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Effect of phosphorus and bio-fertilizers on productivity and quality of soybean at Siwa Oasis

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Abstract

Tow field experiment were carried out during two successive summer seasons 2013 and 2014 at the Experimental Station at Khamisalocation Siwa Oasis, Desert Research Center(DRC), to study, response of soybean (*Glycine max*) Giza, 35 cultivar to the combination between phosphorus fertilization, and four levels phosphorus fertilization:(0, 30, 45and60 kg. P_2o_5 / fed.). And four spring with four bio-fertilizers treatment (control, bio magic compound at a rate of (2 liters / fed.), amino carpi K compound (200 cm^3 / fed.), and Bio greenmeracl compound (1 liters / 200 liters water / fed.).Using the split plot design which, the bio-fertilizers treatment were distributed in the main plots, whereas phosphate fertilization in subplot in four replicates.

The obtained results could be summarized as follows:

The results showed a significant increase in yield and its components, as well as the oil yield / fed. using ground phosphorus fertilization at the rate of 60 kg p_2o_5/fed. in both seasons respectively.

The three bio- fertilizers of significantly differences were significant and increased the yield and its components as well as the oil crop, and the best bio-fertilizer was a compound Amino Kirby K, 200 cm^3, in both seasons. The interaction between phosphorus and bio- fertilizers led to increasing the yield and its component. The best practice at a rate of 60 kg p_2o_5/fed. + spraying with Amino Kirby K, 200 cm^3 /fed., in both seasons.The results showed that phosphorus fertilization at the rate of 60 kg p_2o_5/fed. and spraying with Amino Kirby K, 200 cm^3/ fed.,resulted in significant increase in the chemical components of soybean seeds namely: nitrogen, total protein,oil percentage, phosphorusand potassium, in both seasons.Found from the calculation of the economic yield of crop and oil yield, the use of the high rate of phosphorus fertilization (60 kg. P_2o_5 /fed.) and spraying with amino carpi K compound (200 cm^3 / fed.) is the best experimental economic transaction for the farmer under the conditions of Siwa Oasis, especially that the crop of soybeans is grown for the first time in the oasis.

Key words: soybean, phosphorus, bio-fertilizers, Siwa Oasis

Introduction

Siwa oasis in the western desert of Egypt between longitude 25°18′ and 26°06′ E and latitudes 29°05′ and 29°20′ N, is the most well known of the five major oasis in the Western desert of Egypt and is one of the most promising areas for adding new agricultural land. Most of the new reclaimed areas in Egypt are sandy and loamy sand soil suitable for planting with many crops. The use of bio-fertilizers that have an impact on the increase rate of flowering, as well as the contract, and also the fullness of pods and grains, The combined effect of phosphorus and biological fertilization on the productivity and quality of soybeans.

Soybean seeds are a major source of protein (40%) and oil (20%) for human consumptions. Soybean oil is one of the common vegetable oils containing a significant amount of unsaturated fatty acids: linolenic acid; linoleic acid (omega-6 acid) and oleic acid (, (**Yaklich *et al.* 2002).** Also, soybean is one of the most important summer leguminous crops, extensively successful in many provinces in Egypt; Soybean seed production may be limited by environmental stresses such as soil salinity (**Ghassemi-Golezani *et al.*, 2009).Lehmann *et al.* (2010)** reported that the proline is an important multifunctional amino acid and plays a role in carbon and nitrogen metabolism, cell signaling, nutrient adaptation and protection against osmotic and oxidative stresses. **Sayari et al (2005**) found that the proline accumulation in response to drought or salinity stress has been reported to occur in the cytosol to adjust the osmotic balance. **Sessitch *et al.* (2002**) found that Rhizobium ssp. i.e. rhizobactria and some are endophytes which can produce phytohormones, siderophores, solublitizespringly soluble organic and inorganic phosphates and can colnize the roots. Concerning that the importance of soybean in production of oil, its nutritional important and status of biological fertilizers in sustainable agriculture.

