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# EVALUATION OF CAULIFLOWER GENOTYPES IN HILLY AREA UNDER VARIED SOWING DATES

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## Abstract

The present study was conducted with four cauliflower genotypes viz., CL-170, CL-171, CL-172 and BARI Fulcopi-1 and three sowing dates viz., 25 August, 5 September and 25 October. The experiment was conducted during the winter season of 2013-14 at the field laboratory of Horticulture Department of Sylhet Agricultural University (SAU) to evaluate growth and yield of cauliflower genotypes and to identify the suitable planting time in Sylhet conditions. Results showed that sowing dates and genotypes had significant influenced on growth and yield of cauliflower. The lowest days to first curd harvest was from the plant grown in 5 October sowing (86.25 days) while it was the highest from the plants in 25 August sowing (91.58 days). The highest whole plant weight was recorded from the plants of 25 August sowing (0.78 kg) while the highest individual curd weight (0.48 kg) and only curd weight (0.31 kg) was recorded in 15 September sowing. The plants in 15 September sowing produced the highest curd yield (16.32 t $ha^{-1}$) followed by 15 August sowing (15.64 t $ha^{-1}$). Days to first curd initiation and days to first harvest were significantly different among the genotypes. CL-171 was the earliest to first harvest (88.69 days) while the genotype CL-170 required 91.22 days to first harvest. The genotype BARI Fulcopi-1 had the highest whole plant weight (0.97 kg), marketable curd weight (0.55 kg) and only curd weight (0.32 kg). Among the four genotypes, BARI Fulcopi-1 produced the highest marketable curd yield (18.7 t $ha^{-1}$) followed by CL-171 (16.37 t $ha^{-1}$). Whole plant weight, marketable curd weight and only curd weight were significantly influenced by the interaction of genotypes and sowing dates. The highest marketable curd was harvested from the genotype BARI Fulcopi-1 (20.74 t $ha^{-1}$) when grown in 15 September sowing which was followed by the same genotype from 25 August sowing (18.7 t $ha^{-1}$).

***Keywords:*** Cauliflower, genotype, sowing date, hilly area.

## Introduction

Cauliflower *(Brassica oleracea* var. *botrytis* L.) is a popular winter vegetable in Bangladesh belonging to the family Cruciferae. Cauliflower is an excellent source of protein, carbohydrate, vitamin C, a good source of dietary fiber and provides small but worth wile quantities of various minerals and vitamins (Rashid, 1999). Cauliflower also contains indole-3-carbinol, the photo nutrient sulforaphane and folate. Cauliflower grows well in a cool moist climate. It cannot withstand extreme cold or much heat (Christopher, 1958; Shoemaker, 1953 and Thompson and Kelly, 1957). The crop is grown successfully in summer or spring months in temperate region and during cool period in tropical region (Rashid *et al.* 1990). In Bangladesh, the crop is grown during cool season, which is popularly known as Rabi cropping season. The crop is very sensitive to soil and climatic requirements (Halim *et al.* 1999). Sylhet region is best owed with plane land along with hill and hillock also evident in some part of this region. Hilly area like Sylhet is a suitable area for the production of vegetables, but there is a huge area of land remains fallow every year, the main reason is that the people of this region have a tendency to go abroad and they are not interested about vegetable production. Vegetable consumption in Bangladesh is very low, only 32 g per person per day against the minimum recommended quantity of 200 g $day^{-1}$ (FAO, 1986). So, there is an ample scope to cultivate vegetables in Sylhet region. Cauliflower is very much sensitive to temperature. Most of the varieties of the world are of annual type, which in the temperate zones produced curds in the year of sowing. In tropical areas, these annual types often remain vegetative, though there are some varieties, which are capable of producing normal curds at temperature above $20^0$C. An intermediate type between annual and biennial varieties is

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autumn varieties. The temperature for curd initiation of these varieties is somewhat lower than that of annual varieties. Bose and Som (1986) stated that the optimum temperature for curd formation is $17^0$C. According to them, cultivars or lines form curds at 20-$25^0$C and late cultivars or lines form at around $10^o$ C. Selection of suitable varieties for sowing at proper time is the key factor for successful cauliflower production. In Bangladesh, the growers cultivate cauliflower varieties indiscriminately, which results delayed curd initiation or buttoning. Production of cauliflower in Sylhet region is not so common like other parts of the country. Besides, the genotypic response of the cauliflower differs from location to location and planting dates. Some of the genotypes perform better in early while some other in late season (Chatterjee and Swarup, 1983). Therefore, the present study was undertaken to select suitable cauliflower genotype at different sowing dates under hill valley conditions.

