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EFFECT OF SOWING DATES AND PLANT DISTANCE ON GROWTH YIELD, YIELD COMPONENTS AND ASSOCIATED WEEDS OF RAPESEED PLANTS (*Brassica napus*)

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ABSTRACT

Two field experiments were carried out at the Experimental Station of the National Research Centre, Shalakan Kalubia Governorate during the two seasons of 1998/99 and 1999/2000 to study the effect of sowing dates and plant distance on associated weeds, growth characters, yield and its components of Rapeseed plants (*Brassica napus* var. Pactol). The main results were :

The highest depressing effect at 75 days after sowing on annual broad-leaved and total weeds were recorded by sowing date on 15th Dec. while Nov. 15th and Nov. 30th were the most effective treatments for decreasing fresh weight of perennial and grassy weeds, respectively. At 105 days all data revealed that Nov. 30th reflected the same significant response to decreasing the fresh weight of broad-leaved, grassy and perennial weeds.

For plant distance results show that fresh weight of associated weeds of oil seed rape were significantly affected. Furthermore, sowing under plant distance 10 cm between hills characterized by its inferiority significant values for the fresh weight of associated weeds compared with the other two distances 20 and 30 cm between hills at 75 and 105 days after sowing. In addition, progressive increase in the distances from 10 to 20 and up to 30 cm harvested the higher values from the fresh weight of associated weeds along the growth period of plants. The interaction between sowing dates and plant distance on annual grasses, perennial and total weeds significantly responded at 105 days after sowing. The associated weeds caused its lowest values under sowing date on Dec.15th and plant distance 10 cm.

All growth characters of rapeseed plants, had a significant response to sowing dates along the growth period of plants. Vegetative growth characters of oilseed rape plants give an evidence that plant height, number of leaves/plant, leaves dry weight/plant, LA at 75 days after sowing and plant height at 105 days increased significantly with Dec. 15th sowing date. While SLW at 75 days and number of leaves, number of branches/ plant, leaves, stem, and total dry weights/plant, SLW, LA and LAI at 105 days responded significantly on Nov. 30th sowing date.

Data indicated that plant density revealed significant effect on number and dry weight of leaves/plant, SLW, LA and LAI at 75 days, as well as number of branches/plant leaves dry weight, SLW and LAI at 105 days after sowing.

The highest values of number, dry weight of leaves/plant and LAI at 75 days after sowing and number of branches, total dry weight/plant, LA and LAI at 105 days obtained from 10 cm between hills.

The effect of interaction between sowing data on Nov. 30th and plant distance 20 cm caused significant effect on SLW but 10 cm distance between hills had superior effect on LA and LAI under sowing date Nov. 30th at 105 days after sowing.

Data revealed that cultivating oil seed rape on Nov. 30th was the most effective treatment to collecting the greatest significant values from each of number of pods, weight of pods, seeds weight/plant, oil %, seed and oil yield/fed. While 15th Dec. sowing date produced the highest value of pod weight.

Sowing oil seed rape at plant distance 10 cm between plants gave the highest significant values from weight of pod, seeds weight/pod, seed yield and oil yield/fed, while the distance 20 cm produced significant increases in seed oil %. On the contrary, significant superiority was found in number of pods, weight of pods and weight of seeds/plant at the plant distance 30 cm between plants.

Data illustrated that interaction between sowing date Nov. 30th and plant distance 30 cm gave maximum values from number of pods, weight of pods and weight of seeds/plant. With respect to the sowing date Dec. 15th and plant distance 10 cm harvested the greatest values of seed yield and oil yield/fed.

INTRODUCTION

Rapeseed oil known as rape oil, colza oil and recently canola oil is obtained mainly from the seed of *B. napus* (rape) and *B. compestris* (turnip rape). The recent rapeseed varieties known as canola contain low level of both erucic acid and glucosinolate. Rapeseed oil could be used as an edible oil in cooking, margarine, and shortening.

In Egypt the combination of population explosion, inadequate of local oil production and increasing consumption rate per capita made it necessary to import large quantities of edible oils every year. However, increasing the local oil production (100,000 ton) is very hard because most of the oil comes from cotton seeds. But increasing area devoted to cotton in Egypt is not possible due to many factors such as limited cultivated area, lack of hand labors, increasing the cost of cotton cultivation. Also, increasing the cultivated area of summer oil crops such as soybean, sunflower and sesame is unexpected in the Nile Valley and Delta due to the strong competition with other main crops, and shortage in irrigation water in summer season. Therefore, introduction a new oil crop in the winter season seems to be easier due to its lesser water requirements than summer ones.

