In line with this manner of naming, the following designations are proposed for the citrus viruses:[6]

Citrivir italicum (italicum = pertaining to Italy). The virus causing infectious mottling of citrus.[7]

Citrivir psorosis (psorosis, Latin genitive of *psorosis* = of the psorosis disease). The virus causing psorosis of citrus.[8, 9]

C. psorosis var. *vulgare* (vulgare = general, common). The virus of psorosis A, or the common scaly bark type.[8, 9]

C. psorosis var. *anulatum* (anulatum = with a ring). The virus of psorosis B, a distinctly different type from A.[8, 10]

Other forms which are believed to be due to varieties of the psorosis virus pending further evidence are "concave gum," "blind pocket," "crinkly leaf" of lemon and "infectious variegation."

There are still other virus-like effects in citrus in which viruses are suspected but about which insufficient knowledge regarding transmission is known to justify virus names at present. Some of these are leprosis of Florida and South America, cyclosis of Brazil and concentric ring blotch of South Africa. In this connection it should be pointed out that there is no known experimental evidence to justify Atanosoff in listing as virus diseases a number of other things on citrus. To list certain effects as virus diseases merely because they have no known causal agent serves no useful purpose and tends to fill the literature with misleading erroneous citations.

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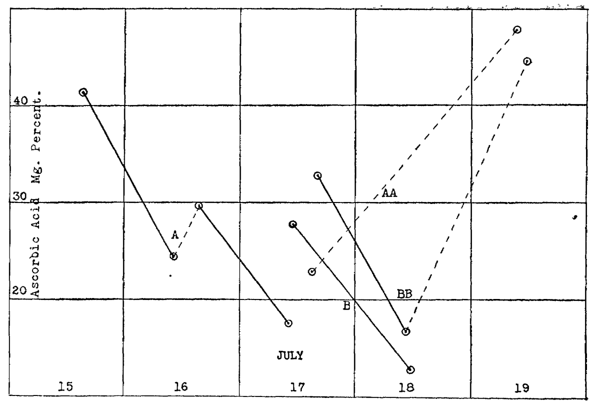
SOLAR RAYS AND VITAMIN C

IN an attempt to correlate the ascorbic acid content of young tomato plants of different varieties with the Vitamin C content of the tomatoes they produce, we have discovered a striking relationship between solar irradiation and ascorbic acid content in the plants.

Tomato seeds were planted on June 4, 1940; 24 plants of each variety transplanted into separate flats on June 14. They were kept in the greenhouse until June 26, when the flats were placed in the open. Five flats (Group A) were brought into the laboratory on July 15 and five additional flats (Group B) on July 17, for ascorbic acid studies. On Chart 1, graphs A and B represent the values when single whole plants, cut off at the ground (about 10 g), were used as samples. For graphs AA and BB the upper portions of 3 to 5 plants (about 10 g), from just below the two upper side leaves, were used. Since variety showed no consistent effect, averages of the five varieties at each time of analysis are indicated. Between points connected by solid lines the flats were in the laboratory, with diffuse sunlight during the daytime, while between points joined by broken lines they were in the open on the roof.

CHART 1.



It is evident from Chart 1 that there was a rapid loss of ascorbic acid when the plants were kept in the laboratory over night, and a rapid recovery when the plants were exposed to direct sunlight.

This observation raises the question of the role of ascorbic acid in plant life, about which little is known in comparison with our knowledge of its functions in animal physiology. The loss of Vitamin C in market vegetables is commonly ascribed to atmospheric oxidation. The much more rapid losses in these growing plants suggests its use in some physiological process, with solar rays as essential to its production.

We also have evidence of a positive correlation between ascorbic acid and sugar in the ripe tomato fruit. Is it possible that ascorbic acid is a step in the formation of other carbohydrates? We present these data in the hope that others may carry such studies further, since they are beyond our province.

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INEFFICACY OF PANTOTHENIC ACID AGAINST THE GRAYING OF FUR

GYÖRGY and Poling have recently reported[1] the results of studies which indicated that pantothenic acid has a curative effect on the nutritional achromotrichia

[6] Because of limitations of space, at the suggestion of the editor the detailed descriptions of these viruses are omitted. These are being submitted to *Phytopathology*.

[7] T. Petri, *Bol. R. Staz. Pat. Veg.*, n.s., 11: 105–114, 1931.

[8] Howard S. Fawcett, "Psorosis: In Citrus Diseases and Their Control." 2nd ed., pp. 188 to 203. New York: McGraw-Hill Book Company, 1936.

