

STUDIES ON THE ABILITY OF BARLEY PLANT FOR GROWTH AND WEED COMPETITION UNDER SALINE AND CALCAREOUS SOILS CONDITIONS

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ABSTRACT

Two successive growth seasons were conducted at Two locations in 2005/2006 and 2006/2007 growing seasons. 1-Wadi Sudr Agricultural Experimental Station, Desert Research Center South Sinai Governorate (saline soil). 2-Maryut Agricultural Research Station, Desert Research Center, at Maryut region, 35 Kms. west Alexandria (sandy and calcareous soil). This study was conducted to evaluate the effect of three weed control treatment and three foliar application as well as three biofertilizer treatments on acclimation and improving growth, yield and its components as well as the Chemical composition of barley plant grown under saline and calcareous soil conditions . Split split plot design with three replications was used, the main plots were devoted at random to the weed control, i.e., Topik140 g/fed , Derby 30Cm/fed and tap water as a control and three foliar application treatments, i.e., Kcl 2% , Biomagic 3Kg/fed and tap water as a control in the sup plot as well as three biofertilizer treatments, i.e., Nitroben 1Kg/fed and Seryalen 800g/fed and tap water as a control in the sub sub plots . The obtained results could be summarized as follows:

Topik as a weed control treatment was better than Derby for all growth traits, yield and yield components as well as chemical composition of barley plant under saline and calcareous soil in 2005/2006 and 2006/ 2007 growing seasons. However, Kcl 2% as a foliar application recorded the highest significant mean values for all growth traits, yield and yield components as well as chemical composition of barley under saline soil during both seasons. Biomagic 3Kg/fed. Surpassed the other foliar application for increasing growth traits, yield and its components as well as accumulation of carbohydrates, protein and prolein contents in barley plants under calcareous soil during both seasons. Generally, inoculation of seeds by Seryalen biofertilizer treatment was better than Nitroben for growth traits yield and its components in addition, chemical composition of barley plant as compared with the control under saline and calcareous soils condition.

Keywords: Adaptation - weed control - biofertilizer - foliar application- Growth -Yield - Biomagic - chemical composition.

INTRODUCTION

Barley (*Hordeum vulgare L.*) is considered one of the most important cereal crops in the world being used for many purposes such as malting and brewing industry, animal feeding , bread making as it is or by mixing with wheat flour in some places, some human food and beverages and many other uses. barley grown under wide range of environmental conditions. Generally, it grows in areas where water supply is limited and where crop production depends mainly upon rainfall. Barley has been grown as the main cereal crop in the most of rain-fed areas at Western North Coasts in Egypt (El- Sayed *et. al.* 2003).

However, the application of improved cultural practices could raise productivity and minimize the wide range between the high and low yield environments. Limited water availability is one of the most widespread environmental constraints on plant growth and yield. Many investigators studied the effect of water deficit on barley yield and its components.

Foliar application and biofertilizer considered well known treatments for improving plant growth and correct the balance of chemical constituents that has been disturbed in most plants under saline and calcareous conditions (El-Agamy *et al.*, 1991 and Sallam, 1992).

Recently, increasing salt tolerance of plants by using biostimulant (biomagic) as a foliar application or seeds inoculation by biofertilizer treatments is gaining more enhancement growth of crops. Abdel- Hameed (2002) found that treatments by Nitroben and seryalen, as a biofertilizer treatments or biomagic foliar application revealed positive effect with Olive trees. In this respect, Ismail, (2002) reported that growth, yield and its components of Pea plants (*Pisum sativum* L) improved with the applied biofertilizer treatment. Also, the application of biostimulant (Biomagic) as a foliar application increased root and vegetative growth characteristics of pea plant under saline and calcareous soil, (Ismail, 2002). Moreover, the application of K was recommended as effective agent for improving growth, yield and some chemical composition of barley plant parallel with several reports indicating the increase of Na and Cl ions in tissues of different plant species accompanied by a decrease in K content upon increasing NaCl salinity (Ozoris *et al.*, 1984).

Therefore the aim of this investigation was to evaluate the effectiveness of weed control (i.e., Derby and Topik) and foliar application (i.e., Biomagic and KCl) treatments as well as biofertilizer (i.e., Nitroben and seryalen) on acclimation and improving growth, yield and its components as well as the Chemical composition of barley plant grown under saline and calcareous soil conditions

MATERIALS AND METHODS

Two successive growth seasons were conducted at Two locations in Egypt during 2005/2006 and 2006/2007 growing seasons. Wadi Sudr Agricultural Experimental Station, Desert Research Center South Sinai Governorate (saline soil). Maryut Agricultural Research Station, Desert Research Center, at Maryut region, 35 Kms. west Alexandria (sandy and calcareous soil). This study was conducted to evaluate the effect of three weed control (Derby 30 Cm/fed ,Topik 140gm/fed.and tap water as a control), three foliar application treatments (KCl 2% , Biomagic 3Kg/fed. and tap water as a control as well as three biofertilizer treatments (Nitroben(1Kg/fed) ,Seryalen(800g/fed) and control) on acclimation and improving growth, yield and its components as well as the Chemical composition of barley plant grown under saline and calcareous soil conditions.

Seeds of barley Variety Giza 123 was obtained from Agricultural Research Center and were planted on 15th November in the Two seasons at rate 70 Kg/fed at Two locations. The experimental units area at Two location

were 6m² (2mx3m) with 12 rows, 25cm apart with 2m length. Organic manure and calcium super phosphate (15.5 % P₂O₅) at the rate of 25 m³ and 31 kg P₂O₅/fed respectively were applied during tillage. While ammonium nitrate (33.5% N) at the rate of 70 kg N/fed. was added in Two equal doses at 30 and 60 days from sowing date respectively. Plants were irrigated directed and twice foliar-spraying application were applied after 45 and 75 days from sowing using Tween 20 as wetting agent.

In each location, the experiment included 27 treatments, which were the combination of three different weed control treatments x three foliar application x three biofertilizer treatments. Treatments were arranged in a split split plot design with three replications. The main plots devoted to the weed control treatments were randomly arranged in the main plot. Whereas, foliar application was allocated at random in the sub plots and biofertilizer treatments were the sub – sub plots. At Two location mechanical and chemical analysis of soil as well as underground irrigation water are presented in Tables (1,2 a and b). Such mechanical and chemical analyses were determined according to *Richards (1954) and Jackson (1958)*.

Table (1): Mechanical and chemical properties of the experimental soil and chemical analysis of irrigation water at Wadi Sudr.

a). Soil Physical analysis

Depth (cm)	sand (%)	Silt (%)	Clay (%)	Texture class
0-40	64.0	16.2	19.8	Sand

b). Chemical analysis of soil paste and irrigation water.

Depth (cm)	EC dS.m ⁻¹	PH	Soluble cations (meq/L.)				Soluble anions (meq/L.)		
			Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺	HCO ₃ ⁻	Cl ⁻	SO ₄ ⁻
Soil (0 –40cm)	10.3	7.62	29.0	33.82	85.3	1.30	12.74	85.75	50.20
Irrigation Water	9.7	7.25	26.80	23.00	30.00	0.69	4.50	47.0	29.0

Table (2): Mechanical and chemical properties of Maryut Farm soil and chemical analysis of irrigation water.

a). Physical analysis

Depth(cm)	CaCO ₃ (%)	Particle size distribution (%)				Texture
		Coarse Sand	Fine sand	Silt	Clay	
0 – 40	32.00	9.57	46.40	19.22	24.81	Sand clay loam

b). Chemical analysis of Maryut Farm soil and irrigation water

Depth (cm)	E.C. mmhos/cm	pH	O.M. (%)	Soluble anions (meq/L.)				Soluble cations (meq/L.)			
				HCO ₃ ⁻	CO ₃ ⁻	Cl ⁻	SO ₄ ⁻	Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺
0-40	4.00	7.8	0.49	3.20	-	25.21	18.24	15.25	5.30	24.70	0.82
Irrigation Water	2.80	7.5	-	8.54	-	15.32	6.20	6.20	7.75	16.60	0.33

Two samples at 60 and 160 days from sowing date were randomly taken from each plot (tillering and harvesting stages) to determine the following characters. Plant height (cm), No. of tillers/plant, fresh and dry weights/plant and flag leaf area (cm²) at tillering stage. Plant height (cm), No. of grains/spike, 1000-grain weight (g), grains yield (ton/fed.) and straw yield (ton/fed.) were recorded at harvesting time. The plants were harvested from each plot for grain and straw yield determined. Shoot samples dried in an oven at 70°C to calculate the dry matter. The dried and fresh materials for the first sample were ground into a fine powder and used for chemical analysis.

