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ANALYTICAL STUDIES ON FLAX GENOTYPE GROWTH AND RESPONSE TO NITROGEN LEVELS AND BIOFERTILIZER UNDER SANDY SOIL CONDITION

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ABSTRACT

The response of three flax genotype, i.e. Sakha 1 , strain 402/12 and strain 399/2/1/3 to nitrogen fertilizer levels (45,67.5 and 90 kg nitrogen / faddan) ., biofertilizer and compost were studied concerning growth, growth analysis as well as physiological growth parameters of flax plants .

Experiment was conducted at Ismalia Agric. Res. Station season 1998 /1999 and 1999 / 2000 to study effect of biofertilizer inoculation (Biofertan) as N2 fixers bacteria and VAM fungi and organic manure (compost) on growth and growth parameters of flax genotypes compared with three levels of nitrogen fertilizer. Growth measurements were recorded at 60,90,120 days after sowing. The results revealed that plant height, number of leaves / plant and dray weight for many of growth parameters continued to increase until the last sampling dates. Flax genotypes showed significant effect on growth attributes i.e. leaves area, leaves weight, stem weight and number of leaves per plant to the age of plant and growth characters of genotype.

Sakha 1 superiority the strain 402/12 and 399/2/1/3 in crop growth rate (C.G.R.), relative growth rate (R.G.R.) and Net assimilation rate (N.A.R.) . Biofertan exceed organic matter in most of growth attributes. The highest relative contribution for yield was obtained from plant height and root weight 34.2 and 13.2% respectively.

The highest positively and significantly correlated between plant height and most of growth characters were obtained from Sakha 1 for straw yield. On the other hand there was appositive and significant correlated in strain 402/12 between weight of fruiting zone and most of growth attributes for seed yield. It mean that sakha 1 tend to be dual purpose and strain 402/12 type seed.

This results are of great interest to increase seed and straw yield / fad through selection of the yield character which have large direct effect of both three genotypes under study using biofertlizer as well as the indirect effects through the attributes that have big indirect in flax genotypes under study.

INTRODUCTION

Statement about growth analysis and its relation characters have been useful to maximize crop productivity. It is useful to the breeders in selection and fixing the important stages in plant life which to be defined the biggest. Also it can fix contribution each of growth attributes in yield of flax (seed and straw).

The growth of flax genotype has been studied by many investigators like Momtaz and El-Farouk (1979) found that flax varieties different significantly in their dry weight / plant, percentage of leaves, and recovered roots .He added

that dry weight in stem, roots and leaves increased with advance in age. Mourad *et al.* (1990), indicated that plant height, root weight, number of leaves/plant, dray weight/plant and percentage of dray matter in stem continued to increase until the last sampling.

Abo–Shetaia *et al.* (1996), Kineber and El-Kady (1998) and El-Gazzar (2000) found that total and technical length of Giza (7) at different stage of growth, (N.A.R.), (R.G.R.) and (C.G.R.) where higher than those of Giza (8) and they were more active during the period from 60 till 90 days after planting. Mabrouk and Aly (1988) studied Growth in maize under organic and mineral N sources on sandy soil. He found that dry weight of maize leaves and grains increased by added mineral fertilizer and organic nitrogen (compost). Also Dubtez *et al.*, (1975) found that organic manures could be more effective than inorganic fertilizers in increasing crop yields. Momtaz and El-Farouk (1979) found that positive and significant correlation between seed yield and fruiting zone.

MATERIALS AND METHODS

Two field experiments were carried out during 1998/1999 and 1999/2000 seasons in Ismailia Agriculture Research Station to study growth and growth parameters of three flax genotypes to nitrogen fertilizer and biofertilizer.

Nitrogen fertilizer levels (90,67.5 and 45 kgN/fed) in the form of ammonium sulphate 20.5% was added at four equal amount during vegetative growth till the beginning of flax blooming and biofertilizer (Biofertan, compost and control). Two promosing strains were used i.e., 402/12 and 399/2/1/3 in addition to the newly flax variety Sakha1. The promising strains were proceed from cross between, Giza5X import No.235 from USA and Sakha 1 import 1485 x Bombay. Chemical analysis and physical properties of the experimental soil are presented in Table (1).

Table (1): physical and chemical analysis of the soil before the sowing.

