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EFFECT OF AMOUNT OF DRIPPED WATER ON SEED YIELD AND ITS COMPONENTS AND THEIR RELATIVE CONTRIBUTION AND CORRELATION IN TWO FABA BEAN (*Vicia faba L.*) CULTIVARS.

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ABSTRACT

Two field experiments were carried out on faba bean under a drip irrigation system, during 1997/1998 and 1998/1999 seasons, to study the effect of three watering levels {513.37 (I_1), 1026.74 (I_2) and 2053.48 (I_3) m^3/fed.} on the growth and yield of Giza 3 (V_1) and Giza 429 (V_2) varieties. A split plot design with three replications was used, where irrigation levels occupied the main plots, meanwhile the sub-plots were devoted to the two varieties. Water use efficiency W.U.E. was calculated for all the combination treatments. correlation and relative contribution of some traits were calculated under each of the independent five treatments.

The obtained results revealed significant increments in all traits except 100 seed weight, were secured by varying watering level from I_1 to I_2. Thereafter increments were insignificant. Seed yield /fed. in the two respective seasons, viz. 840.0 and 813.5 kg. were detected for I_2. The V_1 out yielded V_2 in both seasons. The combination $I_3 \times V_1$ produced the highest seed yield, in both seasons, but without significant difference with $I_2 \times V_1$. Water use efficiency (W.U.E.) was the highest in both seasons for the $I_2 \times V_1$ treatment. Moreover the combination of either I_2 or V_1 with others produced the soundly W.U.E.

With few exceptions, traits were positively correlated to each other, where all correlation coefficient with seed yield / plant were significant. The 100 seed weight always showed insignificant correlations. Frequency of correlation coefficient was higher by increasing water supply and using V_2.

It seemed that plant height, no. of branches / plant and no. of pods / plant were the main contributors to seed yield / fed. Their total contribution amounted to 62.49, 84.17, 73.70, 67.36 and 62.52% through the treatments of I_1, I_2, I_3, V_1 and V_2, respectively.

INTRODUCTION

Faba bean (*Vicia faba L.*) gives a permanent dish for Egyptian people, either directly as a human food or indirectly as an animal feed. In the two last decades, Egypt was forced to import about 20% of the local need of faba bean. No doubt, the fast and effective method to face such problem was the improvement of faba bean management including the different cultural practices, where irrigation control and chosen varieties are the most important factors. Authors observed the value of irrigation and declared the negative effect of water deficit on faba bean growth and yield. Different amounts of applied water (m^3 / fed.) were given as 1377.2-1706.0 Khalil (1995) and 1715.3-1861.8 El-Ganayni (2000). Such amounts were under

furrow irrigation in old cultivated area, where they varied according to location, prevailing climatic factors and agricultural practices.

Drip irrigation may be the best technique, for the new reclaimed area. Such technique mainly saves added water by about 60%, compared to furrow irrigation Badr (1990). Achieving optimal soil water status for high plant productivity, through restricting root volume, Plaut *et al* (1988), applied water to the soil as often as desired and in smaller quantities. Ministry of Agriculture (A.R.C.) still devote a program for faba improving, where 14 cultivars are available to day, Anonymour (2001), reported that such varieties vary to each other according to their agriculture region and some agricultural traits.

Considering the previous abovementioned considerations the present study was carried out to grow two faba bean varieties under three watering amounts levels, through drip irrigation, in a new reclaimed area. The main target was to give recommendations needed for optimal production under such conditions.

MATERIALS AND MATHODS

Two field experiments were carried out during 1997-1998 and 1998-1999 seasons, to study the effect of irrigation level on faba in a private farm which is located in Regwa Company Area, Kilometer 62, Desert Road Cairo-Alexandria. Mechanical analysis of the soil, at 0 - 30 cm. depth, over the two seasons, showed that the soil was loamy sand, containing 13.1% clay, 13.1% silt and 75.8% sand. The prevailing climatic conditions are summarized in Table 1.

Super phosphate (15.5% P_2O_5) at a rate of 100 kg / fed, as well as, an equal rate of potassium sulphate (50% K_2O) were added during seed bed perpetration.

Table 1: The average daily values of air temperature (^{0}C) and rainfall (mm and m^3/fed.) at Nobaria area , during the two seasons.

