AN INTEGRATED APPROACH TO BIOMASS UTILISATION: STUDIES ON *Saccharum munja* Roxb.

By

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Dedicated to

My Parents

who have given

so much & asked

for

so Little in RETURN

CERTIFICATE

This is to certify that the thesis entitled 'AN INTEGRATED APPROACH TO BIOMASS UTILISATION : STUDIES ON *Saccharum munja* Roxb' submitted by Mr. GURBINDER SINGH GUJRAL has been prepared under our supervision in conformity with the rules and regulations of Indian Institute of Technology, Delhi. The research report and results presented in this thesis have not been submitted for any degree in any other University/Institution.

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- GURBINDER SINGH GUJRAL

ABSTRACT

Biomass as a resource has been exploited since ancient times. However, in recent years in the wake of the primary and secondary energy crisis, increased attention is being focussed towards the production, conversion and utilisation of this renewable resource. With a limited land availability, it is important to consider the application of biomass as a whole so that every part of it is fully used for satisfying the major needs of food, fodder, fertilizer ,fibre besides fuel and materials. Further, the potential of a variety of underexploited plants including weeds inhabiting marginal and unproductive waste-lands must be given special attention. The present thesis is a study on two plants - Saccharum munja Roxb. and Lantana camara Linn., which are very prolific in their growth and are also considered as 'Weeds'.

Both the weeds are known to be hardy and able to sustain and multiply under adverse agroclimatic conditions, requiring little agricultural inputs for their growth. They can be propagated vegetatively and can be coppiced. A surprisingly large biomass yield of the order of 60-90 tons/ha on dry weight basis has been recorded. This is comparable or even higher than the yields of plants currently popular. This biomass can be directly used as fuel for burning or indirectly after conversion into charcoal by pyrolysis or

biogas by anaerobic digestion. Various other applications are also feasible. While neither plant has any direct value as food/feed (L.camara is toxic and S.munja is a hardy weed not relished by cattle), the indirect use of S.munja as a substrate for the growth of an edible mushroom Pleurotus sajor-caju has been established. The spent mushroom compost as well as ensiled S.munja biomass is found suitable as animal feed. The fertilizer value of directly composted S.munja, spent mushroom compost and the effluent slurry from the biogas digester have been evaluated for the growth of vegetables. In addition, other traditional and non-traditional uses have been studied. It has been seen that Sarkanda (stem) is used in making furniture while munj is used in making ropes. Detailed extraction procedures and properties of munj fibres have been analysed. The pulping of leaves into coarse sheets and their subsequent use has also been studied. The biomass can be converted into chemicals like oxalic acid by suitable treatments. The economics of various processes evaluated in terms of the current prices in India indicate that the yield from one hectare (which is the average land-holding) is sufficient to give employment to the whole family and also lifting it above the poverty line. In fact, even if the raw materials are to be purchased, say, by a landless entrepreneur,most of the processes are economically viable for putting up a small industry. It has been shown that S.munja is not only ecologically compatible,but also exerts a positive influence in reducing soil salinity.

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