Since 1978, some spring varieties of *B. napus* have been introduced from Europe and evaluated under Egyptian conditions. The crop has great promise as oil seed crop in the winter season in Egypt (Sharaan, 1987). However, weeds are considered a major problem in rape fields that cause great losses in seed yield because weeds compete directly with plants for light, moisture, carbon dioxide and soil nutrients. Therefore weed control is one of the essential cultural practices for raising the yield and quality of oil

rape. Weeds have been partially controlled by herbicides which often undesirable due to possible injury to animal and humans potential toxic plant and soil residues, complexity application of the treatments and high cost, (Abdallah, 1991). The use of many herbicides on crops has been discontinued as a result of their long persistance and adverse effect on following crops (Tawfik, 1972). Nowadays, these is a direction to minimize the usage of herbicides and to depend upon a nonherbicide technique. The suitable date of sowing and space between rapeseed plants are considered as one of the main limitation of associated weeds growth.

Sowing date, plant distance and weeds competition are important factors affect yield and its components of rapeseed. Thus, the present study aimed to investigate the effect of sowing dates and plant distance on associated weeds, growth, seed yield and oil quality of oilseed rape.

MATERIAL AND METHODS

Two field experiments were carried out at Experimental Station of National Research Centre at Shalakan, Kalubia Governorate, Egypt in 1998/99 and 1999/2000 growing seasons to study the effect of sowing dates and plant distance on growth, yield components and associated weeds of Rapeseed (*Brassica napus* var. Pactol).

Each experiments included nine treatments which were the combination of three sowing dates (Nov. 15th, Nov. 30th and Dec.15th)and three plant distance (10, 20 and 30 cm between hills). The experimental design was split plot design with four replications, where, sowing dates occupied the main plots, while, plant distance were allocated at random in the sub plots. The experimental unite area was 1/400 feddan i.e. 10.5 square meters, 3.5 meters in length and 3.0 meters in width containing five ridges. Normal cultural practices were followed as usual in rapeseed plants. The plants were thinned to two plants per hill after 45 days from sowing.

In both seasons weeds were hand pulled from the middle ridges of each plot at 75 and 105 days after sowing date and classified into two groups, annual weeds and perennial weeds where fresh weight of annual weeds, i.e. broad leaved and grasses, fresh weight of perennial weeds and fresh weight of total weeds (g/m^2) were estimated.

Samples of ten guarded plants from each plot were taken at random from the middle ridges of every plot during the two growing seasons on two dates at one month by intervals starting on 75 days after sowing, to estimate plant height (cm), number of leaves/plant, dry weight of leaves/plant also, leaf area (LA) (cm^2/plant) were measured as mentioned by Bremner and Taha (1966), where, leaf area index (LAI) were calculated as Watson (1952) and specific leaf weight (SLW) (mg/cm^2) was determined as the method described by Pearce *et al.* (1969). In addition, with the above mentioned characters, number of branches/plant, stem dry weight (g/plant) and total dry weight (g/plant) were measured at 105 days from sowing.

At harvest a random sample of ten plants from each plot were taken to determine number of pods/plant, weight of pods/plant, weight of pod (g),

seeds number/pod, seeds weight (g/plant). Plants of the middle 3 ridges from each plot were harvested by hand. The plant were dried under sunshine for one week. Therefore, the pods were threshed and seeds were cleaned after separation from pods and seed yield per fed (kg) were determated. A seeds samples were taken, where, crude oil was determined according to A.O.A.C. (1985).

The combined analysis of data of the two growing seasons was carried out according to the outlined by Snedecor and Cochran (1990). For comparison between means LSD test was used.

