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PERFORMANCE OF CANOLAPRODUCTIVITY UNDER EL-WADI EL-GIDID CONDITIONS.

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ABSTRACT : Two field experiments were conducted in the Desert Research Center (D.R.C.) farm at El-Kharga Oasis, New valley Governorate in 2000/2001 and 2001/2002 growing seasons. under sandy clay loam soils conditions, drip irrigation system was used for all treatments. The study aimed to investigate the effect of sowing date (i.e. 1, 15 October and 1, 15 November in the first season and 15 Sep., 1,15 October, 1 November in the second season) and three irrigation levels (60, 80, 100 % from crop evapotranspiration (ETc) in the first season and 80, 100, 120 % from ETc in the second season) and the interaction on yield and its attributes, chemical content and water use efficiency (WUE).

As a results of different sowing date growth criteria, yield and its attributes exhibited significant difference. The promising date of sowing was 1 October compared with other to sowing date, Maximum WUE was obtained by sowing date on 1 October. Increasing the moisture levels from 60% to 100% from ETc increased canola yield and its attributes in the first and second seasons, while WUE, decreased by increasing soil moisture from 60% to 100 %ETc.

Interaction between sowing date and irrigation levels, on yield and its attributes of canola, were by sowing date at 1October and 100 % ETc.

Key Words: Canola, sowing dates, irrigation levels, yield, water use efficiency, El Wadi-El Gidid.

INTRODUCTION

Canola (Brassica napus L.) is one of the most important edible crops in the world. It is preferred due to its high yield potential and oil content (45%). Using suitable agronomic techniques i.e. time of sowing and irrigation levels can increase yield potential of this crop. The weather prevailing during the growth phases had a considerable influence on seed yield varietal performance Chandrakar and Urkurkar, (1993).

The sowing dates significantly influenced the yield attributes and yields, 5th of October gave significantly higher yield than 15th and 25th of October (Yadav *et al.*, 1994). Sarma and Sarma, (1994) found that delay in sowing beyond 1 October gradually decreased the grain yield, the reduction in grain yield in crops sown on 16 and 31 October was 3 and 37 % respectively compared with that sown on 1 October. The results were similar to those of Shastry and kumar (1981)

Irrigation is a key input to increase productivity, water requirement of crop depends on soil type and climatic of the region. High yield can be obtained when irrigation is applied at proper time (Chakor and Sharma, 1994). Also, Patel and Patel (1999) found that irrigation schedule had, a significantly effect on the seed yield over 0.6, 0.4 irrigation water depth (IW): cumulative pan evaporation (CPE) ratios. Yadav *et al.*, (1999) found that water use efficiency (WUE) were more in early sowing (17-27 Oct.,) than late sowing (6-16 Nov.,). These results were similar to those of Jadhav and Singh (1992).

Hence, this investigation was made to study the effect date of sowing and irrigation levels on yield of canola variety pactol under El-Wadi El-Gidid conditions

MATERIALS AND METHODS

Two filed experiments were carried out in the Experimental farm, of Desert Research Center (D.R.C.) at El-Kharga Oasis (30.53 altitude, 25.4 latitude and elevation 78.8 m), New Valley Governorate, during the winter seasons (September- March) for studding the effect of sowing dates i.e. October 1st, October 15th November 1st and November 15th and three irrigation of non-saline water levels (676 ppm) 60 %, 80 % or 100 % from crop evapotranspiration (ETc) in the first growing season (2000-2001) and September 15th, October 1st, October 15th and November 1st and three irrigation levels 80%, 100 or 120 %

from ETc in the second Growing season2001/2002 on canola plants (Brassica napus L.) variety Pactol grown in New Valley under sandy clay loam soil conditions. The experiment unit area for both experiments was 27.5m2 (11 m length x 2.5 m width) consisting of five ridges, 4-6 seeds were sown in hills 25 cm apart. Agronomy Research Institute, Agric.Res.Center, kindly provided canola seeds Water amount for irrigation level was calculated based on evapotranspiration rate for every growing phase during every growing season. Calculations of rapeseed crop water requirement reference crop evapotranspiration (ETo) were determined by using the following procedure.1-Determining reference crop evapotranspiration (ETo) according to climatic data of the region (Penman equation 1948) 2-Determining crop factor (K.C) FAO1984.3-Crop evapotranspiration ETc. according to the following equation.

$$ETc = KC \times ETo$$

Phosphorus (p2O5), nitrogen (N) and potassium (k2o) fertilizers were added at a rate of 30, 45 and 50 kg/fed., pre sowing, three equal doses (at sowing, thinning, before flowering) and at flowering respectively.

