

AUTOMATIC STRAW PROCESSING AND PACKAGING MACHINE FOR OYSTER MUSHROOM

India produces 130 million tonnes of paddy straws per year. Some of the farmers in rural areas use these paddy straws (Agricultural Residues) to grow mushrooms like Oyster Mushrooms that are healthy and nutritious food. Even though a farmer is able to produce 600 grams to 900 grams of Oyster Mushroom from 1 kg of paddy straw, the overall production of Oyster Mushroom in India is as less as 35000 tonnes per year.

So, there is huge gap between the production potential and current production of Oyster Mushrooms in India. One of the main reasons of low production of Oyster Mushrooms is the manual and tedious processes that are currently employed by the farmers in rural areas to produce Oyster Mushroom.

Thus, to produce Oyster Mushroom, a farmer in the rural India currently practices the following step wise processes

- i. Manually cuts the paddy straws into 2.5 cm to 5 cm size pieces to use these cut paddy straws as substrate for growing Oyster Mushroom.
- ii. Sterilize the cut straws either by boiling the straws in a water drum or dipping the straws in chemical solutions like Bavistin solution.
- iii. Dehydrate the straws to around 70 percent moisture content by spreading the cut and sterilized straws under sun.
- iv. Use the dehydrated straws to make thin round pads manually.
- v. Manually inoculate the round pad with mushroom mycelium.
- vi. Layer one pad on the other and continue the inoculation process till the total substrate with the mushroom mycelium reaches a particular height like 45 cm or 75 cm depending on the polythene used for packing these for growing Oyster Mushrooms.
- vii. Pack the inoculated substrate in polythene bags for growing Oyster Mushrooms.