Season	Month	Air Temp. ^{0}C	Rainfall	
			(mm)	(m^3/fed.)
1997 / 1998	November	19.30	0.66	2.77
	December	15.89	12.72	53.42
	January	14.71	27.84	116.93
	February	14.77	21.12	88.70
	March	15.29	18.18	76.36
Total		-	80.52	338.18
Mean		-	16.10	67.64
1998 / 1999	November	19.30	4.62	19.40
	December	15.92	12.24	51.41
	January	16.81	25.92	108.86
	February	16.88	2.28	9.58
	March	17.44	14.16	59.47
Total		-	59.22	248.72
Mean		-	11.84	49.74

Each irrigation was carried out for 90 minutes, through a drip irrigation system, where drippers of G.R. type were used. Such dripper discharges 2,4 and 8L./ hr. Amounts of applied water are presented in Table 2. Number of drippers was 15556 / fed. , discharging about 31.11, 62.22 and 124.44 m^3/ fed. per one hour. For every irrigation, the previous watering amounts would be about 46.67, 93.34 and 186.68 m^3/ fed. , respectively. Such number of drippers / fed. was calculated by the following equation:

$$Nod = Fe.ar. \div Rap \times Dap$$

where :
Nod = Number of drippers / fed.
Fe.ar. = fed. Area = $4200m^2$
Rap = Rows apart = 90 cm
Dap = Drippers apart = 30 cm

All Egyptian faba inbreds belong to equine type and are characterized by buff seed coat color with black helium. Two faba bean varieties, viz. Giza 3 (medium seed variety, 100-seed weight between 65-75 gm. flowering after 55-65 day, late maturity and specified for South Delta) and Giza 429 (medium seed variety, 100-seed weight 65-70 gm., flowering after 50-55 day and specified for Middle Egypt), Anonymour (2001). Seeding was on November 13th in both seasons. Commercial seeds were sown in rows 90 cm apart. Two seeds were drilled in hills 30 cm apart. Thereafter five independent treatments, viz. (I_1) 46.67 m^3/fed., (I_2) 93.34 m^3/fed. , (I_3) 186.68 m^3/fed. , (V_1) Giza 3 and(V_2)Giza 429 were used. All the other agricultural practices as well as other fittings and rules in dripping systems were carried out as usual.

A split plot design with three replications was used. The main plots were devoted for the three irrigation levels. The sub plots were occupied by the two tested varieties. Plot area was 40.52 m^2 (45 m long x 0.9 m apart)

Studied characteristics

Eighteen guarded plants were randomly taken from each plot at harvest to study the following traits:
1- Plant height, cm. (Pl. H.).
2- Number of branches / plant (Br. / Pl.).
3- Number of pods / plant (Pd. / Pl.).
4- 100-seed weight, gm. (100-S.W.).
5- Seed yield / plant, gm. (S.Y. / Pl.).
6- Seed yield / fed., kg. (S.Y. / fed.).

Water use efficiency (W.U.E.)

Water use efficiency was calculated for the six combination treatments, depending upon both amount of delivered water (A.D.W), which includes irrigation water and rainfall. According to Vietes (1965) equation as follows:
W.U.E. = S.Y. / fed. (Kg) . A.D.W. (m^3)

Table 2: Applied water (m^3/fed.) through irrigation (time frequency quantity) and rainfall (m^3/fed.), as well as total applied water amounts in both seasons.

Time		Fre.	Irrigation regime in both seasons.			Rainfall (m^3/fed.)		Total applied water quantities (m^3/fed.)					
								Season 1			Season 2		
Day	Month		2L/h.	4L/h.	8L/h.	Season 1	Season 2	2L/h.	4L/h.	8L/h.	2L/h.	4L/h.	8L/h.
29	11	1	46.67	93.34	186.68	2.77	19.40	49.44	96.11	189.45	66.07	112.74	206.08
10 & 25	12	2	93.34	186.68	373.36	53.42	51.41	146.76	240.10	426.78	144.75	238.09	424.77
12 & 27	1	2	93.34	186.68	373.36	116.93	108.86	210.27	303.61	490.29	202.20	295.54	482.22
10 , 18 & 25	2	3	140.01	280.02	560.04	88.70	9.58	228.71	368.72	648.74	149.59	289.60	569.62
3 , 9 & 15	3	3	140.01	280.02	560.04	76.36	59.47	216.37	356.38	636.40	199.48	339.49	619.51
Total		11	513.37	1026.74	2053.48	338.18	248.72	851.55	1364.92	2391.66	762.09	1270.46	2302.20

Statistical analysis

Analysis of variance: At the end of both seasons, means of the studied traits were subjected to analysis of variance, where they were compared by the use of L.S.D. method at 0.05 level of significance, according to Snedecor and Cochran (1981).

