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Impact of Crushing Capacity of Sugarcane in India

Varucha Misra, A.K. Shrivastava, S. Solomon, M.I. Ansari and S.P. Shukla

ICAR-Indian Institute of Sugarcane Research, Lucknow, India

Abstract: Crushing is the most essential process for the production of sugar as well as other by-products like ethanol, baggase, molasses etc. Cane crushing affects the production of sugar and it is known that crushing capacity varies from place to place and even from mills to mills. Present data revealed that crushing capacity, both in U.P and Maharashtra as well as in whole of the India have similar trend over the past many years. On comparing, Maharashtra has higher sugar recovery than U.P. The average crushing duration was highest in U.P east and central Maharashtra in comparison to other zones of U.P and Maharashtra.

Key words: Crushing capacity · Maharashtra · Recovery · Sugarcane · U. P.

INTRODUCTION

Crushing is an important aspect in sugarcane crop as it leads to production of sugar. The crushing period starts in the month of October (when previous year ratoon was harvested) and ends in March and April of the immediate succeeding year. The maximum crushing month is January where large amount of harvested sugarcane is being crushed. In different states of India, this crushing period varies on the basis of the availability of sugarcane. This season may be delayed by one and half months [1]. In general, the crushing capacity affects the quality as well as quantity of sugar production [2]. Crushing of sugarcane is not only required for production of sugar but also for formation of other by-products *viz.*, Bagasse, press mud, khandsari etc., which are also equally economically important. The left-over fibrous residue of sugarcane (known as baggase) after crushing leads to production of electricity in sugar mills and also helps in paper industry as a raw material. About 3500 MW power has been estimated to generate electricity annually without extra fuel and fewer investments than required for generating it through thermal power plants. Press mud is filled with many nutrients of the plant (major and minor nutrients) and could be an important source of organic matter. These by-products are used for establishing facilities to produce alcohol, ethanol, power, bio-compost etc. [3].

Crushing is generally done by crushers and can be used for small to medium scale processors having range in capacity from 200 kg to over 900 kg of cane per hour. Crushing of sugarcane is generally done through

- Mangle (wringler) in olden times, basically used for squeezing out water while cleaning
- Roller crushers, most common
- Screw expellers

Roller crushers are extensively used in large scale industries and even in small scale ones and are relatively easy to use and maintain. In small scale industry, these crushers are either two or three roll configuration and are generally made up of cast iron or steel. These crushers are located in frames made up of different materials (wooden, steel or cast iron). There are two types of roller crushers horizontal and vertical. Vertical roller crushers are small crushers having capacity between 200-500 kg canes per hour and can be driven both by animal and diesel. Horizontal roller crushers are generally powered by small engines or electric motors.

Screw expellers are used mainly in large scale sugar producing mills. These crushers are more efficient in comparison to the roller crushers. It has been observed that a single expeller has the extraction efficiency similar to a three or four three roll mill tandem. These crushers if used in small scale industry require more maintenance [4].

Corresponding Author: Varucha Misra, ICAR-Indian Institute of Sugarcane Research, Lucknow, India.

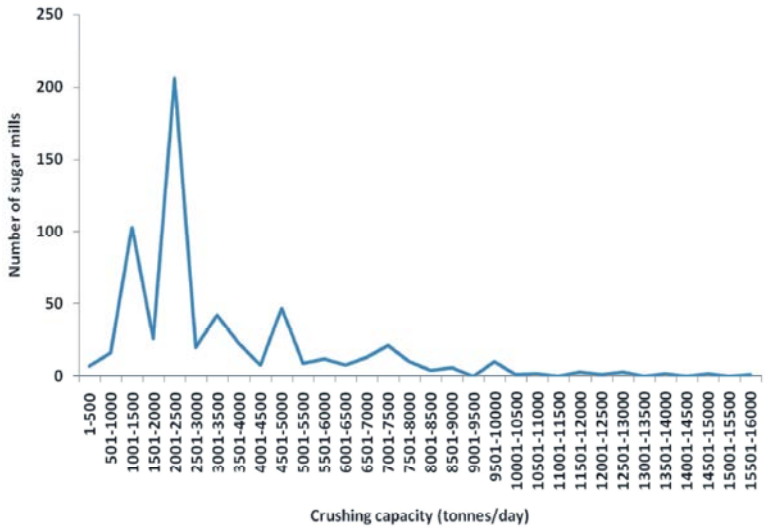

Fig. 1: Crushing capacity (tonnes/day) of sugarcane in India
(Source: Based on the data from Anonymous, 2011-12. List of cane sugar factories and refineries and distilleries. The Sugar Technologists Association of India. Pp 494)

This paper highlights the impact of crushing capacity on sugar as well as depicts a clear scenario of the present condition of crushing capacity of sugar mills in India.

