

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM



A

**PROJECT REPORT ON
BIOGAS GENERATION FROM WASTE FRUIT PEELS BY THE
APPLICATION OF NITROGEN PURGING**

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ABSTRACT

Energy forms the foundation of all our industrial, agricultural and developmental activities. There has been an enormous increase in the demand for energy as a result of industrial development and population growth. Supply of energy is, therefore, far less than the actual demand. Solid wastes from fruits and vegetables, by virtue of being renewable, represent a potentially sustainable resource of energy, if they can be biologically converted to methane. This is directed towards leading a sustainable life. Fruit wastes are disposed off by dumping, spreading on land or by feeding to animals. One way of solving the problem is to make use of this waste for the production of biogas which could be suitably utilized in the surrounding areas and the digested slurry as organic manure.

In this research work, an attempt is being made to recover methane from the waste fruit peels discarded by the surrounding juice centers. The waste fruit peels collected on weekly basis was shredded and ground into slurry form of 2 kg weight and introduced into the reactor with *Equus ferus feces* (horse dung) as a seeding material in different ratios. The whole setup is kept in a dark room. The biogas generated will be quantified.

The various mix proportions of waste fruit peels and *Equus ferus feces* (horse dung), considered for study were, 10:0.5, 10:1.0 and 10:1.5 for which, 590 ml, 430 ml and 950 ml of biogas generated respectively for an observation period of 7 days/cycle. The BOD was reduced from 370 mg/L to 310 mg/L, 430 mg/L to 310 mg/L, 560 mg/L to 420 mg/L for the same respective mix proportions. COD was also reduced from 2320 mg/L to 520 mg/L, 2640 mg/L to 720 mg/L, 2480 mg/L to 400 mg/L. The nitrate, phosphate and sulphate concentration for the same observation period were increased considerably i.e., nitrate concentration increased from 0.36 mg/L to 0.52 mg/L, 0.98 mg/L to 1.67 mg/L, 1.38 mg/L to 1.90 mg/L, phosphate increased from 1.44 mg/L to 2.19 mg/L, 3.75 mg/L to

4.81 mg/L, 4.38 mg/L to 5.31 mg/L and sulphate increased from 0.44 mg/L to 1.11 mg/L, 1.22 mg/L to 1.64 mg/L, 1.47 mg/L to 1.68 mg/L for mix proportions of 10:0.5, 10:1.0 and 10:1.5 respectively. The obtained results indicate that the digested waste can serve as excellent manure.

The research work was further extended with use of Water Hyacinth as a combination of mix proportion 10:2.0:2.5 (10 g of Fruit Peel slurry, 400g and 500 g Water Hyacinth), it has been observed that COD and BOD values of the waste fruit peel were reduced from 39600 mg/L to 5400 mg/L and 1440 mg/L to 38 mg/L respectively. Increase in nitrogen, phosphorus and sulfur content in the feed was observed during the digestion. The values of the same were increased from 2.97 to 8.6 mg/L, 67.5 to 350 mg/L and 8 to 68.42 mg/L respectively. This efficiency was achieved for degrading 2 kg of waste fruit peel slurry. The calorific values of the raw fruit peels and digestate and the biogas constituents for the mix proportions 10:2.0:2.5 was determined. The calorific value was found to be 49,813.4 KJ/Kg and 67,394.6 KJ/Kg respectively. Further, the concentration of nitrogen, mercaptans and hydrogen sulphide was found to be 1 ppm, 4 ppm and 2 ppm respectively.

Keywords: *Biomethanation, Waste Fruit Peels, BOD, NPK value, Calorific value*