SOLUBLE SOLIDS IN CITRUS FRUITS

SUTHERST[1] and Haas and Klotz[2] have shown that a physiological gradient exists in mature citrus fruits. Haas and Klotz found that the osmotic pressure of the juice from the pulp of the stylar-end third of Valencia fruits in late summer was approximately 18.34 atm while that from the stem-end third was only 13.49 atm. In making a study of an abnormal physiological condition in Valencia fruits, many thousands of fruits have been cut and observed. In many instances, and especially during the summer of 1937, after the low temperatures of the preceding winter, fruit segments were found to be frozen at the stylar end and not at the stem end. The high osmotic pressure in the stylar end of the fruits would naturally indicate that any freeze injury which might occur should be found in the stem end rather than in the stylar end of the fruit.

Between January 5 and March 21 the soluble solids content of the juice in the stem and stylar halves of each locular segment in 50 Valencia and 15 navel oranges and in 9 grapefruits was determined separately—1,542 determinations. The determinations were made with an Abbé refractometer.

Of the 268 segments from Valencia fruits picked between January 5 and February 16, twenty-two per cent. had a lower soluble solids content in the stylar end than in the stem-end half. The remainder of the tests on Valencia segments (248) were made between March 11 and March 21 when the fruits had become more mature. During this period only one segment was found that had a lower soluble-solids content in the stylar than in the stem half.

Most of the low temperatures in California come in the months of December and January. The results just mentioned explain why freeze injury may occur in the stylar end of a Valencia segment and not in the stem end. They indicate that the soluble solids polarity, so far as the stem and stylar ends of the Valencia fruit are concerned, does not become noticeably evident until the fruit has nearly or actually reached maturity.

In making a study of the results of the soluble-solids tests, another interesting and unexpected evidence of polarity in citrus fruits was discovered. Thirty-nine of the 44 Valencia fruits picked from the twigs on the *outside* of the trees had a higher soluble-solids content in the three north segments than in the three south segments of the same fruit. This condition prevailed in the stem half as well as in the stylar half of the segments and was equally true for fruits borne on the north, east, south or west side of the trees. The differences were not great but apparently significant. The amounts of soluble solids in the fruit having the greatest difference were 12.17 per cent. in the three south segments and 13.27 per cent. in the three north segments. Similar figures for the one showing the least difference were 11.56 per cent. and 11.62 per cent., respectively. These figures represent an actual difference in amount of materials of 8 per cent. in the former and 1 per cent. in the latter, or an average of 3.4 per cent. One of the 44 fruits had equal amounts of soluble solids in the three north and in the three south segments, while in four of them the soluble-solids content of the three south segments was slightly greater than that of the three north segments. The results of tests on other Valencia fruits, based on dry weight rather than on per cent. of soluble solids, gave results similar to those already recorded in this paragraph, except that the differences were slightly higher.

The remaining six of the 50 Valencia fruits tested for soluble solids were taken from the *inside* of the trees, near the trunk. The soluble-solids content of four of these was greatest for the three south segments and only two had the highest content in the three north segments. It was of interest to find that there was a difference, one way or the other, in all but one of the 50 Valencia fruits tested.

The navel oranges and grapefruits, picked between January 10 and February 28, showed a north-south polarity of soluble solids similar to that in the Valencias. The average difference was more pronounced in the navel (6 per cent.) than in either the Valencia (3.4 per cent.), or the grapefruit (4 per cent.).

A more complete report of these and further results will be published elsewhere in the near future.

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[1] Sutherst, *California Cultivator*, 36: 612, 1911.
[2] Haas and Klotz, *Hilgardia*, 9: 181–217, 1935.

A RELATION BETWEEN THE ELECTRONIC RADIUS AND THE COMPTON WAVE-LENGTH OF THE PROTON

THE classical radius of the electron ($a = e^2/(mc^2)$) and the Compton wave-length of the proton ($b = h/(m_p c)$) seem to be in the simple ratio of 3 to $\sqrt{2}$. We have by definition

$$\frac{a}{b} = \frac{m_p/m}{2\pi\alpha}$$

where $\alpha (= (hc)/(2\pi e^2))$ is the reciprocal of Sommerfeld's fine-structure constant. If, in accordance with Birge,[1] we insert the values $m_p/m = 1835$, and $\alpha = 137.06$, we find as an empirical value $a/b = 2.13$, whereas $3/\sqrt{2}$ is 2.1213. The divergence seems to be within the limits of observational error.

[1] R. T. Birge, *Phys. Rev.*, 49: 203, 1936.