The seedlings were thinned to two plants / hill after 3 week from planting. Mechanical, chemical analysis and moisture properties of experimental soil and irrigation water were determinind (pH 7,Ec 676, total cation 8.25 and total anions 8.51 were the records of irrigation water) while the structure of experimental soil was sandy clay loam 4, 3.25, 1.66, and 15.79 of Ca+, Mg++, K+ and, Na+ meq/L cations and 0.0, 1.2, 18 and 5.5 CO3, HCO3, CL and SO meq/L anions respectively.

Plant samples were manually harvested at maturity, from three inner square meters for yield measurement for every date of sowing in the first and second growing season. (seed, straw, biological yield and 1,000-seed weight, hulling % = seed wt ÷pod wt. crop index = seed yield ÷ straw yield × 100, harvest index = seed yield ÷ biological yield × 100 from three replicates. Samples for growth were manually harvested from the other three replicates. Plant height, number of branches carried pods / plant, number of pods/plant. oil content (A.O.A.C.1975) and protein content of the seed (A.O.A.C. 1980) were determined, yield of

protein was calculated by multiplying N % by 6.25 (Tripath *et al.*, 1971). Water use efficiency (WUE) was measured = seed yield (kg/fed) ÷ irrigation water (m3) (Plaut *et al.*, 1988).

RESULTS AND DISCUSSION

Sowing dates:

Data reported in Tables (1,2,3,4) indicate the effect of sowing date, and irrigation levels on canol yield its attributes and chemical content.

In the first growing season the yield, its attributes exhibited significant difference for different date of sowing, The promising date of sowing was October 1st for canola yield and its attributes criteria cultivated under the New Valley conditions. Delaying date of sowing from October 1st till November 15th decreased these characters significantly. These results were true for all criteria except those of crop and harvest indexs, which reached their minimum values by sowing plant at October 1st than November 15th.Thus, it appears proportionately more of the products of photosynthis was utilized in the production of seed and less for non-economic parts under early sowing date (October 1st).

The increase in canola yield and its attributes by planting early i.e. 1st of October in the first and second growing season was a result of exposing plant to optimum temperature (28.5-28.4 C) during vegetative growth (for 70 days from sowing). Whereas delaying planting exposed canola to lower temperature that decreased the accumulative heat units during vegetative growth consequently they were not sufficient for completing the optimum vegetative growth. The average accumulative heat units for vegetative growth of the two growing season were 1135, 959 and 772 units of sowing plants on October 1st , October 15th and November 1st respectively. These results might be due to the fact that early sown crop completed their vegetative phase and pod formation in favorable climatic conditions.

Sowing canola earlier in the second season i.e. September 15th decreased the aforementioned criteria also according to the high temperature prevailing during vegetative growth, which was higher than the optimum.

Flower initiation and 10 % pod formation were taken more in late sown dates, whereas seed-filling stage was less due to increase in temperature at that stage, resulted in better yield of early crop while

Table (1) Effect of sowing date and irrigation levels on yield and its attributes and some criteria of canola in the first growing season 2000/ 2001under El-Wadi El-Gidid conditions

Characters / Treatments	No. of branches carried pods / plant	No. of pods / Plant	No. of seeds / pod	1000 - seed weight (g)	Seed yield (kg/ fed)	Straw yield (ton/fed)	Biological yield (ton / fed)
Sowing date							
October 1st	6.57	235.4	22.45	3.44	1024	4.68	5.81
October 15th	5.28	215.4	21.73	3.20	926.3	3.90	4.82
November 1st	4.40	190.4	21.31	2.65	727.5	2.62	3.35
November15th	3.55	156.0	19.91	2.43	471.3	1.65	2.12
L S D at 5 %	0.42	10.12	0.30	0.06	10.74	0.21	0.38
Irrigation levels							
60 % Etc	3.88	163.5	20.29	2.58	629.8	2.61	3.24
80 % Etc	4.86	210.4	21.18	2.97	785.4	3.23	4.09
100 % Etc	6.11	223.9	22.58	3.23	946.8	3.80	4.75
L S D at 5 %	0.30	9.11	0.45	0.03	10.71	0.23	1.02

Table (2) Effect of sowing date and irrigation levels on crop index, harvest index, length of pod and diameter oil, protein contents and yields and water use efficiency of canola in the first growing seson 2000/ 2001under El Wadi -El Gidid conditions.

