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 الوثائق الاصلية تالفة

بالرسالة صفحات
لم ترد بالاصل

STUDIES OF CERTAIN FACTORS AFFECTING THE AVAILABILITY OF SOIL IRON IN AL-DHAHERA AREA, SULTANAT OF OMAN.

BY

HAMED BIN GAMEEL BIN HUMAID AL-SHANDOODY
B.Sc.Agric. Ain Shams Univ., 1989

A thesis submitted in partial fulfillment
of
the requirements for the degree of

MASTER OF SCIENCE
In
Agriculture
(Soil Science)

Department of Soil Science
Faculty of Agriculture
Ain Shams University

1997

APPROVAL SHEET

STUDIES OF CERTIN FACTORS AFFECTING THE AVAILABILITY OF SOIL IRON IN AL-DHAHERA AREA, SULTANAT OF OMAN.

BY

HAMED BIN GAMEEL BIN HUMAID AL-SHANDOODY

B.Sc.Agric. Ain Shams Univ., 1989

This thesis for (M.Sc.) degree has been approved by:

Prof. Dr. Mostafa H. Hilal M.H.Hilal

Prof. of soil science, Department of soil and water
National Research Center, Doki.

Dr. Tayea Abdel - Latif Taha

Associate Prof. of soil science, Department of soil science,
Faculty of Agriculture, Ain shams university.

Prof. Dr. Abdel monem Mohamed Elgala A.M.Elgala

Prof. of soil science, Department of soil science, Faculty of Agriculture, Ain shams university.

Date of examination : 26 / 6 / 1997

STUDIES OF CERTAIN FACTORS AFFECTING THE AVAILABILITY OF SOIL IRON IN AL-DHAHERA AREA, SULTANAT OF OMAN.

BY

HAMED BIN GAMEEL BIN HUMAID AL-SHANDOODY
B.Sc.Agric.Ain Shams Univ., 1989

Under supervision of :

1. Prof. Dr. Abdelmonem Mohamed Elgala

Prof. of Soil Science, Faculty ofAgriculture, Ain Shams University .

2. Dr. Mohamed Abdel-Fattah Mohamed Eid

Lecturer of Soil Science, Faculty of Agriculture, Ain Shams University.

ABSTRACT

Hamed Bin Gameel Bin Humaid Al-Shandoody,Studies of certain factors affecting the availability of soil iron in Al-Dhahera area, Sultanat of Oman. Unpublished Master of Science, Ain Shams University, Faculty of Agriculture, Department of Soil Science, 1997.

The aim of this work was to study iron status and factors affecting its availability in two representative soil collected from the Sultanat of Oman.

An incubation experiment was conducted to study the effect of $CaCO_3$ content, organic matter, forms of Fe application, sulphur and the time of incubation on the availability of Fe and other chemical properties of soil. Also, a greenhouse experiment was carried out to study the effect of organic matter and Fe-EDDHA soil or foliar application on the soil availabilitly of N, P, K , Fe, Mn and Zn in the two soils and their effects on the dry weight, contents and uptake of some macro and micro nutrients of corn plants grown under different treatments. A factorial experiment in randomized complete block design was used in the two experiments. The data were analyzed statistically by analysis of varians and by multiple range test.

Results showed that the pH values were decreased from 8.27 and 9.15 to 7.88 and 8.47 for sand and sandy loam soil, respectively with 6 months of incubation. Total N and available P, Fe and Zn increased with organic matter applications for the two experiments soils. The same effect were observed for available K in incubated soils, but in the greenhouse soils, where plant grown, the available K and Mn decreased with application of O.M. This effects of O.M were higher for sandy loam soil (19% $CaCO_3$ and 1.4% O.M) than sand soil (28% $CaCO_3$ and 0.7% O.M) . Sulphur increased the availability of Fe and Mn in incubated soils treatments . With

increasing the time of incubation, the O.M, available P and Fe were decreased, but available Zn was increased. The treatments of incubated soils with Fe as chelated or mineral forms had no significant effect on the available content of Fe. On the other hand, the soil application of the Fe-EDDHA increased the availability of Fe in the greenhouse experiment soils. Organic matter applications increased the dry weight of corn and the concentration of P in the plants, and decreased the concentration of N, K and Mn in the corn plants . However, the plant uptake of all elemental nutrients were increased with O.M application. This effects were more pronounced for second soil than the first one . Plant content and uptake of Fe were slightly affected by soil or foliar Fe-EDDHA application .

Key Wards

Iron chlorosis, $CaCO_3$. Organic matter. Sulphur. Fe-EDDHA .$FeSO_4$. Iron foliar. Available nutrients, Dry matter , Elemental content of corn plants .

ACKNOWLEDGMENT

I would like, first of all , to express my faithful and sincere gratitude to **"Allah"**,the most beneficent who took good care of me and strengthened my will, thus enabling me to complete this work .

I wish to express my deepest gratiteude and thanks to **Prof. Dr. A. M. Elgala, Prof. of Soil Science , Faculty of Agric. Ain Shams Univ.** For supervision, guidance, and valuable discussion throughout the whole period of this investigation .

My deep thanks and appreciation are extended to **Dr. M. A. Eid Lecturer of Soil Science, Faculty of Agric., Ain Shams Univ.,** for his supervision, valuable help during the course of this investigation and preparation of the manuscript.

Sincere thanks are extended to **Dr. M. Y. Khdr Associate Professor of Soil Science, in the same Department,** for his valuble help in the morphological description of soil samples .