The use of fertilizer is considered to be one of the most important factors in increasing crop yield. Phosphorous has been shown to be an essential element and its application has been shown to be important for growth, development and yield of soybean (**Kakar *et al.*, 2002)**. Also, phosphorus is an important plant nutrient involved in several energy transformation and biochemical reactions including nitrogen fixation. Phosphorus deficiency can cause a limit nodulation in legumes and P fertilizer application can also overcome this deficiency (**Carsky *et al.*, 2001**). The use of phosphate

solubilizing bacteria is able to change insoluble phosphorus in soil into the absorbed soluble form (**Turan*et al.*, 2006**). **El-Gizawy and Mehasen (2009)** showed that application of mineral phosphorus fertilizer with phosphate- solubilizing bacteria had a significant effect on bean seed yield and its components, nitrogen, phosphorus and zinc content in seeds. Seeds inoculated with bio fertilizers in combination with foliar application of micronutrients gave higher values of all estimated parameters of pea bean than plants fertilized with chemical fertilizers in the presence or absence of foliar application **(Zaghloul*et al.*, 2015).** In all cases, fertilizers are major factors in maintaining soil fertility, but using too much of them, greatly reduce the amount of soil microorganisms. Environmental problems caused by irregular application of chemical fertilizers have harmful effects on biological cycles and destroyed farming stability systems; these factors altogether encourage the application of bio fertilizers (**Kannayan, 2002**). Integration of chemical and bio fertilizers is one of the ways to increase production in sustainable agriculture (**Ali *et al.*, 2008).** From otherwise, one biological way to increase the productivity in the agricultural sector is the effective use of beneficial microorganisms that have more ability to enhance plant growth and yield.

Therefore the present investigation was aimed to study the productivity of Soybean (Giza, 35 cultivar) to combination between Phosphate fertilizer, and four types of bio-fertilizers on yield and its components under Siwa Oasis conditions.

Materials and Methods

Tow field experiment were carried out during two successive summer seasons 2013 and 2014 at the Experimental station ofat Khamisalocation Siwa Oasis, Desert Research Center, to study, the response of Soybean (Giza, 35 cultivar) to the combination between four phosphorus fertilization, 0,30,45 and 60 kg.P_2O_5/ fed. as a soil applicationas affected by four in spraying of types of bio-fertilizers is as follows: (spraying with tap water, bio magic compound 2 liters / fed., amino carpi K compound 200 cm^3/ fed.and Bio greenmeracl compound 1 liter / fed.

A split plot design with four replicates was used. The main plots were devoted to the bio-fertilizers treatments and sub plots were devoted to the Phosphorous fertilizer levels.Each experimental unit contained 5 in ridges 2.5m long and 60 cm apart. The seeds were sowing on April 10thboth seasons. Before sowing all plots received 30m^3/ fed. Organic fertilizer. In addition, 100 kg ammonium sulphate (20.5% N) and 200 kg potassium sulphate / fed. (48% K_2O) were applied at two doses after two and three weeks from sowing, Agriculture was carried out on both sides of the line and the distance between the dots was 30 cm, fertilization was added in three batches between the batch and the other 20 days after planting, respectively.

Mechanical and chemical analysis of the experimental soil is shown in Tables (1).

The soil analysis was carried out according to **Jackson (1967).**

Table 1. Mechanical properties of the experimental soil at Khamisa research station**.**

Depth (cm)	Particle size distribution (%)				Soil texture
	Coarse sand	Fine sand	Silt	Clay	
0-30	46.8	28.2	15.4	9.6	Sandy loam
30-60	50.0	25.9	18.0	6.1	Sandy loam

Chemical analyses.

Depth (cm)	pH	Ec (dS/m)	O.M %	Saturation soluble extract							
				Soluble anions (meq / L)				Soluble cations (meq / L)			
				Co^-_3	HCO^-_3	SO^-_4	Cl^-	Ca^{++}	Mg^{++}	Na^+	K^+
0-30	7.4	12.32	0.7	-	2.8	26.8	70.4	30.7	17.24	49.6	1.31
30-60	7.8	13.04	0.5	-	3.0	20.5	76.5	26.2	15.8	57.3	0.7

Regular irrigation was carried out in the whole experiment every one week after sowing. The meteorological data of Khamisa location was shows in Table (2).

