Zagazig J. Agric. Res., Vol. 45 No. (1) 2018 105-117

Plant Production Science

http:/www.journals.zu.edu.eg/journalDisplay.aspx?Journalld=1&queryType=Master

EFFECT OF ORGANIC, MINERAL AND BIO-NITROGEN FERTILIZATION ON GROWTH AND PRODUCTIVITY OF SOME SNAP BEAN CULTIVARS GROWN IN CLAY SOIL

Ahmed A.M. Abdallah*, A.A. Gad, A. Bardisi and Dalia A.S. Nawar

Hort. Dept., Fac. Agric. Zagazig Univ., Egypt

Received: 13/11/2017 ; Accepted: 17/12/2017

ABSTRACT: This work was carried out during the two successive summer seasons of 2016 and 2017 in a Private Farm, Dondet Village, Meet Ghamr District, Dakhlia Governorate, Egypt to study the effect of various sources of nitrogen fertilization which equal 60 kg N/fad., on growth, yield and pod quality of snap bean cultivars (Paulista and Bronco) grown in clay soil under flood irrigation. The results showed that, fertilizing Paulista cultivar with 30 kg N as organic nitrogen (ON) + 30 kg N as MN/fad., (ammonium sulphate) + Nr (nitrobein) increased dry weight of leaves, branches and shoot dry weight/ plant, chlorophyll a, b, total (a+b) in leaves tissues, total yield/fad., and average number of pods/ plant as well as total carbohydrates and total protein in green pods in both seasons. Whereas, the interaction between fertilizing of Bronco cultivar with 20 kg N as ON+40 kg N as MN/fad.,+Nr increased average pod weight and total fibers in green pods in both seasons.

Key words: Snap bean, organic, paulista, bronco, mineral and bio nitrogen, yield and pod quality.

INTRODUCTION

Snap bean (*Phaseolus vulgaris* L.) is one of the most important vegetable crops grown in Egypt not only for local consumption, but also for export purpose. In Egypt, the cultivated are of green beans plants in year of 2014 was 59.664 fad., which produced 253110 tons with average 4.242 ton/fad. (**FAOSTAT, 2015**).

For increasing the productivity of snap bean to meet the increment in human population, that may be achieved by increasing the cultivated area with using good cultivars for the best yield and good quality.

Many investigators reported that there were differences between snap bean cultivars for growth **(Abdel-Mawgoud *et al.*, 2005; Malagi, 2005 ; Ali 2015),** leaf pigments (**Ismail, 2000** on snap bean**; Nour, 2005** on cowpea**)**, yield and pod quality (**El-Hefny, 2010** on cowpea**; Mandour, 2014; Beshir *et al.*, 2015**; **Yunsheng *et al.*, 2015; Hamaiel *et al.*, 2016; Shafeek *et al.* 2017** on snap bean**)**.

Excessive amounts of inorganic fertilizers are applied to vegetables in order to achieve a higher yield. However, chemical fertilizers alone generate several deleterious effects to the environment and human health and also should be replenished in every cultivation season since, the synthetic N fertilizer is rapidly lost by either evaporation or by leaching in drainage water causing dangerous environmental pollution (**Ali *et al.*, 2007**). Moreover, continuous usage of inorganic fertilizer affects soil structure. Hence, organic manures can serve as alternative to mineral fertilizers, improving soil structure and microbial biomass (**Dauda *et al.*, 2008**). The role of nutrients is one of paramount importance in booting productivity and quality of snap bean which is a heavy feeder of mineral elements and continuous use of inorganic fertilizers resulted in a deficiency of micronutrients, imbalance in soil physiochemical properties and unsustainable crop production (**Jeyathilake *et al.*, 2006**). As a result, farmers are currently changing from conventional to organic farming systems which don't use synthetic fertilizers and pesticides

* **Corresponding author: Tel. :** +201008117058
E-mail address: dondait@gmail.com

(**Colla *et al*., 2002**). It is due to the continuous increase of prices of synthetic chemicals in the world market organic farming provides several benefits to the growers. It reduces production cost and it is an environmentally friendly method of cultivation. Addition of organic and bio fertilizers improves soil structure and enhances activities of useful soil organisms. Agricultural commodities resulted from organic cultivation are good for human health.

In this regard, fertilizing snap bean with organic, mineral and bio nitrogen increased plant growth (**Arisha and Bardisi, 1999; Mahmoud *et al*., 2010; El-Awadi *et al.*, 2011),** leaf pigments **(Arisha and Bardisi, 1999 on** snap bean, **Shokr, 2000 ; El-Mansi *et al*., 2000** on pea), yield and pod quality **(Shehata *et al.*, 2011; El-Seifi *et al*., 2013; Feleafel and Mirdad, 2014; Mandour, 2014; Sathe *et al.,* 2015; Alhrout *et al.* 2016; Bucagu *et al.*, 2017; Shafeek *et al.*, 2017** on snap bean).

Therefore, the object of this work was to evaluate the possibility of partial substitution of the expensive nitrogen chemical fertilizers by organic manure and nitrobein biofertilizer and their effects on the growth, productivity and green pod quality of two snap bean cultivars (Paulista and Bronco) grown in clay soil under flood irrigation.

MATERIALS AND METHODS

This work was carried out during the two successive summer seasons of 2016 and 2017 in a Private Farm, Dondet Village, Meet Ghamr District, Dakhlia Governorate, Egypt, to study the effect of various sources of nitrogen fertilization which equal 60 kg N/fad., on growth, yield and pod quality of snap bean cultivars (Paulista and Bronco) grown in clay soil under flood irrigation. The physical and chemical properties of the experimental soil are presented in Table 1.

This experiment included 16 treatments, which were the combinations between two cultivars (Paulista and Bronco) and 8 fertilization treatments (combinations among mineral, organic and bionitrogen fertilizers) as follows: 60 Kg N as organic N (ON), 60 Kg as mineral N (MN), 40 Kg N as ON + 20 Kg N as M N, 30 Kg N as ON + 30 Kg N as M N, 20 Kg N as ON +40 Kg N M N, 40 Kg N as ON + 20 Kg N as MN + nitrobein (Nr), 30 Kg N as ON + 30 Kg N as MN + Nr and 20 Kg N as ON +40 Kg N as MN + Nr. 60, 40, 30 and 20 kg N/fad., equivalent 7.89, 5.26, 3.95 and 2.63 ton FYM/ fad., respectively.

The treatments was arranged in a split plots in a complete block design with three replications. Snap bean cultivars was randomly distributed in the main plot and sources of nitrogen fertilization was randomly arranged in the sub plot.

