

Yield and yield components of two rapeseed cultivars as affected by plant population and seeding date

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Abstract

A field experiment was carried at Darab Agricultural Experimental Center to determine the effects of plant population and seeding date on yield and yield components of two rapeseed (*Brassica napus* L.) cultivars (CVS), Hyola 308 and Hyola 401. The experiment was conducted as factorial design arranged in randomized complete block with four replications. Plant population were 48, 67 and 111 plants per m² and seeding dates were Oct. 22, Nov. 11 and Dec. 1, 2002. Increased plant population significantly increased harvest index (HI) and seed protein percentage and decreased pods per plant. Delayed seeding significantly decreased pods per plant, pods per m², 1000-seed weight, harvest index, seed oil percentage and significantly increased seeds per pod and seed protein percentage. Seeding date did not significantly increase seed yield, however, the highest seed and oil yields were obtained at the 2nd date. There was significant difference between two cultivars for pods per m², seeds per pod, 1000-seed weight, HI and seed protein percentage. Hyola 308 cultivar had more pods per m², seeds per pod, HI, 1000-seed weight and oil yield. Interaction between seeding date, plant population and cultivars on seed yield were significant and the highest seed yield (5537 kg/ha) was obtained from early seeding of Hyola 401 at 48 plants per m². Delayed seeding and increased plant population decreased seed and oil yields in both cultivars.

Key words: Plant population, Seeding date, Seed yield, Oil yield, Protein percentage, Pods per plant

Introduction

Plant population has the greatest effect on yield and yield components of individual plant. Optimum plant population of a crop is influenced by many factors including resource levels. The greater the availability of resources, the greater will be expression of plasticity. McGreger *et al.* (1987) showed that the yield varied widely indicating the importance of environmental and management factors. Anagadi *et al.* (2003) found that the number of pods per plant in canola is an important factor in yield determination. Mottalebipour and Bahrani (2006) found the highest seed and oil yield of rapeseed (Okapi CV.) at 222 plants per m².

Seeding dates has also lot of influence on crop productivity. Guy and Moore (1995) stated that late sowing of rapeseed can lower plant growth and seed yield. Kondra (1975) found the highest oil and protein yields of canola at early sowing date.

Rapeseed is a new oilseed crop in Iran and its hectareage has been currently expanding. However, there are not enough information on the plant population and seeding dates of different cultivars in different parts of the country where this irrigated winter crop is often grown in rotation with wheat (*Triticum aestivum* L.) or barley (*Hordeum vulgare* L.). The purpose of this study was to determine the plant population rate and seeding date of two rapeseed CVS in Darab, southeast of Fars province, Iran.

Materials and methods

A field experiment was carried out at Darab Agric. Exp. Center to determine the effects of plant population and seeding date on yield and yield components of two rapeseed cultivars, Hyola 308 and Hyola 407. The experiments was conducted as factorial design arranged in randomized complete block with four replications. Plant population were 48, 67 and 111 plants per m² and seeding dates were Oct. 22, Nov. 11 and Dec. 10, 2002. The fertilizers included 100 kg urea ha⁻¹, 200 kg potassium sulfate ha⁻¹ and 100 kg triple super phosphate that were added by fertilizer broad caster before seeding and 150 kg of seeds were planted on 30 cm row width by hand after soil preparation. The plants were thinned at 2-4 leaf stage to 7, 5 and 3 cm in row to maintain the desired plant population, respectively. Plots were irrigated by siphon as required.

The seeds were harvested at physiological maturity stage and were dried and weighed. Yield components such as seeds per pod, pods per m², and per plant, 1000-seed weight, harvest index seed oil and protein percentages were also determined. The data was analyzed by MSTAT-C software and means were compared according to Duncan's test.

Results and discussion

Delayed seeding significantly decreased the pods per plant which was similar to Lutman and Dixon (1986) (Table 1). Increased plant population significantly decreased pod per plant due to competition of plants as reported by Clarke *et al.* (1978).

Delayed seeding significantly increased seeds per pod due to decrease in pods per plant as reported by Mendham *et al.* (1981). Early seeding produced more pods which did not fill with sufficient seeds and the seeds abort as mentioned by

Mendham *et al.*, 1981. Plants with many pods compete for assimilates and limit seed production. Hyola 308 had significantly higher seeds per pod than Hyola 401 cultivars.

Delayed seeding significantly decreased 1000-seed weight as reported by Degengardt and Kondra (1981). Late seeding (Dec. 1) postponed and shortened the seed filling period which coincide with warmer part of growing season. Hyola 401 cv. had significantly higher 1000-seed weight than Hyola 308.

Delayed seeding significantly decreased seed yield due to decrease in growth period, pods per m² and 1000-seed weight as reported by others (Degenhardt and Kondra, 1981; Scarbrick *et al.* 1981), however the difference was insignificant (Table 1). Hyola 308 had more seed yield than Hyola 401, because of having higher seeds per pod and pods per m², but lower 1000-seed weight and this can be the reason for insignificance of seed yield in both cultivars. Delayed seeding decreased oil yield, but the difference was insignificant. Highest oil yield (1.96 t ha⁻¹) was obtained from second seeding date (Nov. 11). Delayed seeding decreased oil yield more than early seeding.

Finally, it can be concluded that the best time for rapeseed seeding in Darab region is between Oct. 22 and Nov. 11 with plant population of 48 to 111 plants per m². The highest seed and oil yield was obtained at Nov. 11. Hyola 308 CV. had more seed yield than Hyola 401 with delayed seeding. Overall, delayed seeding and increased plant population decreased seed and oil yields in Hyola 401 and increased in Hyola 308.

Table 1. Effect of seeding date, plant population on seed yield and yield components of two rapeseed cultivars.

Treatment	Pods per plant	Seeds per pod	1000-seed weight (g)	Seed yield (t ha ⁻¹)	Oil yield (t ha ⁻¹)
Plant population (per m ²)					
48	239.7a	27.1 a	3.7a	4.30a	1.92a
67	143.6b	26.6 a	3.7a	4.20a	1.83a
111	87.6c	26.6 a	3.6a	4.20a	1.86a
Seeding date					
Oct. 22	183.1a	25.5b	3.8a	4.26a	1.90a
Nov. 11	148.7ab	26.9 a	3.7a	4.38a	1.96a
Dec. 1	138.9b	28.0 a	3.5b	4.07a	1.76a
Cultivar					
Hyola 308	168.5a	27.5a	3.3b	4.41a	1.96a
Hyola 401	145.3a	26.0b	4.1a	4.07a	1.79a

Means of each column in each treatment with similar letters are not significantly different (Duncan 5%).

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