RESPONSE OF RAPESEED (*Brassica napus* L.) VARIETIES TO NITROGEN AND PHOSPHORUS FERTILIZER IN YIELD AND ITS COMPONENTS UNDER TWO DIFFERENT SOWING

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ABSTRACT:

A field experiment was carried out during 2017, using factorial split- split- plot experiment laid out in RCBD, to investigate the effect of planting date on plant height, seed yield kg $ha^{-1}$and its components of two spring rapeseed (*Brassica napus* L.) varieties under three N/P_2O_5 fertilizer levels. The results of experiment showed the tallest plant and greater yield and yield components (number of branches per plant, number of pod per plant, length of pod (cm), pods weight (g) per plant, number of seed per pod, 1000 seed weight (g), biological kg ha^{-1}, and harvest index were obtained at earlier planting date (7^{th} March) and under 90/60 kg N/P_2O_5 ha^{-1} fertilizer by Dunkild variety with values (105.40, 12.33, 82.33,7.09, 7.08, 17.57, 3.13, 781.15, 266.19 and 0.34) respectively, for all mentioned parameters in comparison with Sherally variety under other N/P_2O_5 levels and late planting date.

Keyword: N/P_2O_5 fertilizer, *Brassica napus* L.

INTRODUCTION:

Rapeseed (*Brassica napus* L.), is an annual oil crop a member of the family Brassicaceae. Seed content a high amount of oil varies from (30- 45 %) depending on the species, the variety and climatic conditions under which is grown. Brassica napus has been found to be a rich source of oil with a high content of polyunsaturated fatty acids (7- 10%) α-linolenic acid and (17-21%) linoleic acids and a low content of saturated fatty acids (5-7%). It is therefore considered as a very healthy and an important source of edible oil in many countries (1)and it is now the second most important source of vegetable oil after soybean in the word(5). There are many cultural practices that affect growth, development and yield of rapeseed, among them planting date, (10) fertilizer and cultivars (8).There were a significant positive correlation between day to flowering and day to maturation and all yield components in different planting date, the late in sowing time decreases the day to flowering and flowering duration led to decreases in plant height, decline in biomass and all yield component especially number of pod per plant which cause the reduction in seed and oil (12,16) Moreover, (12) concluded that the both seed yield and quality of rapeseed varieties reduced dramatically due to late sowing, as the crop exposed to high temperature during flowering, fertilization and grain filling stage when rapeseed sowed after 15^{th} of October. So that for obtaining a high yield in rapeseed the most important practices is sowing time (9) and there is an optimum time for sowing of a particular variety of rapeseed on a specific area(11). Also, fertilizer play an important role in rapeseed growth and yield, nitrogen fertilizer alone and in combination with phosphorus increased plant height, number of branches, number of pod per plant,

number of seed per pod and 1000 seed weight (7) Recently, it has been reported that nitrogen increases rapeseed yield and seed oil content via increases in yield components, biological yield kg/ha, harvest index (%), seed yield kg ha^{-1} and seed oil content (%) (6). However, the rapeseed crop has not been introduced to Kurdistan region/Iraq also the effect of environmental factors and cultural practices have not been studied.

AMIS

This study is an attempt to investigate the effect of different spring sowing times and three levels of nitrogen and phosphorus fertilizer on growth, yield and its components under rain fed condition in Sulaimani region.

MATERIAL AND METHODS

This study was conducted in Sulaimani region, at Qlysan research center. (45˚, 992′ E, 765m above mean sea level longitude and Lat35˚ 34′ 307 ″). The field experiment was split-split plot based on randomized complete block design (RCBD) in three replicates .The seed of two different varieties (Sherally and Dunkild) of rapeseed were sown in two different dates (7/3/2017 and 27/3/2017) which randomized in main plots and three nitrogen levels consisting of (0, 60 and 90 kg ha^{-1}) in the form of urea (46% N) and three levels of phosphorus in the form P_2O_5levels consisting of (0, 30 and 60 kg ha^{-1}) were applied to the sub- plots. Weed control was done manually. The metrological data for Qlysan location was presented in (table. 1) and some of the physical and chemical properties of the soil were shown in (table. 2). At maturity, 5 randomly selected plants were uprooted for data collection. Data were collected on plant height, number of branches per plant, length of pod (cm), pod weight (g), number of seed per plant, 1000 seed weight (g), biological kg ha^{-1} and seed yield kg ha^{-1}.