RESULTS AND DISCUSSION

A. Associated weeds:

A.1. Effect of sowing dates:

There were significant effect of sowing dates on fresh weight of annual weeds (broad leaved and grasses), fresh weight of perennial weeds, fresh weight of total weeds at 75 days, also, fresh weight of annual grasses weeds and perennial weeds at 105 days age associated for oilseed rape per m^2 (Table 1). Moreover, sowing date on Nov. 15th gave the highest significant value for associated weeds of oilseed rape, i.e. fresh weight of annual broad leaved, grasses and fresh weight of total weeds (g/m^2) at 75 days after sowing, also, the fresh weight of annual grasses or perennial weeds (g/m^2) were significant at 105 days after sowing with sowing date on Nov. 15th compared with sowing dates on Nov. 30th and/or Dec. 15th .

On the other hand, the medium sowing date (i.e. Nov. 30th) significantly decreased fresh weight of annual weeds (broad leaved and grasses), fresh weight of total weeds at 75 days as well as fresh weight of annual gasses weeds and fresh weight of perennial weeds at 105 days, whereas, insignificant decrement in fresh weight of annual broad leaved weeds and fresh weight of total weeds were found under sowing date Nov. 30th compared with Nov. 15th .

With respect to the late sowing date on Dec. 15th characterized by lowest mean value from fresh weight of annual broad leaved weeds and total weeds per m^2 at 75 days, as well as, fresh weight of total associated weeds/m^2 at 105 days, respectively in comparison with the early and medium sowing date (i.e. 15 and 30th of Nov.), meanwhile, insignificant enhancement in fresh weight of annual grasses weeds at 75 and 105 days and broad leaved as well as, fresh weight of perennial weeds 105 days compared with sowing on Nov. 30th as shown in Table 1.

A.2. Effect of plant distance:

Results in Table 1 show that fresh weight of associated weeds of oilseed rape/m^2 was significantly affected by the plant distance. Furthermore, sowing under plant distance 10 cm between plants characterized by its inferiority significant values for the fresh weight of associated weeds compared with the other two distances under this study 20 and 30 cm between plants along the growth period of oilseed rape plants. However, the

Table 1 : Effect of sowing dates and plant distance on fresh weight of associated weeds of with rapeseed plants after 75 and 105 days from sowing (Over two seasons 1998/99 and 1999/2000).

Characters / Treatments		At 75 days after sowing				At 105 days after sowing			
		Fresh wt. of annual weeds (g/m²)		Fresh wt. of perennial weeds (g/m²)	Fresh wt. of total weeds (g/m²)	Fresh wt. of annual weeds (g/m²)		Fresh wt. of perennial weeds (g/m²)	Fresh wt. of total weeds (g/m²)
		Broad leaved	Grasses			Broad leaved	Grasses		
Sowing dates	Nov. 15th	521.00	271.33	95.22	887.55	939.44	351.11	304.66	1595.21
	Nov. 30th	414.77	238.11	99.88	752.00	906.55	287.11	254.33	1525.79
	Dec. 15th	391.77	239.22	111.33	742.33	920.00	311.44	261.88	1493.32
LSD at 0.05		52.57	15.48	7.76	46.31	NS	13.33	10.07	NS
Plant distance	10 cm.	417.33	217.77	78.00	713.11	817.66	266.77	219.11	1381.00
	20 cm.	429.44	258.11	102.00	789.55	942.00	326.66	283.55	1552.22
	30 cm.	480.77	272.77	126.44	879.22	1006.33	356.22	318.55	1662.11
LSD at 0.05		52.57	15.48	7.76	46.31	54.67	13.33	10.07	139.20
Effect of interaction :									
Nov. 15th	10 cm.	467.00	226.00	74.66	767.66	877.33	326.33	240.66	1444.33
	20 cm.	510.00	278.00	96.33	884.33	954.66	332.66	294.00	1581.33
	30 cm.	586.00	310.00	114.66	1010.66	986.33	394.33	379.33	1760.00
Nov.-30th	10 cm.	401.00	208.00	76.66	685.66	818.66	256.66	222.66	1531.33
	20 cm.	394.00	252.00	97.00	743.00	898.00	309.00	283.00	1490.00
	30 cm.	449.00	254.00	126.00	827.33	1003.00	295.66	257.33	1556.00
Dec. 15th	10 cm.	384.00	219.33	82.66	686.00	757.00	217.33	193.00	1167.33
	20 cm.	384.33	244.33	112.66	741.33	973.33	338.33	273.66	1585.33
	30 cm.	407.00	254.00	138.66	799.66	1029.66	378.66	319.00	1727.33
LSD at 0.05		NS	NS	NS	NS	NS	23.09	17.45	241.10

differences between the two distance 10 and 20 cm between plants in fresh weight of annual broad leaved at 75 days after sowing failed to reach the significant level at 0.05. On the contrary, increasing the distance between plants from 10 to 20 cm caused significant increment in fresh weight of associated weeds except the increase in fresh weight of annual broad leaved was not significant. In addition, a progressive increase in the distance between oilseed rape plants up to 30 cm harvested the maximum values from the fresh weight of associated weeds along the growth period of plants.

