

سامية محمد مصطفى



شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم



سامية محمد مصطفى



شبكة المعلومات الجامعية



شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



سامية محمد مصطفى



شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



سامية محمد مصطفى



شبكة المعلومات الجامعية



بعض الوثائق الأصلية تالفة



سامية محمد مصطفى



شبكة المعلومات الجامعية



بالرسالة صفحات
لم ترد بالأصل





Alexandria University
Faculty of Agriculture
Saba Basha
Plant Production Dept.

**EFFECT OF DATES AND SOURCES OF NITROGEN
FERTILIZATION ON YIELD AND QUALITY OF
SUGARBEET UNDER SURFACE AND SPRAY
IRRIGATION METHODS IN
NEWLY RECLAIMED AREAS**

A THESIS

Submitted on Partial Fulfillment of the Requirements
For the Degree of

**DOCTOR OF PHILOSOPHY
IN
AGRICULTURAL SCIENCES**

**IN
AGRONOMY**

**BY
SAHAR FAYEZ TAWFIK**

2000

B
10702



ALEXANDRIA UNIVERSITY
Faculty of Agriculture
Saba Basha
Plant Production Dept.

**EFFECT OF DATES AND SOURCES OF NITROGEN
FERTILIZATION ON YIELD AND QUALITY OF
SUGARBEET UNDER SURFACE AND SPRAY
IRRIGATION METHODS IN
NEWLY RECLAIMED AREAS**

Presented By

SAHAR FAYEZ TAWFIK

**Submitted on Partial Fulfillment of the Requirements
for the Degree of
Doctor of Philosophy in Agricultural Sciences
in
(AGRONOMY)**

Examiner's Committee :

Prof. Dr. MAHMOUD ABD EL-AZIZ GOMAA
Prof. of Agronomy, and Vice Dean for Students
and Teaching Affairs, Faculty of Agriculture,
(Saba-Basha), Alexandria University.

Prof. Dr. ABDALLAH KAMEL NASRALLAH
Prof. of Agronomy, Plant Production Department
Fac. of Agric. (Saba Basha), Alexandria University.

Prof. Dr. MOHAMED FATHY MOHAMED MAAREG
Chief Researchers, Sugar Crops Research Institute
(SCRI), Agric. Res. Center (ARC), Giza, Egypt

Prof. Dr. FATHY IBRAHIM RADWAN
Prof. of Agronomy, Plant Production Department
Fac. of Agric. (Saba Basha), Alexandria University.

Approved

M. A. G. G. G.

A. K. M. A. M.

M. F. Maareg

F. I. Radwan

SUPERVISORS' COMMITTEE

Prof. Dr. Mahmoud A. Gomaa

*Prof. of Agronomy and Vice Dean for
Education and Students Affairs, Fac. of
Agric., Saba Basha, Alexandria University.*

Prof. Dr. Abdallah Kamel Nasrallah

*Prof. of Agronomy, Plant Production Dept.,
Faculty of Agriculture, Saba Basha,
Alexandria University.*

ACKNOWLEDGEMENT

The author wishes to express her deepest appreciation to **Prof.Dr. M.A. Gomaa**, Professor of Agronomy and Vice Dean for Education and Student Affairs, Faculty of Agriculture, Saba Basha, Alexandria University for his supervision, suggesting the problem, guidance and encouragement during this investigation.

I wish to extend my thanks to **Prof.Dr. A.K. Nasrallah** Professor of Agronomy, Plant Production Dept., Faculty of Agriculture, Saba Basha, Alexandria University for his supervision, valuable guidance and constructive criticism during the course of this study and the preparation of this manuscript.

Special thanks are due to **Prof.Dr. M.F. Maareg**, Chief Researchers and Head of Plant Protection Research Dept., Sugar Crops Research Institute (SCRI), Agricultural Research Center (ARC), Giza for his consistent following, encouragement, offering great facilities, valuable advice and kind help throughout the investigation.

Sincere thanks are due to **Prof.Dr. A.M. Ebieda** and **Dr. M.A. Hassanien** for their helps during the course of this study.