N, P and K fertilizers, calcium super phosphate (16% P_2O_5) and potassium sulphate (48% K_2O) were added at rates of 300, 100 and 50 kg/fad., respectively. The phosphorus fertilizer was added during soil preparation and before seed sowing.

The mineral nitrogen as ammonium sulphat (20.6% N) at different rates and potassium fertilizers were divided into two equal parts and the first part was added during the soil preparation, the second part was added 35 days after seed sowing. The organic mineral (FY_{14}) at different rates was added during soil preparation.

Seeds of snap bean cv. Paulista or Bronco were obtained from Hort. Res. Inst., Agric. Res. Center, Egypt and sown on the second week of March in both seasons. The area of experimental plot was 10.5 m^2. Every plot consisted of 3 ridges 5 m in length and 0.7m in width one ridge was used to measure plant growth triats and the other two ridges were used to measure yield and its components. Seeds were sown in hills 15 cm apart on one side of ridge and two seeds per hill. The normal agriculture practices of snap bean under surface irrigation system were followed according to the recommendations of Agriculture Ministry. The chemical analysis of FYM used in this study is shown in Table 2.

The other normal agricultural treatments for growing snap bean plants were practiced.

Data Recorded

A random samples, each of ten plants from every experimental unit were taken after 60 days from sowing and the following data were recorded:

Dry weight

Different plant parts were oven dried at 70°C till constant weight, and the following data were recorded:

Table 1. The physical and chemical properties of the experimental soil in 2016 and 2017 seasons

	Clay (%)	Silt (%)	Sand (%)	Texture class	EC dS/cm	pH	OM (%)	Available (ppm)		
								N	P	K
2016 season	67.53	25.87	6.60	Clay loam	1.44	7.89	1.43	8.92	0.041	0.62
2017 season	69.	24.76	6.13	Clay loam	1.46	7.99	1.54	9.42	0.048	0.69

Table 2. Chemical composition of the applied farmyard manures (average two seasons)

Organic manure	pH	C (%)	N (%)	P (%)	K (%)
FYM	7.7	8.1	0.76	0.43	0.89

Dry weight of leaves, dry weight of branches and total dry weight (branches +leaves).

Photosynthetic pigments

Disk samples from the fourth upper leaf were obtained after 60 days from sowing in all plots to determined chlorophyll a and b as well as carotenoids in both seasons according to the method described by **Wettestein (1957)**.

Pod yield and its components

Green pods of each plot were harvested at the proper maturity stage, counted and weighted in each harvest and yield/plant and total fresh pod yield (fad.) were determined.

Ten plants were randomly marked from each plot for determining the number of pods/plant. Twenty pods were randomly chosen from each treatment to determine; average weight of pod.

Pod quality

Total carbohydrates (%): was determined in pods dry matter according to the method described by **Dubois *et al.* (1956)**.

Pod protein: pod protein percentage, pod total N was determined and a factor of 6.25 was used for conversion of total N to protein percentage (**Kelly and Bliss, 1975**).

Fiber percentage was determined in the dry matter of pods according to **AOAC (1995)**.

Statistical Analysis

The data of these experiments were subjected to proper statistical analysis of variance according to **Snedecor and Cochran (1980)** and the differences among treatments were compared using LSD at 0.05 level.

RESULTS AND DISCUSSION

Dry Weight

Effect of cultivars

There were significant differences between Paulista and Bronco cultivars in dry weight of leaves and total dry weight/plant, but there were no significant differences between them in branch dry weight in both seasons (Table 3).

Paulista cultivar recorded higher dry weight of leaves and total dry weight/plant compared to Bronco cultivar in both seasons.

Difference in growth attributes observed among cultivars may be due to the growth habit and to the genetically potential of each genotype. This might be due to the genetic differences among cultivars and their ability for utilizing the environmental sources especially light, CO_2, water and nutrients (**Hafiz and Damarany, 2006**).

These results are in agreement with those reported by **Abdel-Mawgoud *et al.* (2005)**, **Malagi (2005) and Ali (2015).**

Effect of organic, mineral and bio nitrogen fertilization

Fertilizing snap bean plants with organic, mineral and bio nitrogen had significant effect on dry weight of leaves, branches and total dry weight/ plant in both seasons (Table 3).

Fertilizing snap bean plants with 20 kg N as ON+40 kg N as MN/fad. + Nr significantly increased dry weight of leaves, branches and total dry weight in both seasons with no significant differences with 40 kg N as ON+20 kg N as MN/fad.+Nr in the 1st season and 30 kg N as ON+30 kg N as MN/fad.+Nr in the 2nd season

From foregoing results it could be concluded that, fertilizing with 40 kg N as ON+20 kg N as MN/fad.+ Nr., and 30 kg N as ON+30 kg N as MN/fad.+ Nr increased dry weight of leaves, branches and total dry weight/ plant.

These results are in agreement with those obtained with **Arisha and Bardisi (1999), Mahmoud *et al*. (2010) and El-Awadi *et al.* (2011)** on snap bean.

Effect of the interaction

The interaction between cultivars and organic, mineral and bio-nitrogen fertilization had significant effect on dry weight of leaves, branches and total dry weight in both seasons (Table 4).

Fertilizing Paulista cultivar with 30 kg N as ON+30 kg N as MN/fad. + Nr significantly increased dry weight of leaves, branches and total dry weight in both seasons, with no significant differences with 40 kg N as ON+20 kg N as MN/fad. + Nr., with respect to dry weight of leaves and total dry weight/ plant in the 1st season.

As for Bronco cultivar, fertilizing Bronco cultivar with 20 kg N as ON+40 kg N as MN/fad. +Nr increased dry weight of leaves, branches and total dry weight .

From foregoing results it could be concluded that, fertilizing with 30 kg N as ON+30 kg N as MN/fad. + Nr or with 20 kg N as ON+40 kg N as MN/fad.+ Nr increased dry weight of leaves, branches and total dry weight/ plant of Paulista cultivar, whereas, fertilizing with 20 kg N as ON+40 kg N as MN/fad. + Nr increased dry weight of leaves, branches and total dry weight/ plant of Bronco cultivar.

The positive effects of organic and bio nitrogen interaction may be attributed to farmyard manure activate many species of living organisms, which release phytohormones and may stimulate the plant growth and absorption of nutrients (**Arisha *et al*., 2003**). Such organisms need nitrogen and organic carbon for multiplication which is provided by the FYM. This is a plausible that use of FYM with biofertilizer showed a beneficial effect on vegetative growth characters of snap bean plants.

