

## Vanadium Pentoxide as a Catalyst for Sodium Chlorate in Weed Destruction

It is well known that vanadium pentoxide, used as a catalyst, greatly increases the efficiency of sodium chlorate when employed as an oxidizing agent in the production of certain dyes. Investigations have been carried out to determine whether similar use could be made of vanadium in certain methods of weed destruction, more particularly in connexion with the practice of smearing the cut surfaces of bracken fronds with chlorate solution or introducing it into the tissues of bramble plants by immersing the ends of stems from which the tips have been cut.

The experiments were carried out in September of the present year. Brambles were treated by placing the cut ends of the trailing stems in small bottles each containing 50 c.c. of the various materials in aqueous solution.

Ten bottles of each of the following were employed :

(1) Vanadium pentoxide only; 0.02 per cent solution.

(2) Sodium chlorate; 10 per cent solution.

(3) Sodium chlorate; 10 per cent solution, plus 1 part vanadium pentoxide per 500 parts sodium chlorate.

Observations were made on rate of travel up the stem, as evidenced by the destruction of the parts, and on the intensity of the effects. The findings were as follows :

(1) Vanadium pentoxide only; no effect noted.

(2) Sodium chlorate only; the usual toxic effects, a fair degree of killing with dark brown scorching of the leaves, taking ten days to reach completion.

(3) Sodium chlorate plus vanadium; severe destructive effect noted after five days, the rate of travel having been greater and exceeding the final effect of the sodium chlorate solution without vanadium. Apart from this speeding up and greater intensity of killing, a remarkable bleaching effect appeared after twenty-one days. The stems for about a foot above the points of immersion became quite white, ranging to a light yellow above. The leaves took on a light yellow tint, and in the piece of cleared woodland where the trial was carried out, these vanadium-treated plants could be distinguished at a distance without reference to the labels.

Stems from all three treatments were kept under further observation. In treatment 2, they became blacker, but extremely tough and hard, and the leaves were retained. In treatment 3, the stems became soft and brittle and the leaves all broke off from the base of the petioles.

A further trial gave similar, though not so definite, results with an addition of 1 part vanadium pentoxide to 1,000 parts of sodium chlorate.

The above observations suggest the possibility of enhancing the value of sodium chlorate as a herbicide by the employment of a catalyst. Vanadium pentoxide in the proportion used would not be ruled out on the grounds of cost. It is, however, not readily soluble in water, and further investigation is required on this point.

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## Spectrochemical Analysis of Eggs

IN the course of an investigation into the mineral content of foodstuffs, some analyses of hens' eggs were made. The white and yolk were treated separately. The ash was analysed by the ordinary arc spectrum method, and the liquids were also analysed directly by a spark technique similar to that described by Langstroth and Macrae<sup>1</sup>. Calcium, magnesium and sodium were present in relatively large quantities in all specimens. Potassium and lithium were also present in fair quantity. Traces of the following elements were also found in both yolk and white: copper, iron, manganese, strontium, silicon, phosphorus and aluminium. Barium was present in the yolk but could not be detected in the white. A very small trace of lead was indicated in one specimen of white, but its presence could not be detected in other specimens. The following elements were not present in detectable quantity in any specimen: boron (< 0.2), chromium (< 1.0), molybdenum (< 1.0), zinc (< 10), nickel (< 1.0), cobalt (< 1.0), cadmium (< 0.2) and antimony (< 20, < 200); the figures given in brackets indicate limits of detection in parts per million.

These results are in general agreement with those of Drea<sup>2</sup> except that he reported barium, molybdenum zinc and chromium as present in both yolk and white. He also reported rather stronger indications of aluminium and strontium. Drea used graphite electrodes, and Webb<sup>3</sup> has shown that spurious indications of a number of elements (including barium, molybdenum, zinc, chromium, aluminium and strontium) may be obtained with these electrodes. In order to avoid this effect, the present work was done with a silver spark technique, and this probably accounts for the fact that a smaller number of elements is reported as present. My analyses indicated that the copper and manganese content was of the order 0.001 of the magnesium content and did not exceed a few parts per million. Chemical analyses<sup>4</sup> indicate magnesium content of order 100 parts per million and copper content of order 0.3 parts per million. From my analyses the order of magnitude of the abundance of the other metals may be roughly estimated (in parts per million) as follows: iron (> 1.0), strontium (0.2), aluminium (0.2) and barium (0.2).

A number of fertilized eggs were examined at different stages of development in order to try to trace changes in the passage of mineral elements from the yolk to embryo. The changes found were, however, only of the same order as the differences between different specimens at the same stage of incubation. The only conclusion to be drawn was the purely negative one that there is no rapid and obvious preferential removal of one mineral constituent from the yolk during early stages of incubation.

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<sup>1</sup>Langstroth and Macrae, *Can. J. Res.*, A, **16**, 17 (1938).

<sup>2</sup>Drea, *J. Nutrition*, **10**, 354 (1935).

<sup>3</sup>Webb, *Sci. Proc. Roy. Dublin Soc.*, **21**, No. 46, 501 (1937).

<sup>4</sup>McCance and Widdowson, "Chemical Composition of Foods".