Characters	Crop Index	Harvest index	Diameter of pod cm	Length of pod cm	Oil		Protein		Water Use efficiency kg/m3
Treatments					Content (%)	Yield Kg/fed	Content (%)	Yield Kg/fed	
				Sowing date					
October 1st	21.86	17.65	2.89	6.38	42.07	430.83	19.80	201.94	0.720
October 15th	23.47	19.04	2.75	5.92	41.63	384.31	19.93	184.48	0.713
November 1st	27.74	21.71	2.64	5.63	39.92	289.90	21.16	153.90	0.622
November15th	28.52	23.30	2.54	5.17	39.36	186.46	22.41	105.74	0.343
L S D at 5 %	1.16	2.16	0.08	0.08	0.24	4.17	0.18	1.57	-
				Irrigation levels					
60 % Etc	25.38	20.98	2.38	5.46	40.50	256.37	21.02	131.36	0.636
80 % Etc	25.15	19.85	2.79	5.76	40.98	323.68	20.69	160.37	0.593
100 % Etc	25.67	20.43	2.95	6.11	40.76	388.56	20.76	192.82	0.570
L S D at 5 %	Ns	Ns	0.13	0.07	0.32	2.31	0.51	4.02	-

delay sowing there was a drastic reduction due to shorter reproductive period. (Brar *et al.*, 1998)

The optimum temperature during the vegetative phase had positive correlation with the seed yield. (Shstry and Kumar, 1981), (Rajput *et al.*, 1991) and (Thakur and Singh, 1998) reported that Brassica Species sown on 5 October gave significantly higher seed yield than sowing on later dates. The findings confirm the results of Patel et al., (1980) and Yadav et al., (1994).

Reduction of growth criteria by delaying date of sowing in both growing season may be attributed to the difference of the accumulated heat units for occurrence of various growth stages from sowing to specific growth stage (Patel and Mehta, 1987).

Maximum water use efficiency was obtained by sowing canola on October 1st while it was decreasing continuously and consistently by delaying sowing date up to November 15th in the first growing season and to November1st in the second growing season. These results might be attributed to the suitable climatic factors during early sowing i.e. October 1st for optimum growth criteria, which reflected positively on yield and its attributes. Plant investment of water for producing assimilates that directed to seed was efficient in early sowing than late sowing Bishnoi and Singh (1982) reported similar observations. Yadav *et al.*, (1999) found that (WUE) were more in early sowing -(17-27 October) than late sowing (6-16November) indicating that these results may be due to efficient utilization of available soil moisture at each stage of growth. These results were similar to those of Jadhav and Sing (1992).

Irrigation levels:

Evapotranspiration (ETc) of plant and soil were calculated according to Penman equation. Maximum amount of irrigation was 100 % from ETc considered as a control treatment, two other treatments were applied, one at 60 % from ETc irrigation with low amount of water (exerted moisture stress condition) and the other at 80 % from ETc irrigated with a moderate amount of water.

Increasing moisture content in the rhizosphere of canola from level 60% from ETc to level 100% from ETc through level 80% from ETc increased the criteria of all yield attributes. i.e. plant height, number of seeds /pod, pod length

Table (3) Effect of sowing date and irrigation levels on yield and its attributes and some criteria of canola in the second growing season 2001/ 2002under El Wadi -El Gidid conditions.

Characters / Treatments	No.of branches carried pods / plant	No. of Pods / Plant	1000 -seed weight (g)	No. of Seeds /Pod	Seed yield (kg/ fed)	Straw yield (ton/fed)	Biological yield (ton/fed)
Sowing date							
Septomber15th	5.93	212.8	3.35	23.59	1072	4.72	5.88
October 1st	6.75	217.8	3.46	24.95	1132	4.82	5.91
October 15th	5.49	211.6	3.21	23.94	1039	4.18	5.22
November 1st	4.77	181.4	2.78	22.33	781.3	3.48	4.26
L S D at 5 %	0.40	2.92	0.03	0.94	5.57	0.09	0.13
Irrigation levels							
80 % ETc	5.16	196.61	3.04	22:84	937.3	3.74	4.75
100 % Etc	5.91	209.15	3.23	23.92	1040	4.56	5.55
120 % ETc	6.15	211.91	3.33	24.35	1041	4.60	5.64
L S D at 5 %	0.39	1.99	0.05	0.36	15.42	0.08	0.32

Table (4) Effect of sowing date and irrigation levels on crop index, harvest index, length of pod and diameter oil, protein contents and yields and water use efficiency of canola in the second growing season 2001/ 2002under El- Wadi El- Gidid condition.

