are also inoculated into anaerobic medium and incubated for at least one week.

CONCLUSIONS

Bacteriophage may be prepared and kept for long periods of time without fear of secondary cultures.

No antiseptic need be added.

Merthiolate destroys the action of a staphylococcus bacteriophage within a period of five days at a temperature of 37.5° C.

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EFFECT OF THALLIUM ON GROWTH OF TOBACCO PLANTS

IN view of the recent interest in thallium poisoning[1, 2] the following preliminary report of the effect of this element on the growth of tobacco is given at this time. The previous papers[3] dealing with the effects of this element report the death of the plant, but no mention appears to have been made as to its effects when present in smaller amounts than that causing death. In recent years an extensive search has been conducted as to the cause and the control of the so-called frenching disease of tobacco. Valleau and Johnson[4] have reported that this disease is due to nitrogen deficiency, but our results have not substantiated their findings. In connection with a study of this disease trials were made of the toxicity of several of the heavy metals as possible causes of the trouble. Thallium in the form of the nitrate was included in this study and produced very decided effects on the growth of the tobacco plant. The element was applied in pot cultures at 35 and 75 p.p.m. based on the air dry weight of the soil after the plants had become established. Three typical sandy loam tobacco soils were used, two of which were held at two moisture contents. The severity of the effects of thallium differed to some extent in the different soils and was greater at the higher moisture contents. In many instances the stem was killed at the surface of the soil. This effect may have been due to the fact that the material was applied in solution and was not leached to any considerable extent from the surface layers. Thallium, when applied as the nitrate, was not leached from an inverted bell jar containing soil, to a pot below which was watered only by the leachings from the bell jar, in sufficient quantity to affect a tobacco plant growing in the pot, indicating that this element is not readily leached from the soil. This point is being tested further, and it is possible that much smaller quantities of this element will prove toxic if evenly distributed through the soil mass.

In solution culture tests one part per million of the element thallium has been found to produce the following described effects. Where the plant is not killed outright thallium toxicity is manifested by a series of effects which are characteristic symptoms of frenching, though the two are not identical in all particulars. The first effect is a slowing down of the growth rate and the development of a lighter green color along the veins of the upper leaves of the plant. The younger leaves as they develop show at first a chlorosis following out the smallest branches of the vascular system, but this chlorosis does not so characteristically originate at the tip and margins of the leaf as is the case with typical frenching. The subsequent growth produces leaves which are decidedly distorted and in many instances may consist essentially of only the midrib. This is followed by a proliferation of the lateral buds resulting in the so-called witches broom effect. These later stages agree very closely with the symptoms of typical frenching, which has been observed so widely in the field on practically all soil types where tobacco is grown but usually only on small local areas in any given field.

Whether the typical frenching disease of tobacco is due to thallium toxicity can not be definitely stated at this time, but it appears that there is much in common in growth manifestations exhibited by the two pathological conditions. It is at any rate a matter of considerable interest to recognize the striking effects on plant growth produced as a result of the toxicity of this element.

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[3] W. Knop, Ueber die Aufnahme Verschiedener Substanzen durch die Pflanzen Welche Nicht zu den Nahrungstoffen gehoren. K. Sächsische Gesellschaft der Wissenschaften Berichte ueber Verhandlungen. Math-Physiche Classe, 35–37, 1883–1885.

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