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Destalking machine for chilli

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This paper presents the review on chilli destalking/destemming machine with the related search. Chilli is an important spice crop and India is one of the leading producer and consigner of chilli in the world. Chilli is widely used around the world in food as a spice both in dried and fresh form which adds flavour to the meal by creating spicy pungent taste. The study specifies factors influencing the chilli destalking process and recommends a design options for destalking machine. These designs are based on a systematic study of the destalking process for dry chilli, related to which some literatures reviews and works of them are explained. The manual operated, mechanical system, sensor based and artificial neural network (ANN) based system are some of the approach been made for destalking of chilli.

Key Words : Chilli, Post harvest, Destemming, Mechanization, Destalking

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INTRODUCTION

Chilli (*Capsicum annuum* L.) the spice of many wonders is widely used around the world in food in dried and fresh form which adds flavour to the meal by creating spicy pungent and also used as traditional medicine. Orginated from South America and cultivated in all climatic zones expect temperate zones; it forms a major trading commodity across the world accounting 16 per cent of the total spice trading. The chemical component of the chilli varies considerably depending on the postharvest treatments and location of cultivation. The dry chilli mainly contains two components the one is cryptoxanthin which are responsible for colour in *Capsicum* species and other is alkaloid compound called as capsaicinoids which attribute pungency, were as the pigments such as capsorubin, capsanthin, zeaxanthin and these are the two characteristics based on which commercial grading of chilli is done. It also holds properties of health promoting due to the presence of, potassium, vitamins, iron, magnesium, flavonoids and phenolic acids and also holds diseases preventing properties such as gastro protective effects, antioxidant, anti-inflammatory and antibacterial activities. Mapping the post harvest management of chilli not only gauges the degree of losses but establish links between distinct value chain constraints and respective post harvest losses and their limitations. India has much potential in the processing of chilli as it the highest producer of dry chilli in the world with 20 lack metric tonne and exported to the tune of 3 lack metric tonne (Indiastat, 2019). Destalking is the unit operation where the chilli pod is separated by stalks along with cylix. Stalks in the chilli are considered as the foreign matter. Major of the chilli processing industry prefer destalked chilli for their value added products, but

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presently no much work has been done this unit operation and destalking operation is still restricted to tradional method, where it is done manually which are laborious, cost intensive restrict speed of processing and time consuming activity.

Traditional method of destalking process:

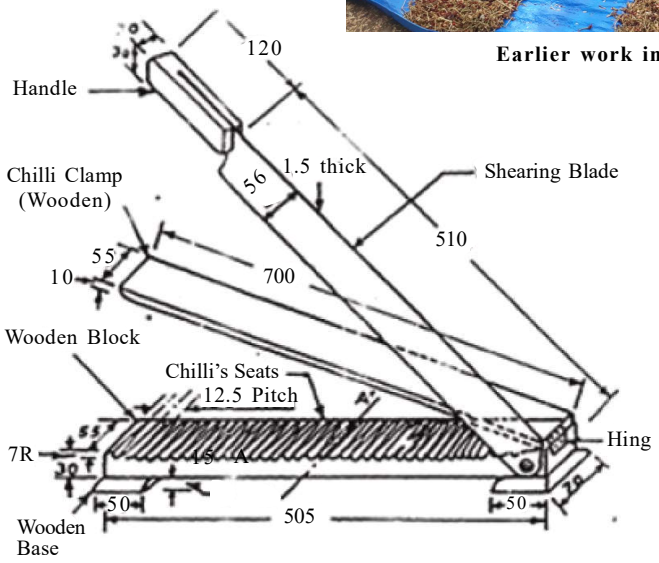
The following evaluation is carried out in Karnataka for destalking Guntur sannam cultivar chilli, it was found that to destalk 50 kg of dry chilli, it took 24 labour hours, the productivity work for destalking was been limited to max 6 hours due to health related issue to the labours caused due to pungency. Cost of destalking was Rs. 15/ kg and the performance of manual destalking process are shown in Table 1.

Table 1: Performance of manual destalking process

Sr. No.	Parameters	Value
1.	Quantity fed (kg)	50
2.	Man power requirement (No.)	4
3.	Time (h)	1
4.	Destalking rate (%)	97
5.	Breaking rate (%)	3
6.	Unstalked rate (%)	nil
7.	Power consumption (kWh)	nil
8.	Productive work per day	6 (max)
9.	Cost of destalking Rs./kg in Rs.	15

Mangraj *et al.* (2001) developed manual operated, batch type destalking machine of 0.25 kg capacity, built with a wooden material with slots provided to place the

Earlier work in chilli destalking



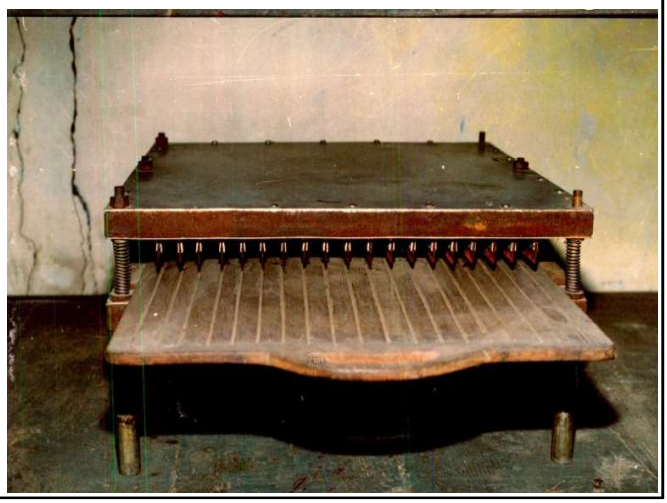


Fig. 1 : Human operated destalking machine

chilli as shown in the Fig. 1. The working principle of the machine was based on the principle that when chilli stalks are slightly given cutting force, it separates stalks from the chilli.

