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Comparative Investigation Upon Yielding Index Of Sesam Applying Two Different Water Resources.

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Abstract: Sesam was grown as filed cultivation in the province Fayoum, Egypt applying two rechargeable water resources; Nile water and saline field drainage. Two Seasam cultivars, and two spacing intervals were used to determine the reaction of yield to salinity. The investigation was carried out in two successive seasons.

Salinity did not exceed 200 ppm in the Nile water and reached 1700 ppm in the field drainage. The yield and yield index showed higher values, for the two cultivars, when applying Nile water, yet with no significant yield differences when considering the average of both seasons. Whether using Nile water or field drainage the Seasam cultivar Giza 25 showed higher yields due to the capsules number/plant, and the weight of seeds/plant when applying the two water resources, and consequently the yield/ fedden, than the cultivar Giza 32. Furthermore, showed the cultivar Giza 25 higher values in oil yield, carbohydrate, and protein percentage than Giza 32.Spacing the plants at 20 cm showed higher values than at 10cm.As the difference in yield and yield qualities are more caused through other factors, can be highly recommended to apply field drainage, and save the Nile water for local self-satisfaction of alimentary and cash crops.

Introduction

Seasamis a secondary crop in Egyptrepresents some need for certain food, and relevant food industries. Cultivation surfaces are no problem as 96% of the country are deserts whose soil is suitable to tolerate any crop. Irrigation water represents the real shortage. The province Fayoum, Egypt is supplied with Nile water through the Wahba Canal, meanwhile field drainage is collected in the Albats drainage system reaching a salinity of 1700 ppm. Both resources are rechargeable and sustainable. The purpose of this filed investigation is to examine the possibility to cultivate Seasm when irrigated with field drainage and to reach qualitatively and quantitatively acceptable yield, even if little less to cover the needs for alimentary consumption. The role of differing Seasam cultivars and plant spacing intervals are of importance to affect the tolerability for water salinity.

Materials and Methods

The seedcorn of two cultivars, namely Giza 25 and Giza 32 were obtained from the Agricultural Research Centre of Egypt and sown on hills. The interval between holes was 10 cm and 20 cm, letting only one plant after three weeks from emergency. Fertilization was applied at the rate of 40 kg/feddansuperphosphate, nitrogen at the rate of 40 kg/feddan nitrogen as ammonium nitrate, and potassium 40 kg/feddan from potassium sulphate. All of them were added as side dressing after thinning, three weeks after emergency A split-split plot design with four replications[1], was followed.

Sowing the seedcorn took place in the last two foregoing seasons (15 May 2013 and 2014) in plots;

each representing 1/100 feddan, from each plot the plants were gathered at random for each sampling to be included for the statistical analysis. Statistical analysis was considered when estimating the yielding potentials, and was not applied for the chemical evaluations, as they are depending upon biochemical processes, which are not under precise control in the present filed conditions. Harvest took place after 120 days from sowing. Soil samples were collected from the cultivated field out of 10 sites of the experimental area, and were mixed thoroughly to get a representing average (Tables 1, and 2). Irrigation water, whether Nile or drainage were taken three times; when preparing the location, 6 weeks afterwards, and lastly four weeks after the second one.

Each sample date was individually analyzed. The results were expressed as an average of the three dates and are shown in table 3. Soil evaluation showed the texture as loamy sand in both depths of 0-30, and 30-60 cm with some differences in silt and clay between the two depths. As expected, the comparison between Nile and drainage resources showed an alkaline trend and much higher values of calcium, magnesium potassium, and sodium cations, as well as chlor and sluphate anions. Additively, as further values the percentages of carbohydrates and protein were estimated for the feeding of farm animals.

Table (1): Mechanical soil analysis of the experimental site

Depth cm	Particle size distribution%				Textural class
	Sand		Silt	Clay	
	Coarse	Fine			
0-30	13.80	69.20	11.50	5.50	Loamy sand
30-60	18.00	66.50	8.50	7.00	Loamy sand

Table (2): Chemical analysis of the experimental site

Depth cm	D.M %	pH	$CaCO_3$	EC dSm^{-1}	Exchangeable cations mg/100g soil				Exchangeable anions mg/100g soil			
					Ca	Mg	K	Na	CO^3	HCD^3	CI	SO^4
0 -30	1.0	8.3	9.4	2.0	8.0	4.5	0.2	14.8	-	5.5	17.5	5.5
30 -60	0.2	8.3	13.6	2.8	5.4	0.4	1.5	16.2	-	7.6	18.4	1.2

Table (3): The chemical analysis of each water resource

Water Quality	pH	EC dSm^{-1}	Cationsmeq/liter				Anionsmeq/liter			
			Ca	Mg	K	Na	CO_3	HCO_3	CI	SO_4
Nile	7.35	0.56	2.19	0.96	0.19	0.99	-	2.14	0.75	1.49
Drainage	8.35	2.63	11.9	5.1	1.39	9.21	-	10.4	11.6	0.06

Results and Discussion

A. Number of Capsules/ Plant

There was no necessity to identify the tremendous differences between the two cultivated varieties, reaching several manifolds in each respect(Table 4) and yet show significant increases for both cultivars when using the Nile water for irrigation. Spacing shows mostly significant increases for the favour of wider intervals of 20 cm. In general, taking all factors in consideration shows the Nile water distinct significant increases over drainage, especially when growing the cultivar Giza 25.

