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EFFECT OF VANADIUM ON HYBRID MAIZE¹

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Abstract

The influence of varying levels of vanadium on the growth of hybrid-maize (Zea-mays L. Var. G-3) grown in sand culture was investigated.

Of all the attributes studied the net assimilation rate (NAR) was the least affected by vanadium deficiency. The effects were more pronounced on the growth rate. Dry matter accumulation and photosynthetic area was significantly affected by the application of this element.

INTRODUCTION

Vanadium has been proved essential for certain micro-organisms (Arnon and Wessel, 1955) especially of marine habitats (Bertrand, 1950). According to recent reports vanadium favours the growth of asparagus, lettuce, rice and corn and acts adversely on that of clover and wheat (cf. Steward, 1963). This paper deals with the effect of vanadium on the growth of hybrid maize.

MATERIAL AND METHODS

Hybrid maize (Zea mays L. Var. G-3) plants were raised in sand culture at 4 levels of vanadium (V₀=0; V₁= \cdot 05; V₂ =0.25; V_3 =1.25 ppm). For each treatment there were 20 pots arranged in two blocks. Each pot was filled with acid washed sand free from organic matter. Three seeds were sown in each pot, the young seedlings were progressively thinned until one vigorous plant remained. The plants were irrigated daily, care being taken not to disturb the roots. The complete and deficient solutions were prepared as described by Hoagland and Arnon (1950). Stock solutions were prepared from A.R. grade salts and were purified against vanadium. The pH of the solution was adjusted daily to 7.0. Vanadium was supplied as vanadium pentoxide.

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On four occasions tri-weekly observations were made, three plants were harvested from each of the four treatments. A final sampling was made at 12 weeks after sowing. Total photosynthetic area and dry weight of plant parts (leaves, leaf-sheaths, stems, roots, tassels, ear and silk) were taken. The net assimilation rate (NAR) and relative growth rate (RGR) were calculated according to the formulae described by Fisher (1920) and Williams (1946). Crop growth rate (CGR) was calculated following Watson (1952).

RESULTS AND DISCUSSION

The area of photosynthetically-active parts of the maize plants is taken to include the leaf sheaths and husks around the ears. The data obtained are presented in Fig. 1 A. It is evident that the photosynthetic-area under 0.25 ppm. vanadium increased up to 63 days after planting (i.e., flowering stage), followed by a gradual decline; at the highest dose, i.e., 1.25 ppm. the NAR was less than in the control.

Dry matter accumulation at the different sampling dates are presented in Fig. 1 B. It is clear from the figure that the highest dry matter has been accumulated at 84 days after planting in all the group of plants. It is seen that dry matter accumulation is very slow up to second week of planting (not given in the figure) after that a sudden and sharp rise takes place up to 63 days, then again the rates of increment decreases. Vanadium has indentical effects as in photosynthetic area.

Figure 2A shows that vanadium at 0.25 ppm has some favourable effects and higher concentration has got detrimental effects. The age of the plants also shows

significant effect in net assimilation rate. It seems interesting to note that in control plants the net assimilation rate goes on increasing up to sixth week, while in vanadium treated plants it increased up to



Fig. 1. A-B. Effect of vanadium on photosynthetic area and dry matter content.

eighth week after planting. Vanadium has similar effect on relative growth rate (Fig. 2B). But the age effect appears different, it increases with increasing age of the plants.

The crop growth rate is significantly affected by vanadium nutrition up to 42 days after planting (Fig. 2 C). The effect is favourable up to 0.25 ppm of vanadium







Fig. 2B. Effect of vanadium on NAR, NGR and CGR.

concentration, afterwards a fall in the nature of curve is noticed, but the main point to be taken into consideration is the effect of vanadium on latter stages of plant growth and it is so effective that even 1.25 ppm concentration is slower in losing photosynthetic area than the control. The effects of vanadium on RGR are more pronounced in comparison to NAR and CGR. Amongst all the attributes studied, NAR is least affected by these treatments.

It has been found that photosynthetic area of the hybrid maize plants has been favourably affected up to 0.25 ppm concentration, afterwards a sudden fall is observed. The highest values of NAR in vanadium deficient plants were obtained during the sixth week of plants development, more or less similar values for NAR have also been reported elsewhere (Njoku, 1959; Eijnatten, 1963). Maximal value of NAR during sixth week of planting was mainly due to the appearance of male and female flowers (Briggs et al., 1920), while in treated plants the net assimilation rate attains its maximal value during eighth week of planting. This is mainly due to delayed germination as observed by the author.

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STUDIES IN THE LABIATAE I. STRUCTURE AND DEVELOPMENT OF SEED AND FRUIT IN TWO SPECIES OF SALVIA L.¹

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Abstract

Embryology, fruit and seed] structure of Salvia coccinea and S. splendens have been studied. The ovule is anatropous, tenuinucellar and unitegminal. The development of the female gametophyte is of the Polygonum type. Endothelium is

Ibadan, Nigeria. J. Agric. Sci. 69: 65-72. *FISHER, R. A. 1920. Ann. Appl. Biol. 1: 30.

[•]Original not seen.

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