Total carbohydrate content was determined photometrically at 480 nm according to the phenol-sulphuric acid method described by Cherry (1973). Total nitrogen in the powdered samples was determined by using the modified Microkeldahl method as described by A.O.A.C. (1985). The factor (6.25) was used for converting total nitrogen to crude protein (Deyoe and Shellenberger, 1965). Proline was determined in fresh leaves according to the method of Bates *et al.* (1973). Data were subjected to the statistical analysis of variance according to Steel and Torrie (1960). LSD was used to detect significant differences at 0.05 level.

RESULTS AND DISCUSSION

1-Growth traits:-

1-1 Effect of weed control treatments:-

In regard to the effect of weed control treatments in both growing seasons 2005/2006 and 2006/2007, Derby and Topik exhibited non-significant enhancements for all growth traits comparing with the unweeded under saline condition (Table 3). Meanwhile, under calcareous soil, plant height, no. of tillers/plant, fresh and dry weights/plant as well as flag leaf area of barley plant detected significant increase values with Derby and Topik as weed control treatments as compared with the control in 2005/2006 and 2006/2007 seasons. However, Topik as a weed control treatment was better than Derby for all growth traits under saline and calcareous soil during both seasons. These results are in agreement with those obtained by Fakkar (1999), mentioned that application of Topik 24% at 100 cc/fed. reduced significantly dry weight of grass weeds (*Avena fatua*, *Lolium multiflorum* and *Phalaris* spp). Also, Lyengar *et al.* (1977), evaluated seven varieties of barley under sea water saline conditions, diluted the solution to 1500 ppm. They found that salinity reduced the plant height, number of tillers/plant and number of kernels per spike compared with the control. However, Raffel and Flush (1992) reported that, Topik consists of CGA 1849271 S [Clodinafop] + the safener CGA185072 [Cloquintocet]. It is a new herbicide for the post-emergence control of annual grasses in cereals.

Concerning the effect of tralkoxydim Devine and Rashid (1993), reported that the use of tralkoxydim at 125, 250, 375 and 500 g/ha significantly inhibited the growth of *Avena fatua* plants.

Table(3): Effect of weed control on growth traits of barley at tillering stage under saline and calcareous soil in 2005/2006 and 2006/2007 seasons.

weed control	At saline soil					At calcareous soil				
	Plant height (cm)	No. of tillers/plant	Fresh and dry weights g/pl		Flag leaf area cm ²	Plant height (cm)	No. of tillers/plant	Fresh and dry weights g/pl		Flag leaf area cm ²
			F	D				F	D	
2005 / 2006										
Control	48.463	1.448	4.537	1.052	18.911	78.478	3.200	6.311	2.889	22.978
Derby 30Cm/fed	48.559	1.456	4.459	1.041	18.901	79.460	3.678	6.570	3.233	23.937
Topik 140 g/fed	48.554	1.471	4.478	1.048	18.896	79.519	3.856	6.589	3.256	23.919
L.S.D. 5%	0.687	0.155	0.234	0.246	0.198	0.297	0.024	0.074	0.174	0.213
2006/ 2007										
Control	53.378	1.448	5.422	1.811	18.919	83.382	3.204	7.254	3.419	22.937
Derby 30 cm/fed	53.519	1.459	5.465	1.877	18.530	83.978	3.681	7.578	3.500	23.933
Topik 140 g/fed	53.488	1.470	5.733	1.872	18.908	84.419	3.863	7.596	3.533	23.919
L.S.D. 5%	0.502	0.156	0.942	0.078	0.874	0.389	0.123	0.182	0.055	0.220

1-2 Effect of foliar application:-

Data in (table 4) show the effect of different foliar application treatments on growth traits of barley under saline and calcareous soils in both growing seasons 2005 /2006 and 2006/ 2007. It is evident from the present data that, plant height, No. of tiller / plant, fresh and dry weights/plant, flag leaf area, significantly increased with Biomagic 3kg/fed. And Kcl 2% as a foliar application treatments as compared with control (tap water) under Two types of soil in 2005/2006 and 2006/ 2007 growing seasons. However, Kcl 2% as a foliar application produced the highest mean values for all growth traits of barley ie. plant height, No. of tiller / plant, fresh and dry weights/plant, flag leaf area under saline soil during both growing seasons which reached (51.71cm, 1.87, 5.51 gm, 1.22 gm and 19.63 cm² respectively in 2005/2006) and (56.69cm, 1.87, 6.625gm, 2.146gm and 19.645 cm² respectively in 2006/2007). Meanwhile, Biomagic 3Kg/fed. As a foliar application detected the highest mean values for all growth traits of barley ie. plant height , No. of tiller / plant, fresh and dry weight/plant , flag leaf area under calcareous soil during both growing seasons which reached (82.18cm, 4.437, 7.515gm, 3.544gm and 24.267 cm² respectively in 2005/2006) and (87.056cm, 4.44, 8.500gm,3.83gm and 24.26 cm² respectively in 2006/2007.

In the same direction, calcareous soil surpassed saline soil for all growth traits with all foliar application in 2005/2006 and 2006/2007 growing season.

These results are in agreement with those obtained by EL-Sokkary (1973),reported that desert calcareous and saline soil supply lower amounts of K to plants than alluvial soils. However, K consider an essential macronutrient for plant metabolism (Mengel and Kirkby,1978). This element is implicated functionally in numerous roles within the plant (Graham and Ulrich, 1972). Also, using KCL as a foliar application improving

asmoroglation and correcting the adverse effect of salinity for improving salt tolerance of some field crops (Farrag, 1978, EL-Kadi *et.al*, 1979; EL-Bagouri *et.al*; 1983, Wassif *et.al.*;1983; Shukla & Nukhi; 1985 and Dahdoh; 1986). Also, The biofertilizer (BF) and biostimulant biomagic (BS) which used in this experiment were produced by soil microbiology unit, desert research center, biomagic is a biological promoter of macrobial orrigin (El- Sibaie, 1995). It dose not contain any of the synthetic phytohormon , but it contains many of the biological products ,which affect the plant growth and productivity and increase the plant immunity to microbial diseases. It contains N, P, K and all the trace elements especially Zn , Mn , Fe required by the major plants in a very suitable formula. (Khalil *et al.*, 1997).

Table(4): Effect of foliar application on growth traits of barley at tillering stage under saline and calcareous soil in 2005/2006 and 2006/2007 seasons.

Foliar application	At saline soil				At calcareous soil					
	Plant height (cm)	No. of tillers/plant	Fresh and dry weights g/pl		Plant height (cm)	No. of tillers/plant	Fresh and dry weights g/pl		Flag leaf area cm ²	
			F	D			F	D		
2005 / 2006										
Control	46.111	1.115	3.537	0.915	18.419	76.789	2.874	5.804	2.756	23.167
Biomagic3Kg/fed.	47.752	1.389	4.426	1.004	18.656	82.182	4.437	7.515	3.544	24.267
Kcl 2%	51.713	1.870	5.511	1.222	19.634	78.485	3.422	6.152	3.078	23.400
L.S.D. 5%	0.769	0.103	0.216	0.092	0.184	0.207	0.153	0.065	0.166	0.230
2006/ 2007										
Control	50.980	1.119	4.601	1.567	18.419	81.386	2.878	6.769	3.259	23.126
Biomagic3Kg/fed.	52.711	1.389	5.394	1.847	18.293	87.056	4.440	8.500	3.833	24.263
Kcl 2%	56.693	1.870	6.625	2.146	19.645	83.337	3.430	7.159	3.359	23.400
L.S.D. 5%	0.216	0.113	0.862	0.065	0.616	0.474	0.103	0.130	0.145	0.272

1-3 Effect of biofertilizer treatments:

Growth traits of barley plants had a significant increase with applying the different biofertilizer treatments of Nitroben and Seryalen as compared with the control under saline and calcareous soils during 2005/2006 and 2006/2007 growing seasons (Table 5). Generally, inoculation of seeds by Seryalen biofertilizer recorded the highest significant mean values of plant height, no. of tillers/plant, fresh and dry weights/plant as well as flag leaf area under Two types of soil which reached (49.9cm , 1.70 , 5.09gm , 1.16 gm and 19.4 cm² under saline soil and 80.5cm , 3.9 , 6.89 gm , 3.32 gm and 24.08 m² under calcareous soil respectively in 2005/2006 growing seasons) . However, during second season reached , (54.9 cm,1.70 , 6.11 gm , 2.03 gm and 19.4 m² under saline soil and 85.5 cm , 3.9 , 7.87 gm , 3.62 gm and 24.08 m² under calcareous soil respectively . Where, all growth traits with different biofertilizer treatments under calcareous soil were better than under saline soil during both seasons 2005/2006 and 2006 / 2007 .

