

aquere, to Usina Santa Bárbara, and to Fazenda Paraizo, which made possible the plant-scale tests. They also acknowledge the technical assistance of Renato F. Ribeiro, Miguel Falcone, Durval M. Nogueira, and Helio P. Engelberg.

#### Literature Cited

- (1) Almeida, J. R., "Alcool e Destilaria," pp. 40, 85, Livraria e Papelaria Brasil, Piracicaba, São Paulo, Brasil, 1940.
- (2) Alzola, Francisco, *Mem. conf. anual asoc. técnicos azucar. Cuba* **14**, 323-6, 1940.
- (3) *Ibid.*, **19**, 357 (1945).
- (4) Asai, T., Kiyomoto, U., Tetsuia, K., *J. Agr. Chem. Soc. Japan* **26**, 564 (1952).
- (5) *Ibid.*, **27**, 586 (1953).
- (6) Bilford, H. R., Scalf, R. E., Stark, W. H., Kolachov, P. J., *Ind. Eng. Chem.* **34**, 1406 (1942).
- (7) Borzani, Walter, *Bol. dep. quim. Escola Politécnica (São Paulo)* No. **4**, 1 (1956).
- (8) Borzani, Walter, Brazil Patent **44,531** (Oct. 27, 1953).
- (9) Borzani, Walter, *Engenharia e quim. (Rio de Janeiro)* **1**, 10 (1953).
- (10) Borzani, Walter, *Ibid.*, **7**, 5 (1955).
- (11) Borzani, Walter, Falcone, M., *Bol. assoc. brasil. quim.* **10**, 5 (1952); *J. AGR. FOOD CHEM.* **1**, 1070 (1953).
- (12) Browne, C. A., Zerban, F. W., "Physical and Chemical Methods of Sugar Analysis," 3rd ed., p. 746. Wiley, New York, 1941.
- (13) Council of Scientific and Industrial Research, Indian Patent **43,542** (Sept. 3, 1952).
- (14) Day, W. H., Serjak, W. C., Stratton, J. R., Stone, L., *J. AGR. FOOD CHEM.* **2**, 252 (1954).
- (15) Dinaburg, A. M., Russ. Patent **64,934** (July 31, 1945).
- (16) *Ibid.*, **65,004** (Aug. 31, 1945).
- (17) Florey, H. W., Chain, E., Heatley, N. G., Jennings, M. A., Sanders, A. G., Abraham, E. P., Florey, M. E., "Antibiotics," vol. **I**, p. 126. Oxford Univ. Press, London, 1949.
- (18) Garey, J. C., Rittschof, L. A., Stone, L., Boruff, C. S., *J. Bacteriol.* **49**, 307 (1945).
- (19) Keussler, O., Ger. Patent **744,682** (Nov. 25, 1953).
- (20) Kuffner & Kuffner, Austrian Patent **134,100** (July 10, 1933).
- (21) Malchenko, A. L., Chistiakov, M. P., Russ. Patent **77,813** (Dec. 31, 1949).
- (22) Mariller, C., Mejane, J., Martraise, M., Tourliere, S., *Inds. agr. et aliment (Paris)* **69**, 775 (1952).
- (23) Mattos, A. R., U. S. Patent **2,451,156** (Oct. 12, 1948).
- (24) Maxon, W. D., *Appl. microbiol.* **3**, 110 (1955).
- (25) Meloni, G., "L'industria dell'alcole. Alcolometria," Editore Ulrico Hoepli, Milan, 1952.
- (26) Owen, L. W., *Sugar* **43**, No. 2, 36 (1948).
- (27) Scholler, H., Brit. Patent **486,481** (June 3, 1938).
- (28) Strandskov, F. B., Bockelmann, J. B., *J. AGR. FOOD CHEM.* **1**, 1219 (1953).
- (29) Underkoffer, L. A., Hickey, R. J., "Industrial Fermentations," vol. **I**, p. 78, Chemical Publ. Co., New York, 1954.
- (30) *Ibid.*, p. 89.
- (31) White, J., "Yeast Technology," p. 135. Chapman & Hall, London, 1954.