Correlation and path coefficient analysis:

The average over the two seasons was computed for each record pair. Thereafter, 18 averages of each trait was used in correlation and path analysis according to Dewey and Lu (1959). It was assumed that the total variation of seed yield / fed. was completely determined by the variation in the above mentioned traits.

RESULTS AND DISCUSSION

1-Performance of seed yield/fed and its attributer:

Table 3 gives the means of studied traits as affected by irrigation levels and faba varieties in the two successive seasons.

1-a - Irrigation effect:

In both seasons, significant differences were obtained in all traits by varying watering levels except with respect to 100-seed weight in the first season, indicating the unquestionable role of water on faba growth and yield. The highest products of the traits plant height, no. of branches / plant, no. of pods / plant , 100 seed weight , seed yield / plant and seed yield / fed. were 96.40 cm, 3.10, 10.87 , 77.63 gm., 16.71gm. and 840.00 kg/fed. in 1997 / 1998 and 74.50 cm , 3.10, 11.03, 74.65 gm., 19.96 gm. and 813.50 kg/fed. in 1998 /1999, respectively. These data clearly indicated that saving irrigation water through applying 1026 m^3/fed. instead of 2052 m^3/fed. did not reflect significant decrease in seed yield/fed. or in any of seed yield attributer. However, the further decrease in the amount of irrigation water to 10513 m^3/fed. was followed by significant decreased in seed yield / fed. and all of its attributer except seed index. It seemed that additional watering increased plant elongation through more cell division, enlargement and expansion . Amer (1986) and El-Ganayni (2000) found similar results. Moreover, it appeared that the promoting effect of enough water on plant height was reflected, also on the number of branches / plant. The present results are in agreement with those of Zoromba (1983).

With respect to no. of pods / plant, it was observed, that in both seasons, such trait any positively responded to increase in water supply. The present results agree with those of El-Ganayni (2000) who found that reducing water supply significantly reduced no. of pods / plant. The absence of significant differences with respect to 100 seed weight, in both seasons, may be resulted however such trait is a good inherited one and does not highly affect by environment. El-Ganayni (2000) found similar findings. Superior seed yield/ plant may be attained by the corresponding excess in term of no. of

pods/ plant. The present results confirmed those of Khalil (1995) and El-Ganayni (2000).

Seed yield / fed. as the final result of all the above mentioned traits, showed in both seasons, that dripping water at I_3 yielded, in the first season, 840 kg/fed. , surpassing I_2 and I_1 by about 12.0 and 133.3 % , respectively. In the second season, the corresponding values were 813.50 kg/fed., 7.32% and 132.10% , respectively. This means that higher irrigation may promote studied yield components, which in turn translocated to be stored in seed and consequently increased their yield. The present results are in full agreement with those reported by El-Ganayni (2000).

1-b - Variety effect:

Results in Table 3 clearly show that Giza 3 out yielded Giza 429 cultivars in seed yield / fed, where the former produced 760 and 758 kg/fed. whereon the latter produced 540 and 568 kg/fed in the two seasons, respectively. The superiority of Giza 3 was also observed in the number of pods / plant in the first season and in seed index in the second one as well as plant height in both seasons. No significant differences could be detected between the two cultivars, regarding the number of branches in the two seasons or seed index in the first season and seed yield / plant in the second season.

Anonymour (2001) stated that V_1 usually over yielded V_2 one because its heavier seeds, especially in South Delta , the nearest area to the experimental site of the present study.

I-C- Interaction effect

Table 3 shows that, in the both seasons, no significant effect could be detected between irrigation treatments and varieties with all respects. Such results suggest that irrigation and faba varieties may had not successfully interacted. Such appearance could be contributed to the narrow differences between the two varieties which showed similar response to the different irrigation levels. Generally, the abovementioned results showed that the second season over yielded the first one in respect to seed yield combinations. Such results may be explained as the second season was warmer as compared to the first one, (Table 1). The higher temperature in the second season as compared to the first one during active growth periods of faba, as recorded in January and February (flowering period), as well as in March (poding period) could account for this increase. It is a matter of fact that high temperature accelerates growth. Salwa Soliman (1979) came to the same conclusion in wheat.