	1998/1999	1999/2000
1-Mechanical analysis:		
Coarse sand (%)	75	75.13
Find sand (%)	35.81	34.90
Silt (%)	3.50	4.00
Clay (%)	2.50	2.40
2- Chemical analysis:		
pH (1:2.5 suspension)	7.73	7.13
E.C (mmhos cm^{-1} (1:5)	0.099	0.089
Organic matter (%)	0.051	0.041
Available N (ppm)	7.20	6.15
Available P (ppm)	1.30	1.22
Available K (ppm)	49.50	48.40

The trails were in split-split plot design in three replicates. Genotype putting in the main plot, meanwhile the nitrogen fertilizer levels in sub-plot where biofertilizer take the sub-sub plot. The sub sub plot area was $6m^2$ (2 x 3 m) which equal 1/200 feddan.

Flax seeds were drilled in rows; seeds were sown on November 15th in the first season and on November 20th in the second one. Samples of 5 plants/ plot were taken at 30 days in tervals starting on 60 days after sowing. This means that samples were picked up at 60, 90 and 120 days from planting. Plants were carried immediately to the laboratory where the following records were obtained.

1- Plant height cm.
2- Number of leaves / plant.
3- Leaf area / plant (cm2) was determined by using a planimeter.
4- Fresh weight of roots (g)
5- Dry weight of roots (g) .
6-Fresh weight of stem (g)
7- Dry weight of stem (g)
8-Fresh weight of leaves (g).
9- Dry weight of leaves (g).

Physiological growth parameters, relative growth rate (R.G.R.) , crop growth rate (C.G.R.) and net assimilation rate (N.A.R.) were computed according to Watson (1958).

10- R.G.R. = (log w2 – log w1) / (T2- T1) mg/day where loge w1, loge refer to natural log for dry weight of the first and second samples respectively.
11- Crop growth rate (C.G.R.) = (W2- W1) (T2 – T1) mg/day where W1 and W2 are the total dray weight / plant at T2 and T1.
12- Net assimilation rate (N.A.R.) = (W2 – W1) (loge A2-loge A1) / (A2-A1) (T2-T1) mg/cm^2/day where W1 A1 and W2,A2 refer to dry weight and leaf area at time t1 and T2, respectively.

Statistical analysis:

Statistical analysis was carried out according to Snedecor and Cochran (1982). Means were compared by the least significant differences (L.S.D.) test at 5% level of probability. Combined analysis was performed for all characters previously mentioned over the two seasons according to LeClerg *et al.* (1966)

Relative contribution between yield and studies characters which used to determination (R^2) for each component were done according to Draper and Smith (1966).

RESULTS AND DISCUSSION

1- Varietals differences:

a- Growth analysis:

Data in Table (2) and (3) showed no significant differences between the three genotypes in number of leaves, leaves weight, stem weight, root weight and fruiting zone weight, Meanwhile leaves area, leaves weight in the first sample and leaves area, number of leaves and leaves weight in the second simple which differences reach the level of significant.

Leaf area, leaves weight, stem weight and number of leaves at strain 399/2/1/3 in the second simple of growth exceeded significantly the first simple and other two genctypes on growth. This increase due to the age of plant and the growth characters of genotype. These findings are in agreement with those obtained by Hella *et al.* (1989) and Nasr El-din *et al.*, (1989) .

b- Physiological growth parameters:

Relative growth rate (R.G.R.), crop growth rate(C.G.R.) and net assimilation rate (N.A.R.) were highest on Sakha 1 followed by strain 402/12 and 399/2/1/3 .

This finding are in harmony with those obtained by Momtaz *et al.* (1979) Mourad *et al.* (1990), Kineber and El-Kady (1998) and El-Shimy and Moawed (2000) whereas found that flax varieties varied significantly in their dry weight per plant, percentage of leaves, stem and recovered roots . All varieties showed an increase in their dry weight per plant and percentage of stems with advance in age.

2- Effect of nitrogen levels :

i- Growth analysis :

Data in table (2) and (3) indicated that there was no significant affect on dray weight of most of growth attributes by added nitrogen fertilizer levels in the two samples. In this respect we found similar results were recorded by El-Kady (1985) , Abd el-fatah (1994) and El-Gazzar (2000).

ii- Physiological growth parameters:

The highest relative growth rate, crop growth rate and net assimilation rate were obtained by 45kg nitrogen / fadden . This finding may be due to growth auxin (Beta indol acetic acid) which be efficiency at low concentration from nitrogen, meanwhile it be unsuccessful at hight level of nitrogen. This results agree with those obtained by El-Kady (1985), Abdel- Fatah(1994) and El-Gazzar (2000) .