The data were statistically analyzed according to the (JMP Pro 13) of variance, using split-split plot based on randomized complete block design (RCBD) as a general test, and the significant differences between treatments were determined using least significant differences (LSD) at probability of 0.05 level.

Table 1. Average air temperature and rainfall during the growing seasons of 2016-2017 at Qlyasan Location.

Months	*Average Air Temperature (°C)*		*Rainfall (mm)*
	Max.	*Min.*	
November	21.3	7.6	44.5
December	11.1	3.0	158.0
January	11.10	1.46	59.2
February	13.02	0.26	96.5
March	17.73	7.45	111.5
April	23.89	10.97	54.5
May	31.63	13.48	27.7
Total			551.9

Table 2. Physical and chemical properties of the studied soil:

Soil Properties		***Qlyasan location***
P.S.D		Clay
Sand (g Kg^{-1})		41.00
Silt (g Kg^{-1})		430.50
Clay (g Kg^{-1})		528.50
E.C. (dS m^{-1})		0.61
pH		7.32
O.M (g Kg^{-1})		11.60
Total N (mg Kg^{-1})		1.07
Available Phosphate (mg Kg^{-1} Soil)		5.95
$CaCO_3$ (g Kg^{-1})		107.00
Soluble Cataions and Anions (Mmole L^{-1})	Calcium (Ca^{+2})	0.39
	Potassium (K^{+})	0.12
	Sodium (Na^{+})	0.31
	Carbonate ($CO_3^{=}$)	0.00
	Bicarbonate ($HCO_3^{=}$)	3.11
	Chloride (Cl^{-})	0.49
	Sulphate ($SO_4^{=}$)	0.77

RESULTS AND DISCUSSIONS

Effects of each of planting date, fertilizer and varieties on plant height, seed yield and yield components

Analyzed data (table3) revealed that different spring planting dates had significant effect on plant height (cm) at maturity, and all yield components attributors (number of branches per plant, length of pod (cm), pod weight (g), condition (temperature, light intensity and rainfall) (table.1) led to sufficient plant growth cycle and producing more plant vegetative (biological yield kg ha^{-1}). The increased biological yield at early sown may be attributed to a better photosynthesis and dry matter translocation from source to sink, as a resultant the maximum seed yield kg ha-^{1} was recorded. These results are in agreements with that reports by other number of seed per pod, 1000 seed weight (g), biological kg ha^{-1}) and seed yield kg ha^{-1}. Plant height and all yield components of two varieties studied significantly increased by early sowing time 7th of March recording (80.40, 9.06, 47.56, 5.71, 4.52, 13.95, 2.99, 325.28 and 83.81) for above mentioned characters respectively, compared to 27th of March with values of (71.02, 5.10, 33.33, 4.92, 2.87, 10.76, 2.98, 199.76 and 57.21) respectively, this may be due to the favorable weather researchers (4, 1, 14, 15, 12) who reported that at late sown the duration of plant growth stages and produce smaller plants as compared to early sown plants and led to a significant reduction in seed yield as the inflorescence time and flowering and seed fill duration in plants have decreased at rising temperature in late spring and a period of drought starting after. The result in table shows that harvest had no significantly affected (HI) by planting date

sowing this result support the previous finding that harvest index (HI) is relatively stable.

According to (table 3), different levels of fertilizer had significant effects on plant height (cm) at maturity, yield and yield components, all these parameters significantly increased with increased fertilizer application compared to untreated (control) plants, and the level of 90/60 kg N/P_2O_5 ha^{-1} significantly produced taller plants, and all of the yield and yield components studied markedly increased with values of (80.68, 8.25, 52.03, 5.66, 4.84, 13.68, 2.99, 330.22 and 112.29) respectively, for all above mentioned characters compared to 60/30 kg N/P_2O_5 ha^{-1} with values of (78.12,7.40, 41.17,5.44, 4.09, 12.57, 2.99, 278.74 and 56.81) respectively, and the minimum

As shown in (table3) the variety of Dunkild significantly produced taller plants at maturity, and all yield components attributors (number of branches per plant, length of pod (cm), pod weight (g), number of seed per pod, 1000 seed weight (g), biological kg ha^{-1}) and seed yield kg ha^{-1} recording (90.98,