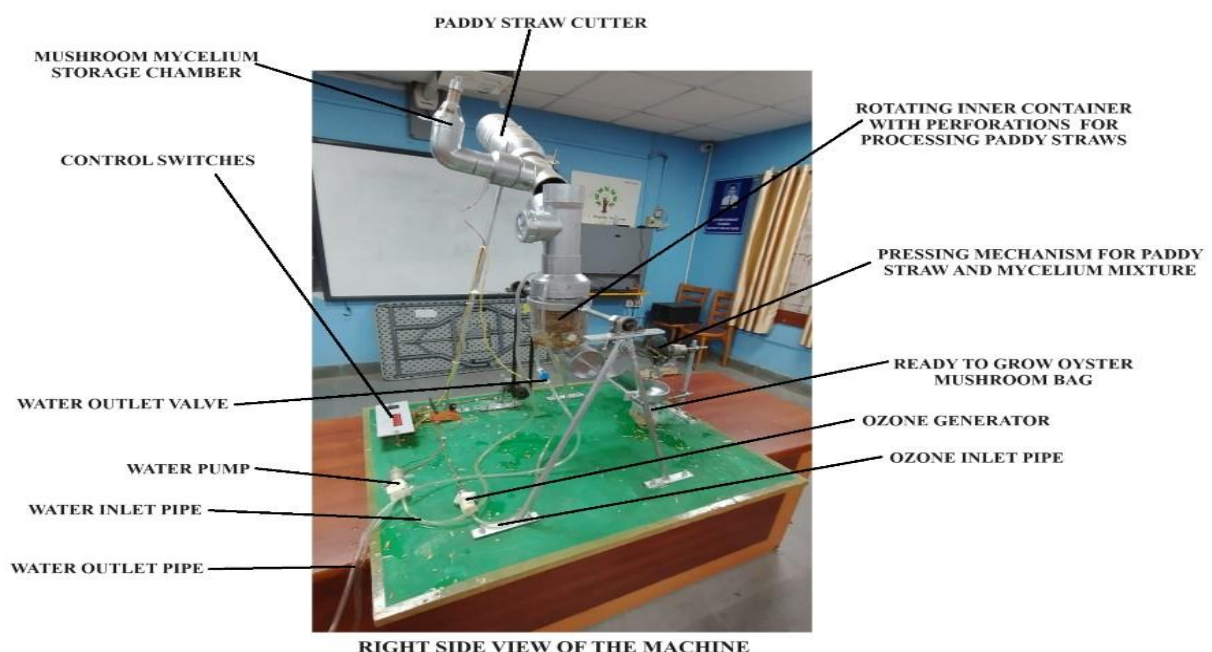
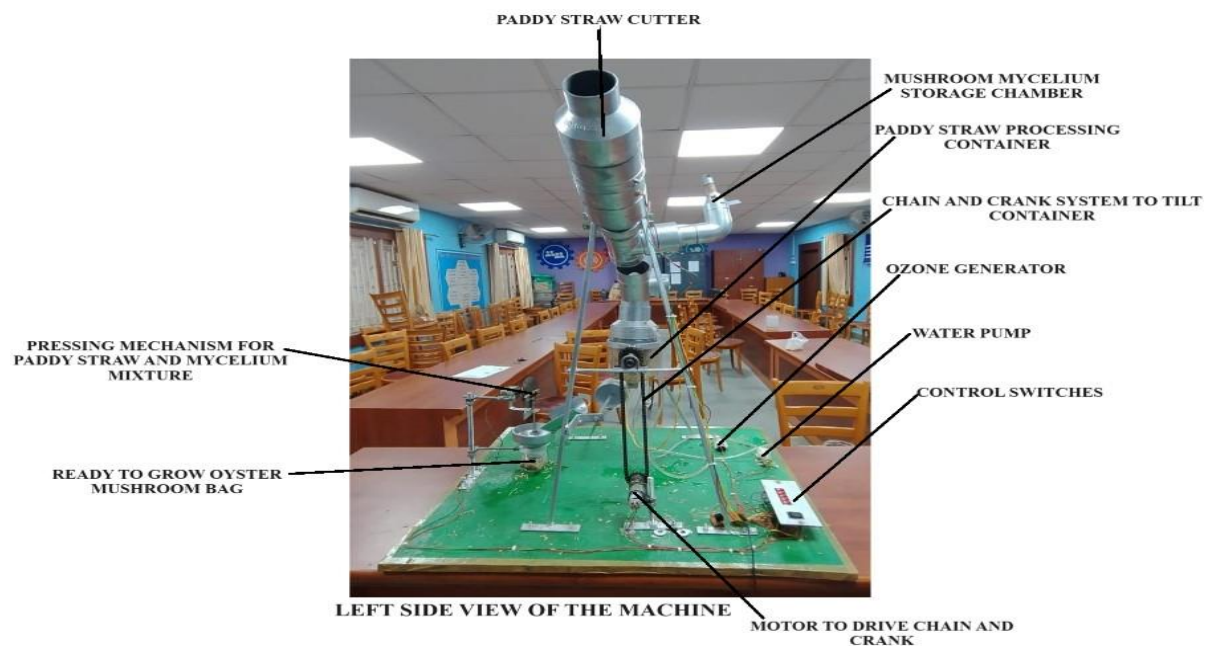
The above processes that are currently being practiced by the farmers in rural areas to grow Oyster Mushrooms are time consuming, tedious and many a time contaminate the substrate leading to production losses. Therefore, not many farmers find it convenient to grow the nutritious foods like Oyster Mushrooms despite availability of large quantities of paddy straws that can be used as substrate to grow Oyster Mushrooms.

