Response of yield and yield components of rapeseed to seeding rates in dryland conditions

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Abstract

In order to study the effects of seeding rates on yield and yield components of rapeseed in dryland conditions, a factorial experiment laid out as randomized complete block design in Sararood Dryland Agricultural Research Station in Iran. The factors were two cultivars of rapeseed *Brassica napus* var. Okapi and *Brassica juncea* var. Lethbridge and six levels of seeding rates 6, 8, 10, 12, 14 and 16 kg/ha. Results showed that there was not significant difference between two cultivars in seed yield, the number of branches per plant, the number of pods per plant, but there was in the number of harvest-able plants per area unit, the number of seeds per pod and 1000-seed weight and plant height. Mean of seed yield for Okapi and Lethbridge cultivars obtained 1135.9 and 1035.3 kg/ha, respectively. Seed yield, the number of branches per plant, the number of pods per plant, and the number of seeds per pod were not different between seeding rates, but were showed a difference significant in the number of harvest-able plants per area unit and 1000-seed weight. Interaction of cultivar and seeding rate was not significant except the number of harvest-able plants per unit area and 1000-seed weight. Based on the results, the number of harvest-able plants per unit area increased with increasing of seed rate, but different responses observed about other trials. The highest seed yield for Okapi (1195.2 kg/ha) and Lethbridge (1307/1 kg/ha) obtained at 12 and 10 kg/ha seeding rates, respectively.

Key words: Rapeseed, seeding rate, yield, yield components

Introduction

Rapeseed is one of the most important oil crops that its oil use for cooking or industry consumption depend on fatty acid content especially erucic acid (Auld *et al*., 1984). Growth, yield and quality of rapeseed is affected by genotype and environment conditions (Shipway, 1981). Mahler and Auld (1991) demonstrated that there was a significant interaction between rapeseed cultivars and environment. Plant density is very important to determination of growth, development and yield of crops. The result of different experiments showed although the range of suitable plant density of rapeseed is wide (Degenhardt and Kandra, 1984 ; Scarisbrick *et al*., 1982 and Van Denyze et al., 1992), but excess of weed, thick stem and lodging within low plant density and intense competition within high plant density reduced yield (Weiss, 1983). Clark and Simpson (1978) reported that seed rate of 20 kg/ha had the highest seed yield among 2.5, 5, 10 and 20 Kg/ha seed rates. Kandra (1975, 1977) observed that among 3, 6 and 12 kg/ha seed rates, the highest seed yield blong to 6 Kg/ha seed rate. In rapeseed cultivation seed losses is considerable because of seed small size. Different factors such as seeding rate, seeding depth, soil texture and structure, plant competition for area, water and nutrients, pests, diseases, weather, the intense and length of frigidity before roset are effective in rapeseed seed losses. Most of experiments on rapeseed carried out under irrigated conditions in Iran. Thus, our objectives were to study the effects of seeding rates on yield and yield components of rapeseed under dryland conditions.

Materials and Methods

A field experiment was conducted at Sararood Dryland Agricultural Research Station. This site located in the west of Iran (34° 21' N latitude, 47° 19' E longitude, elevation 1351 m above see level and 17 km far from Kermanshah, on a silty-clay-loam soil, pH 7.5 and EC=0.86 mmhos/cm. During the growing season precipitation was 430.0 mm, mean of minimum temperature -2.6 °C in January and maximum temperature 30.6 °C in June. A factorial experiment laid out as randomized complete block design with four replications. The factors were two cultivars of rapeseed, namely, *Brassica napus* var. Okapi and *Brassica juncea* var. Lethbridge and six levels of seeding rates 6, 8, 10, 12, 14 and 16 kg/ha seeding did by experimental seeder. Each plot included 5 rows with 30 cm distance and 12 m length. Fertilizers were applied as N_{80} P_{60} S_{20} kg/ha. Lethbridge and Okapi cultivars harvested in June 30th and 12th June, respectively. Final harvesting area was 9 m^2 and 10 plants also consider to yield components measurements.

Results and Discussion

Analysis of variance showed that there was not significant difference between two cultivars in seed yield, the number of branches per plant and the number of pods per plant, but there was in the number of harvest-able plants per area unit, the number of seeds per pod and 1000-seed weight (Table 1). Mean seed yield for Okapi and Lethbridge cultivars obtained 1135.9 and 1035.3 kg/ha, respectively. The nmber of seeds per pod and 1000-seed weight in Okapi was higher than Lethbridge, but

the number of plants per area unit was higher in Lethbridge (Table 2).