Contents

	Page
1. INTRODUCTION	1
2. REVIEW OF LITERATURE	5
2.1. Effect of irrigation on sugarbeet	5
2.2. Effect of nitrogen sources on sugarbeet	13
2.3. Effect of nitrogen levels on sugarbeet	22
2.4. Effect of nitrogen application time on sugarbeet	41
2.5. The effect of interaction (nitrogen x irrigation) on sugarbeet	51
3. MATERIALS AND METHODS	55
4. RESULTS AND DISCUSSION	62
I. Surface Irrigation	62
A. Growth parameters	62
1. Leaf area per plant	62
2. Leaf area index	66
3. Dry matter accumulation per plant	70
4. Leaf area ratio	75
5. Crop growth rate	97
6. Relative growth rate	82
7. Net assimilation rate	84
8. Crop index	87

	Page
B. Photosynthetic pigments	91
1. Chlorophyll (a)	91
2. Chlorophyll (b)	94
3. Total chlorophyll (a+b)	96
C. Plant characters	98
1. Foliage height	98
2. Number of leaves	101
3. Foliage weight	102
4. Root length	105
5. Root diameter	109
6. Root weight	111
D. Yield	115
1. Foliage yield (ton/fad.)	115
2. Root yield (ton/fad.)	118
3. Biological yield (ton/fad.)	123
4. Root/leaves ratio	127
E. Quality parameters	129
1. Total soluble solids percentage	129
2. Gross sugar content	135
3. Soluble non-sugars (sodium, potassium and α -amino-nitrogen content) and alkalinity coefficient	138
4. Extractable white sugar percentage	140
5. Loss sugar percentage	143
6. Juice purity percentage	145
7. Sugar yield (ton/fad)	146

	Page
II. Spray Irrigation	150
A. Growth parameters	150
1. Leaf area per plant	150
2. Leaf area index	154
3. Dry matter accumulation per plant	158
4. Leaf area ratio	164
5. Crop growth rate	166
6. Relative growth rate	169
7. Net assimilation rate	172
8. Crop index	175
B. Photosynthetic pigments	178
C. Plant characters	181
1. Foliage height	181
2. Number of leaves	185
3. Foliage weight	188
4. Root length	190
5. Root diameter	193
6. Root weight per plant	196
D. Yield	200
1. Foliage yield (ton/fad.)	200
2. Root yield (ton/fad.)	204
3. Biological yield (ton/fad.)	207
4. Root/leaves ratio	210

	Page
E. Quality parameters	211
1. Total soluble solids percentage	211
2. Gross sugar content	215
3. Soluble non-sugars (sodium, potassium and α -amino-nitrogen content) and alkalinity coefficient	217
4. Extractable white sugar percentage	218
5. Loss sugar percentage	220
6. Juice purity percentage	221
7. Sugar yield (ton/fad.)	223
III. Effect of Surface and Spray Irrigation Systems on Plant, Yield and Quality Characters of Sugarbeet	226
1. Plant characters	226
2. Yield characters	229
3. Quality characters	232
IV. Effect of Source, Level and Application Time of Nitrogen Fertilizer on Water Utilization Efficiency for Sugarbeet Yields under Surface and Spray Irrigation Systems	237
4.1. Water applied in irrigation	237
4.1.1. Surface irrigation	237
4.1.2. Spray irrigation	237
4.2. Water utilization efficiency (W.Ut.E) (kg/m^3)	240
4.2.1. Water utilization efficiency under surface irrigation	240
4.2.2. Water utilization efficiency under spray irrigation	244
5. SUMMARY	250
6. REFERENCES	280
ARABIC SUMMARY	

INTRODUCTION

1. INTRODUCTION

Sugarbeet (*Beta vulgaris*, L. var. *Saccharifera*) is an important sugar crop in many countries all over the world. Sugarbeet needs less water requirements and well-known to be adapted to poor saline, alkaline and calcareous soils. So, its future is really promising in the newly reclaimed soils (as Al-Bustan and Western Nubariya).

Owing to the increasing gap between production and consumption of sugar in Egypt, there was a necessity to cultivate sugarbeet in a suitable area to increase sugar production which depended for many decades or even centuries only on sugarcane (*Saccharum officinarum*, L.). Sugarcane is a perennial sugar crop of highly requirements and needs extra fertile soils.

In Egypt, cultivated area of sugarbeet increased markedly during the last two decades. Such area reached 103 thousand feddans in 1998, with an increase of 86 thousand feddans than in 1982. This increase is due to cultivating sugarbeet in new reclaimed soils in five governorates, viz, Souhag, Qeena, El-Menia, El-Fayoum as well as El-Behera (especially desert area at Al-Bustan and Western Nubariya regions).

The climate in Egypt differs from one area to another, and according to the available meteorological data Egypt is divided into the following nine agroclimatic zones as distinguished by Rijtema and Abu-Khalid (1975):

1. Coastal area.

2. Central Delta area.