On the other hand, the low difference between seasonal means of seed yield / fed. , i.e. 5.0 kg, to the second season, (Table 3) may be explained however the two seasons sheared the positive climatic effects. It was previously mentioned that the second season benefited the warm conditions, meanwhile it may be added herein that the first season may welly used the higher rainfall, i.e. 338.18 m^3/fed., as compared to the second one, i.e. 248.72 m^3/fed.

Table 3: Seed yield / fed and some of its attributes as affected by the amount of irrigation water and the two faba bean varieties and their interaction in the two seasons.

Traits / Independent treatments	Plant height (cm)	Branches / Plant (No.)	Pods/ Plant (No.)	100-Seed Weight (gm)	Seed Yield / Plant (gm)	Seed Yield/ fed. (Kg)
1997/1998 Season						
Irrigation						
(513m3/fed) 2L./H. (I1)	79.0	1.9	5.3	59.3	8.49	360.00
(1026 m3/fed) 4L./H. (I2)	93.4	3.1	10.7	77.6	16.71	750.00
(2052 m3/fed) 8L./H. (I3)	96.4	3.1	10.9	76.5	15.84	840.00
L.S.D.5%	7.59	0.67	1.64	n.s.	3.11	220.00
Varieties						
Giza 3 (V1)	98.80	2.7	10.1	69.5	15.90	760.00
Giza 429 (V2)	80.44	2.4	7.8	72.8	11.46	540.00
L.S.D.5%	*	n.s.	*	n.s.	*	*
Interaction effect	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
1998/1999 Season						
Irrigation						
(513m3/fed) 2L./H. (I1)	62.0	1.9	6.2	57.9	7.75	350.50
(1026 m3/fed) 4L./H. (I2)	74.5	2.7	10.7	74.7	19.96	758.00
(2052 m3/fed) 8L./H. (I3)	72.7	3.1	11.0	76.2	18.35	813.50
L.S.D.5%	5.93	0.69	1.94	2.30	6.34	189.30
Varieties						
Giza 3 (V1)	75.4	2.8	10.6	68.4	18.87	758.00
Giza 429 (V2)	64.1	2.3	8.1	70.8	12.63	568.00
L.S.D.5%	*	n.s.	n.s.	*	n.s.	*
Interaction effect	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

2- Water uses efficiency W.U.E.

Table 4 gives the calculated W.U.E. values kg / m^3 for the six combination treatments in the two studied seasons.

The views on the pervious table declare that W.C.U. values within each combination treatment were close to each other. Such small differences may be contributed to the small difference in rainfall quantities in the two seasons as previously mentioned, (Table 2). In addition, the combination $I_2 \times V_1$ showed the highest W.U.E., i.e. 0.62 and 0.68 kg/m^3 in the first and second seasons, respectively. On the other hand, lowest W.C.U. values, viz. 0.27 and 0.30 m^3/fed. were observed on $I_3 \times V_2$ in the two respective seasons. Combination of I_1 either with V_1 or V_2 were in between. Such results, as previously mentioned, may be explained as additional watering over I_2, the denominator in the used equation, was not accompanied by similar increase in seed yield / fed., the numerator in the previous equation. Generally, the combinations of either I_2 or V_1 produced the soundly W.U.E. values, because of their superiority previously mentioned. El Ganayni (2000) found that W.U.E. was 1.02 kg/m^3 by irrigation at 1.30 accumulative Pan evaporation and K addition at 72.0 kg/fed.

Table 4: Water uses efficiency (kg/m^3) for the six combination treatments in the two studied seasons.

Treatments / Seasons	$I_1 \times V_1$	$I_1 \times V_2$	$I_2 \times V_1$	$I_2 \times V_2$	$I_3 \times V_1$	$I_3 \times V_2$
First	0.52	0.33	0.62	0.48	0.42	0.27
Second	0.57	0.35	0.68	0.52	0.43	0.30

3- Correlation:

Table 5 gives correlation coefficients between all possible pairs of the six studied traits under the effect of the five independent treatments. Plant height revealed significant positive correlation with all traits, except with 100 seed weight where correlation was always negative but significant except for the I_3 irrigation treatment. Such positive correlation reached the level of significance with no. of branches/plant ($r_{=}0.70$), for the I_2 dripping treatment, indicating that such dripping quantity may promoted both traits as well. Similar positive and significant correlation were detected with seed yield / fed. on V_1 ($r_{=}$ 0.57), as well as on V_2 with both no. of branches/plant ($r_{=}0.59$) and no. of pods / plant ($r_{=}$ 0.52). Increasing frequency of positive correlation with V_2 may refer to this variety was more stable than V_1. Such positive correlation is logic, however greater no. of branches/plant is mostly formed on taller plants. Moreover, such greater no. of branches/plant produced higher no. of pods / plant and consequently soundly seed yield/either plant or fed. , (Table 3). Thereafter positive correlation would be calculated. On the other hand, the negative correlation previously mentioned between plant height and 100 seed weight may be explained as taller plants usually give higher no. of branches / plant, hence no. of pods / plant which produce greater numbers of lighter seed. The present result suggest an importance to plant height as a good positive correlative trait with faba yield and most of its components under a wide range of environments. The present findings supported those reported by Salwa Soliman (1991) as well as Hafiz and Abd El Mottaleb (1998).

Number of branches / plant showed positive correlation with all respects, however such correlations were significant with seed yield / plant on dripping I_1 ($r_{=}$ 0.78), V_1 ($r_{=}$ 0.57) and V_2 ($r_{=}$ 0.77). Also, significant coefficients of correlation were estimated on no. of branches / plant with no. of pods / plant ($r_{=}$ 0.56) on V_1 and with 100-seed weight on each I_1 ($r_{=}$ 0.64), I_2 ($r_{=}$ 0.76) and V_2 ($r_{=}$ 0.83). Sindhu *et al.* (1985-b)and Salwa Soliman (1991) found the same.

Number of pods/plant was positively correlated with all respects except 100-seed weight when dripping I_2 where correlation was negative ($r_{=}$ -0.12). In addition, all correlation of the trait with seed yield / plant were significant. These results mean that no. of pods/plant may be a main former to seed yield / plant. The present results are in accordance with these of Salwa Soliman (1991).

The 100-seed weight declared contradicting results with the two traits of seed yield. However the correlation coefficients of 100-seed weight were positive and significant with seed yield/plant with all independent treatments, meanwhile the corresponding correlation coefficients with seed yield / fed.

were always insignificant and negative. Such adverse results mean that seed yield/fed. may be affected by more adverse effects than seed yield / plant. Salwa Soliman (1991) found different findings, meanwhile Hafez and Abd El Mottaleb (1998) agree with the present results.

Seed yield / plant showed positive and insignificant correlations except under dripping I_3 where the correlation was negative ($r_=$ -0.20). It was noticed that all correlation coefficients of seed yield/plant were greater than the corresponding ones of seed yield/fed., except in respect to plant height where it was adverse. This mean that correlation between seed yield/fed. and other traits may be controlled by higher number of adverse effects as compared to those between such traits and seed yield / plant. The abovementioned results suggest that seed yield / plant may be an important former in seed yield / fed. Results herein are in complete harmony with those reported by Hafiz and Abd El Mottaleb(1998) who stated that there was a positive significant correlation between seed yield / plant and seed yield/fed.

A final word about correlation, however, Table 5 represents the frequencies of significance with all respects, clearly, V_2 reflected the greatest no. of significance, i.e. 7 among the independent treatments. This means that such variety may strongly protects the normal correlative relationship between yield components from environments as far. On the other hand the lowest significance frequency, was 2. This indicates that higher watering may differently affected yield components. On the other hand, among the studied traits, seed yield / plant gave the highest significance frequencies, i.e. 10. This means that such trait as the final one may gathered other traits within itself, and highly interacted with the five environments. The absence of significances on 100-seed weight assured that such traits is a good inherited one.

4- Percentage contribution

Table 6 presents percentage contributions of studied yield components to seed yield / fed. Clearly, all direct contributions were positive. The highest direct contributions on plant height, no. of branches / plant, no. of pods / plant, 100 seed weight, seed yield / plant and seed yield / fed. were 26.66% (I_3), 16.74% (I_1), 6.81% (V_1), 24.32 % (I_1) and 10.44 % (I_3), respectively. These results show that direct contribution is not the same for different treatments and traits. Considering total contribution, it was observed that the greatest values overall respects were detected at I_3 on plant height, i.e. 52.98 % followed by the contribution of the same trait with V_2, i. e. 48.50 %, then by the contribution of no. of pods/plant with V_1, i. e. 25.01 %. Obviously, Table 6 indicated that plant height was the greatest contributor with respect to V_2 (48.50 %), I_2 (50.76 %) and I_3 (52.98 %). Moreover, plant height occupied the second and third place, as a higher contributor, with V_1 (22.03 %) and I_1 (21.36 %). Also, no. of pods/plant revealed the highest contribution with respect to V_1 (25.01 %), while no. of branches/plant was the greatest former under I_1 (40.82 %) . In most cases, seed yield/plant replaced late position. Also, 100 seed weight contributions were in medium position in special with I_1 and I_2 levels. Thereafter, no difficult to decide herein that plant height, no. of branches/plant and no. of pods/plant gathered most of