Photosynthetic Pigments

Effect of cultivars

There were significant differences between Paulista and Bronco cultivars in chlorophyll a (Chl.a), chlorophyll b (Chl. b), total chlorophyll (total Chl. a+b) and carotenoides in leaf tissues (Table 5).

Paulista cultivar recorded higher Chl.a, Chl. b, total Chl. a+b and carotenoides in leaf tissues compared to Bronco cultivar in both seasons.

The variability among the snap bean cultivars in leaf pigments might be due to the difference in their genetic constitutions. These results are supported by many researchers such as **Ismail (2000)** on snap and **Nour (2005)** on cowpea. In this respect, **Ismail (2000)** found that snap bean cultivars differed significantly in their leaf pigments.

Effect of organic, mineral and bio nitrogen fertilization

Fertilizing snap bean with organic, mineral and bio nitrogen had significant effect on Chl.a, Chl. b, total Chl. a+b and carotenoides in leaf tissues, except Chl. b in the 2nd season (Table 5).

As for Chl. a and total Chl (a+b), fertilizing with 30 kg N as ON+30 kg N as MN/fad.+Nr increased Chl. a and total Chl (a+b) in leaf tissues with no significant differences with 40 kg N as ON + 20 kg N as MN/fad., in the 1st season with respect to Chl.a. concerning carotenoides fertilizing with 40 kg N as ON+20 kg N as MN/fad., increased carotenoides in leaf tissues with no significant differences with 40 kg N as ON+20 kg N as MN/fad., and 30 kg N as ON+30 kg N as MN/fad.+ Nr in the 1st season.

Table 3. Effect of cultivars and organic, mineral and bio-nitrogen fertilization on dry weight of snap bean at 60 days after sowing during summer seasons of 2016 and 2017

Treatment	Dry weight of leaves (g)		Dry weight of branches (g)		Total dry weight/ plant (g)	
	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017
Effect of cultivar						
Paulista	5.12	5.86	2.08	3.14	7.20	9.01
Bronco	4.49	5.63	2.21	2.88	6.71	8.51
LSD at 0.05 level	0.38	0.18	NS	NS	0.35	0.43
Effect of fertilization treatments (kg/fad.)						
60 kg N as ON	3.67	3.65	1.80	2.43	5.47	6.08
60 Kg N as MN	3.98	4.53	2.00	2.38	5.98	6.92
40 Kg N as ON +20 Kg N as MN	3.95	5.00	1.86	2.33	5.82	7.33
30 Kg N as ON+30 Kg N as MN	4.52	5.97	1.85	3.05	6.37	9.02
20 Kg N as ON+40 Kg N as MN	5.18	6.05	2.32	3.28	7.50	9.33
40 Kg N as ON+20 Kg N as MN+Nr	5.85	6.52	2.43	3.23	8.28	9.75
30 Kg N as ON+30 Kg N as MN+Nr	5.47	7.00	2.23	3.77	7.70	10.77
20 Kg N as ON+40 Kg N as MN+Nr	5.83	7.27	2.68	3.62	8.51	10.88
LSD at 0.05 level	0.45	0.80	0.30	0.46	0.58	0.94

ON= organic nitrogen, MN= mineral nitrogen, Nr= nitrobein, 60, 40, 30 and 20 kg N/fad., equivalent 7.89, 5.26, 3.95and 2.63 ton FYM / fad., respectively.

Table 4. Effect of the interaction between cultivars and organic, mineral and bio-nitrogen fertilization on dry weight of snap bean at 60 days after sowing during summer seasons of 2016 and 2017

Treatment		Dry weight of leaves (g)		Dry weight of branches (g)		Total dry weight/ plant (g)	
Cultivar	Fertilization treatments (kg/ fad.)	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017
Paulista	**60 kg N as ON**	4.13	4.26	1.70	2.63	5.83	6.90
	60 Kg N as MN	4.50	4.76	2.00	2.66	6.50	7.43
	40 Kg N as ON +20 Kg N as MN	4.06	4.03	1.96	2.16	6.03	6.20
	30 Kg N as ON+30 Kg N as MN	4.10	4.83	1.73	3.36	5.83	8.20
	20 Kg N as ON+40 Kg N as MN	5.46	6.56	2.20	3.00	7.66	9.56
	40 Kg N as ON+20 Kg N as MN+Nr	6.46	6.90	2.36	3.33	8.83	10.23
	30 Kg N as ON+30 Kg N as MN+Nr	5.83	8.43	2.20	4.00	8.03	12.43
	20 Kg N as ON+40 Kg N as MN+Nr	6.40	7.13	2.46	4.00	8.86	11.13
Bronco	**60 kg N as ON**	3.20	3.03	1.90	2.23	5.10	5.26
	60 Kg N as MN	3.46	4.30	2.00	2.10	5.46	6.40
	40 Kg N as ON +20 Kg N as MN	3.83	5.96	1.76	2.50	5.60	8.46
	30 Kg N as ON+30 Kg N as MN	4.93	7.10	1.96	2.73	6.90	9.83
	20 Kg N as ON+40 Kg N as MN	4.90	5.53	2.43	3.56	7.33	9.10
	40 Kg N as ON+20 Kg N as MN+Nr	5.23	6.13	2.50	3.13	7.73	9.26
	30 Kg N as ON+30 Kg N as MN+Nr	5.10	5.56	2.26	3.53	7.36	9.10
	20 Kg N as ON+40 Kg N as MN+Nr	5.26	7.40	2.90	3.23	8.16	10.63
LSD at 0.05 level		0.63	1.13	0.43	0.65	0.82	1.33

ON= organic nitrogen, MN= mineral nitrogen, Nr= nitrobein, 60, 40, 30 and 20 kg N/fad., equivalent 7.89, 5.26, 3.95and 2.63 ton FYM / fad., respectively.

