



EFFECT OF SPACING ON GROWTH AND YIELD OF PROMISING CULTIVARS OF CAULIFLOWER (*Brassica oleracea* var. *botrytis* L.)

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ABSTRACT

The present experiment was carried out to estimate the spacing effect on quality, yield and yield related traits in cauliflower during 2015-16. The experiment consists of eight elite varieties/hybrids named as Spring Star, Aishwarya, Snowball-16, Pornima Snow White, US-Agri., RIJK du-Bishop RZ 26-904, Jyoti 2 and Denali RZ 26-960 (F₁ Hybrid). These were plotted in split-plot design i.e. main factor (Spacing (60 & 45 cm)) and sub factor (cultivars) with three replications. Data was recorded for plant height (cm), curd weight (g), leaf length (cm), leaf width (cm), number of leaves per plant, curd spreading diameter (cm), stalk length (cm) and yield per hectare (T/ha). Relatively wide range of variation was found among cultivars and RIJK-du and Denali RZ 26-960 performed better for quantitative and qualitative characters such as yield per hectare, curd weight and leaf length. RIJK-du had maximum curd weight (1210.22 gm) and leaf length (33.50 cm) whereas Denali RZ 26-904 had maximum curd yield (280.42 q), spreading diameter (55.40 cm), curd knobs (17.30), equatorial diameter (23.90 cm), plant height (16.90 cm), half cut length (18.47 cm), number of leaves (16.90), leaf width (20.32 cm), leaf area (778.10 sq. cm) and stalk length (16.42 cm). However, Spacing does not have significant effect on curd count number, curd weight, Curd yield, plant height, number of leaves per plant, spreading diameter and stalk length. Out of eight cultivars, two cultivars viz; RIJK-du (280.10 q/ha) and Denali RZ 26-960 (280.42 q/ha) were found promising for yield per hectare. So thereby recommended for large scale cultivation.

Keywords: Cauliflower, Equatorial diameter, Spacing, Spreading, Yield

Introduction

Cauliflower (*Brassica oleracea* var. *botrytis* L.) is an important *Cole* crop consumed by large number of people in many countries like China, India, Italy, Europe and America. The edible portion '*Curd*' surrounded by leaves cover the head, which differentiate it from other vegetables. In India, Cauliflower was introduced from Kew in 1822 by Dr. Jemson (Nath *et al.*, 1994). It has good nutritional value. 100 g of cauliflower contains about 90.8 percent moisture, 2.6 g protein, 0.4 g fat, 4.0 g carbohydrates, 0.01 mg riboflavin, 0.04 mg thiamine, 56 mg vitamin C, 33 mg calcium and 1.5 mg iron with good amount of anti-oxidants, on dry weight basis (Dhaliwal, 2014). India is the second largest producer of cauliflower

(8,067,917 m/t) in the world. In India, Cauliflower is third important vegetable crop occupied 411,000 Ha area with productivity 19.80 mt/ha (NHB 2015).

There are three broader classes of cauliflower early, mid and late season crop varieties are cultivated, different from each other in terms of sowing time, methodology, transplanting technology and spacing etc. In North Indian region, on the basis of temperature requirements, cauliflower has been grouped in nine groups namely First Early, Early Kunwari, Ketki, Aghani, Poosi, Magi, Snowball and Holland species. However, in Punjab major nursery sowing has been completed in first week of August and thereafter transplanting in early September and curd become ready for

harvesting in early December (Ram, 2006). Temperature and humidity are two major components of farmer's success. When temperature is on higher side (i.e. >30°C), cauliflower plants will either wither or stop growing. On the other hand, if there is fog for longer period, it will cause 'Buttoning' or small heads. This problem can be avoided by planting seedlings at right time and proper spacing. Punjab farmers usually adopted two methods of cauliflower planting. First one is ridge and furrow method and second one is flat bed planting. Since curd size and weight along with quality parameters is utmost importance, Spacing is considerable factor which effect growth and development of the plant.

