

Influence of Various Row Spacing on the Yield and Yield Components of Raya Anmol and Faisal Canola under Coastal Climatic Conditions of Lasbela

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Abstract

During 2013-2014 a field experiment was conducted at experimental area of Faculty of Agriculture under Lasbela University of Agriculture, Water and Marine Science, Uthal, Lasbela to evaluate the influence of various row spacing on the yield and yield components of Raya Anmol and Faisal Canola under coastal climatic conditions of Lasbela. Randomized complete block design (RCBD) with factorial arrangement having 3 replications was used. Experiment comprises two canola varieties, C₁ = Raya Anmol, C₂ = Faisal Canola at 3 row spacing distances RS₁ = 30 cm, RS₂ = 45 cm and RS₃ = 60 cm respectively. Result showed that yield and yield contributing traits are significant. It was concluded that seed yield of C₁ (Faisal Canola) was better as compared to that of Raya Anmol. Row spacing (RS₃ = 60 cm) yielded more crop canopy and the highest number of pod per plant, pod length and seed yield under agro climatic condition of Lasbela as compared to other densely arranged row spacing.

Keywords

Canola, Cultivar, Row Spacing, Coastal Environment

1. Introduction

Canola cultivation comes under the conventional oil seed crop in Pakistan. Pakistan pays a large foreign exchange on the import of edible oil for own consumption which is increasing with the passage of time. The major

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oilseed crops include cottonseed, sunflower, canola and rapeseed/mustard. Local production of edible oil is remained 0.636 million tonnes while imports were 2.148 million. During the year 2012-2013 (July-March), 1.738 million tonnes of edible oil valued at Rs. 153.3 billion (US \$1.595 billion) have been imported. The local production during 2012-2013 (July-March) was 0.612 million tonnes. Total availability of edible oil from all sources is provisionally estimated at 2.35 million tonnes during 2012-2013 (July-March). The contribution of rapeseed and canola in term of area is 0.482 million hac with a production of 176 million tonnes' seeds [1].

Rape seed and mustard are the 2nd most important edible source of oil after cotton seed, but quality of oil obtained is inferior due to the presence of high content of erucic acid and glucosinolates in oil. New developed canola cultivars with low erucic acid and glucosinolates made the canola oil highly valuable. Cholesterol level in canola oil is very low as compared to other. Improved canola or hybrids are capable to produce higher yields when it was grown under optimum agronomic practices.

Plants cultivated in wider rows may not properly utilize the natural resources such as light, water and nutrients, whereas growing in narrower rows may result in different ways [2].

Christensen and Drabble observed that narrower row produced better result as compared to in wider row in case of *B. napus* or *B. rapa*. The establishment of an adequate and uniform canola stand is critical to achieve high grain yield.

Boundary of lasbela is directly touched to Arabian Sea and has an approximately 300 km coastal area along the sea. It is very hot during May and June, and gets cold during the December and January. The rainy season is mostly in July and August. Geographically, the district can be divided into the alluvial plain surrounding Lasbela extending southwards upto the Bay of Sonmiani and the hilly regions situated in the east and west of this plain. The plain itself consists of alluvium deposits of Porali and other rivers. At the edge of the plain there are adjoining hilly regions and near the coast, lying raised sea-beaches, situated some 15 to 25 meters above the sea level. The botanical feature of Raya Anmol and Faisal Canola is that plant height is equal in both varieties but other yield contributing traits differ from each other. Raya Anmol and Faisal Canola locally produced varieties of Pakistan according to its climatic condition.

Seed yield of canola is a function of planting geometry which is very plastic and adjustable across a wide range of population [3]. Therefore, it is of crucially importance about how to manipulate the row spacing in order to increase plant productivity.