Table 5. Effect of the cultivars and organic, mineral and bio-nitrogen fertilization on leaf pigments (mg/100 mg DW) of snap bean at 60 days after sowing during summer seasons of 2016 and 2017

Treatment	Chl. a		Chl.b		Total (a+b)		Carotenoides	
	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017
				Effect of cultivars				
Paulista	215.00	238.66	116.80	126.56	331.80	365.21	129.86	130.07
Bronco	191.89	214.25	103.15	111.41	295.04	325.65	108.80	111.90
LSD at 0.05 level	15.01	6.29	5.73	7.07	20.35	7.16	10.04	6.85
				Effect of fertilization treatments (kg/fad.)				
60 kg N as ON	208.17	232.73	104.18	114.19	312.35	346.92	111.23	113.08
60 Kg N as MN	208.65	229.94	114.22	123.35	322.87	353.29	121.12	126.15
40 Kg N as ON +20 Kg N as MN	214.53	236.47	110.58	119.43	325.12	355.90	136.32	142.53
30 Kg N as ON+30 Kg N as MN	190.70	211.68	107.88	116.51	298.58	328.19	122.95	129.77
20 Kg N as ON+40 Kg N as MN	189.67	208.87	112.23	121.21	301.90	330.08	104.02	112.97
40 Kg N as ON+20 Kg N as MN+Nr	198.02	226.47	112.30	121.29	310.32	347.75	118.35	113.00
30 Kg N as ON+30 Kg N as MN+Nr	222.35	246.81	118.40	127.87	340.75	374.68	125.42	118.08
20 Kg N as ON+40 Kg N as MN+Nr	195.48	218.65	100.00	108.00	295.48	326.65	115.25	112.32
LSD at 0.05 level	9.45	11.79	5.73	NS	12.03	14.45	14.08	12.90

ON= organic nitrogen, MN= mineral nitrogen, Nr= nitrobein, 60, 40, 30 and 20 kg N/fad., equivalent 7.89, 5.26, 3.95and 2.63 ton FYM/fad., respectively.

From foregoing results it could be concluded that, fertilizing with 30 kg N as ON+30 kg N as MN/fad.+ Nr increased Chl. a, total Chl (a+b) and carotenoides in leaf tissues of snap bean.

The enhancing effect due to the increase in nitrogen dose on photosynthetic pigments might be owe much to that N is a constituent of molecule for chlorophyll. Moreover, nitrogen is the main constituent of all the amino acids and hence of proteins and lipids as glactolipid, acting as a structural components of chloroplasts. Correspondingly, an enhancement of protein synthesis and chloroplasts formation leads to an increase in chlorophyll and carotene (**Marschner, 1995**).

Hsieh and Hsu (1993) reported that the use of manure increased acidity, organic matter, available P, exchangeable Mg, Mn and Zn and this in turn may affect leaves pigments.

Similar results were obtained by **Arisha and Bardisi (1999)** on snap bean, **Shokr (2000) and El-Mansi *et al*. (2000)** on pea.

Effect of the interaction

Obtained results in Table 6 show that, the interaction between cultivars and organic, mineral and bio-nitrogen fertilization had a significant effect on Chl.a, Chl. b, total Chl. a+b and carotenoides in leaf tissues.

Fertilizing Paulista cultivar with 30 kg N as ON+30 kg N as MN/fad.+Nr gave the highest values of concentration of Chl.a , Chl. b, total Chl. a+b and carotenoides in leaf tissues in both seasons.

Fertilizing Bronco cultivar with 40 kg N as ON+20 kg N as MN/fad. +Nr, 30 kg N as ON+30 kg N as MN/fad. +Nr and 20 kg N as ON+40 kg N as MN/fad. +Nr gave the lowest values of Chl.a, Chl. b, total Chl. a+b and carotenoides concentrations in leaf tissues.

Yield and its Components

Effect of cultivars

There were significant differences between Paulista and Bronco cultivars in yield/plant and

Table 6. Effect of the interaction between cultivars and organic, mineral and bio-nitrogen fertilization on leaf pigments (mg/100 mg DW) of snap bean at 60 days after sowing during summer seasons of 2016 and 2017

Treatment		Chl. a		Chl.b		Total (a+b)		Carotenoides	
Cultivar	Fertilization treatments (kg/fad.)	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017
Paulista	60 kg N as ON	213.03	233.13	111.60	123.86	324.63	357.00	104.20	99.61
	60 Kg N as MN	200.73	219.48	119.83	129.42	320.57	348.90	107.90	108.55
	40 Kg N as ON +20 Kg N as MN	211.33	231.25	110.73	119.59	322.07	350.84	139.07	142.13
	30 Kg N as ON+30 Kg N as MN	182.43	202.50	105.40	113.83	287.83	316.34	129.83	138.92
	20 Kg N as ON+40 Kg N as MN	206.13	225.48	112.90	121.93	319.03	347.41	110.87	121.96
	40 Kg N as ON+20 Kg N as MN+Nr	214.13	251.02	126.87	137.02	341.00	388.04	150.83	148.39
	30 Kg N as ON+30 Kg N as MN+Nr	266.67	296.00	139.80	150.98	406.47	446.98	159.50	152.70
	20 Kg N as ON+40 Kg N as MN+Nr	225.57	250.38	107.23	115.81	332.80	366.19	136.70	128.30
Bronco	60 kg N as ON	203.30	232.33	96.77	104.51	300.07	336.84	118.27	126.54
	60 Kg N as MN	216.57	240.39	108.60	117.29	325.17	357.68	134.33	143.74
	40 Kg N as ON +20 Kg N as MN	217.73	241.69	110.43	119.27	328.17	360.96	133.57	142.92
	30 Kg N as ON+30 Kg N as MN	198.97	220.85	110.37	119.19	309.33	340.05	116.07	120.62
	20 Kg N as ON+40 Kg N as MN	173.20	192.25	111.57	120.49	284.77	312.74	97.17	103.97
	40 Kg N as ON+20 Kg N as MN+Nr	181.90	201.91	97.73	105.55	279.63	307.46	85.87	77.61
	30 Kg N as ON+30 Kg N as N+Nr	178.03	197.62	97.00	104.76	275.03	302.37	91.33	83.46
	20 Kg N as ON+40 Kg N as N+Nr	165.40	186.93	92.77	100.19	258.17	287.12	93.80	96.33
LSD at 0.05 level		13.37	16.68	8.11	8.31	17.01	20.44	19.92	18.25

ON= organic nitrogen, MN= mineral nitrogen, Nr= nitrobein, 60, 40, 30 and 20 kg N/fad., equivalent 7.89, 5.26, 3.95and 2.63 ton FYM/fad., respectively.

total yield/fad., in both seasons, except yield/ plant in the 1st season (Table 7).

Paulista cultivar recorded higher total yield/ fad., pod length and pod number/plant whereas, Bronco cultivar gave higher average pod weight in both seasons. The variability among the snap bean cultivars in yield components might be due to the difference in their genetic constitutions.

The increases in total yield was about 7.12 and 7.62% for Paulista cultivar than Bronco cultivar in the 1st and 2nd seasons, respectively.

The differences between cultivars in yield per faddan (Table 7) as a result of their variation in the total dry weight (Table 3) and leaf pigments (Table 5). Such results were obtained by **El-Hefny (2010)** on cowpea; **Mandour (2014), Beshir *et al.* (2015)**, **Yunsheng *et al.* (2015), Hamaiel *et al.* (2016) and Shafeek *et al.* (2017)** on snab bean. They found that yield and its components of snap bean are greatly affected by cultivars.

