

Development of Power Operated Curry Leaf (*Murraya Koenigii*) Stripper



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Abstract

Curry leaf (*Murraya Koenigii*) is used as a leafy spice in Indian cuisine for its characteristic flavour and is reported to have a lot of medicinal values. It is one of the prime ingredients in masala and pickle industries in raw/dried or powdered form. These products have large demand in both domestic and international markets. The primary requirement to obtain the curry leaves is to strip the leaflets from the stem. At present this operation is being carried out manually in unhygienic conditions. To reduce the drudgery of the human labour and to increase the output capacity, a power operated curry leaf stripper has been developed to strip out the leaflets from the branch. The equipment comprises four major components viz., power source, pulling mechanism, stripping mechanism and collecting tray. With this device, an operator can safely strip 36-44 kg of curry leaflets per hour. The saving in labour and cost over conventional method is to the tune of 80 percent and 60 percent, respectively. An Indian patent no 1146/MUM/2008 has been assigned for the equipment and the equipment has been commercialized

Introduction

Curry leaf (*Murraya Koenigii*) is a shrub or small tree native to India (**Fig. 1**). It is used as a leafy spice in Indian cuisine for its characteristic flavour and is reported to have a lot of medicinal values. Curry leaf is cultivated on a commercial scale in the southern provinces of India. The leaves have 66.3 percent moisture, protein 6.1 percent, carbohydrate 16 percent, fibre 6.4 percent, phosphorus 600 mg, iron 0.93 mg and β -carotene (Vit. A) 7.56 mg. (Shankaracharya and Natarajan, 1971). Fresh curry leaves on steam distillation yield 2.5 percent volatile oil, which is used as a fixative in soap industry (Lathan Kumar *et al.*, 2003). The antioxidant and anticarcinogenic effect of curry leaves have been studied and it has been reported that the curry leaves have a high potential as a reducer of the toxicity of carcinogen (Khanum *et al.*, 2000; Palaniswamy, 2001). The leaves of the plant are employed exten-

sively as flavourant in curries like 'dal', 'South Indian Sambar', 'rasam' and 'chutneys'. Powdered curry leaf with mature coconut kernel and spices forms an excellent preserve. Curry leaf is used in traditional medicine, like ayurvedic and unani medicine. The plant is credited with tonic, stomachic and carminative properties. The undiluted essential oil exhibits strong antibacterial and antifungal activity when tested on microorganisms. Crude leaf extracts of curry leaf plant are reported to possess antibacterial activity. It has a potential role in the treatment of diabetes.

The curry leaves have good export potential besides internal consumption. The leaves rapidly lose

Fig. 1 Curry leaf (*Murraya Koenigii*) field



their moisture and get wilted. They retain their flavor even after drying and hence these are marketed both in fresh and dried forms. The dried curry leaves find its application as an ingredient in masala powders. It is one of the prime ingredients in masala and pickle industries in raw, dried or powdered form. These products have large demand in both domestic and international market.

The existing method of stripping the curry leaf from the harvested leaflets is done manually with bare hands by labour in an unhygienic way and there is every possible risk of contamination in handling. Further, since the product is being used in the export market both as fresh product and in the powder/ masala industries, there is also the possibility of contamination being carried over to the processed product in the food chain. It is highly laborious to strip the leaflets manually with hands just after harvesting, as it needs more force (Ravindra Naik *et al.*, 2008). The power operated curry leaf stripper developed would overcome the difficulties encountered in this operation.

Material and Methods

Material

Curry leaf varieties Sen Kaampa, Dharwad-1 and Dharwad-2 which were procured from curry leaf farmers of Karaimadai (District) of Tamil Nadu, were used for evaluation.

Concept of mechanical stripper:

The concept of mechanical stripper is given in Fig. 2. The stripping of the curry leaflets from the petioles is done manually by holding the bottom of the petiole in the left hand and by gripping leaflets together between two fingers of the right hand and gliding down the fingers from bottom of petiole to its tip. In a similar way, the stripping mechanism has been developed which could carry out the function of gripping and holding the leaflets,

while the branch with petioles is pulled through by a pair of striped roller (Stripping mechanism) which revolve in opposite direction. The leaflets are striped by reciprocating motion of nylon plate with holes (stripping mechanism). By the simultaneous action of gripping of leaflets while pulling of the branch and stripping, the leaflets are stripped from the petioles of the branch. The striped leaflets are collected in the tray placed below the machine so that the hygienic condition is maintained, thereby avoiding contamination.