2. Material and Method

A field experiment was conducted at experimental area of Faculty of Agriculture to evaluate the influence of various row spacing on the yield and yield components of Raya Anmol and Faisal Canola under coastal climatic conditions of Lasbela. Experiment was laid out under randomized complete block design (RCBD) with factorial arrangement having 3 replications with net plot size of 1.8 m × 2 m was used. Experiment were comprises two canola varieties; C₁ = Raya Anmol, C₂ = Faisal Canola at 3 row spacing distances RS₁ = 30 cm, RS₂ = 45 cm and RS₃ = 60 cm respectively. Recommended fertilizer rates 75 - 50 kg·ha⁻¹ NP was used respectively. Half of N and full dose of P were applied as a basal dose while the remaining half N was applied at flowering. Nitrogen and phosphorus were used in the form of urea and DAP respectively. The crop was sown on Nov, 2013 using a seed rate of 5 kg ha⁻¹ and harvested on March 25, 2014. All agronomic practices like plant population, number of irrigations, and plant protection measure etc. were kept uniform and normal for all other treatments. Following parameter like plant height, pod length, number of pod per plant, number of seed per pod and seed yield were recorded and analyzed statistically using Fisher's analysis of variance technique and LSD test at 5% probability was used to compare the differences among treatments means [4]. Weather data 2013-2014 during the crop season was given in Table A1.

3. Results and Discussion

3.1. Plant Height at Maturity (cm)

Plant height is directly affected by genetic traits and environmental characteristics. In plant height was significantly influenced by Raya Anmol and Faisal Canola. The data in (Table 1) shows C₂ produced maximum plant height as compared C₁. Same results were reported by [5]-[9].

In case of row spacing RS₃ was give maximum plant height while minimum plant height was found in RS₁ and was significantly different. These results are in agreement with the findings of [5]-[7].

Table 1. Effect of Faisal Canola and Raya Anmol varieties and different row spacing on plant height at maturity (cm).

Treatments	Plant height (cm)
A) Varieties	
C ₁ = Raya Anmol	96 ^b
C ₂ = Faisal Canola	110 ^a
B) Row spacing	
RS ₁ = 30 cm	91 ^c
RS ₂ = 45 cm	99 ^b
RS ₃ = 60 cm	105 ^a
C) Interaction (varieties × row spacing)	
C ₁ RS ₁	85 ^d
C ₁ RS ₂	89 ^d
C ₁ RS ₃	90 ^c
C ₂ RS ₁	100 ^b
C ₂ RS ₂	103 ^b
C ₂ RS ₃	112 ^a

Mean values in column not having the same letter vary significantly at P = 0.05.

Humidity is low in mostly coastal area of the world and Temperature mostly range deviate very little from normal range in cropping season.

An interactive effect between rapeseed varieties and row spacing was statistically significant.

3.2. Pod Length (cm)

Table 2 showed that pod length is directly control by genetic traits. Pod length was significantly influenced by Raya Anmol and Faisal Canola. C₂ (Faisal canola) produced maximum pod length as compared C₁. Same results were reported by [10]-[12].

Effect of row spacing on pod length was also observed significant. In case of row spacing RS₃ was give maximum pod length while minimum pod length was found in RS₁ and was significantly different. These results are in opposite to the findings of [10]. Interactive effect between rapeseed varieties and row spacing was statistically significant.

3.3. Number of Pod per Plant

Number of pod per plant is directly affected the yield. Number of pod per plant was significantly influenced by Raya Anmol and Faisal Canola. Data in (**Table 3**) shows that C₂ produced maximum number of pod per plant as compared C₁. Similar results were reported by [3] and [13].

A for as row spacing RS₃ was give maximum number of pod per plant while minimum number of pod per plant was found in RS₁ and was significantly different from each other as showed in table. These results are in closely related with the findings of [8] [10].

An interactive effect between rapeseed varieties and row spacing was statistically significant. Maximum interactive effect was observed for C₂RS₃ as compared to other treatment.

3.4. Number of Seed per Pod

Number of seed per pod statistically significant. **Table 4** showed that number of seed per pod was significantly influenced by Raya Anmol and Faisal Canola. It was found that C₂ produced maximum number of seed per pod as compared C₁. These result are lined with [8] and [14]-[16].

Table 2. Effect of Faisal Canola and Raya Anmol varieties and different row spacing on pod length.

