STUDIES ON UPTAKE AND DISTRIBUTION OF Fe IN THE RABI CROPS WHEAT, AS INFLUENCED BY CONCENTRATION OF P AND Fe IN A NUTRIENT SOLUTION

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Abstract

The Subject of the study is the influence of P and Fe concentration in a nutrient solution on the trans-function of Fe. With high Fe concentrations translocation is also affected when P concentration are low.

Introduction

In many cases an inadequate amount of Fe is the result of Fe action on other nutrients and vice versa. P is one of the macro-nutrients that take part in this-interaction. The phosphate ion may affect Fe nutrition either through precipitate mechanism before it's absorbed by the plnts[1] or through an inactivating process with the plant[2,3]. The present study concerns the effect of P and Fe concentration in the nutrient solution.

Experimental

For the indoor experiment, a hybrid wheat (Triticum aestivum) var.RR-21 was cultivated hydro-phonically "Absorption through the air". was the method used, which is the same as Van Dried's. The nutrient solution contained varying P and Fe concentrations while the remaining nutrients remained unchanged[4]. The experiment factorically combined 4 P levels (1,10,100 and 1000, M) with 3 Fe levels (10,20 and 40 μM)

The plants were analyzed in their phenological state corresponding to pollination and the amount of Fe in the root, stalks and leaves was established through spectrophotometry on the principle of atomic absorption.

Results and Discussion

The Fe concentration in the roots (fig.1) shows a tendency towards minimal Fe absorption in more developed plants. This was already observed in rice. It is as if highest yield was coupled with greater Fe mobility or a lesser need for this element. However, other plants such as beans act differently, i.e., the Fe concentration is higher in the roots that are more developed[6].

While there is a tendency towards a lower Fe concentration in the root, it was also observed at the same time that the P concentration in the nutrient solution increased to maximum yield (100 μMP) to increase when the Fe level in the solution is increased[7]. This is logical and occurs with all P levels that were situated.

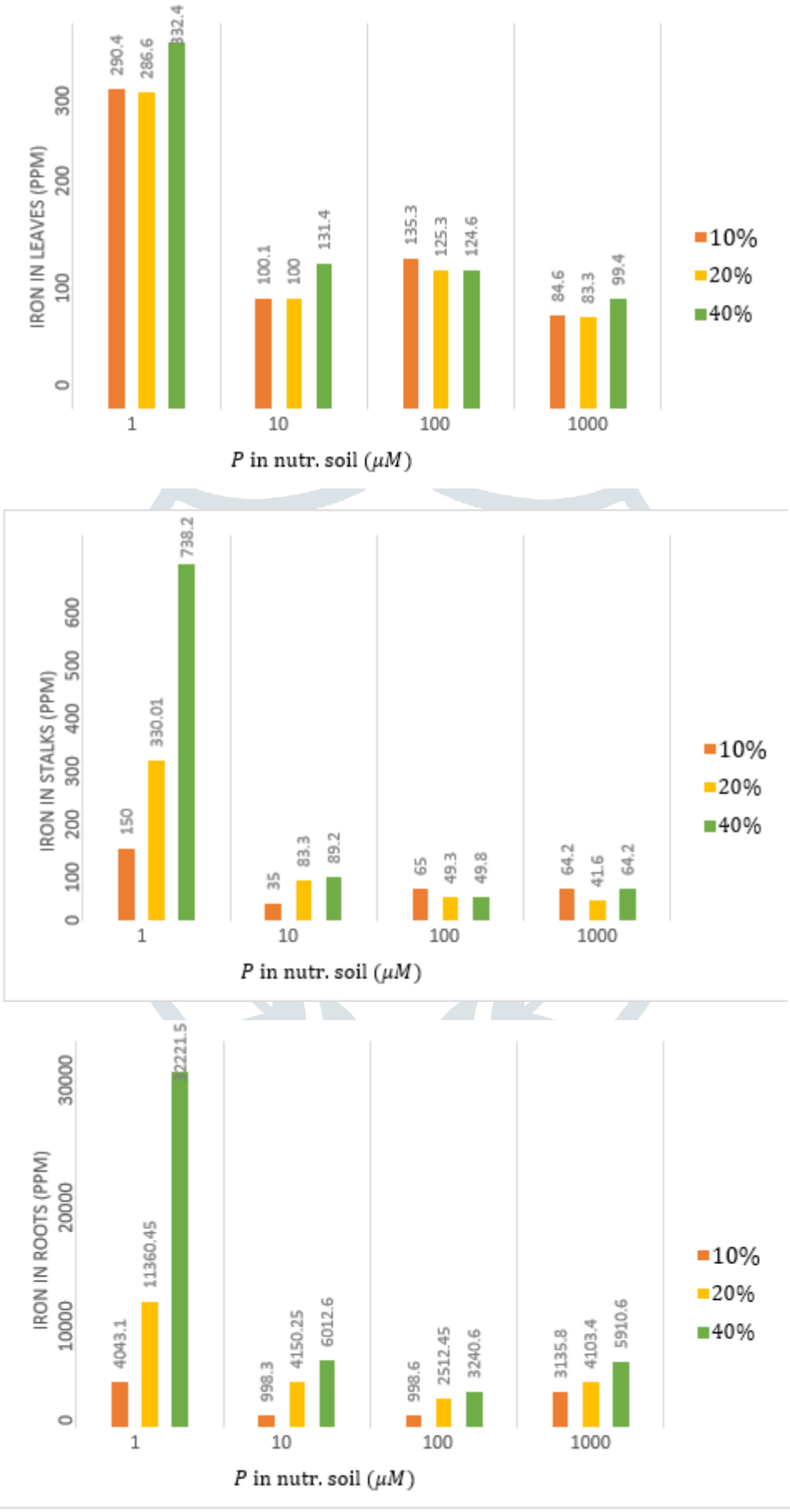

Figure 1. Effect of P and Fe concentration in the nutritive solutions on the Fe levels in the roots stalks leaves of wheat plants.