Average Crushing Capacity over the Years in India: Sugarcane in India is grown in tropical as well as sub-tropical regions. The sugarcane production has increased significantly over years and so did the crushing capacity. Recent data had shown that maximum numbers of sugar mills have highest crushing capacity in range between 2000-2500 TCD (Fig. 1).

Sugarcane Crushing Capacity in Maharashtra and Uttar Pradesh: In sub-tropical zone, Uttar Pradesh is the highest producer of sugarcane. The total sugar recovery of this region varies form 8.8-9.5% only. About 30 districts of U.P produces sugarcane in which Bareilly, Bijnor, Bulandshahr, Deoria, Ghaziabad, Kheri, Meerut, Moradabad, Muzaffarnagar, Saharanpur and Sitapur are important sugarcane producers [5]. About 70% of the cane in the state has been contributed all together by the upper Ganga-Yamuna Doab, Rohilkhand and trans-Saryu regions. Among all the three regions of U.P., i.e., East, West and Central, U.P East has the highest cane crushed in comparison to the other two. This trend of cane crushing continued during the last 10 years. The cane crushed was lowest in U.P. east during 2005-06 but during the year 2008-09, it was rather lowest in both western as well as Central U.P. (Fig. 2). During the last 10 years, the state of U.P. crushed maximum cane in the year 2006-07 followed by 2012-13, 2011-12 and 2013-14. The least cane crushed was observed during the year 2008-09 (Fig. 2).

Similarly, for tropical region, highest cane production comes from Maharashtra. In comparison to sub-tropical region (U.P.), having almost same percentage of area of country, this state had higher sugarcane productivity, area, sugar recovery and duration of crushing. This crop grows mostly on black lava soil with the help of irrigation. Most of the production of this crop comes from Ahmednagar, Kolhapur, Pune, Nashik, Solapur, Sangli, Satara, Osmanabad and Aurangabad [5]. Of the last 10 years, 2010-11 was found to be the year of having the highest total cane crushed followed by 2011-12 and 2006-07. Although data showed that Maharashtra Central had the highest cane crushed in last 10 years in comparison to Maharashtra North and Maharashtra South but in the year 2004-05, Maharashtra Central was the second highest in cane crushed. In the year 2006-07, Maharashtra North had highest cane crushed while the year 2004-05 had the lowest cane crushed. Leaving the three years *viz.,* 2004-05, 2005-06 and 2008-09 all others years showed cane crushed ranged between 10,000 to 20,000 (‘000 tonnes). For the central region of Maharashtra, 2010-11 was found to be the highest, 2004-05 to be the lowest year for cane crushed. The maximum range for this region ranged between 30,000-40,000 (‘000 tonnes). In South Maharashtra, during 2010-11 the highest and lowest cane was crushed in the year 2004-05. The maximum range of cane crushed for this region ranged between 20,000 to 30,000 (‘000 tonnes) (Fig. 3).

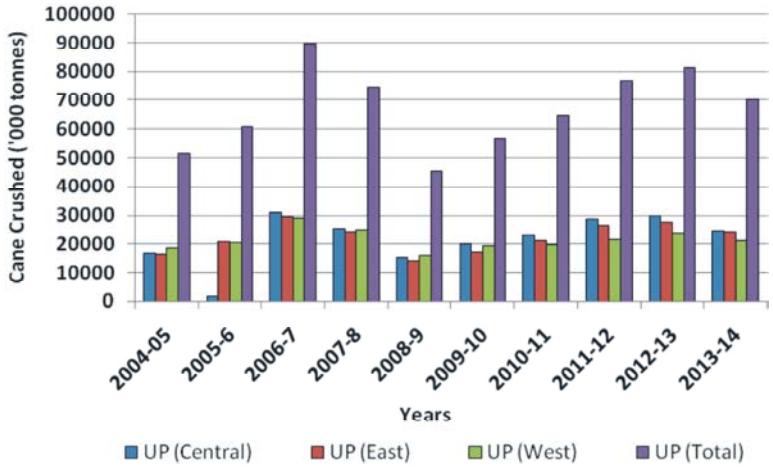

Fig. 2: Cane crushed by sugar mills in Uttar Pradesh of last 10 years
Source: Based on the data from Cooperative Sugar, 2015; 46 (8):47