These results in Table 1 show that narrow distance between plants had inhibition effect on fresh weight of associated weeds, and this may be attributed to that the narrow distance between plants had inhibition effect on total annual weeds growth and this may be due to the high shadding which lowered light intensity to penetrate these vegetation, and hard competition with plants for moisture, carbon dioxide and soil nutrient. Similar conclusions were recorded by El-Naggar (1991) who found that high population (10 cm between hills) caused reduction in total dry weight of weeds at different period of growth.

It is noteworthy to mention that results of the decrement in the fresh weight of associated weeds for oilseed rape in this study are confirmed with the results obtained by El-Naggar (1991) and Afifi (2000).

A.3. Effect of interaction:

The interaction between sowing dates and plant distance was insignificant on fresh weight of associated weeds at 75 days and annual broad leaved at 105 days, however, fresh weight of annual grasses, perennial weeds and total weeds/m^2 significantly responded to this interaction (Table 1). On the other hand, at 105 days after sowing fresh weight of associated weeds caused it's lowest values under sowing date on Dec. 15th and plant distance 10 cm between plants.

On the contrary, sowing oilseed rape on Nov. 15th under plant distance 30 cm between plants gave the highest fresh weight of annual weeds and total weeds/m^2 at 75 days, as well as fresh weight of each from annual grasses, perennials and total weeds/m^2 at 105 days, meanwhile, sowing on Dec. 15th under 30 cm between plants produced the greatest fresh weight of perennial weeds at 75 days and annual broad leaved at 105 days after sowing, as shown in Table 1.

B. Growth characters:

B.1. Effect of sowing dates:

Vegetative growth characteristics of oilseed rape plants listed in Table 2 give an evidence that plant height, number of leaves/plant, leaves dry weight/plant and LA at 75 days after sowing and plant height at 105 days after sowing increased significantly with Dec. 15th sowing date, as well as number of leaves/plant, number of branches/plant, leaves, stem and total dry weights per plant, SLW, LA and LAI at 105 days and SLW at 75 days responded significantly on Nov. 30th sowing date.

Table 2 : Effect of sowing dates and plant distance on growth characters of oilseed rape plants at 75 and 105 days from sowing. (Over two seasons 1998/99 and 1999/2000).

