

## Screening of Promising Sugarcane Genotypes for Quality Jaggery

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### Abstract

A study was undertaken to evaluate the promising sugarcane genotypes for quality jaggery at the AICRP on Post Harvest Engineering and Technology, Regional Sugarcane and Jaggery Research Station, Kolhapur during the year 2023-24. Eleven (11) promising sugarcane genotypes viz.; Co 13008, Co 14004, Co 14005, CoSnk17006, CoT1 14111, PI 15131, CoVSI17121, Co 11015, CoN 15071, Co 19008, CoM 18022 were tested along with three released varieties for the state viz., CoM 09057, Co 92005 and Co 86032 at 12 months of crop age. At 12 months crop age juice quality parameters viz. brix, sucrose and CCS per cent were found statistically significant except purity per cent. The sugarcane genotype Co 11015 recorded the highest brix (22.50°) which was on par with the genotypes CoM 18022 (22.20°), Co 13008 (21.50°), CoN 15071 (21.50°) and the variety Co 09057 (22.00°), Co 92005 (21.70°), CoM 18022 (22.20%) Co 86032 (21.50°). The significantly highest sucrose per cent was recorded by the genotype Co 11015 (19.11%) which was on par with the genotypes CoM 18022 (18.90%) and varieties Co 09057 (18.67%), Co 92005 (18.45%), Co 13008 (18.31%). However, the highest CCS per cent was recorded by the genotype Co 11015 (13.31%) which was on par with the genotypes CoM 18022 (13.19%) variety Co 09057 (13.00%), Co 92005 (12.86%), Co 86032 (12.77%) Co 13008 (12.77%). The variety Co 86032 recorded the significantly highest NRS (83.12%) which was on par with the genotypes PI 15131(82.91%), Co 11015 (82.70%), Co 92005 (82.28%), CoM 09057 (82.28%) The significantly lowest colour intensity of jaggery (0.051 O.D.) was recorded by the variety Co 92005 which was on par with variety CoM 09057 (0.057 O.D.) and followed by the genotypes Co 11015 (0.071 O.D.) & variety Co 86032 (0.074 OD). The variety Co 86032 recorded significantly highest jaggery yield (16.37 t ha<sup>-1</sup>) which was on par with variety CoM 09057 (14.92 t ha<sup>-1</sup>) and followed by the genotypes CoM 18022 (13.54 t ha<sup>-1</sup>) Co 13008 (11.57 t ha<sup>-1</sup>) and Co 11015 (11.14 t ha<sup>-1</sup>).

**Key words :** Sugarcane, Promising genotypes, Juice quality and Jaggery quality.

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Maharashtra is one of the leading state in area (16.06 lakh ha) and production (99 lakh ton) of sugarcane crop in India, during the year 2015-26 (Anonymous, 2026). It is also well known state for production of quality jaggery from sugarcane. Around 20 to 25 per cent of total sugarcane production of the India is utilized for jaggery production through the small jaggery processing units located in rural areas of the India during the year 2025-26. Kolhapur is one of the main markets for jaggery in India as it ranks first in qualitative terms helping local farmers and jaggery producers to get higher monetary returns.

Sugarcane is used as raw product for

preparation of jaggery and therefore it is of utmost importance for quality jaggery production. Hence, prime essentiality should be given for selection of sugarcane variety while growing sugarcane crop for the purpose of jaggery production. Sugarcane varieties have a pivotal role in the production of quality and quantity of jaggery per unit area and time. It is a common experience with jaggery manufacturers to find a wide variation in the quality of jaggery resulting from different varieties although grown under natural condition (Ghosh et. al., 1998). Quality of jaggery is influenced by many factors of pre harvest technology viz.; soil type, sugarcane variety, crop management and

harvesting at right maturity etc. Sugarcane variety with proper maturity plays an important and dominant role in jaggery yield and quality (Jadhav et al., 1999).

