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Effect of planting pattern and cultivar on some quantitative characteristics of canola

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ABSTRACT: The seed yield of oilseed rape is a function of population density, number of pods per plant, number of seeds per pod and seed weight. However, yield structure is very plastic and adjustable across a wide range of populations. Canola oil (low glucosinolate and erucic acid) originated high erucic acid rapeseed oil. Previous studies have shown that plant density is an important factor affecting rapeseed yield. Plant density in rapeseed governs the components of yield, and thus the yield of individual plants. Weed competition with canola has reduced crop growth, leaf area and subsequently increased infertile flowers and pods. The field experiment was laid out in randomized complete block design with split plot design with three replications. Analysis of variance showed that the effect of cultivar on number of seed, grain yield in pod was not significant. Analysis of variance showed that the effect of planting pattern all parameters was significant.

***Keywords*:** grain yield, number of seed, number of weeds, fresh weight of weeds

INTRODUCTION

Oilseed rape is cultivated and processed for many different purposes. The importance of rape has thus increased in recent years and today it is one of the most important oil seed crops in the world (Bybordi, 2009). The seed yield of oilseed rape is a function of population density, number of pods per plant, number of seeds per pod and seed weight. However, yield structure is very plastic and adjustable across a wide range of populations. The number of pods per plant is the most responsive of all the yield components in oilseed rape (Clarke, 1978). Canola (Brassica napus L.) is an important oilseed, which can be grown as winter and summer crop. It belongs to Crucifera family and is the most cultivated species in this family (Snowdon, 2006). Brassica napus L. originated from the Mediterranean region of South-West Europe where the two contributing parents, B. oleracea and B. rapa, with natural hybridization (Saha, 2008). It has commercial importance with having high oil content (about 30-45%) (Oad, 2001). Canola oil (low glucosinolate and erucic acid) originated high erucic acid rapeseed oil (Przybylski, 2005). Canola oil was developed which has low erucic acid and glucosinalates also known as “double zero” varieties made the canola oil more popular (Saleem, 2001). In addition, higher unsaturated fatty acids and lower saturated fatty acids contributed to popularity of canola oil. Its production reached 17.95 million metric tons and has become of third important oilseed crop about oil production after soybean and palm oil (USDA, 2008). In oilseed rape, row spacing or plant density vary considerably worldwide, depending on the environment, production system and cultivar. Previous studies have shown that plant density is an important factor affecting rapeseed yield. Plant density in rapeseed governs the components of yield, and thus the yield of individual plants. A uniform distribution of plants per unit area is a prerequisite for yield stability (Diepenbrock 2000). Al-Barzinjy (1999) investigated the effects of different plant densities ranging from 20 to 130 plants/m2 in rapeseed. They concluded that pods per plant, seed weights and dry matter per plant decreased as plant density increased. Leach (1999) also reported that plants grown at high density had fewer pod-bearing branches per plant but produced more branches, and that with an increase in density 1000-seed weight increased. Efficient and timely weed control is one of the major tasks of competitive contemporary agriculture (Liebman, Staver, 2001; Sarrantonio, Gallandt, 2003). Public concern about the effects of herbicide use on the environment and human health has increased the interest in reducing the use of herbicides in agriculture and in developing alternative methods for weed control. One way to control weeds in cereals is to improve the ability of the crop itself to suppress weeds (Jordan, 1993; Lemerle, 2001; Mohler, 2001). The seeding rate of the crop is an important factor in determining the biomass production of weeds and most studies show a decreasing weed biomass at higher crop densities (Blackshaw, 1993; Tollenaar et al., 1994; Doll, 1997; Petraitis, 2001; Auškalnis, Auškalnienė, 2007). Weed competition with canola has reduced crop growth, leaf area and subsequently increased infertile flowers and pods (Tomass, 1992). Moreover, weed competition and crop loss in winter-sown canola will be more severe as compared with the spring-sown variety. Therefore, weed control at initial growth stages is indispensable for gaining a higher seed yield of canola (Blackshaw, 2002). In an experiment Esser (1999) examined the weed competition effects on canola and showed that white mustard (Brassica hirta) had the greatest affect in all treatments. Similarly, the competitive ability of weeds on canola was measured by weed biomass. Davis (1999) studied the effect of weed seeds of the Brassica family, including wild mustard (Brassica kaber), black mustard (Brassica nigra), birdrape mustard (Brassica rapa), shepherd's purse (Capsulla bursa – pastoris), flix weed (Descurainia sophia), thumble mustard (Sisymbrium altissimum) and fieldpenny cress (Thlaspi arvensis), on the quality of canola oil and seed cake. They concluded that the presence of two percent weed seeds in canola seed would considerably reduce the quality of oil and seed cake.