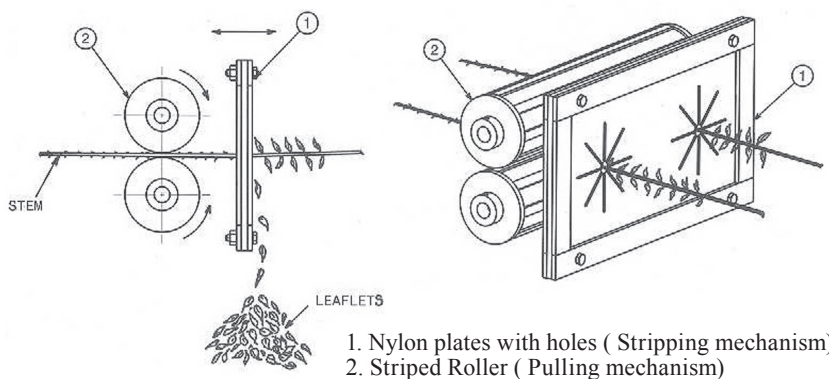
Details of the power operated curry leaf stripper: To reduce the human labour and to increase the output capacity, a power operated curry leaf stripper has been designed and developed (Fig. 3). The

main components of the equipment are pulling mechanism, stripping mechanism, collecting tray and power source

Stripping Mechanism

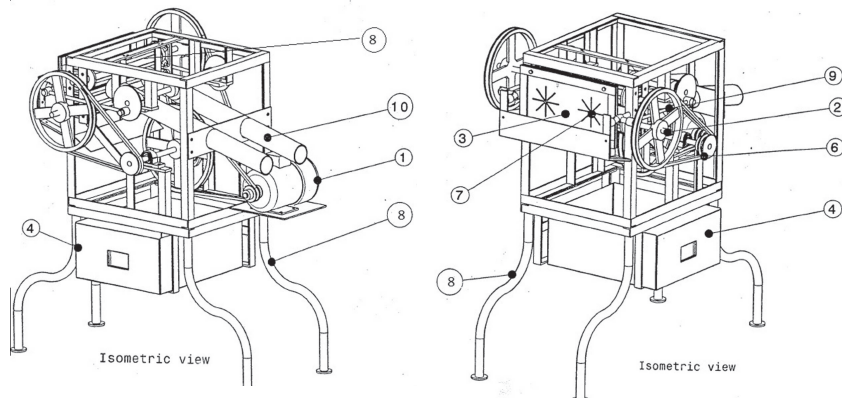
The curry leaf branches are fed in to the stripping mechanism, which is made of nylon plate. The nylon plate fixed vertically in the front has two tapered holes at the centre. The plate is also provided with a set of eight slots placed radially from the periphery of the central hole. The slots are of 50 mm length, and 5 mm height and at 45° angle from the central hole to enable the petiole to pass through it. A MS pipe that acts as a baffle is provided behind the nylon stripper plate. The lower end of curry leaf branch, which is fed in to the stripping mechanism first, is

Fig. 2 Concept of mechanical stripping of curry leaf



1. Nylon plates with holes (Stripping mechanism)
2. Striped Roller (Pulling mechanism)

Fig. 3 Isometric view of Power operated Curry leaf stripper



1. Power source- Motor; 2. Pulling mechanism; 3. Stripping mechanism; 4. Collecting tray; 5. Striped rollers; 6. Power transmission system; 7. Nylon plates with holes; 8. Stand; 9. Reciprocating rocker arm; 10. Stem outlet pipe

pulled inside the system by the pulling mechanism.

Pulling Mechanism

It is a set of striped rollers made of mild steel (MS) used as pulling rollers. The stripes (8 no.) made of MS, give better grip to hold the curry leaf branch subjected to stripping mechanism. The rollers rotate in opposite direction to each other. The speed of the rollers has been optimized to 60 rpm and the drive is obtained by using series of belt and pulley drives. The pulling mechanism is fitted just behind the stripping mechanism. The rollers in the pulling mechanism draw the stem through them from the rear side of the stripping plate as the curry leaf is inserted through the holes in the stripper plate. Simultaneously the stripping mechanism is subjected to a reciprocating motion through a pair of rocker arms of 400 mm in length, which is operated with the help of a cam. The stripping mechanism strips curry leaflets from the petioles of the branch. The nylon plate provided in the stripping mechanism facilitates easy stripping by 2 persons. The nylon plate reciprocates by to and fro motion (with a stroke length of 55 mm) holding the branch to be stripped, enabling the stripping process when the stem passes through the hole and pulled