Interaction effects

Both planting date and N/P_2O_5 fertilizer levels had significant effects (table.4) on plant height(cm), yield contributing components (number of branches per plant, length of pod (cm), pods weight (g) per plant, number of seed per pod, 1000 seed weight (g), biological kg ha^{-1}) and seed yield kg ha^{-1} , all these parameters were greater for earlier sown plants and the higher level of 90/60 kg N/P_2O_5 ha^{-1} with values of (86.12, 10.50, 61.50, 6.06, 6.13, 15.68, 3.01, 414.13,and 137.73) respectively, followed by late sown plants with 90/60 kg N/P_2O_5 ha^{-1} for seed yield with value of (86.85) and then followed by earlier sown plants with 60/30 values of all parameters recorded by control plants. Seed yield increased in current study when fertilizer applied as a result of increasing each of branch number per plant, pod per plant, seed per pod, 1000 seed weight and biological yield. These results are in agreement with that previously reported by (7). Who reported that plant height, yield and components were significantly affected by nitrogen and phosphorus levels and application of 100N (urea) and 50 P (super phosphate) gave the highest yield. More recently 300kg ha^{-1} nitrogen in the form of urea was recommended for obtain maximum yield of rape seed. Moreover, these results can be supports by (3) who found that the level of 90/60kg N/P_2O_5 ha^{-1} gave the greater seed yield and its components in rapeseed crop compared to 60/30 kg N/P_2O_5 ha^{-1}.

8.56, 52.72, 5.82, 4.71, 12.06, 3.11, 491.51 and 136.35) respectively, in comparison with Sherally with values of (60.43, 5.60, 28.72, 4.88. 2.69, 12.65, 2.86, 33,54, and 4.67) respectively. It might be due to genetic potential of the Dunkild variety. This result is in conformity with the finding (2).

kg N/P_2O_5 ha^{-1} with values of (83.24, 9.33, 48.83, 6.05, 4.93, 15.03, 2.99, 333.44 and 69.22) respectively for all above mentioned characters. However, the lowest of seed yield obtained by late sown plants with application of 60/30 kg N/P_2O_5 ha^{-} which was in par with untreated (control) plants at both planting dates with values of (228.28 and 224.04) for earlier and late planting dates respectively, this might be due to high temperature and limited moisture (table.1) led to decline in plants nutrient use efficiency as resultant exhibited reduction in seed yield.

Data presented in (table. 5) shows the delayed planting of both varieties resulted in significant reduction in plant height(cm), yield contributing components

(number of branches per plant, length of pod (cm), pods weight (g) per plant, number of seed per pod, 1000 seed weight (g), biological kg ha^{-1}, seed yield kg ha^{-1} and harvest index HI with values of (84.95,6.33, 45.67, 5.41, 3.76, 10.58, 3,10, 378.55 ,11.77 and 0.30) respectively, for Dunklid variety and for Sherally variety 7.33, 35.33, 5.34, 3.39, 13.17, 2.87, 46.10, 6.68 and 0.15) for Sherally variety and for all above parameters. This may be due as mentioned earlier reduction in growing period , higher temperature and moisture deficiency at the stages of growth (table 1) might be increased the respiration rate which led to a reduction net photosynthesis rate and photoproducts translocation from sink to source (13). However, the variety of Dunkild was superior over Sherally at both planting date in producing taller plant and more yield and yield components except of number of seed per pod, this mean that variety of Dunkild has genetic potential

than the Sherally as mentioned earlier and more resistance to high temperature and water deficiency.