In the recent past, new jaggery manufacturing pockets like Daund, Latur and Parbhani are emerging in the state due to surplus production of sugarcane and release of ban on new jaggery processing plants by the state government. As such there is a need to provide special sugarcane variety which will produce jaggery of superior quality and fetch higher prices in the market. With this view screening and evaluation of promising sugarcane genotypes were undertaken to study the jaggery yield and quality.

### Materials and Methods

The field experiment was conducted at the research farm of Regional Sugarcane and Jaggery Research Station, Kolhapur during the year 2023-24. Eleven (11) promising sugarcane genotypes viz., Co 13008, Co 14004, Co 14005, CoSnk17006, CoT1 14111, PI 15131, CoVSI17121, Co 11015, CoN 15071, Co 19008, CoM 18022 were tested along with three released varieties for the state viz., CoM 09057, Co 92005 and Co 86032. The crop was planted on ridges and furrows, spaced at a distance of 1.20 meter. The experiment was laid out in randomized block design with 6 x 6 m plot size. The sugarcane was planted in the second fortnight of February. The recommended dose of fertilizers for jaggery production i.e., 200:115:115 NPK kg ha<sup>-1</sup> was applied to suru sugarcane crop. The crop was cultivated by adopting recommended package of practices.

The sugarcane varieties and genotypes were harvested at 10 and 12 months crop age. The randomly five sugarcane clumps were selected for observation and mean values were worked out for investigation. The harvested sugarcane

was crushed through horizontal, three roller crusher. The juice samples were taken to the laboratory and were analyzed for brix and sucrose content as per analytic methods described by Parthasarathi et al. (1979). Based on brix and sucrose content data, the CCS and Purity per cent were computed by using Winter's formula.

The jaggery samples were prepared from the selected varieties and genotypes using small pan of 25 L capacity. Improved jaggery production process was adopted for experimental jaggery production (Mungare *et al.*, 2001). The jaggery samples were analyzed for jaggery quality parameters viz; Reducing Sugars, Non Reducing Sugars, pH, and Colour intensity. The reducing sugar was determined by Lane - Eynon volumetric method (A.O.A.C., 1960). The non reducing sugar was determined by using Polarimeter. The colour intensity was measured by using spectrophotometer at 540 nm wavelength.

### Resulta and Discussion

The quality of juice and jaggery of promising genotypes and released varieties were studied at 10 and 12 months crop age. The data on juice, jaggery quality, jaggery recovery and yield parameters are presented in Table 1 and Table 2, respectively.

#### Juice quality at 10 months crop age :

It was found that, the quality parameters viz. brix and sucrose per cent were found statistically significant, The genotypes CoM 18022, Co 11015 and Co 13008 recorded highest brix (20.71°), (19.42°), (19.32°) and highest sucrose (17.72%), (16.68%), (16.53%) respectively and followed by the variety Co 92005, CoM 09057 and genotypes CoN 15071. However, the quality parameters viz. CCS per cent was noticed with same trend.

#### Juice quality at 12 months crop age :

The juice quality parameters viz. brix, sucrose and CCS per cent were found statistically significant except purity per cent. The genotype Co 11015 recorded the highest brix (22.50°) which was on par with the genotypes CoM 18022 (22.20°), Co 13008 (21.50°), CoN 15071 (21.50°) and the variety Co 09057 (22.00°), Co 92005 (21.70°), CoM 18022 (22.20%) Co 86032 (21.50°). The significantly highest sucrose per cent was recorded by the genotype Co 11015 (19.11%) which was on par with the genotypes CoM 18022 (18.90%) and varieties Co 09057 (18.67%), Co 92005 (18.45%), Co 13008 (18.31%). However, the highest CCS per cent was recorded by the genotype Co 11015 (13.31%) which was on par with the genotypes CoM 18022 (13.19%) variety Co 09057 (13.00%), Co 92005 (12.86%), Co 86032 (12.77%) and Co 13008 (12.77%).