## Materials and Methods

The experiment was conducted at the experimental field of Horticulture Department at Sylhet Agricultural University (SAU), Sylhet during August 2012 to March 2013. The experimental site located under the Agro-ecological Zone-20: Eastern Surma-Kusiyara Flood Plain (UNDP and FAO, 1988). The land was situated just beside some hillocks of the university campus. The area was within the monsoon climatic zone, with annual average highest temperature is $23^0$c (August - October) and average lowest temperature is $7^0$c (during January) (BBS, 2012). Nearly 80% of the annual average rainfall of 3,334 mm occurs between May to September and scanty during rest of the year. The reaction of soils ranges from strongly acidic to neutral (4.7-6.9), (UNDP and FAO, 1988). Previous crop was tomato in the experimental field. The materials of the experiment included four Cauliflower genotypes viz. CL-170, CL-171, CL-172 and BARI Fulcopi-1. The seeds of the genotypes were collected from the Department of Horticulture, Sylhet Agricultural University, Sylhet. The experiment was laid out in a Randomized Complete Block Design with three replications. In field experimentation, the unit plot size was 2.4 m × 1.0 m having double row $bed^{-1}$ and 12 plants $row^{-1}$ and 24 plants $plot^{-1}$. Plants were spaced at 60 cm × 40 cm between plant to plant and row to row, respectively. The unit plot and blocks were separated by 50 cm. The following doses of fertilizers (Rashid, 1999) were applied in the experimental field as cowdung: 15-20 t $ha^{-1}$, Urea: 300 kg $ha^{-1}$, TSP: 200 kg $ha^{-1}$and MoP: 150 kg $ha^{-1}$. Seeds of four cauliflower genotypes were sown at three different sowing dates on 25 August, 15 September and 5 October of 2013 in raised seed beds to produce normal and healthy seedlings. Healthy and uniform sized 25 days old seedlings of each sowing dates were transplanted in the experimental field. Light irrigation was provided just after transplanting. Data on different parameters were recorded from sowing to harvest. The parameters viz. plant height (cm), number of leaves $plant^{-1}$, length of the largest leaf (cm), breadth of the largest leaf (cm), days to curd initiation, days to harvest, whole plant weight (kg), marketable curd weight (kg), only curd weight (kg), curd height (cm), curd breadth (cm) and marketable curd yield (t $ha^{-1}$) were recorded. Collected data on different parameters were subjected to statistical analysis using MSTAT software for analysis of variance and mean separation.

## Results and Discussion

**Effect of sowing dates:** Sowing dates had significant influence on almost all parameter of growth and yield attributing characters of cauliflower except days to harvest (Table 1). The highest number of days to harvest (91.58), number of leaves $plant^{-1}$ at harvest (21.88) and whole plant weight (0.78 kg) were obtained by planting at 25 August but the lowest number of leaves $plant^{-1}$ at harvest (17.88), the maximum marketable curd weight $plant^{-1}$ (0.48 kg), only curd weight $plant^{-1}$ (0.31 kg) and curd breadth (18.17 cm) were obtained at 15 September planting. Dutta (1999) reported that sowing time exhibited a significant effect on whole plant weight, marketable curd weight, only curd weight, curd height and curd breadth. In present study, plant sown in 15 September might be congenial atmospheric conditions to produce highest marketable curd weight, only curd weight, curd height and curd breadth. This result is in agreement with the findings of Ara *et al.* (2009).

**Marketable curd yield:** Variations were recorded in different sowing time in respect of marketable curd yield (t $ha^{-1}$), (Fig. 1). The $2^{nd}$ sowing ($T_2$) crops on 15 September gave the highest marketable curd yield (16.32 t $ha^{-1}$) and the lowest (13.94 t $ha^{-1}$) was found in $3^{rd}$ sowing ($T_3$) crops on 5 October which was identically followed by $1^{st}$ sowing crops on 25 August ($T_1$).