Characters / Treatments		At 75 days after sowing						At105 days after sowing								
		Plant height (cm)	No. of leaves /plant	Dry wt. of leaves (g/ plant)	SLW (mg/ cm²)	LA (cm²/ plant)	LAI	Plant height (cm)	No. of leaves /plant	No. of branches /plant	Dry wt. of leaves (g/ plant)	Stem dry wt. (g/ plant)	Total dry wt. (g/ plant)	SLW (mg/ cm²)	LA plant (cm²)	LAI
Sowing date	Nov. 15th	37.44	6.56	8.89	3.31	2685.44	3.91	63.22	11.31	6.75	6.23	7.24	13.47	4.16	1506.67	2.31
	Nov. 30th	39.79	7.78	10.61	4.31	2457.67	4.20	128.08	21.25	10.11	26.67	26.81	53.47	5.45	4909.44	7.79
	Dec. 15th	43.56	9.31	10.71	3.25	3295.00	4.74	136.17	12.45	7.60	10.08	15.50	25.58	4.34	2328.00	3.56
LSD at 0.05		3.62	0.80	1.61	0.05	480.34	NS	9.51	9.51	1.15	2.96	3.40	4.42	0.03	584.06	1.08
Plant distance	10 cm.	40.39	7.25	8.46	3.56	2405.89	6.64	110.45	14.68	7.28	14.59	16.04	30.62	4.32	3136.33	7.84
	20 cm.	40.18	8.11	10.38	3.69	2850.33	3.56	109.22	15.92	8.02	8.02	17.19	17.19	4.97	2724.89	3.41
	30 cm.	40.22	8.28	11.37	3.63	3181.89	2.65	107.81	14.42	9.17	9.17	16.31	16.31	4.65	2882.89	2.40
LSD at 0.05		NS	0.80	1.61	0.05	480.34	0.72	NS	NS	1.15	1.15	NS	NS	0.03	NS	1.08
Effect of interaction :																
Nov. 15th	10 cm.	38.33	6.25	7.50	3.27	2129.69	5.74	64.34	11.92	6.17	5.84	6.45	12.28	3.73	1567.67	3.92
	20 cm.	37.00	6.50	9.58	3.33	2880.33	3.60	66.17	11.17	6.50	5.83	7.40	13.23	4.53	1286.67	1.61
	30 cm.	36.50	6.92	9.58	3.32	2879.33	2.40	59.17	10.83	7.58	7.03	7.86	14.89	4.22	1665.67	1.34
Nov. 30th	10 cm.	39.71	7.17	8.99	4.22	2477.67	7.20	125.08	20.25	8.83	28.33	26.25	54.58	5.15	5498.33	13.75
	20 cm.	41.46	8.08	10.83	4.37	2765.67	3.10	128.08	22.33	9.75	26.27	29.17	55.83	5.77	4626.00	5.78
	30 cm.	38.21	8.08	12.02	4.35	2791.33	2.31	131.08	21.17	11.75	25.00	25.00	50.00	5.43	4664.00	3.84
Dec. 15th	10 cm.	42.63	8.33	8.90	3.19	2296.67	6.98	141.92	11.86	6.83	9.58	15.42	25.00	4.09	2343.00	5.86
	20 cm.	42.08	9.75	10.72	3.36	3193.00	3.99	133.42	14.25	7.81	10.42	15.00	25.42	4.61	2262.00	2.83
	30 cm.	45.96	9.83	12.51	3.21	3900.67	3.25	133.17	11.25	8.17	10.25	16.08	26.33	4.31	2379.00	1.98
LSD at 0.05		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.05	584.06	1.86

Generally speaking the above mentioned results indicated that medium sowing date Nov. 30th surpassed early as well as late sowing date in most growth characters of oilseed rape plants at 105 days. It could be concluded that the previally climatic conditions of medium sowing date Nov. 30th especially temperature of day and night, light duration and light intensity especially when adequate requirements of nutritional state is available increase plant photosynthesis to utilize water, minerals and light with high efficiency, therefore, synthetic surface became great, then more metabolic substances which enhance differentiation as well as development of different plant growth periods, the results of all over mean for 75 and 105 days after sowing showed that there were a progressive and constituent increase in plant height, number of leaves/plant, dry weight of leaves/plant and SLW with advancement of plant towards maturity as shown in Table (2). The finding of Mendham et al. (1981), Mendham *et al.* (1990) Misra and Rana (1992), Pradhan *et al.* (1997), Shirani and Ahmadi (1997), Brar *et al.* (1998) and Surya *et al.* (1999) confirm our results.

B.2. Effect of plant distance:

Data presented in Table 2 indicated clearly that plant density revealed significant effect on number and dry weight of leaves/plant, SLW; LA and LAI at 75 days, as well as number of branches/plant, SLW and LAI at 105 days after sowing date. The highest values of plant height at 75 and 105 days as well as LA and LAI at 105 days were recorded at 10 cm between hills. On the other hand, number and dry weight of leaves and LA at 75 days, also, number of branches/plant at 105 days after sowing increased at 30 cm between hills. In addition, results in Table 2 show that the medium distance between plants (20 cm) gave the maximum mean values for each of SLW at 75 and 105 days as well as number of leaves/plant, stem dry weight/plant and total plant dry weight at 105 days after sowing. The obtained results are in harmony with those obtained by Misra and Rana (1992), Pradhan *et al.* (1997), Shirani and Ahmadi (1997) and Leach *et al.* (1999).

B.3. Effect of interaction:

The interaction between sowing dates and plant distance of oilseed rape showed significant differences of some growth attributes of oilseed rape plants such as SLW, LA and LAI at 105 days after sowing as shown in Table 2. Sowing date on Nov. 30th and plant distance at 10 cm between plants recorded the highest values on leaves on LA and LAI at 105 days. While the highest value of SLW was recorded under Nov. 30th sowing date and 20 cm plant distance, at 105 days after sowing.

