Green Technology for Rice-Straw-Pulp-Appliance (RSPA)

[*Patented Technology of Environment Friendly Microbial Mediated Method of Rice Straw Pulp Preparation and Uses Thereof*]

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Prologue

The rice straw production in India is around 140.6 MT. However, due to lack of economically viable options for rice straw utilization, farmers in India, are compelled to burn the straw in fields (K. Malik et al., 2023). Around 16% of crop residues are subjected to burn on fields in India out of which 60% is rice straw (Bhattacharyya et al., 2020). Open-field burning has harmful environmental effects including air pollution and greenhouse gases emissions. On the other hand, large-scale use of plastic plates/appliances (non-biodegradable) causing environmental pollution. Therefore, we developed a green technology (microbial mediated) for the making of rice-straw-pulp-appliances (RSPA). In our innovative patented technology, we used a novel microbial consortium (*Bacillus* cereus.: MN784664 + *Penicillium* sp.: MK855473) with a low concentration of sodium hydroxide (60% less than commercial used concentrations) at low temperature (65% less temperature than generally commercial used temperature) for pulp plate/appliances making (Technology got patented: patent no: 473791; Dated-28-11-2023). This process could save 65-70% of energy over the existing commonly used technology. This green technology has the potential to reduce carbon footprint and help in climate change mitigation. Details about the Green Technology (microbial mediated) for making the rice-straw-pulp-appliances (RSPA) are presented below.

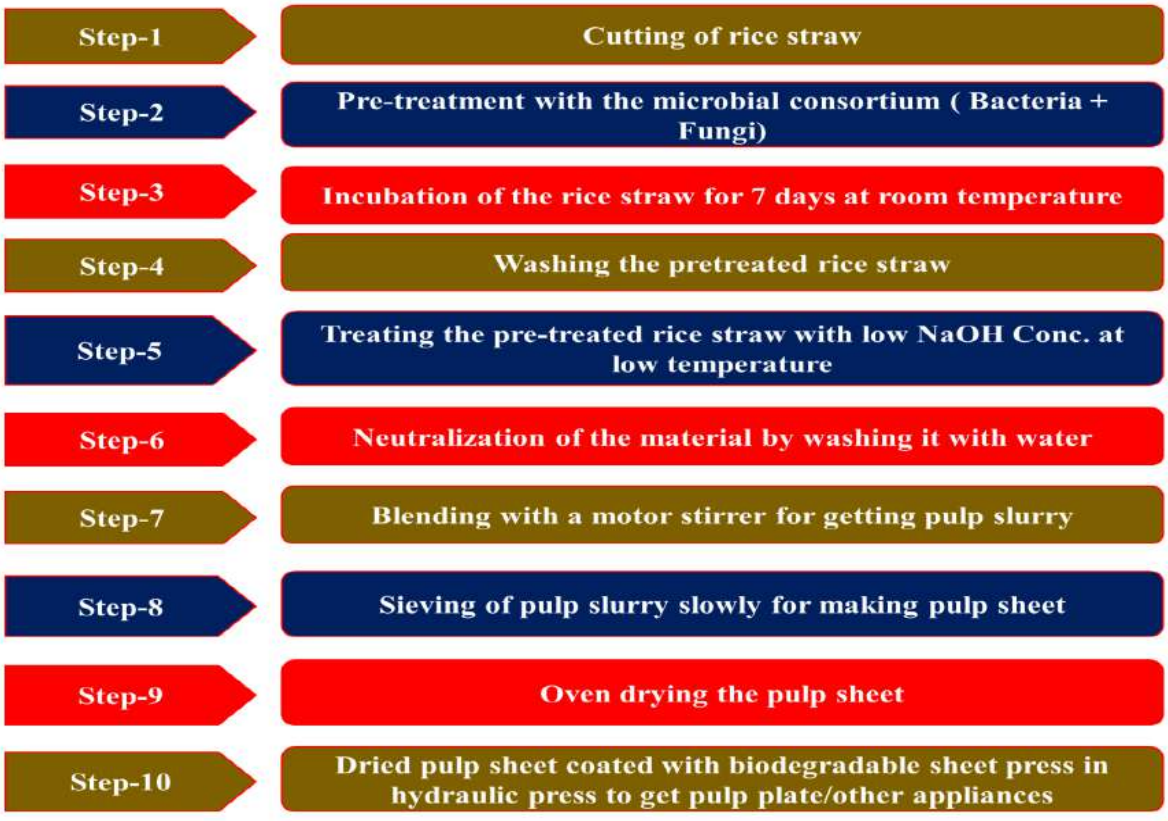

Fig. 1: Green technology for making RSPA

Physical and chemical characteristics of the RSPA

Tensile strength: 2-4 Newton per square millimetre
Water absorption: 300-500 Grams per square meter
Cellulose content: 60-75%
Lignin content: 2.5-4%

Economics of RSPA

[For the making of 5.76 lakh rice straw pulp plates (2000 per Days; 48000 per Month; 5.76 lakh per annum in a small-scale industries or start-ups]

[Non-recurring Cost] (Cost-A) (Approximately)	
(A) Machinery	**Cost (INR in Lakh) (approximately)**
Hydraulic plate press	2.0
Oven	0.5
Straw cutting Machine	0.4
Autoclave	0.5
Biosafety Cabinet	1.5
Cost (A)	**4.9**
[Recurring Cost] (Cost-B)	
Items	**Cost (INR in Lakh)**
(B) Consumables	
Straw **57000 kg (57 tonnes) @ 2/kg**	1.12
Sodium Hydroxide (NaOH) **172.8 kg @ 720/kg**	1.24
Cultural Media for Microbes **5760 liter @70/liter**	4.03
Cost (B)	**6.39**
(C) Rent + Labour + Electricity	0.48
(D) Licencing Cost (with MSME certificate & Startups)	1.12
(E) Royality **@ 5%** of total sell amount	0.85
(F) GST **@ 18%**	0.20
(G) Machinery **@ 10% Depreciation value**	0.49
(H)Total @ Production Cost (B+C+D+E+F+G)	**9.53**
(I) Selling Cost @ 3.0/per plate (5.76×3 /-)	**17.28**
Net (Approx.) Profit (I-H)	**7.75**

Economic and environmental importance of RSPA

1. Rice straw pulp-appliances (RSPA) is a biodegradable product and a good alternative to plastic appliances which causes environmental menace.
2. The technology is cheaper than existing methods and environmentally friendly.
3. The cost of the rice-straw-pulp-appliances (RSPA), for example @ Rs 3.0/- per plate (with biodegradable sheet coating) and Rs 2.0/- per plate (without coating)
4. The process requires cheap equipment (approx. cost is 4.9 lakh).
5. This process could save 65-70% of energy compared to the commercial method.
6. The RSPA can be produced locally by small industries and start-ups.

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Patented Technology

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