Soybean growth and yield of the two inner ridges were determined for each sub plot and a sample of five plants were taken at harvesting lime at random to estimate the following characters: plant height(cm.), No. of pods /plant, pod length (cm.),pods weight / plant (g.), No. of seeds / plant, seed weight / plant (g.), 100 - seed weight (g.),seed,straw and biological yields and (chemical composition of seeds i.e., nitrogen, phosphorus, potassium, total crud protein and oil content which estimated by using according to **A.O.A.C. (1975).** Oil and protein yields (Kg/fed) was determined by multiplying seed yield (Kg/fed) by seed oil percentage nitrogen % x 6.25= protein %, protein% x seed yield=protein yield/ fed.and oil yield. All the obtained data were subjected to statistical analysis, the two seasons. The mean values were compared according to the procedures of analysis of variance **(ANOVA)** by using LSD at the level of 5% of significance according to **Snedecor and Cochran (1980).**

Table 2. Meteorological data of temperature (°C), relative humidity (%), and Relative Humidity (%) of Khamisalocation

Months	Average temperature. (°C)		Average rain full (mm)		Average relative humidity (%)	
	2013	2014	2013	2014	2013	2014
March	27.35	28.14	-	-	75.66	77.33
April	34.84	34.51	-	-	77.25	78.18
May	37.78	38.25	-	-	81.42	83.44
Jun	39.57	41.40	-	-	83.29	84.06
July	41.32	43.55	-	-	85.41	87.63
August	41.45	42.78	-	-	84.62	86.08
September	38.12	39.22	-	-	82.11	83.60

Economic Assessment:

A comprehensive economic assessment of the experiment (for both inputs and outputs of the experiment) is performed.

Results and Discussion

I: - Yield and yield components.

The results obtained from tables (3and 4) showed that soil additions of phosphorus fertilization resulted in a significant increase in the yield. From to the height yield was obtained from rate of 60 kg p_2o_5 / fed. compared with the rest of the other treatments in yield and its components, plant height, number of pods /plant, pod length, pods weight / plant, number of seeds / plant, seed weight / plant, 100 - seed weight,seed,straw as well as biological yields, and oil and protein yields. These results are agreement with those obtained by **Kakar, et. al.(2002) and El-Gizawy and Mehasen (2009).** Also, the results also showed that the use of spraying with different types of bio-fertilizers increasing the yield and its components combination withspraying by tap water. The best values in yield characteristics and its components were due to the addition of the amino-karbi K compound (200 cm / fed.), Then the lower of the Bio greenmeracl compound (1 liters / fed.). anda biomagic compound at a rate of (2 liters / fed.), While the lowest values were for the un- biological fertilizer treatment. It may be noted that the soybean crop of leguminous crops that require phosphorus and the amino-karbi K compound contains this element, which increases the flowering rate - as well as the contract and thus works to fill the pods and seeds.

The interaction between soil applications for phosphorus fertilizer at a rate of 60 kg P_2O_5/ fed. and spraying by Amino karbi K. compound at a rate of (200 cm^3/200 liters of water/fad.) gave the highest values in yield and its components, while the lowest values were when using the treatment without adding ground for phosphorus fertilization with spraying and tap water. The percentage of increase in these characteristics was: 18.34%, 19.21%, 18.19%, 20.10%, 21.64%, 20.44%, 21.17%, 22.11%, 18.96%, 17.34% and 18.81%, respectively. In this respect, **Amin and Ezatollah (2014).** Found that the combined effect of phosphorus and bio-fertilization on the productivity and quality of soybeans increased the proportion and quality of soybean oil using. Contract, and also the fullness of centuries and grains, mineral fertilization (phosphate) balanced increases the proportion of oil.These results were obtained by **Yaklich, et. al. (2002), Abdelhamid and El-Metwally, (2008), Abdel-Fattah, et.al. (2011), Iraj, et.al.(2012) and Amin and Ezatollah (2014).**