Received for review November 17, 1955.  
Accepted July 26, 1956.

## CORRESPONDENCE

### Reduction of Dental Caries and Goiter by Crops Fertilized with Fluorine and Iodine

SIR: McClendon and Gershon-Cohen [*J. AGR. FOOD CHEM.* **3**, 72 (1955)] have reported the results of some experiments upon the prevention of goiter in rats by feeding materials from plants fertilized with compounds containing iodine. The diet consisted of ground sunflower seeds, dried sunflower leaves, yeast, and sodium chloride. The controls received a diet that was similar except that the sunflowers used had been grown in water culture without iodine. The dried leaves of these plants contained no iodine; those of the plants grown in the fertilized plots contained from 0.19 to 0.38 p.p.m. of iodine, depending upon the nature of the compound used for fertilization.

No analysis of the seeds, which furnished eight times as much of the diet as did the leaves, was presented. However, in a letter to me dated June 14, 1955, Dr. McClendon wrote, "The leaves contain about 100 times as much iodine as the seeds, whenever iodine is present." If we assume that each rat ate about 10 grams of its diet per day, the differences in the amounts of iodine furnished by the two kinds of diet varied from 0.19 to 0.38  $\gamma$  per day. If we assume that the yeast furnished no appreciable quantity of iodine, the iodine consumption of the test group would correspond to an intake of from 19 to 38  $\gamma$  per 4000 calories. This is far less than the usual intake even in regions in which goiter is endemic, ac-

ording to one of my reports [*J. Clin. Nutrition* **3**, 215 (1955)].

However, it is consistent with the report by McClendon and Hathaway [*Proc. Soc. Exptl. Biol. Med.* **21**, 129 (1923)] that an intake of 20  $\gamma$ , with an excretion in the urine of 7  $\gamma$ , was sufficient to prevent goiter in man 23 years old. If that be accepted, there is no need of iodized salt, for there were few foods, if any, the analyses of which were reported by McClendon ("Iodine and the Incidence of Goiter," Univ. Minnesota Press, Minneapolis, Minn., 1939) that did not contain at least 20  $\gamma$  per 4000 calories.

If, on the other hand, the yeast did contain appreciable quantities of iodine, the difference between the two kinds of diet would still be only 19 to 38  $\gamma$  per 4000 calories. This amount would be furnished by 190 to 380 mg. of iodized salt containing 0.01% of iodine. Is it seriously contended that freedom from goiter hangs by so slight a thread?

ISIDOR GREENWALD

SIR: In order to provide an iodine-containing vegetable component in an experimental diet, I tried fertilizing the soil with iodine to get iodine into edible plant materials and obtained 0.19 to 0.38 p.p.m. of iodine in sunflower leaves. Goiter in rats was prevented by feeding 10% sunflower leaves and 80% sun-

flower seeds in the diet [*J. AGR. FOOD CHEM.* **3**, 72 (1955)]. Unfortunately, I was retired for age as this study was being completed, and the sunflower seeds were never analyzed.

Dr. Greenwald chooses this paper for attack in his fight against iodized salt as a goiter prophylaxis, but this subject has already been discussed by me at the request of Samuel Soskin ("Progress in Clinical Endocrinology," pp. 20-6, Grune and Stratton, New York, 1950), and by Wespi [*Münch. med. Wochschr.* **35**, 1150 (1956)], Stanbury and others ("Monograph in Medicine and Public Health No. 12," Harvard Univ. Press, Boston, Mass., 1954), and M. Roche and others [*J. Clin. Endocrinol. and Metabolism* **17**, 99 (1957)]. In the article cited, Stanbury writes, "Any remaining doubt that iodine deficiency can be a cause of endemic goiter has been erased by the present studies."

A man would receive about 38  $\gamma$  per day from Swiss iodized salt, provided there is no loss in storage by volatilization, after oxidation by nitrite that is present as an impurity or has crept with moisture into the container. Physicians often prescribe 30 times the requirement of an essential food element over a period of a year, so why fight over a few micrograms of iodine, when 10,000 are needed by the thyroid gland?

J. F. McCLENDON