

A Research on Traditionally Available Sugarcane Crushers

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Abstract

The Traditionally available sugarcane crushers namely, Two roller power operated sugarcane crusher, Three roller traditional sugarcane juice extractor, and Three roller gear box type sugarcane crushers were used to analyse the different parameters of sugarcane juice extracted from the four varieties of traditionally available sugarcane crushed in different sugarcane crushers based on the performance evaluation of the number of rollers present in the crushers. Using these three sugarcane crushers the Amount of juice extracted (gm/kg), Bagasse weight (gm/kg), Brix content (%), Sucrose content (%), Reducing sugars and Purity percent were studied and evaluated. From the study it could be concluded that, as the number of rollers increases in sugarcane crushers the Amount of juice extracted (gm/kg) increases and Bagasse weight (gm/kg) decreases. Brix content (%), Sucrose content (%), Reducing sugars and Purity percent has no effect on the number of rollers present in sugarcane crushers. There is no much variation in the values of varieties of sugarcane used for the study. Therefore, there is a need for improving crushing technology in crushing of sugarcane by increasing the number of crushers in order to increase the efficiency of sugarcane juice extraction.

Keywords: Sugarcane crusher, Number of Rollers, Amount of juice extracted.

INTRODUCTION

Sugarcane is an important industrial crop of India. The country producing about 300 MT of sugarcane to feed about 450 sugar producing factories with a crushing capacity ranging from 1,250 to 10,000 tones of cane per day and period of crushing ranges from 160 to 180 days with an average recovery of 10 per cent. About 50 per cent of sugarcane produced in Karnataka is crushed in sugar industries and 40 per cent is crushed for making jaggery and rest 10 per cent for seed as well as local juice consumption. The sugarcane contains 65 per cent water, 15.5 per cent sugar, 3.5 per cent non sugars and 16 per cent fiber. As per the estimation, on an average of about 79 per cent of juice is expressed in sugar mills by multistage crushing on the other hand about 65 per cent of juice is expressed in three roller crusher used in jaggery industry. Unviable low crushing capacity with obsolete technology is responsible for getting low yield juice in the cane crushed by jaggery industries. Therefore, processing of sugarcane to extract maximum juice plays an important role in jaggery industries and entire cane crushing system in jaggery industry warrants a complete over hauling and needs an improved method of crushing so that yield of jaggery increases and production cost comes down. The sugarcane crushers used in jaggery industries should meet the requirements like optimum power input, effective juice extraction, reasonable maintenance, care in operation and resistance to vibration, wear and tear and investment on the crushers should be within the reach of the investor / farmer.

In general there are three types of traditional sugarcane crushers used in jaggery industry in Karnataka depending upon the power source. The power source may be electrical or diesel operated. The existing sugarcane crushers are namely,

- Two roller power operated sugarcane crusher.
- Three roller traditional sugarcane juice extractor.
- Three roller gear box type sugarcane crusher.

Four varieties of popularly grown sugarcane were selected and used for crushing in the above mentioned crushers are,

- CO419
- CO62175
- CO7804
- B37172

Bhalwar ^[1] (1976) suggested the replacement of existing crusher with screw press in sugar industry to achieve better performance of juice extraction. Miah *et al.* ^[2] (1993) made a comparison of draught power source for crushing sugarcane. Baboo and

Soloman^[3] (2000) stated that 50-55 per cent of juice is extracted using three-roller crushers in the jaggery industry. There is a loss of nearly 25 per cent of the juice in the bagasse due to poor extraction and which will be burnt later with bagasse as fuel in the jaggery industry itself. Further, they have suggested that there is a possibility of improving extraction of juice up to 80 per cent by adopting crushers having more than three rollers / cylinders. According to Singh (2004) ^[4] horizontal type rollers have better juice extraction than vertical ones.

MATERIAL AND METHODS: Experiments were conducted at Shivalli village of Mandya district in Karnataka, to analyze the amount of juice extracted from different sugarcane crushers under actual field conditions adopting standard techniques and procedures using four varieties of popularly grown sugarcane.