[9] *Idem, Phytopathology,* 24: 659–668, 3 figures, 1934.

[10] *Idem, Phytopathology,* 28: 669, 1938 (abst.) and 29: 6, 1939 (abst.).

[1] P. György and C. E. Poling, SCIENCE, 92: 202, 1940.

of rats maintained on a diet devoid of pantothenic acid. These results are in apparent conflict with observations made in the writer's laboratory. In our experiments, neither pantothenic acid concentrates nor pure pantothenic acid exhibited a preventive or curative effect on the gray hair of rats, although the rate of growth and the length of life were greatly enhanced. Evidently, some other circumstances which we can not as yet define influence the occurrence of achromotrichia. We note that our diet differs from that of György and Poling most conspicuously in the substitution of 8 per cent. butter for 2 per cent. corn oil. Such a difference might result in significantly differing amounts of the factor described by Nielsen, Oleson and Elvehjem.[2]

Our rats in which graying of hair occurred were maintained on the following basal diet: sucrose (or starch) 76 per cent., purified casein 18 per cent., salts 4 per cent., and corn oil 2 per cent., supplemented with 24 micrograms B_1, 40 micrograms B_2, 50 micrograms B_6, 6 mgs nicotinic acid and 6 mgs choline every other day and two drops of halibut liver oil weekly.

Group 1. Five litter mates, 2 black, 1 piebald, 1 tan and 1 white, received the basal sucrose diet. The two black rats as well as the tan one received, in addition to the above vitamins, every other day, 0.571 mg of Ba pantothenate of 40 per cent. purity derived from natural sources. Gray hair was observed in both black rats on the 16th day after the Ba pantothenate was first instituted and persisted until the experiment terminated four and one half months later. The tan rat on Ba pantothenate showed no changes in the fur. The white and piebald rats which received no Ba pantothenate developed a "rustiness" of the fur around the head on the 20th and 27th day, respectively.

Group 2. This group was composed of seven black littermates. Five of them were maintained on the above basal sucrose diet, while the remaining two received a basal diet in which methanol extracted starch was substituted for the sucrose. Three of the five rats on the sucrose diet received, in addition to the above vitamins, 4 mgs of methanol starch extract every other day. All five rats on the sucrose diet developed gray hair by the 28th day of the experiment. Two days later the starch extract was discontinued in the three rats receiving this supplement and two days later all seven rats were thereafter given 500 micrograms Ba pantothenate of 40 per cent. purity every other day. On the fifth day after the institution of Ba pantothenate, graying of the fur was observed in the two rats on the extracted starch diet. Two of the sucrose rats also showed "rustiness" of the fur about the head while on the Ba pantothenate. Twenty-five days after the institution of Ba pantothenate, 4 gms of wheat bran extract were given every other day to the three rats which had originally received the starch extract and to one of the rats on the extracted starch diet. The graying persisted in all rats during the subsequent six weeks. At this time pure Ca pantothenate became available and was substituted for impure Ba pantothenate in the amount of 200 micrograms Ca pantothenate every other day. Four of the rats on the sucrose diet and one on the extracted starch diet showed no improvement in gray hair during the subsequent two weeks, while the remaining two rats, one on sucrose and wheat bran extract and one on the extracted starch diet and wheat bran extract, showed a general decrease in graying.

Group 3. Thirteen black rats were maintained on the above sucrose diet supplemented with 6 mgs vitamin C, 200 micrograms vitamin K and 500 micrograms Ba pantothenate of 40 per cent. purity in addition to the previously mentioned vitamins every other day, and 21 mgs alpha tocopherol and 350 mgs linseed oil weekly. In addition, four of the rats received 2 gms waste cane molasses, three received 4 cc steep water, a by-product of starch manufacture, and three were given 400 mgs wheat germ every other day. Five weeks later, pure Ca pantothenate became available and was substituted for 40 per cent. pure Ba pantothenate in the amount of 200 micrograms every other day. By the 11th day after Ca pantothenate was first instituted, all the rats receiving wheat germ and steep water, one of the four receiving molasses and one of the three receiving none of these special supplements developed gray hair. On the 25th day, graying was observed in the remaining three rats on molasses and in one of the two remaining rats receiving none of the special supplements. The other rat of this latter group never developed gray hair.

The pantothenic acid salts used were kindly supplied in part by Merck and Company, Inc., Rahway, N. J. and in part by Professor R. J. Williams, of the University of Texas.

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SUMMIT, N. J.

[2] E. Nielson, J. J. Oleson and C. A. Elvehjem, *Jour. Biol. Chem.*, 133: 637, 1940.

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