

RESEARCH PAPER

Performance Evaluation of Bajaj Boll Opener for Cleaning and Opening of *kawdi* Cotton in Ginneries

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Abstract

India is the leading cotton producing country in the world with production of about 20 m t of seed cotton harvested every year. The harvested seed cotton contains dust particles, leaves, and immature and unopened cotton bolls, called *kawdi* cotton for resemblance to *kawdi* sea shells. When raw seed cotton is taken to ginneries, it is passed through many cleaning systems like hot-box dispenser and pre-cleaner where *kawdi* cotton is removed. If seed cotton is infested by insect attack or improper production technology, significant amount of *kawdi* cotton is present in it. About 5-25% *kawdi* cotton is expected in ginneries depending on the extent of infestation and damage. This material is generally ignored by ginners considering it as a waste material. However, it can be processed and good quality lint can be recovered from it that can provide additional income to ginners. Difficulties in processing *kawdi* cotton are causing ginners huge losses. If this material is cleaned, opened and ginned, a ginner can make about 1000 bales in a single season and earn an additional profit of around Rs. 2 crore from it. Though, research on processing of *kawdi* cotton is scant with no reported past data, machines like 'Bajaj Boll Opener' are available in the market for cleaning and opening of *kawdi* cotton, selected for performance evaluation in this study. It was found that the machine could process *kawdi* cotton at about 1.0 t per h capacity with 40% recovery of ginnable seed cotton. The ginning trials and fibre quality analysis revealed that good quality lint could be obtained from the opened *kawdi* cotton, thus yielding additional profit to ginners.

Keywords: Kawdi cotton, Boll opener, Pink bollworm infested cotton, HVI

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Introduction

India is the leading cotton producing country in the world with cotton production of around 6.2 m t obtained from about 20 m t of seed cotton harvested in the country every year (CCI, 2018). In India, entire cotton is manually harvested (Sundaram *et al.*, 1999). The harvested cotton contains dust particles, leafy trash and immature and unopened cotton bolls, called *kawdi* cotton for their resemblance in size and shape to *kawdi* sea shells. When raw seed cotton is taken to ginneries, it is passed through many cleaning systems like hot-box dispenser and pre-cleaner where dust particles, leaves and *kawdi* cotton are removed. During ginning and further processing the remaining *kawdi* is removed through the grid and the gin hopper. The unopened bolls/*kawdi* cotton obtained from different cleaning sections is generally ignored by ginners considering it as a waste material. However, this material can be processed and good quality lint can be recovered from it that can provide additional income to ginners. Difficulties in processing *kawdi* cotton are causing ginners huge losses. If this material is cleaned, opened and ginned, a ginner can make about 1000 bales in a single season and earn an additional profit of around Rs. 2 crore from it.

If seed cotton is infested by insect attack or due to improper production technology, significant amount of *kawdi* cotton is present in it. About 5-25% *kawdi* cotton is expected in ginneries depending on the extent of infestation. In India, cotton crop is severely affected by pink boll worm attack increasing the percent of *kawdi* in seed cotton received at ginneries.

Industry people are asking better and efficient solution to process this material. Also, they want technological interventions to gin *kawdi* cotton so that its quality could be improved. Although, a significant amount of *kawdi* is obtained at ginneries, yet the research on processing of *kawdi* cotton has not been undertaken so far. There is no reported past data available. However, machines like 'Bajaj Boll Opener' are available in the market for cleaning and opening of *kawdi* cotton.

Therefore, there is a need to study the ginning aspects of the *kawdi* cotton. The present investigation was carried out for evaluating the performance of 'Bajaj Boll Opener' machine for cleaning and opening of *kawdi* cotton for making it ginnable using either double roller (DR) or Saw Gins.



Fig. 1: Bajaj Boll Opener used for processing of kawdi cotton in Indian ginneries

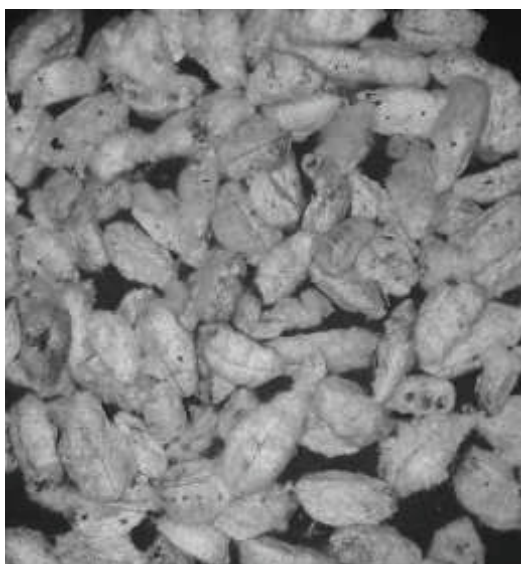


Fig. 2: Raw kawdi cotton and opened kawdi on processing through Bajaj Boll Opener