What happens in the root also happens in the stalks except that the amount of Fe in the stalks does not increase with the Fe concentration in the nutrient solution for adequate or higher P concentration (100 and 1000 μM)

With regard to the leaves, the observations made with the root and stalks do not apply. It appears as if Fe in the leaves act more independently compared to the Fe in the nutrient solution.

With the highest Fe level (40 μM), Fe concentration in the leves decreases when the P concentration in the nutrient solution is increased, the same as in the root and stalks. However, in the leaves, this process continues even after reaching the best yield levels. We believe that translocation in the leaves is more important than absorption as such. This explains the greenation tendency for Fe to decrease while P increased in the solution, the latter making mobility more difficult for the former.

The effect of a decreased Fe concentration in the leaves after an increase of the P level in the nutrient solution was observed in rice plants[8].

A bibliographic survey of the subject shows, however, that hybrid rice plants Ys_1/Ys_2, which were treated with a nutrient substance containing a high level of P presented lower Fe concentration in the root when the P concentration in the nutrient solution was increased. This appears contradictory at first, to what we observed. A lower Fe concentration is observed in the part of the plant that remains surrounded by air, an observation that coincides with ours. The apparent contradiction, referred to above in the part of the plant that remains surrounded by air, an observation that coincides with ours. The apparent contradiction, referred to above, may be the result of a saline effect in the nutrient solution since the Fe concentration with which the maize plants are treated (100 μM Fe) is higher than the one used by us (10,20, and 40μM Fe)[9].

The relation $Fe_{\text{in tops}}$ / $Fe_{\text{in roots}}$ (Fig.2) shows that there are no differences in the lower Fe levels (10 μM) in plants treated with a nutrient solution where the P concentration was between 1 and 100 μM . However, a decrease is observed with high P concentration (1000 μM) and the ration for normal and higher Fe levels (20 and 40 μM) is optional with a P concentration of 100 μM) while a decrease occurs both with higher and lowers concentrations. This leads to the fact that for low Fe concentrations. Fe translocation suffers mainly with high P concentrations, while high and normal Fe concentrations, while with high and normal Fe concentration in the nutrient solution translocation. Suffers both with high and low P concentrations. This confirms the existence of optional P/Fe ratio, especially with regard to Fe mobility in the plants.

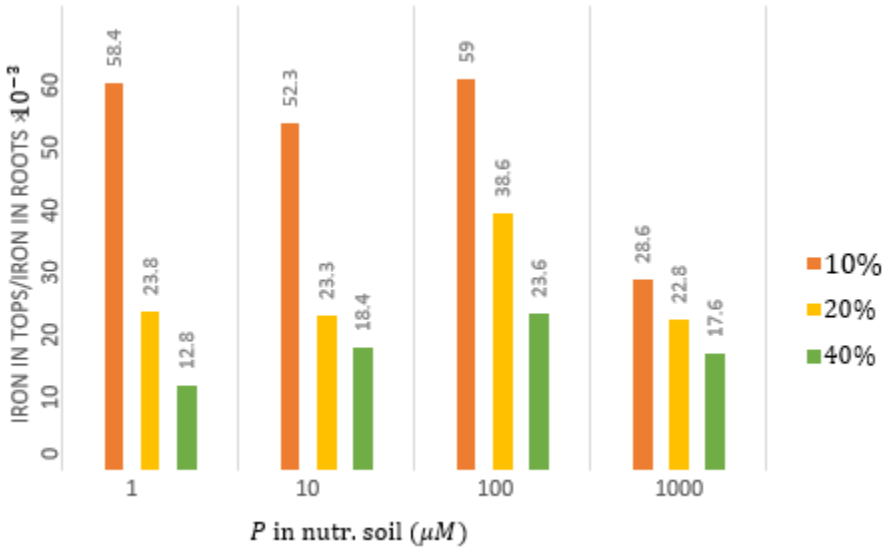

Fig. 2 Relationships between $Fe_{\text{in tops}}$/ $Fe_{\text{in roots}}$ and P in nutrient solutions for each level of Fe in the medium.

With high P levels into he nutrients solution, wheat plants develop symptoms of chlorosis. This may be due to an increasing amount of P in the tissue which produces a greater of P in the tissue which produces a greater amount of Fe combined with phosphate. A sa result, there is a small amount of Fe that can assimilated Through the functions of the nutrient inside the plant, such as the chlorophyll-producing functions. Since the Fe combined with phosphorus-proteins in the plant cells is ferric and not ferrous, the reason for the P/Fe ratio may be measure to ensure ferric-ferrous balance in the cells.

Through a study of autoradiograms, it was observed that high P concentration in the nutrient solution made Fe absorption and translocation impossible since the plants resisted intervinal translocation perhaps because Fe was inactivated or precipitates in the veins and translocation of mesphyll did not take place[11].

In conclusion, it may be said that Fe translocation in the wheat plant depends on the P concentration in the nutrient solution when the Fe concentration in the solution in high. In all the other cases only high P concentration in the solution have an effect Fe.

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