Treatments	Pod length
A) Varieties	
C ₁ = Raya Anmol	4 ^b
C ₂ = Faisal Canola	7 ^a
B) Row spacing	
RS ₁ = 30 cm	5 ^b
RS ₂ = 45 cm	7 ^a
RS ₃ = 60 cm	8 ^a
C) Interaction (varieties × row spacing)	
C ₁ RS ₁	4 ^c
C ₁ RS ₂	4 ^c
C ₁ RS ₃	5 ^c
C ₂ RS ₁	6 ^b
C ₂ RS ₂	7 ^b
C ₂ RS ₃	9 ^a

Mean values in column not having the same letter vary significantly at P = 0.05.

Table 3. Effect of Faisal Canola and Raya Anmol varieties and different row spacing on number of pod per plant.

Treatments	Pod per plant
A) Varieties	
C ₁ = Raya Anmol	356 ^b
C ₂ = Faisal Canola	386 ^a
B) Row spacing	
RS ₁ = 30 cm	300 ^b
RS ₂ = 45 cm	326 ^b
RS ₃ = 60 cm	381 ^a
C) Interaction (varieties × row spacing)	
C ₁ RS ₁	305 ^d
C ₁ RS ₂	296 ^d
C ₁ RS ₃	315 ^c
C ₂ RS ₁	348 ^b
C ₂ RS ₂	345 ^b
C ₂ RS ₃	363 ^a

Mean values in column not having the same letter vary significantly at P = 0.05.

On the other hand row spacing RS₃ was give maximum number of seed per pod while minimum number of seed per pod was found in RS₁ and was significantly different from each other as showed in table. These results are correlated with the findings of [14] and [15].

An interactive effect between rapeseed varieties and row spacing was statistically significant. Maximum interactive effect was observed for C₂RS₃ as compared to other treatment.

3.5. Seed Yield

Seed yield is cumulative sum of number of pod per plant, number of seed per pod and pod length. Seed yield

was statistically significant and observed that number of seed yield was significantly influenced by Raya Anmol and Faisal Canola. It was found that C₂ produced maximum number of seed yield as compared C₁. These results are lined with [2] [3] [14] [15] [17].

In interaction row spacing RS₃ was give maximum number of seed yield while minimum seed yield was found in RS₁ and was significantly different from each other as showed in **Table 5**. These results are correlated with the findings of [2] and [17].

An interactive effect between rapeseed varieties and row spacing was statistically significant. Maximum interactive effect was observed for C₂RS₃ as compared to other treatment.

Table 4. Effect of Faisal Canola and Raya Anmol varieties and different row spacing on number of seed per pod.

Treatments	Number of seed per pod
A) Varieties	
C ₁ = Raya Anmol	20 ^b
C ₂ = Faisal Canola	28 ^a
B) Row spacing	
RS ₁ = 30 cm	19 ^c
RS ₂ = 45 cm	23 ^b
RS ₃ = 60 cm	27 ^a
C) Interaction (varieties × row spacing)	
C ₁ RS ₁	18 ^c
C ₁ RS ₂	20 ^c
C ₁ RS ₃	26 ^b
C ₂ RS ₁	27 ^b
C ₂ RS ₂	29 ^a
C ₂ RS ₃	30 ^a

Mean values in column not having the same letter vary significantly at P = 0.05.

Table 5. Effect of Faisal Canola and Raya anmol varieties and different row spacing on seed yield.

Treatments	Seed yield (kg·ha ⁻¹)
A) Varieties	
C ₁ = Raya Anmol	2996 ^b
C ₂ = Faisal Canola	3456 ^a
B) Row spacing	
RS ₁ = 30 cm	3256 ^c
RS ₂ = 45 cm	3301 ^b
RS ₃ = 60 cm	3325 ^a
C) Interaction (varieties × row spacing)	
C ₁ RS ₁	3002 ^c
C ₁ RS ₂	2953 ^c
C ₁ RS ₃	2856 ^c
C ₂ RS ₁	3306 ^a
C ₂ RS ₂	3205 ^b
C ₂ RS ₃	3376 ^a

Mean values in column not having the same letter vary significantly at P = 0.05.