Table(5): Effect of Biofertilizer on growth traits of barley at tillering stage under saline and calcareous soil in 2005/2006 and 2006/2007 seasons.

Bio fertilizer	At saline soil					At calcareous soil				
	Plant height (cm)	No. of tillers/plant	Fresh and dry weights g/pl		Flag leaf area cm ²	Plant height (cm)	No. of tillers/plant	Fresh and dry weights g/pl		Flag leaf area cm ²
			F	D				F	D	
2005 / 2006										
Control	47.124	1.204	3.878	0.926	18.448	77.893	3.230	6.070	2.911	23.122
Nitroben (1Kg/fed)	48.463	1.474	4.504	1.056	18.856	79.111	3.581	6.511	3.144	23.633
Seryalen (800g/fed)	49.989	1.696	5.093	1.159	19.404	80.452	3.922	6.889	3.322	24.078
L.S.D. 5%	0.658	0.087	0.195	0.076	0.145	0.689	0.145	0.076	0.044	0.195
2006/ 2007										
Control	52.084	1.207	5.120	1.648	18.444	82.544	3.233	7.063	2.948	23.081
Nitroben (1kg/fed)	53.359	1.474	5.393	1.884	18.489	83.760	3.585	7.496	3.485	23.630
Seryalen (800g/fed)	54.941	1.696	6.109	2.027	19.423	85.474	3.930	7.869	3.619	24.078
L.S.D. 5%	0.266	0.087	0.762	0.107	0.542	0.231	0.123	0.116	0.076	0.243

Similar results were reported by Ribaudo *et al.*, (1998) who found that inoculation seeds of maize hybrids by biofertilizer such as *Azospirillum* showed a significant increase in the mean dry weight of shoots and roots at the milk ripeness stage. On the same line, plant growth of pearl millet, wheat, mustard and sunflowers was generally increased by inoculation with *Azotobacter brasilense* or *Azotobacter chroococcum* (Kundu and Sharma, 1994). However, Abdel- Hameed 2002, reported that treatments of *Azotobacter*, *Azospirillum*, and phosphate dissolving bacteria as a biofertilizer treatments revealed positive effect with Olive trees. Moreover, Khafaga and Kishk (1999) showed that Increasing nitrogen and phosphorus levels Produced significant increment for plant height, No. of branches/plant, fresh and dry weight/plant as well as dry matter accumulation (%) of vernonia plant under calcareous soil.

1-4 Effect of interaction between weed control, foliar application and biofertilizer treatments:

Data in Table (6) showed that all growth characters of barley plant significantly increased by weed control combine with foliar application and biofertilizer treatments under saline and calcareous soil in 2005/2006 and 2006/2007 growing season. Derby as a weed control combine with KCl 2% as a foliar application and Seryalen as a biofertilizer interaction treatment was the best effect treatment for inducing a significant increase for plant height and flag leaf area of barley plant under saline soil during both seasons. Meanwhile, Topik as a weed control combine with KCl 2% as a foliar application and Seryalen as a biofertilizer interaction treatment detected the highest mean values for No. of tillers/plant, fresh and dry weights/plant under the same conditions in 2005/2006 and 2006/2007 growing season.

However, Topik as a weed control combine with Biomagic3Kg/fed. as a foliar application and Seryalen as a biofertilizer interaction treatment recorded the highest significant mean values for all growth traits under calcareous soil except flag leaf area during both seasons. Derby as a weed control combines with Biomagic3Kg/fed. as a foliar application and Seryalen as a biofertilizer interaction treatment was the best treatment for flag leaf area during both seasons. From the results we noticed that Topik as weed control with Biomagic as a foliar application on inoculation seeds by Seryalen interaction was the best treatment under calcareous soil such finding may be related to the role of three factor for increasing growth traits of barley plant such finding may be related to Biomagic which is a biological promoter of microbial origin (El-Sibaie, 1995). However, Raffel and Flush (1992) reported that, Topik consists of CGA 1849271 S [Clodinafop] + the safener CGA 185072 [Cloquintocet]. It is a new herbicide for the post-emergence control of annual grasses in cereals. Also, plant growth of pearl millet, wheat, mustard and sunflowers was generally increased by inoculation with *Azotobacter brasilense* or *Azotobacter chroococcum* (Kundu and Sharma, 1994).

2-Yield and yield components:-

2-1 Effect of weed control treatments:-

Data presented in (Table 7) showed that used of Derby and Topik as a weed control treatments increased plant height, spike length, no. of grains/spike, 1000-grain weight (gm), grains yield (ton/fed.) and straw yield (ton/fed.) of barley plant as compared with the control . Whereas, spraying weeds plants with the Topik dose gave the highest significant increase values in plant height, no. of grains/spike grains yield (ton/fed.) and straw yield (ton/fed.) for barley plant under saline condition which reached (85.64 cm, 39.26, 1.74 Ton/fed and 2.21 Ton/fed respectively in 2005/2006) and (90.48 cm , 39.38, 1.89 Ton/fed and 2.30 Ton/fed respectively in 2006/2007). Meanwhile foliar application with Derby as a weed control was better than Topik for spike length, and 1000 grain weight/g under the same condition during both seasons. However, under calcareous soil spraying weed plants with the Topik was better than Derby for yield and its components of barley plant in 2005/2006 and 2006/2007 growing seasons except spike length during first season. However, yield and yield components of barley plant were better than during second season as compared the first one by spraying weeds plants with weed control under saline and calcareous soil

Similarly results were obtained by Hassanein et al (1993), they recorded that the application of Topik 24% EC at 0.238 l/ha increased wheat grain yield. Meanwhile, Elan *et al.* (1996), noted that the addition of Grasp 10% EC at 2.38 l/ha, Topik 24% EC at 0.24 l/ha. and hand weeding twice increased significantly wheat grain yield compared with the unwedded treatment. On the same direction, Yehia *et al.* (1996), found that the application of Topik at 0.24 l/ha, and Grasp at 2.38 l/ha. gave the best results in grain yield than hand weeding twice (30 and 60 days) in wheat plant. Also, Balyan *et al.* (1992), recorded that the application of trakoxydim at rate of 0.35 kg/ha., at 30 days after sowing gave significantly better wheat yields compared to unwedded

treatment. in the same direction Vanova (1992), reported that the application of Grasp 10% EC (tralkoxydim) at rate of 2.5 l/ha. gave the highest yield (132% above the control).

Table(7): Effect of weed control on yield and its components of barley at harvesting stage under saline and calcareous soil in 2005/2006 and 2006/2007 seasons.

weed control	At saline soil					At calcareous soil				
	Spick length	No .of grains / spicke	1000 grain wt/g	Grain yield Ton/ fed	Straw yield Ton/ fed	Spick length	No .of grains / spicke	1000 grain wt/g	Grain yield Ton/ fed	Straw yield Ton/ fed
	2005 / 2006									
Control	12.678	35.807	41.416	1.656	2.144	16.537	45.922	51.519	1.999	2.744
Derby 30 cm/fed	14.370	38.000	43.804	1.744	2.200	18.570	48.037	52.656	2.222	2.867
Topik 140 g/fed	13.397	39.263	43.778	1.744	2.212	17.811	50.241	53.681	2.244	2.844
L.S.D. 5%	0.078	0.593	0.146	0.011	0.035	0.716	0.803	1.166	0.013	0.038
2006/ 2007										
Control	14.667	35.689	43.463	1.759	2.230	18.659	45.934	53.544	2.211	2.844
Derby 30 cm/fed	16.344	37.967	45.704	1.844	2.300	21.033	48.026	54.407	2.322	2.968
Topik 140 g/fed	15.770	39.378	45.570	1.894	2.300	21.241	50.159	54.448	2.344	2.946
L.S.D. 5%	0.078	0.593	0.146	0.012	0.034	0.135	0.477	0.191	0.193	0.036

2-2 Effect of foliar application :-

Data in table (8), showed that Biomagic and Kcl 2% as foliar application recorded significant increase for yield and yield components of barley in terms of Plant height (cm), spike length (cm), no. of grains/ spike, 1000- grain weight (g), grains yield (ton/fed.) and straw yield (ton/fed.) as compared with the control under saline and calcareous soil in both seasons. Spraying barley plant by Kcl 2% produced the highest significant mean values for Plant height (cm), spike length (cm), no. of grains/ spike, 1000- grain weight (g), grains yield (ton/fed.) and straw yield (ton/fed.) as compared with the other foliar application treatments under saline soil in 2005/2006 and 2006/2007 growing seasons. Whereas, Biomagic (3kg/fed.) as a foliar application surpassed Kcl 2% for yield and yield components of barley in terms of Plant height (cm), spike length (cm), no. of grains/ spike, 1000- grain weight (g), grains yield (ton/fed.) and straw yield (ton/fed.) under calcareous soil during the Two seasons.

