

## Performance evaluation of improved cook stoves

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**ABSTRACT :** Biomass is the organic matter produced by plants. Incomplete combustion of biomass fuel generate high levels of indoor pollutant gases like CO, NO<sub>2</sub>, SO<sub>2</sub>, sulphur oxides etc. A modified version of the traditional cook stoves is the improved cook stove in which the biomass is burnt more efficient with respect to fuel consumption, thermal efficiency and also makes them convenient for cooking and much safer from a health point of view. The thermal efficiency of MS rod was 23.80 per cent while it was 24.10 per cent for the cook stove made of GI wire and 24.30 per cent for the cook stove made of perforated stainless steel as compared to that of 12.20 per cent for traditional cook stove. The combustion efficiency of husk cook stove with central fire port made of stainless steel perforated mesh was highest (74.10 %) as compared to 71.3 and 70.8 per cent for that of GI wire and MS rod, respectively while it was 56.4 per cent for traditional cook stove. So it is concluded that the improved cook stoves are more efficient than traditional cook stoves for thermal applications.

**Key words :** Biomass, Thermal efficiency, Improved cook stoves, Combustion efficiency, Traditional cook stoves, Fuel consumption

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### INTRODUCTION

The majority of the households in the developing countries like India, use biomass fuels such as wood, dung and other fibre residues on a daily basis for cooking and heating (World Resources, 1998). Smoke from biomass combustion contains high levels of indoor pollutants which may be harmful to the health of the exposed individuals. India bears one of the largest burdens of disease due to the use of unclean household fuels (Smith *et al.*, 2000). The exposure was found to be highest in women and young children groups in both rural and urban groups of developing countries. Rathore and Jain (2001) developed single and double pot improved cook stoves for rural and tribal people. They reported that the thermal efficiency of these improved cook stove was in the range of 21.78 – 29.08 per cent. Laura Spautz *et al.* (2006) reported that the parameters like thermal efficiency, combustion efficiency, concentration of carbon monoxide and carbon dioxide are the main criteria for evaluating the performance of cook stoves. Desai *et al.* (2007)

studied the adoption of improved cook stoves by rural women of Raichur region. They reported that the thermal efficiency of Udairaj improved double pot cook stove varied from 24-26 per cent as compared to 10-12 per cent for traditional cook stoves. The power output rating of the improved cook stoves was 1.42 kW while it was 0.98 kW for traditional cook stoves.

### EXPERIMENTAL PROCEDURE

#### **Fabrication of husk cook stove:**

A cylinder of 20cm diameter with 17cm height was fabricated using 22 gauge MS perforated mesh. A cone shape structure of 34cm top diameter and 20cm base and height of 15cm was fabricated using 22 gauge GI sheet. This was welded to the perforated MS cylinder. A grate of diameter 20cm made up of 20gauge MS perforated sheet was fixed at the bottom of the stove on which the ash will be collected. In order to hold the cook stove a stand was fabricated using 2/8" MS rod to which 3 legs made up of MS flat of 1"X1/8" were welded. Three different central fire ports were fabricated as explained below:

#### **Husk cook stove with central fire port made up of MS rod:**

Two numbers of circular rings of 9cm diameter were made

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