C. Yield and its components:

C.1. Effect of sowing dates:

Data given in Table 3 show that sowing dates significantly affected on weight of pod, seeds weight/plant, number of pods/plant, weight of pods/plant, seed yield/fed, seed oil % and oil yield/fed.

Table 3 : Effect of sowing dates and plant distance on yield and its components of oilseed rape. (Over two seasons 1998/99 and 1999/2000).

Characters / Treatments		No. of pods/ plant	Wt. of pods (g/plant)	Weight of pod (g)	Seed number /pod	Seeds weight (g/pod)	Seed wt. (g/plant)	Seed yield kg/fed.	Oil %	Oil yield kg/fed.
Sowing date	Nov. 15th	161.89	30.81	0.152	20.78	0.055	10.54	787.15	43.62	298.75
	Nov. 30th	313.00	52.38	0.175	22.76	0.058	17.11	959.60	44.94	430.85
	Dec. 15th	214.00	34.70	0.181	22.70	0.059	13.74	892.77	43.26	383.07
LSD at 0.05		37.29	4.23	0.015	NS	NS	1.81	89.51	0.95	40.86
Plant distance	10 cm.	204.33	33.78	0.173	22.08	0.062	12.11	1271.55	43.07	546.81
	20 cm.	229.67	38.27	0.166	22.60	0.049	13.90	729.52	44.86	327.42
	30 cm.	254.89	45.84	0.169	21.56	0.060	15.38	538.42	43.88	238.46
LSD at 0.05		37.29	4.23	0.015	NS	0.007	1.81	89.51	0.95	40.86
Effect of interaction :										
Nov. 15th	10 cm.	181.33	25.51	0.163	20.77	0.063	10.68	1121.75	42.76	497.50
	20 cm.	139.67	35.50	0.137	22.02	0.045	11.84	621.43	45.08	279.88
	30 cm.	164.67	31.42	0.158	19.55	0.056	9.09	318.27	43.07	136.88
Nov. 30th	10 cm.	234.00	37.99	0.175	21.60	0.059	12.16	1277.15	44.64	569.25
	20 cm.	281.00	40.98	0.174	23.69	0.055	13.19	692.48	45.19	313.95
	30 cm.	424.00	78.15	0.176	22.98	0.059	25.98	909.18	44.99	409.36
Dec. 15th	10 cm.	197.67	37.83	0.181	23.87	0.064	13.48	1415.75	41.82	591.68
	20 cm.	268.33	38.33	0.189	22.09	0.047	16.66	874.65	44.38	388.41
	30 cm.	176.00	27.94	0.173	22.14	0.065	11.08	387.92	43.59	169.12
LSD at 0.05		64.59	7.33	NS	NS	NS	3.14	155.03	NS	70.78

Cultivating oilseed rape on Nov. 30th was the most effective treatment to collecting the greatest significant values from each of seed weight plant, number of pods/plant, weight of pods/plant, seed oil %, seed and oil yields/fed compared with the early and late sowing dates (i.e. Nov. 15th and Dec. 15th).

Generally the above mentioned results indicated that the medium sowing date Nov. 30th surpassed early and late sowing in most yield and its components of oilseed rape (Table 3), and this may be due to that the prevailing climatic conditions of medium sowing date especially temperature of day and night, light duration and light intensity especially when adequate requirements of nutritional state is available increase plant photosynthates. Moreover, suitability of these factors encourage plant to utilize water, minerals and light with high efficiency, therefore, synthetic surface became great, then more metabolic substances which enhance differentiation as well as development of different plant growth periods. Similar results were given by Mendham *et al.* (1981), Mendham *et al.* (1990), Misra and Rana (1992), Pradhan *et al.* (1997), Shirani and Ahmadi (1997), Brar *et al.* (1998), Ghosh (1998), Wielebski and Wojtowiez (1998), Om *et al.* (1999) and Surya *et al.* (1999).