percentage contributions with all studied treatments, where they totaled 62.97, 84.17, 73.70, 61.36 and 67.52 % on I_1, I_2, I_3, V_1 and V_2, respectively, indicating that the contribution of the previous three traits may be more greater under higher water supplies. The present results partly disagree with those of Salwa Soliman (1991) who reported that no. of pods / plant revealed the highest contribution to seed yield / fed. , meanwhile plant height contribution was the lowest one.

Table 5: Simple correlation coefficients between all possible pairs of the studied traits, under the studied independent treatments.

Treatments	Traits	S.Y. / fed	S.Y. / Pl.	100 S.W.	No. Pd. / Pl.	No. Br. / Pl.	Significance total
46.67 m^3 / fed. (I_1)	Pl. H.	0.78*	0.34	-0.45	-0.01	0.26	1
	Br. / Pl.	0.39	0.78*	0.48	0.64*	-	2
	Pd. / Pl.	0.08	0.62*	0.51	-	-	1
	100 S.W	-0.50	0.38	-	-	-	-
	S.Y. / Pl.	0.38	-	-	-	-	-
Significance		1	2	-	1	-	4
93.34 m^3 / fed. (I_2)	Pl. H.	0.65*	0.48	-0.36	0.54	0.70*	2
	Br. / Pl.	0.34	0.52	-0.47	0.76*	-	1
	Pd. / Pl.	0.16	0.72*	-0.12	-	-	1
	100 S.W	-0.78*	0.23	-	-	-	1
	S.Y. / Pl.	-0.20	-	-	-	-	-
Significance		2	1	-	1	1	5
186.68 m^3 / fed. (I_3)	Pl. H.	0.84*	0.22	-0.26	0.55	0.20	1
	Br. / Pl.	0.07	0.33	0.16	0.10	-	-
	Pd. / Pl.	0.29	0.79*	0.21	-	-	1
	100 S.W	-0.49	0.32	-	-	-	-
	S.Y. / Pl	-0.01	-	-	-	-	-
Significance		1	1	-	-	-	2
Giza 3 (V_1)	Pl. H.	0.57*	0.36	-0.19	0.44	0.41	1
	Br. / Pl.	0.26	0. 57*	0.33	0.56*	-	2
	Pd. / Pl.	0.17	0.87*	0.44	-	-	1
	100 S.W.	-0.35	0.48*	-	-	-	1
	S.Y. / Pl.	0.01	-	-	-	-	-
Significance		1	3	-	1	-	5
Giza 429 (V_2)	Pl. H.	0.76*	0.38	-0.22	0.52*	0.59*	3
	Br. / Pl.	0.42	0.77*	0.34	0.83*	-	2
	Pd. / Pl.	0.38	0.84*	0.42	-	-	1
	100 S.W	-0.32	0.57*	-	-	-	1
	S.Y. / Pl.	0.17	-	-	-	-	-
Significance		1	3	-	2	1	7
Significance total		6	10	-	5	2	23

Table 6: Contribution percentage of the studied yield component to seed yield / fed. under the independent treatments

