pounds) is the number of free protons in the nucleus, rather than the number of planetary electrons." The chapters on radioctivity and colloids are brief and inadequate. Polonium, not radium (II, 206), was "the first radioactive element to be discovered"; and the Great Bear Lake deposits, rather than Colorado carnotite, deserve mention. Also, in attempting to make chemistry easy the authors have omitted such difficult but important topics as chemical equilibrium, energy in chemical reactions, determination of atomic and molectular weights and a thorough treatment of ionization. There are three chapters on pH, including colorimetric and electrometric methods for determining pH; nevertheless their excellent treatment justifies the inordinate space, one tenth of Volume I, allocated to it. To lower costs, pictures and portraits are omitted.

The concluding two volumes are vastly better. The beginner will find Volume III an unusually good brief on aliphatic and aromatic compounds, and I can recommend it enthusiastically. The descriptive matter is carefully organized and intelligently presented. Volume IV is a reprinting of "Chemicals of Commerce," the valuable reference book which has already reserved a niche for itself on the shelves of important chemical literature.

HUBERT N. ALYEA

PRINCETON UNIVERSITY

SPECIAL ARTICLES

A NOTE ON ASCORBIC ACID: NITROGEN RELATIONSHIPS IN GRAPEFRUIT

PHYSIOLOGICAL studies of the yield, quality and maturity of Marsh grapefruit in Arizona carried on by the Department of Horticulture of the Arizona Agricultural Experiment Station[1] have revealed certain influences of seasonal nitrogen supply. Grapefruit from trees having a high nitrogen nutrition throughout the year, as determined by foliar analyses, have been found to be less sweet, to color later, be thicker-skinned, poorer-shaped and to be of lower market grade than fruit from trees having a declining nitrogen content through the period of fruit growth and maturity.

Since the importance of grapefruit lies chiefly in its nutritive value, especially its vitamin C content, it seemed desirable to investigate the relationship of the ascorbic acid content of the fruit to the nitrogen nutrition of the tree.

Accordingly, five representative fruits picked from the north, south, east, west and center of four grapefruit trees from a high nitrogen experimental plot and four grapefruit trees from a low nitrogen experimental plot at the university orchard, Yuma, Arizona, were harvested at weekly or bi-weekly intervals beginning September 28, 1942, continuing until January 31, 1943. The fruit was shipped to the Department of Human Nutrition, of the Arizona Agricultural Experiment Station in Tucson. A total of 540 of these Marsh grapefruit were analyzed separately for their volume of juice, pH, total acidity, Brix: acid ratio, and ascorbic acid content. The ascorbic acid assays were made following the method of S. A. Morell. The bleaching effect of ascorbic acid on 2–6 dichlorobenzenone indophenol was measured in the Evelyn photoelectric colorimeter, correction being made for turbidity and other interfering pigments.

Analyses were carried on in a similar fashion with Marsh grapefruit from the Phoenix, Ariz., area. Data were found to agree with those shown in Table I for Marsh grapefruit from Yuma.

TABLE I

ASCORBIC ACID CONTENT OF MARSH GRAPEFRUIT JUICE (YUMA) AS RELATED TO NITROGEN NUTRITION OF THE TREE

Date of Analysis	Low nitrogen nutrition					High nitrogen nutrition				
	Tree 3	Tree 33	Tree 4	Tree 44	Ave.	Tree 5	Tree 55	Tree 6	Tree 66	Ave.
	Ascorbic acid content mg/ml*					Ascorbic acid content mg/ml				
9/30/42	.56	.53	.59	.53	.55	.48	.46	.41	.43	.45
10/ 7/42	.50	.49	.49	.47	.49	.46	.43	.38	.39	.42
10/13/42	.51	.51	.50	.45	.49	.42	.43	.42	.40	.42
10/21/42	.49	.47	.48	..	.48	.41	.44	.39	.35	.40
10/27/42	.48	.47	.46	.47	.47	.43	.40	.35	.33	.38
11/ 3/42	.50	.45	.50	.42	.47	.38	.41	.35	.31	.36
11/10/42	.45	.41	.50	.45	.45	.40	.38	.33	.33	.36
11/17/42	.48	.43	.48	.47	.47	.37	.42	.36	.34	.37
11/24/42	.50	.46	.47	.44	.47	.40	.42	.36	.34	.38
12/ 9/42	.44	.43	.41	.40	.42	.38	.41	.36	.36	.38
12/20/42	.47	.43	..	..	.45	..	..	.36	.34	.35
1/ 5/43	.48	.46	..	..	.47	..	..	.34	.37	.36
1/19/43	.46	.40	.41	.38	.41	.39	.37	.35	.34	.36
2/ 2/43	.43	.42	.44	.38	.42	.36	.36	.33	.33	.35
Average	.48	.45	.48	.44	.47	.41	.41	.36	.35	.38

* Average of 5 fruits from each tree.

