شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

بعض الوثائـــــــق الاصليـــــة تالفـــة

بالرسالة صفحات لم ترد بالاصل

Dynamics of ion transport for some nutritional elements in plant

By

Gehan Hossny Youssef

B. Sc. Agric. Sci. (Soil Science), Ain Shams University, 1986

M. Sc. Agric. Sci. (Soil Science), Ain Shams University, 1993

A thesis submitted in partial fulfillment

of

the requirements for the degree of

Doctor of Philosophy

in

Agricultural Science

(Soil Science)

Department of Soil Science

Faculty of Agriculture

Ain Shams University

2001

Approval sheet

Dynamics of ion transport for some nutritional elements in plant

By

Gehan Hossny Youssef

B. Sc. Agric. Sci. (Soil Science), Ain Shams University, 1986

M. Sc. Agric. Sci. (Soil Science), Ain Shams University, 1993

This thesis for Ph. D. degree has been approved by :

Prof. Dr. M. K. Sadik

Prof. of Soil Sci., Moshtohor Fac. of Agric.,

Zagazig University

Prof. Dr. S. M. El-Sherif

Prof. of Soil Sci., Fac. of Agric.,

Ain Shams University

Prof .Dr. Adel E. El-Laboudi

Prof. of Soil Sci., Fac. of Agric.,

Ain Shams University (Supervisor)

Date of examination: 22 / 8 / 2001

Dynamics of ion transport for some nutritional elements in plant

By

Gehan Hossny Youssef

B. Sc. Agric. Sci. (Soil Science), Ain Shams University, 1986

M. Sc. Agric. Sci. (Soil Science), Ain Shams University, 1993

Under the supervision of:

Prof. Dr. A. E. EL-Leboudi

Prof. of Soil Sci., Fac. of Agric.,

Ain. Shams Univ.

Dr. H. E. Abu-Hussin

Associate Prof. of Soil Sci., Fac. of Agric.,

Ain. Shams Univ.

Prof. Dr. A. S. Ahmed

Prof. Res., Soils, Water and Environment

Res. Institute, Agric. Res. Center,

Ministry of Agric.

Abstract

Gehan Hossny Youssef. Dynamics of ion transport for some nutritional elements in plant. Unpublished Doctor of philosophy Dissertation, Ain-Shams University, Faculty of Agriculture, Department of Soil Science, 2001.

Two main series of experiments were carried out to evaluate the possibility of understanding the regulation mechanisms of both ammonium and nitrate utilization by barley plants to be then used in exceeding efficiency of nitrogen nutrition by plants. The first experiment series (preliminary experiments) included two experiments performed to select seedlings having varied different nitrogen concentrations throughout prefed with different nitrogen concentrations of either nitrate or ammonium form of nitrogen and durations for such pretreatment. The second series (uptake experiments) included two experiments the first was to evaluate the net flux and kinetic parameters V_{max} and K_m for both ammonium and nitrate uptake by excised barley roots of the previously selected nitrogen prefed seedlings under different conditions of nitrogen nutrition of either nitrate or ammonium. The second experiment was to complete the picture of factors affecting nitrogen (ammonium or nitrate form) uptake by the studied selected seedlings; responses to internal different nitrogen components in root tissues was statistically evaluated through evaluating the share of each parameter in the final output of the indicated uptake of nitrogen.

Data obtained from the first experiment indicated that dry matter content, representing growth, of the studied barley seedlings had no appreciable response to external nitrogen nutrition.

Status of nitrogen forms in the studied seedlings showed a positive response to nitrogen treatments (both concentration and time of prefeeding) in both experiments.

Correspondent results obtained from the second experiment indicated that accumulation of either ammonium or nitrate in the studied roots increased with time progress; an opposite trend was observed for nitrogen uptake starting

from 15 min time interval, values being dependent on the nitrogen form and time interval of nutrition. Accumulation of nitrate seemed to be generally higher than that of ammonium.

With regard to mechanics of ion absorption by the concerned excised roots, data generally showed that two mechanisms were present in the absorption medium. Both V_{max} and K_m parameters were evaluated as an expression for kinetics of absorption by roots whose values were gradually increased by increasing prefed concentrations dependent on nitrogen form of nutrition and duration of prefed time interval. Values of V_{max} parameter for both ammoniacal and nitrate forms of nitrogen were generally responded negatively to absorption time interval, an opposite trend being observed for K_m parameter whose values were positively responded.

Regarding the response of nitrogen uptake dynamics to internal nitrogen components of root tissue, for ammonium–prefed plants, both ammonium and nitrate internal contents of the studied roots, were generally related to both kinetic parameters of nitrogen uptake. Indicated parameters seemed to be responded positively to ammonium but negatively to nitrate content at the 15 min absorption period; as absorption time goes on, nitrate internal content, opposite to ammonium content, started to be stimulative at least at 180 minute time interval. For nitrate-prefed plants, on the other hand, similar to ammonium-fed plants, internal inorganic nitrogen content of the studied roots had a pronounced effect on both studied parameters of N uptake kinetics.

Finally, regardless of the nitrogen fed form, it could be concluded that equations representing responses of both V_{max} and K_m for the uptake of both ammonium and nitrate proved that the internal inorganic nitrogen content of the studied roots, among all studied internal components, was the most effective factor.

Key word: Ion uptake, Uptake kinetic parameter, Ammonium nutrition, Nitrate nutrition, Nitrogen form, Amino acids, Total nitrogen.

Acknowledgement

The authoress wishes to express her deep gratitude and appreciation to Prof. Dr. A. E. El-Leboudi and Ass. Prof. Dr Hashem El-Sayed Abu-Hussin, Soils Department, Faculty of Agriculture, Ain Shams University, for suggesting the problem, supervision, continuous help and introducing all facilities needed throughout the whole investigation and during writing the manuscript.

The authoress wishes to express her deep thanks to Prof. Dr. A. S. Ahmed, Soils, Water and Environment Research Institute, Agricultural Research Center, Ministry of Agriculture, for his deep contribution in supervision, encouragement, great help and providing facilities during the whole research work including writing the manuscript

Thanks are also extended to all staff members of the Soils, water and Environment Research Institute for sincere help in providing all needed facilities.

Special appreciation is also extended to her parents and her husband for their continuous patience and kindness; such gratitudes are also due for her collegues for their help and encouragement.