These results may be mainly due to the role of Kcl and biomagic as a stimulus foliar application for improving growth characters of barley plant which was reflected on yield and its components. In these respect, (Ismail, 2002) showed that, no. of seeds/pod., seed weight /pod (g) , 1000 seeds weight (g) ,and shell out % of fresh pod for pea plants(*Pisum sativum L.*) exhibited maximum significant mean values with Biomagic as foliar

application. Also, Abdel-Hameed 2002 reported that fruit length , fruit diameter, fruit volume and fruit weight of olive plants achieved the highest significant mean values with biomagic as a foliar application compared with the control. Concerning, the effect of Kcl 2% (Kishk *et al.*, 2004) showed that yield and its components of vernaonia(ie No. of heads/plant , 1000seed weight (g), seeds weight/plant and seeds yield /fed) recorded positive effects with Kcl 2% as a foliar application under calcareous soil. These results may be due to the physiological role of potassium on photosynthesis process and carbohydrates structure which is considered the base of building other components like protein and nucleic acids, (Kastori *et al.* 1987).

Table(8): Effect of foliar application on yield and its components of barley at harvesting stage under saline and calcareous soil in 2005/2006 and 2006/2007 seasons.

Foliar application	At saline soil					At calcareous soil				
	Spick length	No .of grains/spicke	1000 grain wt/g	Grain yield Ton/fed	Straw yield Ton/fed	Spick length	No .of grains/spicke	1000 grain wt/g	Grain yield Ton/ fed	Straw yield Ton/fed
2005 / 2006										
Control	11.549	36.767	40.315	1.644	2.101	16.178	47.048	49.022	2.047	2.700
Biomagic3Kg/ fed	12.756	37.541	42.631	1.711	2.367	19.256	49.444	56.233	2.334	2.956
Kcl 2%	15.141	38.763	46.052	1.989	2.589	17.485	47.707	52.600	2.200	2.800
.L.S.D. 5%	1.605	0.647	0.374	0.150	0.335	0.678	0.756	0.782	0.159	0.265
2006/ 2007										
Control	14.519	36.686	42.322	1.744	2.186	19.148	47.041	50.815	2.144	2.800
Biomagic3Kg/ fed	15.115	37.644	44.744	1.811	2.256	21.870	49.430	57.270	2.433	3.058
Kcl 2%	17.148	38.704	47.670	1.992	2.389	19.915	47.648	54.315	2.300	2.900
.L.S.D. 5%	0.145	0.565	0.113	0.010	0.038	0.122	0.344	0.122	0.169	0.285

2-3 Effect of biofertilizer treatments:

Yield and its components of barley were significantly increased with seeds inoculation with the applied different biofertilizer treatments (Nitroben and Seryalen) under saline and calcareous soil as compared with the control during the Two seasons 2005/2006 and 2006/2007 (Table 9). However, significant differences were observed between the effect of the applied biofertilizer treatments under saline and calcareous soil in 2005/2006 and 2006/2007 growing seasons. Moreover, Seryalen application gave the maximum mean values for yield and its attributes in terms of Plant height (cm), spike length (cm), no. of grains/ spike, 1000- grain weight (g), grains yield (ton/fed.) and straw yield (ton/fed.) followed by Nitroben as a biofertilizer application in a descending order under saline and calcareous soil during the 1st and 2nd seasons. However , yield and yield components of barley in terms of Plant height (cm), spike length (cm), no. of grains/ spike, 1000- grain weight (g), grains yield (ton/fed.) and straw yield (ton/fed.) recorded the highest mean values under saline and calcareous soil during 2nd seasons as compared with the 1st one. The positive response for yield and its attributes resulting from the application of biofertilizer treatments could be due to the

role of such treatments in the osmotic pressure adjustment of plants under saline and calcareous soil conditions, and consequently its importance of being required in the external medium to maintain selectivity and integrity of cell membrane (Satti and Lopez 1994).

Table(9): Effect of Biofertilizer on yield and its components of barley at harvesting stage under saline and calcareous soil in 2005/2006 and 2006/2007 seasons.

Bio fertilizer	At saline soil					At calcareous soil				
	Spick length	No .of grains/spicke	1000 grain wt/g	Grain yield Ton/fed	Straw yield Ton/fed	Spick length	No .of grains/spicke	1000 grain wt/g	Grain yield Ton/fed	Straw yield Ton/fed
	2005 / 2006									
Control	11.907	36.404	41.557	1.667	2.122	16.374	46.689	50.981	2.126	2.733
Nitroben (1kg/fed)	13.700	37.711	43.081	1.711	2.289	17.663	48.230	52.711	2.278	2.822
Seryalen (800g/fed)	14.837	38.956	44.359	1.897	2.345	18.881	49.281	54.163	2.378	2.900
.L.S.D. 5%	1.537	0.802	0.613	0.139	0.262	0.594	0.707	0.697	0.159	0.265
2006/ 2007										
Control	14.263	36.457	43.541	1.767	2.219	19.189	46.685	52.619	2.222	2.833
Nitroben (1kg/fed)	15.700	37.702	44.974	1.814	2.389	20.559	48.115	54.111	2.378	2.924
Seryalen (800g/fed)	16.819	38.874	46.222	1.967	2.422	21.185	49.319	55.670	2.478	3.000
.L.S.D. 5%	0.107	0.490	0.138	0.149	0.135	0.116	0.421	0.151	0.169	0.165

However, these results are in agreement with those recorded by Abdel-Hameed 2002 who noted that yield and its components of olive plants were enhanced with biofertilizer treatments (Azotobacter, Azospirillum and phosphate dissolving bacteria) as compared with the control. Also, Mal-teeva *et al.*, (1995) found that inoculation rye seed with *Azospirillum brasilense* increased grain yield by 18.2% in a field experiment. On the same line, seed inoculation of wheat, barley, sorghum and rice with *Azospirillum brasilense* increased grain yields by 63, 56, 60 and 61%, respectively, compared with the un inoculated seeds (Sudhir pradhan *et al.*, 1998). In the same regard, Dibut *et al.*, (1996) showed that treatment of durum wheat cv. CC-204 with *Azotobacter chroococcum* increased yield and its components. Moreover, Ismail 2002 reported that seed inoculation of pea plant (*Pisum sativum L.*) with phosphate dissolving bacteria enhanced no. of seeds/pod., seed weight /pod (g) , 1000 seeds weight (g) ,and shell out % of fresh pod as compared with the un inoculated seeds.

2-4 Effect of interaction between weed control, foliar application and biofertilizer treatments:

Data in Table (10) showed that Plant height (cm), spike length (cm), no. of grains/ spike, 1000- grain weight (g), grains yield (ton/fed.) and straw yield (ton/fed.) of barley plant significantly increased by weed control combine with foliar application and biofertilizer treatments under saline and calcareous soil in 2005/2006 and 2006/2007 growing season.

Topik as a weed control combine with Kcl 2% as a foliar application and Seryalen as a biofertilizer interaction treatment was the best effect treatment for inducing a significant increase for Plant height (cm), spike length (cm), no. of grains/ spike, 1000- grain weight (g), grains yield (ton/fed.) and straw yield (ton/fed.) under saline soil during both seasons. However, Topik as a weed control combine with Biomagic3Kg/fed. as a foliar application and Seryalen as a biofertilizer interaction treatment recorded the highest significant mean values for yield and its components under calcareous soil in 2005/2006 and 2006/2007 growing season . These increments under saline and calcareous soil were in agreements with that obtained by Abdel- Hameed 2002 and Ismail 2002 on olive and pea plant respectively. Also, Mansour, 1998 showed that, all biofertilizers were very effective in improving yield of Anna apple trees. On the other hand the interaction between weed control combine with foliar application and biofertilizer treatments under saline and calcareous soil improving growth traits and reflect on enhancement yield and its components of barley plant.