#### Jaggery quality at 10 months crop age:

The lowest RS (9.40%) and highest NRS (81.45%) was recorded by the genotype CoVSI

17121 which was on par with the genotypes Co 14005 (RS 9.45%) & NRS (81.45%). The varieties Co 92005, CoM 09057 and the genotype Co 11015 were recorded the lowest colour intensity (0.075 OD) at 10 months crop age.

#### Jaggery quality at 12 months crop

**age:** The variety Co 86032 recorded the significantly highest NRS (83.12%) which was on par with the genotypes PI 15131(82.91%), Co 11015 (82.70%), Co 92005 (82.28%), CoM 09057 (82.28%).Significantly lowest RS (8.59%) was registered by the genotype Co 11015 at 12 months crop age which was on par with the varieties Co 86032 (8.76%), Co 92005 (8.80%) and CoM 09057 (8.80%) and genotypes PI 15131 (8.72%), Co 11015 (8.70%). In respect of jaggery pH, significantly lowest pH was recorded by the variety CoM 09057 (4.96) which was on par with varieties Co 86032 (4.99), Co 92005 (4.99) and genotypes Co 11015 (5.00).

**Table 1.** Juice quality of sugarcane varieties at 10 and 12 month crop age

| Variety     | 10 month crop age |             |            |         | 12 Month crop age |             |            |         |
|-------------|-------------------|-------------|------------|---------|-------------------|-------------|------------|---------|
|             | Brix (°)          | Sucrose (%) | Purity (%) | CCS (%) | Brix (°)          | Sucrose (%) | Purity (%) | CCS (%) |
| Co 13008    | 19.32             | 16.53       | 85.57      | 11.56   | 21.50             | 18.31       | 85.15      | 12.77   |
| Co 14004    | 17.80             | 15.42       | 86.61      | 10.85   | 20.50             | 17.50       | 85.36      | 12.22   |
| Co 14005    | 17.67             | 15.34       | 86.84      | 10.81   | 21.00             | 17.94       | 85.44      | 12.54   |
| CoSnk 17006 | 17.33             | 15.04       | 86.78      | 10.59   | 20.50             | 17.50       | 85.36      | 12.22   |
| CoT1 14111  | 17.50             | 15.19       | 86.82      | 10.70   | 20.00             | 17.13       | 85.63      | 11.98   |
| PI 15131    | 17.50             | 15.11       | 86.37      | 10.62   | 20.50             | 17.58       | 85.74      | 12.31   |
| CoVSI 17121 | 18.02             | 15.57       | 86.41      | 10.94   | 21.00             | 17.94       | 85.45      | 12.54   |
| Co 11015    | 19.42             | 16.68       | 85.92      | 11.69   | 22.50             | 19.11       | 84.92      | 13.31   |
| CoN 15071   | 18.55             | 16.02       | 86.39      | 11.26   | 21.50             | 18.31       | 85.15      | 12.77   |
| CoM 09057   | 18.55             | 16.02       | 86.39      | 11.26   | 22.00             | 18.67       | 84.86      | 13.00   |
| Co 86032    | 18.02             | 15.57       | 86.39      | 10.94   | 21.50             | 18.30       | 85.13      | 12.77   |
| Co 92005    | 18.70             | 16.00       | 85.59      | 11.20   | 21.70             | 18.45       | 85.03      | 12.86   |
| Co 19008    | 16.52             | 14.36       | 86.96      | 10.13   | 20.99             | 17.94       | 85.49      | 12.54   |
| CoM 18022   | 20.71             | 17.72       | 85.56      | 12.39   | 22.20             | 18.90       | 85.14      | 13.19   |
| SE ±        | 0.28              | 0.24        | 0.19       | 0.17    | 0.43              | 0.35        | 0.21       | 0.24    |
| CD at 0.05  | 0.83              | 0.70        | 0.55       | 0.49    | 1.26              | 1.03        | NS         | 0.71    |

