to his own personal interest or particular hobby, some topics treated too briefly, while others at greater length than they would seem to deserve. For instance, too much emphasis, it seems to me, has been laid on soil nitrification—a process which, under our climatic conditions, is not very important because of the small amount of raw humus prevalent in our soils. A discussion of a soil classification, as it is related to forests, mechanical and structural composition of the soil, and its flora and fauna, would be more serviceable in explaining the success or failure of forest plantations, and the differences in composition and growth of forest stands, than the nitrogen and mineral cycles of the soil. However, a writer of a text-book is necessarily limited by the state of knowledge in the different fields, and soil nitrification in the past has received greater attention than other soil relationships.

On the whole, the book is an outstanding contribution to our too scanty scientific forestry literature. Its thorough scientific and analytical approach to the present-day practices, its lucid style and its interesting method of presentation make it stimulating and readable. It should, therefore, be of distinct service in the classroom and helpful to the practicing forester who is confronted with silvicultural problems for which there is no empirical knowledge.

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SPECIAL ARTICLES

DIFFERENTIATION OF THE ANTI-DERMATITIS FACTOR[1]

WE demonstrated some time ago that if vitamin B carriers are exposed to ultra-violet irradiation at least one member of the vitamin B complex is destroyed, and all rats that receive the irradiated preparations sufficiently long develop a severe dermatitis and succumb. The basal diet, No. 1669, is made up of casein 20, sucrose 71, salts 4, cod liver oil 2, cellulose 3, and presumably is deficient in all members of the vitamin B complex. The vitamin B carrier is a water extract of yeast, which is submitted to intense irradiation for a period of 10 hours. This is supplied separately in doses of 50 mg dry matter daily.

It soon became evident that the destructive action of ultra-violet irradiation can not be demonstrated if the experimental diet contains any considerable amount of corn-starch. Since it was unlikely that the dermatitis was healed or prevented by starch itself, it seemed probable that the active agent was a contaminant, and so the starch was extracted with alcohol. The extracted starch was found to be inactive, so the extract was concentrated and supplied to animals which had pronounced lesions. When supplied in daily doses of 100 mg healing followed promptly, so other oils were investigated also. Wheat-germ oil has approximately the same activity. Mazola and linseed oil were less effective, and cocoanut oil was almost entirely ineffective.

The fact that the alcohol extract of corn-starch prevents this type of dermatitis supports an earlier suggestion[2] that the preventive agent is not identical with vitamin G, as that term is commonly understood, and an attempt was made to establish this fact more definitely. It had been observed two years ago that dermatitis was healed by tikitiki, but the animals grew slowly and in 12 to 16 weeks they developed extensive denuded areas. It was also observed, as would be expected, that if the young rats are given tikitiki at the beginning of the experimental period as the sole source of the vitamin B complex they become denuded in the same way in about the same length of time. This condition is apparently identical with that described by Sherman and Sandels,[3] but, however that may be, the symptoms have at most only a superficial resemblance to our type of dermatitis. It was decided therefore to produce the two types of symptoms more or less simultaneously and to study their response to various curative agents.

A number of rats were denuded by the procedure described above, and then supplied with 100 mg of wheat-germ oil daily, but this supplement had not the slightest observable effect. The animals declined steadily and died in about the same time as the controls. In the meantime it had been announced that flavines are identical with vitamin G, so their[4] curative properties were investigated. Five of the denuded animals, in addition to the tikitiki, were given daily one drop, 1.0 mg organic matter, of the flavine preparation. They began growing rapidly, and in 2 weeks the denuded areas were completely covered with a new growth of fur. The animals were entirely normal in appearance, but insufficient time has elapsed to deter-

[1] Contribution from the Missouri Agricultural Experiment Station Journal Series No. 412. From the Departments of Animal Husbandry and Agricultural Chemistry, University of Missouri.

[2] A. G. Hogan and L. R. Richardson, *Jour. Nutrition*, 8: 385, 1934.

[3] H. C. Sherman and M. R. Sandels, *Jour. Nutrition*, 3: 395, 1931.

[4] We are greatly indebted to Dr. J. F. Stare, of Washington University, who supplied the material used in establishing the nutritional properties of flavines. More recently lacto-flavine prepared by Dr. Richardson has been found equally effective. See R. Kuhn, P. Gyorgy and Th. Wagner-Jauregg, *Ber.*, 66: 1037, 1933.

mine whether they can reach, and maintain, normal mature weights on this combination.

Rats suffering from dermatitis were also supplied with the flavine preparations, but these did not retard the course of the disease in the slightest degree. As mentioned previously, wheat-germ oil heals the dermatitis. The animals gained slowly for several weeks and then declined, with no recurrences of dermatitis. These animals did not become denuded, an anomaly that is hard to explain. If, in addition to the oil, these animals are also given 1 drop daily of the flavine preparation they gain in weight and assume a normal appearance. It is too early as yet to determine whether they can reach mature weight, or whether the maximum weight can be sustained. Additional details are supplied in Fig. 1.