Characters / Treatments	Crop Index	Harvest index	Length of pod cm	Diameter of pod cm	Oil		Protein		Water use efficiency (kg/m3)
					Content (%)	Yield Kg/fed	Content (%)	Yield Kg/fed	
Sowing date									
September15th	22.87	18.65	5.87	2.96	41.47	444.56	19.86	212.88	0.533
October 1st	23.74	19.17	6.07	3.10	40.68	461.06	20.14	227.93	0.737
October 15th	25.0	19.96	5.38	2.94	39.88	413.38	20.82	217.34	0.624
November 1st	22.43	18.54	4.83	2.88	39.67	320.57	21.84	170.64	0.460
L S D at 5 %	0.27	0.35	0.20	0.10	0.19	17.22	0.31	4.01	-
Irrigation levels									
80 % ETc	25.0	20.08	5.02	2.87	40.47	378.48	20.75	193.87	0.671
100 % ETc	22.99	18.77	5.78	2.94	40.92	427.08	20.39	211.86	0.596
120 % Etc	22.54	18.40	5.82	3.11	39.88	424.12	20.85	215.92	0.498
L S D at 5 %	0.35	0.34	0.20	0.09	1.03	15.48	0.36	6.07	-

and diameter and 1000-seed weight in the first and second growing seasons significantly, but number of seeds/pod in the first season and plant height, pod length and diameter in the second season. of 80 % from ETc remained on par statistically with the level of 100 % from ETc.

Seed, straw, biological, oil, and protein yield /fed increased by increasing the moisture levels from 60% to 100% ETc in the first and second season significantly. But biological yield in the first season, seed yield, straw yield, oil and protein yield of ETc 80 remained on par statistically with the level of 100 % from ETc in the second season .The difference between 60 % ETc and 100 % ETc in seed, straw, biological, oil in the first season were 33.4, 31.0, 31.7, 34.1 and 31.8 kg /fed, whereas they were 9.9, 17.9, 14.4, 11.3 and 8.4 kg/fed in the second season for the same respective yields in the favoer of high soil moisture content. The increase in seed yields by increasing soil moisture content (from 60 to 100% from ETc). might be attribute to the increase in number of pods/plant, number of seeds /pod and 1000-seed weight. Singh and Dixit, 1989 reported that irrigation at 0.8 and 0.6 IW/CPE ratio had greater siliquae/plant, length, seeds / siliquae and test weight which in turn affected favourably the seed yield of mustard plant. Exposing plant stress condition causes depression in growth criteria, which could not meet the atmospheric evaporative demand (Yang and Jang, 1972). Khan and Agarwal, 1985, revealed that exposing plant to moisture stress reduced net assimilation rate which adversely affected yield and its components.

In the second season, crop and harvest index for stressed plant overcome those irrigated sufficiently (Table 4) indicating that more energy is being utilized in the production of seed and less for non-economic plants parts.

It was obvious that exposing canola plant to soil moisture stress increased water use efficiency. Siag and Verma (1990) reported that water use was higher when crop was irrigated at CPE 100-mm confirming those obtained by Bhan (1981), and Siag *et al.*, (1993), Patel and Patel (1999).

Interaction between sowing date and irrigation level.

Interaction between two factors is the failure of the differences in effect between levels of one factor

Table (5) Effect of interaction between sowing date and irrigation levels on yield and its attributes, oil, protein content and yields of canola in the first season 2000/2001 under El-Wadi El-Gidid conditions.

Characters		Seed yield	Straw yield	1000-seed	Oil		Protein	
Sowing date	Irrigation levels	(kg /fed)	(ton/fed)	weight (g)	Contents %	Yield Kg/fed	Content %	Yield Kg/fed
	60	769.31	3.69	2.66	41.40	320.83	20.23	155.67
October 1st	80	1003.8	4.54	3.62	42.42	425.78	19.87	199.51
	100	1299.46	5.81	3.84	42.41	545.89	19.29	250.65
	60	681.8	3.15	2.79	41.49	283.23	20.29	138.33
October 15th	80	911.4	3.93	3.32	42.01	381.15	19.40	176.87
	100	1185.8	4.62	3.50	41.39	488.55	20.09	238.26
	60	669.2	2.28	2.39	39.70	265.91	21.32	142.68
November 1st	80	732.6	2.70	2.58	39.86	290.45	21.10	154.84
	100	779.8	2.81	2.94	40.22	313.34	21.05	164.20
	60	399.0	1.34	2.30	39.40	155.53	22.25	88.75
November15th	80	492.8	1.75	2.36	39.66	197.37	22.37	110.27
	100	522.2	1.87	2.64	39.02	206.48	22.63	118.20
L S D at 5 %		24.42	0.41	0.25	0.23	6.41	0.32	4.73

Table (6) Effect of interaction between sowing date and irrigation levels on yield and its attribute oil, protein contents and yields of canola in the second growing season2001/2002 under El-Wadi El -Gidid conditions.