3- Chemical constituents :-

3-1 Total carbohydrates ,crude protein and prolein contents:

3-1 Effect of weed control treatments:-

Total carbohydrates and protein contents on dry shoots and grains as well as prolein in fresh shoot (f. Sh.) of barley plant exhibited a marked increase with all weed control treatments as compared with the control under saline and calcareous soil (Table11). However, Topik surpassed Derby for accumulation of total carbohydrates (carbo.), protein and prolein contents in shoot and grains of barley plant. Generally, total carbohydrates, protein and prolein accumulation under calcareous soil were more than under saline soil.

Table(11): Effect of weed control on Carbohydrates, Protein and Prolen contents of barley under saline and calcareous soil in 2006/2007 season.

weed control	At saline soil					At calcareous soil				
	Shoots		Grains		Prolen Umol/g F.sh.	Shoots		Grains		Prolen Umol/g F.sh.
	Carbo. %	Protein %	Carbo. %	Protein %		Carbo. %	Protein %	Carbo. %	Protein %	
Control	44.2	11.8	57.5	9.8	0.76	48.2	14.0	58.6	11.0	0.62
Derby 30cm/fed	44.7	12.0	58.6	10.4	0.81	50.1	14.5	60.5	11.5	0.67
Topik 140 g/fed	47.0	12.6	59.5	10.6	0.88	50.7	14.6	61.5	12.4	0.72
.L.S.D. 5%	1.23	0.04	0.73	0.42	0.24	0.47	0.01	0.33	0.52	0.10

Regarding chemical composition in grains of wheat, EL-Desoky (1990) and EL-Ashkar (1998) in Egypt found that all-herbicide treatments and hand pulling twice increased carbohydrates and protein contents in grains compared with unweeded check. Also, Porwal and Gupta (1993) in India concluded that herbicide treatments increased wheat grain crude protein content by 14.1 to 15% compared to the unweeded treatment. Saad and Omar (1991), found that the maximum increase in protein content was

obtained by the application of bromoxynil at the rate of 0.4 kg.a.i after 30 days and at 0.8 kg.a.i after 60 days in comparison with the control treatment. Selim (1996), found that Na accumulation increased in sensitive wheat varieties than in tolerant varieties which reflect on increasing protein content.

3-2 Effect of foliar application treatments:-

Data in Table (12) showed that the different applied of foliar application treatments induced an enhanced effect on carbohydrates and protein contents on dry shoots and grains as well as protein in fresh shoot of barley plant as compared with the control under saline and calcareous soil. Kcl 2% as a foliar application treatment surpassed Biomagic 3kg/fed for improving carbohydrates, protein and protein contents in shoot and grains under saline soil. In contrast Biomagic 3kg/fed was better than Kcl 2% as a foliar application treatment for enhancement total carbohydrates , protein accumulation and protein under calcareous soil in shoot and grains of barley plant.

Table(12): ffect of foliar application on Carbohydrates , Protein and Prolein contents of barley at under saline and calcareous soil in 2006/2007 season.

Foliar application	At saline soil					At calcareous soil				
	Shoots		Grains		Prolein Umol/g F.sh.	Shoots		Grains		Prolein Umol/g F. sh.
	Carbo. %	Protein %	Carbo. %	Protein %		Carbo. %	Protein %	Carbo. %	Protein %	
Control	43.6	11.4	57.1	9.2	0.74	49.6	13.2	59.3	7.1	0.58
Biomagic3Kg/fed.	45.4	11.9	59.0	10.6	0.83	50.7	15.3	61.4	12.5	0.73
Kcl 2%	46.9	13.1	59.4	11.1	0.87	48.6	14.6	59.9	11.9	0.69
.L.S.D. 5%	1.01	0.43	1.45	0.78	0.04	1.03	0.02	0.55	0.22	0.04

These finding may be mainly due to the efficiency of the application of some elements such as KCL may be with a corrective and/ or compensative effect on mineral balance (Misra 1964). Meanwhile, the response of protein content obtained in the present work may be attributed to the compensation of the reduction in the content and/or the activity of endogenous cytokinins, especially under stress conditions, that reflects upon protein synthesis (*Ben- Zioni et al., 1967 and Itai and Vaadia, 1971*). Also, Reddy *et al.*, (1989) and Ram and Dixit (2000), who mentioned that P and K application help plants to grow under salinity stress and improved chlorophyll and protein formation as well as P and K uptake. However, K considers an essential macronutrient for plant metabolism (Mengel and Kirkby; 1978). This element is implicated functionally in numerous roles within the plant (Graham and Ulrich, 1972). Also, Chaplin and Westwood (1980) showed that the effect of Zinc may be attributed to the increase in protein production and the increase of photosynthetic areas.

3-3 Effect of biofertilizer treatments:

Accumulation carbohydrates, protein and prolein contents in barley plants had a significant increase with applying the different biofertilizer treatments of Nitroben and Seryalen as compared with the control under

saline and calcareous soils (Table 13). Generally, inoculation of seeds by Seryalen biofertilizer marked the highest mean values of carbohydrates, protein and prolein contents under calcareous and saline soil as compared with the inoculation of seeds by Nitroben. However, carbohydrates, protein and prolein contents under calcareous soil were better than under saline soil. The previous results indicated that, inoculated seeds of barley with biofertilizer treatments enhancement, total carbohydrates, protein and prolein contents of barley plants.

Table(13): Effect of Biofertilizer on Carbohydrates, Protein and Prolein contents of barley under saline and calcareous soil in 2006/2007 season.

Bio fertilizer	At saline soil					At calcareous soil				
	Shoots		Grains		Prolein Umol/g F. sh.	Shoots		Grains		Prolein Umol/g F. sh.
	Carbo. %	Protein %	Carbo. %	Protein %		Carbo. %	Protein %	Carbo. %	Protein %	
Control	43.9	11.6	57.4	10.0	0.76	43.5	12.4	52.1	10.1	0.61
Nitroben (1kg/fed)	45.3	12.2	58.7	10.2	0.82	49.7	14.4	60.1	11.6	0.68
Seryalen (800g/fed)	46.7	12.6	59.4	10.7	0.87	50.4	14.9	61.9	12.1	0.72
.L.S.D. 5%	1.05	0.04	0.99	0.01	0.03	1.05	0.05	0.79	0.03	0.07

Such findings were harmony with that obtained by Ismail 2002 and Abdel- Hameed 2002. Also, Amit-jasrotia *et al.*, 1999 observed that, carbohydrates and protein contents of olive trees significantly increased as the nitrogen application. Such observations were also recorded by Haggag 1996.

3-4 Effect of interaction between weed control, foliar application and biofertilizer:-

Data in Table (14) illustrated that carbohydrates, protein and prolein contents in barley plants significantly increased by weed control combine with foliar application and biofertilizer treatments under saline and calcareous soil as compared with the control. Topik as a weed control combine with KCl 2% as a foliar application and Seryalen as a biofertilizer interaction treatment was the best effect treatment for inducing a significant increase for carbohydrates, protein and prolein contents under saline soil. However, Topik as a weed control combine with Biomagic3Kg/fed. as a foliar application and Seryalen as a biofertilizer interaction treatment marked the highest significant mean values for carbohydrates ,protein and prolein contents in barley plants under calcareous soil. From the previous results we noticed that The regulator effect of biomagic which contend trace elements such as Zn or Mn as a foliar application on protein and total carbohydrates contents of barley plants are in harmony with those obtained by Sallam and Khafaga (1999) on fodder beet plant. However, Shalaby and Kishk (1985) indicated that carbohydrate accumulation in wheat plant was enhanced by NaCl seed pre-treatment, whereas, the reverse effect was noticed with the application of KCl foliar treatment.

