

107219

EFFECT OF SOME CULTURAL TREATMENTS ON GROWTH AND PRODUCTION OF ASPARAGUS SEEDLINGS

BY

THANAA FOUAD MOHAMMADY AL-RABBAT



25200

THESIS

SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE OF

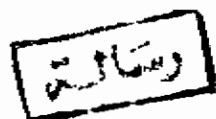
MASTER OF SCIENCE

IN

AGRICULTURE SCIENCE

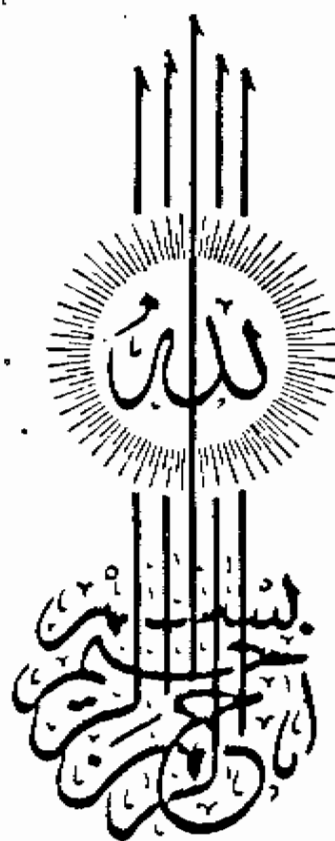
(VEGETABLE CROPS)