Traits \ Treatments	Dripping at 46.67 m^3/fed. (I1)	Dripping at 93.34 m^3/fed. (I2)	Dripping at 186.68 m^3/fed. (I3)	Giza 3 cv. (V1)	Giza 429 cv. (V2)
Plant height					
Direct contribution	5.34	14.85	26.66	6.03	23.80
Indirect contribution	16.02	35.91	26.32	16.00	24.70
Via no. of Br. / Pl.	4.92	-14.30	1.30	3.12	4.33
Via no. of Pd. / Pl.	0.00	6.73	12.66	5.65	10.23
Via 100 S.W.	10.15	8.19	5.07	1.82	2.99
Via S.Y. / Pl.	0.95	-6.69	-7.29	-5.41	-7.15
Total	21.36	50.76	52.98	22.03	48.50
No. of branches / plant					
Direct contribution	16.74	7.08	0.40	2.41	0.57
Indirect contribution	24.08	18.64	2.01	11.91	5.51
Via no. of Pd. / Pl.	0.71	-6.29	0.29	4.51	2.53
Via 100 S.W.	-19.54	-7.30	-0.38	-1.96	-0.72
Via S.Y. / Pl.	3.83	5.05	-1.34	-5.44	-2.26
Total	40.82	25.72	2.41	14.32	6.08
No. of pods / plant					
Direct contribution	0.02	2.45	5.03	6.81	4.03
Indirect contribution	0.77	5.24	13.28	18.20	8.91
Via 100 S.W.	-0.67	1.10	-1.80	-4.37	-2.32
Via S.Y. / Pl.	0.10	-4.14	-11.48	-13.83	-6.59
Total	0.79	7.69	18.31	25.01	12.94
100 S.W.					
Direct contribution	24.32	8.69	3.56	3.62	1.91
Indirect contribution	2.26	2.50	3.43	3.80	3.08
Via S.Y. / Pl.	-2.26	2.50	3.87	3.80	3.08
Total	26.58	11.19	7.43	7.42	4.99
Seed yield / plant					
Direct contribution	0.36	3.34	10.44	9.31	3.80
Indirect contribution	-	-	-	-	-
Total	0.36	3.34	10.44	9.31	3.80
All total	89.81	98.70	91.57	78.09	76. 31
Residual	10.19	1.30	8.43	21.91	23.69

From all the above mentioned results the followings may be concluded

- Significant differences could be detected in most yield components among studied irrigation levels and varieties.
- Enough watering encouraged all studied traits, where insignificant difference was detected between medium and high dripping supply.
- The I_2 treatments recorded as much averages as I_1 for all the studied traits, where Giza 3 had also the higher average.
- For maximal seed yield, the combination I_2xV_1 may be recommended.
- Because of the superiority of each I_2 and V_1, their combination produced the highest W.U.E. values in both seasons.

- Because plant height represents the base for forming branches and pods, it was positively correlated with yield and most of its components under a wide range of environments.
- Because 100 seed weight is a good inherited trait, its correlation with other ones was insignificant.
- Seed yield / fed seemed to be adversely affected by plant population at harvest and hence was not significantly correlated with the seed yield per plant.

All direct effects were positive.

Plant height, no. of branches / plant and no. of pods / plant were the main contributors to seed yield / fed. under different environments. Their contribution seemed to be increased with the increased of the amount of dripped water and as well for Giza 3 cultivars.

REFERENCES

Anonymour (2001). (*Vicia faba L.)* production. Bull. no. 700, A.R.C. (2001) Giza Egypt, in Arabic.

Amer, M.I.A. (1986). Effect of some agronomic practices on productivity of some broad bean varieties. Ph.D. Thesis, Fac. Agric. Zagazig Univ. Egypt.

Badr, A.A. (1990). Management of irrigation and drainage. Part 1. Irrigation. Fac. of Agric. Cairo Univ. Giza, Egypt.

Dewey, D.R., and K.M. Lu (1959). A correlation and path coefficient analysis of components of crested wheat grass seed production. Agron. J. 51: 515-518.

El-Ganayni, A.A. (2000). Scheduling irrigation using Pan evaporation under some potassium levels in *Vicia faba L.*J. Agric. Sci. Mansoura, 25 (3): 1523-1538.

Hafiz, S.I. and H.M. Abd El-Mottaleb (1998). Response of some faba bean cultivars to foliar fertilization under newly reclaimed sandy soil conditions. Pro. 8th. Agron, Suez Canal Univ., Ismailia, Egypt: 307-316.

Khalil, F.A.F. (1995). Scheduling irrigation of faba bean using the evapotranspriation Pan method. M. Sc. Thesis, Fac. Of Agric., Moshtohor, Zagazig Univ. Egypt.

Plaut, Z., A. Carm and A. Grava (1988). Cotton growth and production under drip irrigation restricted soil wetting. Irrg. Sic. 9 : 143-156.

Salwa, E. Soliman (1979). Effect of some climatic factors and nitrogen fertilization on wheat and its evapotranspiriation .Ph.D. Thesis, Fac. of Agric. Sci, Godollo Univ., Hungary

Salwa, E. Soliman (1991). Factor analysis of yield in some seed legume crops, 1- Path coefficient in *Vicia faba L.* . Egypt. J. Appl. Sci., 6, (11): 527-535

Sindhu, J.S., D.P. Singh and K.P. Singh (1985 b). Component analysis of factors determining grain yield in faba bean (*Vicia faba L.)*.FABIS Newsletter,13, 3-5.

