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# GREEN COB AND FODDER YIELD OF SWEET CORN AS INFLUENCED BY SOWING TIME IN THE HILLY REGION

M. SHAHEENUZZAMN[1], R. R. SAHA[2], B. AHMED[3]
J. RAHMAN[4] AND M. SALIM[5]

## Abstract

A field experiment was conducted at the farm of Hill Tract Agricultural Research Station, Ramgarh, Khagrachari Hill District during *Rabi* season of 2010-11 and 2011-12 to determine the optimum sowing time for better yield of green cob as well as fodder of sweet corn (var. BARI Sweet corn-1) in the hilly region. Five sowing dates (November 20, November 30, December 10, December 20 and December 30) were included in the study. During 2010-11, the highest green cob yield was obtained from 20 November sowing (8.43 t/ha) followed by 30 November sowing (7.81 t/ha) and the lowest yield (5.00 ton/ha) from 20 December sowing. During 2011-12, the maximum green cob yield (8.60 t/ha) was also obtained from 20 November, which was statistically identical with that of 30 November (8.03 t/ha), 10 December (7.67 t/ha) and 20 December (8.11 ton/ha) sowing. Average of two years result showed that, the maximum fodder yield (39.99 t/ha) was obtained from 30 November sowing which was at par with that of 20 November sowing. Maximum TSS (Total soluble sugar) value of Sweet corn was obtained from 20 November sowing during 2010-11 and 30 November sowing during 2011-12. Across over two years, 20 November to 30 November sowing was found suitable for sweet corn production in the hilly areas in terms of green cob and fodder yield and also TSS value.

Keyword: Sweet corn, green cob, fodder, hill region

## Introduction

Sweet corn is mainly produced for human consumption either as a fresh cob or processed product. The kernel of sweet corn is translucent in fresh condition. The green cob is suitable for fresh consumption due to its sweet and delicious taste. Tribal people of hilly areas normally take any type of corn as boiled or roasted condition. Generally the people of this area cultivate the corn as jhum along with other crops. Sweet corn may be a good option for them. BARI already released a sweet corn variety i.e. BARI Sweet corn-1. As sweet corn is harvested early (i.e.20-25 days after silking) then the plant and husk could be used as fodder.

[1]Scientific Officer, Agronomy Division, Bangladesh Agricultural Research Institute (BARI), Gazipur-1701, [2]Principal Scientific Officer, Physiology Division, BARI, Gazipur-1701, [3]Scientific Officer, Physiology Division, BARI, Gazipur-1701, [4]Senior Scientific Officer, Agronomy Division, Regional Agricultural Research Station, BARI, Jamalpur, [5]Scientific Officer, Agronomy Division, Hill Agricultural Research Station, Ramgarh, Khagrachari, Hill District, Bangladesh

Potential yield of sweet corn can be achieved through optimum use of inputs and agronomic practices. Planting date and variety selection are the major factors affecting maize production in addition to soil fertility, temperature regimes and irrigation (Ramankutty *et al.,* 2002). For optimization of yield, planting at the appropriate time is very critical (Anapalli *et al.,* 2005). Rogers *et al.* (2000) reported that The effects of sowing time on sweet corn yield and quality were examined by sowing three sweet corn hybrids (Sheba, Challenger and XP1029) of varying maturity at approximately fortnightly intervals from 21 September 1999 to 20 January 2000 in New Zealand. Delayed sowing reduced total crop biomass by 0.86 t/ha per 10-days delay. Harvestable ear yield declined by 1.6 t/ha per 10-days delay in sowing, mainly through reduced mass of harvestable secondary ears. Photoperiod and temperature influence the time from sowing to tassel initiation with appreciable genetic differences in relative sensitivity to these factors (Ellis *et al.,* 1992). Yield can be increased to a greater extent provided high yielding varieties are identified and planted at proper time (Khan *et al.,* 2009; and Arif *et al.,* 2001). The influence of sowing date on crop development and yield of maize was studied during 1983-85 at Arlington, Wisconsin. Sowing dates were April 26 to May 6 (early), May 14 to 19 (middle), and May 27 to June 6 (late). The highest grain yields were generally obtained when planting was completed by early May, with yield declining as planting was delayed (Imholte and Carter, 1987). Herbek *et al.* (1986) emphasised that a yield increase trend was observed as planting date progressed from the first planting date (late April) to the second (mid-May). Yield increased with delayed planting dates. Erbay and Koycu (1986) reported that the highest yield was obtained from the Akponar variety sown on the May 3 and that yield decreased as planting time was delayed. Yield and tasseling period decreased with the delay in sowing dates. Therefore, the present study was conducted to determine the optimum sowing time for better marketable yield of green cob as well as fodder of sweet corn in the hilly areas.