C.2. Effect of plant distance:

Data presented in Table 3 show that distance significantly affected on seeds weight/pod, weight of pod, seeds weight/plant, number of pods/plant, weight of pods/plant, seed oil %, seed and oil yields/fed. Sowing oilseed rape at plant distance 10 cm between plants produced the highest significant values from seeds weight/pod, weight of pod, as well as, the highest significant values from seed yield/fed. and/or oil yield/fed in comparison with the other two distances 20 and 30 cm between plants. On the other hand, sowing oilseed rape at the distance 20 cm between plants produced significant promotion effect on seed oil %. On the contrary, significant superiority was found in seed weight/plant, number of pods/plant and weight of pods/plant at the plant distance 30 cm in comparison with the plant distance 10 and 20 cm between plants.

The high yield potential that fiddling in the narrow distance between plants 10 cm may be due to the inhibition effect on total annual weeds growth thus high shading lowered high intensity to penetrate these vegetation. Again, high population caused a reduction in total dry weight of weeds to different period of growth (El-Nagar, 1991) where weed growth inhibited with weeding and shortening in plant distance.

Our results are in full agreement was those obtained by Leach *et al.* (1999), Misra and Rana (1992), Pradhan *et al.* (1997), Shirani and Ahmadi (1997) and Afifi (2000).

C.3. Effect of interaction:

Data illustrated in Table 3 observed that seed weight/ plant, number of pods/plant, weight of pods/plant, seed yield/fed and oil yield/fed significantly responded to the interaction between sowing dates and plant distance. In addition, data collected show that sowing oilseed rape on Nov.

30th under plant distance 30 cm between plants gave the highest value from seed weight/plant, number of pods/plant and weight of pods/plant. With respect to the late sowing date i.e. Dec. 15th data given in Table 3 show that seed yield/fed and oil yield/fed harvested the greatest values under the conditions of 10 cm plant distance.

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تأثير مواعيد الزراعة والمسافة بين النباتات على النمو والمحصول ومكوناته والحشائش المصاحبة لنباتات الريب

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***قسم بحوث المحاصيل و **قسم النبات المركز القومى للبحوث – الدقى – القاهرة**

يهدف هذا البحث الى دراسة تأثير مواعيد الزراعة والمسافة بين النباتات على الحشائش المصاحبة ونمو ومحصول نباتات الريب – لذلك اجريت تجربتان حقليتان خلال موسمى ١٩٩٨/١٩٩٩ و ١٩٩٩/٢٠٠٠ بمزرعة المركز القومى للبحوث – بشلقان – قليوبية – واشتملت كل تجربة على ٩ معاملات عبارة عن التوافيق لثلاث مواعيد زراعة هى ١٥ نوفمبر ، ٣٠ نوفمبر و ١٥ ديسمبر وثلاث مسافات بين الجور هى ١٠ ، ٢٠ و ٣٠ سم ووزعت المعاملات فى تصميم القطع المنشقة مرة واحدة حيث كانت مواعيد الزراعة فى القطع الرئيسية – اما المسافات بين النباتات فقد وزعت عشوائيا فى القطع الشقية وكان ذلك فى اربع مكررات وكانت اهم النتائج كالاتى :

١- وجد ان لميعاد الزراعة ١٥ ديسمبر كان له تأثيرا معنويا فى انقاص الاوزان الغضة للحشائش عريضة الاوراق وكذلك الحشائش الكلية – بينما وجد ان ميعادى الزراعة ١٥ نوفمبر و ٣٠ نوفمبر كان لهما تأثيرا فعالا فى انقاص أوزان الحشائش ضيقة الاوراق وكذلك المعمرة وذلك بعد ٧٥ يوم من الزراعة.

- اوضحت النتائج انه بعد ١٠٥ يوم من الزراعة كان لميعاد ٣٠ نوفمبر تأثيرا معنويا فى انقاص الاوزان الغضة للحشائش الحولية عريضة وضيقة الاوراق وكذلك الحشائش المعمرة .

- بالنسبة لمسافات الزراعة اوضحت النتائج ان مسافة ١٠ سم بين الجور تميزت بانها اعطت اقل قيم بالنسبة للاوزان الغضة للحشائش اذا ماقورنت بمسافتى ٢٠ سم او ٣٠ سم بين الجور بعد ٧٥ يوم من الزراعة بالاضافة الى انه وجد كلما زادت المسافات بين الجور من ١٠ الى ٢٠ وحتى ٣٠ سم زادت الاوزان الغضة للحشائش المصاحبة لنباتات الريب .