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دراسات عن قدرة نبات الشعير على النمو ومنافسة الحشائش تحت ظروف الاراضى الجيرية والملحية

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** وحدة أقالمة النباتات- قسم الأصول الوراثية- مركز بحوث الصحراء

نفذت هذه التجارب فى موقعين (محطة بحوث راس سدر بمحافظة جنوب سيناء تحت ظروف الاراضى الملحية مع الري بمياة الابار الملحية - ومحطة بحوث مريوط محافظة الاسكندرية تحت ظروف الاراضى الجيرية خلال موسمي ٢٠٠٦/٢٠٠٥ - ٢٠٠٦/٢٠٠٦ وذلك لدراسة تأثير كل من:-
* ثلاث معاملات كمبيدات للحشائش (توبك - دربي- بالإضافة الى الماء العادى كنترول) مع ثلاث معاملات لرش النباتات (المنشط الحيوى ببيوماجك كجم للفدان- بوتاسيوم كلوريد ٢% - بلاضافة الى الماء العادى كنترول). بلاضافة الى ثلاث معاملات من خلط الحبوب مع السماد الحيوى (نيتروبيين - سريالين - بالإضافة الى الكنترول حبوب جافة). على صفات النمو والمحصول وبعض المكونات الكيميائية لنباتات الشعير. تم إنتاج المنشط الحيوى وكذلك السماد الحيوى المستخدم فى التجربة بوحدة الميكروبيولوجى بمركز بحوث الصحراء والمنشط الحيوى (البيوماجيك) يحتوى على أحماض أمينية وفيتامينات وعناصر كبرى وصغرى. أتبع تصميم القطع المنشقة مرتين فى ثلاث مكررات حيث وضعت معاملات مبيدات الحشائش فى القطع الرئيسية ومعاملات رش النباتات فى القطع المنشقة والتسميد الحيوى فى القطع تحت المنشقة.
وأوضحت النتائج الآتى:

- * كانت لمعاملات مقاومة الحشائش اثر فعال فى الزيادة المعنوية خلال مرحلة النمو الخضري والحصاد تحت ظروف الاراضى الكلسية خلال الموسمين مقارنة بالكنترول. كذلك لم تظهر هذه المعاملات اى زيادة معنوية تحت ظروف الاراضى الملحية خلال فترة النمو الخضري واثاء الحصاد.
- * حقق الرش بكلوريد البوتاسيوم افضل زيادة معنوية خلال مرحلة النمو الخضري كما كان لها اثر ايجابى على المحصول ومكوناته خلال الحصاد تحت ظروف الاراضى الملحية خلال الموسمين مقارنة بالكنترول كما ظهر الرش بالمنشط الحيوى (البيوماجيك) افضل استجابة معنوية لجميع صفات النمو والإنتاجية لنباتات الشعير خلال مرحلة النمو الخضري ووقت الحصاد خلال الموسمين ٢٠٠٦/٢٠٠٥ - ٢٠٠٧/٢٠٠٦ تحت ظروف الاراضى الكلسية مقارنة بمعاملات الرش الاخرى
- * أدى تلقيح البذور بالسماد الحيوى (نيتروبيين- سريالين) ألي زيادة معنوية فى جميع صفات النمو والإنتاجية لنباتات الشعير خلال فترة النمو الخضري ووقت الحصاد مقارنة بالكنترول. كذلك تفوق السريالين على النيتروبيين فى جميع صفات النمو والإنتاجية (طول النبات (سم) - عدد الافرع - الوزن الغض والجاف بالجرام- مساحة ورقة العلم سم خلال فترة النمو الخضري وكذلك طول النبات (سم) - طول السنبله (سم) - عددالحبوب فى السنبله - وزن ١٠٠٠ حبة (جم) محصول الحبوب /الفدان - محصول القش /الفدان وقت الحصاد) تحت ظروف كل من الاراضى الملحية والكلسية خلال الموسمين ٢٠٠٦/٢٠٠٥ - ٢٠٠٧/٢٠٠٦.
- * ادى التفاعل الثلاثى بين معاملات مقاومة الحشائش ونظم الرش المختلفة مع تلقيح الحبوب بالسماد الحيوى الى افضل زيادة معنوية فى جميع صفات النمو والإنتاجية طول النبات (سم) - عدد الافرع - الوزن الغض والجاف بالجرام- مساحة ورقة العلم سم خلال فترة النمو الخضري وكذلك طول النبات (سم) - طول السنبله (سم) - عددالحبوب فى السنبله - وزن ١٠٠٠ حبة (جم) محصول الحبوب /الفدان - محصول القش /الفدان وقت الحصاد) تحت ظروف كل من الاراضى الملحية والكلسية خلال الموسمين ٢٠٠٦/٢٠٠٥ - ٢٠٠٧/٢٠٠٦ مقارنة بالكنترول.
- * كذلك ارتفعت نسبة البروتين الخام والكاربوهيدرات الكلية اثناء مراحل النمو الخضري وفي الحبوب مع تطبيق معاملات مقاومة الحشائش ونظم الرش المختلفة وكذلك تلقيح البذور بالسماد الحيوى تحت ظروف كل من الاراضى الملحية والكلسية والذى انعكس على المحصول ومكوناته مقارنة بالكنترول.
- * ادى تطبيق معاملات مقاومة الحشائش (دربي - توبك) ونظم الرش المختلفة (كلوريد البوتاسيوم- المنشط الحيوى البيوماجيك) وكذلك تلقيح الحبوب بالسماد الحيوى (نيتروبيين- سريالين) الى تراكم البرولين فى الاوراق اثناء طورى التفريع مقارنة بالكنترول.

Table(6): Interaction effect of weed control, Foliar application and Biofertilizer on growth traits of barley at tillering stage under saline and calcareous soil in 2005/2006 and 2006/2007 seasons.

weed control	Foliar application	Treatments Bio fertilizer	At saline soil					At calcareous soil				
			Plant height (cm)	No. of tillers/ plant	Fresh and dry weights g/pl		Flag leaf area cm ²	Plant height (cm)	No. of tillers/ plant	Fresh and dry weights g/pl		Flag leaf area cm ²
					F	D				F	D	
2005 / 2006												
Control	control	Control	44.767	1.000	3.233	0.800	18.133	74.700	2.167	5.400	2.100	22.100
		Nitroben(1kg/fed)	45.833	1.100	3.500	0.900	18.433	75.833	2.300	5.600	2.500	22.600
		Seryalen(800g/fed)	47.533	1.233	3.800	1.000	18.700	77.800	2.600	5.600	2.500	22.800
	Biomagic3Kg/fed.	Control	46.933	1.133	3.833	0.867	18.567	79.867	3.900	6.400	3.100	22.700
		Nitroben (1kg/fed)	47.633	1.400	4.567	1.000	18.733	81.833	4.033	7.700	3.300	23.500
		Seryalen(800g/fed)	48.700	1.633	5.100	1.133	18.700	82.733	4.300	8.400	3.700	24.800
	Kcl 2%	Control	49.767	1.433	4.600	1.033	18.600	76.933	3.000	5.600	2.800	22.600
		Nitroben (1kg/fed)	51.933	1.800	5.700	1.300	19.533	77.700	3.200	5.800	2.900	22.800
		Seryalen(800g/fed)	53.067	2.300	6.500	1.433	20.800	78.900	3.300	6.300	3.100	22.900
Derby 30cm/fed	Control	Control	44.733	1.000	3.200	0.833	18.200	75.967	2.600	5.700	2.900	23.100
		Nitroben(1kg/fed)	45.900	1.133	3.600	0.933	18.467	76.700	3.000	5.800	2.900	23.600
		Seryalen(800g/fed)	47.800	1.233	3.800	1.000	18.667	78.333	3.500	6.300	3.000	23.800
	Biomagic3Kg/fed.	Control	46.833	1.167	3.833	0.933	18.500	80.970	3.900	6.633	3.300	23.700
		Nitroben (1kg/fed)	47.833	1.433	4.200	1.000	18.600	82.800	4.600	7.700	3.700	24.500
		Seryalen(800g/fe)	48.600	1.533	5.100	1.100	18.800	83.900	5.000	8.200	3.900	25.533
	Kcl 2%	Control	49.633	1.433	4.600	1.100	18.600	77.933	3.200	6.200	2.900	23.500
		Nitroben (1kg/fed)	51.767	1.933	5.567	1.200	19.467	78.833	3.500	6.200	3.200	23.800
		Seryalen(800g/fe)	53.933	2.233	6.233	1.267	20.807	79.700	3.800	6.400	3.300	23.900
Topik 140 g/fed	control	Control	44.667	1.000	3.200	0.833	18.200	76.067	2.900	5.800	2.900	23.100
		Nitroben (1kg/fed)	45.933	1.133	3.633	0.933	18.400	76.767	3.200	5.833	2.900	23.600
		Seryalen 800g/fed)	47.833	1.200	3.867	1.000	18.567	78.933	3.600	6.200	3.100	23.800
	Biomagic3Kg/fed.	Control	46.900	1.170	3.800	0.900	18.500	80.667	4.200	6.700	3.300	23.900
		Nitroben (1kg/fed)	47.633	1.400	4.300	1.000	18.600	82.900	4.800	7.700	3.700	24.500
		Seryalen(800g/fe)	48.700	1.633	5.100	1.100	18.900	83.967	5.200	8.200	3.900	25.267
	Kcl 2%	Control	49.883	1.500	4.600	1.033	18.733	77.933	3.200	6.200	2.900	23.400
		Nitroben (1kg/fed)	51.700	1.933	5.467	1.233	19.467	78.633	3.600	6.267	3.200	23.800
		Seryalen 800g/fed)	53.733	2.267	6.333	1.400	20.700	79.800	4.000	6.400	3.400	23.900
.L.S.D. 5%			0.389	0.135	0.815	0.138	1.849	0.827	0.174	0.091	0.052	0.234