Knorr and Victor (2008) developed chilli destalker using laser sensors and machine vision algorithms. In this method, for recognition of a chilli shoulder and stem or interior regions are made in order to generate a controlled signal and to initiate process to destalk the chilli. In particular, several methods are provided that includes mechanical system, a machine vision system, the laser system, a combined machine vision system and other equivalent implementations. Fig. 2 depicts the lazer based destalking mechanism.

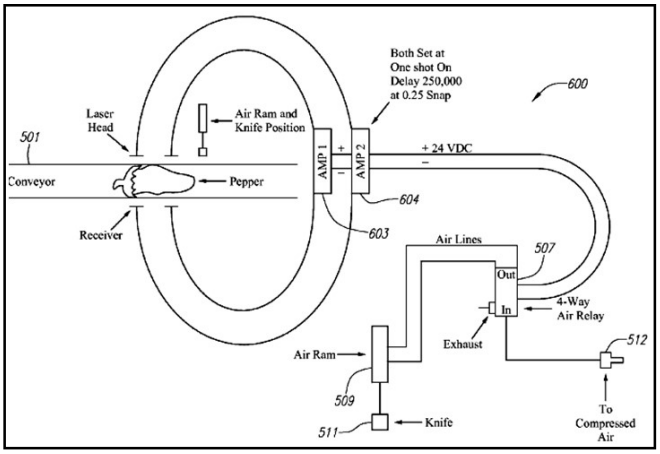


Fig. 2 : Lazer based destalking mechanism (Knorr and Victor, 2008)

Herbon (2016) has attempted in a mechanical system by developing a computer vision system to destalk chilli by using images from X-ray cameras with the distance from edge image method.

Gunes and Badem (2016) studied GPU- and CPU-based software for aligning the chilli and developed CUDA using GPU software which is 78 - 76 times faster than CPU. This accelerated algorithm is used in destemming/destalking process of chilli. Firstly, hybrid intuitionist fuzzy algorithm edge detection has been used for pre-processing of original image and Otsu method has been used for estimating automatic threshold in algorithm. This study performed architecture of ANN (MLP) is used for determining the position of red pepper to the destemming machine successfully.

Phong *et al.* (2017) studied on designing, development and testing a chilli destalking semi-automatic machine in production and processing of chilli products aiming to reduce manual labour, production costs and increase production efficiency in the chilli destalking stage. The study has demonstrated that the destalking rate of of chilli was 88.37 per cent, the damaging rate was 6.34 per cent, the specific power consumption was 20.15 Wh/kg and the capacity of the machine reached to 13.9 kg/hour at an orientation belt conveyor velocity of 0.13 to 0.18 m/s. The rate between the velocity of destalking structure and velocity of orientation conveyor belt was 1.66.

Fig. 3 : Semi automatic chilli stem separator fully fabricated and assembled

Khanh *et al.* (2019) reported chilli stalk separating mechanism as shown in Fig. 4, where the belt conveyor and cutting blades are used to destalk the chilli, the belt is designed for 100 chilli fruit. The efficiency of the machine was found to be 84.4 per cent.

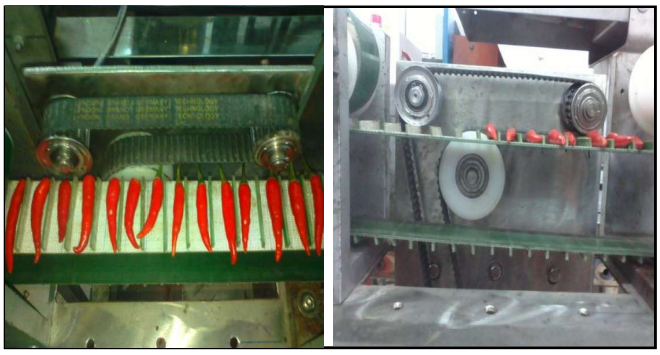


Fig. 4 : Mechanism to separate chilli stalk

Balli *et al.* (2020) designed and developed of Bird's eye chilli stalk separator machine as depcted in Fig. 5,

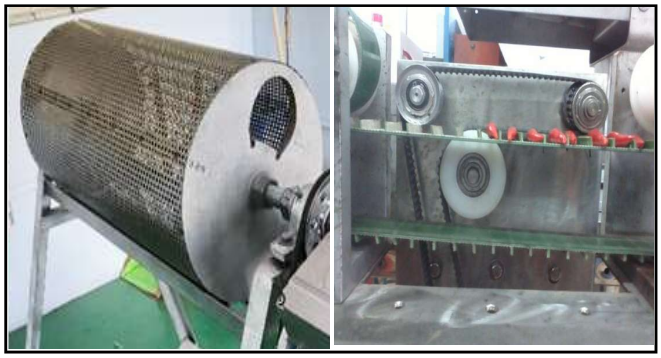


Fig. 5 : Destalking machine developed for bird eye chilli

the developed destemmer for birds eye chilli had capacity of the stalk separator is 15kg/ h with 100 per cent efficiency.

Conclusion:

From the study of earlier work it is being observed that the machines which are developed are all of different capacities and for different cultivars. Attempt has been made to destalk the chilli using various models, ANN and other mechanism. But destalking machine for multiple cultivar, cost effective and efficient performance machines are still a challenging in dry chilli processing.

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