

## Evaluating Viability of Using South African Forestry Process Biomass Waste Mixtures as an Alternative Pyrolysis Feedstock in the Production of Bio Oil

**Authors :** Thembelihle Portia Lubisi, Malusi Ntandoyenkosi Mkhize, Jonas Kalebe Johakimu

**Abstract :** Fertilizers play an important role in maintaining the productivity and quality of plants. Inorganic fertilizers (containing nitrogen, phosphorus, and potassium) are largely used in South Africa as they are considered inexpensive and highly productive. When applied, a portion of the excess fertilizer will be retained in the soil, a portion enters water streams due to surface runoff or the irrigation system adopted. Excess nutrient from the fertilizers entering the water stream eventually results harmful algal blooms (HABs) in freshwater systems, which not only disrupt wildlife but can also produce toxins harmful to humans. Use of agro-chemicals such as pesticides and herbicides has been associated with increased antimicrobial resistance (AMR) in humans as the plants are consumed by humans. This resistance of bacterial poses a threat as it prevents the Health sector from being able to treat infectious disease. Archaeological studies have found that pyrolysis liquids were already used in the time of the Neanderthal as a biocide and plant protection product. Pyrolysis is thermal degradation process of plant biomass or organic material under anaerobic conditions leading to production of char, bio-oils and syn gases. Bio-oil constituents can be categorized as water soluble (wood vinegar) and water insoluble fractions (tar and light oils). Wood vinegar (pyro-ligneous acid) is said to contain contains highly oxygenated compounds including acids, alcohols, aldehydes, ketones, phenols, esters, furans, and other multifunctional compounds with various molecular weights and compositions depending on the biomass material derived from and pyrolysis operating conditions. Various researchers have found the wood vinegar to be efficient in the eradication of termites, effective in plant protection and plant growth, has antibacterial characteristics and was found effective in inhibiting the micro-organisms such as candida yeast, E-coli, etc. This study investigated characterisation of South African forestry product processing waste with intention of evaluating the potential of using the respective biomass waste as feedstock for boil oil production via pyrolysis process. Ability to use biomass waste materials in production of wood-vinegar has advantages that it does not only allows for reduction of environmental pollution and landfill requirement, but it also does not negatively affect food security. The biomass wastes investigated were from the popular tree types in KZN, which are, pine saw dust (PSD), pine bark (PB), eucalyptus saw dust (ESD) and eucalyptus bark (EB). Furthermore, the research investigates the possibility of mixing the different wastes with an aim to lessen the cost of raw material separation prior to feeding into pyrolysis process and mixing also increases the amount of biomass material available for beneficiation. A 50/50 mixture of PSD and ESD (EPSD) and mixture containing pine saw dust; eucalyptus saw dust, pine bark and eucalyptus bark (EPSDB). Characterisation of the biomass waste will look at analysis such as proximate (volatiles, ash, fixed carbon), ultimate (carbon, hydrogen, nitrogen, oxygen, sulphur), high heating value, structural (cellulose, hemicellulose and lignin) and thermogravimetric analysis.

**Keywords :** characterisation, biomass waste, saw dust, wood waste

**Conference Title :** ICEP 2023 : International Conference on Environment Protection

**Conference Location :** Cape Town, South Africa

**Conference Dates :** November 06-07, 2023