**Materials and Method**

A field experiment was conducted at the farm of Hill Tract Agricultural Research Station, Ramgarh, Khagrachari Hill District during *Rabi* season of 2010-11 and 2011-12, in the hilly region. The soil of this hill area having acidic soil where $p^H$ mostly ranges from 4.5-5.0 belongs to AEZ 29. Five different dates of sowing viz. November 20, November 30, December 10, December 20 and December 30 at 10-days interval were included as treatment variables in the experiment. The trial was laid out in a randomized complete block design with three replications. The unit plot size was 4.5m×3.5m. Seeds of sweet corn (var. BARI Sweet corn-1) were sown according to treatment with the spacing of 45 cm×25 cm. The experimental plots were prepared and labeled properly. Lime was also applied due to minimize the soil acidity in hilly areas. Fertilizers at the rate of 150-60-90-

20 kg/ha of NPKS were applied in the form of Urea, Triple Super Phosphate (TSP), Muriate of Potash (MoP) and Gypsum, respectively. The full amount of TSP, MoP, Gypsum and 1/3 of urea were applied as basal dose during final land preparation. The remaining 2/3 of urea were applied as side dressing at 30 and 55 days after emergence. Weeding, irrigation and insecticides spraying were done as when required to maintain an optimum growth condition for the crop. The green cob was harvested at 20-24 days after silking when the corn silks were turned to dry as brown color. The collected data were analyzed statistically and means were separated using LSD test at 5% level of significance.

**Results and Discussion**

Days to emergence showed considerable variation among the sowing time (Fig. 1) and this might be occurred due to variation of prevailing temperature of growing period (Table 3 and 4). Days to tasseling of sweet corn was also markedly differed by sowing time (Fig.1). This result is in agreement with the findings of Khan *et al.* (2009). They reported that days to tasseling were significantly affected by date of sowing. Days to tasseling decreased with delaying of sowing time. This might be due to differences in photoperiod and temperature among sowing times. Photoperiod and temperature can influence the timing of development events in maize (Aitken, 1977 and Allison and Daynard, 1979). These results are also in conformity with that of Khan *et al.* (2009), Khan *et al.* (2004) and Shaw (1988) who reported the dependence of tasseling duration on temperature and variety. Days to silking was influenced by sowing time (Fig.1). The minimum days to silking were recorded from 30 November sowing and the maximum days to silking were recorded from 20 December sowing. Significant effects of sowing date on days to silking in corn are reported by Khan *et al. (*2009) and Shafi *et al.* (2006).