3- Effect of biofertilizer

i- Growth analysis:

The results indicated that there was significant effect on all growth characters by use biofertilizer in dry weight in the two simples. Biofertan exceeded organic matter in most of growth attributes. The increase in dry

weight might be attributed to supply the soil by nitrogen which enhances meristimatic activity. It encouraged the vegetative growth of flax plant owing to stimulation of meristimatic activity and formation of new leaves. Nitrogen supply had a marked effect on protein synthesis, and consequently. Cell division at the remarkable increase in flax plant height. In addition nitrogen caused an increase in the number and size of active growing leaves during growth, and its in turn, caused an increase in the synthetic surface. Metabolism new reproductive organs and dry matter due to adding biofertan as a source of nitrogen was be clear. Similar results were obtained by Gaafar *et al.* (1990)) Abo-shetaia *et al.*, (1996) and El-Shimy *et al.*, (2001).

ii- Physiological growth parameters:

Data in table (2) show that (R.G.R.), (C.G.R.) and (N.A.R.) were more active by used biofertilizer than control. These results are harmony with those obtained by Momtaz and El-Farouk (1979), Abo–Shetaiea *et al.*, (1996) and El-Gazzar (2000).

Interaction effect:

The combined analysis of both seasons Table (2) indicated that, the interaction between genotype, nitrogen levels and biofertan had significant effect on all growth parameters except (C.G.R.), (N.A.R.) in the first simple which differences not reach the level of significant. The highest values of C.G.R. were obtained from sakha 1, 45kgs. N/fed and biofertilizer by 0.05, 0.06 and 0.62 respectively. The same trends were obtained for R.G.R. and N.A.R. this findings are agreement with those obtained by El-Gazzar (2000).

Correlation study:

Results of simple correlation coefficients in table (4) for Sakha 1 variety indicated that there were correlated between nine growths characters of flax. Plant height was positively and significantly correlated with each of leaf area, C.G.R., N.A.R., root weight, stem weight and weight of fruiting zone with R values of 0.753, 0.656, 0.420, 0.543, 0.648, 0.525 and 0.585 respectively. This indicated that these characters had the greatest influence on straw and fiber yield of flax. It mean that Sakha (1) tend to be dual purpose for its seed and fiber and it involved to improve these characters in breeding programs These results are in agreement with those obtained by Momtaz *et al.*, (1977), El-Shimy *et al.*,(2001) Nasr (1998) and Al kaddoussi and Moawed, 2001 .

Leaf area ratio /cm^2 was significant and positive with C.G.R. (0.818), R.G.R. (0.522), N.A.R. (0.745), weight of roots (0.792), weight of stem (0.673), while the R^2 values were positive and insignificant with number of leaves (0.366) and weight of fruiting zone (0.288).

Crop growth rate mg/day was correlated positively and significantly with R.G.R. (0.881), N.A.R. (0.980), weight of roots (0.634) and weight of stem (0.465).

Relative growth rate was positively and significantly correlated with each of N.A.R. (0.937) and weight of root (0.387). On the other hand, there are positive and insignificant correlated with weight of stem (0.181), number of leaves (0.082) and weight of fruiting zone (0.069).

Table (2) : Means of some growth characters, as affected by genotypes, nitrogen Levels and biofertilizer on the first sample (60 days after sowing) (combined data of two seasons)