The differences in plant height, yield components (number of branches per plant, length of pod (cm), pods weight (g) per plant, number of seed per pod, 1000 seed weight (g), biological yield kg ha^{-1}) and seed yield kg ha^{-1} produced by different varieties varied with different N/P_2O_5 levels as show in (table 6), all theses parameters were significantly greater for variety of Dunkild with untreated (control) plants and both levels of (60/ 30, and 60/90kg N/ P_2O_5 ha^{-1}) compared to variety of Sherally with same levels of N/P_2O_5. The maximum values of all parameters studied were obtain by variety of Dunkild under application of 90/ 60 N/P_2O_5 kg ha $^{-1}$fertilizer with values of (69.67, 6.59, 6.11, 14.25, 3.12, 623.60, with values (57.08, 3.87, 21.00, 4.44, 1.98, 10.94, 2.86, 20.98, 2.66 and 0.12) respectively, for all above mentioned parameters compared with earlier planting date for Dunklid variety with values of (97.02, 10.78, 59.78, 6.22, 5.66, 14.72, 3.12, 604.46, 160.94 and 0.25) and with values of (63.78, 218.19 and 0.35) respectively, for average number of pods per plant, average pods weight (g) per plant, average number of seeds per pod, average biological yield kg ha^{-1} ,average seed yield kg $ha^{-1}$and average harvest index (HI) as compared by other treatments expect of plant height, number of branches per plant and 1000 seed weight (g) which was no significant differences between variety of Dunkild when grown under 60/30 kg N/P_2O_5 ha^{-1} and Dunkild grown under 90/60 kg N/P_2O_5 ha^{-1} recording the highest seed yield with values of (218.19 and 109.45 kg ha^{-1}) respectively, for 90/60 kg N/P_2O_5 ha^{-1} and 60/30 kg N/P_2O_5 ha^{-1} followed by unfertilized Dunkild with value of (81.41 kg ha^{-1}) and then followed by (6.39, 4.17 and 3.45 $kgha^{-1}$) respectively, for Sherally and 90/60 kg N/P_2O_5 ha^{-1}, 60/30 kg N/P_2O_5 ha^{-1} and unfertilized plants which reported no significant differences. Overall, the lowest of all parameters produced by untreated (control) Sherally variety plants. This might be due to the more ability of variety of Dunkild for benefit from the soil nutrient content or and it has the more nitrogen and phosphate use efficiency than variety of Sherally.

Data presented in (table.7) shows that both varieties significantly responded to fertilizer when sown earlier on 7th March than late sown on 27th March. Indicating that the prolonged growth period in earlier planting sown gave the plant more fortunately to take nutrient and the favorable environmental condition make the plants use nutrient more

efficiency. Over the all treatments, the variety of Dankild with 90/60 kg N/P_2O5 ha^{-1} at earlier sown significantly produced grater plant height, seed yield ,all yield components studied and harvest index (HI) with values of (105.40, 12.33, 82.33, 7.09, 7.08, 17.57, 3.13, 781.15, 266.19 and 0.34) respectively, for all above mentioned parameters followed by Dankild variety with 90/60 kg N/P_2O_5 ha^{-1} at late sown date with values of (87.01, 7.67, 57.00, 6.11, 5.14, 10.93,3.10, 466.05, 170.18 and 0.36) respectively, and then followed by same variety with 60/30 kg N/P ha^{-1} in producing significant seed yield kg ha^{-1} with value of (86.29 kgha $^{-1}$) as compared to other treatments. However, the lowest seed yield was obtained by variety of Sherally with application of both N/P_2O_5 fertilizer levels with value of (5.81 kgha-^{1}) and untreated (control) with value of (4.97 kgha-^{1}) at both sowing dates, which there were a slight increment in seed yield when fertilizer applied but there were no significant differences between fertilizer levels and with untreated (control) plants at both sowing dates. In addition, the untreated (control) plants of Dankild variety significantly produced greater seed yield at both planting date with values of (413.13 and 241.97 kgha-^{1}) respectively, for early and late planting dates compared fertilized Sherally variety with values of (9.23 and 5.81 kgha-^{1}) respectively, for both 90/60 kg N/P_2O_5 ha^{-1} and 60/30 kg N/P_2O_5 ha^{-1} fertilizers levels at early and with values of(3.52 and 2.52 kgha-^{1}) respectively, for both 90/60 kg N/P_2O_5 ha^{-1} and 60/30 kg N/P_2O_5 ha^{-1} fertilizers levels at late planting date.

Table 3. The effect of each of planting date, fertilizer and varieties on plant height at maturity, yield and yield components.

