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THE IMPORTANCE OF COOPERATIVE STUDIES OF THE BIOLOGY OF MAN

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MAN is to-day the most studied of animals. He is being investigated by anthropologists, anatomists, physiologists, bacteriologists, parasitologists, pathologists, geneticists, psychologists, psychiatrists, ecologists and other specialists in many sub-branches of the broad field of biology. Most of these investigators are fully competent and the results of their researches are of high value. An increase in the volume of research in every one of these fields would be profitable and very desirable. I venture to suggest, however, that in addition to the studies now being made of man in each of these special divisions of science, it would be highly profitable to study also the whole man in relation to his heredity and to his environment. In making this suggestion I am well aware that numerous investigations of man now in progress or recently completed involve several diverse subdivisions of biology. However, no investigation or group of investigations now in progress is in my opinion sufficiently comprehensive to secure anything like a complete picture of man the animal, as he exists in this constantly changing world.

Every human being is the product of his heredity and of his environment. Arguments about which of the two is the more important are futile, because no group of hereditary factors in sperm or egg can produce an individual organism except through interaction with the environment. Neither can the environment produce any organism without the presence of a group of hereditary factors combined in a reproductive unit of some kind. We can and should, however, measure to the best of our ability the role that each hereditary factor and each feature of the environment plays in the production and maintenance of the individual and of the race and species.

The importance of heredity in the development of

the heat increment is also shown by five series of experiments conducted at this laboratory (Forbes, *et al., Jour. Nutr.,* 10 (1935), 461; 15 (1938), 285; 18 (1939), 47; 20 (1940), 47), with mature as well as with growing rats as subjects, in which the heat production of animals receiving equicaloric diets differing in protein content decreased slightly in the order of the increase in protein.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE CHEMICAL CONTROL OF BERMUDA GRASS AND OF CROWFOOT GRASS

SODIUM CHLORATE[1, 2] and cyanamide[3] have been suggested for an eradication of Bermuda grass (*Cynodon dactylon* Pers.). The compounds have been used with a varying degree of success.[4] Experiments with other herbicides seemed therefore indicated. As laboratory experiments[5] had shown that ammonium sulfamate has a high toxicity for Bermuda grass, tests at roadside plots and at a tennis court were started with this salt as well as with calcium thiocyanate, as this compound had been used successfully in the eradication of nut grass.[6]

Series of experiments were started in October, January, February, July, August and September, so as to compare the influence of the various seasons. 0.5 to 3 liters of the solution were sprinkled per square meter, which contained from 200 to 1,000 plants. The calcium thiocyanate has always been used as a solution 1.25 molar in CNS^-, while the concentration of the ammonium sulfamate varied from 0.5 to 2 molar. We are obliged to the American Cyanamide Company for the supply with calcium thiocyanate solution and to E. I. du Pont de Nemours and Company, Inc., for the ammonium sulfamate.

The control of the Bermuda grass has been completed within a week with as small an amount as 0.6 l. 1.25 m CNS^- per square meter if there was no rain in the first four days after the treatment. The plots remained free of weeds for three to six months after the treatment. However, the success of the treatment depends largely on the season. In dry weather the control was complete. If there was about 0.5 inch rain in the first few days after the application of the solution, complete control of the weed could still be reached by the use of 1 liter 1.25 m CNS^- per square meter. Heavier rains limited the eradication and could not be counteracted by higher doses of the herbicide. Also the length of time for which a complete control lasted was influenced by the rain, immigration of weeds, especially crowfoot grass (*Eleusine indica*) from neighboring plots occurred much quicker in the rainy than in dry season.

Ammonium sulfamate killed the Bermuda grass in doses of 0.6–1 liter of molar solution completely in the dry season. The control lasted from 3 to 5 months. Weaker solutions were only partially effective. The rain affected its action more than that of the calcium thiocyanate; 0.5 inch rain in the first 4 days already reduced the control to about 90 per cent., stronger rains made it rather incomplete.

Some of the plots treated with calcium thiocyanate contained also a large number of crowfoot grass (*Eleusine indica*). Ada Georgia[7] reports that carbolic acid can be used for its eradication, but otherwise little seems to be known about its chemical control. Its eradication by 1.25 molar CNS^- seemed much more difficult than that of Bermuda grass. 1 to 1.5 liter per square meter gave only a 50 to 80 per cent. control. The picture changed, however, when the treatment was preceded by a cutting of the grass. Then, 1 liter of 1.25 m CNS^- eradicated 90 to 100 per cent. of the grass within the first week, also heavy rains (more than 3 inches in the first 4 days) did not seriously interfere with the herbicidic action of the calcium thiocyanate.

Hence, it can be said that 1.25 m CNS^- or m ammonium sulfanate control Bermuda grass effectively if applied at the ratio of 0.6 to 1 liter per square meter in the dry season. 1.25 m CNS^- at the ratio of 1 liter per square meter will eradicate crowfoot grass only if the grass was previously cut.

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[1] Fred V. Grau, *C.A.*, 30: 6123[3], 1936.
[2] *Agr. Jour.* (*Barbados*), 7: 13, 1938.
[3] Sturkie, *C.A.*, 32: 714[7], 1938.
[4] Robbin, Crafts and Warner, "Weed Control," p. 458, McGraw-Hill, 1942.
[5] Fromm, *Ciencia y Técnica*, 1: 69, 1943.
[6] Fromm, SCIENCE, 96: 337, 1942.
[7] A. Georgia, "Manual of Weeds," p. 53, Macmillan, 1930.

BOOKS RECEIVED

BROWNE, CHARLES A. *A Source Book of Agricultural Chemistry.* Illustrated. Pp. 290. Chronica Botanica Co. $5.00.

CAIN, STANLEY A. *Foundations of Plant Geography.* Illustrated. Pp. xiv + 556. Harper and Brothers. $5.00.

SANDELL, E. B. *Colorimetric Determination of Traces of Metals.* Illustrated. Pp. xvi + 487. Interscience Publishers. $7.00.