II: **-chemical composition of soybean seeds:**

Results in Table (5) Showed that the chemical analysis of soybean seeds showed phosphorus fertilizers a significant increase in the study characteristics, i.e., nitrogen, phosphorus, potassium, total crud protein and oil percentages compared with un fertilizer treatment.With the addition of the rate of 60 kg. P_2O_5/ fed. led to a significant increase in the proportion of oil in the seeds, which had a clear effect in the oil yield, as well as the increase in the percentage of total protein by a clear percentage of the rest of the transactions. The results showed that the use of spraying by Amino karbi K. compound at a rate of (200 cm^3/ fed.). Significant differences the rests of the other biochemical compounds in all studied traits. Similar results were obtained by **Agwu, et. al. (2009), El-Gizawy and Mehasen (2009), Gordana, et. al.(2014) and Amin and Ezatollah (2014).**

The interaction between soil applications for phosphorus fertilizers at a rate of 60 kg P_2O_5/ fed. and spraying by amino karbi K. compound at a rate of 200 cm^3/fed.gave the highest values of the chemical analysis of soybean seeds.The percentage of increase in the qualities under study characteristics, i.e., nitrogen, phosphorus, potassium, total crud protein and oil. 11.34%, 12.58%, 10.95%, 14.59% and 14.66%, respectively as compared significantly increased all chemical composition tharl the other biofertilizer. Similar results were obtained by **Sayari, et. al. (2005), Abdelhamid and El-Metwally, (2008), Ali, et. al. (2008), and Manal, et. al. (2014).**

Table 3. Effect of phosphorus and bio-fertilizers application of soybean on yield and its components of 2013 and 2014 growing seasons.

Characters / treatment		Plant height(cm.)		Number of pods /plant		Pod length (cm.)		Number of seeds / plant		Pods weight / plant (g.)	
		1st.	2nd.	1st.	2nd.	1st.	2nd.	1st.	2nd.	1st.	2nd.
Bio.1	P1	84.12	83.78	43.01	42.18	5.00	5.01	98.54	99.54	18.22	19.67
	P2	86.54	85.67	44.55	45.09	5.09	5.10	102.14	104.11	19.04	20.22
	P3	88.95	89.15	45.00	46.22	5.67	5.77	108.56	107.55	20.55	21.00
	P4	91.24	91.58	46.28	46.22	5.69	5.88	111.50	112.50	21.55	22.02
Mean		87.71	87.54	44.71	44.92	5.36	5.44	105.18	105.93	19.84	20.73
Bio.2	P1	89.57	88.97	45.88	45.67	5.66	5.72	107.68	108.64	19.98	20.88
	P2	98.32	99.12	48.66	48.76	6.11	6.21	114.80	114.00	21.20	22.98
	P3	104.66	105.32	52.22	55.66	6.25	6.22	122.47	123.12	23.32	24.65
	P4	111.55	115.84	59.58	58.64	6.76	6.22	134.21	135.64	25.94	26.76
Mean		101.03	102.31	51.59	52.18	6.19	6.09	119.79	120.35	22.61	23.82
Bio.3	P1	102.55	101.31	58.14	57.25	6.48	6.55	124.81	123.25	23.32	24.54
	P2	109.54	110.55	60.21	61.00	6.89	6.99	134.66	135.87	25.58	26.57
	P3	111.88	114.00	63.00	64.85	7.54	7.66	142.54	143.55	27.48	28.34
	P4	115.22	121.02	66.57	65.47	8.01	8.21	155.21	154.87	31.57	30.86
Mean		109.79	111.72	61.98	62.14	7.23	7.35	139.31	139.39	26.99	27.57
Bio.4	P1	103.54	102.99	52.01	53.01	5.98	6.01	108.22	109.11	20.18	21.07
	P2	105.64	105.66	53.87	54.45	6.87	6.81	115.61	115.00	22.56	23.57
	P3	108.94	108.00	56.04	55.21	6.77	6.89	124.00	124.95	25.88	25.88
	P4	109.54	108.44	60.18	57.64	7.00	6.84	132.58	133.87	27.00	27.61
Mean		106.91	106.27	55.52	55.08	6.65	6.63	120.10	120.73	23.91	24.53
P_2O_5	P1	94.94	94.26	49.76	49.52	5.78	5.82	109.81	110.13	20.42	21.54
	P2	100.01	100.25	51.82	52.32	6.24	6.27	116.80	117.24	22.09	23.33
	P3	103.60	104.11	54.06	55.48	6.55	6.63	124.39	124.79	24.20	24.96
	P4	106.88	109.22	58.15	56.99	6.86	6.78	133.37	134.22	26.51	26.81
Mean		101.35	101.96	53.44	53.57	6.25	6.37	121.09	121.59	23.30	24.16
LSD 5% P.		2.012	2.028	0.658	0.661	0.023	0.026	2.012	2.019	1.002	1.014
Bio.		2.022	2.023	0.651	0.658	0.022	0.023	2.008	2.011	1.001	1.010
PxBio		1.892	1.976	0.422	0.549	0.018	0.020	1.867	1.908	0.982	0.984