**Table 2.** Initial analysis of jaggery quality parameters of sugarcane at 10 and 12 month crop age

| Variety     | 10 month crop age |        |      |             |        |                  |                             |         |
|-------------|-------------------|--------|------|-------------|--------|------------------|-----------------------------|---------|
|             | NRS (%)           | RS (%) | pH   | Colour (OD) | MC (%) | Jaggery Rec. (%) | Yield (t ha <sup>-1</sup> ) |         |
|             |                   |        |      |             |        |                  | Cane                        | Jaggery |
| Co 13008    | 78.33             | 10.15  | 5.43 | 0.111       | 7.48   | 9.30             | 97.07                       | 9.03    |
| Co 14004    | 78.12             | 10.65  | 5.34 | 0.135       | 6.55   | 8.90             | 81.85                       | 7.28    |
| Co 14005    | 81.45             | 9.45   | 5.44 | 0.114       | 6.84   | 9.05             | 70.69                       | 6.40    |
| CoSnk 17006 | 78.12             | 10.65  | 5.42 | 0.150       | 7.70   | 8.97             | 105.19                      | 9.43    |
| CoT1 14111  | 80.00             | 10.20  | 5.49 | 0.115       | 6.56   | 9.13             | 104.86                      | 9.57    |
| PI 15131    | 81.24             | 9.54   | 5.34 | 0.134       | 5.93   | 9.30             | 81.51                       | 7.58    |
| CoVSI 17121 | 81.45             | 9.40   | 5.41 | 0.109       | 8.44   | 9.63             | 53.11                       | 5.12    |
| Co 11015    | 81.24             | 10.42  | 5.23 | 0.075       | 7.44   | 9.47             | 82.58                       | 7.82    |
| CoN 15071   | 80.41             | 10.65  | 5.48 | 0.106       | 7.07   | 9.18             | 75.40                       | 6.92    |
| CoM 09057   | 80.83             | 10.54  | 5.23 | 0.075       | 8.51   | 9.75             | 92.02                       | 8.97    |
| Co 86032    | 80.20             | 10.65  | 5.23 | 0.084       | 7.25   | 9.52             | 117.69                      | 11.21   |
| Co 92005    | 81.66             | 9.99   | 5.43 | 0.075       | 6.84   | 9.37             | 90.41                       | 8.47    |
| Co 19008    | 81.74             | 9.81   | 5.31 | 0.131       | 7.27   | 9.46             | 91.28                       | 8.63    |
| CoM 18022   | 79.04             | 10.68  | 5.38 | 0.176       | 7.22   | 9.56             | 103.54                      | 9.90    |
| SE ±        | 0.87              | 0.20   | 0.15 | 0.003       | 0.47   | 0.15             | 5.63                        | 0.52    |
| CD at 0.05  | 2.54              | 0.57   | NS   | 0.010       | NS     | 0.43             | 16.47                       | 1.52    |

