

**RESPONSE OF *Pinus halepensis* Mill. AND *Grevillea robusta* A. Cunn. SEEDLINGS TO SOME
TREATMENTS OF BIOFERTILIZERS,
BIOSTIMULANTS AND MINERAL NUTRIENTS**

By

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**B.Sc. Agric. Sci. (Ornamental Horticulture), Fac. Agric., Cairo Univ., 2003
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ABSTRACT

This study was carried out in the Experimental Nursery of Ornamental Horticulture Department, Faculty of Agriculture, Cairo University, Giza, during two seasons 2014-2015 and 2015-2016 to study the response of *Pinus halepensis* Mill. and *Grevillea robusta* A. Cunn. seedlings to some treatments of biofertilizers, biostimulants and mineral nutrients. The obtained results can be summarized as follows: 1. The inoculation with (NFB) significantly increased plant height and number of branches of *P. halepensis* in both seasons, while (AMF) resulted in the longest branches and leaves (needles), the heaviest stem fresh and dry weights. The treatment of (PSB) produced the thickest of stems and main roots as well as the longest roots and increased the fresh and dry weights of leaves and roots. The treatments of (GSB) and (PSB) were the most effective in case of pigments (chall-a, b and cartonoids). The content of total carbohydrates increased markedly with (NFB). 2. Spraying *P. halepensis* seedlings with Zn at 100 ppm gave the tallest plants and branches as well as the thickest stems, the heaviest fresh and dry stems. Whereas, the maximum number of branches/plant and the heaviest fresh leaves were produced by treating with Se at 5 ppm. The highest values of needles length, main root diameter and length as well as fresh and dry weight of roots were recorded in plants sprayed with Ni at 10 ppm. Spraying pine plants with Se at 5 ppm and Ni at 10 and 5 ppm resulted in the maximum values of chlorophyll-a, while, the highest content of chlorophyll-b was produced by Co and Ni at 10 ppm. Treatments of Zn at 50 and 100 ppm, significantly increased the content of total carotenoids as well as total carbohydrates (%D.W.), N, P, K% and Zn (ppm) in all parts of pine seedlings, in the two season. The maximum Co concentration (ppm) in all parts of seedlings were recorded by treating with Co at 10 and 5 ppm, in different order, however the highest Ni concentration (ppm) in needles, stems and roots were obtained by Ni at 10 and 5 ppm, in both seasons. Anatomical study on main stem of *P. halepensis* indicated that the values of all tissues diameter and length in transverses sections as well as in longitudinal sections in plants treated with zinc at 100 ppm were higher over those of untreated plants. 3. Sprayed *G. robusta* plants with Zn at 100 and 50 ppm produced the tallest plants, the thickest stem and main root as well as the heaviest fresh and dry weights of all plant parts. The plants treated with Ni at 10 ppm gave the maximum numbers of leaves and the longest roots. Spraying plants with Ni at 10 and Se at 5 ppm increased the content of chlorophyll-a, b and total carotenoids, while treating seedlings with Zn at 50 and 100 ppm increased the total carbohydrates, N%, P%, K% and Zn (ppm). The plants produced the maximum concentration of Co (ppm) when they were sprayed with Co 10 and 5 ppm, however the concentration of Ni (ppm) were increased markedly in response to 10 and 5 ppm of Ni treatments. Study the anatomical structures of the transverse and the longitudinal sections of main stem of *G. robusta* were showed an increments by treated with Zn at 100 ppm as compared with untreated plants. 4. The application of seaweed extract (algae) and humic acid on *G. robusta* seedlings resulted in the tallest plants, the greatest number of leaves/plant, the thickest stems and root, the maximum weights of all plant parts. Seedlings of *G. robusta* were obtained great response to humic acid and seaweed extract treatments, which produced the highest content of chlorophyll-a, b and total carotenoids as well as total carbohydrates (%D.W.), N, P and K% in the various parts.

Key words: *Pinus halepensis* Mill. and *Grevillea robusta* A. Cunn., biofertilizers, zinc, cobalt, nickel, selinum and biostimulants.

DEDICATION

This thesis is dedicated to both my parents whom I owe a great debt and can never ever be thanked enough. My late father Mohamed Abd El-Magied, thank you for instilling positive moral values, overwhelming love and care that you have given me. My mother, I am extremely thankful for ongoing love, support and constant encouragement, I never would have made this work without you. Great appreciation is due to my grandpa Mostafa Mohamed Abdel Reheem for showing me how to rely upon Allah as well as mean of faith and commitment. Heartfelt thanks to my daughter Lujain and my sister Shaimaa for their patience and all the support they lovely offered along the period of my post graduation as well as to my late brother Abd El-Rahman for his love and encouragement.

WITH MY GRATITUDE AND LOVE

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ARABIC SUMMARY	

INTRODUCTION

Pinus halepensis Mill. (Aleppo pine), belongs to family Pinaceae is one of the most economic domestic trees in Mediterranean area (Farjon and Filer, 2013 and Alfaro, *et al.*, 2015). Its range extends from northern and Middle East, up to southern Mediterranean Europe (Mitsopopoulos and Dimitrikopoulos, 2007), it easily adaptable to various ecoclimatic conditions and used as tree species in reforestation programs (Elaieb, *et al.*, 2017). Aleppo pine is a coniferous, evergreen tree which is member of the gymnosperms that growing to 25 m tall, trunk diameter up to 80cm, with needle-like leaves produced in pairs between 6 and 12cm long and the branches forming conical crown (Mauri *et al.*, 2016). Aleppo pine reproduces by seed only with high germination percentage but survival of the seedlings is low.

In the world nowadays, pines have a huge impact on economy due to the value of its timber, its pulp production, watershed management, fuel and ecological restoration (Fady, 2012), it has been used in several afforestation and reforestation programmes and soil protection (Pâques, 2013). Furthermore those, its drought tolerance have led to its use in high density plantations for controlling soil erosion (Prévosto *et al.*, 2011). *P. halepensis* is widely grown for a variety of amenity purposes, as windbreaks, shelterbelts and shade trees and it has considerable value as an ornamental tree in many temperate regions. The wood of the Aleppo pine is fairly strong, so in ancient Egypt was used it for boats, weapons, general construction and coffins. It could be valuable as furniture and/or structural material (Gale, *et al.*, 2000).