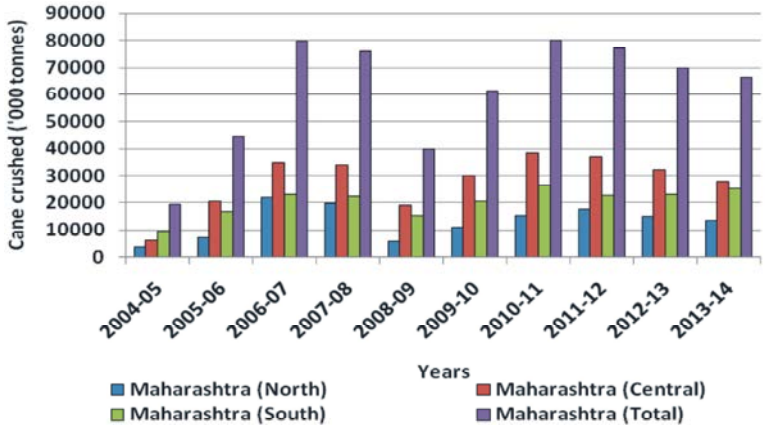

Fig. 3: Cane crushed by sugar mills in Maharashtra for the last 10 years
Source: Based on the data from Cooperative Sugar, 2015; 46 (8):47

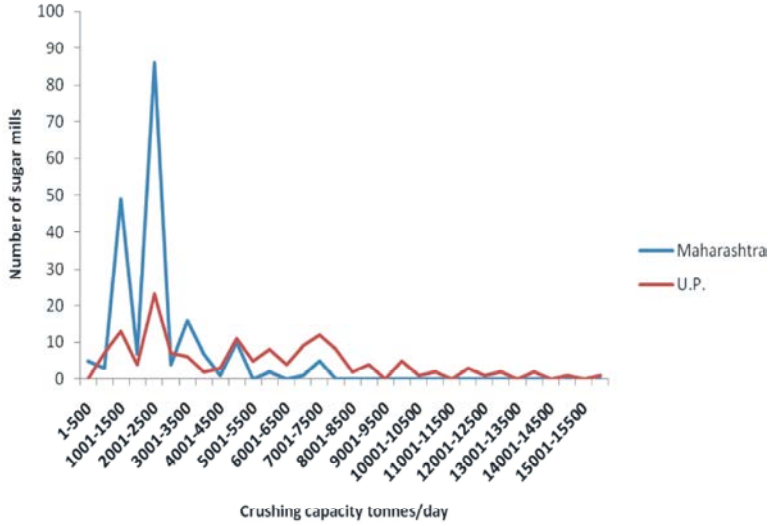

Fig. 4: Cane crushing capacity (tonnes/day) of sugar mills in Maharashtra and U.P
(Source: Based on the data from Anonymous, 2011-12. List of cane sugar factories and refineries and distilleries. The Sugar Technologists Association of India. Pp 494)

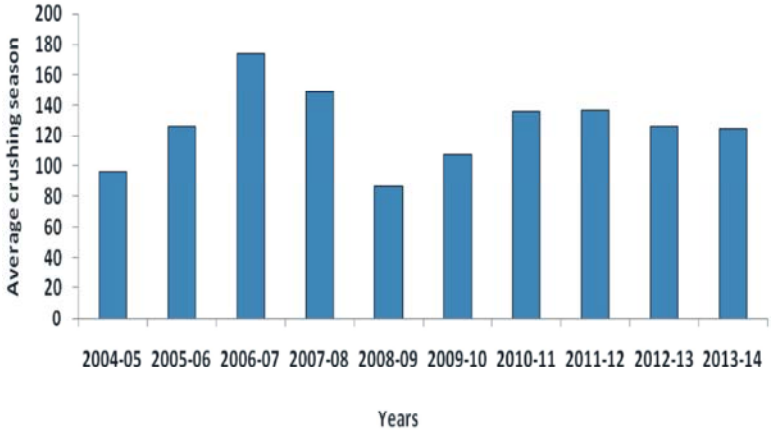

Fig. 5: Average duration of crushing season in India of last 10 years (Source: Indian Sugar, March 2015; LXV (12): 53).