**Effect of genotypes:** The result in respect of yield and yield attributes of cauliflower lines are presented in Table 2. Days to harvest, whole plant weight, marketable curd weight, only curd weight, curd height and curd breadth were

significantly affected by genotypes. Among the genotypes, no significant variation was observed in case of number of leaves plant$^{-1}$ at harvest (Table 2). Days to harvest for CL-170 (91.22) was significantly higher than that of other genotypes indicating that rest of the advanced genotypes were comparatively earlier to curd harvest, the maximum number of leaves (20.11), whole plant weight (0.97 kg), marketable curd weight (0.55 kg), only curd weight (0.32 kg) at harvest, curd height (8.50 cm) and only curd breadth (18.06 cm) was produced by the genotype BARI Fulcopi-1. This finding supports the results of Ara *et al.* (2009).

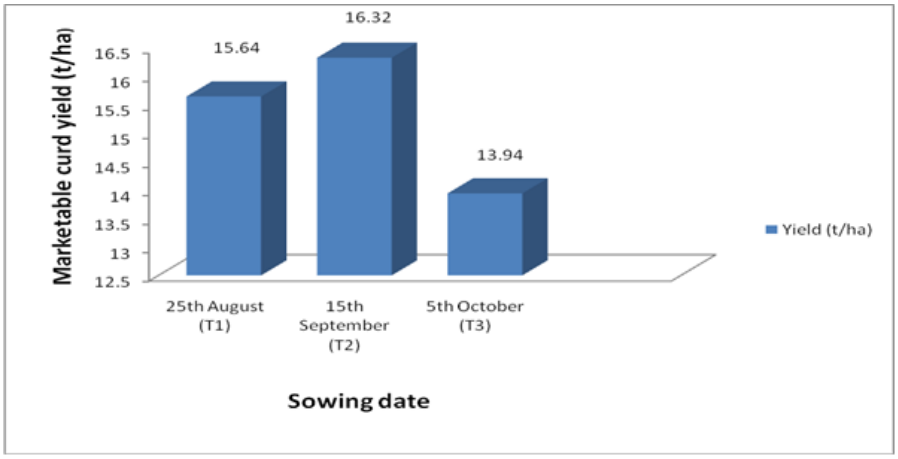



**Fig. 1. Effect of sowing dates on marketable curd yield of cauliflower genotype.**

**Table 1. Effect of sowing dates on the yield and yield attributes of cauliflower.**

| Sowing dates | Days to harvest | No. of leaves plant$^{-1}$ at harvest | Whole plant weight (kg) | Marketable Curd weight (kg) | Only curd weight (kg) | Curd height (cm) | Curd breadth (cm) |
|---|---|---|---|---|---|---|---|
| 25 August ($T_1$) | 91.58a | 21.88a | 0.78a | 0.46a | 0.29a | 7.8b | 15.17b |
| 15 September($T_2$) | 91.33a | 17.88b | 0.76a | 0.48a | 0.31a | 8.75a | 18.17a |
| 05 October ($T_3$) | 86.25b | 18.00b | 0.72b | 0.41b | 0.23b | 7.89b | 15.46b |
| F-test | NS | ** | * | ** | ** | * | * |
| CV(%) | 1.92 | 9.58 | 6.6 | 7.52 | 16.08 | 10.73 | 16.43 |

*NS indicates non significant, * indicates significant at 5% level of probability, ** indicates significant at 1% level of probability*

