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**caribbean
food
crops society**

19

**Nineteen
Annual Meeting
August 1983**

PUERTO RICO

Vol. XIX

EVALUATION OF DRY BEANS GROWN LOCALLY

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Dry beans are consumed in considerably amounts by all sectors of the Puerto Rican population, but nevertheless, production is limited. By 1973-74 per capita consumption of beans of all varieties was 16.31 lbs. (7.4 kg.) corresponding 0.33 lbs. (150 grams) to beans grown locally and 15.98 lbs. (7.3 kg) to imported beans. During 1980 Puerto Rico imported 53,276,695 lbs. (24,216,680 kgs.) of beans from the United States alone with a cash value of \$18,213,257. Of these, 45,643,273 lbs. (20,746,942 kgs.) were dry beans with a cash value of \$15,639,536.

Puerto Rico has an ideal climate to produce a various harvest of beans in a single year. Guadalupe-Luna found that it is possible to harvest beans twice in a single year with good yields if the beans are planted in spring, summer and winter.

The beans selections used in this study were grown at the Isabela Substation of the Agricultural Experiment Station. There were 4 selections of Red Kidney, 7 selections of White and 11 selections of Striped. Beans were planted in winter and allowed to dry in the field. They were brought to the laboratory and stored under controlled conditions (75°F and 60% R. H.) until used.

The beans moisture content ranged from 12.38% to 14.11% averaging 13.48% for Red Kidney, 12.67% for White and 13.48% for Striped.

The beans selections were evaluated as for home style cooked beans and as for canning. In both cases the beans were hydrated first to a hydration rate of 2, that is, when they double their weight. To determine the hydration rate and time, a known weight of beans was soaked in three times its weight of tap water. After every hour the beans

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were drained and weighted. If the hydration rate was not reached, they were put back in water. The procedure was repeated until the hydration rate of 2 was reached. The hours needed to reach a hydration rate of 2 is known as the hydration time.

Red Kidney beans of the Lajas selection doubled its weight in only 7 hours while Calima and Rosita Lajas of the striped varieties doubled their weights in 10 hours. The other selections took from 12 to over 18 hours to double their weights.

Except in Rosita Lajas and Galana Selection hydration was faster at the beginning of the hydration time, then leveling up.

After the beans were hydrated for the time determined for each selection, they were home style cooked and canned. For home style cooked, the beans were boiled in water until soft and stew Puerto Rican style. Stewing Puerto Rican style consist of cooking the beans in a condiment called sofrito until the sauce thickens. Diced pumpkin is also added to help thicken the sauce. The sofrito is prepared from onion, green pepper, sweet pepper, garlic, coriander leaves, smoked ham, tomato sauce, salted fat back and salt. Samples were presented in small dishes to the taste panel in group of not more than four samples per serving.

Results were statistically analyzed using the analysis of variance and the Duncan's multiple range test. Correlation coefficients were calculated using a quick ranking procedure as explained by Kramer and Twiggs. All samples were found acceptable regarding appearance. Borinquen and Guayamesa selection of the Striped beans variety obtained the higher scores while the selection Lajas of the Red Kidney variety obtained the lower scores. No significant difference in appearance was observed among white selections.

All selections were also found acceptable regarding flavor, ranging from between "like and like very much" in selections Guayamesa, Bonita #4, #7 and #8, Cuarentena, Borinquen, Calima and Oro Rico to between "neither like nor dislike" and "like moderately" in Dominicana #5 and Naranjito. No significant differences in flavor were observed among samples of Red Kidney variety.

Naranjito selection was slightly rejected regarding texture. Selections White 117 and 142, Lajas, Marca Diablo 1973, Dominicana #5, Pompador Dominicana and Galana also

obtained low scores. Guayamesa, Calima and Cuarentena selections obtained the highest texture scores.

All selections were accepted when evaluated for overall acceptability. Texture was one of the most important attributes that contributes to the acceptability of cooked beans. Thus, correlation coefficient (r) between overall acceptability and texture when all beans selections were taken in account was equal to .92 which means that 84.64% of the overall acceptability may be explained in terms of texture. The correlation coefficient between overall acceptability and flavor was .83 which is still a significant correlation, but the correlation coefficient between overall acceptability and appearance was not significant (r = .70).

For canning the beans were hydrated as explained before. After hydrated, the beans were hot water blanched at 190°F (87.8°C) for 5 minutes and cooled. All the split beans were discarded. The fill weight of beans was placed in each can, a 2% boiling brine added, steam exhausted, sealed and processed. The fill weight placed in each can was 9.5 oz. (269.3 g) for all varieties.

The beans were processed at 250°F (121.1°C) for different periods of time, depending on the initial temperatures. After processed, they were stored under ambient conditions.

The samples were kept under ambient conditions for two weeks before submitting them to physical and bacteriological analyses and sensory evaluation.

In the laboratory the samples were analyzed for vacuum, drained weight, brine volume, brine turbidity and the presence of matting. There was not a significant difference in the drained weights of the selections of striped beans during the storage period. There drained weight was significantly higher in the selections of Red Kidney beans after 15 days in storage. In the case of White beans, the drained weight was also significantly higher after 15 days.

The brine of the White beans selections were much clear and transparent that the brine from the Red Kidney and striped selections. The brine of the Red Kidney and Striped varieties had to be diluted in a proportion of 5:1 in order to be able to obtain a reading in the Kelt Summerson Spectrophotometer.

Matting was observed in some of the selections within each variety. Selections Lajas and 1973 of the Red Kidney, Abraham Africa and White 142 of the White and Naranjito,

Galana, Rosita Lajas, and Oro Rico of the Striped were the ones showing matting at a highest degree.

All the selections were sensory evaluated after 15 days (0 months), 3 months and 6 months of storage. They were prepared in the same manner as the home style cooked beans.

The Red Kidney selections were well accepted throughout the shelf life period for appearance, except for the selection Marca Diablo Lajas, which was rated neither like nor dislike at 3 and 6 months and being significantly different to varieties Violeta, Marca Diablo 1973 and Selección 27 R.

All selections of white beans were accepted in appearance at 0, 3 and 6 months of storage. At 3 months, White 142 was significantly difference to Abraham Africa. No significant difference was observed between all white selections at 6 months storage.

The Striped beans selections were rated acceptable at 0 month, except Galana, Rosita Lajas and Oro Rico that were rated "neither like nor dislike". Galana and Rosita Lajas were significantly different to all Striped beans selections. Significant difference was also reported between Oro Rico and Dominicana #5, Naranjito, Selección Pompadour, Boringuen, Colombia 91 P, Calima and Guayamesa. At 3 months storage Galana and Rosita Lajas were again the lowest rated reporting significant difference with the other selections. Rosita Lajas was the only selection rated as "neither like nor dislike" at 6 months and being significantly different to all others.

No significant difference was reported in flavor of Red Kidney beans selection at 0 and 3 months. At 6 months, significant difference was found between varieties Violeta and Marca Diablo Lajas. All selections of this variety were well accepted by the taste panel throughout the shelf life study.

Beans of the White selections were also acceptable in flavor from "like to like moderately" at 0, 3 and 6 months. No significant differences were observed between bean selections at 0, 3 and 6 months. No significant difference was observed between the selections at 0, and 6 months storage. At 3 months, Bonita #8 was the lowest rated and was significantly different to all the other white selections, except Bonita #7.