Planting date	Plant height (cm)	No. of branches plant^{-1}	No. of pods plant^{-1}	Length of pod (cm)	Pods weight plant^{-1}(g)	No. of seeds pod^{-1}	1000 seed weight (g)	Biological yield (kg ha^{-1})	Seed yield (kgha^{-1})	Harvest index
7/3/2017	80.40 ^{a}	9.06 ^{a}	47.56 ^{a}	5.71 ^{a}	4.52 ^{a}	13.95 ^{a}	2.99 ^{a}	325.28 ^{a}	83.81 ^{a}	0.20
27/3/2017	71.02 ^{b}	5.10 ^{b}	33.33 ^{b}	4.92 ^{b}	2.87 ^{b}	10.76 ^{b}	2.98 ^{b}	199.76 ^{b}	57.21 ^{b}	0.21
L.S.D ≤ 0.05	3.20	0.59	13.39	0.48	0.30	1.22	0.01	5.32	10.35	N.S
Fertilizer										
0/0 kg N/P_2O_5ha^{-1}	68.27 ^{c}	5.58 ^{c}	28.08 ^{c}	4.96 ^{c}	2.15 ^{c}	10.82 ^{c}	2.98	178.60 ^{c}	42.43 ^{c}	0.19 ^{b}
60/30 kg N/P_2O_5 ha^{-1}	78.12 ^{b}	7.40 ^{b}	41.17 ^{b}	5.44 ^{b}	4.09 ^{b}	12.57 ^{b}	2.99	278.74 ^{b}	56.81 ^{b}	0.16 ^{c}
90/60 kg N/P_2O_5 ha^{-1}	80.68 ^{a}	8.25 ^{a}	52.03 ^{a}	5.66 ^{a}	4.84 ^{a}	13.68 ^{a}	2.99	330.22 ^{a}	112.29 ^{a}	0.26 ^{a}
L.S.D ≤ 0.05	1.71	0.68	7.35	0.33	0.22	0.79	N.S	11.01	7.12	0.01
Varieties										
Sherally	60.43 ^{b}	5.60 ^{b}	28.72 ^{b}	4.88 ^{b}	2.69 ^{b}	12.65 ^{a}	2.86 ^{b}	33.54 ^{b}	4.67 ^{b}	0.14 ^{b}
Dunkild	90.98 ^{a}	8.56 ^{a}	52.72 ^{a}	5.82 ^{a}	4.71 ^{a}	12.06 ^{b}	3.11 ^{a}	491.51 ^{a}	136.35 ^{a}	0.27^{a}
L.S.D ≤ 0.05	1.59	0.83	4.52	0.38	0.15	0.59	7.56	7.43	5.77	0.01

Means followed by the same letter in a column do not differ significantly at P≤ 0.05.

Table 4. The interaction effect of planting date and fertilizer on plant height, yield and yield components of rapeseed

Planting date& Fertilizer		Plant height (cm)	No. branches plant^{-1}	No. pods plant^{-1}	Length of pod (cm)	Pods weight plant^{-1}(g)	No. seeds pod^{-1}	1000 seed weight (g)	Biological yield (kgha^{-1})	Seed yield (kg ha^{-1})	Harvest index
7/3/2017	0/0 kg N/P_2O5ha^{-1}	71.84 ^{d}	7.33 ^{c}	32.33 ^{cd}	5.24 ^{b}	2.52 ^{d}	11.12 ^{bc}	2.99 ^{ab}	228.28 ^{d}	44.48 ^{d}	0.16 ^{d}
	60/30 kg N/P_2O_5 ha^{-1}	83.24 ^{b}	9.33 ^{b}	48.83 ^{b}	6.05 ^{a}	4.93 ^{b}	15.03 ^{a}	2.99 ^{ab}	333.44 ^{b}	69.22 ^{c}	0.17 ^{d}
	90/60 kg N/P_2O_5 ha^{-1}	86.12 ^{a}	10.50 ^{a}	61.50 ^{a}	6.06 ^{a}	6.13 ^{a}	15.68 ^{a}	3.01 ^{a}	414.13 ^{a}	137.73 ^{a}	0.27 ^{a}
27/3/2017	0/0 kg N/P_2O_5ha^{-1}	64.69 ^{e}	3.83 ^{e}	23.83 ^{d}	4.68 ^{c}	1.78 ^{e}	10.52 ^{c}	2.98 ^{b}	128.93 ^{e}	40.38 ^{d}	0.22 ^{c}
	60/30 kg N/P_2O_5 ha^{-1}	73.11 ^{cd}	5.47 ^{d}	33.50 ^{cd}	4.83 ^{bc}	3.27 ^{c}	10.10 ^{c}	2.99 ^{ab}	224.04 ^{d}	44.40 ^{d}	0.16 ^{d}
	90/60 kg N/P_2O_5 ha^{-1}	75.25 ^{c}	6.00 ^{d}	42.67 ^{bc}	5.26 ^{b}	3.56 ^{c}	11.67 ^{b}	2.99 ^{ab}	246.31 ^{c}	86.85 ^{b}	0.25 ^{b}
L.S.D ≤ 0.05		2.42	0.97	10.39	0.47	0.31	1.12	0.02	15.57	10.06	0.02

Means followed by the same letter in a column do not differ significantly at P≤ 0.05.