Effect of organic, mineral and bio nitrogen fertilization

Using organic, mineral and bio nitrogen fertilization had significant effect on yield/ plant and total yield/fad., in both seasons (Table 7).

Fertilizing snap bean plants with 20 kg N as ON + 40 kg N as MN/fad. + Nr, significantly increased yield/plant and total yield/fad., pod length, pod number/plant and average pod weight with no significant differences with 40

Table 7. Effect of cultivars and organic, mineral and bio-nitrogen fertilization on yield and its components of snap bean during summer seasons of 2016 and 2017

Treatment	Pod number/ plant		Average pod weight (g)		Yield/ plant (g)		Total yield (ton/fad.)		Relative increases in total yield (%)	
	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017
Effect of cultivars										
Paulista	15.93	16.18	5.03	5.90	82.67	96.07	3.791	3.858	107.12	107.62
Bronco	13.32	13.94	5.92	6.65	83.57	89.70	3.539	3.585	100.00	100.00
LSD at 0.05 level	0.31	0.48	0.07	0.50	NS	3.17	0.062	0.139	--	--
Effect of fertilization treatments (kg/ fad.)										
60 kg N as ON	10.83	11.56	4.20	4.72	48.24	50.89	3.001	3.181	91.80	96.60
60 Kg N as MN	12.86	13.23	4.84	5.44	63.75	69.63	3.269	3.293	100.00	100.00
40 Kg N as ON +20 Kg N as MN	14.73	15.33	5.63	6.32	85.96	92.38	3.341	3.361	102.20	102.06
30 Kg N as ON+30 Kg N as MN	15.03	15.46	5.66	6.36	87.15	94.91	3.562	3.483	108.96	105.77
20 Kg N as ON+40 Kg N as MN	15.43	15.98	5.78	6.50	91.90	99.55	3.844	3.850	117.59	116.91
40 Kg N as ON+20 Kg N as MN+Nr	16.51	16.76	6.15	7.08	102.72	116.33	3.966	4.096	121.32	124.39
30 Kg N as ON+30 Kg N as MN+Nr	15.10	15.38	5.41	6.58	83.19	100.33	4.182	4.238	127.93	128.70
20 Kg N as ON+40 Kg N as MN+Nr	16.51	16.76	6.11	7.20	102.10	119.07	4.158	4.269	127.19	129.64
LSD at 0.05 level	0.82	0.64	0.18	0.39	5.31	8.26	0.132	0.135	--	---

ON= organic nitrogen, MN = mineral nitrogen, Nr= nitrobein, 60, 40, 30 and 20 kg N/fad., equivalent 7.89, 5.26, 3.95and 2.63 ton FYM/fad., respectively.

kg N as ON + 20 kg N as MN/fad. + Nr in both seasons with respect to yield/plant and with 30 kg N as ON + 30 kg N as MN/fad. + Nr in both seasons with respect to total yield/faddan.

The increases in total yield was about 27.93 and 28.70% for fertilizing snap bean with 30 kg N as ON + 30 kg N as MN/fad. +Nr than that plants which fertilized with 60 Kg MN/fad., in the 1st and 2nd seasons, respectively.

The maximum yield in 30 kg N as ON + 30 kg N as MN/fad. + Nr was due to more number of pods and large sized green pods as well as increased vegetative growth and balanced C/N ration, which might have increased the synthesis of carbohydrates which ultimately promoted greater growth and yield. It has been also reported that, the secret of hormones like IAA, cytokinin, auxin and GA which might have been another factor for increasing the yield (**Brown *et al.*, 1993**).

The positive effects of organic and bio nitrogen interaction may be attributed to FYM activated many species of living organisms, which release phytohormones and may stimulate the plant growth and absorption of nutrients (**Arisha *et al.*, 2003**) on some pepper *cvs*. Such organisms need nitrogen and organic carbon for multiplication which is provided by the FYM. This is a plausible that use of FYM with biofertilizer showed a beneficial effect on vegetative growth characters of snap bean plants. Moreover, this interaction in improving nutrient availability in the root zone and accordingly reflected in increasing the vegetative growth, and pods yield characteristics of snap bean.

In this regard, **Chaudhari *et al.* (2001)** reported that highest green pod yield per plant in French bean was due to the combine application of organic and inorganic manure and fertilizer. Similar results were noticed by **Shehata *et al.* (2011), El-Seifi *et al.* (2013), Fleafel and Mirdad (2014), Sathe *et al.* (2015), Alhrout *et al.* (2016) and Bucagu *et al.* (2017)** on snap bean.

Effect of the interaction

The interaction between cultivars and organic, mineral and bio-nitrogen fertilization had significant effect on yield/plant and total yield/ fad., in both seasons (Table 8).

As for yield/plant, fertilizing Paulista with 20 kg N as ON + 40 kg N as MN/fad. + Nr, significantly increased yield/plant, whereas, fertilizing Bronco with 40 kg N as ON + 20 kg N as MN/fad. + Nr increased yield/plant in both seasons.

Respecting total yield/fad., and pod traits, fertilizing Paulista and Bronco with 30 kg N as ON+30 kg N as MN/fad. + Nr and 20 kg N as ON+40 kg N as MN/fad. + Nr increased total yield/fad., pod length and average number of pods/plant in both seasons. The interaction between fertilizing Bronco with 20 kg N as ON+40 kg N as MN/fad. + Nr increased average pod weight in both seasons

The increases in total yield was about 37.06 and 40.67% for the interaction between fertilizing Paulista with 30 kg N as ON+30 kg N as MN/fad. + Nr and was about 30.03 and 34.92 for the interaction between fertilizing Bronco with 30 kg N as ON+30 kg N as MN/fad.+Nr than the interaction between fertilizing Bronco with 60 kg N as MN/fad., in the 1st and 2nd seasons, respectively.

Pod Qulaity

Effect of cultivars

There were significant differences between two cultivars in total carbohydrates, total fiber and total protein in pod (Table 9).

Paulista cultivar gave higher total carbohydrates and total protein in pods, whereas, Bronco cultivar gave higher total fiber in pods in both seasons.

Similar results were obtained by **Hamaiel *et al.* (2016) and Shafeek *et al.* (2017)**. They found that pod quality of snap bean is greatly affected by cultivars.

Effect of organic, mineral and bio nitrogen fertilization

Results in Table 9 show that, organic, mineral and bio nitrogen fertilization had significant effect on total carbohydrates, total fiber and total protein in pod in both seasons.

