

SUGAR CANE BUD CHIPPING MACHINE

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Abstract

Sugarcane is a vegetative propagated Crop. In India, for conventional system of sugarcane cultivation, about 6 - 8 tones seed cane /ha is used as planting material, which comprises of about 32,000 stalk pieces having 2-3 buds. Cane cuttings with one, two or three buds known as sets are used as seed. This large mass of planting material poses a great problem in transport, handling and storage of seed cane and undergoes rapid deterioration thus reducing the viability of buds and subsequently their sprouting.

One alternative to reduce the mass and improve the quality of seed cane would be to plant excised auxiliary buds of cane stalk, popularly known as bud chips. These bud chips are less bulky, easily transportable and more economical seed material. The bud chip technology holds great promise in rapid multiplication of new cane varieties. The left-over cane can be well utilized for preparing juice or sugar or jiggery.

Despite of all these benefits of bud chips for rapid multiplication of new cane, a common problem many sugar cane farmers are facing in a developing country like India is affordable (low cost) bud chipping machine. The existing (traditional) tools used for bud chipping of sugar cane are unsafe, messy and need skill and training. The risk of injury is also too high. This necessitates the development of a bud chipping machine for sugar cane. In this direction, literature survey, patent search, market survey and concept generation was carried out. Different concepts were developed using concept generation.

Index Terms – sugar cane, buds, worm and worm gear chipping machine.

I. INTRODUCTION

Agriculture is one of the most significant sectors of the Indian Economy. Agriculture is the only means of living for almost two thirds of the workers in India. The agriculture sector of India has occupied 33% of India's geographical area, and is contributing 15.1% of India's GDP. Agriculture still contributes significantly to India's GDP despite decline of its share in India's GDP. There are number of crops grown by farmers. These include different food crops, commercial crops, oil seeds

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etc., sugarcane is one of the important commercial crops grown in India. Sugarcane is the main source of sugar in Asia and Europe. Sugarcane is grown primarily in the tropical and sub-tropical zones of the southern hemisphere. Sugarcane is the raw material for the production of white sugar, jiggery (gur) and khandsari. It is also used for chewing and extraction of juice for beverage purpose. The sugarcane cultivation and sugar industry in India plays a vital role towards socio-economic development in the rural areas by mobilizing rural resources and generating higher income and employment opportunities. About 7.4 percent of the rural population, covering about 34 million sugarcane farmers, their dependents and a large number of agricultural labors are involved in sugar cane cultivation, harvesting and ancillary activities.

Little portion of stem with one bud is known as bud chip. Bud chips are used to raise settling in nursery. They were found to produce a good crop when transplanted in main field. The principal advantage of bud chips is substantial saving in seed material. Seed requirement is reduced to less than one ton per ha.

The farmers usually remove the bud chips from whole cane using a sharp edged knife in such a way that each bud has a little portion of stem. The method is laborious time consuming and dangerous. The seed cutter machines can efficiently conserve time and labor and cost as it chips more buds in less time.

Hence, non-availability of quality seed material is one of the major problems faced by farmers in developing countries. Further, the bulky cane cuttings used for planting as seed harbor many pests and diseases thereby decreasing cane yield and quality drastically. Accumulation of diseases over vegetative cycles leads to further yield and quality decline over the years. In fact, poor quality seed is a major constraint in sugarcane production. Development of tissue culture technology for rapid multiplication of disease-free planting material has greatly facilitated mass production of quality seed in sugarcane. A number of micro propagation techniques have been adopted successfully by farmers and industry in some sugarcane growing countries of Asia-Pacific, e.g. India, Australia and the Philippines. This publication details mainly the micro propagation technology for sugarcane seed production developed at Sugarcane Breeding Institute, Coimbatore, India (SBI) and adopted in several states of the country. Success stories of impact of micro propagation technology, integration of micro propagation with conventional seed production system and suggestions for future strategies are included in the publication. Ningappa H Kuri, Prof.Reddy Naik.(2010) Design and Development of Sugar Cane Bud , When compared to the traditional sugar cane bud chipping tools the newly designed and developed sugar cane bud machine is cheaper .Also, this new machine has totally eliminated the manual effort required in punching the sugar cane machine.[1]

N. Loganandhan et. al.(2010) Sustainable Sugarcane Initiative (SSI): A Methodology of labor costs and lack of any alternate innovative technologies. So, it is necessary to improve the cane productivity and maintain it sustainably. Hence, there is a strong need for some alternate methods of cane production based on the principles of "more with less".

