

Physiological studies on some ornamental plants

Presented By

Moustafa Mohamed Ali El- Sagher

B. Sc. Agric., Fac. of Agric., South Wady Univ. (2009)

Thesis

Submitted in partial fulfillment of the requirement for the

Degree of

Master of Science in Horticulture

Hort. Dept. ornamental Plants Division

Fac. of Agric. Minia Univ.

Supervised by

Farouk S. Badran, Ph.D.

Prof. of ornamental plants

Fac. of Agric., Minia Univ.

Examined By

Adel Abd Al Aziz Zaid , Ph.D.

Prof. of medicinal plants

Agriculture Research center

El- Mowfy A. El- Ghadban, Ph.D.

Prof. of Medicinal plants

Hort. Res. Inst. Giza

Farouk S. Badran, Ph.D.

Prof. of ornamental plants

Fac. of Agric., Minia Univ.

Ragaa A. Taha , Ph.D.

Prof. of ornamental plants

Fac. of Agric., Minia Univ.

Mohamed K. Aly, Ph.D.

Prof. of ornamental plants

Fac. of Agric., Minia Univ.

Ragaa A. Taha , Ph.D.

Prof. of ornamental plants

Fac. of Agric., Minia Univ.

APPROVAL SHEET

Name of Candidate: *Moustafa Mohamed Ali El- Sagher*
Title of Thesis: " Physiological studies on some ornamental plants "

This Thesis for the M. Sc. Degree
has been approved by:

Adel Abd Al Aziz Zaid , Ph.D.

Prof. of medicinal plants Agriculture Research center

Farouk S. Badran, Ph.D.

Prof. of ornamental plants Fac. of Agric., Minia Univ.

Mohamed K. Aly, Ph.D.

Prof. of ornamental plants Fac. of Agric., Minia Univ.

Ragaa A. Taha, Ph.D.

Prof. of ornamental plants Fac. of Agric., Minia Univ.

Committee in charge

July 2016

CONTENTS

INTRODUCTION	1
REVIEW OF LITERATURE	5
Effect of irrigation	5
Vegetative growth characters.	5
Chemical constituent parameters	8
Effect of organic fertilization	10
Vegetative growth characters.	10
Chemical constituent parameters	13
Effect of NPK fertilization	16
Vegetative growth characters.	16
Chemical constituent parameters	23
Effect of organic / NPK fertilization	28
Vegetative growth characters.	28
Chemical constituent parameters	30
MATERIALS AND METHODS	32
RESULTS	37
Vegetative growth characters	37
Plant height	37
Stem diameter	40
Number of branches / plant	44
Number of leaves / plant	47

Leaves fresh weight per plant and per fed.	50
Leaves dry weight per plant and per fed.	54
Chemical constituent parameters	59
Photosynthetic pigments	59
Leaves percent of N,P,K, Ca and Mg	63
Leaves content of N,P,K, Ca and Mg	70
Leaves contents of vitamins A, B ₁ , B ₂ and C	77
Leaves of contents of amino acids	83
DISCUSSION	94
SUMMARY AND CONCLUSION	102
REFERENCES	106
ARABIC SUMMARY	1-3

LIST OF TABLES

Table No.		Page
Table (a)	Physical and chemical analysis of the soil	32
Table (b)	Amounts of water during the experimental period for both seasons	34
Table (c)	Chemical analysis of the used poultry manure	35
Table (1)	Effect of irrigation intervals and NPK/organic fertilization treatments on plant height (cm) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	38
Table (2)	Effect of irrigation intervals and NPK/organic fertilization treatments on stem diameter (cm) 10 cm above soil surface of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons	41
Table (3)	Effect of irrigation intervals and NPK/organic fertilization treatments on stem diameter 100 cm above soil surface (cm) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	42
Table (4)	Effect of irrigation intervals and NPK/organic fertilization treatments on branch number / plant of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	45

Table (5)	Effect of irrigation intervals and NPK/ organic fertilization treatments on number of leaves/ plant of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	48
Table (6)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves fresh weight/ plant (kg.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	51
Table (7)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves fresh weight/ fed (ton) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	52
Table (8)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves dry weight / plant (kg.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	55
Table (9)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves dry weight / fed. (ton) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	56
Table (10)	Effect of irrigation intervals and NPK/ organic fertilization treatments on chlorophyll a content (mg/ g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	60

Table (11)	Effect of irrigation intervals and NPK/ organic fertilization treatments on chlorophyll b content (mg/ g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	61
Table (12)	Effect of irrigation intervals and NPK/ organic fertilization treatments on carotenoids content (mg/ g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	62
Table (13)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves nitrogen % of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	64
Table (14)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves phosphorus % of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	65
Table (15)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves potassium % of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	66
Table (16)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves calcium % of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	67

Table (17)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves magnesium % of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	68
Table (18)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves nitrogen content (g / plant) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	71
Table (19)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves phosphorus content (g/ plant) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	72
Table (20)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves potassium content (g/ plant) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	73
Table (21)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves calcium content (g/ plant) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	74
Table (22)	Effect of irrigation intervals and NPK/ organic fertilization treatments on leaves magnesium content (g/ plant) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	75

