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Research Article

Cane juice quality variation at different sampling locations

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Abstract

Qualitative analysis of Sugarcane (*Saccharum officinarum*.L) is a matter of prime concern and important for millers as sugar recovery of a sugar factory depends upon quality of cane juice. Studies reported here were conducted by collecting samples of two approved sugarcane varieties viz; SPF 234 and CP 77-400 from different locations/districts of Punjab. Fifteen samples of SPF 234 and seven samples of CP 77-400 were analyzed for their qualitative behavior under different agro-climatic conditions of the Punjab. It was found that in case of SPF 234, maximum (13.44%) and minimum (9.83%) sugar recoveries were obtained, when sampling was made from Rajanpur and D.G. Khan, respectively, while average sugar recovery remained 11.91%. At Sugarcane Research Institute (SRI) farm, it was 12.58%. Similarly, CP 77-400 showed the highest (13.18%) and lowest (8.68%) sugar recoveries at Shakargarh and Narowal sampling sites, respectively, while its average sugar recovery was 12.98% at SRI farm on the same day. Results revealed that same variety may produce different qualitative results under different agro-climatic conditions.

Key word: locations, sampling, sugarcane, varieties, Pakistan.

Introduction

Sugarcane is a major source of sugar and raw material for agro based industries (Ghaffar *et al.,* 2008). The major cane producing countries of the world like Brazil, India and China have higher cane production of 71915700, 277750000 and 111454359 million tones, respectively, as compared to 29372900million tonnesin Pakistan (FAO,2010). Sugarcane plays a vital role in agrarian economy of Pakistan as it is the main source of *Gur, Shakar* and white sugar (Atta *et al.,* 1992). However, cane yield and sugar recovery depend upon a high yielding variety. Therefore, constant replacement of old varieties with new ones is necessary as old susceptible varieties coupled with orthodox production technology is a major yield limiting factor (Atta *et al.,* 1991).

Similarly sugarcane varieties deteriorate after some years due to pathogens and environmental changes (Aslam *et al.,* 1998). Unfortunately, the pace of varietal development is slow as compared to sugar industry expansion (Fasihi *et al.,* 1988). Sugarcane growers are mainly interested in variety for production while millers in sugar recovery (Malik, 1994), as cane growers are concerned with tops and trash while low recovery varieties increase sugar price by increasing manufacturing cost and affecting profit margin of industry (Malik, 1994). So a sugarcane variety must be recommended for cultivation, after characterizing for various economic traits (Malik, 1998).The present study was therefore, designed on two approved sugarcane varieties to evaluate their juice quality behavior under different agro-climatic conditions of the Punjab.

Materials and Methods

To determine the cane quality during cane crushing seasons, samples of two approved sugarcane varieties i.e. SPF 234 and CP 77-400 were collected from growers and sent to Sugarcane Technology Laboratory of Sugarcane Research Institute (SRI), Faisalabad for qualitative analysis. Juice of variable concentration was extracted from these samples by crushing through a power crusher. Extracted juice was then taken in 500 mL volumetric cylinders. After twenty minutes, brix and temperature of juice were recorded with the help of a hydrometer calibrated at 20 °C. Then 100mL of juice sample was separated to mix with it dry lead sub-acetate in a glass jar. The mixture was then filtered through filter paper sheets to

obtain a transparent filtrate in a 250 mL volumetric flask in order to determine pol reading of juice through polarimeter. Brix was corrected by adding/subtracting a correction factor. Pol of juice was determined with the help of Schmitz's table. Purity was calculated by the following relation.

$$\text{Purity } (\%) = \frac{Pol}{Brix} \times 100$$

Commercial cane sugar was calculated by CCS formula by using brix and pol valuesat constant

$$\text{CCS} = \frac{3P}{2}\left(1 - \frac{F+5}{100}\right) - \frac{B}{2}\left(1 - \frac{F+3}{100}\right)$$

fiber 12.5%.

Sugar recovery percentage was calculated by multiplying a constant value 0.94 with CCS. The analytical methods used for the analysis were the same as mentioned by Spencer and Meade (1963).

Results and Discussion

Brix: Brix indicates total soluble solids in cane juice. A perusal of data embodied in Table 1&2, indicated the highest brix (20.57%) in the sample collected from Rajanpur in case of SPF 234 and 20.37% in CP 77-400 from Shakargarh. The highest brix may be due to maturity of crop. The lowest brix (15.90%) in SPF 234 and 16.60% in CP 77-400 were observed in samples collected from D.G. Khan and Narowal, respectively. The lowest value of brix may be due to immature cane crop. The average brix was 18.71%. Variation in brix was also noted by Bashar and Paul (2005) when they observed the performance of four sugarcane clones along with two standard varieties under different agro-climatic conditions.