RESULTS AND DISCUSSION

- 1. Amount of juice extracted (gm/kg) in different sugarcane crushers:** The amount of sugarcane juice extracted (Table 1) from Two roller power operated sugarcane crusher was 443.16 (gm/kg), 3 roller traditional sugarcane juice extractor was 499.50 (gm/kg) and 572.33 (gm/kg) in 3 roller gear box type sugarcane crusher as the number of rollers and power consumption increased the Amount of juice extracted (gm/kg) (Fig 1) also increased, the results hold good with the readings of Baboo and Solomon, 2000 ^[3].
- 2. Bagasse weight (gm/kg) in different sugarcane crushers:** The amount of bagasse weight (Table 2) from Two roller power operated sugarcane crusher was 582.60 (gm/kg), 3 roller traditional sugarcane juice extractor was 451.66 (gm/kg) and 422.33 (gm/kg) in 3 roller gear box type sugarcane crusher as the Amount of juice extracted (gm/kg) increased the bagasse weight decreased gradually (Fig 2).
- 3. Brix content in different sugarcane crushers :** Fig. 3 shows the amount of brix content in the sugarcane juice extracted from different types of sugarcane crushers. The amount of brix (Table 3) from Two roller power operated sugarcane crusher was 20.04 (%), 3 roller traditional sugarcane juice extractor was 20.00 (%) and 20.10 (%) in 3 roller gear box type sugarcane crusher the results were similar to findings of Gupta ^[5] (1981).

- 4. Sucrose content (%) in different sugarcane crushers:** It could be seen from Fig.4 that the percent sucrose content in Two roller power operated sugarcane crusher was 20.22 (%), 3 roller traditional sugarcane juice extractor was 21.18 (%) and 22.60 (%) in 3 roller gear box type sugarcane crusher (Table 4), the values of the Gravios *et al.* ^[6] (1991) holds good with these findings.
- 5. Reducing sugar in different sugarcane crushers:** The amount of reducing sugars (Table 5) from Two roller power operated sugarcane crusher was 7.5, 3 roller traditional sugarcane juice extractor was 7.39 and 7.54 in 3 roller gear box type sugarcane crusher (Fig 5) and are similar to the findings of the Rekhi and Gil ^[7] (1987).
- 6. Purity percent in different sugarcane crushers:** The purity percent (Table 6) from Two roller power operated sugarcane crusher was 98.00 (%), 3 roller traditional sugarcane juice extractor was 98.25 (%) and 99.83 (%) in 3 roller gear box type sugarcane crusher (Fig 6) the findings are similar to the findings of the Rekhi and Gil ^[7] (1987).

Table 1: AMOUNT OF SUGARCANE JUICE EXTRACTED FROM DIFFERENT TYPE OF CRUSHERS.

Type of crusher	SUGARCANE VARIETIES			
	CO419	CO62175	CO7804	B37172
Two roller power operated sugarcane crusher	452	412	442	458
Three roller power operated traditional sugarcane crusher	477	508	505	480
Three roller power operated gear box type sugarcane crusher	547	583	578	568

Table 2: BAGASSE WEIGHT OBTAINED FROM DIFFERENT TYPE OF CRUSHERS

Type of crusher	SUGARCANE VARIETIES			
	CO419	CO62175	CO7804	B37172
Two roller power operated sugarcane crusher	574	629	584	565
Three roller power operated traditional sugarcane crusher	504	428	432	502
Three roller power operated gear box type sugarcane crusher	453	424	426	415

Table 3: BRIX CONTENT OBTAINED FROM DIFFERENT TYPE OF CRUSHERS

Type of crusher	SUGARCANE VARIETIES			
	CO419	CO62175	CO7804	B37172
Two roller power operated sugarcane crusher	20.00	19.80	19.70	20.00
Three roller power operated traditional sugarcane crusher	18.80	21.00	20.00	20.00
Three roller power operated gear box type sugarcane crusher	20.05	19.50	19.00	21.00