Fig. 4 Power operated curry leaf stripper



Table 1 Performance of power operated curry leaf stripper

| Parameters | Range | Mean |
|---------------------------------------------|------------|-------|
| Output capacity/ feed/ inlet, kg/h | 18-22 | 20 |
| Total capacity of the equipment, kg/h | 36-44 | 40 |
| Stripping efficiency (including petiole), % | 97.5-99.05 | 98.46 |
| Stripping efficiency (without petiole), % | 88.5-91.10 | 90.2 |

by the pair of rollers. During the backward motion of the stripper mechanism, a small vibration is generated when the stripper plate hits the MS pipe acting as a baffle. This vibration partially helps in the release and dropping of the clogged leaflets in the nylon plate in to the collection tray below. The stripped stem passes through the two stem Outlet pipes made of Plastic. The outlet pipes are provided such that the stripped stem does not come in contact with the driving mechanism and are positioned in such a way that the stripped stem is collected behind the equipment. Thus the curry leaf branch to be stripped is subjected to pulling and stripping action simultaneously resulting in stripping of the leaflets from the petiole of the branch.

Collecting Tray

The stripped leaflets are collected in to the collecting tray. The MS/ plastic collecting tray is provided below the equipment. The stripped leaflets fall on an inclined sheet

Fig. 5 Evaluation of power operated curry leaf stripper



placed at an angle 45° to the horizontal and get collected in the tray. The collection tray can be easily slide in and out from the equipment.

Power Source

Single-phase one hp electric motor is used as power source to operate the pulling rollers and the stripping mechanism. Energy used by the equipment was recorded by using wattmeter

The cost economics of the developed curry leaf stripper was analysed as per Regional Network for Agricultural Machinery Test code for Farm Machinery (RNA, 1983)

Results and Discussion

Evaluation of the Equipment

The equipment was fabricated at the Research centre of Central Institute of Agricultural Engineering - Regional Centre, Coimbatore, India (**Fig. 4**). Long duration evaluation of the equipment was also carried out (**Fig. 5**). The output capacity of the equipment when two operators are using the equipment ranged from 36-44 kg of fresh leaves. The stripping efficiency with petioles and without petiole was to the tune of 98.46 and 90.2 percent respectively (**Table 1**).

Extent of Damage to Striped Curry Leaf

The striped leaves were grouped in to five groups based on the extent of damage to the leaves (based on visual

observation). The details of the extent of damage are given in Fig. 6. From the figure, it is seen that the curry leaf obtained without leaf damage was about 85 percent. Further, the extent of damage from 0-3, 3-5, 5-10 and more than 10 percent were 6, 4, 3 and 2 percent, respectively.

Energy Consumed for Operation of Equipment

The equipment was connected with the wattmeter (0-1000 W) and the energy required was recorded. It was found that the energy required to operate the machine was in the range of 285-300 W, whereas the energy required for stripping the curry leaves was very low (15-20 W). The stripped curry leaves could be used either for culinary industry or can be packaged and sold in the market. There is no loss reported in the nutrition due to the stripping action by the equipment.

Cost Economics of Curry Leaf Stripping

The cost of stripping one kg of fresh curry leaf using the stripper has been worked out to be Rs.3.50 per kg whereas the manual stripping was found to be Rs.9.0 per kg. Hence the percentage savings in

cost was found to be about 60 percent using the stripper and the percentage saving of labour was 80 percent. An Indian patent no 1146/MUM/2008 has been assignment to the equipment and the equipment has been commercialized

Conclusion

Curry leaf (*Murraya Koenigii*) is used as a leafy spice in Indian cuisine for its characteristic flavour and is reported to have a lot of medicinal values. The curry leaves are to be striped from the stem for making use in masala and pickle industries in raw. At present this operation is being carried out manually in unhygienic conditions. To reduce the drudgery of the human labour and to increase the output capacity, a power operated curry leaf stripper has been developed. The capacity of the equipment is 36-44 kg of curry leaflets per hour with a saving in labour and cost over conventional method is to a tune of 80 percent and 60 percent, respectively.

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Fig. 6 Extent of damage of curry leaf stripped using power operated curry leaf stripper