I am particularly greatful to all members of the Department of Soil Science, Faculty of Agriculture , Ain Shams Univ. for their help and cooperation .

Special thanks for remarkable encouragement of following organizations :

Ministry of Agriculture in Sultanat of Oman and Embassy of Sultanat of Oman in Egypt .

CONTENTS

Page

1. INTRODUCTION 1

2. REVIEW OF LITERATURE : 3

2.1 Iron chlorosis and stress in calcareous soil 3

2.2 Some factors affecting the iron availability in solis. 5

2.2.1 Soil pH 5

2.2.2 Carbonate and bicarbonate 6

2.2.3 Soil moisture 7

2.2.4 Organic manure 9

2.2.5 Sulphur application 10

2.3 Behavior of iron chelates compound in soil 10

2.4 Iron uptake by plants 12

3. MATERIALS AND METHODS : 14

3.1 Sampling and studied area. 14

3.1.1 Chemical analysis 14

3.1.2 Physical analysis 19

3. 1.3 Plant samples 19

3.2 Soil properties and supplying power of plant Nutrients (Incubation experiment) 19

3.3 Pot experiment 21

3.3.1 Soil analysis 22

3.3.2 Plant analysis 22

3.4 Statistical analysis 22

4. RESULTS AND DISCUSSION: 23

4.1 Concentration of some macro and micro nutrients in the leaf of selected growing crops in studied area. 23

4.2 Soil properties and supplying power of plant Nutrients (Incubation experiment) 26

4.2.1 Soil pH. 26

4.2.2 Soil organic matter 27

4.2.3 Soil electrical conductivity 27

4.2.4 Soil total nitrogen. 30

Page

4.2.5 Soil available phosphorus 30
4.2.6 Soil available potassium 33
4.2.7 Soil available iron 35
4.2.8 Soil available manganese 37
4.2.9 Soil available zinc 39
4.3 Pot experiment : 45
4.3.1 Effect of soil type, organic matter , and Fe-application forms on some properties of the cultivated soil. 45
4.3.1.1 Soil pH 45
4.3.1.2 Organic matter content 45
4.3.1.3 Electrical conductivity 49
4.3.1.4 Total nitrogen 49
4.3.1.5 Available phosphorus 49
4.3.1.6 Available potassium 53
4.3.1.7 Available iron 55
4.3.1.8 Available manganese 55
4.3.1.9 Available zinc 57
4.3.2 Effect of soil type, organic matter, and foliar or soil application of Fe on some characteristics of corn plant grown on two calcareous soils 60
4.3.2.1 Dry matter 60
4.3.2.2 Concentration and uptake of plant N. 60
4.3.2.3 Concentration and uptake of plant P. 64
4.3.2.4 Concentration and uptake of plant K 66
4.3.2.5 Concentration and uptake of plant Fe. 66
4.3.2.6 Concentration and uptake of plant Mn. 71
4.3.2.7 Concentration and uptake of plant Zn. 73
5. SUMMARY 75
6. LITERATURE CITED 79
7. APPENDIXES 93
8. ARABIC SUMMARY

LIST OF TABLES

Table No. **Page**

1. Main Morphological features of the Studied Soil 15
2. Some soil chemical and physical characteristics of two profiles in Ibri town, Sultanat of Oman..... 16
3. Fractionation of calcium carbonate particles in surface layers of the two studied profiles 18
4. Concentration of some macro and micro nutrient in the leaves of selected growing crops from the studied area, Sultanat of Oman 25
5. Some chemical properties and available amounts of some nutrients in differently treated soil samples of location(1) (sand soil) 41
6 .Some chemical properties and available amounts of some nutrients in differently treated soil samples of location(2) (sandy loam soil) 43
7. Effects of iron applications on some chemical properties and available amount of nutrient in the two studied soils treated or untreated with organic matter 46
8. Effects of iron applications on dry weight of *Zea maize* plants grown in the two studied soils treated or untreated with organic matter 61
9. Effects of iron applications on some nutrient concentration of *Zea maize* plants grown in the two studied soils treated or untreated with organic matter 61
10. Effects of iron applications on some nutrient uptake by *Zea maize* plants grown in the two studied soils treated or untreated with organic matter 62

LIST OF FIGURES

Fig. No. **Page**

1. Changes of O.M. content in the two soils treated with O.M., S and forms of Fe during 6 months 28
2. Changes of E.C. in the two soils treated with O.M., S and forms of Fe during 6 months 29
3. Effect of Fe, O.M., and S on the total N in the two soils during 6 months of incubation 31
4. Effect of Fe, O.M., and S on the available P in the two soils during 6 months of incubation 31
5. Effect of Fe, O.M., and S on the available K in the two soils during 6 months of incubation 34
6. Effect of Fe, O.M., and S on the available Fe in the two soils during 6 months of incubation 36
7. Effect of Fe, O.M., and S cn the available Mn in the two soils during 6 months of incubation 38
8. Effect of Fe, O.M., and S on the available Zn in the two soils during 6 months of incubation 40
9. Effect of Fe and organic matter on pH in the two soils 47
10. Effect of Fe and organic matter on organic matter content in the two soils 48
11. Effect of Fe and organic matter on soluble salt in the two soils 50
12. Effect of Fe and organic matter on available N content in the two soils 51
13. Effect of Fe and organic matter on available P content in the two soils 52
14. Effect of Fe and organic matter on available K content in the two soils 54
15. Effect of Fe and organic matter on available Fe content in the two soils 56