

IDENTIFICATION AND DETERMINATION OF POLYBASIC ORGANIC ACIDS PRESENT IN WEST INDIAN CHERRIES (*Malpighia Punicifolia* L.) AND IN THREE VARIETIES OF GUAVA (*Psidium Guajava*)

Rafael Santini, Jr.¹

INTRODUCTION

C. C. Gumarals and María de Abreu (1)², working with guavas and guava products reported that the two polybasic organic acids present in the fruit were levo-malic acid, which was said to be present in large quantities, and tartaric acid.

They said that citric acid is not present in the fruit and suggested that this lack could be used as a test for adulteration of jellies. Thus, if citric acid is present in the jelly, it could be regarded as adulterated.

Since there is no reference in their paper to the analytical method employed or to the varieties of guavas used, we decided to repeat this work quantitatively using different varieties of guavas. The same work was done with the West Indian cherry, a small fruit which has been described recently by C. F. Asenjo and C. G. Moscoso (2). There is nothing in the literature regarding the polybasic organic acids present in West Indian cherries. The only acid which has been identified and isolated in this fruit is the monobasic acid, ascorbic acid (3).

EXPERIMENTAL PROCEDURE

Three different varieties of guavas were employed in the work: Dominica Roja Agria, Dominica Blanca Agria, and Puerto Rico Rosada Agria. A complete quantitative determination of all acids present was made in the Dominica Roja Agria. The samples for analysis were prepared the same way for West Indian cherries as for guavas. The method for preparing the samples was as follows:

About 5 pounds of the fruit were cut in small pieces and then triturated in the Warring Blendor for 5 minutes. They were then passed through a china cap strainer with $\frac{1}{16}$ -inch-diameter perforations. For the determination representative samples of 50 gm. were weighed in small containers and stored in the freezer. The method employed for the identification and determination was the Hartman Scheme for Polybasic Organic Acids (4).

¹ Associate Chemist, Agricultural Experiment Station, University of Puerto Rico, Río Piedras, Puerto Rico. The author wishes to express his thanks to F. Aróstegui and C. G. Moscoso for supplying the fruits used in the analysis, and to Josefina Escabi-Agostini for her assistance in the analysis performed.

² Numbers in parentheses refer to Literature Cited, p. 198.

RESULTS

The results obtained with the West Indian cherries are tabulated in table 1. Each analysis was performed in duplicate.

TABLE 1.—*Results of the determination of all acids in West Indian cherries*

| Acids | Aliquot 1 | Aliquot 2 | Average |
|--|--------------------|--------------------|--------------------|
| | <i>Meq./50 gm.</i> | <i>Meq./50 gm.</i> | <i>Meq./50 gm.</i> |
| Total acidity..... | 9.26 | 9.25 | 9.26 |
| Ascorbic acid..... | 2.35 | 2.40 | 2.38 |
| Levo-malic acid..... | 4.72 | 4.58 | 4.65 |
| Dehydroascorbic acid..... | 1.20 | 1.25 | 1.23 |
| Nonidentified acids ¹ | — | — | 1.00 |

¹ Difference between the average of total acidity and the total of all acids identified.

TABLE 2.—*Results of the determination of levo-malic acid in 2 samples of West Indian cherries*

| Sample No. | Aliquot 1 | Aliquot 2 | Average |
|------------|--------------------|--------------------|--------------------|
| | <i>Meq./50 gm.</i> | <i>Meq./50 gm.</i> | <i>Meq./50 gm.</i> |
| 1 | 2.40 | 2.40 | 2.40 |
| 11 | 4.19 | 4.21 | 4.20 |

