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Assessment of snap bean (*Phaseolus vulgaris* L.) rendering by iron micronutrient foliar applications and inoculation yeast extract under sandy soil conditions

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ABSTRACT

Two field experience with snap bean (*Phaseolus vulgaris L.*) cv Giza 3 was con ducted aiming to explore the influence of joint inoculation of yeast offprint (0, 2 and 4 g/L) with Agro Fe 8.5 % at concentrations of (20, 40, and 60 cm/L) on growth, yield and some biochemical ingredients. Results discovered that, the elevated values of plant growth standard explicit as plant length, number of leaves and branches as well as fresh and dry weight of leaves and branches and the biggest values of total pods yield and various organs and the pods tenor of percentage of nitrogen, phosphorus, potassium and TSS in pods tissues were registered when inoculated by high level of yeast extract (4 g/L) with rising standard of Agro Fe (60 cm/L).

Key words: Snap bean - yeast extract -Agro Fe 8.5 %- growth - total yield –pods quality.

Introduction

Snap bean (*Phaseolus vulgaris* L.) is suggested to be one of substantial vegetable crops cultivated in Egypt for domestic market and it has a major prominence for exportation. However, bean plants are comparatively susceptible to environmental stresses that may happen in the field (particularly under sandy soil conditions) like the most vegetable crops which negatively influence they growth, yield and even the goodness of pods.

Many studies proved that yeast is one of the wealthy source of high quality protein, namely the fundamental amino acids such as lysine, tryptophan etc., include the major minerals and trace elements, namely calcium, cobalt, iron ..etc. and better sources of the B-complex vitamins like B1, B2, B6 and B12. The extract is a worthy source of bio-constituents particularly, cytokinins Amer, (2004), that work as a easily available growth complement for plants that finally improve plant product Ghoname, *et al* (2009)**.** However, it is an exporter of cytokinins and protein that promote cell segmentation and magnification (Barnett, *et al* 1990). Moreover, Yeo, *et al* (2000) found that yeast extracts include trehalose-6-phosphate structure which had a key enzyme for substitute bio synthesis. Also, Mahmoud, *et al* (2013) found that, yeast extracts increased all the pea tested vegetative growth characters, green pods yield and pod quality were registered with utilized the highest concentration of yeast extracts (2%). Moreover, EL-Desuki, and EL-Gereadly, (2006) notify that, the growth of pea plant, leaves purport of photosynthesis pigments, free amino acids, carbohydrates and cytokininis, pod yield and quality as well as nourishing value was increased by increasing the level of yeast extract in spraying solution from 1% up to 3%. The increasing of growth, flowering, total yield and pods quality of some plants by foliar application with yeast extract was reported by (Fathy, *et al* 2000, Wanas, 2002, El-Tohamy and El-Greadly 2007, Abou EL-Yazied and Mady 2012, Kamal and Ghanem 2012 and Neama, *et al* 2014).

An equiponderant fertilization programmed with macro and micronutrients in plant alimentation is highly substantial in the production of rising total yield with high quality output Sawan, *et al* (2001). Iron (Fe) plays an important function in human growth, expansion, and conservation of the invulnerable regulation Shenkin, (2006). Iron (Fe) is one of the ultimate important micronutrients and approximately 2 billion people sustain from Fe shortage worldwide, which has predominating alleged to be the dominant reason of anemia Welch and Graham, (1999). It involves approximately 5% of the earth's crust and is the fourth most many element in the lithosphere Tisdale, *et al* (1993). Fe is a fundamental nutrient element for plant growth and evolution, and is implicated in chlorophyll (Chl)