Materials and Methods

The trial was experimented at Agricultural field, School of Agriculture, Lovely Professional University, Phagwara (Punjab) during Sep. 2015 to Feb. 2016. The experiment consists of one main plot (spacing 60 and 45 cm) and sub plot (Varieties- 8) treatments arranged in split- plot design. For this experiment we taken 8 elite varieties/cultivars named as Spring Star, Aishwarya, Snowball-16, Pornima Snow White, US-Agri., RIJK du-Bishop RZ 26-904, Jyoti 2 and Denali RZ 26-960 (F1 Hybrid) have been planted in 560 sq. meters plot area. The observations were recorded on 13 quantitative and 4 qualitative characters. Three plants were tagged in each row and used for recording the data/observations and randomly selected for the characters like Curd yield per hectare (in q), Leaf area (sq.cm), Leaf length (cm), Leaf width (cm), Curd covering by inner leaves, Spreading diameter of plant (cm), Plant height (cm), Number of leaves per plant, Curd knob count, Curd weight (g), Stalk length (cm), Half cut length (cm), Polar diameter (cm), Equatorial diameter (cm) Curd yield per hectare (in q), Leaf color, Curd doming, Curd color and Curd bolting

Results and Discussion

This experiment has been designed to identify best plant to plant spacing while keeping spacing between rows is 60 cm (due to mechanized limitation) and selection of best combination of hybrid and spacing for farmer's field cultivation in existing conditions. For this, we have taken eight elite hybrids from reputed private companies that are popular among the farmers and studied their significance at two different spacing between plant to plant is 60 cm and 45 cm in a split plot design with spacing as main plot and varieties as subplot factors.

In the present study, curd yield has been significant different among varieties. As variety 'Spring Star' and 'Aishwarya' has been showed comparatively less curd yield (157.47 and 161.15 q/ha respectively) on the other hand RIJK-du, Jyoti 2 and Denali RZ 26-960 showed significantly higher curd yield (280.10, 276.65 and 280.42q/ha respectively). Different varieties showed considerable variation for curd weight as low as 634.4gm to 1221.5gm per curd. Variety 'Spring Star' and 'Aishwarya' has reported relatively less curd weight (657.52 and 660.57 cm respectively) but 'RIJK-du', 'Jyoti 2' and 'Denali RZ 26-960' showed significantly more curd weight (1210.22, 1162.67 and 1193.95 cm respectively). Spread of plant also has been reported significant variation among varieties. Variety 'Spring Star', 'Aishwarya' and 'Snowball 16' showed comparatively less plant spread or closed canopy (39.00, 39.97 and 39.35 cm respectively) but 'US-Agri', 'RIJK-du', 'Jyoti 2' and 'Denali RZ 26-960' showed significantly spread of plant (53.65, 52.57, 51.65 and 55.40 cm respectively).

In case of Curd knob count reported variation among varieties as variety 'Spring Star' and 'US-Agri' showed comparatively lesser curd knobs (11.87 and 11.95 respectively) than mean knob numbers (15.02) and 'Snowball-16', 'Pornima Snow White' and 'Denali RZ 26-960' showed significantly more curd knobs (17.75 respectively). On the

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other hand Variety ‘Spring Star’, ‘Aishwarya’ and ‘Pornima Snow White’ showed comparatively lesser diameter (16.00, 16.87 and 15.60 cm respectively) but ‘US-Agri’ and ‘Denali RZ 26-960’ has reported significantly more equatorial diameter (20.60 and 23.90 cm respectively). Variety ‘Spring Star’, ‘Aishwarya’ and ‘Pornima Snow White’ showed relatively less polar diameter (12.80, 13.15 and 13.35 cm respectively) but ‘Jyoti 2’ and ‘Denali RZ 26-960’ showed significantly more polar diameter (15.80 and 17.05 cm respectively). Half cut showed relatively considerable variation among varieties. Variety ‘Spring Star’, ‘Aishwarya’, ‘Snowball 16’ and ‘Pornima Snow White’ reported relatively less half cut (11.47, 13.80, 12.00 and 13.25 cm respectively) but ‘US-Agri’, ‘RIJK-du’, ‘Jyoti 2’ and ‘Denali RZ 26-960’ showed (17.75, 17.20, 15.95 and 18.47 cm respectively). Result revealed that the variety ‘Spring Star’ has minimum number of leaves out of two varieties but ‘Denali RZ 26-960’ has maximum number of leaves. As conclusion it can be said plant height directly effects to curd yield per hectare and variety ‘Spring Star’, ‘Aishwarya’ and ‘Snowball 16’ has showed less leaf length (21.47, 21.95 and 21.55 cm respectively) but ‘US-Ari’, ‘RIJK-du’, ‘Jyoti 2’ and ‘Denali RZ 26-960’ showed significantly more leaf length