Characters Sowing date	Irrigation levels	Seed Yield (kg /fed)	Straw yield (ton/fed)	1000 - seed weight (g)	Oil		Protein	
					Contents %	Yield Kg/fed	Contents %	Yield Kg/fed
September 15th	80	1002.4	4.03	3.19	41.15	411.37	20.07	201.22
	100	1112.43	5.10	3.34	41.81	467.61	19.23	213.99
	120	1101.33	5.04	3.52	41.46	454.71	20.29	223.44
October 1st	80	1016.4	4.08	3.35	40.11	405.99	20.19	205.21
	100	1185.7	5.20	3.46	41.55	494.69	20.08	230.15
October 15th	120	1192.6	5.17	3.64	40.38	482.51	20.16	240.43
	80	956.73	3.51	3.06	40.43	386.40	20.88	199.80
November 1st	100	1075.2	4.69	3.24	40.07	429.11	20.78	226.433
	120	1085.0	4.63	3.32	39.13	424.65	20.81	225.78
	80	773.73	3.33	2.56	40.25	310.19	21.87	169.24
	100	785.33	3.54	2.87	40.25	316.93	21.47	168.68
	120	784.70	3.54	2.90	38.56	334.60	22.17	174.01
L S D at 5 %		16.52	0.13	0.79	0.44	28.02	0.51	6.90

to be the same at all levels of the other factor.

Data reported in tables (5,6) indicate effect of the interaction between sowing date and irrigation levels. on yield and its attributes of canola. In the first and second season the difference between date of sowing on yield and its attributes increased as the rate of water content of the soil was increased. These results were similar for seed, straw, oil and protein yield / fed and 1,000-seed weight. Maximum values were obtained by irrigated October 1st sown plants with 100% from ETc as indicated in Tables (5,6). Yadav *et al.*, (1999) reported same findings.

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أداء محصول الكانولا تحت ظروف الوادي الجديد

علاء محمد محمود بغدادى*- نعمت عبد العزيز نور الدين**

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***مركز بحوث الصحراء-المطرية-القاهرة-مصر.**

**** قسم المحاصيل-كلية الزراعة-جامعة عين شمس -القاهرة-مصر.**

أجريت هذه الدراسة بالمزرعة البحثية التابعة لمركز بحوث الصحراء (واحة الخارجة) بمحافظة الوادي الجديد في موسمي ٢٠٠١ , ٢٠٠٢ لدراسة تأثير مواعيد الزراعة ومستويات الري على المحصول,مكوناته, والمحتوى الكيماوي, وكفاءة استخدام الماء تحت نظام الري بالتنقيط. وتتلخص أهم النتائج في الأتي .

١ - أظهرت النتائج تفوق ميعاد الزراعة أول أكتوبر فى المحصول ومكوناتة فقد سجل اكبر قيمة لارتفاع النبات عدد ألا فرع الحاملة للقرون عدد القرون لكل نبات النسبة المئوية للتصافى- عدد البذور لكل قرن-وزن ١٠٠٠ بذرة .كذلك محصول البذور والقش والمحصول البيولوجي كجم/فدان والمحتوى الكيميائي للبذور .

٢- تأخير الزراعة من أول أكتوبر إلى ١٥ أكتوبر إلى ١ نوفمبر إلى ١٥نوفمبر أدى ألـــي نقص المحصول بنسبة ٩,٥ - ٢٨,٩-٥٣,٥ % في الموسم الأول بينما نقص المحصـــول بنسبة ٨,٢ و٣٠ % في الموسم الثاني على التوالي.

٣- زاد المحصول ومكوناتة بزيادة مستويات الري من ٦٠% الى ١٠٠% من البخر نتـــح حيث زاد المحصول باستخدام معاملة ١٠٠% البخر نتح بنسبة ٣٣,٤ % عن معاملة ٦٠ % البخر نتح في الموسم الأول بينما زادت معامله ١٠٠% عن ٨٠ % بنسبة ٩،٩ في الموســـم الثاني.

٤- كانت أعلى كفاءه لاستخدام المياه بالزراعة في ميعاد أول أكتوبر بينما تناقصت بتـأخير الزراعة حتى ١٥ نوفمبر.