Table 4. Effect of phosphorus and bio-fertilizers application of soybean on yield and its components and oil yield of 2013 and 2014 growing seasons.

Characters		Seed weight / plant (g.)		100 - Seed weight (g.)		Biological yield (Ton /Fed.)		Seed yield (Ton /Fed.)		Straw yield (Ton /Fed.)		Oil yield (Ton /Fed.)	
treatment		1st.	2nd.	1st.	2nd.	1st.	2nd.	1st.	2nd.	1st.	2nd.	1st.	2nd.
Bio.1	P1	16.66	17.20	14.65	14.25	2.263	2.135	0.882	0.834	1.381	1.301	0.175	0.166
	P2	18.24	18.96	15.07	15.10	2.439	2.449	0.938	0.942	1.501	1.507	0.197	0.199
	P3	19.57	19.67	15.15	15.24	2.545	2.592	0.994	0.997	1.551	1.595	0.212	0.213
	P4	19.99	20.21	15.34	15.33	2.575	2.751	1.006	1.058	1.569	1.693	0.227	0.239
Mean		18.61	19.01	15.05	14.98	2.455	2.481	0.955	0.957	1.500	1.524	0.202	0.204
Bio.2	P1	18.25	19.85	14.88	15.00	2.442	2.538	0.954	0.976	1.488	1.561	0.190	0.196
	P2	20.65	21.55	15.22	15.34	2.553	2.623	0.997	1.009	1.555	1.614	0.222	0.225
	P3	21.86	23.09	15.65	15.69	2.821	2.891	1.102	1.112	1.719	1.779	0.262	0.266
	P4	23.54	24.00	16.22	16.34	3.215	3.260	1.256	1.254	1.959	2.006	0.300	0.300
Mean		21.07	22.12	15.49	15.59	2.757	2.828	0.829	1.088	1.680	1.740	0.243	0.246
Bio.3	P1	22.11	22.89	15.34	15.66	2.524	2.602	0.986	1.001	1.538	1.601	0.200	0.214
	P2	24.16	24.88	16.24	16.34	3.066	3.091	1.198	1.189	1.868	1.902	0.259	0.269
	P3	26.55	26.95	17.44	17.60	3.297	3.409	1.288	1.311	2.009	2.097	0.289	0.315
	P4	28.57	28.99	18.00	17.85	3.724	3.762	1.455	1.447	2.269	2.315	0.372	0.363
Mean		25.34	25.93	16.75	16.86	3.152	3.216	1.231	1.237	1.921	1.978	0.281	0.292
Bio.4	P1	20.14	20.97	14.65	14.56	2.427	2.566	0.948	0.987	1.479	1.579	0.190	0.197
	P2	22.65	21.54	15.07	15.10	2.563	2.673	1.001	1.028	1.562	1.649	0.212	0.219
	P3	23.97	23.00	15.55	15.73	3.039	3.115	1.187	1.198	1.852	1.917	0.266	0.271
	P4	25.22	24.58	16.55	16.87	3.196	3.377	1.248	1.299	1.947	2.078	0.298	0.305
Mean		22.99	22.52	15.43	15.57	2.806	2.932	1.096	1.128	1.710	1.805	0.241	0.248
P_2O_5	P1	19.29	20.22	14.88	14.86	2.414	2.460	0.942	0.949	1.471	1.510	0.188	0.193
	P2	21.42	21.73	15.40	15.47	2.655	2.705	1.033	1.042	1.621	1.668	0.222	0.228
	P3	22.98	23.17	15.94	16.06	2.922	3.001	1.142	1.154	1.782	1.847	0.257	0.266
	P4	24.32	24.44	16.52	16.59	3.177	3.287	1.241	1.264	1.936	2.022	0.299	0.293
Mean		22.00	22.39	15.68	15.74	2.792	2.854	1.089	1.102	1.702	1.762	0.241	0.245
LSD 5% P.		1.029	1.032	0.068	0.072	0.077	0.078	0.056	0.057	0.062	0.064	0.035	0.038
Bio.		1.022	1.028	0.067	0.069	0.074	0.076	0.052	0.054	0.060	0.061	0.033	0.035
PxBio		0.998	1.003	0.059	0.062	0.064	0.066	0.048	0.048	0.049	0.052	0.021	0.024