Pol: It describes the sugar concentration. Table 1& 2 showthe highest pol (18.58%) in SPF 234 fromRajanpur and 18.28% in CP 77-400 from Shakargarh. The highest brix were also observed in the same samples of same locations. The lowest pol (13.88% and 13.13%) were recorded in the samples of SPF 234 and CP 77-400 collected from D.G. Khan and Narowal. Javed *et al.* (2000) also recorded variation in pol when they studied five clones of sugarcane for their yield and quality characteristics.

Purity: It is ratio of pol to brix. According to data presented in Tables 1 and 2, the highest purities of 90.39% and 89.91% were obtained in samples collected from T.T. Singh and farms of Sugarcane Research Institute for varieties SPF 234 and CP77-400, respectively. The lowest purities in SPF 234 (86.44%) and CP 77-400 (79.10%) were in the samples from Multan and Narowal, respectively. The average juice purities remained 88.83% in SPF 234 and 89.91% in CP 77-400, respectively. In case of SPF 234, two samples from different localities Lodhran and Burewala showed same juice purity (89.28%). These observations are in consonance with Javed*et al.*(2001) who recorded similar kind of observations.

CCS and Sugar recovery: These are interrelated terms. Tabulated data indicated highest CCS (14.30%) and sugar recovery (13.44%) in the samples of SPF 234 collected from Rajanpur while thelowest CCS (10.46%) and sugar recovery (9.83%) in the samples collected from D.G. Khan. The highest CCSand sugar recovery may be due to higher brix and pol of these samples. While in case of CP 77-400, maximum CCS (14.02%) and sugar recovery (13.18%) wer found in the cane juice of samples from Shakargarh. Similarly, minimum CCS (9.23%) and sugar recovery (8.68%) were observed in the samples of Narowal. The maximum and minimum CCS and sugar recovery in the samples of CP 77-400 were due to the highest and the lowest brix and pol, respectively, in these samples. These observation are in lines with those reported by Soomro*et al.*(2007) who reported difference in CCS when studied sugarcane genotypes at Thatta. Similar results were reported by Bahadar*et al.* (2007) when they found sugar recovery variations in sixty three genotypes.

Conclusion

It is concluded from the above discussion that same sugarcane variety may produce different juice qualitative results under different agro-climatic conditions.