4. Conclusion

On the basis of finding it was concluded that cultivation of crops in coastal climate favored the yield of canola because humidity was low and the temperature mostly deviated very little from normal sequence in cropping season. Seed yield of C₁ (Faisal Canola) was better as compared to that of Raya Anmol. Wider row spacing (RS₃ = 60 cm) yielded more crop canopy and the highest number of pod per plant, pod length and seed yield under agro climatic condition of Lasbela as compared to other densely arranged row spacing.

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Appendix

Table A1. Weather data of 2013-2014 during crop season.

Days	November, 2013			December, 2013			January, 2014			February, 2014			March, 2014		
	Rainfall (mm)	Temp max °C	Temp mini °C	Rainfall (mm)	Temp max °C	Temp mini °C	Rainfall (mm)	Temp max °C	Temp mini °C	Rainfall (mm)	Temp max °C	Temp mini °C	Rainfall (mm)	Temp max °C	Temp mini °C
1	0	36.5	18.5	0	31.5	14	0	23.2	1.5	0	28	14	0	29	10
2	0	35	18.5	0	33	13	0	24.5	2.2	0	27.5	15	0	29	15
3	0	34	18	0	33	12	0	25.5	2.5	0	28.5	14.5	0	25	14
4	0	34	17.5	0	32	12.5	0	26.5	4.5	0	28.5	13.5	0	27	14.5
5	0	37.5	17	0	36	13	0	26	7	0	28	16	0	30	16
6	1.6	33.5	17	0	30.5	12	0	25	7	0	28	16	0	30	14.5
7	0	31.5	18.5	0	30	14	0	27	7	0	23.5	12.5	0	32.5	15.5
8	0	31	18.5	0	31	16	0	24	9.5	0	26	8.5	0	34	15.5
9	0	30	17.5	0	29	16.5	0	27	8.5	0	26	9.5	0	34	15.5
10	0	30	17	0	29	14	0	24	7.5	0	26.5	10.5	0	33.5	15.5
11	0	30.5	17	0	29.5	13.5	0	24	6.5	0	26	8	0	30.5	16.5
12	0	31	16	0	30.5	15	0	25	6.5	0	25	7	0	31	12
13	0	31.5	17.5	0	30.5	13.5	0	25	12	0	26	9	0	33.5	15.5
14	0	32.5	17	0	31	12.5	0	25	11.5	0	28.5	8.5	0	32.5	16
15	0	31	15	0	30.5	13.5	0	25	10.5	0	26.5	11	0	34.5	17.5
16	0	33	14	0	29.5	14.5	0	27	10.5	0	29	7	0	33.5	17.5
17	0	30.5	15	0	31.5	15	0	27.5	11.5	0	29	8	0	17	33.5
18	0	33	16	0	29	15.5	0	28.5	10	0	29	9	0	34.5	15.5
19	0	32	15	0	28	12	0	25.5	12	0	27	10.5	0	34	15.5
20	0	34	15.5	0	28	9	0	25.5	8	0	30.5	14	0	34.5	14.5
21	0	34.5	16	0	27.5	12	0	26.5	4.5	0	28	16	0	33	16
22	0	33	16	0	25	11	0	26	7	0	28	16	0	33.5	17
23	0	33	17.5	0	26.5	8.5	0	25	7	0	23.5	12.5	0	30.5	20
24	0	32	16.5	0	25.5	9.5	0	27	7	0	26	8.5	0	31.5	16.5
25	0	32.5	16	0	24.5	10	0	24	9.5	0	26	9.5	0	32.5	12.5
26	0	32.5	16	0	24.5	5.5	0	27	8.5	0	26.5	10.5	0	30	17
27	0	31.5	16	0	25	4.5	0	24	7.5	0	26	8	0	32	14
28	0	32.5	15.5	0	24.5	5	0	24	6.5	0	28	16	0	34	19
29	0	32.5	16.5	0	26	5.5	0	25	6.5				0	34	18
30	0	32.5	15	0	25	6.5	0	25	6.5				0	35	19.5
31				0	24.5	0	0	26	9.5				0	35.5	19

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