Cont. Table (6)

		2006/ 2007										
Control	control	Control	49.800	1.000	4.200	1.400	18.133	79.767	2.200	6.300	2.067	21.733
		Nitroben (1kg/fed)	49.800	1.100	4.533	1.533	18.433	80.737	2.300	6.500	2.233	22.600
		Seryalen(800g/fed)	52.533	1.233	4.767	1.633	18.700	82.733	2.600	6.557	2.233	22.800
	Biomagic3Kg/fed	Control	51.867	1.133	4.800	1.600	18.567	84.567	3.900	7.300	2.467	22.700
		Nitroben (1kg/fed)	52.633	1.400	5.567	1.800	18.733	86.800	4.033	8.600	2.867	23.500
		Seryalen(800g/fed)	53.733	1.633	6.133	2.033	18.767	87.733	4.300	9.433	3.067	24.800
	Kcl 2%	Control	54.833	1.433	5.567	1.800	18.600	81.700	3.000	6.567	2.167	22.600
		Nitroben (1kg/fed)	57.067	1.800	6.200	2.233	19.533	82.667	3.200	6.767	2.233	22.800
		Seryalen(800g/fed)	58.133	2.300	7.033	2.267	20.800	83.733	3.300	7.267	2.433	22.900
Derby 30cm/fed	Control	Control	49.700	1.033	4.533	1.567	18.200	79.200	2.600	6.733	2.233	23.100
		Nitroben (1kg/fed)	50.800	1.133	4.567	1.600	18.467	79.667	3.000	6.767	2.233	23.600
		Seryalen(800g/fed)	52.800	1.233	4.810	1.600	18.667	83.633	3.500	7.267	2.433	23.800
	Biomagic3Kg/fed	Control	51.833	1.167	4.817	1.633	18.500	85.733	3.900	7.700	2.567	23.700
		Nitroben (1kg/fed)	52.833	1.433	3.933	1.827	15.270	87.600	4.630	8.733	2.867	24.467
		Seryalen(800g/fed)	53.500	1.533	6.600	2.233	18.800	89.067	5.000	9.167	3.067	25.533
	Kcl 2%	Control	54.567	1.433	5.893	1.863	18.600	82.633	3.200	7.233	2.367	23.500
		Nitroben (1kg/fed)	56.833	1.933	6.833	2.233	19.467	83.600	3.500	7.233	2.367	23.800
		Seryalen(800g/fed)	58.800	2.233	7.200	2.333	20.800	84.667	3.800	7.367	2.367	23.900
Topik 140 g/fed	control	Control	49.790	1.000	4.600	1.567	18.200	81.200	2.900	6.767	2.267	23.100
		Nitroben (1kg/fed)	50.800	1.133	4.567	1.600	18.400	81.800	3.200	6.867	2.267	23.600
		Seryalen(800g/fed)	52.800	1.200	4.833	1.600	18.567	83.733	3.600	7.167	2.367	23.800
	Biomagic3Kg/fed	Control	51.867	1.167	4.800	1.533	18.500	85.433	4.200	7.733	2.567	23.900
		Nitroben (1kg/fed)	52.767	1.400	5.567	1.800	18.600	87.333	4.800	8.667	2.867	24.500
		Seryalen(800g/fed)	53.367	1.633	6.333	2.167	18.900	89.233	5.200	9.167	3.167	25.267
	Kcl 2%	Control	54.500	1.500	6.867	1.867	18.700	82.667	3.200	7.233	2.433	23.400
		Nitroben (1kg/fed)	56.700	1.933	6.767	2.333	19.500	83.633	3.600	7.333	2.433	23.800
		Seryalen(800g/fed)	58.800	2.267	7.267	2.380	20.807	84.733	4.067	7.433	2.433	23.900
.L.S.D. 5%			0.319	0.105	0.915	0.128	1.849	0.277	0.148	0.139	0.091	0.292

Table(10): Interaction effect of weed control, Foliar application and Biofertilizer on yield and its components of barley at harvesting stage under saline and calcareous soil in 2005/2006 and 2006/2007 seasons.

weed control	Foliar application	Bio fertilizer	At saline soil					At calcareous soil				
			Spick length	No .of grains/spicke	1000 grain wt/g	Grain yield Ton/fed	Straw yield Ton/fed	Spick length	No .of grains/spicke	1000 grain wt/g	Grain yield Ton/fed	Straw yield Ton/fed
2005 / 2006												
control	control	Control	9.900	33.333	36.400	1.500	1.900	12.967	43.633	46.700	1.927	2.500
		Nitroben (kg/fed)	13.433	34.533	37.533	1.500	2.000	16.000	44.933	47.733	1.900	2.600
		Seryalen(800g/fed)	13.900	36.733	38.600	1.600	2.100	16.967	46.700	49.667	2.000	2.700
	Biomagic3Kg /fed	Control	10.567	34.633	40.813	1.600	2.100	16.000	45.833	53.567	2.210	2.800
		Nitroben (kg/fed)	10.900	35.733	41.900	1.700	2.200	19.033	46.933	54.733	2.300	2.900
		Seryalen(800g/fe)	11.800	36.900	43.033	1.700	2.200	20.567	47.833	55.967	2.300	2.900
	Kcl 2%	Control	13.067	35.867	43.933	1.800	2.200	18.067	44.900	50.700	2.000	2.700
		Nitroben(1kg/fed)	14.733	36.800	44.767	1.800	2.300	14.567	45.800	51.800	2.200	2.800
		Seryalen(800g/fe)	15.800	37.733	45.767	1.700	2.300	14.667	46.733	52.800	2.200	2.800
Derby 30cm/fed	Control	Control	12.833	35.900	40.867	1.700	2.100	16.867	45.833	46.800	2.000	2.700
		Nitroben 1kg/fed)	13.833	37.833	41.667	1.700	2.100	17.967	47.867	48.867	2.000	2.700
		Seryalen(800g/fed)	13.900	38.667	42.733	1.700	2.200	18.533	48.667	49.867	2.200	2.900
	Biomagic3Kg /fed	Control	13.900	36.900	42.000	1.700	2.100	17.733	47.867	54.933	2.300	2.900
		Nitroben 1kg/fed)	14.733	37.667	42.667	1.800	2.200	18.767	48.733	56.867	2.400	3.000
		Seryalen(800g/fed)	15.733	38.700	43.733	1.800	2.200	21.533	50.033	58.000	2.500	3.100
	Kcl 2%	Control	13.733	37.733	45.900	1.700	2.200	17.900	46.667	51.733	2.200	2.700
		Nitroben 1kg/fed)	13.800	38.733	46.867	1.800	2.300	19.067	47.833	52.967	2.200	2.900
		Seryalen(800g/fed)	16.867	39.867	47.800	1.900	2.400	19.767	48.833	53.867	2.300	2.900
Topik 140g/fed	control	Control	9.833	36.633	40.767	1.700	2.200	12.833	46.733	48.833	2.000	2.700
		Nitroben(1kg/fed)	12.600	37.733	41.700	1.700	2.200	16.700	49.200	50.633	2.200	2.700
		Seryalen(800g/fed)	12.703	39.533	42.567	1.700	2.207	16.767	49.867	52.100	2.200	2.800
	Biomagic3Kg /fed	Control	9.533	36.867	40.733	1.700	2.100	17.800	50.867	54.867	2.300	2.900
		Nitroben 1kg/fed)	13.700	39.733	42.867	1.700	2.200	20.067	53.000	57.933	2.300	3.000
		Seryalen800g/fed)	13.933	40.733	45.933	1.800	2.200	22.800	53.900	59.233	2.500	3.100
	Kcl 2%	Control	13.800	39.767	42.600	1.700	2.200	17.200	47.867	50.700	2.200	2.700
		Nitroben 1kg/fed)	15.567	40.633	47.767	1.800	2.300	17.800	49.767	52.867	2.200	2.800
		Seryalen(800g/fe)	18.900	41.733	49.067	1.900	2.400	18.333	50.967	55.967	2.300	2.900
.L.S.D. 5%			1.843	0.961	0.635	0.078	0.055	0.712	0.848	0.836	0.052	0.053