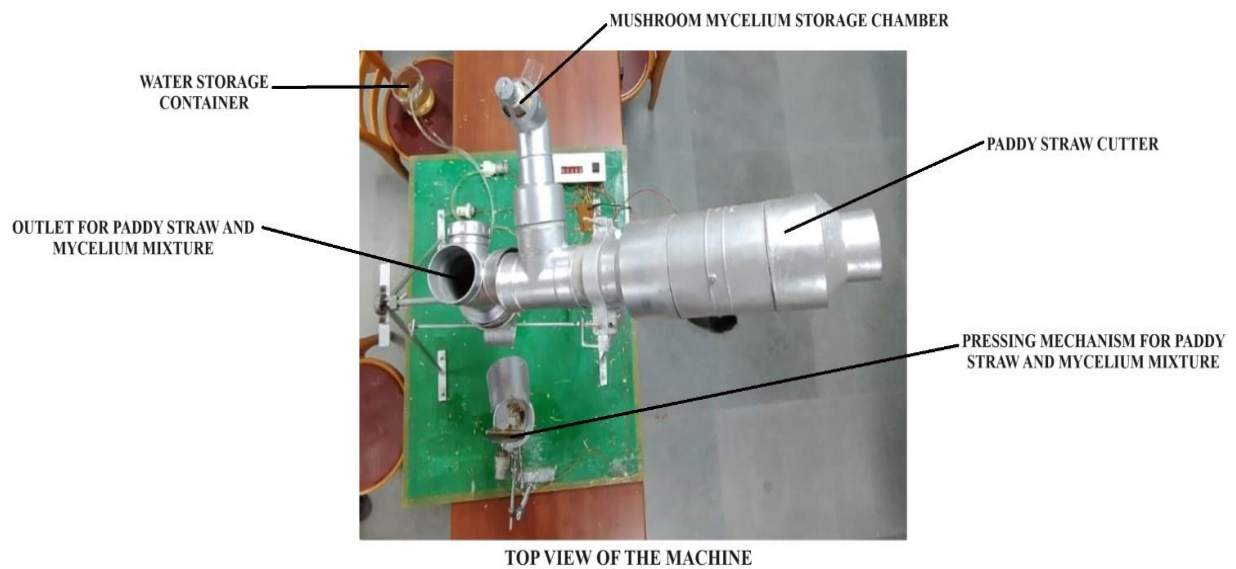
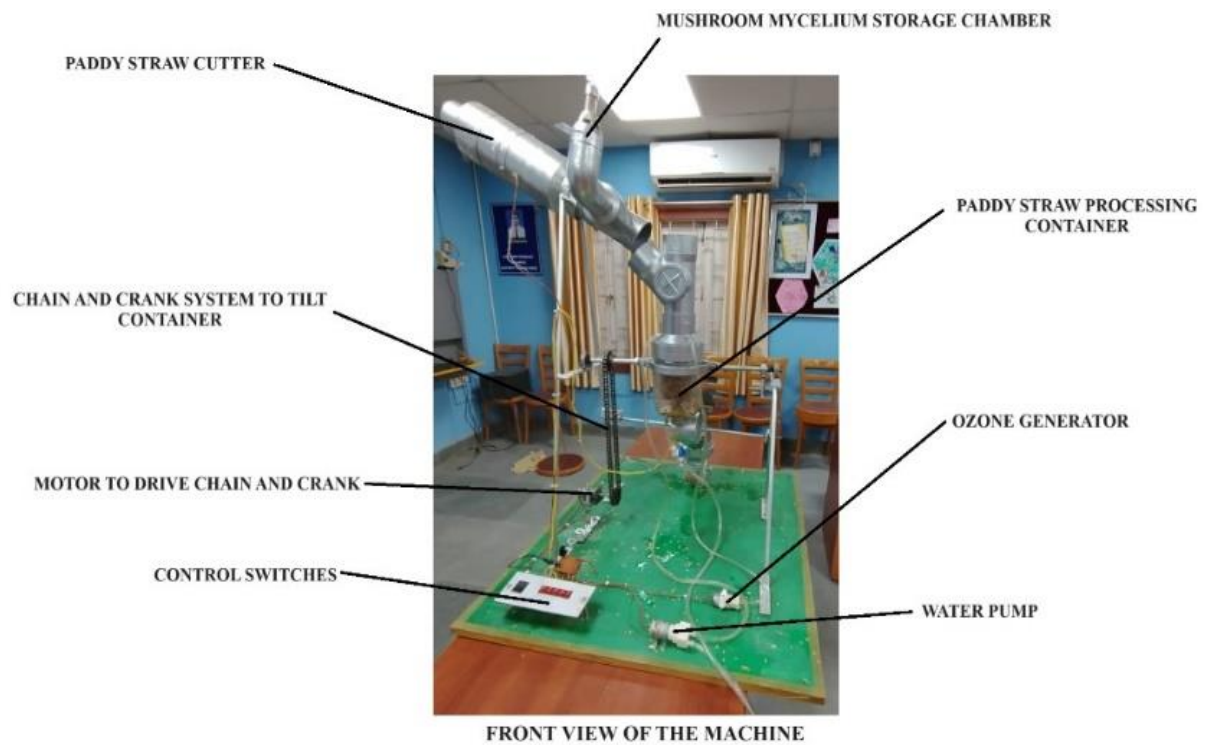
In order to address the current issues of Production of Oyster Mushrooms by farmers in rural areas, I have designed an AUTOMATIC STRAW PROCESSING AND PACKAGING MACHINE FOR OYSTER MUSHROOM and have made a working prototype of the machine. This machine would perform multiple tasks