Table 5. The interaction effect of planting date and varieties on plant height,yield and yield components on rapeseed crop.Means followed by the same letter in a column do not differ significantly at P≤ 0.05.

Planting date& varieties		Plant height (cm)	No. branches plant^{-1}	No.pods plant^{-1}	Length of pod (cm)	Pods weight plant^{-1} (g)	No. seeds Pod $^{-1}$	1000 seed weight (g)	Biological yield (kgha^{-1})	Seed yield (kgha^{-1})	Harvest index
7/3/2017	Sherally	63.78 ^{c}	7.33 ^{b}	35.33 ^{c}	5.34 ^{b}	3.39 ^{d}	13.17 ^{b}	2.87 ^{c}	46.10 ^{c}	6.68 ^{c}	0.15 ^{c}
	Dunkild	97.02 ^{a}	10.78 ^{a}	59.78 ^{a}	6.22 ^{a}	5.66 ^{a}	14.72 ^{a}	3.12 ^{a}	604.46 ^{a}	160.94 ^{a}	0.25 ^{b}
27/3/2017	Sheray	57.08 ^{d}	3.87 ^{c}	21.00 ^{d}	4.44 ^{c}	1.98 ^{d}	10.94 ^{c}	2.86 ^{c}	20.98 ^{d}	2.66 ^{c}	0.12 ^{d}
	Dunkid	84.95 ^{b}	6.33 ^{b}	45.67 ^{b}	5.41 ^{b}	3.76 ^{b}	10.58 ^{c}	3.10 ^{b}	378.55 ^{b}	111.77 ^{b}	0.30 ^{a}
L.S.D ≤ 0.05		2.25	1.17	6.39	0.53	0.21	0.07	0.01	10.51	8.17	0.01

Table 6. The interaction effect of varieties and fertilizer on plant height, yield and yield components on rapeseed crop.

Varieties & fertilizer		Plant height (cm)	No. branches plant^{-1}	No. pods plant^{-1}	Length of pod (cm)	Pods weightplant^{-1} (g)	No. seeds pod^{-1}	1000 seed weight (g)	Biological yield (kgha^{-1})	Seed yield (kgha^{-1})	Harvest index
Sherally	0/0 kg N/P_2O_5 ha^{-1}	55.89 ^{e}	4.83 ^{c}	18.33 ^{e}	4.69 ^{c}	1.71 ^{e}	10.81 ^{c}	2.87 ^{b}	29.66 ^{d}	3.45 ^{d}	0.12 ^{e}
	60/30 kg N/P_2O_5 ha^{-1}	60.24 ^{d}	5.47 ^{bc}	31.67 ^{d}	5.25 ^{bc}	2.78 ^{d}	12.27 ^{b}	2.86 ^{b}	34.13 ^{d}	4.17 ^{d}	0.12 ^{e}
	90/60 kg N/P_2O_5 ha^{-1}	65.16 ^{c}	6.50 ^{b}	34.50 ^{C}	4.72 ^{c}	3.57 ^{c}	13.10 ^{b}	2.88 ^{b}	36.84 ^{d}	6.39 ^{d}	0.17 ^{d}
Dunkild	0/0 kg N/P_2O_5 ha^{-1}	80.64 ^{b}	6.33 ^{b}	37.83 ^{C}	5.22 ^{bc}	2.60 ^{d}	10.83 ^{c}	3.11 ^{a}	327.55 ^{c}	81.41 ^{c}	0.26 ^{b}
	60/30 kg N/P_2O_5 ha^{-1}	96.10 ^{a}	9.33 ^{a}	50.67 ^{b}	5.63 ^{b}	5.41 ^{b}	12.87 ^{b}	3.12 ^{a}	523.36 ^{b}	109.45 ^{b}	0.21 ^{c}
	90/60 kg N/P_2O_5 ha^{-1}	96.20 ^{a}	10.00 ^{a}	69.67 ^{a}	6.59 ^{a}	6.11 ^{a}	14.25 ^{a}	3.12 ^{a}	623.60 ^{a}	218.19 ^{a}	0.35 ^{a}
L.S.D ≤ 0.05		2.75	1.43	7.83	0.65	0.26	1.02	0.013	12.87	10.00	0.02

Means followed by the same letter in a column do not differ significantly at P≤ 0.05.