Table 4: SUCROSE PERCENT OBTAINED FROM DIFFERENT TYPE OF CRUSHERS

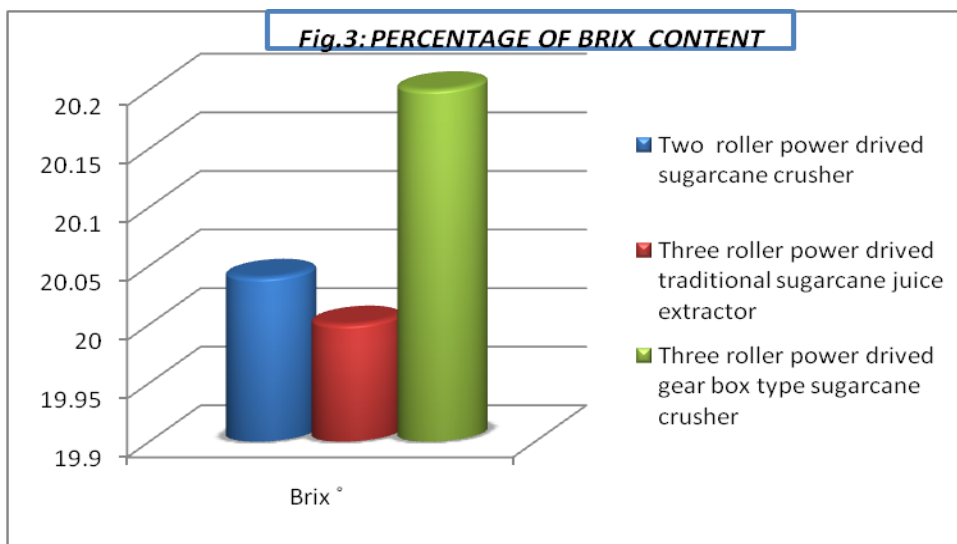
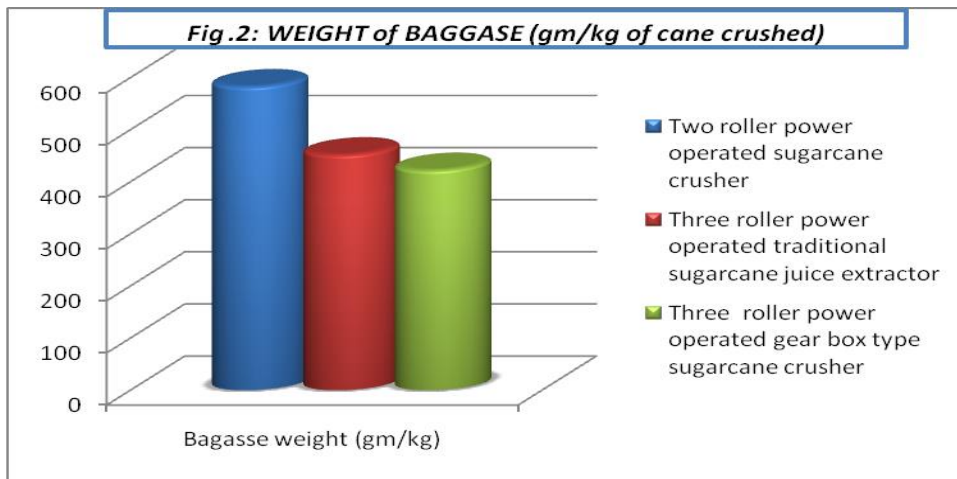
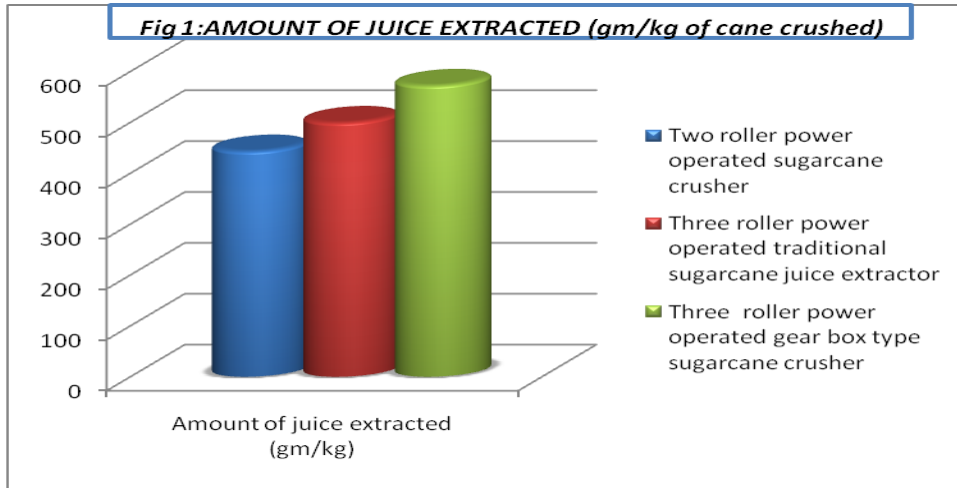
Type of crusher	SUGARCANE VARIETIES			
	CO419	CO62175	CO7804	B37172
Two roller power operated sugarcane crusher	20.56	20.32	20.22	20.12
Three roller power operated traditional sugarcane crusher	21.05	21.25	20.30	21.69
Three roller power operated gear box type sugarcane crusher	22.76	22.92	22.80	21.80