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and thylakoid structure and chloroplast expansion. Although the total Fe content of soils is frequently higher than plants request but its bioavailability is restricted Guerinot and Yi, (1994), especially in calcareous soils, which covering about 30% of the earth's surface Vose (1982). As a result, Fe deficiency chlorosis is clear in about 30% of crops worldwide Imsande (1998). Catalase has main role in photorespiration response, as well as in glycolate passage and involved in the protection of chloroplast from the free stems produced during the water splitting response of photosynthesis Allen and Pilbeam, (2007). Fe is a cofactor for approximately 140 enzymes that catalyze unparalleled biochemical response Brittenham (1994). Foliar feeding is a relatively new and dialectical technique of feeding plants by applying liquid fertilizer immediately to their leaves Baloch, *et al* (2008). The main feature of foliar applied Fe is that the fixation reactions of Fe in alkaline/ calcareous soils are bypass Mengel (1995). The foliar nutrition to lowering shortage problem is an alternative option in case of failure to do so in soil implementation Cakmak (2008). In open environment, the factors assuming nutrients uptake are various, fertilization to leaf can confer considerable consequence. Enforcement of Fe on the leaves of plant lowering the effect of dryness Sultana, *et al* (2001). In plants, micronutrients uptake and transmit can be enhanced by the employ of fertilizer over leaf. The foliar enforcement is useful and retroactive method to supply the nutrients to crop cereals. To decrease the micronutrients shortage in plants, fertilization through leaf has been applied Godsey, *et al* (2003). In the same respect, Ali, *et al* (2014) established that enforcement of 1.5% foliar Fe SO_4 both at branching and flowering stages accord higher number of pods per plant (44.64%), number of seeds per pod (45.31%), 1000-grain weight (18.97%), and grain yield (38.66%) and also improved the quality of grains by mounting protein contents (6.60%) and iron contents (46.39%) in grains as parallel to control.

The aim of the sitting study was to correct the efficiency of foliar implementation of Fe and inoculation yeast extract on ameliorative bean growth and productivity under sandy soil conditions.

Materials and Methods

Two field experiments were carried out at the Agricultural Production and Research Station, National Research Centre, El Nubaria Province, El Behira Governorate, Egypt, during the two successive winter seasons of 20114-2015 and 2015-2016 to study the response of snap bean plants c.v. Giza 3 to compound foliar fertilizer with micronutrient iron (Agro Fe 8.5 %) at (20, 40 and 60 cm/L) and inoculation snap bean seeds by yeast extract at levels of (0, 2 and 4 g/L) on growth, yield and some biochemical constituents. Physical and chemical characters of soil (0-30 depth) in the experimental site were as follows: sand 91.2 %, silt 3.7 %, clay 5.1%, PH 7.3, organic matter 0.3 %, $CaCO_3$, 1.4%, EC 0.3 dS/m, soluble N 8.1 ppm and available P 3.2 ppm, soil measured as described by Chapman, and Pratt, (1978). Chemical analysis of activated yeast is shown in Table (1).

Table 1: chemical analysis of activated yeast (mg/ 100g dry weight).

Minerals		Amino acids		Vitamins	
Total N	7.23	Arginine	1.99	Thiamin	2.71
P2O5	51.68	Histidine	2.63	Riboflavin	4.96
K2O	34.39	Isoleiucine	2.31	Nicotinic acid	39.88
MgO	5.76	Leucine	3.09	Pantothenic acid	19.56
CaO	3.05	Lysine	2.95	Biotin	0.09
SiO2	1.55	Methionine	0.72	Pyridoxine	2.90
SO2	0.49	Phrnylalanine	2.01	Folic acid	4.36
NaCl	0.30	Theronine	2.09	Cobalamin	153ug
Fe	0.92	Tryptophan	0.45	Enzymes	
Ba	157.6	Valine	2.19	Oxidase	0.350
Co	67.8	Glutamic acid	2.00	Peroxidase	0.290
Pd	438.6	Serine	1.59	Catalase	0.063
Mn	81.3	Aspartic acid	1.33		
Sn	223.9	Praline	1.53	Carbohydrates	23.20
Zn	335.6	Tyrosine	1.49		

The experimental unit area was 10.5 m^2 consisting of fifteen rows (3.5 m long and 20 cm between rows), 20 cm between hills. The experimental design was split- plots with three replicates, yeast extract levels were assigned in the main plots and complete foliar application with iron (Agro Fe 8.5 %) was randomly distributed in the sub-plots. Yeast extract was prepared from brewer's yeast (*Saccharomyces Cerevisiae*), dissolved in water followed by adding sugar at a ratio of 1: 1 and kept 24 hours in a warm place for reproduction according to the methods of Morsi, *et al* (2008). Yeast extract levels were inoculated before seeds sowing. Iron (Agro Fe 8.5 %) spraying was conducted three times; first one was after 20 days of planting date and then every 15 days for the second and third spray. Spraying was applied in early morning. Nitrogen fertilizer at the rate of 30 kg N/fed was added as ammonium sulfate (20.6 % N) in three equal doses after 15, 30 and 45 days after sowing. Phosphorus fertilizer, as calcium superphosphate (15.5% $P_2 O_5$) at the rate of 15 kg P_2O_5 /fed and potassium sulfate (48 % K_2O) at the rate of 24 kg K_2O/ fed were applied during seed bed preparation. Organic fertilizer was added at the rate of 20 m^3/fed. snap bean seeds variety Giza 3 were sown on first week of December in the two seasons. The normal agronomic practices of growing snap bean were practiced till harvest as recommended by Legumes Research Dept., A.R.C., and Giza.