TABLE 3.—*Results of the determination of all acids in the Dominica Roja Agria variety of guava*

| Acids | Aliquot 1 | | Aliquot 2 | | Aliquot 3 | | Average |
|--|--------------------|-----------------|--------------------|----------------|--------------------|----------------|--------------------|
| | <i>Meq./50 gm.</i> | <i>Per cent</i> | <i>Meq./50 gm.</i> | <i>Percent</i> | <i>Meq./50 gm.</i> | <i>Percent</i> | <i>Meq./50 gm.</i> |
| Total acidity..... | 14.13 | | 14.10 | | — | | 14.12 |
| Total ascorbic acid (includes dehydroascorbic acid)..... | .17 | | .18 | | .19 | | .18 |
| Citric acid..... | 12.40 | (1.59) | 11.70 | .1.505 | 12.11 | (1.55) | 12.07 |
| Tartaric acid..... | 1.11 | (.33) | 1.09 | (.33) | 1.29 | (.39) | 1.16 |
| Levo-malic acid..... | .47 | (.063) | .47 | (.063) | .45 | (.061) | .46 |
| Nonidentified acids ¹ | — | | — | | — | | .25 |

¹ Difference between the average of total acidity and the total of all acids identified.

Table 1 shows that the only polybasic organic acid present in large amounts is levo-malic acid. This was checked by preparing two different samples and determining levo-malic acid present in each. The results are given in table 2.

Neither tartaric nor citric acid were found to be present in the West Indian cherry by the method employed.

Just to have an idea of the pectin content of the West Indian cherry, an analysis was run in duplicate, using the alcohol-precipitation method. The results obtained showed an average of 0.32 percent.

When the Dominica Roja Agria variety of guavas was employed for the identification and quantitative determination of polybasic organic acids present, the results shown in table 3 were obtained.

Since C. C. Gumarals and María de Abreu emphasized the fact that citric acid was not present in guavas, we checked our work with two other varieties, the Dominica Blanca Agria and the Puerto Rico Rosada Agria. In both cases, citric acid was found to be present in large amounts. Tartaric

TABLE 4.—Results of the determination of total acidity and of citric acid in 2 varieties of guavas

| Determination | Aliquot 1 | | Aliquot 2 | | Aliquot 3 | | Average |
|---|--------------------|----------------|--------------------|----------------|--------------------|----------------|--------------------|
| <i>Dominica Blanca Agria variety</i> | | | | | | | |
| | <i>Meq./50 gm.</i> | <i>Percent</i> | <i>Meq./50 gm.</i> | <i>Percent</i> | <i>Meq./50 gm.</i> | <i>Percent</i> | <i>Meq./50 gm.</i> |
| Total acidity..... | 10.68 | | 10.59 | | — | | 10.64 |
| Citric acid..... | 5.79 | (0.75) | 5.73 | (0.73) | 5.78 | (0.74) | 5.77 |
| <i>Puerto Rico Rosada Agria variety</i> | | | | | | | |
| Total acidity..... | 12.58 | | 12.60 | | 12.67 | | 12.62 |
| Citric acid..... | 10.55 | (1.35) | 10.50 | (1.35) | 10.86 | (1.39) | 10.64 |

and levo-malic acid were determined qualitatively and they were found to be present in both varieties. Table 4 shows the results obtained for citric acid.

SUMMARY

Citric acid was found to be the polybasic organic acid present in large amounts in guavas. Therefore its determination cannot be used as a test for adulteration of guava jelly. Tartaric acid, as well as levo-malic acid, was also present in small amounts in the three varieties of guavas analyzed.

The only polybasic organic acid found in the West Indian cherry was levo-malic acid. Monobasic acid, ascorbic acid, and dehydroascorbic acid (lactone form) were also present in considerable quantities.

RESUMEN

El ácido cítrico es el ácido orgánico polibásico que se encuentra en grandes cantidades en la guayaba. Por lo tanto su determinación no se puede

usar como una prueba para la adulteración de las jaleas de guayaba. El ácido tartárico y el levo-málico, también se encontraron presentes en pequeñas cantidades en las tres variedades de guayaba analizadas.

El único ácido orgánico polibásico que se encontró en la acerola fué el levo-málico. El ácido ascórbico, que es un ácido monobásico, y el ácido dehydroascórbico (en forma de lactona) se encuentran también presentes en cantidades considerables.

LITERATURE CITED

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