Seed yield, the number of branches per plant, the number of pods per plant and the number of seeds per pod were not different among seeding rates, but were significantly different in the number of harvest-able plants per area unit and 1000-seed weight. Interaction of cultivar and seeding rate were not significant except the number of harvest-able plants per unit area and 1000-seed weight (Table 1). Based on the results, the highest seed yield of Okapi (with 1195.2 and 1183.7 kg/ha) obtained at 12 and 14 kg/ha seed rates, but for Lethbridge (with 1307.1 kg/ha) obtained at 10 kg/ha seed rate (Table 2). The number of harvest-able plants per area unit increased significantly with increasing of sowing rates. Maximum 1000-seed weight of Okapi and Lethbridge were at 10 and 14 kg/ha seed rates, respectively.

Table 1.Analysis of variance for some traits in rapeseed.

S.O.V	df	Seed Yield	Plant/m^2	Branch/plant	Pod/plant	Seed/pod	1000-SW
Replication	3	61873.20	465.20	14.36	316.03	1.31	0.00
Cultivar (C)	1	121529.82^{ns}	2945.33**	0.060^{ns}	14.19ns	511.36**	19.05**
Seed rate (S)	5	55061.47^{ns}	4177.96**	1.608^{ns}	95.45ns	2.80ns	1.97**
C. S	5	149949.36^{ns}	658.65**	0.982^{ns}	127.17ns	1.20ns	1.59**
Error	33	68632..30	126.42	0.072	81.32	2.54	0.00
CV	-	24.13	7.39	17.25	9.84	9.41	0.00

ns, * and **: Non-significant, significant at 1 and 5% levels, respectively.

Table 2. Table of Comparison of Means.

Treatments	Seed Yield kg/ha	Plant/m^2	Branch/plant	Pod/plant	Seed/pod	1000-SW (g)
Okapi (C_1)	1135.9^{a}	144.37^{b}	5.97^{a}	91.1^{a}	20.22^{a}	4.39^{a}
Lethbridge (C_2)	1035.3^{a}	160.04^{a}	6.04^{a}	92.2^{a}	13.69^{b}	3.13^{b}
6 kg/ha (S_1)	1202.1^{a}	130.45^{d}	6.25^{a}	92.3^{a}	17.21^{a}	4.25^{b}
8 kg/ha (S_2)	1122.4^{a}	142.50b^{cd}	5.85^{a}	90.8^{a}	17.30^{a}	3.75^{c}
10 kg/ha (S_3)	1144.8^{a}	138.04^{cd}	6.63^{a}	96.6^{a}	17.01^{a}	3.30^{e}
12 kg/ha (S_4)	1009.5^{a}	152.08^{bc}	5.47^{a}	91.1^{a}	17.69^{a}	3.73^{d}
14 kg/ha (S_5)	1038.6^{a}	155.12^{b}	6.25^{a}	92.9^{a}	16.38^{a}	4.40^{a}
16 kg/ha (S_6)	996.22^{a}	195.04^{a}	5.56^{a}	86.0^{a}	16.13^{a}	3.15^{f}
$C_1. S_1$	1146.6^{ab}	133.0^{d}	5.55^{a}	88.5^{ab}	19.85^{a}	5.00^{b}
$C_1. S_2$	1272.2^{a}	144.0^{cd}	5.97^{a}	97.1^{ab}	20.83^{a}	4.50^{c}
$C_1. S_3$	982.5^{ab}	129.5^{d}	6.50^{a}	93.6^{ab}	20.07^{a}	3.90^{e}
$C_1. S_4$	1195.2^{ab}	145.4^{cd}	5.72^{a}	88.7^{ab}	21.30^{a}	5.06^{a}
$C_1. S_5$	1183.7^{ab}	134.9^{d}	6.30^{a}	95.2^{ab}	19.53^{a}	4.40^{d}
$C_1. S_6$	1035.3^{ab}	179.3^{b}	5.75^{a}	83.4^{b}	19.73^{a}	3.50^{f}
$C_2. S_1$	1257.5^{ab}	127.9^{d}	6.95^{a}	96.1^{ab}	14.57^{b}	3.50^{f}
$C_2. S_2$	972.6^{ab}	141.0^{cd}	5.72^{a}	84.5^{ab}	13.77^{b}	3.00^{g}
$C_2. S_3$	1307.1^{a}	146.5^{cd}	6.75^{a}	99.7^{a}	13.95^{b}	2.70^{I}
$C_2. S_4$	823.8^{b}	158.7^{c}	5.22^{a}	93.5^{ab}	14.07^{b}	2.40^{j}
$C_2. S_5$	893.6^{ab}	175.3^{b}	6.20^{a}	90.6^{ab}	13.23^{b}	4.40^{d}
$C_2. S_6$	957.1^{ab}	210.7^{a}	5.38^{a}	88.7^{ab}	12.52^{b}	2.80^{h}

Mean followed by the same letter(s) in each column (between two horizontal lines) are not significantly different (Dancan 5%).

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