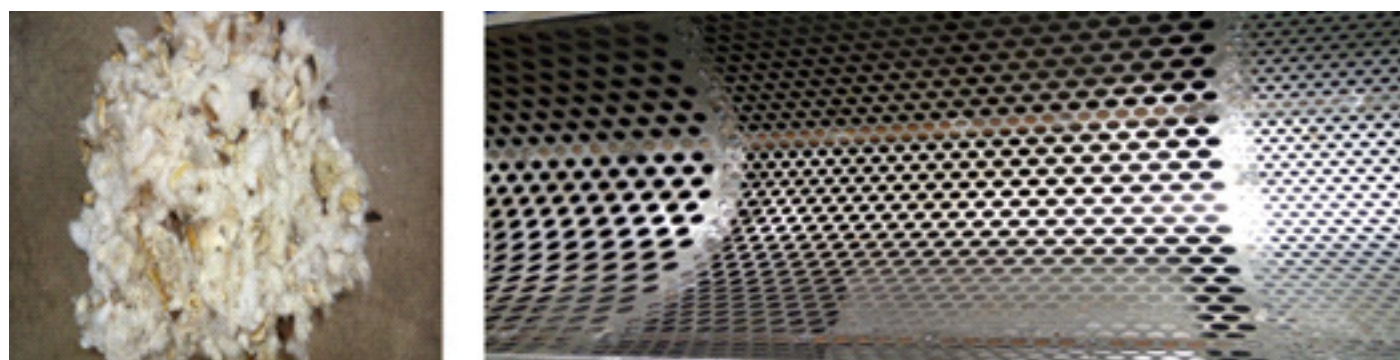
Materials and Methods

The existing *kawdi* cotton openers available in the market were reviewed. About 500 kg of *kawdi* cotton, which is obtained from different stages in the cleaning process like hot-box dispenser, pre-cleaner chamber and gin waste was processed in this study. The bulk density of seed cotton was calculated as kg/m³ on weight basis using the measuring cylinder of known volume by filling it loosely to the brim and weighing it. The boll opener consists of different sizes of screens arranged in series and having a rotating helical beater shaft cylinder assembly mounted on a frame (Fig. 1). The rubbing action between screens and beater cylinder opens the *kawdi* and separates the trash and usable seed cotton. Generally, the screen sizes used in boll opener are 12, 20 and 25 mm.

The test trials of Bajaj Boll Opener were conducted at Ginning Training Centre (GTC), Nagpur. The performance of the machine was evaluated in terms of its handling capacity of *kawdi* cotton processed per hour (t/h) and the seed cotton recovery (%), which was calculated as the percentage of opened *kawdi* with respect to input weight of *kawdi* cotton. Trash chamber losses through different screens (12, 20 and 25 mm) and dust and other losses were also determined as weight percentages based on the weight of input *kawdi* cotton. The fibre properties of ginned *kawdi* cotton was analysed using HVI using standard testing procedure (Booth, 1964).

Results and Discussion

The test trials of 'Bajaj Boll Opener' machine, conducted at the

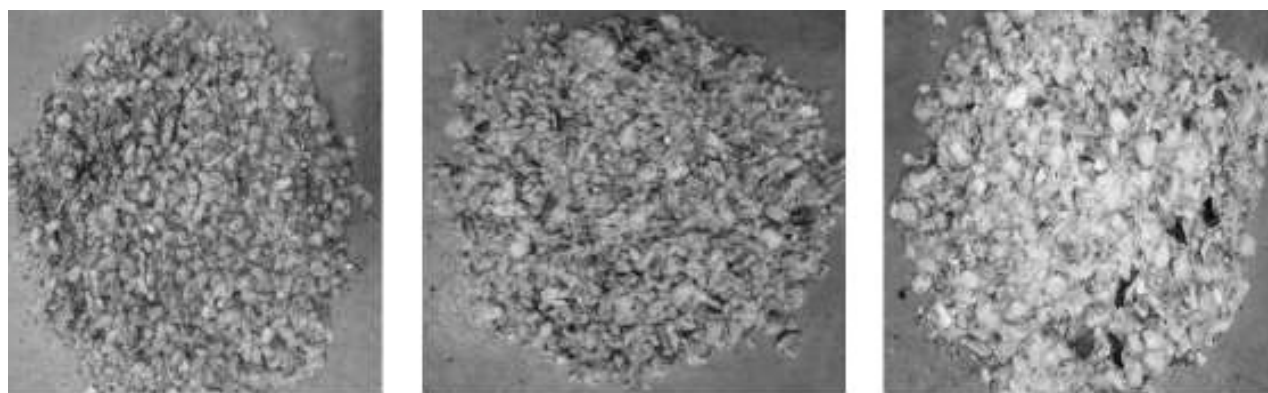


Opened kawdi cotton

25 mm

20 mm

12 mm



Losses through 12-, 20- and 25- mm screens from left to right

Fig. 3 : Kawdi cotton output obtained from different screens of Bajaj Boll Opener