1-Growth characters:

A random sample of ten plants from each plot was taken at 90 days after sowing to the laboratory where the following characters were recorded, plant height (cm), number of branches and leaves/plant, fresh and dry weight of leaves and branches as g/plant.

2-Yield and its components:

A random sample of 20 pods were taken from each experimental plot were recorded, seed yield was weighed and expressed as values per feddan as (ton/fed.) as well as its quality and the pod length, average number of seeds/pod were recorded.

3- Chemical analysis of soil and seeds:

N % in dry pods and soil were determined according to the method of Pregl, (1945). In addition, protein percentages in dry pods were calculated by multiplying nitrogen content by 6.25. Potassium was assayed using flame spectrophotometer according to Allen, *et al* (1984). Phosphorous was extracted and measured spectrophotometer according to Jackson, (1965).

The obtained data were subjected to the analysis of variance procedure and treatment means were compared to the LSD test according to Gomez, and Gomez, (1984).

Results and Discussion

Growth characters :

1- Effect of yeast extract:

Related inoculation by yeast extract, Table (2) that, the level of 4 g/L was the most suitable for increasing plant growth, expressed as plant length (cm), number of leaves and branches as well as fresh and dry weight (g) of leaves, branches and whole plant in both two seasons as parallel with the other calculated treatments by inoculation yeast extract. The statistical analysis of the acquired data disclosed that the divergence within different inoculation treatments of yeast extract were sufficient to reach the 5% level of significance except number of stems plant in both seasons. However, high level of yeast extract at 4 g/L significantly increased the most growth characters of bean plant compared to the low level (2 g/L). These returns are in convention with the results of Abou EL-Yazied and Mady, (2012) and Kamal, and Ghanem, (2012) on bean plants and Mahmoud, et al (2013) on pea plants who reported that the increase concentration of yeast extract inoculation increased plant growth. The excellence of plants growth in response to inoculation of yeast extract may be attributed to its contents of different nutrients, i.e. (P, K, Mg, Ca, Fe, Ba, Mn and Zn), higher percentage of proteins, higher

amount of free amino acid and vitamins (Table 1) which may play an important function in increasing growth and controlling the incidence of fungi diseases Bevilacqua, et al (2008). This consequence is corroborative by Neama, et al (2014).

Table 2: Effect of bio fertilizer yeast and foliar application of mineral Fe levels on growth characters of green bean plant during 2015 and 2016 seasons.

Bio fertilizer g\L	Fe Foliar spray (cm\L)	Plant length (cm)	No. of		Fresh weight (g)		Dry weight (g)	
			leaves	stems	leaves	stems	leaves	stems
2015								
0	20	51.50	18.73	4.33	33.53	34.33	11.33	12.67
	40	51.17	19.67	5.33	35.63	36.33	11.67	13.33
	60	52.80	21.33	5.33	41.47	41.33	12.67	13.33
main		51.82	19.91	5.00	36.88	37.33	11.89	13.11
2	20	52.43	22.00	5.67	39.20	42.67	12.67	13.67
	40	59.50	23.33	5.67	41.47	44.67	13.67	14.67
	60	63.17	23.67	6.00	42.00	45.00	14.67	15.00
main		58.37*	23.00*	5.78	40.89*	44.11*	13.67*	14.44*
4	20	54.13	24.00	5.67	42.87	45.67	14.33	14.67
	40	62.13	24.33	6.33	45.67	47.33	15.67	15.00
	60	64.27	25.33	6.67	46.20	48.33	16.33	15.67
main		60.18**	24.56**	6.22	44.91**	47.11*	15.44*	15.11**
average	20	52.69	21.58	5.22	38.53	40.89	12.78	13.67
	40	57.60*	22.44	5.78*	40.92*	42.78*	13.67*	14.33*
	60	60.08	23.44	6.00	43.22	44.89*	14.56	14.67
LSD at 5% level	yeast	1.43	1.23	NS	2.22	0.47	0.62	0.31
	Fe	1.51	0.87	0.40	1.31	1.46	0.31	0.51
	interaction	2.62	NS	NS	NS	NS	NS	NS
2016								
0	20	49.83	17.73	3.67	31.53	32.67	10.33	11.67
	40	49.63	18.67	5.00	33.47	35.00	10.67	12.67
	60	49.13	20.33	5.17	38.47	37.33	11.67	12.67
main		49.53	18.91	4.61	34.49	35.00	10.89	12.33
2	20	49.07	20.33	4.83	35.33	40.67	11.33	12.33
	40	55.40	22.67	5.00	38.13	43.33	12.33	13.67
	60	60.80	22.33	5.50	38.67	43.33	13.33	14.00
main		55.09*	21.78*	5.11	37.38*	42.44*	12.33*	13.33*
4	20	50.77	22.33	5.17	39.67	43.67	12.67	13.67
	40	58.07	23.00	5.67	42.67	45.67	14.00	13.67
	60	60.20	24.00	6.17	43.00	46.33	14.67	14.67
main		56.34**	23.11*	5.67	41.78*	45.22*	13.78*	14.00*
average	20	49.89	20.13	4.56	35.51	39.00	11.44	12.56
	40	54.37*	21.44*	5.22*	38.09*	41.33*	12.33*	13.33*
	60	56.71	22.22	5.61	40.04	42.33	13.22	13.78
LSD at 5% level	yeast	1.13	1.14	NS	2.18	1.15	0.82	0.72
	Fe	1.85	0.66	0.34	1.44	1.25	0.31	0.45
	interaction	3.20	NS	NS	NS	NS	NS	NS