Fertilizing snap bean plants with 30 kg N as ON+30 kg N as MN/fad.+Nr increased total carbohydrates, total fiber and total protein in pods in both seasons. Whereas, 20 kg N as ON+40 kg N as MN/fad., or 20 kg N as ON+40 kg N as MN/fad. +Nr increased total fiber in pods in both seasons.

These results are similar to that recorded by **Mandour (2014) and Shafeek *et al.* (2017)** on snap bean.

Effect of the interaction

Results in Table 10 show that the interaction between cultivars and organic, mineral and bio-nitrogen fertilization reflect significant effect in total carbohydrates, total fiber and total protein in pod in both seasons.

Fertilizing Paulista cultivar with 30 kg N as ON + 30 kg N as MN/fad.+Nr, significantly increased total carbohydrates and total protein in both seasons, with no significant differences with 20 kg N as ON+40 kg N as MN/fad.+Nr in the 1st season, as well as with 40 kg N as ON+20 kg N as MN/fad. + Nr and 30 kg N as ON+30 kg N as MN/fad., in the 2nd season.

Fertilizing Bronco cultivar with 30 kg N as ON+30 kg N as MN/fad. + Nr or with 20 kg N as ON+40 kg N as MN/fad. + Nr, significantly increased total carbohydrates and total protein in pods.

As for total fiber, fertilizing Bronco cultivar with 20 kg N as ON+40 kg N as MN/fad. or with 40 kg N as ON+20 kg N as MN/fad.+Nr significantly increased total fiber in pods.

These results are confirm finding by **Mandour (2014) and Shafeek *et al.* (2017)** on snap bean.

Table 8. Effect of the interaction between cultivars and organic, mineral and bio-nitrogen fertilization on yield and its components of snap bean during summer seasons of 2016 and 2017

Treatment		Pod number/ plant		Average pod weight (g)		Yield / plant (g)		Total yield (ton/fad.)		Relative increases in total yield	
Cultivar	Fertilization treatment (kg/fad.)	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017
Paulista	60 kg ON	11.30	12.26	3.65	4.10	44.77	46.35	3.19	3.376	101.92	109.75
	60 kg N as ON	13.86	14.23	4.40	4.95	62.76	68.70	3.40	3.510	108.63	114.11
	60 Kg N as MN	15.86	16.00	4.99	5.61	79.99	89.13	3.49	3.450	111.50	112.16
	40 Kg N as ON +20 Kg N as MN	16.26	16.40	5.11	5.75	83.96	93.58	3.65	3.757	116.61	122.14
	30 Kg N as ON+30 Kg N as MN	16.96	17.33	5.32	5.98	92.29	101.53	3.99	3.983	127.48	129.49
	20 Kg N as ON+40 Kg N as MN	17.53	17.46	5.48	6.50	95.87	113.90	4.05	4.102	129.39	133.36
	40 Kg N as ON+20 Kg N as MN+Nr	17.13	17.10	5.37	7.03	91.84	120.50	4.29	4.327	137.06	140.67
	30 Kg N as ON+30 Kg N as MN+Nr	18.53	18.66	5.89	7.28	109.95	134.89	4.25	4.361	135.78	141.78
Bronco	60 kg N as ON	10.36	10.86	4.75	5.34	51.71	55.43	2.81	2.986	89.78	97.07
	60 Kg N as MN	11.86	12.23	5.28	5.94	64.73	70.56	3.13	3.076	100.00	100.00
	40 Kg N as ON +20 Kg N as MN	13.60	14.66	6.26	7.04	91.94	95.64	3.18	3.273	101.60	106.40
	30 Kg N as ON+30 Kg N as MN	13.80	14.53	6.21	6.98	90.33	96.24	3.47	3.210	110.86	104.36
	20 Kg N as ON+40 Kg N as MN	13.90	14.63	6.24	7.02	91.51	97.58	3.69	3.717	117.89	120.84
	40 Kg N as ON+20 Kg N as MN+Nr	15.50	16.06	6.82	7.66	109.57	118.75	3.88	4.091	123.96	133.00
	30 Kg N as ON+30 Kg N as MN+Nr	13.06	13.66	5.46	6.14	74.55	80.15	4.07	4.150	130.03	134.92
	20 Kg N as ON+40 Kg N as MN+Nr	14.50	14.86	6.33	7.12	94.25	103.25	4.06	4.177	129.71	135.79
LSD at 0.05 level		1.16	0.91	0.25	0.55	7.51	11.68	0.187	0.192	--	--

ON= organic nitrogen, MN= mineral nitrogen, Nr= nitrobein, 60, 40, 30 and 20 kg N/fad., equivalent 7.89, 5.26, 3.95and 2.63 ton FYM/fad., respectively.

Table 9. Effect of cultivars and organic, mineral and bio-nitrogen fertilization on pod quality of snap bean during summer seasons of 2016 and 2017

Treatment	Total carbohydrates (%)		Total fiber (%)		Total protein (%)	
	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017
	Effect of cultivars					
Paulista	23.92	26.14	7.077	8.23	15.21	18.41
Bronco	23.33	25.65	7.914	9.24	14.53	17.58
LSD at 0.05 level	0.54	NS	0.09	0.07	0.32	0.37
	Effect of fertilization treatments (kg/fad.)					
60 kg N as ON	22.23	24.16	6.87	7.84	12.87	15.57
60 Kg N as MN	22.54	24.76	7.48	8.75	14.81	17.92
40 Kg N as ON +20 Kg N as MN	23.45	25.80	7.46	8.73	14.53	17.58
30 Kg N as ON+30 Kg N as MN	23.51	25.86	7.56	8.85	14.78	17.89
20 Kg N as ON+40 Kg N as MN	23.67	26.04	7.79	9.11	15.41	18.65
40 Kg N as ON+20 Kg N as MN+Nr	23.87	26.26	7.57	8.86	15.07	18.23
30 Kg N as ON+30 Kg N as MN+Nr	25.24	27.76	7.52	8.73	16.13	19.52
20 Kg N as ON+40 Kg N as MN+Nr	24.50	26.52	7.69	8.99	15.38	18.61
LSD at 0.05 level	0.51	0.88	0.07	0.18	0.31	0.39

ON= organic nitrogen, MN= mineral nitrogen, Nr= nitrobein, 60, 40, 30 and 20 kg N/fad., equivalent 7.89, 5.26, 3.95and 2.63 ton FYM/fad., respectively.