B. Seed weight g./plant

As shown in (Table 5), the varietal differences are very distinct in both seasons, yet they are significant when using the cultivate Giza 25 comparing the two water resources in the favour of Nile water. The cultivar Giza 32 showed only slight increases between the two water resources in both seasons. That might indicate, regarding seed weight/plant a slight response when applying drainage. Anyhow, this fact is almost of no value as the Giza 32 has much lower yields and cannot be recommended for cultivation. The effect of spacing, in spite of expectations, showed a decrease at 20cm intervals for Giza 32 in both seasons when drainage was applied.Cultivating Giza 25 showed, throughout significant increases when applying Nile water.

Table (4): Effect of water quality, spacing, and varieties on capsules/plant at seasm harvest.

Variety Water	First season		Spacing in cm	Second season	
	Giza 25	Giza32		Giza 25	Giza32
Nile	176.19	43.38	10	127.90	45.14
	152.36	54.63	20	142.94	49.69
Mean	139.27	52.07	-	135.43	47.41
Drainage	107.65	41.07	10	103.28	39.39
	114.34	43.34	20	128.87	39.04`
Mean	110.79	42.20	-	116.76	39.21

L.S.D at 5% Level

Water quality	**7.18**	**4.17**
Spacing	**7.69**	**4.89**
Varieties	**6.68**	**4.65**

Table (5): Effect of water quality, spacing, and varieties on seed weight/plant g.

Variety Water	First season		Spacing in cm	Second season	
	Giza 25	Giza32		Giza 25	Giza32
Nile	20.93	6.48	10	17.19	6.53
	23.63	8.71	20	17.42	7.02
Mean	22.28	7.59	-	17.31	6.78
Drainage	14.99	6.37	10	13.08	6.75
	15.88	5.63	90	14.33	5.94
Mean	15.43	6.00	-	13.71	6.35

L.S.D at 5% Level

Water quality	**2.07**	**0.99**
Spacing	**0.97**	**N.S.**
Varieties	**6.78**	**0.76**

C. Seed yield kg./feddan

Seed yield kg/feddan (Table 6) shows in the common mean of both cultivars, together, almost significant increases in the first season due to the potentials on Giza 25, for the favour of Nile water application. Otherwise, showed the application of Nile water no significant differences when evaluating both cultivars together with noticeable significant increases for the cultivar Giza 25, especially when spacing at 20 cm.The results are apparently contradicting, yet can the tendency be described to alternate between significance under certain varietal and spacing conditions, on one side, and non-significant, otherwise.This situation can recommend the use of drainage to cultivate Seasm, and save the Nile water to grow other necessary crops, such as maize, legumes, and vegetables. Like, always, showed the Giza 25 cultivar superiority over Giza 32, yet the relative differences were much less than the differences when growing Giza 25.Generally there is no doubt to cultivate Giza 25, successfully under the environmental conditions of Fayoum.

Table (6): Effect of water quality, spacing, and varieties on sthe yield of Sesam/ feddan kg.

Variety water	First Season			Spacing In cm	Second season		
	Giza 25	Giza 32	Mean		Giza 25	Giza 32	Mean
Nile	626.74	353.22	489.98	10	567.03	380.06	473.55
	706.89	418.03	526.46	20	646.41	392.16	519.30
Mean	666.82	385.63	526.22	-	600.72	386.13	496.42
Drainage	470.81	291.7	381.30	10	430.06	295.65	362.86
	528.23	326.48	427.46	20	502.43	368.79	435.61
Mean	499.62	309.14	484.38	-	466.25	332.29	399.328

L.S.D at 5% Level

Water quality	**119.13**	**92.46**
Spacing	**51.67**	**44.05**
Varieties	**38.43**	**44.19**

Table (7): Effect of water quality, spacing and varieties on oil yield liter/feddan of season seeds.

Variety Water	First season		Spacing in cm	Second season	
	Giza 25	Giza32		Giza 25	Giza32
Nile	353.06	194.36	10	320.37	206.18
	446.53	230.10	20	366.83	214.60
Mean	379.80	212.33	-	343.60	210.9
Drainage	363.19	158.62	10	245.50	160.82
	302.35	178.48	90	289.34	200.30
Mean	282.77	168.55	-	267.42	180.42

D. Oil yield/feddan

Table (7) indicates the response of Sesam to the quality of irrigation water under the diversity of cultivars and spacing.Applying Nile water resulted, a part of cultivars and spacing, showed much higher values in both seasons over drainage. The differences, under the two water resources, were greater when cultivating Giza 25.Spacing showed the better yields when placing the plants at 20 cm intervals. Also, Giza 25 showed a clear superiority over Giza 32.

The remainder of the seed cake after extracting the oil.namely carbohydrates and protein calculated as percentage was also evaluated.