II. STRUCTURE OF SUGAR CANE BUDS

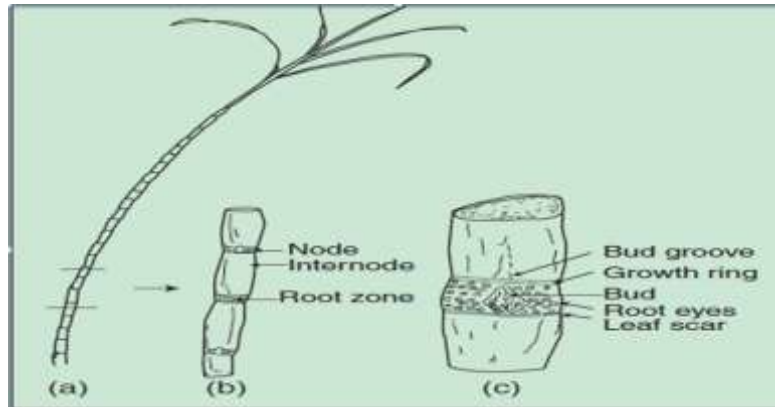


Figure1. Sugar cane, seed cane and seed setts

Fig(1) For raising a healthy sugarcane crop, setts should be harvested from 7 to 10 months old crop which is totally free of diseases and pests. The setts should be healthy and must have high moisture content. The buds should be dormant and the canes used to obtain seed setts must be free from rooting at the nodes, splits on the internodes and other damages. In India, seed setts are prepared manually. Seed canes are harvested and dry leaves removed manually to avoid any damage to the buds. Canes are cut with a sharp knife into setts containing two or three buds each. Sett-cutting machines are now available making the process more efficient.

The cut ends of seed setts become easy entry points of many disease causing microbe leading to sett rotting and damage to the buds and root primordia. Soaking the setts for 4 to 10 minutes in 0.1 per cent solution of a systemic fungicide such as methyl benzimidazole-2-yl-carbamate (MBC) just before planting is recommended to ensure protection.

III. PROBLEM STATEMENT

It has been observed in rural areas most of the people cut the sugarcane buds manually. This consumes a lot of sugar cane and time to cut the buds. In order to identify this cause we have designed and fabricated the sugar cane bud chipping machine which works on electricity. It reduces about 70% of seeding cost. And get more yield. The machine reduces tremendous labour and produces more number of buds in less time. This machine can be easily lifted as it is light in weight. It will prove one of the good ideas for the farmers.

a. OBJECTIVES

- To make a device which is suitable economically for nurseries and former taking in to Consideration the cost factor, this device is suitable for small land owners as well as in nurseries.
- Taking safety as prime consideration: This device is safer in all respects.
- To build a device which cuts the buds without applying greater force
- To develop the abilities such as working in groups, sharing responsibilities, initiative, and perseverance.
- To reduce the human effort to cut the buds from the sugar cane for sowing purpose.

- To design a machine to separate more number of buds in less time and with less human effort and ultimately reduces the production cost.

b. CONSTRUCTION

The buds are separated from the cane with the help of a specially designed machine that is called sugar cane bud chopper.

In this machine we are using a platform, hemi sphere chipping knife of G.I pipe, cam and roller follower with a simple harmonic motion, Electrical A C motor to drive the machine. Worm and worm gear reduction gear box and V-belt drive used for speed reduction. It is used to chip out the bud from sugarcane for sowing purpose. Most of the machines available are using flat cutters that separate the node completely. But In this project using two hemisphere chipping knives which provides gentle cutting of bud without extra loss of sugarcane during sowing. G I cutting Blades are using to cut the buds. Blade tip used is sliding which will give a smooth cutting and increase the blade life. The cam and roller follower transmit the rotary motion of gear shaft in to a reciprocating motion of the cutter. The machine is powered by electric motor. Cutting speed can be calculated as per our motor and reduction gear boxes. Large number of buds can easily be chipped off in this way in a short period of time. We are using two cutters to double the capacity than that of single bud chopper machine. By this sugar cane bud chopper machine we can separate 30 bud's of piece within one minute time, away that it can handle various sugarcane sizes and diameter.

c. 2D DESIGN OF MACHINE.