Treatment / Genotype	Leaves w. Fresh w/ g	Leaves w. Dry w/ g	Stem Fresh w/ g	Stem Dry w/ g	Roots Fresh w/ g	Roots Dry w/ g	N.A.R Mg/cm²/ day	Leaf area ratio cm²	No. of Leaves	Crop growth rate. (C.G.R.) mg/day	Relative growth rate (R.G.R.) mg/day
Sakha 1	0.442	0.112	0.441	0.135	0.203	0.068	0.002	23.160	62.311	0.050	0.090
Strain : 402/12	0.500	0.128	0.445	0.161	0.227	0.070	0.001	26.380	64.447	0.046	0.075
Strain: 399/2/1/3	0.514	0.131	0.435	0.123	0.200	0.061	0.001	28.816	67.962	0.046	0.084
L.S.D. at 5%	0.054	0.006	N.S.	N.S.	N.S.	N.S.	1.999	1.999	N.S.	N.S.	N.S.
Nitrogen levels N											
90 kgs N/fad	0.575	0.122	0.485	0.142	0.242	0.067	0.001	26.301	66.398	0.042	0.071
67.5 kgs /fad	0.511	0.133	0.400	0.140	0.203	0.071	0.001	26.581	64.182	0.038	0.062
45 kgs N/fad	0.397	0.116	0.436	0.138	0.184	0.062	0.002	25.474	64.141	0.063	0.116
L.S.D at 5% Biofertilizer	0.061	N.S.	0.050	N.S.	0.036	0.006	*	N.S	N.S.	**	**
Biofertan	0.586	0.168	0.524	0.153	0.222	0.080	0.002	29.374	67.398	0.061	0.094
Organic matter	0.534	0.112	0.381	0.110	0.179	0.058	0.002	27.702	64.140	0.62	0.102
Control	0.364	0.096	0.415	0.157	0.229	0.061	0.001	21.281	63.183	0.019	0.052
L.S.D at 5%	0.051	0.134	0.061	0.013	0.021	0.009		1.888	N.S.	**	**
(Interaction) AXB	N.S.	**	N.S.	**	*	N.S.	**	**	**	**	**
AXC	**	N.S.	**	**	**	**	**	**	N.S.	**	*
BXC	N.S.	**	*	*	**	*	**	**	N.S.	**	**
AXBXC	*	*	**	**	**	*	*	*	*	N.S.	**

Table (3): Means of some growth characters, as affected by genotypes, nitrogen Levels and biofertilizer on the first sample (90 days after sowing) (combined data of two seasons)

Treatment	Leaves w.		Stem		Roots		Plant height cm	Leaf area ratio cm^2	No. of Leaves	Frutting zoone	
Genotype	Fresh w/ g	Dry w/ g	Fresh w/ g	Dry w/ g	Fresh w/ g	Dry w/ g				Fresh w/ g	Dry w/ g
Sakha 1	0.641	0.235	2.151	1.094	0.441	0.135	84.48	32.790	60.316	3.377	1.034
Strain : 402/12	0.685	0.219	3.307	0.893	0.445	0.161	81.89	36.481	64.700	3.529	1.153
Strain: 399/2/1/3	0.724	0.205	2.221	1.199	0.435	0.123	81.29	41.411	68.235	3.453	1.001
L.S.D. at 5%	N.S.	0.009	N.S.	0.135	N.S.	N.S.		4.355	3.300	N.S.	N.S.
Nitrogen levels N											
90 kgs N/fad	0.742	0.178	2.491	1.044	0.485	0.142	84.1	37.277	62.221	3.322	0.976
67.5 kgs /fad	0.661	0.256	2.696	1.003	0.400	0.140	82.1	36.335	66.157	3.607	1.159
45 kgs N/fad	0.647	0.225	2.493	1.138	0.436	0.138	81.3	37.277	64.873	3.430	1.053
L.S.D at 5% Biofertilizer	0.100	0.039	N.S.	N.S.	0.050	N.S.		N.S.	4.075	N.S.	N.S.
Biofertan	0.828	0.309	3.108	1.274	0.524	0.153	88.2	39.731	65.258	4.429	1.392
Organic matter	0.781	0.198	2.734	1.208	0.381	0.110	85.1	42.664	69.952	4.040	1.271
Control	0.441	0.152	1.838	0.703	0.415	0.157	74.1	28.287	64.042	1.891	0.525
L.S.D at 5%	0.077	0.032	0.336	0.096	0.061	0.013	N.S.	2.224	2.564	0.355	0.143
(Interaction)											
AXB	**	**	**	N.S.	**	*	N.S.	N.S.	N.S.	**	*
AXC	**	*	**	**	**	**	N.S.	**	*	N.S.	N.S.
BXC	**	**	N.S.	N.S.	N.S.	*	N.S	N.S.	**	*	N.S.
AXBXC	**	*	*	**	N.S.	**	N	**	**	**	**

Net assimilation rate showed positively and significantly correlated with only weight of root. On the other hand the differences did not reach the level of significant with weight of stem, number of leaves and weight of fruiting zone which values were (0.366),(0.159) and (0.130) respectively .

Weight of root recorded positive and significant correlation coefficients only with weight of root (0.726), while the R^2 values were positive and insignificant correlated with number of leaves (0.064) and weight of fruiting zone (0.364). Weight of stem showed positive and insignificant association with number of leaves (0.250) and weight of fruiting zone (0.220). Number of leaves / plant showed negatively correlated with weight of fruiting zoon (-0.041). These results were agreement with those obtained El-Shimy and Moawed , (2000) and El-Shimy *et al.* (2001).