- اوضحت النتائج ان التفاعل بين مواعيد الزراعة والمسافة بين النباتات كان لهما تأثيرا معنويا على الاوزان الغضة للحشائش الحولية ضيقة الاوراق والمعمرة وكذلك الحشائش الكلية بعد ١٠٥ يوم من

الزراعة حيث اعطى ميعاد الزراعة ١٥ ديسمبر مع مسافة الزراعة ١٠ سم بين الجور اقل قيم لاوزان الحشائش الغضة .

٢- بالنسبة لصفات النمو وجد ان جميع صفات النمو لنباتات الريب وهى طول النبات - عدد الاوراق للنبات ووزنها الجاف ومساحة الاوراق كان لها استجابة معنوية لميعاد الزراعة ١٥ ديسمبر بعد ٧٥ يوم من الزراعة . بينما عند عمر ١٠٥ يوم من الزراعة وجد استجابة معنوية لطول النبات لهذا الميعاد .

- وجد ان مسافة الزراعة ١٠ سم بين الجور كان لها تأثيرا معنويا على عدد الاوراق ووزنها الجاف للنبات ومساحة الاوراق والكثافة النوعية للاوراق ودليل مساحة الاوراق بعد ٧٥ يوم من الزراعة - اما بعد ١٠٥ يوم من الزراعة فقد وجد ان هناك تأثيرا معنويا لمسافات الزراعة على وزن الاوراق الجاف وعدد الافرع للنبات والكثافة النوعية للاوراق ، دليل مساحة الاوراق . وقد اوضحت النتائج ان اعلى قيم لعدد الاوراق ووزنها الجاف للنبات ودليل مساحة الاوراق وذلك بعد ٧٥ يوم من الزراعة وعدد الافرع للنبات والوزن الكلى الجاف للنبات ومساحة الاوراق ودليل مساحة الاوراق وذلك بعد ١٠٥ يوم من الزراعة قد تم الحصول عليه عند الزراعة على مسافة ١٠ سم بين الجور .

- كان للتفاعل بين ميعاد الزراعة ٣٠ نوفمبر ومسافة ٢٠ سم بين الجور تأثيرا معنويا على الكثافة النوعية للاوراق بينما مسافة ١٠ سم بين الجور اعطت تفوقا فى مساحة الاوراق ودليل مساحة الاوراق مع ميعاد زراعة ٣٠ نوفمبر وذلك بعد ١٠٥ يوم من الزراعة .

٣- بالنسبة للمحصول ومكوناته وجد ان زراعة نباتات الريب فى ميعاد ٣٠ نوفمبر كانت هى المعاملة الفعالة فى اعطاء اكبر قيم لعدد القرون ووزنها ووزن البذور للنبات ونسبة الزيت ومحصول الزيت للفدان بينما الزراعة فى ميعاد ١٥ ديسمبر اعطى اعلى قيم لوزن القرن .

- زراعة نباتات الريب على مسافة ١٠ سم بين الجور اعطت اعلى قيم معنوية لوزن القرن ووزن البذور للقرن ومحصول البذور وكذلك محصول الزيت للفدان - بينما مسافة ٢٠ سم اعطت زيادة معنوية فى نسبة الزيت للبذور ولكن مسافة ٣٠ سم بين النباتات تفوقت معنويا فى عدد القرون ووزنها ووزن البذور /للنبات.

- بالنسبة للتفاعل بين مواعيد ومسافات الزراعة أعطى ميعاد الزراعة ٣٠ نوفمبر ومسافة الزراعة ٣٠ سم قيم عالية لعدد القرون ووزنها ووزن البذور للنبات - بينما ميعاد الزراعة ١٥ ديسمبر ومسافة ١٠ سم بين الجور أعطى اعلى قيم لمحصول البذور ومحصول الزيت للفدان .

التوصية : توصى الدراسة بزراعة نباتات الريب فى ميعاد ١٥ ديسمبر مع مسافة زراعة ١٠ سم بين الجور للحصول على أعلى محصول من البذور والزيت وأعلى كفاءة لتقليل اوزان الحشائش الغضة المصاحبة لنباتات الريب اثناء نموه يجب ان تتم الزراعة فى ميعاد ١٥ ديسمبر مع مسافة زراعة ١٠ سم بين الجور .