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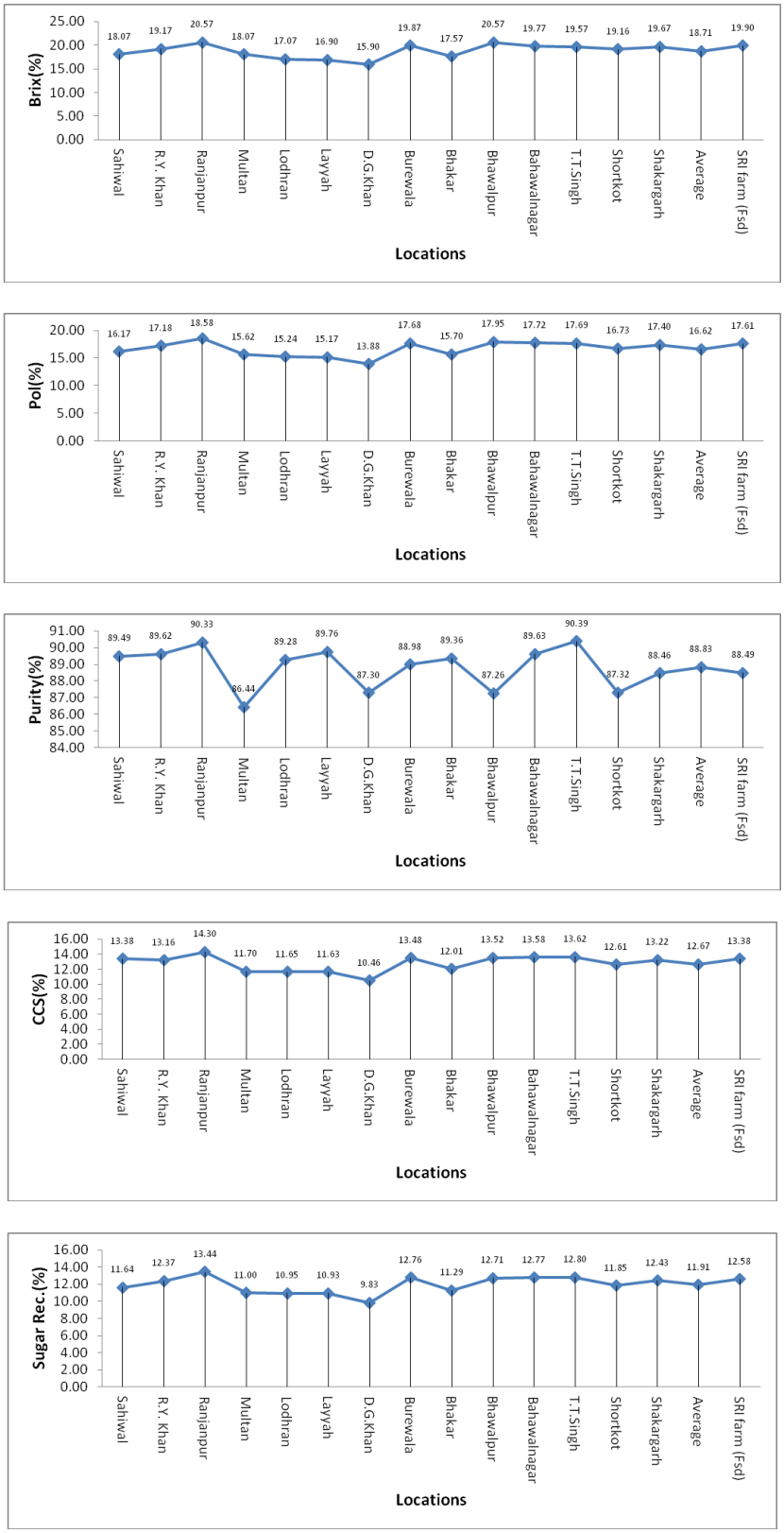
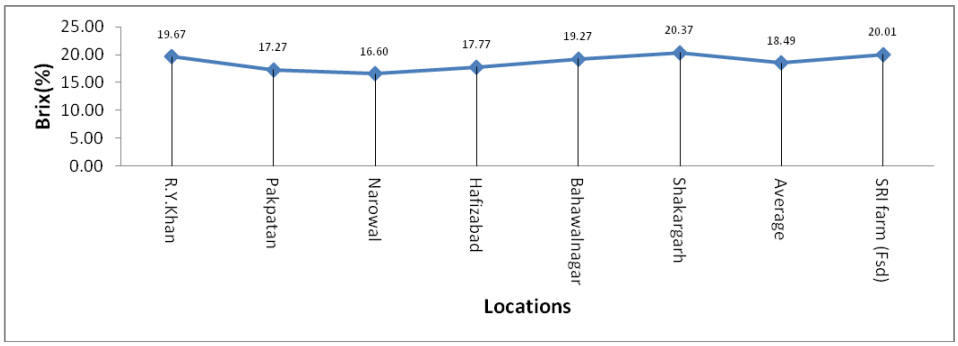
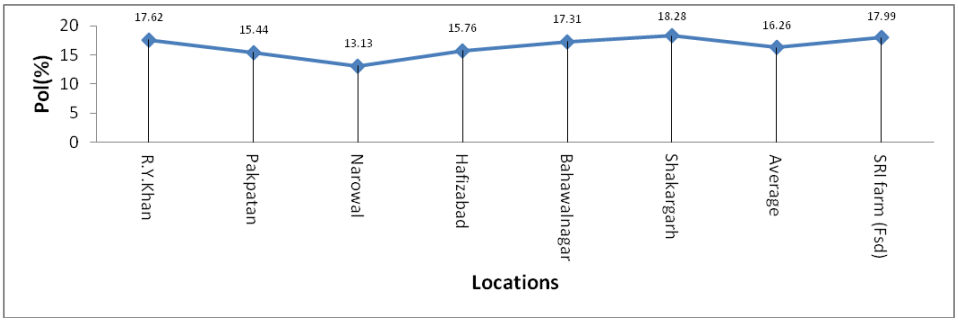
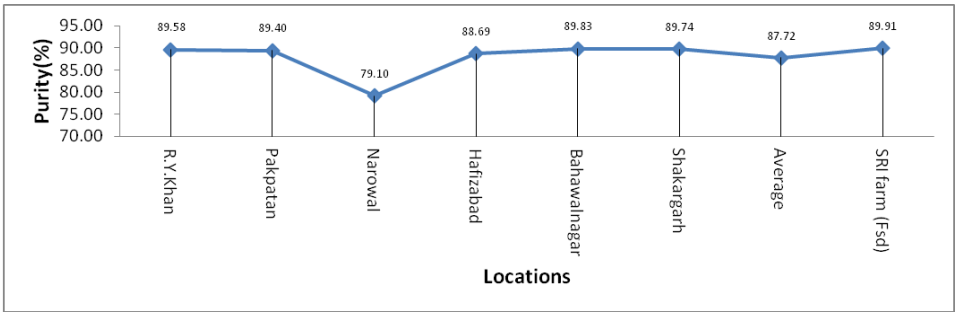
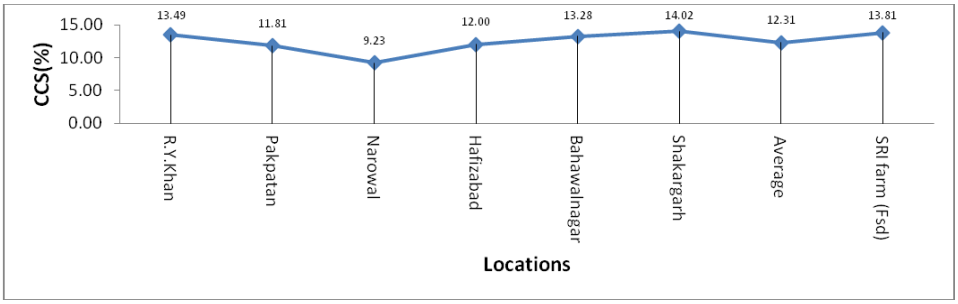