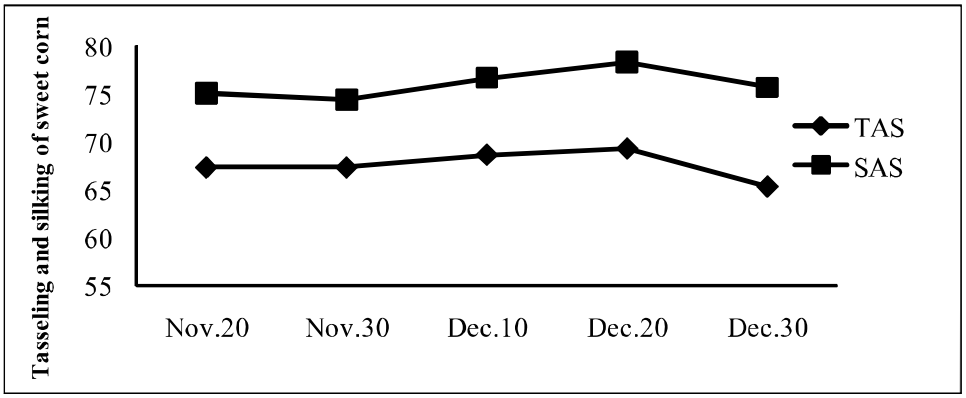


**Fig.1: Effect of sowing time on tasseling and silking of var. BARI Sweet corn-1.**

**Table 1. Effect of sowing time on the yield contributing characters of var. BARI sweet corn-1.**

| Sowing time | Plant height (m) | | Cob length (cm) | | Cob diameter (cm) | | Weight of individual cob (g) | |
|---|---|---|---|---|---|---|---|---|
| | 2010-11 | 2011-12 | 2010-11 | 2011-12 | 2010-11 | 2011-12 | 2010-11 | 2011-12 |
| Nov 20 | 2.40 | 2.46 | 15.85 | 17.46 | 4.09 | 4.82 | 107.4 | 156.77 |
| Nov 30 | 2.61 | 2.63 | 16.03 | 16.80 | 4.21 | 3.82 | 143.2 | 131.50 |
| Dec 10 | 2.68 | 2.57 | 16.66 | 17.00 | 4.18 | 4.44 | 139.43 | 159.43 |
| Dec 20 | 2.79 | 2.52 | 15.87 | 17.87 | 4.44 | 4.5 | 169.23 | 192.37 |
| Dec 30 | 2.81 | 2.70 | 17.37 | 18.07 | 4.18 | 4.5 | 149.4 | 196.00 |
| $LSD_{(0.05)}$ | NS | NS | NS | 0.42 | 0.16 | 0.35 | 6.3 | 8.861 |
| CV (%) | 6.37 | 5.76 | 6.37 | 4.12 | 1.93 | 4.28 | 9.55 | 2.81 |

**Table 2. Effect of sowing time on the yield of green cob, fodder and TSS of var. BARI Sweet corn-1.**

| Sowing time | Yield of green cob ( t/ha) | | | Fodder yield (t/ha) | | | TSS (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2010-11 | 2011-12 | Mean | 2010-11 | 2011-12 | Mean | 2010-11 | 2011-12 | Mean |
| Nov 20 | 8.43 | 8.60 | 8.51 | 38.76 | 38.94 | 38.85 | 13.78 | 12.96 | 13.37 |
| Nov 30 | 7.81 | 8.03 | 7.92 | 38.32 | 39.99 | 39.15 | 13.57 | 14.46 | 14.01 |
| Dec 10 | 5.59 | 7.67 | 6.63 | 40.61 | 34.39 | 37.50 | 13.00 | 13.91 | 13.46 |
| Dec 20 | 5.00 | 8.11 | 6.55 | 38.22 | 37. 08 | 37.65 | 13.27 | 13.31 | 13.29 |
| Dec 30 | 6.46 | 6.15 | 6.30 | 37.47 | 33.94 | 35.70 | 12.54 | 13.62 | 13.08 |
| $LSD_{(0.05)}$ | 1.35 | 2.26 | - | NS | NS | - | 1.10 | 0.59 | - |
| CV (%) | 5.78 | 9.91 | - | 9.05 | 6.73 | - | 4.42 | 2.52 | - |