Table 5. Effect of phosphorus and bio-fertilizers application of soybean on chemical composition of the seeds in 2013 and 2014 growing seasons.

Characters		Protein yield (Ton /Fed.)		Nitrogen (%)		Phosphorus (%)		Potassium (%)		Total crud protein (%)		Oil content (%)	
treatment		1st.	2nd.	1st.	2nd.	1st.	2nd.	1st.	2nd.	1st.	2nd.	1st.	2nd.
	P1	0.281	0.266	5.11	5.07	0.310	0.314	2.122	2.125	29.53	29.25	19.92	19.94
Bio.1	P2	0.305	0.306	5.21	5.20	0.316	0.317	2.149	2.155	30.22	30.16	21.02	21.04
	P3	0.332	0.333	5.36	5.39	0.321	0.324	2.178	2.198	31.09	31.26	21.34	21.35
	P4	0.348	0.370	5.55	5.60	0.345	0.344	2.180	2.200	32.19	32.48	22.58	22.55
Mean		0.316	0.318	5.31	5.33	0.325	0.324	2.157	2.170	30.76	30.80	21.21	21.24
	P1	0.314	0.323	5.28	5.30	0.319	0.320	2.167	2.187	30.62	30.74	20.01	20.05
	P2	0.334	0.341	5.39	5.41	0.328	0.335	2.238	2.298	31.26	31.38	22.29	22.32
Bio.2	P3	0.391	0.394	5.68	5.67	0.357	0.368	2.318	2.355	32.94	32.89	23.79	23.88
	P4	0.469	0.460	5.98	5.88	0.367	0.372	2.524	2.533	34.68	34.10	23.89	23.95
Mean		0.379	0.379	5.58	5.55	0.342	0.348	2.311	2.343	32.37	32.27	22.49	22.56
	P1	0.336	0.345	5.46	5.52	0.329	0.334	2.211	2.311	31.67	32.01	20.33	21.40
	P2	0.431	0.433	5.76	5.84	0.342	0.350	2.310	2.398	33.41	33.87	21.58	22.66
Bio.3	P3	0.490	0.508	6.09	6.21	0.359	0.379	2.555	2.589	35.32	36.02	22.46	23.99
	P4	0.622	0.628	6.84	6.95	0.389	0.398	2.787	2.700	39.67	40.31	25.56	25.09
Mean		0.469	0.478	6.03	6.13	0.354	0.365	2.465	2.500	35.01	35.55	22.48	23.29
	P1	0.314	0.330	5.30	5.36	0.318	0.321	2.198	2.211	30.74	31.09	20.00	20.91
	P2	0.341	0.357	5.46	5.57	0.328	0.339	2.268	2.298	31.67	32.31	21.22	21.83
Bio.4	P3	0.408	0.432	5.50	5.78	0.355	0.359	2.455	2.387	31.90	33.52	22.42	22.76
	P4	0.510	0.514	6.55	6.34	0.365	0.376	2.554	2.511	37.99	36.77	23.88	23.85
Mean		0.393	0.408	5.70	5.77	0.341	0.349	2.368	2.351	33.07	33.42	21.88	22.33
	P1	0.310	0.314	5.28	5.31	0.319	0.322	2.174	2.208	30.64	30.77	20.06	20.57
	P2	0.351	0.358	5.45	5.50	0.328	0.335	2.241	2.287	31.64	31.93	21.52	21.96
P_2O_5	P3	0.403	0.415	5.65	5.76	0.348	0.357	2.376	2.382	32.81	33.42	22.50	22.99
	P4	0.483	0.489	6.23	6.19	0.366	0.372	2.511	2.486	36.13	35.10	23.97	23.86
Mean		0.386	0.493	5.65	5.69	0.340	0.346	2.325	2.340	32.805	32.805	22.014	22.595
LSD 5% P.		0.089	0.086	0.123	0.121	0.0079	0.0084	0.049	0.048	0.864	0.873	0.987	0.982
Bio.		0.082	0.079	0.119	0.114	0.0073	0.0081	0.045	0.044	0.852	0.859	0.973	0.964
PxBio		0.073	0.071	0.102	0.101	0.0066	0.0071	0.035	0.036	0.658	0.684	0.867	0.786