2- Effect of iron foliar spray (Agro Fe 8.5%):

Feeding with iron (Agro Fe) acquired a significant effect on the most snap bean plant growth characters Table (2). Whereas, in both experiments, that its plants which received altitude concentration of Fe as spraying fulfilled the better strength, i.e tallest plant, highest number of leaves, heaviest fresh and dry weight of leaves and stems followed by low concentration treatment. However, foliar spray of elevation level of micronutrient Fe (60 cm\L) give rise to perfect growth characters if compared with that plant resaved medium level (40 cm\L). These returns were whole in both two seasons. It could be concluded that, the excellence of snap bean plant growth which obtained the

micronutrient (Fe) its effect might be attributed to increased photosynthetic efficiency and improved production and accumulation of carbohydrate. In addition, they play an essential function in increasing plant growth, through the biosynthesis of endogenous hormones which answerable for promoting of plant growth Hansch, and Mendel, (2009). The acquired data are in good accordance with those which formerly notified by (Marschner, 1997.; Abadía, *et al* 2002; Hatwar, *et al* 2003, Abd El-azeem, *et al* 2014 and Shafeek, *et al* 2014) they displayed that, the enforcement of micro mineral Fe as foliar spray occasion an enhancement in plant growth.

3- Effect of the interaction between yeast extract and iron foliar spray (Agro Fe):

Regarding with interaction of both operator data in Table (2) recorded that, growth characters of bean plants was not significant effect except plant length in both seasons. Generally, the acquired data specific that, the highest values of plant growth standard expressed as (plant length, number of leaves and branches as well as fresh and dry weight of leaves and branches) were registered when inoculated plants by high level of yeast extract (4 g/L) with high concentration of Agro Fe (60 cm/L) as compared other interaction treatments.

Total pods yield and some pod physical quality:

1-Effect of yeast extract:

As shown in Table (3) inoculation with yeast extract at 4 g/L improved number of pods per plant, total pods yield/plant and total yield (ton/fed.) as well as green pod length, weight and width paralleled with control ones. The statistical analyses of the acquired data detected that (pod weight (g), total pods yield per plant and total pods yield per fed.) significantly increased by increasing yeast extract levels. This increase in total yield / (ton/fed.) by inoculation by high level of yeast extract was (18.35% and 18.41%) at 1st and 2nd seasons respectively when compared by control ones. However, inoculation by high level of yeast extract significantly improved total pods yield per plant compared to the low level and control. These returns are in convention with the results by Mahmoud, *et al* (2013) on pea plants who found that increasing inoculation level of yeast extract increased yields and their ingredients. It could be concluded that, inoculation by yeast extract treatments were proposed to participate useful role during vegetative and reproductive growths through increasing flower formation and their set in some plants due to its high auxins and cytokinins contents and its advantageous effect on carbohydrate accumulation Barnett, *et al* (1990). Also, may be attributed to its contents of different nutrients, higher percentage of proteins, higher values of vitamins, especially B which may play an substantial function in increasing growth and controlling the incidence of fungi diseases as mentioned by Meyer, and Phaff, (1969). The direction of these results is confirming by (Mahmoud, *et al* 2013, Abou EL-Yazied and Mady, 2012, Kamal, A.M. and K.M. Ghanem, 2012 and Neama, *et al* 2014).