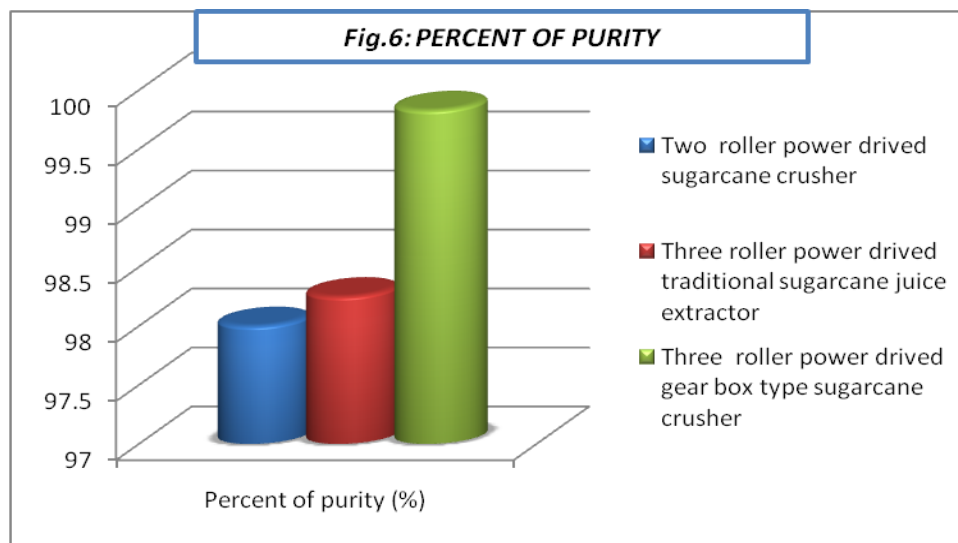
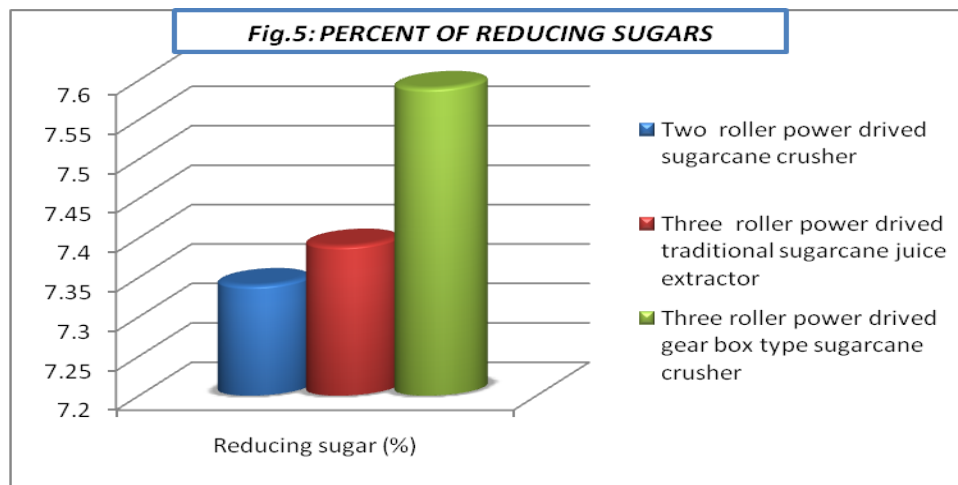
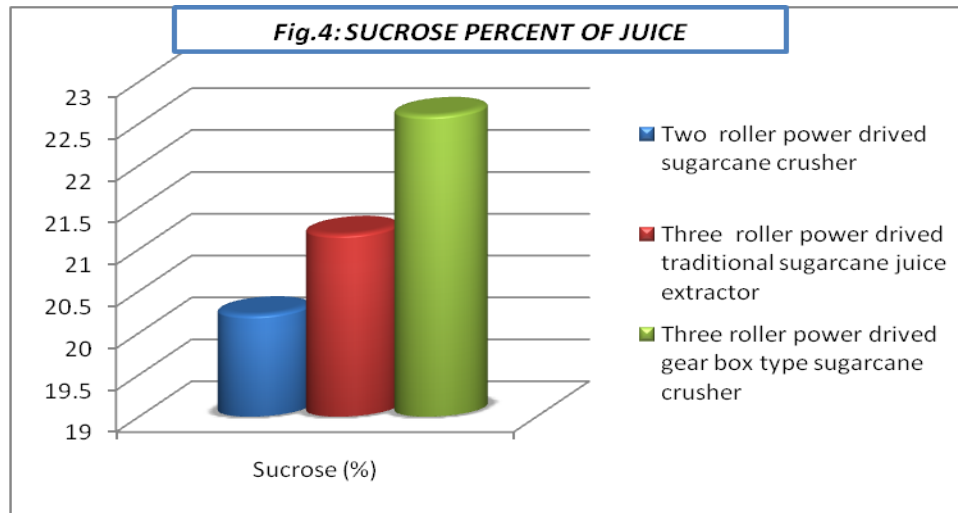
Table 5: REDUCING SUGARS OBTAINED FROM DIFFERENT TYPE OF CRUSHERS

Type of crusher	SUGARCANE VARIETIES			
	CO419	CO62175	CO7804	B37172
Two roller power operated sugarcane crusher	7.48	7.47	7.46	7.50
Three roller power operated traditional sugarcane crusher	6.92	7.66	7.42	7.50
Three roller power operated gear box type sugarcane crusher	7.59	7.19	7.10	7.69

Table 6: PURITY PERCENT OBTAINED FROM DIFFERENT TYPE OF CRUSHERS

Type of crusher	SUGARCANE VARIETIES			
	CO419	CO62175	CO7804	B37172
Two roller power operated sugarcane crusher	98.00	97.90	98.10	98.5
Three roller power operated traditional sugarcane crusher	98.00	99.00	98.00	98.20
Three roller power operated gear box type sugarcane crusher	99.80	100.00	99.90	99.70





CONCLUSION

From the study it could be concluded that the, has the number of rollers increased the Amount of juice extracted (gm/kg) also increases and Bagasse weight (gm/kg) decreases gradually. Further, it could be seen that the type of traditional sugarcane crushers used for extracting juice played no role as far as the presence of Brix content, sucrose content, reducing sugars and purity percent in the juice is concerned. There is no much variation in the values of varieties of sugarcanes used for the study.

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