III: - The economic assessment of the Experiment:

Data in table (6 and 7) reveal assessment of the experimental inputs and outputs as well as the ratio betweenoutputs and inputs for each treatment introducing investment ratio (IR) under the condition of Siwa Oasis, The results indicated the progressive increment in IR by increasing of Soybean Giza, 35 cultivar to combination between phosphorus fertilization, four levels as affected by four in Spraying of types of bio-fertilizers.

Found from the calculation of the economic yield of crop and oil yield, the use of the high rate of soil additive for phosphorus fertilization at the rate of 60 kg. P_2O_5 /fed.and the bio fertilization of the Spraying with amino carpi K compound 200 cm^3/ fed. is the best experimental economic transaction for the farmer under the conditions of Siwa Oasis, especially that the crop of soybeans is grown for the first time in the oasis. With the presence of other factors gave an investment rate higher than the national average, which gives a wide range of selection of transactions according to the conditions of the farmer.

Table 6. The prices of all agricultural management inputs under the condition of field experiment according to market price.

Economic item	Management type	Unit	Price (L.E.)
Input	Bio- fertilizers	Liter/ fed.	350
	Mineral fertilizationP_2O_5	Bag (50 kg./ fed.)	75
	N. fertilization	Bag (50 kg./ fed.)	150
	K_2O	Bag (50 kg./ fed.)	300
	Management operation		750
	Irrigation water	M^3	0.70
	Seeds	Kg. / fed.	120
	Pesticides and herbicides	Fed.	250
	Agricultural rent	Fed.	2100
Output	Seed yields	Kg. / fed.	14

Table7. The economic assessment of the Experiment treatments phosphorus and bio-fertilizers application of soybean on yields

Bio- fertilizers phosphorus fertilizers	Economic item	Soybean			
		Bio.1	Bio.2	Bio.3	Bio.4
P.1= Without fertilization	Input	7296.1	6958.2	6865.2	6734.0
	Output	5448.2	5012.0	5269.0	4883.0
	Investment*	0.74	0.72	0.72	0.69
P.2 = 30 kg. fertilization P_2O_5/Fad	Input	7455.2	7014.0	7113.2	6884.1
	Output	5546.0	5158.1	5111.1	4972.1
	Investment*	0.73	0.72	0.72	0.71
P.3= 45 kg. fertilization P_2O_5/Fad	Input	7669.1	7168.0	7258.1	6973.1
	Output	7601.2	6324.0	6124.1	6014.1
	Investment*	0.98	0.88	1.02	0.86
P.4= 60 kg. fertilization P_2O_5/Fad	Input	7732.0	7311.0	7422.1	7002.0
	Output	7856.1	7211.0	7225.2	6985.1
	Investment*	1.01	0.98	1.12	0.99

*Investment ratio = output / input **National IR = 1.32 LE output / LE input

Conclusions

The study concluded that soybean cultivation is an economic cultivation in Siwa Oasis. We recommend cultivating Giza 35 and phosphorus fertilizers at a rate of 60 kg p_2o_5 fed. and bio fertilization spraying with amino karbi k., at a rate of 200 cm ^{3}/200 L. / fed.