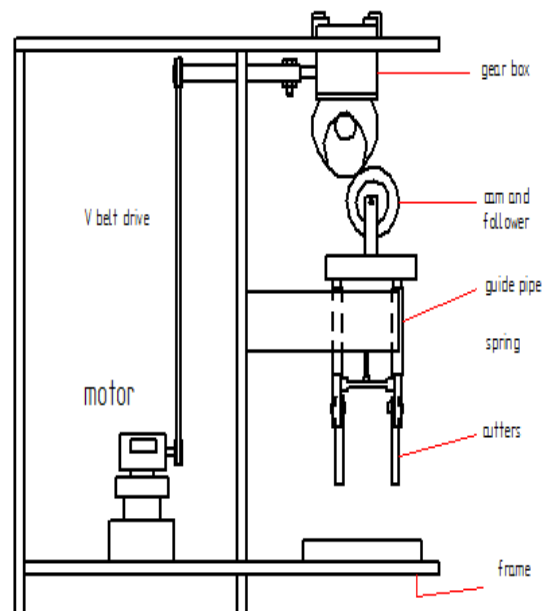


Figure2. Assembly diagram of sugar cane bud chopper machine

d. WORKING

The machine is powered by electrical A C motors which run at 1330 rpm. V belt drive and worm and worm gear box are used to reduce the speed to 28 rpm. The rotary motion of gear shaft is converted in to reciprocating motion by using cam and follower. The two hemispherical cutters are moves vertically and spring provides the return stroke of the cutters. Shanks are used to guide the cutter. The sugar cane feed on the floor form which buds are scoped off in hemispherical shapes. All these are placed on the rigid frame.

The weight of chipped buds is about 84 kg (<4% of the cane weight). The rest of the canes can be sold to sugarcane juice venders and to the factory. The chipped buds were treated with chemical solution to prevent any disease infestation in the resulting plants and were filled into gunny bags.

e. ADVANTAGES

- Easy to operate.
- Labor cost is reduced.
- High cutting speed and more number of buds can be cut.
- Reduces the plantation cost.
- Noiseless.
- Safety in handling.
- No much physical effort required.
- Only about 240kg of seeds are required per acre against of 2-4 ton 3 tones of sugar cane in normal planting.
- The sugarcane after taking buds can be sent for milling or to juice center.
- Transportation cost is less.
- More yield as compared to normal method of plating.
- Less damage of buds as only buds are removed from the sugar cane.
- Injuries caused during normal operation is eliminated.

IV. PROCESS AFTER SUGARCANE BUD CUTTING



Figure 3. Cutted Sugarcane Buds By Machine



Figure 4. seed treatment



Figure 5. Tray Filling



Figure 6. Germinated eye buds (4-5) days after seeding tray for transplantation and Single bud cane

V. RESULTS AND DISCUSSION:

Table: 1 Result and Discussion

Type of machine	Vertical reciprocating and double cutter type
Speed of the cutting tool	20 strokes/min
Speed of motor	1330rpm
Number of stroke per min	20 stroke
Number of bud's cut per min	30 bud's
Speed reduction by	Worm and worm wheel , V- belt drive
Speed reduction gear box	28:1

- Number of strokes per min =20stroke
- Buds cut per min =30buds
- Average number of buds in sugar cane =18buds
- Average weight of sugar cane =2kg
- Weight of sugar cane buds in each cane =0.24kg
- Sugar cane saved =1.74kg
- For each tone =240kg buds
- Sugar cane saved for each tone =740kg

VI. CONCLUSION

Project is an economic means for the farmers which may of great help to them to cut out cane buds from its shoot. Farmers usually cut the sugar cane buds by their conventional knives. The project model can make their task much easier. And moreover by this much of the sugar cane is saved and remaining sugar cane buds are used for the yield. The remaining sugar cane approx 50 to 70 % is transported to sugar mills for production of sugar.

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