Table 10. Effect of the interaction between cultivars and organic, mineral and bio-nitrogen fertilization on pod quality of snap bean during summer seasons of 2016 and 2017

Treatment		Total carbohydrates (%)		Total fiber (%)		Total protein (%)	
Cultivar	Fertilization treatment (kg/fad.)	Season 2016	Season 2017	Season 2016	Season 2017	Season 2016	Season 2017
Paulista	**60 kg ON**	22.61	24.29	6.56	7.413	14.06	17.013
	60 kg N as ON	22.74	25.02	7.17	8.393	15.38	18.610
	60 Kg N as MN	23.91	26.30	6.99	8.180	14.82	17.930
	40 Kg N as ON +20 Kg N as MN	24.26	26.69	7.15	8.370	14.94	18.080
	30 Kg N as ON+30 Kg N as MN	23.72	26.10	7.36	8.610	15.32	18.540
	20 Kg N as ON+40 Kg N as MN	24.26	26.69	7.04	8.230	15.51	18.770
	40 Kg N as ON+20 Kg N as MN+Nr	25.35	27.89	7.22	8.316	16.76	20.280
	30 Kg N as ON+30 Kg N as MN+Nr	24.57	26.16	7.12	8.330	14.94	18.080
Bronco	**60 kg N as ON**	21.86	24.04	7.18	8.283	11.68	14.130
	60 Kg N as MN	22.35	24.50	7.80	9.120	14.25	17.240
	40 Kg N as ON +20 Kg N as MN	23.00	25.30	7.94	9.280	14.25	17.240
	30 Kg N as ON+30 Kg N as MN	22.77	25.04	7.98	9.340	14.63	17.700
	20 Kg N as ON+40 Kg N as MN	23.62	25.98	8.22	9.623	15.51	18.770
	40 Kg N as ON+20 Kg N as MN+Nr	23.48	25.83	8.11	9.490	14.63	17.700
	30 Kg N as ON+30 Kg N as MN+Nr	25.13	27.64	7.82	9.150	15.51	18.770
	20 Kg N as ON+40 Kg N as MN+Nr	24.43	26.88	8.26	9.660	15.82	19.140
LSD at 0.05 level		0.72	1.24	0.09	0.26	0.44	0.55

ON= organic nitrogen, MN= mineral nitrogen, Nr= nitrobein, 60, 40, 30 and 20 kg N/fad., equivalent 7.89, 5.26, 3.95 and 2.63 ton FYM / fad., respectively.

REFERENCE

Abdel-Mawgoud, A.M.R., M. El-Desuki, S.R. Salman and S.D. Abou-Hussein (2005). Performance of some snap bean varieties as affected by different levels of mineral fertilizers. J. Agron., 4: 242-247.

Alhrout, H.H., H. Aldal'in, A.M. Haddad, N.M. Bani-Hani and S.Y. Al-Dalein (2016). The impact of organic and inorganic fertilizers on yield and yield components of common bean (*Phaseolus vulgaris*). Adv. in Environ. Biol., 10 (9) : 8-13

Ali, A.H., F.A. Rizk, A.M. Shaheen and M.M. Abdel-Mouty (2007). Onion plant growth, bulbs yield and its physical and chemical properties as affected by organic and natural fertilization. Res. J. Agric. and Biol. Sci., 3 (5): 380-388.

Ali, M. (2015). Effect of foliar spray of glutamine on growth, yield and quality of two snap bean varieties. J. Agric. Sci. Eng., 1 (2): 39-45.

AOAC (1995). Association of Official Agricultural Chemists. Official Methods of Analysis. 10th. Ed. AOAC, wash., D.c.

Arisha, H.M. and A. Bardisi (1999). Effect of nitrogen fertilization and plant spacing on growth, yield and pod quality of common bean under sandy soil conditions. Zagazig J. Agric. Res., 26 (2): 407-419.

Arisha, H.M., A.A. Gad and S.E. Younes (2003). Response of some pepper cultivars to organic and mineral nitrogen fertilizer under sandy soil conditions. Zagazig J. Agric. Res., 30: 1875-1899.

Beshir, H.M., F.L. Walley, R. Bueckert and B. Tar'an (2015). Response of snap bean cultivars to rhizobium inoculation under dryland agriculture in Ethiopia. Agron., 5 (3): 291-308.

Brown, J.E., C.H. Gilliam and R.L. Shumack (1993). Commercial snap bean response of fertilization with broiler litter. Hort. Sci., 28 : 29-31.

Bucagu, C., B. Ufitinema, D. Umutoniwabo, F. Niyitanga and A. Karangwa (2017). Effect of sheep manure and phosphorus fertiliser on productivity of snap bean (*Phaseolus vulgaris* L.) in northern Rwanda. J. Agric. and Ecol. Res. Int., 12 (1): 1-9.

Chaudhari, C.S., S.N. Mendhe, W.S. Pawar, A.S. Ingole and R.R Nikam (2001). Nutrient management in French bean. J. Soil Crop, (1): 137-139.

Colla, G., J. Mitchell, D. Poudel and S. Temple (2002). Changes of tomato yield and fruit elemental composition in conventional, low input, and organic systems. J. Sustainable Agric., 20 (2): 53-67.

Dauda, S.N., F.A. Ajayi and E. Ndor (2008). Growth and yield of water melon (*Citrullus lanatus*) as affected by poultry manure application. J. Agric. and Social Sci., 4 : 121-124

Dubois, M., K. Gilles, J. Hamillon, P.A. Rebers and F. Smith (1956). Colorimeteric methods for determination of sugars and related substances. Ana. Chem., 28 : 350.

El-Awadi, M.E., A.M. El-Bassiony, Z.F. Fawzy and M.A. El-Nemr (2011). Response of snap bean (*Phaseolus vulgaris* L.) plants to nitrogen fertilizer and foliar application with methnionne and tryptophan- Nature and Sci., 9 (5): 87-95.

El-Hefny, E.M. (2010). Effect of saline irrigation water and humic acid application on growth and productivity of two cultivars of cowpea (*Vigna unguiculata* (L.) Walp). Aust. J. Basic and Appl. Sci., 4 (12): 6154-6168.

El-Mansi, A.A., A. Bardisi and S.A. El-Atabany (2000). Effect of *Rhizobium* and soil plastic mulch on nodulation, plant growth and yield of pea under sandy soil conditions. Zagazig J. Agric. Res., 27 (4): 899-912.

El-Seifi, S.K., M.A. Hassan and A.M. Al-Saeed (2013). The effect of organic, mineral and biofertilization on growth, yield and chemical composition of pigeon pea (*Cajanus cajan*) under Ismailia region conditions. J. Plant Prod., Mansoura Univ., 4 (4): 693 – 703.

FAOSTAT (2015). Food and Agriculture Organization of the United Nations.