It is consistently evident that the fruit from trees handled to give a low nitrogen content at harvest are higher (approximately 20 to 25 per cent.) in ascorbic acid content than those from trees in which a higher nitrogen plane prevailed. Differences of the same order were observed at each date of harvest throughout the season.

In order to gain more evidence in support of these data, studies were conducted in the present season in which both nitrogen and ascorbic acid determinations were made on grapefruit juices. These analyses were made by the Horticulture Department; ascorbic acid by visual titration with 2–6 dichlorobenzenone indophenol and nitrogen by the micro-Kjeldahl method.

[1] William E. Martin, *Univ. Ariz. Tech. Bull.*, 97, 1942.

The results of analyses of four composited samples of representative fruit from each of fifteen different trees from three experimental plots in Yuma are shown in Fig. 1.

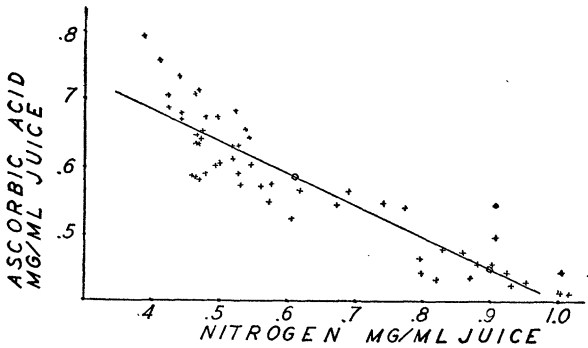

FIG. 1. Regression of ascorbic acid on nitrogen in grapefruit juice.

The data of the figure show a negative correlation coefficient of 0.91 between the nitrogen and ascorbic acid content of the juice of the grapefruit. Just why this relation between nitrogen and ascorbic acid exists in citrus juice is not clear.

As far as we are aware the high values for ascorbic acid are higher than any reported for grapefruit juice. At the same time, however, the nitrogen values are extremely low for those samples that show a high ascorbic acid content.

Perhaps it is associated with the ascorbic acid—oxidase respiratory system as described by Szent-Györgyi.[2]

It would be of interest to know if this relation between ascorbic acid and nitrogen, which has been found in Arizona grapefruit, holds for other citrus-producing areas and for other fruits or vegetables.

WINSTON W. JONES
C. W. VAN HORN
ALTON H. FINCH
Department of Horticulture,
MARGARET CAMMACK SMITH
EMILY CALDWELL
Department of Human Nutrition
AGRICULTURAL EXPERIMENT STATION,
UNIVERSITY OF ARIZONA

THIOUREA AND RESISTANCE TO LOW ATMOSPHERIC PRESSURES ("HIGH ALTITUDES")*

IT has been reported that thyroidectomized rats are better able to tolerate exposures to anoxia and reduced atmospheric pressures[1, 2, 3] than normal animals. Administration of thyroid and injections of anterior pituitary substance have been found to increase the sensitivity of animals to oxygen lack.[1, 2, 4, 5]

Mackenzie and Mackenzie[6] and Astwood *et al.*[7] have shown recently that treatment of rats with thiourea and the sulfonamides results in the development of a state of functional hypothyroidism, characterized by an enlarged, hyperplastic thyroid gland and a drop in the B.M.R. Withdrawal of the drugs results in a return of the animal to a normal condition.[7] The administration of thiouracil to the human suffering from hyperthyroidism results in a reduction of the basal metabolic rate.[8, 9] It has been demonstrated that thiourea produces these effects by interfering with the production of normal thyroid hormone by the thyroid gland.[10]

In view of these results it became of interest to test the effects of thiourea upon the resistance of animals to low atmospheric pressures. One hundred and two adult female rats were employed in these experiments. Thirty-six of these were fed a diet containing 0.5 per cent. thiourea for periods of time varying from 4 to 30 days. Thirty others were injected with 200 mg of thiourea in distilled water 5 hours prior to initiation of the low pressure treatment. Thirty-six animals served as untreated controls. All animals were then exposed to pressures of 200 mm Hg (32,000 feet), for 2 hours in a specially constructed low pres-

TABLE 1

EFFECT OF THIOUREA ON RESISTANCE TO LOW ATMOSPHERIC PRESSURES

Days on thiourea	No. of animals	Percentage mortality	Mean thyroid weight (mg)
0 (Controls) ..	36	75	14.0
0 (Thiourea injections)	30	60	13.9
4–8	18	50	18.0
12	6	0	29.3
14	6	0	30.0
30	6	0	37.4

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