Table (23)	Effect of irrigation intervals and NPK/organic fertilization treatments on vitamin A (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons	78
Table (24)	Effect of irrigation intervals and NPK/organic fertilization treatments on vitamin B ₁ (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons	79
Table (25)	Effect of irrigation intervals and NPK/organic fertilization treatments on vitamin B ₂ (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	80
Table (26)	Effect of irrigation intervals and NPK/organic fertilization treatments on vitamin C (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons	81
Table (27)	Effect of irrigation intervals and NPK/organic fertilization treatments on arginine (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	84
Table (28)	Effect of irrigation intervals and NPK/organic fertilization treatments on leucine (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	85

Table (29)	Effect of irrigation intervals and NPK/organic fertilization treatments on lysine (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	86
Table (30)	Effect of irrigation intervals and NPK/organic fertilization treatments on methionine (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	87
Table (31)	Effect of irrigation intervals and NPK/organic fertilization treatments on phenylalanine (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	88
Table (32)	Effect of irrigation intervals and NPK/organic fertilization treatments on threonine (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	89
Table (33)	Effect of irrigation intervals and NPK/organic fertilization treatments on isoleucine (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	90
Table (34)	Effect of irrigation intervals and NPK/organic fertilization treatments on tryptophane (mg/ 100 g F.W.) of <i>Moringa oleifera</i> plants during 2013 and 2014 seasons.	91

SUMMARY AND CONCLUSION

Moringa oleifera is the most widely cultivated species of the genus *Moringa*, which is the only genus in family Moringaceae. It is a fast-growing evergreen /deciduous tree reaching 10-12 m, height and 45 cm trunk diameter. The tree has an open crown of drooping fragile branches holding feathery foliage. The leaves are small (1-2 cm). The flowers are fragment, 2-5 cm long and 2 cm broad in spreading or drooping flower clusters, 10- 25 cm long. Flowering begins within six months after planting. The fruit is 20- 25 cm long. The seeds have three whitish papery wings and are dispersed by wind and water, (**John, 1993**)

Moringa oleifera is wide adaptability and ease of establishment. Its leaves, pods and flowers are packed with nutrients, vitamins and antioxidants important to both human and animals. (**Dalla, 1993**). *Moringa* is used as food, fodder and for medicinal purpose. It is considered as an important food source in many African and Asian poor countries. The *Moringa* tree is grown mainly in semiarid, tropical and subtropical areas. It grows best in dry sandy soil and tolerates poor soil. It is a sun- and heat- loving plant, (**Raja et al 2013**).

The present experiment was carried out to explore the effect of three irrigation intervals and six organic and/ or

mineral fertilization treatments on vegetative growth characters and chemical constituent parameters of *Moringa oleiofera*.

The main results, in the present experiment, could be summarized as follows:

Effect of Irrigation Intervals:

Vegetative growth characters:

All vegetative growth characters of *Moringa oleifera* plants including plant height, stem diameter at 10 and 100 cm above soil surface, branch number/ plant , leaf number / plant and fresh and dry weights of leaves per plant and per feddan were gradually increased parallel to the gradual reduction in the irrigation interval. Therefore, the highest values were given due to the short irrigation interval (every 14 days), while the least ones were due to the long interval (every 28 days).

Chemical constituent parameters:

Obtained results showed that the three photosynthetic pigments, chlorophyll a and b and carotenoids, as well as , the percentage of nitrogen, phosphorus, potassium, calcium and magnesium in the leaves of Moringa plants were decreased downward due to the reduction in irrigation intervals. An opposite trend was noticed for each of the five nutrients content, the four vitamins and the eight amino acids , as they were increased gradually by the gradual shortening in irrigation interval.

Effect of organic / NPK fertilization:

Vegetative growth characters:

All organic and/ or NPK fertilization treatments augmented different vegetative growth traits in comparison with control plants. Among fertilized plants, the 100 % organic treatment was superior to other treatments, while the least values were obtained from the 100% NPK treatment. It was noticed also that increasing the organic proportion, in the combined organic/ NPK three treatments was in favour of all growth characters. Therefore, the best results , in descending order, were due to 100% organic , 75% organic + 25% NPK, 50% organic + 50 % NPK, 25% organic +75% NPK and 100% NPK.

Chemical constituent parameters:

The same trend for vegetative growth traits , as affected by organic / NPK fertilization treatments, was almost shown for chemical parameters(three photosynthetic pigments, five , N, P, K, Ca and Mg leaves %, five N, P, K, Ca and Mg leaves content, four A, B₁, B₂ and C vitamins and the eight amino acids).

In other words, the highest overall values were due to the 100% organic treatment, the least values were due to the 100% NPK, while the three combined organic / NPK treatments gave intermediate values.

Recommendations:

It is recommended to irrigate *Moringa oleifera* plants every 14 days and supplied them with organic fertilization in form of poultry manure, at the rate of 4 kg/ tree in order to obtain the highest yield of leaves with higher nutritive contents minerals, vitamins and amino acids. However, and from the practical an economical point of view, it might be irrigated every 21 days and supplied with 75% organic fertilizer + 25% NPK mineral fertilization under the environmental and soil type conditions prevailed in Luxor and upper Egypt regions.