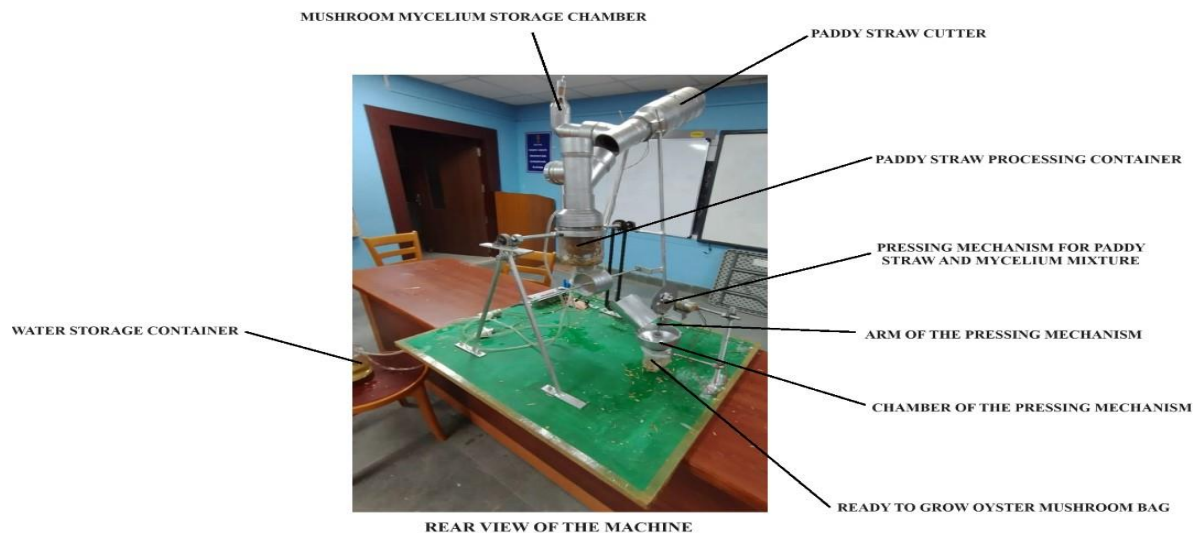
including cutting the straws, sterilizing them, dehydrating straws, inoculating them with mushroom mycelium and packing them into the bags. The end result would be convenient and efficient Mushroom Bags that are ready for growing Oyster Mushrooms.

Automating the processes will streamline and simplify the production of ready to grow mushroom bags, eliminating the need for manual labour and reducing the potential for human error and contamination. Thus, this machine would ensure efficiency, consistency and convenience in the production of Oyster Mushrooms.

The details of the machine and its components are shown in the pictures below.







