RESPONSE OF SOME SNAP BEAN CULTIVARS TO SOWING DATES AND GAMMA IRRADIATION

By

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B.Sc. Agric. Sc. (Horticulture), Ain Shams University, 2003

M.Sc. Agric. Sc. (Vegetable Crops), Ain Shams University, 2011

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ABSTARACT

Amr Mohamed Mounir Farrag : Response of Some Snap Bean Cultivars to Sowing Dates and Gamma Irradiation. Unpublished Ph.D. Thesis, Department of Horticulture, Faculty of Agriculture, Ain Shams University, 2015.

The effect of three doses of gamma irradiation (0, 20 and 30 Gy) and their effect on three cultivars of snap bean Paulista, Xera and Bronco under different sowing dates ,i.e. the 1st, 8th and 15th of October was studied in an experimental farm during 2011/2012 and 2012/2013 seasons. The results revealed that the 1st of October scored the highest leaf and stem dry weight at all ages , plant length , leaf number at 30 DAP , leaf and stem fresh weight at 45 and 60 DAP, leaf area, number of branches and leaf area at 60 DAP. On the other hand, the 8th of October led to the highest values of plant length at all ages, leaf and stem fresh weight and leaf dry weight at 30 DAP, leaf area and number of branches at 30 and 45 DAP, stem fresh weight at 45 DAP and leaf number at 30 and 60 DAP. Regarding the effect of cultivars, cv. Bronco gave the highest leaf and stem fresh weight and leaf area at all ages, leaf number at 30 DAP and leaf dry weight at 45 and 60 DAP, whereas cultivar Paulista had the highest leaf and branch number and stem dry weight, also cultivar Xera gave the highest plant length and branch number at 30 DAP and leaf number and stem fresh and dry weight. Concerning gamma irradiation effect , 20 Gy significantly increased all growth parameters except leaf fresh weight at 45 DAP, stem dry weight at 30 DAP, plant length, leaf number and stem dry weight at 30 and 60 DAP, number of branches and leaf area at 60 DAP. On the other hand, 30 Gy produced the highest leaf fresh weight at 30 and 45 DAP, leaf number, number of branches, leaf dry weight and leaf area at 60 DAP. As for chemical constituents ,the 1st and 8th of October scored the highest gibberellin and indole acetic acid content, while the 15th of October gave the highest values of chlorophyll reading , total phenols and proline content in the first

season. It was found that cultivar Paulista significantly increased chlorophyll reading, total carbohydrate in the second season, while cultivar Xera led to the highest chlorophyll reading and proline content. It was found also that cultivar Bronco scored the highest total phenols in leaves. Regarding the effect of gamma irradiation, 20 Gy significantly increased chlorophyll reading, proline content, gibberellin and indole acetic acid, whereas 30 Gy led to the highest chlorophyll reading, total carbohydrate, total phenols, proline content, indole acetic acid and gibberellin.Concerning yield and its components, the 8th of October gave the highest pod number per plant, plant yield in the second season, local yield class1, exportable yield, total yield and the lowest local yield class 2 per feddan. Cultivar Paulista produced the highest pod length, local yield class1and the lowest local yield class 2, while cv. Bronco had the highest local yield class 2 and local yield class1, cultivar Xera gave the highest pod length, plant yield, and pod number per plant, exportable yield, total yield and the lowest local yield class 2 per feddan. The 20 Gy of gamma irradiation doses produced the highest pod length and fresh weight, plant yield, and pod number per plant, exportable yield, local yield class1and total yield and lowest local yield class 2 per feddan. The 30 Gy of gamma irradiation doses significantly increased pod thickness, pod length, pod fresh and dry weight and lowest local yield class 2 per feddan. Results indicated that the 1st and 15th of October produced the highest fiber percent in green pod , whereas the 15th of October increased total sugars and protein percentage in green pods .As for cultivars, cv. Paulista produced the highest fiber and protein percentage in green pods and cv. Bronco gave the highest percent of total sugars in green pods. Regarding the effect of gamma irradiation, 30 Gy significantly increased total sugars, fiber and protein percentage in green pods.

Key words: Snap bean, cultivars, sowing dates and gamma irradiation.

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CONTENTS

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LIST OF ABBREVIATIONS

Abbreviation	Meaning of abbreviation
A.O.A.C.	Association of official analytical chemists
Cm	Centimeter,
cv., cvs	Cultivar, Cultivars
Fed	Feddan
ha	hectar
g	Gram
Kg	Kilogram
M	Meter
cm^2	Square centimeter
m^2	Square meter
mm	milimeter
DAP	Day after planting
Kr, Krad	Kilo rad = 1000 rad
R, r	Roentegn
sec	Second
K Gy, K Gray	Kilo Gray = 1000 Gray
CO^{60}	Cobalt 60
Cs 137	Cesium 137
M1	First generation
M2	Second generation
γ	Gamma
h	hour
%	percent
C^o	Celsius
max	maximum
min	minimum
temp	temperature
agri	Agriculture
N.O.	number
ml	milliter
ISTA	International Seed Testing Association

1. INTRODUCTION

Snap bean (*Phaseolus vulgaris* L.*)* is one of the most important legumes of family Fabaceae worldwide for direct human consumption. The crop is consumed principally for its dry (mature) beans, shell beans (seeds at physiological maturity) and green pods. When consumed as seed, beans constitute an important source of dietary protein (22% of seed weight).Annual production of dry beans is around 15 million tonnes and average yield is 700 kg ha^{-1}, although yield in certain countries reach 2000-3000 kg ha^{-1}.

Annual production of green beans is around 4.5 million tones, with the largest production around the Mediterranean and the USA. The top producers of snap bean are China, Indonesia, India, Turkey, Thailand and Egypt at the 6^{th} rank with 263, 080 tonnes (FAO 2013).In Egypt snap bean is a major vegetable export crop second to potato in terms of foreign exchange earnings.

The main factor which affects the productivity of high quality exportable yield is the good choice of the suitable cultivars because some cultivars are suitable to the European markets than others. Pod quality characters are the major factor, which affect the percentage of exportable yield. Many investigators reported that the vegetative growth, total and exportable yield as well as pod quality of snap bean are greatly affected by genotype of the varieties (**Nassar ,1986; Abou El –Hassan *et al.* ,1993; Mohamed ,1997 ; Amer *et al.*,2002a).**

Lately a lot of cultivars are introduced in the local market, and they differ in their growth habit, sowing location, yield amount, pod characters and quality. Moreover, **Amer *et al.* (2002b)** concluded that the difference in pod yield of bean varieties might be attributed to the different genetic potentiality of every variety.

Also it is well known that common bean is environmentally sensitive to environmental stresses that may occur in the field