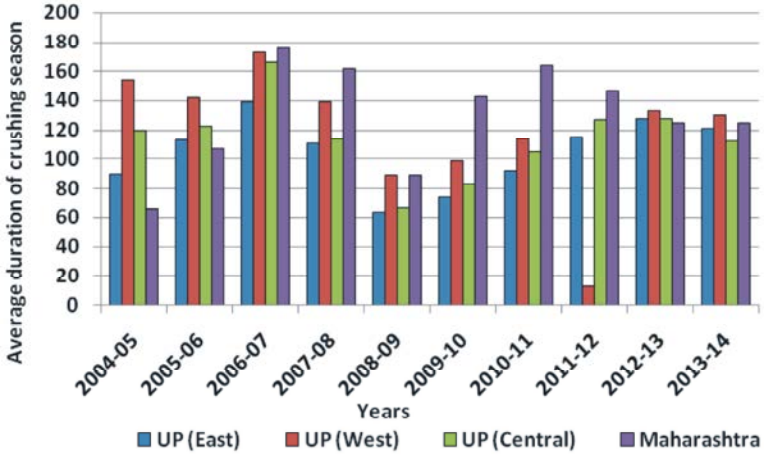

Fig. 6: Average duration of crushing season in Uttar Pradesh and Maharashtra of last 10 years (Source: Indian Sugar, March 2015; LXV (12): 53).

On comparing cane crushing capacity of the sugar mills in Maharashtra and U.P., it was found that about 80-90 mills have the cane crushing capacity of 2001-2500 TCD but in U.P. only 20 sugar mills in U.P. had this capacity. Crushing capacity of 2001-2500 stands second in position for Maharashtra (about 40-50 sugar mills) while the same capacity stands third for U.P. (about 10 sugar mills) (Fig. 4). This clearly depicts that tropical region (particularly Maharashtra) has an advantage of relatively higher crushing capacity and so higher yield as also higher sugar recovery as compared to the sub-tropical region (particularly, Uttar Pradesh).

Impact of Cane Crushing Capacity in India: The average yield of cane is found to be 69.80 MT/ha in India [6]. Contribution of the tropical region was found to be 55% of the total cane produced. Average cane yield of the tropical region (Maharashtra, Tamil Nadu, Karnataka, Andhra Pradesh and Gujarat) was found to be around 80 tonnes per hectare [6]. Evaluating the last 10 years for the highest average crushing season, the year 2006-07 was found to be highest one with 174 days followed by 2007-08 with 149 days, 2011-12 and 2010-11 with 137 and 136 days, respectively. Recovery of sugar for cane in Maharashtra is higher in comparison to U.P. [7]. It has been also revealed that over the last four years there is a consistent crushing season in India while for the last ten years, the average duration of crushing season varies to a greater extent. The present scenario of India indicates that it is almost decreasing its average duration of crushing season (Fig. 5).

The data also showed that in Maharashtra and U.P., the pattern of average duration of crushing season as well as overall duration of crushing period in India were more or less similar (Fig. 6). The year 2006-07 witnessed highest crushing season duration for both the states in the last 10

years. In the past three years in U.P., Central region had almost constant crushing season duration while there is a variance in the pattern of East and West region of U.P. Comparing the average crushing season of the last three years in western region of U.P., 2011-12 has the lowest season while the other two years i.e., 2012-13 and 2013-14 had almost constant crushing season average duration. However, the eastern region of U.P followed a trend similar as to that of central region.

CONCLUSIONS

The present paper reveals that crushing capacity in U.P. (highest cane producer of sub-tropics) and Maharashtra (highest cane producer of tropics) as well as in India as a whole have similar trend over the past many years. On comparing both the states, Maharashtra has higher sugar recovery than U.P. Besides, over the last 10 years, average crushing duration was highest in U.P. east and Maharashtra Central in compared to other zones of U.P and Maharashtra.

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