MATERIALS AND METHODS

The experiment was conducted at the chahshour iranshahr (In Iran) which is situated between 27° North latitude and 60° East longitude and at an altitude of 591m above mean Sea Level. The soil of the experimental site belonging loam. Composite soil sampling was made in the experimental area before the imposition of treatments and was analyzed for physical and chemical characteristics. The field experiment was laid out in randomized complete block design with split plot design with three replications. Main plots consisted of three planting patterns faro 95cm with four row (p1), faro 75cm with two row (p2), Crete method With a constant density of 80 plants per square meter (p3) were considered and sub plot consisted of cultivar hayola 401 (v1), hayola 4851 (v2), hayola 308 (v3), hayola 50 (v4) was done . Data collected were subjected to statistical analysis by using a computer program MSTATC. Least Significant Difference test (LSD) at 5 % probability level was applied to compare the differences among treatments` means.

RESULTS AND DISCUSSION

Number of seed in pod

Analysis of variance showed that the effect of cultivar on number of seed in pod was not significant (Table 1). Analysis of variance showed that the effect of planting pattern on number of seed in pod was significant (Table 1). The maximum of number of seed in pod of treatments a2b2 (29.86) was obtained (Table 2). The minimum of number of seed in pod of treatments a3b4 (15.46) was obtained (Table 2).

Table 1. Anova analysis of the rapeseed affected by Cultivar and Planting pattern

Ms S.O.V	df	Number of seed in pod	Grain yield (kg/ha)	Number of weeds	Fresh weight of weeds (gr/m^2)
R	2	15.48^{ns}	96273.66^{ns}	48.16^{ns}	70.23^{ns}
Planting pattern (A)	2	71.77**	7780936.95**	43095.34**	10759.05**
Error a	4	9.01	127111.00	231.03	265.57
Cultivar (B)	3	16.11^{ns}	303290.54^{ns}	60051.73**	3405.87**
A*B	6	41.58**	751725.78*	31698.48**	16025.19**
Error B	18	9.95	269151.69	152.78	414.67
C.V	-	15.53	24.83	4.01	13.19

*, **, ns: significant at p<0.05 and p<0.01 and non-significant, respectively.

Grain yield

Analysis of variance showed that the effect of cultivar on grain yield was not significant (Table 1). Analysis of variance showed that the effect of planting pattern on grain yield was significant (Table 1). The maximum of grain yield of treatments a2b2 (3278.34) was obtained (Table 2). The minimum of grain yield of treatments a3b4 (803.91) was obtained (Table 2).

Number of weeds

Analysis of variance showed that the effect of cultivar on number of weeds was significant (Table 1). Analysis of variance showed that the effect of planting pattern on number of weeds was significant (Table 1). The maximum of number of weeds of treatments a3b4 (240) was obtained (Table 2). The minimum of number of weeds of treatments a1b2 (53.33) was obtained (Table 2).

Table 2. Comparison of different traits affected by cultivar and Planting pattern

Planting pattern	cultivar	Number of seed in pod	Grain yield (kg/ha)	Number of weeds	Fresh weight of weeds (gr/m^2)
	b1	18.93cdef	1747.22cd	172.66d	8.66abcd
a1	b2	22.53b	2987.5ab	53.33g	4.42d
	b3	20.73bcde	2465.83b	98.33f	6.87abcd
	b4	16.8fg	1190.8de	206.66b	11.65abcd
	b1	19.66bcdef	1973.97c	182.33cd	11.32abcd
a2	b2	29.86a	3278.34a	86f	5.87cd
	b3	21.26bcd	2650.83b	146.66e	7.58abcd
	b4	17.8efg	1222.4d	240a	21.51abcd
	b1	18.66def	1546.4d	190c	11.54abcd
a3	b2	21.93bc	2880ab	87.5f	6.31bcd
	b3	20.13bcde	2323.88bc	147.33e	8.39abcd
	b4	15.46g	803.91e	241.38a	25.01a

Any two means not sharing a common letter differ significantly from each other at 5% probability

Fresh weight of weeds

Analysis of variance showed that the effect of cultivar on fresh weight of weeds was significant (Table 1). Analysis of variance showed that the effect of planting pattern on fresh weight of weeds was significant (Table 1). The maximum of fresh weight of weeds of treatments a2b4 (25.01) was obtained (Table 2). The minimum of fresh weight of weeds of treatments a1b2 (4.42) was obtained (Table 2).

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