Fig. 1: Cane juice quality variation at different sampling locations for SPF 234.


Brix(%)
25.00
20.00
15.00
10.00
5.00
0.00
19.67
17.27
16.60
17.77
19.27
20.37
18.49
20.01
R.Y.Khan
Pakpatan
Narowal
Hafizabad
Bahawalnagar
Shakargarh
Average
SRI farm (Fsd)
Locations


Pol(%)
20
15
10
5
0
17.62
15.44
13.13
15.76
17.31
18.28
16.26
17.99
R.Y.Khan
Pakpatan
Narowal
Hafizabad
Bahawalnagar
Shakargarh
Average
SRI farm (Fsd)
Locations


Purity(%)
95.00
90.00
85.00
80.00
75.00
70.00
89.58
89.40
79.10
88.69
89.83
89.74
87.72
89.91
R.Y.Khan
Pakpatan
Narowal
Hafizabad
Bahawalnagar
Shakargarh
Average
SRI farm (Fsd)
Locations


CCS(%)
15.00
10.00
5.00
0.00
13.49
11.81
9.23
12.00
13.28
14.02
12.31
13.81
R.Y.Khan
Pakpatan
Narowal
Hafizabad
Bahawalnagar
Shakargarh
Average
SRI farm (Fsd)
Locations

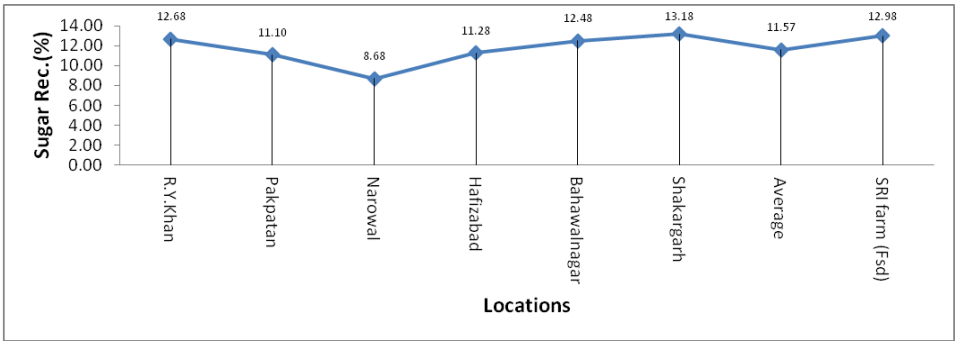

Sugar Rec.(%)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
12.68
11.10
8.68
11.28
12.48
13.18
11.57
12.98
R.Y.Khan
Pakpatan
Narowal
Hafizabad
Bahawalnagar
Shakargarh
Average
SRI farm (Fsd)
Locations

Fig. 2: Cane juice quality variation at different sampling locations for CP 77-400.

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