Table 7. The interaction effect of planting date, Fertilizer and varieties on plant height, yield and yield components on rapeseed crop

Planting date, fertilizer & varieties			Plant height (cm)	No. branches plant^{-1}	No. pods plant^{-1}	Length of pod (cm)	Pods weight plant^{-1}(g)	No. seed pod^{-1}	1000 seed weight (g)	Biological yield (kgha^{-1})	Seed yield (kgha^{-1})	Harvest index
7/3/2017	0/0 kg N/P_2O_5ha^{-1}	Sherally	59.78 f	6.67 bc	25.67 ef	5.20 de	2.12 e	11.31 ef	2.87 cd	43.42 fg	4.97 e	0.12 d
	60/30 kg N/P_2O_5 ha^{-1}		64.72 e	6,67 bc	39.67 c	5.79 bc	2.90 d	14.40 bc	2.86 d	47.77 f	5.81 e	0.12 d
	90/60 kg N/P_2O_5 ha^{-1}		66.83 e	8.67 b	40.67 c	5.03 def	5.17 b	13.80 cd	2.88 c	47.11 f	9.23 e	0.20 c
	0/0 kg N/P_2O_5ha^{-1}	Dunkild	83.90 c	8.00 b	39.00 cd	5.28 cd	2.92 d	10.93 f	3.12 ab	413.13 d	83.99 d	0.20 c
	60/30 kg N/P_2O_5 ha^{-1}		101.76 a	12.00 a	58.00 b	6.30 ab	6.96 a	15.67 b	3.11 ab	619.11 b	132.62 c	0.21 c
	90/60 kg N/P_2O_5 ha^{-1}		105.40 a	12.33 a	82.33 a	7.09 a	7.08 a	17.57 a	3.13 a	781.15 a	266.19 a	0.34 ab
27/3/2017	0/0 kg N/P_2O_5ha^{-1}	Sherally	52.00 g	3.00 d	11.00 g	4.20 f	1.29 f	10.30 f	2.86 d	15.87 h	1.93 e	0.21 d
	60/30 kg N/P_2O_5 ha^{-1}		55.77 g	4.27 d	23.67 f	4.71 ef	2.66 d	10.13 f	2.86 d	20.48 h	2.52 e	0.12 d
	90/60 kg N/P_2O_5 ha^{-1}		63.48 ef	4.33 d	28.33 def	4.4 ef	1.98 e	12.40 d	2.87 cd	26.57 gh	3.52 e	0.13 d
	0/0 kg N/P_2O_5ha^{-1}	Dunkild	77.59 d	4.27 dc	36.67 def	5.17 def	2.27 e	10.73 f	3.10 b	241.97 e	78.83 d	0.32 b
	60/30 kg N/P_2O_5 ha^{-1}		90.45 b	6.67 bc	43.33 bcd	4.95 def	3.87 c	10.07 f	3.12 ab	427.62 d	86.29 d	0.20 c
	90/60 kg N/P_2O_5 ha^{-1}		87.01 bc	7.67 b	57.00 b	6.11 bc	5.14 b	10.93 f	3.10 b	466.05 c	170.18 b	0.36 a
L.S.D ≤ 0.05			3.89	2.02	11.07	0.91	0.36	1.44	0.02	18.20	14.14	0.03

Means followed by the same letter in a column do not differ significantly at P≤ 0.05.

CONCLUSION

It can be concluded that the planting date and N/P_2O_5 fertilizer s significantly affected the seed yield of *Brassica napus L.* which the higher yield for both varieties obtained from the 7th of March and highest level of 90/60 kg N/P_2O_5 ha^{-1} than 27th March sowing date and other levels of N/P_2O_5 fertilizer applied. The variety of Dunkild performed better than variety of Sherally under the rainfed condition in Sulaimani region.

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