2- Effect of iron foliar spray (Agro Fe):

With reference to the effect of the micronutrient implementation Fe on the total yield of snap bean pods (Table 3), the resulted data reported that high concentration of iron had raised pods yield and its synthesis if compared low level. The given data prove that, implementation the highest concentration of iron (60 cm/L) resulted the heaviest pods yield (ton\fed.) was (7.62 % and 10.51 %) at 1st and 2nd seasons respectively as compared to the low level of iron at (20 cm/L). The repayment of number of pods/plant and pod weight to the application of micronutrient iron almost followed the same pattern of alteration which mentioned before. Generally, it could be abstracted that, foliar application of the highest level of Fe had the best favorable effect on the total yield of snap bean pods. Also it could be stated that, high level of Fe acquired an enhancement plant productively if compared to low level these may be due to Fe is directly implicated in manufacture of chlorophyll and important during early growth stage of plant Roy, *et al* (2006). Many scholars applied micronutrient Fe as foliar spraying for vegetable crops and their results supported the acquired data (Hatwar, *et al* 2003; Tamilselvi, *et al* 2002; Savitha, 2008 and Shahean, *et al* 2007).

Table 3: Effect of bio fertilizer yeast and foliar application of mineral Fe levels on total yield of green bean plant during 2015 and 2016 seasons.

Bio fertilizer g\L	Fe Foliar spray(cm\L)	Pod characters			No. of pods/plant	Total yield (ton/fed.)
		Length (cm)	Diameter (cm)	Weight (g)		
2015						
0	20	12.33	0.11	4.20	18.33	6.00
	40	12.67	0.12	4.33	19.67	6.20
	60	13.00	0.12	4.17	20.00	6.77
main		0.11	12.67	4.23	19.33	6.32
2	20	13.00	0.12	4.57	22.33	6.87
	40	13.53	0.13	4.83	23.00	7.03
	60	14.00	0.14	5.07	26.00	7.10
main		0.13	13.51	4.82	23.78	7.00
4	20	13.67	0.16	5.13	24.33	7.20
	40	13.67	0.16	5.13	24.67	7.50
	60	14.33	0.16	5.37	26.67	7.73
main		0.16	13.89	5.21	25.22	7.48
average	20	13.00	0.13	4.63	21.67	6.69
	40	13.29	0.14	4.77	22.44	6.91
	60	13.78	0.14	4.87	24.22	7.20
LSD at 5% level	yeast	0.01	0.17	0.22	1.57	0.09
	Fe	NS	NS	0.11	NS	0.16
	interaction	NS	NS	NS	NS	NS
2016						
0	20	11.33	0.11	3.53	16.67	5.63
	40	11.67	0.11	3.53	19.00	6.03
	60	12.33	0.11	3.57	18.00	6.43
main		11.78	0.11	3.54	17.89	6.03
2	20	12.00	0.11	3.77	20.67	6.40
	40	12.67	0.12	3.43	20.67	6.73
	60	13.33	0.13	4.27	23.67	6.87
main		12.67	0.12	3.82	21.67	6.67
4	20	12.67	0.14	4.33	21.67	6.80
	40	13.00	0.14	4.73	22.67	7.10
	60	14.00	0.15	5.17	24.00	7.53
main		13.22	0.14	4.74	22.78	7.14
average	20	12.00	0.12	3.88	19.67	6.28
	40	12.44	0.12	3.90	20.78	6.62
	60	13.22	0.13	4.33	21.89	6.94
LSD at 5% level	yeast	0.44	0.02	0.60	2.21	0.12
	Fe	0.49	NS	NS	NS	0.16
	interaction	NS	NS	NS	NS	NS

3- Effect the interaction between yeast extract micronutrient iron (Agro Fe):

The interaction effect of yeast extract at levels of 0, 2 and 4 g/L with the treatments of Agro Fe at levels of 20, 40 and 60 cm/L are approaching in Table (3). The registration data found that the highest values of total pods yield and different members were acquired with snap bean seeds which inoculated yeast extract at 4 g/L with foliar spraying by Agro Fe 8.5% at 60 cm/L. The statistical analysis of the obtained data was not great enough to reach the level of significant at 5%.