(31.05, 31.00, 31.05 and 33.50 cm respectively). ‘Snowball 16’, ‘Jyoti 2’ and ‘Denali RZ 26-960’ significantly showed more leaf width (16.95, 18.92 and 20.32 cm respectively). Variety ‘Spring Star’, ‘Aishwarya’, ‘Snowball 16’ and ‘Pornima Snow White’ reported comparatively lesser leaf area (369.35, 429.37, 357.27 and 435.75 cm respectively) and ‘US-Agri’, ‘RIJK-du’, ‘Jyoti 2’ and ‘Denali RZ 26-960’ showed more leaf area (631.10, 720.55, 733.10 and 778.10 cm respectively)

Conclusion

On the basis of overall findings of the present investigation, it was concluded that maximum range of variation was found among the germplasm for all the traits under study. Variability present in the different traits indicated that considerable scope existed for the improvement of cauliflower cultivars. Result revealed that Spacing II (60x45) cm gave best results as with decrease the spacing, number of plants per plot can be increased. Out of eight cultivars, two cultivars viz; RIJK-du (280.10 q/ha) and Denali RZ 26-960 (280.42 q/ha) were found promising for yield per hectare. So they may be recommended for large scale cultivation.

Table:1 Effect of Spacing I (60x60) cm on different cultivars of cauliflower

| Varieties | Plant height (cm) | Leaf length (cm) | Leaf width (cm) | Spreading diameter of plant (cm) | Polar diameter (cm) | Curd weight (g) | Curd weight (g) | Curd yield per hectare (in q) | Half cut length (cm) |
|--------------------|-------------------|------------------|-----------------|----------------------------------|---------------------|-----------------|-----------------|-------------------------------|----------------------|
| Spring Star | 29 | 21.0 | 12.8 | 39.2 | 12.7 | 643.4 | 643.4 | 157.15 | 11.9 |
| Aishwarya | 35.5 | 21.7 | 13.2 | 39.9 | 13.1 | 674.2 | 674.2 | 168.2 | 13.7 |
| Snow ball 16 | 36.3 | 21.0 | 16.9 | 39.4 | 14.8 | 932.6 | 932.6 | 223.5 | 12.2 |
| Pornima Snow White | 40.6 | 26.2 | 16.8 | 48.7 | 13.6 | 951.1 | 951.1 | 232.1 | 13.1 |
| US-Agri | 43 | 31.9 | 14.7 | 54 | 14.2 | 977.2 | 977.2 | 229.7 | 17.9 |
| RIJK-26-904 | 43.5 | 31.3 | 15.4 | 52 | 13.7 | 1221.5 | 1221.5 | 275.8 | 16.7 |
| Jyoti 2 | 47.1 | 31.6 | 18.8 | 50.7 | 15.8 | 1146.6 | 1146.6 | 296.1 | 15.5 |
| Denali RZ 26-960 | 54 | 34.1 | 20.3 | 56.0 | 16.8 | 1185.8 | 1185.8 | 289.8 | 18.7 |

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Table: 2 Effect of spacing II (60x45) cm on different cultivars of cauliflower

| Varieties | Plant height (cm) | Leaf length (cm) | Leaf width (cm) | Spreading diameter of plant (cm) | Polar diameter (cm) | Curd weight (g) | Curd yield per hectare (in q) | Half cut length (cm) |
|--------------------|-------------------|------------------|-----------------|----------------------------------|---------------------|-----------------|-------------------------------|----------------------|
| Spring Star | 30 | 21.9 | 13.9 | 38.7 | 12.9 | 671.6 | 157.8 | 11 |
| Aishwarya | 36.5 | 22.1 | 13.7 | 40 | 13.2 | 646.9 | 154.1 | 13.8 |
| Snow ball 16 | 36.6 | 22 | 17.0 | 39.3 | 13.5 | 962.3 | 214.2 | 11.8 |
| Pornima Snow White | 42 | 27.6 | 14.8 | 49.7 | 13.1 | 980 | 231.9 | 13.4 |
| US-Agri | 42.8 | 30.1 | 17.2 | 53.3 | 13.7 | 944.3 | 213.8 | 17.5 |
| RIJK-26-904 | 44 | 30.4 | 17.5 | 53.1 | 14 | 1198.9 | 284.4 | 17.6 |
| Jyoti 2 | 48 | 30.7 | 19.0 | 52.5 | 15.1 | 1178.7 | 257.2 | 16.3 |
| Denali RZ 26-960 | 52.4 | 32.8 | 20.3 | 54.7 | 17.3 | 1202.1 | 271 | 18.2 |