The distribution of the 1481 responses to the general question asking consumers to name up to three characteristics of good quality cooked beans reveals that the most frequently mentioned (480 times) characteristic was thick broth. In Colombia, plantain is added during the cooking of beans to give the broth the appropriate thickness (van Herpen, 1983) but this was never reported in Guatemala. Characteristics mentioned less frequently were black broth (285 times) and broken-in-the-middle (255 times). The remaining characteristics in descending order were spreadability, soft grains and spongy or doughy.

Breakdown of the data into subgroups showed that the Ladinos most frequently (116 of 511) stated "broken in the middle" as the most important characteristic of good quality cooked beans whereas the Indians most frequently (33 of 89) reported "thick broth". The second most frequently stated method was "spreadability" for the Ladino group and "broken in the middle" for the Indian group. It is possible that the Ladinos look for the spreading characteristic because they prepare a purée of the beans and like them to be smooth while the Indians often eat the beans whole and use the broth as a soup or beverage. In Guatemala City, where beans are more likely to be puréed and used in the refried form, a particularly high number of respondents reported "spreads easily" as the most important characteristic.

The information on principal characteristics of good quality black beans was examined for the effects of location (city, town, rural), cooking style (traditional, mixed, modern, pressure cook, other) and the 6 ranges of cooking time (0-30, 31-60, 61-120, 121-240, 241-360, >360). The characteristics broken-in-the-middle was of similar importance in all three locations, and was mentioned by 23-27% of respondents. Of particular interest were the characteristics relating to the spreadability of the beans and the quality of the broth. "Spreads easily" was mentioned by nearly 32% of city consumers but by only 13-15% of those living outside of the city. In these locations, thick broth was mentioned by nearly 27% of respondents compared with just over 5% in the city. Black broth was also more important in the town and rural areas than in the city.

In the analysis of the relationship of cooking style to the distribution of principal characteristics, twenty-eight percent of those cooking in the traditional way considered broth thickness to be the most important determinant of quality. For those using the mixed style, broth thickness was of major importance to only 15%. Among the small group using the modern style, a higher percentage than might be expected (23%) mentioned thick broth. Those using pressure cookers were the

least concerned with broth characteristics.

It was predicted that consumers cooking the beans for a longer time would consider thickness of the broth an important criterion. Of those cooking beans longer than 120 minutes (223 respondents), 30.5% considered "thick broth" the most important characteristic and 24% mentioned "broken-in-the-middle". For those who cooked beans less than 120 minutes the texture characteristics such as spreadability, soft grains and broken-in-the-middle were important.

SUMMARY AND CONCLUSIONS

Guatemalan consumers selected raw black beans on the basis of color and texture criteria. The physical characteristics of size and shape were not mentioned, although these have been reported to be important selection factors to consumers in Cali, Colombia (van Herpen, 1983). Intense black color and shininess of the seedcoat were considered the primary indicators of good quality by a majority of Guatemalan consumers. Blackness was particularly important to the Indian respondents. Softness, determined by biting or by cutting raw beans with a fingernail, was the next most frequently mentioned quality indicator. Over one-third of all consumers bit raw beans to test for hardness.

Over two-thirds of those surveyed cooked beans in a clay pot placed over or beside a wood or charcoal fire, on the floor or on a clay stove. It was only in Guatemala City that the majority of consumers employed gas or electricity for cooking, and replaced the clay pot with aluminium or enamel cookware, or a pressure cooker. Cooking style influenced reported cooking time, but much less than the altitude of the respondent's community.

Reported cooking times ranged from 20 minutes to over 6 hours. Altitude had a marked effect of cooking times, which averaged under 2 hours at the lower altitudes but almost 5 hours at the highest altitude. Longer cooking times can be attributed, in part, to the lowering of the boiling point of water at the high altitudes. The extended cooking times reported for residents of Chimaltenango reflected the influence of altitude, the traditional cooking style, and the desire of consumers in that department for a thick bean broth.

Consumers assessed the quality of cooked beans primarily on the basis of texture related characteristics. Beans were considered to be of good quality when seedcoat and cotyledon were split at the middle of the bean at the end of the cooking period, when beans produced a thick broth, and when the cooked beans were easy to spread. Thickness of broth was particularly important for the Indian consumers. It appeared that consumers emphasized the quality characteristic appropriate to their usual method of further preparation of beans.