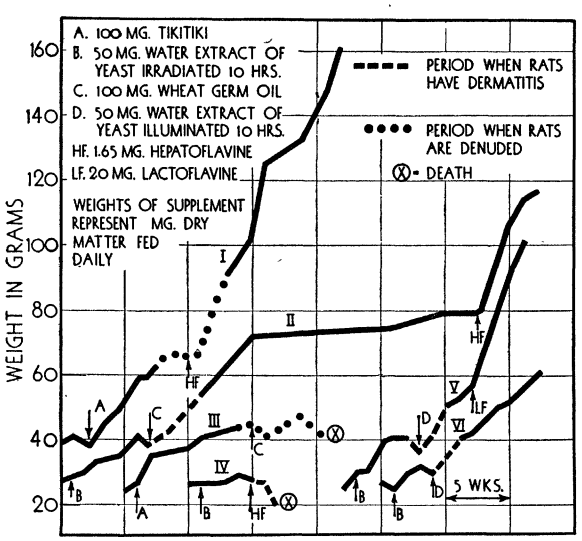

FIG. 1. I. Rats become denuded on tikitiki, and are healed by flavines. II. Dermatitis is healed by wheat germ oil, but growth does not occur unless flavines are added also. III. Wheat germ oil has no effect on denuding. IV. Flavines have no effect on dermatitis. V and VI. Illuminated vitamin B carriers heal dermatitis, but flavines in addition must be added to support normal growth.

Evidently the two conditions have little or no relation to each other. Wheat-germ oil heals dermatitis but does not relieve the denuded condition. Flavine heals the denuded condition but does not relieve the dermatitis. These facts show clearly that ultra-violet irradiation destroys at least two vitamins, the flavine, and the anti-dermatitis factor which has not been identified as yet. It is possible that still others are destroyed also.

It has been reported previously[5] that the anti-dermatitis factor is not destroyed by irradiation if the ultra-violet portion of the spectrum is excluded. Since flavines are labile to the visible spectrum, additional observations on this point seemed desirable. Six rats were each supplied with 50 mg daily of the water extract of yeast that had been illuminated through plate glass for 10 hours at a distance of 10 inches with a 1,500 watt Mazda bulb. They made only slight gains in weight, but there was not a single well-defined case of dermatitis. The controls received 50 mg of the yeast extract that had been subjected to ultra-violet irradiation, and they developed dermatitis and died in the usual time. Ten other rats received the irradiated preparation until they developed definite cases of dermatitis; then they were changed to the preparation which had been illuminated with the Mazda bulb, as described above. Every animal recovered from dermatitis, but the gains in weight were slight. When the illuminated material was fortified with 1 drop daily of the flavine preparation growth was resumed, but it is too early to decide whether this combination is complete in every respect. Some additional details are shown in Fig. 1.

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WHY HAVE SOME INVESTIGATORS BEEN UNABLE TO GROW CHILOMONAS PARAMECIUM IN INORGANIC OR SIMPLE ORGANIC SOLUTIONS?

PRINGSHEIM[1] maintains that *Chilomonas paramecium* will grow in sterile inorganic solutions containing glycocoll and acetate, but not if the nitrogen and carbon containing compounds are less complex. Mast and Pace[2] conclude that it will grow if these two elements are in the form of inorganic or simple organic compounds, *i.e.*, they maintain that it can obtain nitrogen from ammonium salts and carbon either from acetates, formates or carbon dioxide. Pringsheim[3] was unable to confirm these conclusions concerning the utilization of CO_2; and Loefer[4] was unable to confirm the conclusions concerning the utilization of CO_2 or acetates. He says: "It was impossible to maintain bacteria-free cultures of *Chilomonas paramecium*—in a medium containing inorganic nitrogen, even in the presence of sodium acetate as a carbon source." Loefer and Hall[5] repeated the experiments of Loefer, using some of the media of Mast and Pace and their technique as well as that developed by

[5] A. G. Hogan and L. R. Richardson, *Jour. Nutrition*, 8: 385, 1934.

[1] E. G. Pringsheim, *Beitr. z. allg. Bot.*, Bd. 2, S. 88–137, 1921.

[2] S. O. Mast and D. M. Pace, *Amer. Jour. Physiol.*, 101: 75, 1932; *Anat. Rec.*, 54: 101–102, 1932; *Protoplasma*, 20: 326–358, 1933.

[3] E. G. Pringsheim, *Naturwiss., Bd.* 23, S. 110–114, 1935.

[4] J. B. Loefer, *Biol. Bull.*, 66: 1–6, 1934.

[5] J. B. Loefer and R. P. Hall, SCIENCE, 81: 486, 1935.