Fleafel, M.B. and Z.M. Mirdad (2014). Influence of organic nitrogen on the snap bean grown in sandy soil. Int. J. Agric. Bio., (16): 65-72.

Hafiz, N.A. and A.M. Damarany (2006). Variation in the susceptibility of some cowpea (*Vigna unguiclata* L.) genotypes to infestation with certain pests in upper Egypt. Ass. Univ. Bul. Environ. Res., 9(1): 122-128.

Hamaiel, A.F., M.S. Hamada, M.M.B. Shokr and E.M.M. Abd-Elrhem (2016). Response of some snap bean cultivars to foliar application with some antioxidant substances for increasing productivity and quality under local environments at early summer season. J. Plant Prod., Mansoura Univ., 7 (11): 1221 – 1231.

Hsieh, C.F. and K.N. Hsu (1993). Effect of organic manures on the growth and yield of sweet pepper. Bulletin of Taichung District Agric. Improv. Station, 42:1-10.

Ismail, T.B.A. (2000). Response of snap bean varieties to drip irrigation rates under sandy soil conditions. M. Sc. Thesis, Fac. Agric., Suez Canal Univ., Egypt.

Jeyathilake, P.K.S., I.P. Reddy, D. Srihari and K.R. Reddy (2006). Productivity and soil fertility status as influenced integrated use of N-fixing Biofertilizers, organic manures and inorganic fertilizers in onion. J. Agric. Sci., 2 (1): 46-58.

Kelly, I.D. and F.A. Bliss (1975). Heritability estimates of percentage seed protein and

available methionine and correlations with yield in dry bean. Crop Sci., 15: 753-757.

Mahmoud, A.R., M.M. El-Desuki and M. Abdel-Mouty (2010). Response of snap bean plants to bio-fertilizer and nitrogen level application. Int. J. Acad. Res., 2(3): 179-183.

Malagi, S.C. (2005). Response of cowpea genotypes to plant density and fertilizer levels under rainfed vertisols. M. Sc. Thesis, Agron. Dept., Fac. Agric., Dharwad Univ. Agric. Sci.

Mandour, M.A. (2014). Response of two snap bean cultivars to nitrogen fertilizer sources under sandy soil conditions. Global J. Agric. Food Safety Sci., 1(2): 52-66.

Marschner, H. (1995). Mineral Nutrition of Higher Plants. 2nd Ed., Academic Press Limeted, Text Book.

Nour, Kh.A. (2005). Response of some cowpea (*Vigna unguiculate* L.) cultivars to some irrigation levels by drip system and organic manure under sandy soil condition. Ph.D. Thesis, Fac. Agric., Mnsoura Univ., Egypt.

Sathe , B.A., R.V.Gore and R.R. Rathod (2015). Effect of different sources of nitrogen on growth and yield of French bean (*Phaseolus vulgaris* L.) cv. Arka Komal. J. Agric. and Vet. Sci., 8 (4) : 44-46.

Shafeek, M.R., A.M. Shaheen, M.M. Hafez, A.R. Mahmoud and A.H. Ali (2017). Influence of cattle manure levels on the snap bean cultivars grown in sandy soil condition. Middle East J. Appl. Sci., 7 (3): 430-438.

Shehata, S.A., Y.M. Ahmed, E.S. Shalaby and O.D. Saleh (2011). Influence of compost rates and application time on growth, yield chemical composition of snap bean (*Phaseolus vulgaris* L.). Aust. J Basic Appl. Sci., 9 (5): 530 – 536.

Shokr, M.M.B. (2000). Response of some cultivars of pea (*Pisum sativum* L.) to planting date and NPK fertilization. Ph.D. Thesis, Fac. Agric., Mansoura Univ., Egypt.

Snedecor, G.W. and W.G. Cochran (1980). Statistical Methods. 7th Ed. Iowa State Univ., Press, Ames., Iowa, USA.

Wettestein, D. (1957). Chlorophyll. Lethale under submikroskopische formwechsel der plastiden. Exptl. Cell Reso., 12:427-506.

Yunsheng, L., A.M. El-Bassiony, M.E. El-Awadi and Z.F. Fawzy (2015). Effect of foliar spray of asparagine on growth, yield and quality of two snap bean varieties. Agric. Bio. Sci. J., 1 (3): 88-94.

تأثير التسميد النيتروجيني العضوي والمعدني والحيوي على نمو وإنتاجية بعض أصناف الفاصوليا النامية في أرض طينية

احمد عبد الله محمد عبد الله - عبد المنعم عامر جاد - عبد الله برديسى - داليا أحمد سامى نوار

قسم البساتين- كلية الزراعة- جامعه الزقازيق- مصر

أجرى هذا العمل خلال صيف موسمى ٢٠١٦ ، ٢٠١٧ بمزرعة خضر خاصة بقرية دنديط مركز ميت غمر – محافظة الدقهلية – مصر بهدف دراسة تأثير مصادر التسميد النتيروجينى والتى تساوى ٦٠ كجم نيتروجين/ فدان على النمو، المحصول وجودة القرون فى صنفى الفاصوليا بوليستا وبرونكو النامى فى الأرض الطينية تحت ظروف الري بالغمر، وقد أظهرت النتائج أن معاملة التفاعل بين تسميد الصنف بوليستا بمعدل ٣٠ كجم نيتروجين من المصدر العضوى (سماد الماشية) +٣٠ كجم نيتروجين من المصدر المعدني (سلفات النشادر) + المخصب الحيوي النيتروجيني (النيتروبين) أدى إلى زيادة الوزن الجاف للأوراق ، الوزن الجاف للأفرع، الوزن الجاف الكلى للعرش، محتوى الأوراق من كلورفيل أ ، ب، الكلورفيل الكلى (أ+ب)، المحصول الكلى للفدان، ومتوسط عدد القرون/نبات، وكذلك محتوى القرون الخضراء من الكربوهيدرات الكلية والبروتين الكلى في كلا الموسمين، بينما سجلت معامله التفاعل بين تسميد الصنف برونكو بمعدل ٢٠ كجم نيتروجين من المصدر العضوي +٤٠ كجم نيتروجين من المصدر المعدني + المخصب الحيوي النيتروجينى قد ادى الى زيادة متوسط وزن القرن ومحتوى القرون الخضراء من الألياف فى كلا الموسمين.

المحكمون :

١- أ.د. فتحي أبو النصر أبو سديرة أستاذ الخضر – كلية الزراعة بمشتهر – جامعة بنها.

٢- أ.د. محســـن حســـن السواح أستاذ الخضر المتفرغ – كلية الزراعة – جامعة الزقازيق.