**Table 2.** Contd.

| Variety     | 12 month crop age |        |      |             |        |                  |                             |         |
|-------------|-------------------|--------|------|-------------|--------|------------------|-----------------------------|---------|
|             | NRS (%)           | RS (%) | pH   | Colour (OD) | MC (%) | Jaggery Rec. (%) | Yield (t ha <sup>-1</sup> ) |         |
|             |                   |        |      |             |        |                  | Cane                        | Jaggery |
| Co 13008    | 80.41             | 9.18   | 5.76 | 0.097       | 6.16   | 10               | 115.66                      | 11.57   |
| Co 14004    | 80.83             | 9.14   | 5.62 | 0.129       | 6.38   | 10.04            | 94.65                       | 9.50    |
| Co 14005    | 81.24             | 9.01   | 5.83 | 0.103       | 7.76   | 8.89             | 73.17                       | 6.50    |
| CoSnk 17006 | 78.75             | 10.20  | 5.66 | 0.140       | 6.16   | 8.24             | 119.08                      | 9.81    |
| CoT1 14111  | 80.83             | 9.14   | 5.75 | 0.107       | 6.16   | 8.61             | 123.96                      | 10.68   |
| PI 15131    | 82.91             | 8.72   | 5.56 | 0.130       | 5.71   | 9.61             | 91.62                       | 8.81    |
| CoVSI 17121 | 81.24             | 8.72   | 5.63 | 0.099       | 6.16   | 9.21             | 70.53                       | 6.49    |
| Co 11015    | 82.70             | 8.70   | 5.00 | 0.071       | 5.71   | 11.89            | 93.67                       | 11.14   |
| CoN 15071   | 82.49             | 8.72   | 5.76 | 0.090       | 5.93   | 10.07            | 97.86                       | 9.85    |
| CoM 09057   | 82.28             | 8.80   | 4.96 | 0.057       | 5.49   | 12.74            | 117.14                      | 14.92   |
| Co 86032    | 83.12             | 8.76   | 4.99 | 0.074       | 6.61   | 11.09            | 147.60                      | 16.37   |
| Co 92005    | 82.28             | 8.80   | 4.99 | 0.051       | 5.26   | 11.01            | 99.49                       | 10.96   |
| Co 19008    | 81.85             | 9.36   | 5.08 | 0.128       | 4.54   | 9.97             | 109.57                      | 10.92   |
| CoM 18022   | 80.04             | 10.04  | 5.10 | 0.187       | 5.97   | 10.16            | 133.29                      | 13.54   |
| SE ±        | 0.57              | 0.19   | 0.08 | 0.003       | 0.09   | 0.12             | 7.51                        | 0.78    |
| CD at 0.05  | 1.67              | 0.56   | 0.22 | 0.008       | 0.27   | 0.35             | 21.96                       | 2.28    |

The significantly lowest colour intensity of jaggery (0.051 O.D.) was recorded by the variety Co 92005 at 12 months crop age which was on par with variety CoM 09057 (0.057 O.D.) and followed by the genotypes Co 11015 (0.071 O.D.) and variety Co 86032 (0.074 OD). In respect of moisture content significantly lowest moisture content was recorded by the genotype Co 19008 (4.54%) and followed by the varieties Co92005 (5.26%), CoM 09057 (5.49%) the genotypes Co 11015 (5.71%), PI 11131 (5.71%).

**Jaggery recovery and yield at 10 months crop age :** The variety Co 86032 recorded significantly highest jaggery yield ( $11.21 \text{ t ha}^{-1}$ ) which was on par with variety CoM 18022 ( $9.90 \text{ t ha}^{-1}$ ) and followed by the genotypes CoT1 14111 ( $9.57 \text{ t ha}^{-1}$ ). In respect of jaggery recovery, variety CoM 09057 recorded significantly highest jaggery recovery (9.75%) which was on par with the genotype CoVSI 17121 (9.63%), CoM 18022 (9.56%), Co 86032 (9.52%), Co 11015 (9.47%).

**Jaggery recovery and yield at 12 months crop age :** However, at 12 months crop age, the variety Co 86032 recorded significantly highest jaggery yield ( $16.37 \text{ t ha}^{-1}$ ) which was on par with variety CoM 09057 ( $14.92 \text{ t ha}^{-1}$ ) and followed by the genotypes CoM 18022 ( $13.54 \text{ t ha}^{-1}$ ) Co 13008 ( $11.57 \text{ t ha}^{-1}$ ) and Co 11015 ( $11.14 \text{ t ha}^{-1}$ ). The variety CoM 09057 recorded the significantly highest jaggery recovery (12.74%) and followed by the genotype Co 11015 (11.89%).

## Conclusion

Among all the genotypes, Co 11015 was found superior for better quality of jaggery parameters *viz.* NRS (82.70%), lowest RS (8.70%), lowest colour intensity (0.071 OD) and highest jaggery recovery (11.89%).

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