Chemical analysis of seeds:

1-Effect of yeast extract:

Inoculation by yeast extract performed in slight increases in snap bean pods content of N and protein % (Tables 4). The data in this table suggested that there was a statistically significant effect

for the inoculation treatments on the contents of N and protein % in the pods of snap bean plants compared to no treated (control). The highest values of all elements were registered by inoculated yeast extract at a rate of 4 g/L. These results may be due to the content of macro and micro elements and high auxins and cytokinins contents and its advantageous effect on carbohydrate accumulation of yeast extract Barnett, *et al* (1990). However, the contents of phosphorus and potassium % in dry pods tissues did not statistically significant between treatments and control. Also, the increases in snap bean yield and in the contents of micronutrients in pods due to the inoculation of yeast extract come to an agreement with the returns of (Mahmoud, *et al* 2013, Abou EL-Yazied and Mady, 2012, Kamal, A.M. and K.M. Ghanem, 2012 and Neama, *et al* 2014).

Table 4: Effect of bio fertilizer yeast and foliar application of mineral Fe levels on nutritional values of green bean plant during 2015 and 2016 seasons.

Bio fertilizer g\L	Fe Foliar spray(cm\L)	2015				2016			
		%				%			
		N	P	K	TSS	N	P	K	TSS
0	20	2.60	0.36	2.11	4.60	2.43	0.34	2.07	4.27
	40	2.78	0.38	2.16	4.60	2.55	0.35	2.13	4.27
	60	2.94	0.39	2.26	4.69	2.62	0.35	2.23	4.36
main		2.78	0.38	2.18	4.63	2.53	0.35	2.14	4.30
2	20	3.07	0.41	2.29	4.79	3.00	0.38	2.26	4.45
	40	3.37	0.45	2.30	4.81	3.23	0.41	2.27	4.48
	60	3.58	0.48	2.34	4.84	3.47	0.45	2.31	4.50
main		3.34	0.45	2.31	4.81	3.23	0.41	2.28	4.48
4	20	3.60	0.47	2.40	4.93	3.48	0.46	2.37	4.60
	40	3.68	0.50	2.43	4.98	3.51	0.48	2.39	4.65
	60	3.74	0.50	2.45	5.04	3.55	0.51	2.42	4.74
main		3.67	0.49	2.43	4.98	3.51	0.48	2.39	4.66
average	20	3.09	0.42	2.27	4.77	2.97	0.39	2.23	4.44
	40	3.28	0.44	2.30	4.80	3.10	0.41	2.26	4.46
	60	3.42	0.45	2.35	4.85	3.21	0.44	2.32	4.53
LSD at 5% level	yeast	0.07	0.01	0.04	0.06	0.15	0.02	0.04	0.06
	Fe	0.18	0.01	0.03	0.03	0.07	0.02	0.04	0.03
	interaction	NS	NS	NS	NS	NS	NS	NS	NS

2- Effect of micronutrient iron (Agro Fe):

The foliar application of Fe for snap bean pods Table (4) reported more nutritional values, i.e., the percentage of protein, N, P and K in pods tissues. Moreover, that plants which remedy with the high concentration of Fe (60 cm/L) performed the superior chemical characters as in a comparison with that plant received low level (20 cm/L). These results were similar in the two experiments of 2014 and 2015. It could be concluded that, foliar spraying with Fe had an enhancement in the chemical constituents of snap bean pods. El-Fouly. (1983) Reported that, foliar application of microelements is highly recommended under Egyptian conditions. This might be attributed to the role of micronutrient iron in plant metabolism which reflected on the total pods yield and its possessions. Many penman's studied the response of vegetable fruits yield to the application of micronutrient Fe and their reports are in good accordance with that which written here (Savitha, 2008, Shahean, *et al* 2007 , Abd El-Baky, 2005 and Aisha, *et al* 2007).

3- Effect the interaction between yeast extract micronutrient iron (Agro Fe):

Table (3) shows the interaction effect between inoculations by different levels of yeast extract with foliar application of Agro Fe. It is clear that the interaction was not significant in its effect on the percentage of nitrogen, phosphorus, potassium and TSS contents of snap bean pods tissues. Generally, the obtained data fixed that, the highest amounts of N, P, K and TSS % were listed when inoculated

snap bean plants by high level of yeast extract (4 g/L) with altitude concentration of Agro Fe (60 cm/L) as compared other interaction treatments.

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