Sowing time significantly influenced the cob length, cob diameter, weight of individual cob, yield of green cob, yield of fodder and TSS value of BARI sweet corn-1 (Table 1and 2) but no significant variation was observed in plant height. The maximum cob length was recorded from 30 December sowing in 2011-12 but at par to Dec 20 sowing but significant difference was not found during 2010-11. During 2010-11, maximum cob diameter (4.44 cm) was recorded from 20 December sowing whereas minimum from 20 November (4.09 cm) sowing. But during 2011-12, maximum cob diameter (4.82 cm) was recorded from 20 November sowing whereas minimum from 30 November (3.82 cm) sowing. The highest individual cob weight (169.23 g) was obtained from 20 December sowing and the lowest weight of individual cob (107.40 g) was obtained from 20 November sowing. But during 2010-11, individual cob weight (196.00 g) was obtained from 30 December sowing and 20 December (192.37 g) were statistically at par and the lowest weight (131.50 g) from 30 November sowing. Individual cob weight was found higher in late sowing. Temperature was lower at late sown condition (Table 3 and 4). Sencar *et al.* (1997) stated that weight of individual cob increased with delayed sowing time. The maximum green cob yield (8.43 t/ha) was recorded from 20 November sowing followed by nearly 30 sowing in 2010-11 but at par all sowing time except Dec. 30 in 2011-12. It was sorted that green cob increased up to Dec.20 in 2011-12 but dramatically reduced after Nov.30 sowing during 2010-11. In both the years, lowest yield was recorded from 30 December (6.11 t/ha) in 2011-12 but lower yield from Dce.10 to 30 in 2010-11. Average over the years, maximum yield was recorded 20 November sowing (8.51 t/ha) followed by 30 November sowing (7.92 t/ha). There was trend to decrease yield with the advancement of sowing time. Lower yield was recorded from 10 December sowing onward. This might be due to differences of environmental condition during the growing period due to different sowing time. Environmental conditions may have reduced photoassimilate production during the lag phase of late sown maize, because both temperature and incident solarradiation were low at that time which affected biomass production and perhaps sink activity (Ou-Lee and Setter, 1985). Some researchers also stated that delaying the sowing date resulted in decreased yields (Ishimura *et al.* (1984), Tomorga *et al.* (1985), Imholte and Carter (1987). Fodder yield was statistically identical in both the years but maximum fodder yield (40.61 t/ha) was found from 10 December sowing but the maximum fodder was recorded (39.99 t/ha) from 30 December sowing during 2011-12. But higher mean yield of fodder was recorded from 30 November (39.15 t/ha) followed by 20 November sowing (38.85 t/ha). The minimum green fodder yield was recorded from late sowing. Sweetness of the green cob i.e., TSS (% brix) value

varied significantly due to different sowing dates. The TSS value was recorded statistically identical in different sowing time except Dec. 30 sowing during 2010-11 but Nov. 30 and Dec.10 sowing was identical in 2011-12. The highest mean TSS value was recorded at 30 November sowing and reduced TSS statistically with the advancement of sowing time.