Sendecor, G.W. and G.W. Cochran (1981). Statistical methods. 7th ed. Iowa State Univ. Press., Ames, Iowa, USA.

plant .2 Evaporation, crop coefficient, yield and water use efficiency. (C.F. Field Crop Abst. 46(9): 5822-1993).

Vietes, F.G. (1965). Increasing water use efficiency by soil management in plant environment and efficient water use efficiency. J. Amer. Soc. Agron, 26: 537-546.

Zoromba, M.S. (1983). Response of some broad bean cultivars to some agronomic practices. M.Sc. Thesis, Fac. Agric. Zagazig Univ., Egypt.

تأثير كمية مياه الرى بالتنقيط على محصول البذور و مكوناته و مساهمتهما النسبية و الارتباط فى صنفين من الفول البلدى

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* قسم النبات- المركز القومى للبحوث - الجيزة

** قسم المحاصيل - كلية الزراعة جامعة القاهرة- الجيزة

أجريت تجربتان حقليتان على الفول البلدى ، تحت نظام الرى بالتنقيط ، خلال موسمى ١٩٩٧/١٩٩٨ و ١٩٩٨/١٩٩٩ وذلك لدراسة تأثير ثلاثة معدلات من الرى (٥١٣,٣٧، ١٠٢٦,٧٤، ٢٠٥٣,٤٨م٣/فدان) ، و ذلك على نمو و انتاجية صنفين تجاريين هما جيزة ٣، و جيزة ٤٢٩. و قد استخدم تصميم القطع المنشقة فى ثلاثة مكررات، حيث وزعت معاملات الرى على القطع الرئيسية ، وخصصت القطع الشقية للصنفين - و أجرى تحليل التباين لكل موسم على حدي ، و قدرت كفاءة استخدام الماء لجميع المعاملات العاملية فى موسمى الدراسة ثم أجريت دراسات الارتباط و مساهمة مكونات المحصول منفصلة لكل معاملة من المعاملات الخمس المستقلة.

و لقد أوضحت النتائج زيادة معنوية فى جميع الصفات ما عدا دليل البذرة و ذلك بزيادة معدلات الرى و إن كانت الزيادة غير معنوية عند زيادة كمية مياه الرى عن ١٠٢٦,٤٧ م٣/فدان . كذلك أوضحت النتائج تفوق الصنف جيزة ٣ على نظيره جيزة ٤٢٩ فى الموسمين و قد أوضحت الدراسة عدم وجود استجابة صنفيه لكمية مياه الرى حيث كان تداخل الفعل بين عاملى الدراسة غير معنوى على محصول البذور / فدان و مكوناته و من ثم فانه يوصى بزراعة الصنف جيزة ٣ و ريه بمعدل ١٠٢٦ م٣/فدان للحصول على أعلى محصول علما بأن هذه الكمية تحقق أيضا أعلى محصول فى الصنف جيزة ٤٢٩.

كان معامل الارتباط بين محصول البذور / فدان و بعض مكوناته موجب و معنوى باستثناء ارتباطه السالب مع دليل البذرة فى حالة واحدة فقط ، و ظهر أن زيادة معدلات الرى تؤدى الى زيادة تكرار ظهور الارتباط المعنوى بين الصفات المختلفة و كذلك الحال عند استخدام الصنف جيزة ٤٢٩ على أن الارتباط بين محصول النبات الفردى و محصول البذور / فدان لم يكن معنويا بما يوحى باختلاف كثافة النباتات عند الحصاد.

و ساهمت صفات طول النبات ، عدد الفروع / نبات ، و عدد القرون على النبات والتى تمثل المكونات الأهم والدور الأكبر لمحصول البذور بالفدان ، حيث ساهمت هذه الصفات الثلاثة مجتمعة بنحو ٦٢,٩٧ ، ٨٤,١٧ ، ٧٣,٧٠ ، ٦١,٣٦ ، ٦٧,٥٢ % من محصول البذور بالفدان ، و ذلك تحت تأثير المعاملات المستقلة للرى ٥١٣,٣٧م٣ / فدان ، ١٠٢٦,٧٤م٣ / فدان ٢٠٥٣,٤٨م٣ / فدان ، و صنفى الدراسة و جيزة ٣ ، و جيزة ٤٢٩ على التوالى .