**Table 2. Effect of genotypes on yield and yield attributes of cauliflower.**

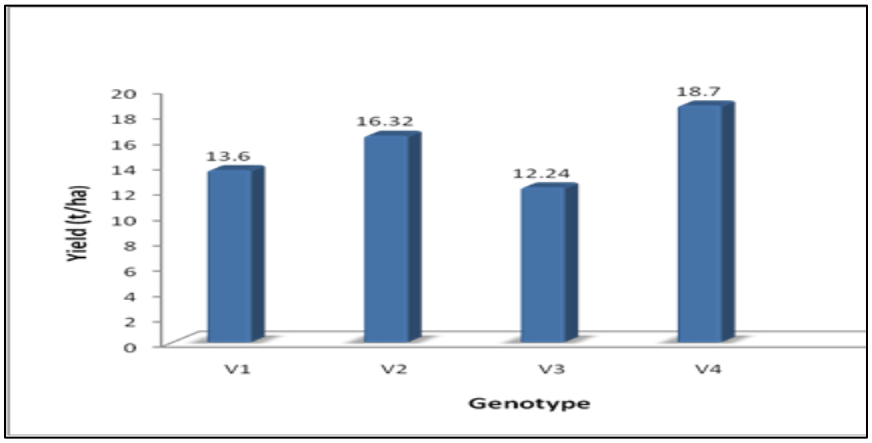
| Genotypes | Days to Harvest | No. of leaves plant$^{-1}$ at harvest | Whole plant weight (kg) | Marketable Curd weight (kg) | Only curd weight (kg) | Curd height (cm) | Curd breadth (cm) |
|---|---|---|---|---|---|---|---|
| $V_1$ | 91.22a | 18.55 | 0.68c | 0.40c | 0.24b | 8.19 | 15.39bc |
| $V_2$ | 88.67b | 19.72 | 0.75b | 0.48b | 0.31a | 8.45 | 17.22ab |
| $V_3$ | 90.11ab | 18.61 | 0.61d | 0.36c | 0.24b | 7.5 | 14.39c |
| $V_4$ | 88.89b | 20.11 | 0.97a | 0.55a | 0.32a | 8.5 | 18.06a |
| F-test | * | NS | ** | ** | ** | NS | * |
| CV (%) | 1.92 | 9.58 | 6.6 | 7.52 | 16.08 | 10.73 | 16.43 |

*NS indicates non significant,* * indicates significant at 5% level of probability, ** indicates significant at 1% level of probability, $V_1$= CL-170, $V_2$= CL171, $V_3$= CL-172 and $V_4$= BARI Fulcopi-1.*

**Marketable curd yield (t ha$^{-1}$):** Among the genotypes, $V_4$ (BARI Fulcopi-1) produced the highest marketable curd yield (18.7 t ha$^{-1}$) which was closely followed (16.32 t ha$^{-1}$) by the $V_2$ (CL-171) genotype (Fig. 2). The lowest marketable curd yield (13.6 t ha$^{-1}$ and 12.4 t ha$^{-1}$) was observed in $V_1$ (CL-170) and $V_3$ (CL-172) genotypes,

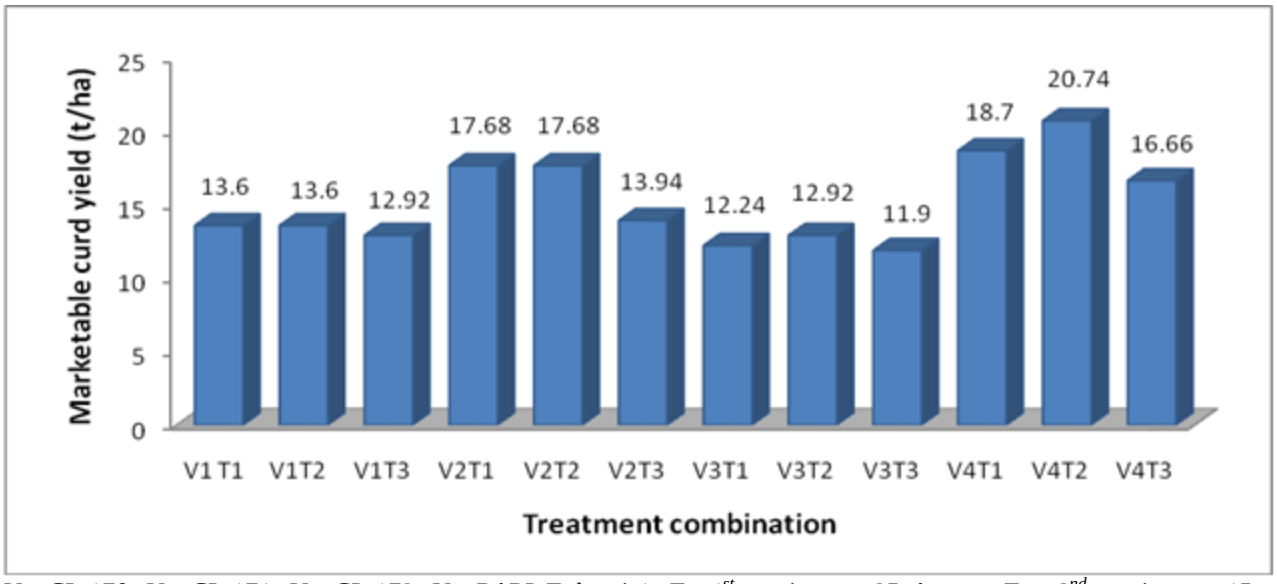
respectively. This result indicates that, the genotypes BARI Fulcopi-1 and CL-171 performed well in case of marketable curd yield than the other genotypes.