E. Caxbohydtate % in Sesam as affected by water quality, spacing, and varieties.

As shown in table 8, the percentage of total carbohydrates, did not show great differences, likewise the results dealing some other bio-mass evaluations. Even between varieties, demonstrating genetic differences no obvious differences were found. Anyhow, the same trend was registered, likewise when comparing the effects of water quality, varieties, and spacing in the previous results shown in (Tables 4,5,6) and. The real differences are obviously reached when multiplying the carbohydrate percentage, in every case, with the corresponding bio-mass quantity, and thus giving higher carbdrydrate yields in the remaining material after the extraction of oil.

Table (8): Effect of water quality, spacing, and varieties on carbohydrate % in Sesam seeds.

Variety Water	First season		Spacing in cm	Second season	
	Giza 25	Giza32		Giza 25	Giza32
Nile	11.70	11.30	10	11.30	11.40
	12.40	12.30	20	11.90	12.10
Mean	12.05	11.80	-	11.60	11.75
Drainage	11.40	11.10	10	11.30	11.20
	11.70	11.30	20	11.50	9.50
Mean	11.55	11.20	-	11.40	10.35

Table (9): Effect of water quality, spacing, and quality varieties on protein % in Seasm seeds.

Variety Water	First season		Spacing in cm	Second season	
	Giza 25	Giza32		Giza 25	Giza32
Nile	18.96	18.30	10	18.50	18.10
	19.40	18.50	20	18.90	18.20
Mean	19.15	18.40	-	18.70	18.15
Drainage	17.50	17.10	10	17.80	16.70
	17.60	17.30	20	18.80	18.70
Mean	17.55	17.20	-	18.30	17.70

F. Protein percentage in Sesam as affected by water quality, spacing, and varieties

The results in table 9 show a similar trend as the carbohydrate percentage. Though showing the same tendency the differences between the two water qualities were higher in the first season than the second seasons leading to higher values of the protein yields. Otherwise, the same trends were observed as the carbohydrates.

The means show slight increases of Giza 25 over Giza 32 at 30 cm, spacing over 10 cm, anyhow, calculating the yields are the differences much higher.

Protein percentage as well as the foregoing carbohydrate percentage, for every variety, underlie the genetic rules, and are hardly to change in the phenotypes evokedthrough normal circumstances. Slight differences can be temporarilyignored and tolerated as a result of probable, sampling errors. In the case, of carbohydrate and protein percentage, a certain tendency was noticed for slight increases when applying Nile water over drainage showing obvious differences when comparing 10 and 20 cm intervals in the second season for protein. That might need a further investigation if it is not a sampling, undesired, error, An error is very probable, as this extra-ordinary trend is more obvious for the carbohydrate percentage, and even ridiculous when comparing, in the second season, the two values resulting from drainage when placing at 10 and 20 cm1.

Reviewing the previous results, dealing with a necessity to deal with all available water resources for the national security is forcing to a continuous regard in this aspect. Egypt is facing the possibility to reduce the allowed Nile waterallowances. Meanwhile, the country is letting 15 billion m^3 drainage water to flow each year in the Mediterranean Sea; over 27% of the allowed Nile water. Drainage water in Egypt is different, and yet suitable to grow all crops; each of them can tolerate any of the drainage qualities[2].Stated that field drainage in Kafr El-Sheikh province is differing in the quality, yet, for each water location could have the appropriate crops. The obtained results show, throughout, increases when growing Giza 25, over Giza 32, depends upon the genetic deviations. Regarding the number of capsules/ plant was the difference much wider, when comparing the two water resources, in the case of Giza 25 over Giza 32. The effect of spacing, apart from the water resource, showed obvious increases for the favour of Giza 25 when letting 20 cm. between holes against the other variety. Seed weight/plant showed significant increases for the favour of Nile water when using Giza 25.

The most important item, namely the seed yield/ feddan showed for both varieties a slight significant increase in the first season when using Nile water, from which the variety Giza 25 was higher, over drainage. In the second season, the increases, using Nile water, were not significant.Combining the tendency of the two seasons does not urge insisting to use Nile water which is needed for other important cultivations. generally, in that respect reported [3] also slight increases when raising the salinity of irrigation by sunflower.The oil yield / feddan showed higher values in both seasons except the variety Giza 32 in the second season with negligible differences.This trend, when applying Nile water may be attributed to higher synthesis results are in accordance with [4,5]. The percentage of carbohydrates and proteins in the remaining seed cake showed a similarity in the tendency favouring the application of Nile water with slight increases specially Giza 25 in the first season. Otherwise, regarding spacing the results showed no uniformity when applying drainage and growing Giza 32, which might be due to a sampling failure and possibly to an extreme change in the soil of the experimental plot. The results of [6]growing some range plants and [7]upon Viciafaba showed similar trend of carbohydrate percentage, through different saline water concentrations under the Egyptian environmental conditions. Similar trends were obtained through[8].

The final recommendation is to use the field drainage in Fayoum to grow corresponding crops, and save the Nile water, for other own consumption and cash crops.

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