**Table 3. Weather data during 2010-2011 (10-days Interval).**

| Date | Temperature ($0^C$) | | Mean | Humidity (%) | Rainfall (cm) |
|---|---|---|---|---|---|
| | Maximum | Minimum | | | |
| 1-10 November,2010 | 24.0 | 20.0 | 22.00 | 77.45 | 0 |
| 11-20 November,2010 | 26.0 | 19.0 | 22.50 | 77.55 | 0 |
| 21-30 November,2010 | 24.5 | 19.0 | 21.75 | 75.00 | 0 |
| 1-10 December,2010 | 24.00 | 18.00 | 21.60 | 78.70 | 0 |
| 11-20 December,2010 | 19.80 | 16.0 | 18.65 | 80.45 | 0 |
| 21-31 December,2010 | 20.00 | 17.00 | 19.17 | 81.63 | 0 |
| 1-10 January,2011 | 24.00 | 13.70 | 18.85 | 77.95 | 0 |
| 11-20 January,2011 | 20.50 | 12.50 | 16.50 | 78.60 | 0 |
| 21-30 Janury,2011 | 24.00 | 13.36 | 18.68 | 76.04 | 0 |
| 1-10 February,2011 | 25.40 | 14.30 | 19.85 | 58.40 | 0 |
| 11-20 February,2011 | 26.70 | 15.80 | 21.25 | 58.37 | 0 |
| 21-28 February,2011 | 27.75 | 18.37 | 23.06 | 56.86 | 0 |
| 1-10 March,2011 | 29.80 | 18.20 | 24.00 | 73.25 | 0 |
| 11-20 March,2011 | 30.70 | 20.70 | 25.70 | 73.10 | 0 |
| 21-31 March,2011 | 31.45 | 23.81 | 27.63 | 74.40 | 0 |
| 1-10 April,2011 | 32.70 | 23.10 | 27.90 | 74.50 | - |
| 11-20 April,2011 | 33.70 | 26.70 | 30.20 | 73.80 | - |
| 21-30April,2011 | 33.40 | 24.70 | 29.05 | 74.35 | 2.80 |
| 1-10 May,2011 | 33.20 | 24.70 | 28.95 | 73.35 | - |
| 11-20 May,2011 | 34.20 | 28.00 | 31.10 | 76.10 | - |
| 21-31May,2011 | 31.00 | 27.60 | 29.30 | 77.95 | 28.48 |

Source: Daily Weather Data, Khagrachari, 2011-12

**Table 4. Weather data during 2011-2012 (10-days Interval)**

| Date | Temperature ($0^C$) | | Mean | Humidity (%) | Rainfall (cm) |
|---|---|---|---|---|---|
| | Maximum | Minimum | | | |
| 1-10 November,2011 | 24.7 | 20.6 | 22.65 | 78.45 | 0 |
| 11-20 November,2011 | 26.5 | 19.4 | 22.95 | 79.55 | 0 |
| 21-30 November,2011 | 24.8 | 19.2 | 22.00 | 78.00 | 0 |
| 1-10 December,2011 | 24.40 | 18.80 | 21.60 | 80.70 | 0 |
| 11-20 December,2011 | 20.80 | 16.5 | 18.65 | 84.45 | 0 |
| 21-31 December,2011 | 20.81 | 17.54 | 19.17 | 81.63 | 0 |
| 1-10 January,2012 | 21.50 | 17.60 | 19.55 | 80.65 | 0 |
| 11-20 January,2012 | 18.50 | 14.5 | 16.50 | 78.30 | 0 |
| 21-30 Janury,2012 | 18.36 | 13.36 | 15.86 | 75.90 | 0 |
| 1-10 February,2012 | 24.20 | 14.20 | 19.20 | 72.30 | 0 |
| 11-20 February,2012 | 26.20 | 15.80 | 21.00 | 69.73 | 0 |
| 21-29 February,2012 | 27.66 | 17.11 | 22.38 | 61.90 | 0 |
| 1-10 March,2012 | 28.60 | 22.40 | 25.50 | 72.80 | 0 |
| 11-20 March,2012 | 28.10 | 20.20 | 24.15 | 68.75 | 0 |
| 21-31 March,2012 | 31.81 | 25.54 | 28.67 | 70.30 | 0 |
| 1-10 April,2012 | 29.70 | 23.70 | 26.70 | 69.60 | - |
| 11-20 April,2012 | 30.20 | 25.10 | 27.65 | 68.45 | - |
| 21-30April,2012 | 30.80 | 27.30 | 29.05 | 71.70 | 19.56 |
| 1-10 May,2012 | 29.50 | 25.30 | 27.40 | 71.70 | - |
| 11-20 May,2012 | 33.60 | 27.70 | 30.65 | 72.15 | - |
| 21-31May,2012 | 32.90 | 29.90 | 31.40 | 75.50 | 11.94 |

Source: Daily weather Data, Khagrachari, 2011-12

## Conclusion

The result revealed that 20 November to 30 November sowing could be suitable for sweet corn cultivation in hilly region in respect of green cob yield as well as fodder yield and TSS value.

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