**Interaction effect of sowing date and genotype:** The interaction between sowing time and genotypes was varied significantly on all parameter of growth and yield of cauliflower except days to harvest (Table 3). The period of curd harvest was longer (93.66 days) in $V_1T_2$ (CL-170 genotype when sown on 15 September) while the treatment combination $V_4T_3$ (BARI Fulcopi-1 when sown on 5 October) needed minimum period (84 days) for curd harvest. From the study it was found that the treatment combination $V_1T_1$ (CL-170 when sown on 25 August) produced maximum number of leaves plant$^{-1}$ at harvest (23.67). The treatment combination $V_1T_2$ (CL-170 when sown on 15 September) produced the minimum number of leaves plant$^{-1}$ at harvest (15). The highest whole plant weight (0.99 kg) was obtained from the treatment combination $V_4T_2$ (BARI Fulcopi-1 when sown on 15 September) which was statistically identical (0.97 kg) to $V_4T_1$ (BARI Fulcopi-1 sown on 25 August), (Table 6). The highest marketable curd weight (0.61 kg) was recorded from $V_4T_2$ (BARI Fulcopi-1 sown on 15 September) and the lowest marketable curd weight (0.35 kg) was produced by the plant of $V_3T_3$ (CL-172 sown on 5 October). The highest only curd weight (0.39 kg) was noted from $V_4T_2$ (BARI Fulcopi-1 sown on 15 September) which was followed (0.36 kg and 0.35 kg) by $V_2T_1$ (CL-171 sown on 25 August). The highest curd height (9.5 cm) and the maximum curd breadth (23 cm) were observed in the treatment combination of $V_4T_2$ (BARI Fulcopi-1 sown on 15 September).




*$V_1$= CL-170, $V_2$= CL171, $V_3$= CL-172 and $V_4$= BARI Fulcopi-1*

**Fig. 2. Effect of genotypes on marketable curd yield of cauliflower.**




*$V_1$=CL-170, $V_2$=CL-171, $V_3$=CL-172, $V_4$=BARI Fulcopi-1, $T_1$=1$^{st}$ sowing on 25 August, $T_2$= 2$^{nd}$ sowing on 15 September and $T_3$= 3$^{rd}$ sowing on 5 October.*

**Fig. 3. Interaction effect of sowing dates and genotypes on yield of cauliflower.**

**Marketable curd yield:** The combined effect of sowing dates and genotypes showed variation among the treatment combinations for marketable curd yield of cauliflower (Fig. 3). Among the treatment combination, $V_4T_2$ (BARI Fulcopi-1 sown on 15 September) gave the highest marketable curd yield (20.74 t ha$^{-1}$) which was followed (18.7 9 t ha$^{-1}$) by the treatment combination of $V_4T_1$ (BARI Fulcopi-1 sown on 15 August), whereas $V_3T_3$ (CL-172 sown on 5 October) obtained the lowest marketable yield (11.9 t ha$^{-1}$). From the observation it is clear that, the genotype BARI Fulcopi-1 recorded the highest yield when it is combined with 2$^{nd}$ sowing on 15 September. On the other hand, genotype CL-172 produced the lowest yield when sown on 5 October.

The overall results obtained from the study facilitated to put forward that all the genotypes were able to produce curd during winter season at Sylhet region. Among the genotypes, BARI Fulcopi-1 and CL-172 can be recommended for cultivation in Sylhet region and among the sowing times, 15 September was found most suitable for cauliflower cultivation in Sylhet region. However, the experiment may be repeated for confirmation of the revealed results in specific location.

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