Data illustrated in table (5) and (6) for the other two genotypes indicated that all studies growth characters take the same trend of Sakha 1 but it did not differ significantly in this respect with the correlation coefficients between most of growth attributes. In table (4) for strain 402/12 the most important relationships to the flax breeder are that between seed yield (frutting zoon weight) and plant height (0.521), leaves weight (0.511), C.G.R. (0.517), R.G.R. (0.519), N.A.R. (0.501) and root weight (0.443).

It mean that strain 402/12 tend to be type seed. These results are in agreement with those obtained by Nasr (1998) and El-Shimy and Moawed (2000).

Relative contribution:

Data in Table (7) for sakha1 shows the relative contribution for all yield factor explained 34% of the total variation in plant height, 8% in leaves weight, 4% in C.G.R., 1% in N.A.R., 13% in root weight and 4% in weight of fruiting zone. Plant height cm and root weight gm had the highest coefficient of determination (R^2=34%, 13%) respectively. This trait is important to the breeders in selection yield. This finding agree with those obtained by Nasr (1998)and Abo-Shetaiea et al., (1996), and Al-kaddoussi and Moawed (2001) the second genotype 402/12 shows 27% in plant height, 26% in leaves weight, 26% in C.G.R., 26% in (R.G.R.), 25% in N.A.R. 9% in weight of fruiting zone and 35% in root weight.

Third genotype 399/2/1/3 revelation contribution i.e. 35% in plant height. 36% in leaves weight, 2% in C.G.R., 24% in root weight and 20% in W. of fruiting zone. These results are in agreement with those obtained by Al-kaddoussi and Moawed (2001).

Table (4) : Simple correlation matrix between the different Flax recorded characters of Sakha 1.

Characters	Plant height cm	leaf area mm.	Crop growth rate	Relative growth rate	Net assimilation rate	Weight of root gm.	Weight of stem gm.	leaves number
Plant height cm.	-							
Leaf area mm.	0.751**	-						
Crop growth rate	0.656**	0.818**	-					
Relative growth rate	0.420*	0.522**	0.881**	-				
Net assimilation rate	0.543**	0.745**	0.980**	0.937**	-			
Weight of root gm.	0.648**	0.792**	0.634**	0.387*	0.540*	-		
Weight of stem gm.	0.525**	0.673**	0.465*	0.181	0.366	0.726**	-	
Leaves number	0.313	0.366	0.178	0.082	0.159	0.064	0.250	-
Fruiting zone weight (yield). gm.	0.585**	0.288	0.200	0.069	0.130	0.364	0.220	-0.041

Table (5) : Simple correlation matrix between the different Flax recorded characters of strain 402/12.

Characters	plant height cm	leaf area mm.	Crop growth rate	Relative growth rate	Net assimilation rate	Weight of root gm.	Weight of stem gm.	Leaves number
Plant height cm.	-							
Leaf area mm.	0.841**	-						
Crop growth rate	0.689**	0.802**	-					
Relative growth rate	0.493**	0.571**	0.920**	-				
Net assimilation rate	0.582**	0.727**	0.979**	0.960**	-			
Weight of root gm.	0.774**	0.711**	0.596**	0.447*	0.502**	-		
Weight of stem gm.	0.550**	0.584**	0.253	0.094	0.182	0.429*	-	
Leaves number	-0.256	-0.245	-0.201	-0.248	-0.275	0.080	-0.133	-
Fruiting zone weight (yield). gm.	0.521**	0.511**	0.517**	0.519**	0.501**	0.443*	0.267	-0.388*

Table (6) : Simple correlation bmatrix between the different Flax recorded characters of strain 399/2/1/3

Characters	plant height cm	Leaf area mm.	Crop growth rate	Relative growth rate	Net assimilation rate	Weight of root gm.	Weight of stem gm.	leaves number
Plant height cm.	-							
Leaf area mm.	0.561**	-						
Crop growth rate	0.200	0.405*	-					
Relative growth rate	0.202	0.212	0.945**	-				
Net assimilation rate	0.095	0.347	0.985**	0.931**	-			
Weight of root gm.	0.516**	0.581**	0.696**	0.582**	0.653**	-		
Weight of stem gm.	0.282	0.677**	0.248	0.034	0.210	0.488**	-	
leaves number	0.104	0.435*	0.509**	0.400*	0.522**	0.379	0.266	-
fruiting zone weight (yield). gm.	0.592**	0.602**	0.171	0.095	0.095	0.497**	0.455**	0.209