Cont. Table (10)

2006/ 2007												
control	Control	Control	11.867	33.383	38.467	1.600	1.967	15.200	43.667	48.700	2.000	2.600
		Nitroben 1kg/fed	15.400	34.553	39.500	1.600	2.100	18.200	44.867	49.700	2.000	2.700
		Seryalen(800g/fed)	15.867	35.700	40.600	1.700	2.200	19.133	46.700	51.800	2.100	2.800
	Biomagic3Kg /fed	Control	12.600	34.600	42.800	1.700	2.100	18.133	45.800	55.600	2.300	2.900
		Nitroben 1kg/fed)	12.867	35.700	44.800	1.800	2.300	21.133	46.900	56.733	2.400	3.000
		Seryalen (800g/fed)	13.800	36.867	45.133	1.800	2.300	22.600	48.103	58.033	2.400	3.000
	Kcl 2%	Control	15.100	35.867	45.900	1.800	2.300	20.133	44.867	52.700	2.100	2.800
		Nitroben 1kg/fed)	16.700	36.833	46.800	1.900	2.400	16.600	45.800	53.800	2.300	2.900
		Seryalen(800g/fed)	17.800	37.700	47.167	1.927	2.400	16.800	46.700	54.833	2.300	2.900
Derby 30cm/fed	control	Control	14.767	35.900	42.867	1.800	2.200	18.800	45.800	48.833	2.100	2.800
		Nitroben (1kg/fed	15.800	37.800	43.667	1.800	2.200	20.133	47.867	50.867	2.100	2.800
		Seryalen(800g/fed)	15.867	38.767	44.700	1.800	2.200	20.533	48.700	53.900	2.300	3.000
	Biomagic3Kg g/fed	Control	15.900	36.800	44.133	1.800	2.300	20.700	47.867	56.733	2.400	3.000
		Nitroben (1kg/fed	16.700	37.700	44.700	1.800	2.300	22.833	48.700	57.300	2.400	3.110
		Seryalen(800g/fed)	17.700	38.833	45.700	1.900	2.300	23.500	50.000	58.300	2.600	3.200
	Kcl 2%	Control	16.700	37.300	47.600	1.800	2.300	19.867	46.700	52.700	2.300	2.800
		Nitroben (1kg/fed	18.800	38.733	48.867	1.900	2.400	21.133	47.800	55.167	2.300	3.000
		Seryalen(800g/fed)	19.867	39.867	49.100	2.000	2.500	21.800	48.800	55.867	2.400	3.000
Topik 140g/fed	control	Control	11.800	36.600	42.800	1.800	2.303	18.867	46.700	48.767	2.100	2.800
		Nitroben(1kg/fed	14.600	37.767	43.700	1.800	2.200	20.600	49.200	50.867	2.300	2.800
		Seryalen(800g/fed)	14.700	39.700	44.600	1.800	2.300	20.867	49.867	53.900	2.300	2.900
	Biomagic3Kg g/fed	Control	14.867	37.900	42.700	1.800	2.200	21.133	50.867	56.833	2.400	3.000
		Nitroben (1kg/fed	15.733	39.667	44.867	1.800	2.300	23.200	52.767	57.367	2.400	3.110
		Seryalen(800g/fed)	15.867	40.733	47.867	1.900	2.200	23.600	53.867	58.533	2.600	3.200
	Kcl 2%	Control	15.767	39.767	44.600	1.800	2.300	19.867	47.900	52.700	2.300	2.800
		Nitroben(1kg/fed	17.700	40.567	47.867	1.900	2.400	21.200	49.133	55.200	2.300	2.900
		Seryalen(800g/fed)	20.900	41.700	51.133	2.000	2.500	21.833	51.133	55.867	2.400	3.000
.L.S.D. 5%			1.843	0.961	0.735	0.071	0.054	0.139	0.505	0.181	0.062	0.043

Table(14): Interaction effect of weed control, Foliar application and Biofertilizer on Carbohydrates and Protein contents of barley under saline and calcareous soil in 2006/2007 season.

weed control	Foliar application	Treatments Bio fertilizer	At saline soil					At calcareous soil				
			Shoots		Grains		Prolen Umol/g F.wt.	Shoots		Grains		Prolen Umol/g F.wt.
			Carbo. %	Protein %	Carbo. %	Protein %		Carbo. %	Protein %			
control	control	Control	41.6	10.8	54.6	8.6	0.66	45.5	12.2	56.5	9.9	0.45
		Nitroben(1kg/fed)	43.0	11.2	56.5	8.8	0.68	47.3	12.8	58.2	10.2	0.52
		Seryalen(800g/fed)	44.5	11.5	57.3	9.5	0.79	50.6	13.6	60.2	10.5	0.55
	Biomagic3Kg/fed	Control	43.2	11.0	56.3	9.6	0.69	47.6	14.2	58.5	11.2	0.63
		Nitroben(1kg/fed)	43.9	11.6	58.2	9.8	0.72	49.2	14.9	59.6	11.6	0.72
		Seryalen(800g/fed)	45.5	11.8	57.8	9.8	0.82	50.5	15.2	62.2	12.5	0.78
	Kcl 2%	Control	44.6	12.2	57.3	10.5	0.73	48.5	13.6	54.2	10.8	0.59
		Nitroben(1kg/fed)	45.2	12.5	58.9	10.8	0.85	46.8	14.2	57.2	10.8	0.66
		Seryalen(800g/fed)	46.5	13.2	60.2	11.0	0.88	47.8	14.9	60.5	11.6	0.69
Derby 30cm/fed	Control	Control	42.2	10.8	55.5	8.8	0.69	48.8	12.6	58.2	10.2	0.56
		Nitroben(1kg/fed)	43.6	11.5	57.6	8.8	0.69	49.5	13.2	59.5	10.5	0.59
		Seryalen(800g/fed)	43.9	11.8	58.2	9.6	0.73	51.0	13.8	60.9	10.8	0.65
	Biomagic3Kg/fed	Control	42.5	11.5	58.5	10.6	0.79	49.8	14.8	59.6	11.9	0.65
		Nitroben(1kg/fed)	44.8	11.8	59.2	10.9	0.83	50.2	15.5	61.2	12.4	0.72
		Seryalen(800g/fed)	46.6	12.2	59.6	11.5	0.91	52.2	15.9	63.0	12.8	0.79
	Kcl 2%	Control	44.3	12.5	58.7	10.8	0.79	48.8	14.5	58.7	11.2	0.62
		Nitroben(1kg/fed)	46.5	12.8	59.5	11.0	0.89	49.6	14.9	61.0	11.8	0.71
		Seryalen(800g/fed)	47.9	13.5	60.6	11.8	0.95	50.9	14.9	62.2	12.0	0.76
Topik 140g/fed	control	Control	42.9	10.9	56.8	9.2	0.79	50.6	12.9	59.0	10.5	0.59
		Nitroben(1kg/fed)	45.0	11.8	58.2	9.5	0.82	51.2	13.5	59.8	10.8	0.65
		Seryalen(800g/fed)	45.6	12.2	59.5	9.8	0.85	51.8	14.2	61.5	11.2	0.68
	Biomagic3Kg/fed	Control	46.2	11.9	59.6	10.6	0.81	50.5	14.9	61.8	12.9	0.69
		Nitroben(1kg/fed)	47.5	12.6	60.5	11.0	0.93	52.6	15.8	62.5	13.5	0.80
		Seryalen(800g/fed)	48.8	12.8	60.9	11.3	0.95	53.5	16.3	63.8	13.8	0.83
	Kcl 2%	Control	47.5	12.9	59.2	11.0	0.85	49.9	14.2	61.0	12.5	0.68
		Nitroben(1kg/fed)	48.6	13.8	60.0	11.5	0.94	50.5	14.8	62.0	13.2	0.75
		Seryalen(800g/fed)	50.8	14.2	60.6	11.8	0.98	45.0	15.2	62.5	13.6	0.77
.L.S.D. 5%			1.05	0.03	1.05	0.06	0.06	1.03	0.02	1.07	0.01	0.08