Department, ethnic group and location of residence (rural or urban) were related to respondents' cooking style, methods of raw bean selection, and criteria for cooked bean quality. Indian respondents had distinct quality requirements, preferring beans that produce a thick broth and split well when cooked. City respondents placed more importance on spreadability than on other quality characteristics. These preferences need to be considered when quality criteria for different varieties and markets are established.

This survey indicates that there are a number of aspects of consumer acceptability of black beans in Guatemala that remain to be explored. Since the appearance of raw beans and the texture of raw and cooked beans are critical to their acceptability, the emphasis in the laboratory testing of new varieties should be

placed on color and texture measurement. Using the demographic and cooking style information from this survey, groups of consumers with different quality requirements should be identified and the relative importance of these requirements determined. Finally, acceptability studies should be conducted which examine the quality of beans in the whole, broth and puréed forms as commonly prepared by the different groups of Guatemalan consumers.

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REFERENCES

- Aguilera, J.M. and D.W. Stanley (1985). A review of textural defects in cooked reconstituted legumes — the influence of storage and processing. *J. Food Proc. Preserv.* 9, 145-169.
- Araya, H., M. Flores and G. Arroyave (1981). Nutritive value of basic foods and common dishes of the Guatemalan rural populations: a theoretical approach. *Ecology Food Nutr.* 11, 171-176.
- Bressani, R., M. Flores and L.G. Elias (1973). Acceptability and value of food legumes in the human diet. In *Potential of Field Beans and Other Food Legumes in Central America*. Centro Internacional de Agricultura Tropical, Cali, Colombia. CIAT Seminar 2E, 17-48.
- Bressani, R. and L.G. Elias (1977). Tentative nutritional objectives in the major food crops for plant breeders. In Hulse, J.H., K.O. Rachie and L.W. Billingsley, eds. *Nutritional Standards and Methods of Evaluation for Food Legume Breeders*. International Development Research Centre, Ottawa, Canada. IDRC-TS7e, 51-61.
- Bressani, R. and L.G. Elias (1980). The nutritional role of polyphenols in beans. In Hulse, J.H., ed. *Polyphenols in Cereals and Legumes: Proceedings of a Symposium, Institute of Food Technologists, June 1979*. International Development Research Centre, Ottawa, Canada. IDRC-145e, 61-72.
- Elias, G.L. (1985). Focus group interviews with Guatemalan consumers. In *Bean Network: Proceedings of the First Workshop, Guelph, Canada, June 1985*. International Development Research Centre, Ottawa, Canada, 211-234.
- Eppright, E.S. (1947). Factors influencing food acceptance. *J. Am. Diet. Assoc.* 23, 579-587.
- Flores, M., B. Garcia, Z. Flores and M.Y. Lara (1964). Annual patterns of family and children's diet in three Guatemalan communities. *Br. J. Nutr.* 18, 281-293.
- Garruti, R.d.S. and M.C. Bourne (1985). Effect of storage conditions of dry bean seeds (*Phaseolus vulgaris* L.) on texture-profile parameters after cooking. *J. Food Sci.* 50, 1067-1071.
- INCAP (1983) *Studies on Selected Factors and Processes Which Affect the Nutritional Potential of Food Legumes*, Final Report submitted to International Development Research Centre, Ottawa, Canada. Institute of Nutrition of Central America and Panama, Guatemala City, Guatemala, Central America, 1-28.
- Pigott, J. and K. Kolasa (1979). Prevalence of malnutrition and dietary habits of preschoolers in a rural Guatemalan village. *Ecology Food Nutr.* 8, 71-78.
- Randall, E. and D. Sanjur (1981). Food preferences — their conceptualization and relationship to consumption. *Ecology Food Nutr.* 11, 151-161.
- SAS Institute (1983). *SAS User's Guide*, 1983 Edition, Statistical Analysis System, Cary, N.C.
- Silva, C.A.B., R.P. Bates and J.C. Deng (1981). Influence of soaking and cooking upon the softening and eating quality of black beans (*Phaseolus vulgaris*). *J. Food Sci.* 46, 1716-1720, 1725.
- Steenkamp, J-B.E.M. (1986). Perceived quality of food products and its relationship to consumer preferences — theory and measurement. *J. Food Quality* 9, 373-386.
- van Herpen, D. (1983). *Attitudes and Preferences Towards Beans in Cali, 1983: Development of a Methodology*. Unpublished. Centro Internacional de Agricultura Tropical, Cali, Colombia.
- Williams, A.A. (1983). Defining sensory quality in foods and beverages. *Chem. Industry* 19, 740-745.