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INFLUENCE OF IRON ON THE DRY MATTER YIELD AND MINERAL CONTENT OF MAIZE PLANT

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INTRODUCTION

Iron fulfils a number of essential functions in plants and a deficiency has far reaching effects on intermediary metabolism. Gris [1] showed that plants which are deprived of an adequate supply of iron failed to develop chlorophyll and become chlorotic. Similarly, it has been found that iron chlorosis develped in plants grown in solution cultures containing relatively high P level [2, 3]. The present communication reports, findings on solution culture experiments, the influence of variable levels of iron on the growth and nutrient content by maize plant.

EXPERIMENTAL

Maize seedlings were raised in moistened sand bed. When the plants grew to a height of about 6–7 cm, seedlings of uniform growth were transferred to a complete nutrient solution contained in one-litre jar at the rate of one plant per jar. Four days after transplanting, iron levels 0, 1, 2, 4, 6, 8, 16 and 24 ppm Fe as ferric citrate were added to the culture medium. The treatment was replicated thrice. The plants were grown for 3 weeks. The nutrient solution was renewed at every one week interval.

The plants were harvested, roots and shoots separated, rinsed with water, dried at 70^{o}, chopped into small pieces and analysed for iron by orthophenanthroline method [4]; manganese was determined by periodate method [4] and phosphorus by vanadomolybdate method [4].

RESULTS AND DISCUSSION

The dry matter yield of maize plants was found to be very much lower in control pot than the other iron treated ones, but the reduction was more in the roots than in the shoots. Results in Table 1 indicate that iron is essential for

Table 1. Effect of iron on the dry matter yield and nutrient content of maize.

	Dry wt.		Nutrient contents in plant parts.					
			Shoots			Roots		
Fe level (ppm)	Shoot (g)	Root (g)	P%	Fe (ppm)	Mn (ppm)	P%	Fe (ppm)	Mn (ppm)
0	0.63 c	0.23 b	0.75 a	395.5 bc	35.57 a	1.40. a	1135.3 d	201.27 a
1	3.23 ab	1.16 a	0.37 de	401.3 bc	15.87 bc	1.08 b	1169.3 d	65.77 c
2	2.42 b	1.00 a	0.54 bc	357.0 bc	30.53 a	1.11 b	1121.0 d	57.33 c
4	2.05 bc	1.12 a	0.61 b	403.0 bc	30.53 a	1.07 b	1179.0 d	57.07 c
8	2.95 ab	1.16 a	0.34 de	610.7 a	12.63 b	0.49 cd	1740.3 c	59.97 c
12	3.41 ab	1.42 a	0.35 de	332.0 c	18.90 b	0.63 c	2091.7 b	103.43 b
16	4.20 a	1.24 a	0.42 cd	459.3 b	18.93 b	0.66 c	2074.7 b	53.33 c
24	3.90 a	1.21 a	0.24 e	402.7 bc	15.60 b	0.39 d	2478.3 a	70.80
S.E.	0.48	0.19	0.05	35.9	3.27	0.068	85.0	8.90
LSD (0.05)	1.45	0.58	0.15	107.6	9.8	0.20	254.8	26.7

the chlorophyll synthesis and provided sufficient iron is available it continues to move up the stem with growth. In contrast if supply is suddenly withheld, its mobility in the plant ceases [3] and the new growth which develops is chlorotic

The visual symptom of abnormality in the growth of plant was noticed after 10 days of treatment. Chlorosis appeared on the young leaves of control plant. The growth of plant was poor with thin, short and narrow leaves. Tops of control plant when analysed at the end of the experiment were found to contain lower iron content than those from the other treatments. However, iron concentration in chlorotic plant was well above the deficient range. The content of iron in the experimental plant was not much different but the maximum iron content was recorded at 8 ppm of Fe level. Our studies showed that iron content in chlorotic leaf tissue (from control jar) was always higher than or equal to its healthy and green counterpart (from treated). This supports the observations of other workers [2].

Table 1 also shows that with increased Fe levels, the P content in shoot and roots decreases, the relative decrease was being more in case of shoots than in roots. This general reduction in the P content in the shoots and roots as the Fe content is increased, indicates its interference with P uptake.

An increase in iron in the growth medium causes a decrease of Mn content of the plant. The change is most noticeable in the roots, possibly indicating that this element is competing for root absorption sites. This present finding is in agreement with those reported by other workers [5,6].

The above findings reveal that the Fe, Mn and P interact each other on the plant roots, thereafter, affecting the translocation of each other to the upper plant parts, manifesting thus the phenomenon of Fe–Mn–P antagonism.

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