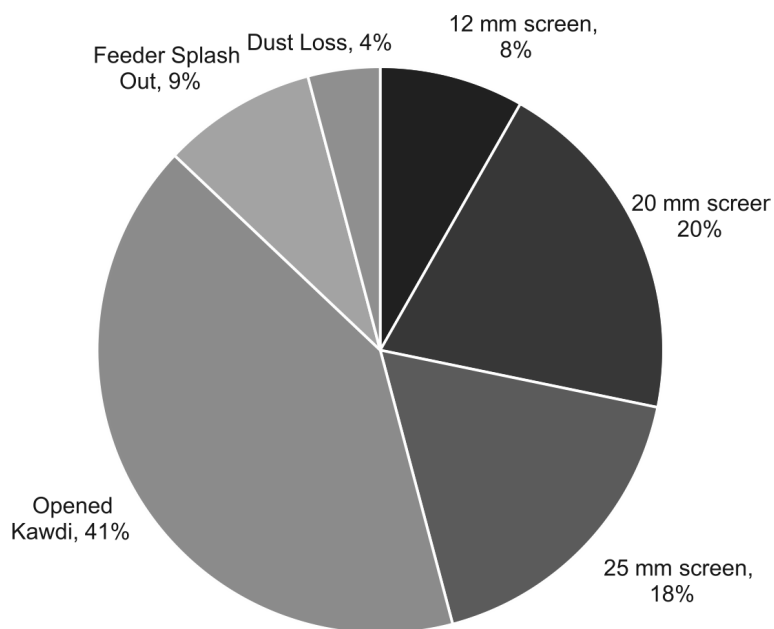


Fig. 4 : Output analysis of kawdi Cotton Processed through Bajaj Boll Opener

Table 1 : HVI Test Results of lint obtained from *kawdi* cotton

Type of Gin	UHML mm	UI %	Mic	Tenacity 3.2 mm (g/tex)	EL %	Rd	+b	CG
DR Gin	28.3	82	3	25.1	5.7	56.4	14	54-3
Saw Gin	27.9	88	3	24.8	5.8	56.5	14	54-3

factory premises and at GTC, Nagpur indicate that the losses seem to be high in the available machine. Significant amount of seed cotton goes into trash chamber along with the trash. The well opened ginnable *kawdi* is obtained at the outlet of the boll opener (Fig. 2). It was found that about 40% *Kawdi* cotton could be recovered for ginning, the losses through 12-, 20- and 25- mm screens being 8, 20 and 18 % respectively (Fig. 3). About 4% material goes as dust loss whereas 9% material is thrown out as Feeder Splash-out (Fig. 4). The bulk density of raw *kawdi* cotton, which was found as 134 kg/m³ reduced by almost half to 73 kg/m³ on passing through Boll Opener, thus indicating its opening for making it ginnable. The capacity of the Bajaj Boll Opener for processing *kawdi* cotton was found to be about 1 t/h. The opened *kawdi* cotton was ginned using DR as well as saw gins. The lint recovery from the opened *kawdi* was marginally higher in saw gin (25%) as compared to DR gin (22%). This was probably due to shorter fibre length of *kawdi* cotton and presence of large numbers of bracts and leafy trash matter in the opened *kawdi*. The HVI test results of the lint thus obtained showed no significant differences in both methods (Table 1).

General observations include fan blockage (*kawdi* gets blocked in between the peripheral support flat of the fan and the screen underneath with a possibility of fire hazard due to friction) and outlet chute safety(risk of operator hand injury in the rotating beater element close to the chute outlet). The location of the feed hopper on top of the machine is observed to be faulty making it inconvenient and difficult for the operator. *Kawdi* has to be manually fed into the hopper using baskets/bags for which two labourers are required, one for filling and delivering the basket to the other standing on the raised platform in order to reach the hopper. Therefore, design modifications are necessary in the existing boll opener machine for arresting the losses and increasing the *kawdi* cotton recovery.

Conclusions

Kawdi cotton- the immature and unopened cotton bolls rejected in ginneries, if properly processed can yield some ginnable seed cotton earning additional profit to ginners. The available systems for processing of *kawdi* cotton seem to be inefficient and there is a need to develop an efficient system to effectively clean and open *kawdi* cotton as well as to maximize the output of the machine so that the economic profits of ginneries can be increased. An improvement in the existing boll opener machines may lead to development of new system with improved efficiency and also a suitable technology to gin *kawdi* cotton to improve its grade.

Acknowledgments

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References

- Booth, J.E. (1964) – Principles of Textile Testing, A Heywood Book, Temple Press Books Ltd. London.
- Sundaram, V., Basu, A., Iyer, K.R.K., Narayanan, S.S. and Rajendran, T. P. (1999) – Handbook of Cotton in India. Published by Indian Society of Cotton Improvement, Mumbai.
- CCI (2018) – Area, production and productivity of cotton in India from 1947-48 onwards. Cotton Corporation of India (<https://cotcorp.org.in/statistics.aspx>)