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تأثير الأسمدة الفوسفاتية والحيوية على إنتاجية وجودة فول الصويا بواحة سيوة

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أقيمت تجربتان حقليتان خلال موسمي 2013 و 2014 م. في المحطة التجريبية في منطقة خميسة بواحة سيوة والتابعة لمركز البحوث الصحراوية لدراسة استجابة محصول فول الصويا صنف جيزة 35 للتسميد الفوسفاتى كاضافة ارضية فى اربع مستويات:بدون اضافة,30 ,45, 60كجم فو$_2$أ$_5$ / فدان والتسميد الحيوى رشا فى اربع مستويات وهى: معاملة المقارنة(رش بماء الصنبور) – الرش بمركب بيوماجيك بمعدل 2 لتر/ فدان – الرش بمركب أمينو كيربى كى بمعدل 200 سم^3/ فدان – الرش بمركب بيوجرين ميركل بمعدل 1 لتر/ فدان). واستخدم تصميم القطع المنشقة مرة واحدة حيث وزعت معاملات الرش بالسماد الحيوى فى القطع الرئيسية , بينما التسميد الفوسفاتى فى القطع الشقية, وذلك فى أربع مكرارات.

ويمكن تلخيص النتائج فيما يلي .

1- أظهرت النتائج زيادة كبيرة فى المحصول ومكوناتة وايضا محصول الزيت للفدان باستخدام التسميد الفوسفاتى الأرضى بمعدل 60 كجم فو$_2$أ$_5$ / فدان وذلك فى كلا الموسمين .
2- بينت النتائج ان التسميد الحيوى بالأنواع المختلفة عن وجود اختلافات معنوية عالية وعملت على زيادة المحصول ومكوناتة وكذلك محصول الزيت مقارنة بمعاملة الرش بماء الصنبور وكانت أفضل الأسمدة الحيوية هى مركب أمينو كيربى كى بمعدل 200 سم^3 / فدان, مقارنة بباقى الأسمدة الحيوية الأخرى, وذلك فى كلا الموسمين.
3- دلت النتائج المتحصل عليها من التفاعل بين عاملى الدراسة (التسميد الفوسفاتىوالتسميد الحيوى) أثر معنويا على المحصول ومكوناتة وكذلك محصول الزيت وقد تفوقت معاملة التسميد الفوسفاتى بمعدل 60 كجم فو$_2$ أ$_5$/ ف مع الرش بمركب أمينو كيربى كى بمعدل 200 سم^3 / ف أدت الى زيادة المحصول ومكوناتة زيادة واضحة وكانت افضل معاملة , مقارنة بباقى المعاملات الأخرى, وذلك فى كلا الموسمين.
4- أوضحت النتائج أن التسميد الفوسفاتى بمعدل 60 كجم فو$_2$أ$_5$ / فدان, والرش بمركب أمينو كيربى كى بمعدل 200 سم^3 / فدان, قد أدى الى زيادة معنوية واضحة فى نسب المكونات الكيماوية لبذور فول الصويا وهى: النيتروجين , الفوسفور, البوتاسيوم, البروتين الكلى, الزيت وكذلك محصول الفدان من الزيت, وذلك فى كلا الموسمين.
5- وجد من حساب العائد الأقتصادى لمحصول البذور ومحصول الزيت ان استخدام المعدل المرتفع من الأضافة الأرضية للتسميد الفوسفاتى 60 كجم فو$_2$أ$_5$ / فدان والتسميد الحيوى بمركب أمينو كيربى كى 200سم^3 /فدان, هو افضل المعاملات التجريبية اقتصاديا للمزارع تحت ظروف واحة سيوة وخصوصا انة يزرع لاول مرة بالواحة, مع وجود معاملات اخرى اعطت معدل استثمار اعلى من المعدل القومى مما يعطى مجالا واسعا لاختيار المعاملات حسب ظروف المزارع الأقتصادية.