

**EFFECT OF PLANT DENSITY, SEED SIZE AND
SEAWEED EXTRACT ON PRODUCTIVITY
AND QUALITY OF SNAP BEAN SEEDS**

BY

YEHIA IBRAHIM MANSOUR ABU SEIF

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YEHIA IBRAHIM MANSOUR ABU SEIF

B.Sc. Agric. Sci. (Horticulture), Fayoum University, 2008

This thesis for M. Sc. Degree has been approved by:

Dr. Zakaria Fouad Fawzy Hassan

Researcher Prof. of Vegetable Crops, Agriculture and
Biological Research Division, National Research Centre

Dr. Sabry Moussa Soliman Youssef

Associate Prof. of Vegetable Crops, Faculty of Agriculture, Ain
Shams University

Dr. Salah El-Din Mahmoud El- Miniawy

Associate Prof. of Vegetable Crops, Faculty of Agriculture, Ain
Shams University (Principal Supervisor).

Date of Examination: 2016/ 12/ 12

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YEHIA IBRAHIM MANSOUR ABU SEIF

B.Sc. Agric. Sci. (Horticulture), Fayoum University, 2008

Under the supervision of:

Dr. Salah El-Din Mahmoud El- Miniawy

Associate Prof. of Vegetable Crops, Department of Horticulture,
Faculty of Agriculture, Ain Shams University (Principal
Supervisor).

Dr. Nashwa Attia Ibrahem Abu El-azm

Lecturer of Vegetable Crops, Department of Horticulture,
Faculty of Agriculture, Ain Shams University.

Dr. Amal Zakaria Abd El-Hak Hegazi

Head Research, Vegetable Crops Seed Production and
Technology Department, Horticulture Research Institute,
Agricultural Research Center.

ABSTRACT

Yehia Ibrahim Mansour Abu Seif: Effect of Plant Density, Seed Size and Seaweed Extract on Productivity and Quality of Snap Bean Seeds. Unpublished M.Sc. Thesis, Department of Horticulture, Faculty of Agriculture, Ain Shams University, 2017.

Two field experiments were conducted during the two growing summer seasons of 2013 and 2014 at the Experimental Farm of Vegetable Crops at Kaha, Qalyubia Governorate, Horticulture Research Institute, Agriculture Research Center (ARC), Egypt, in order to investigate the effect of seed size, plant density and foliar application with some algae extracts on vegetative growth, chemical composition, flowering characteristics and seed yield and its quality of snap bean cv. Valentino. Seed size, i.e., large, small and control (without grading), seeds were separated into two seed size classes by sieving through laboratory sieves (>4.76 mm for large seeds and > 4 mm for small seeds) and a random seed sample, taken from cleaned seeds, not graded and used as the control. Plant density at rate of 22 and 33 plants per m^2 obtained by planting seeds at 7.5 and 5 cm apart on one side of the irrigation line, respectively. Foliar application with some algae extracts such as seaweed (Algost at 3 ml/ l), fresh water algae (spirulina at 1 ml/ l), mixture of them (3 ml/ l of Algost + 1 ml/ l of Spirulina) and control (sprayed with distilled water). Plants were sprayed three times during the growing seasons, the first was after 21 days from sowing and then two weeks intervals.

A split-split plot design was used with three replications, where three seed sizes distributed randomly in the main plots and two plant population rates arranged in sub plots and foliar spray with algae extract treatments allocated in sub-sub plots. Results showed a clear enhancement of plant vegetative growth

parameters, chlorophyll, N, P, K contents of leaves and seed yield quantity and quality by sowing large seeds compared with other seed sizes. Meanwhile, higher plant density at rate of 33 plants per m² gave the highest values of plant length and seed yield per feddan, while the lower plant density at rate of 22 plants per m² gave the highest values of number of branches and leaves, leaf area as well as fresh and dry weight per plant, leaves chlorophyll and macro-elements (NPK) content, the percentage of fruit set and seed yield per plant as well as seed quality, on the other hand there were no significant differences in weight of 100 seeds between the two plant densities in both seasons. All foliar application with algae extracts significantly increased all the studied parameters of vegetative growth, seed yield and its quality compared to the control treatment. The best application was spray with the mixture between seaweed extract and fresh water algae extract together followed by spray with seaweed extract alone in the two seasons.

The three-way interaction indicated that sowing large seeds with higher plant density at rate of 33 plants per m² then spray plants with the mixture gave the highest significant increase in plant length and seed yield per feddan. Meanwhile, sowing large seeds with lower plant density at rate of 22 plants per m² and spray with seaweed extract alone or mix with fresh water algae extract gave the highest significant increase in other studied parameters.

Keywords: Snap bean, Plant density, Seed size, Foliar spray, Seaweed, Fresh water algae extract, Seed yield.

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INTRODUCTION

Beans (*Phaseolus vulgaris* L.) of Fabaceae family is considered one of the most important economic member of vegetable crops in Egypt for domestic consumption or for exportation. It is grown for green pods or to get its dry seeds. Also, it plays an important role for human nutrient as a good source of protein and carbohydrates. The total area cultivated with snap bean in Egypt is about 57163 feddan according to Economic Affairs Sector-Ministry of Agriculture 2013 with an average yield per fed. about 4.504 tons of green pods.

Snap bean cultivation in Egypt suffers from many problems led finally to minimizing either yield of green pods or seeds. There are many reasons for decline growth and yielding of snap bean:

1- Most growers used to produce their own seeds by allowing the tail end of their crops to mature into seeds or by cultivation a little area or obtain the seeds from uncertified other farms.

2- Uncertified seeds are cheap with unknown quality attributes and often small sized because of repeating cultivation of less quality seeds and without apply certificated practices for production high quality seeds.

3- The farmers use in the cultivation these seeds without volumetric grading process which lead to variation in plant growth and thus occur proportion of the deterioration in the crop output, both green pods or dry seeds.

Seed size is an important physical indicator of seed quality that affects vegetative growth and is frequently related to yield. Seed size plays a major role in germination and establishment of vigorous seedlings with higher seedling growth rates, tolerance to sub optimal conditions and pest and diseases resistance and

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subsequent development of plants to produce high yield. For a successful crop production, the use of good quality seed is very essential which increase the yield by 15-20 % (**Ambikaet al., 2014**). Generally, large seed is related to better agronomic aspects and thus has better field performance than small seed.

Also, plant density i.e., number of plants per unit area is an important agronomic practice that can affect crop yield. Optimal density is the density through which environmental factors (water, weather, light and soil) are used perfectly and at the same time inter-plant and intra-plant competition is minimized so that maximum possible yield and optimal quality are achieved. Studies showed that there was a significant difference between different plant density in terms of their effects on vegetative growth and seed yield traits of snap bean (**Tuarira and Moses, 2014**).

Another important agronomic practice is the foliar spray which can be of great effectiveness because within short time the plant can transports nutrition from its leaves all the way down to its roots. Some seaweed extract can be used as foliar spray and it is registered as a biostimulant. Previously, cytokinins, auxins and polyamines were identified in the algae extract. Recently, other groups of plant growth regulators, abscisic acid, gibberellins and brassinosteroids have been quantified (**Striket al., 201 4**). It elicits many beneficial responses including improvement root and shoot growth, higher yields and greater resistance to abiotic and biotic stresses.

Based on the previous information this investigation aimed to aid the growers within simple practices for maximize yield potential of snap bean crop. So we investigated the impact of sizing seeds before cultivation and if presence relation between seed size and its cultivation rate, we cultivated the three sizes of