In the AUTOMATIC STRAW PROCESSING AND PACKAGING MACHINE FOR OYSTER MUSHROOM the following processes are sequentially performed

- i. Starts with cutting the straws into 2.5 cm to 5 cm size pieces through a motorized paddy straw cutter.
- ii. The cut straws fall into an inner paddy straw processing container with perforation which is housed within an outer container.
- iii. After the cut paddy straws fall into the inner container, it is filled with water through a water pump.
- iv. Then ozone is passed through an ozone generator into the container with water for 30 minutes to sterilize the cut paddy straws.
- v. The water is then drained out from the container through a valve.
- vi. The inner container with the sterilized straw is then spined through a motor attached at the base of the container. Through the spinning of the container the water in the paddy straws move out through the perforations in the inner container. Thus, the straws get dehydrated to the required moisture content.
- vii. After the straws are dehydrated and water is again drained out of the container, mushroom mycelium is added to the dehydrated straws by opening a slit of the mushroom mycelium storage chamber.
- viii. Once again, the inner container is made to spin to thoroughly mix the mushroom mycelium with the paddy straws to inoculate the substrate (paddy straws).
- ix. Then the container system is tilted through a motorized crank and chain system so that the inoculated paddy straw substrate falls into a chamber where it is pressed through a motorized pressing mechanism and the inoculated substrate gets packed in the polythene bag attached at the bottom of the chamber.

Thus, the above processes help to prepare a ready to grow Oyster Mushroom bag.

The AUTOMATIC STRAW PROCESSING AND PACKAGING MACHINE FOR OYSTER MUSHROOM with its components and functions and advantages over the existing process employed by the farmers are given in the table below.

Sl. No	Component of the Machine	Function of the Component	Advantage Over the Existing Process Employed by the Farmers
1	Paddy Straw Cutter	This is a motorized paddy straw cutter to cut paddy straws into 2.5 cm to 5 cm size pieces.	Cutting through motorized paddy straw cutter is faster than the manual cutting; cuts paddy straws into standard sizes and are not labour intensive.
2	Paddy straw processing containers with an outer container and an inner container with perforations and an attached motor to rotate it.	The outer container houses the inner container and stores water for sterilization of paddy straws through ozonation. The inner container which can rotate and has perforations holds the cut paddy straws. Rotation of the inner container helps to dehydrate cut paddy straws and to thoroughly mix the mycelium with the cut paddy straws.	It eliminates the manual process of dehydration of the straws and inoculation and prevents contamination of the substrate.
3	Water storage container, Water Pump and Ozone generator	The water pump feeds water from the water storage container into the containers containing the cut paddy straws to aid the process of ozonation. The ozone generator produces ozone which is passed through the cut paddy straws for sterilization.	Eliminates manual process involved in sterilization of paddy straws through boiling in water drum or dipping in harmful chemical mixture.
4	Mushroom Mycelium Storage chamber	Holds the mushroom mycelium. It has a slit below the chamber with a plate covering the slit. The plate is pulled out to	Eliminates the manual process of adding mushroom mycelium to the substrate thus saving

		open the slit and the mushroom mycelium falls into the inner container that holds the cut paddy straws.	time and preventing contamination.
5	Chain and crank system with a motor	It tilts the paddy straw processing container so that the inoculated substrate (paddy straw and mushroom mycelium mixture) falls into the pressing mechanism chamber.	Eliminates the manual handling of packing the paddy straw and mushroom mycelium mixture into the polythene bags.
6	Pressing mechanism with motor, chamber and pressing arm	Presses the mixture of paddy straw and mushroom mycelium into the polythene bag under the pressing chamber.	Eliminates the manual handling of packing the paddy straw and mushroom mycelium mixture into the polythene bags.
7	Control switches	The switches control the operation of the motors, water pumps and ozone generator.	Eliminates the manual processes currently being practices by the farmers.

Thus, automating the process of preparing ready to grow Oyster Mushroom bags through the use of the AUTOMATIC STRAW PROCESSING AND PACKAGING MACHINE FOR OYSTER MUSHROOM will provide the required convenience to the farmers in the rural areas to extensively use agricultural residues like paddy straws to enhance the overall production of Oyster mushrooms for self-consumption and sale. A farmer need not buy the machine; an entrepreneur can have the machine at the community level and famers can come and avail services from her/him. A farmer can just come with paddy straws, feed the paddy straws at one end of the machine and get the ready to grow Oyster Mushroom bags at the other end of the Machine.

Video Link of The Prototype

https://drive.google.com/file/d/1X1Kj_MGUafswf5avkcFVdSjttZ9aVn-7/view?usp=drivesdk