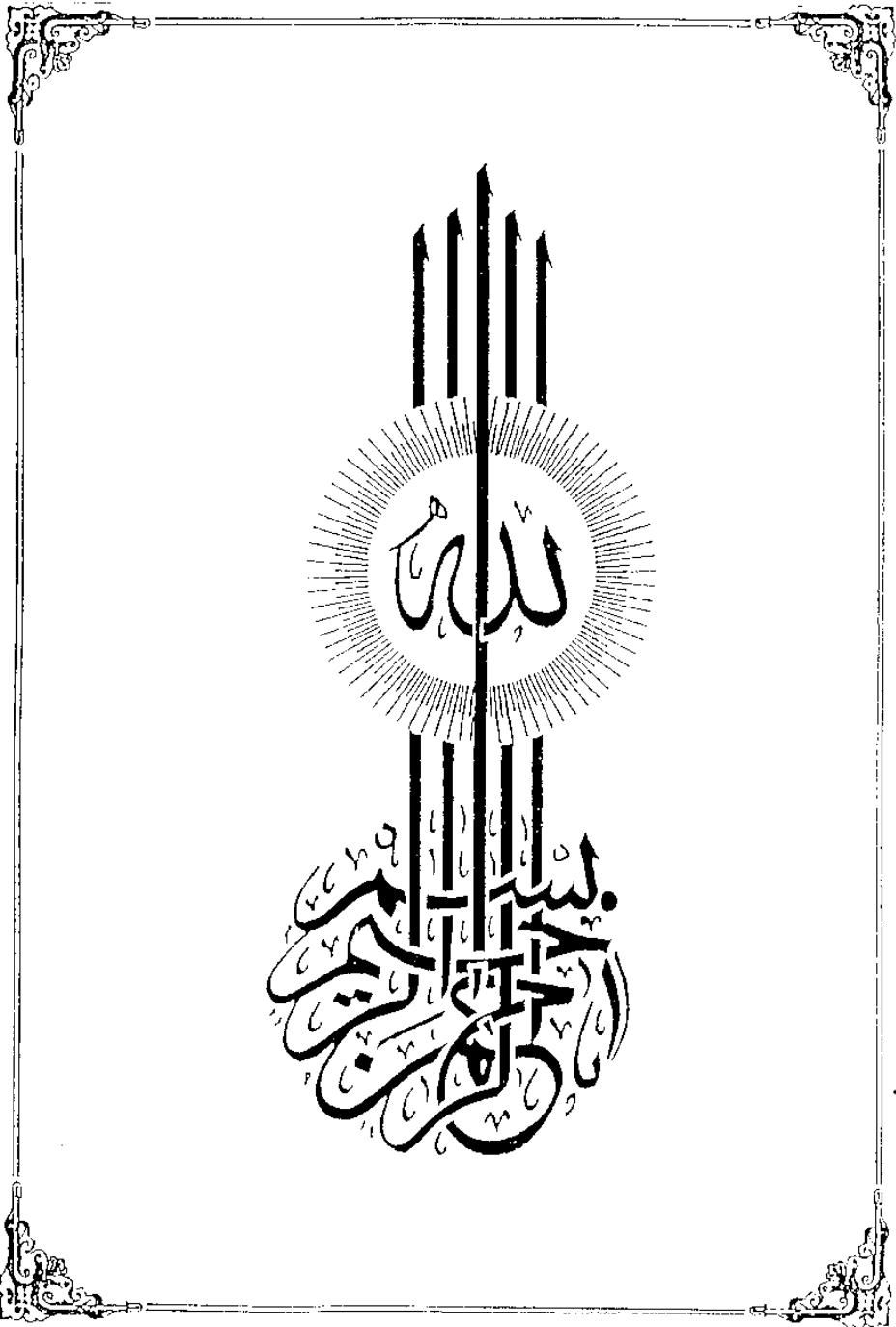
25200



**HORTICULTURE DEPARTMENT
FACULTY OF AGRICULTURE
AIN SHAMS UNIVERSITY
CAIRO — EGYPT**

1988





APPROVAL SHEET

=====

Thesis title : Effect of some cultural treatments
on growth and production of asparagus
seedlings.

Degree : M.Sc. in Vegetable Crops.

Name : Thanaa Fouad Mohammady Al Rabbat

Approved by: ..M.-El-Saied..Zaki'
I-EL-OKSH
Refant Helal

Committee in Charge

Date: 3 /3/1988.

ACKNOWLEDGEMENTS

The author wishes to express her deep appreciation and gratitude to Dr. HOSNIA GOMAA and Dr. REFAAT HELAL , Professors of Vegetable Crops, Faculty of Agriculture, Ain Shams University for their supervision , suggesting the problem, helpful guidance and valuable criticism throughout the course of this study and during finishing of this work.

I wish to thank Dr. ABD EL-AZIM ABD EL-GAWAD Professor and Head of Agronomy Department, Faculty of Agriculture, Ain Shams University for the help given by him in the chemical analysis of this study.

Thanks are also due to all the staff of Horticulture and Agronomy Departments and every one helped me in this thesis.

CONTENTS

	<u>Page</u>
1. INTRODUCTION	1
2. REVIEW OF LITERATURE	3
3. MATERIAL AND METHODS	11
3.1. Experimental procedures	14
3.1.1. Plant growth measurements	15
3.1.2. Chemical analysis	16
3.2. Statistical analysis	17
4. RESULTS AND DISCUSSION	18
4.1. First experiment : Effect of mineral nutrition on asparagus seedlings	18
4.1.1. Plant growth measurements	18
a. Plant height	18
b. No. of shoots / plant	21
c. Fresh weight of shoots	21
d. Dry weight of shoots	22
e. Fresh weight of roots	23
f. Dry weight of roots	28
g. Fresh weight of rhizome	29
h. Dry weight of rhizome	30
i. No. of buds / crown	31
4.1.2. Influence of N, P and K on aspara- gus seedlings growth ratio	32
4.1.3. Chemical composition of the seed- lings	36
4.1.3.1. Total nitrogen	36
4.1.3.2. Phosphorus	42
4.1.3.3. Potassium	43
4.1.3.4. Total carbohydrates	45
4.2. Second experiment : Effect of plant spacing on asparagus seedlings.	49
4.2.1. Plant growth measurements	49
4.2.2. Correlation analysis	56
5. SUMMARY AND CONCLUSION	59
6. REFERENCES	66
7. ARABIC SUMMARY	--

* * * * *

INTRODUCTION

1. INTRODUCTION

Asparagus (Asparagus officinalis, L.) is one of the most important perennial vegetable crops in U.S.A. and some European countries. In Egypt, it is considered as one of the non-traditional horticultural crops which may be grown successfully in desert areas where soil moisture stress is quite high. Consequently, there is fairly promising potentialities of exporting infinite amounts of this crop to European markets.

Asparagus production can be commenced more rapidly by transplanting seedlings to the field than by direct sowing. Also the high cost of seed of high yielding cultivars makes seedling production more attractive, since a high percentage of seedlings become established.

A clear understanding of the growth phases of field seeded asparagus seedlings may indicate the need to intensify cultural practices (irrigation, fertilization, etc.) to enhance bud production and crown quality.

Adequate mineral nutrition is one of the most important factors for high growth rate of seedlings. The role of N in combination with P and K on the growth and development of seedling asparagus has not

been investigated. Moreover, the seedling technique of establishment appears to have potential, but there have been no detailed studies on methods of producing plants.

Therefore, the aim of this study was to investigate the effect of N, P and K fertilizers as well as plant density on production of asparagus seedlings.