Table (7): correlation coefficients analysis between yield and yield factor. (Relative contribution)

Yield factor	Sakha 1		Strain 402/12		Strain 399/2/1/1	
	R	R^2 %	R	R^2 %	R	R^2 %
Plant height cm.	0.585**	34.2	0.521**	27.1	0.592**	35.0
Weight of Leaf (gm).	0.288	8.2	0.511**	26.1	0.602**	36.2
Crop growth rate	0.200	4.40	0.517**	26.7	0.171	2.09
Relative growth rate	0.069	0.4	0.519**	26.9	0.095	0.9
Net assimilation rate	0.130	1.06	0.501**	25.1	0.095	0.9
Weight of root gm.	0.364	13.2	0.443*	35.8	0.497**	24.7
Weight of fruiting zone gm.	0.220	4.08	0.267*	9.1	0.455*	20.7
No. of leaves	-0.041	1.00	-0.388	15.5	0.209	4.3

R correlation coefficient R^2 Relative contribution
** Sig. at 1% * Sig. at 5%

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دراسات تحليلية على نمو بعض التراكيب الوراثيـــة للكتـــان ومـــدى اســـتجابتها للتسميد النيتروجيني والحيوى تحت ظروف الأراضى الرملية

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تم دراسة مدى استجابة النمو وفسيولوجيا النمو وعوامله لثلاثة تراكيب وراثيـــة للكتـــان منـــها الصنـــف التجارى سخا (١) والسلالة ١٢/٤٠٢ ، ٣/١/٢/٣٩٩ لكل من مســـتويات التســـميد النيـــتروجينى (٤٥ ، ٦٧,٥ ، ٩٠ كجم ن / فدان) وكذلك السماد الحيوى (كومبوست – والبيوفرتان) .

وقد أجريت الدراسة بمحطة البحوث الزراعية بالإسماعيلية موسمى ١٩٩٩/٩٨ ، ٢٠٠٠/١٩٩٩ لبحـث مدى تأثر كل من النمو وصفاته لعدد من الســـلالات المبشـــرة والصنـــف التجـــارى ســـخا (١) بالســـماد النيتروجينى وكذلك السماد الحيوى متمثلا فى الكومبوست (ســـماد عضـــوى) وكذلـــك البيوفرتـــان (مخصب حيوى وهى بكتريا وفطريات مثبتة للأزوت الجوى بالتربة) وبدون .

وقد أخذت عينات خضرية من المحصول خلال موسمى النمو فى أعمار ٦٠ ، ٩٠ ، ١٢٠ يـــوم مـــن الزراعة لأجراء الدراسة المعملية عليها .

وتتلخص النتائج فيمايلى:-

- استمرت الزيادة فى الوزن لطول النبات وعدد الأوراق والمادة الجافة بمعظم صفات النمـــو فـــى جميـــع مراحل أخذ العينات .
- أظهرت الاختلاف فى الأصناف والسلالات أظهر تأثير معنوى على صفات النمو مثل مســـاحة الأوراق ووزنها ووزن الساق وعدد الأوراق وكذلك بالنسبة لعمر النباتات.
- تفوق الصنف التجارى سخا (١) على السلالتين ١٢/٤٠٢ ، ٣/١/٢/٣٩٩ فى معدل نمو المحصـــول ومعدل نمو المحصول النسبى وصافى معدل التمثيل الضوئى .
- أثر التسميد الحيوى عن باقى المعاملات على معظم صفات النمو تحت الدراسة
- كانت قيم معامل الارتباط معنوية وموجبة لطول النبات ومعظم صفات النمو الخاصة بـــالقش بـــالصنف التجارى سخا (١) .
- ساهم طول النبات بأكبر جزء فى المحصول (٣٤%) يليه وزن الجذور (١٣%) .
- تميزت السلالة ١٢/٤٠٢ بقيم لمعامل الارتباط معنوية وموجبة لوزن المنطقة الثمرية ومعظم صفات النمو الخاصة بالبذرة لذلك يمكن القول بأن الصنف سخا (١) يميل لأن يكون صنف ثنـــائى الغـــرض بينمـــا السلالة ١٢/٤٠٢ تميل لأن تكون متجهة للبذور ويمكن أخذ ذلك فى الاعتبار بـــبرامج التربيـــة الخاصـــة والتى يتم فيها الاعتماد على هذه البيانات عند الإنتخاب والتهجين .