**REVIEW
OF
LITERATURE**

71

2. REVIEW OF LITERATURE

Although growth and yield of asparagus plants are well known to be greatly affected by fertilizers, studies evaluating the N,P and K nutritional needs of asparagus seedlings as well as plant distances are quite scarce. In order to have a wide view on the effect of some cultural practices on asparagus seedlings, the review of literature will be subdivided under two titles :-

1. Effect of mineral nutrition on asparagus seedlings.
2. Effect of plant spacing on asparagus seedlings.

1. Effect of mineral nutrition on asparagus seedlings:

Nitrogen fertilizers has been found to have great effect on asparagus seedlings. In a study conducted by Born (1979) it was found that N deficiency caused a reduction in growth of asparagus seedlings. In this connection, Precheur and Maynard (1983) found an increase in asparagus shoot and root growth by increasing N rates added to the transplants.

In California, U.S.A. , a general fertilization recommendation is to apply 100 pounds of nitrogen , 50 pounds of phosphorus and 100 pounds of potassium per acre before preparing the field for asparagus planting (Takatori et al., 1977).

Studying the effects of nitrogen and phosphorus nutrition on the growth of asparagus seedlings, Fisher and Benson (1983) found that N and P increased shoot dry-weight by increasing mean dry weight and number of shoots. Increasing P had no effect on shoot growth at 50 mg l⁻¹. N increased root dry weight (crown and shoots) by increasing root number , whereas, P decreased root dry weight. As for total, plant dry weight, they reported that N increased total plant dry weight, but P had no effect.

In another study conducted by Adlar et al. (1983). Green Giant Select asparagus seeds were germinated in sandy culture using plastic containers. The treatments were factorial combinations of aqueous solutions of N from urea at 0, 100 and 200 ppm, P from phosphoric anhydride at 0, 10 and 20 ppm and K from K Cl at 0, 100 and 200 ppm. Results indicated that increasing P rates

from 0 to 20 ppm increased shoot and crown fresh and dry weights, plant height, fleshy root and bud production in 10 week old seedlings. Increasing K rates from 0 to 200 ppm decreased the production of fleshy roots relative to buds. Shoot production progressively increased as N rates increased from 100 to 200 ppm in conjunction with P rates increasing from 10 to 20 ppm.

Studying the dynamic growth characteristics in seedling asparagus, Dufault and Greig (1983 b) found that root: bud ratio increased to 3:1 in 6-month old direct-seeded asparagus.

In an experiment conducted by Spiers and Nichols (1985) asparagus seedlings (cv. Limbras 10) were grown in a glasshouse for 20 weeks with five levels of nitrogen liquid feed. Growth was greatly retarded at low N rates. Best growth occurred with weekly feeds of 200-300 mg N/litre. Other plant growth measurements, i.e., number of shoots, fresh weight and plant height, followed the same trends as dry weight (increased with increasing N rate).

Studying the effect of N,P and K fertilizers on the chemical composition of asparagus plants,

Brasher (1958) reported that in a fertile soil as the soil application of N,P and K increased , the content of these elements increased in the asparagus plants. Soil applications of N greater than 40 pounds per acre had no effect on N content of the fern. The K content of the fern increased significantly when the soil application of K reached 360 pound per acre. The P content of the fern was not affected when the soil applications of P were increased from 0 to 240 pounds per acre.

Plant analysis revealed that 2.6-2.7 % N and 0.29 - 0.36 % P, on a dry weight basis, were present fifty days from seed sowing in the asparagus shoots with the high concentrations of N and P (i.e. 150 mg l⁻¹ and 22.5 mg l⁻¹ respectively). There was no significant difference in % N on dry weight basis between the 100 and 150 mg l⁻¹ N levels for shoot tissue. In other cases the % N or P in the plant tissue increased significantly as the nutrient levels increased (Fisher and Benson 1983).

In another study conducted by Spiers and Nichols (1985) it was found that nitrogen concentration of root, both total N and soluble (NO₃) N,

increased with increasing N rates, Total N concentration of the foliage was greater than the roots in all cases.

Concerning the effect of fertilizers on carbohydrate content of asparagus seedlings, Dufault and Greig (1983 b) reported that increasing N rates led to vigorous fern development throughout the growing season which increased the potential to produce high quality large crowns and therefore, it led to a great carbohydrate storage. They reported that root carbohydrate levels of two asparagus cultivars tended to decrease between 10 and 14 weeks after emergence coinciding with the onset of increased growth. Conceivably the lag phase in seedling growth was a period of carbohydrate deposition for later use during the log phase of growth.

Harvesting a young planting of asparagus for 4 to 6 weeks the second year after transplanting 1 year old crowns, Shelton and Lacy (1979) found that carbohydrate levels in asparagus storage roots decreased during harvest and continued to decrease after harvest during fern production.