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OIL PALM BIOMASS WASTE AS ROOTING MEDIA FOR TOBACCO TRAY SEEDLINGS AND AS A FUEL FOR CURING OF FCV TOBACCO

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Oil palm (*Elaeis guineensis* Jacq.), the most efficient oilseed crop cultivated in many countries of world. Malaysia and Indonesia produce about 85% of the world's palm oil. Andhra Pradesh has been the leading palm oil producing state in India contributing approximately 85 per cent of country's production.The oil palm plantations produce a significant amount of biomass residues concomitant to the production of palm oil, with pruned trunks and fronds remaining in situ and oil palm empty fruit bunches (OEFB) as a by-product at the processing plant. Investigations were carried out to effectively utilize this biomass waste. The waste has been tried as rooting media for tobacco tray seedlings and fuel for curing of FCV tobacco. Results indicated that oil palm fronds (OF)biomass (50%) + coirpith (50%) and oil palm trunk(OT)biomass (50%) + coirpith (50%) shown positive response for growth of the tobacco tray seedlings. Oil palm empty fruit bunches and oil palm empty fruit bunch briquettes were tried as an alternative fuel for curing of FCV tobacco. Results indicated that oil palm empty fruit bunch briquettes were able to save wood fuel to an extent of 19%. As a fuel, OEFB Biomass consumed for curing of 1kg cured leaf is 4.0kg. Whereas, Fuel wood consumed was 5.6 kg for curing of 1kg cured leaf. The equivalent weight of fuel wood with that of OEFB biomass was 1.4kg for curing of FCV tobacco. OEFB Biomass can be effectively utilized as a fuel for curing of FCV tobacco.Utilization of Empty fruit bunch alone as a fuel for Curing in entire northern light soil region (NLS) region of Andhra Pradesh will save 15.6 % of wood fuel.

INTRODUCTION

Oil palm (*Elaeis_guineensis_*Jacq.), the most efficient oilseed crop in the world produces 4.0 to 6.0 tonnes of crude palm oil and 0.4 to 0.6 tonnes of palm kernel oil/ha/annum from 4th to 30th year of its productive life span. It is cultivated in many countries of world and Malaysia and Indonesia produces about 85% of the world's palm oil. In Andhra Pradesh, it is being cultivated in 1,70,000 ha area of which 70, 000 ha area lies in West Godavari district alone.The production of palm oil generates biomass residue from plantation and mill sites. This biomass residue can be classi-fied into six types *viz.,* oil palm fronds (OF) and oil palm trunks (OT) produced at plantation site, oil palm empty fruit bunches (OEFB), palm kernel shells (PKS), mesocarp fibre (MCF) and palm oil mill effluent (POME) produced at mill sites. The oil palm plantation of ten-year-oldproduces 59.62 ton of biomass/ ha under irrigated and 36.53 ton of biomass/ha under rain fed conditions in India. Oil Palm produces about 24 leaves/palm/year which is equivalent to 10.50 t/ha /year on dry matter basis and replacement of old plantation for new planting generates huge amount of trunk biomass. Empty fruit bunches (EFB) are what remains of the fresh fruit bunches after the fruit has been removed for oil pressing and accounts for nearly 20-23% of fresh fruit (FFB). In general, these biomass generated from plantations are either unutilized or under-utilized.With good planting material, proper crop management and assured irrigation, oil palm has the potential to produce 20-25 tonnesof fresh fruit bunches (FFB) per hectare after attaining the age of 5 years while 25 tonnes of FFB produces 5 tonnes of EFB. In India, around 16, 25,463tonnes of FFB produced during 2017-18. Out of which, Andhra Pradesh accounts of 14, 27, 827 tonnes of FFB, the lion share of FFB are produced in Andhra Pradesh. From this quantum of FFB, approximately 2, 85, 565tonnes of EFB from oil palm plantations of Andhra Pradesh. Therefore, it has the huge

Key words: Oil palm empty fruit bunches, oil palm fronds, oil palm trunk, curing, Fuel wood and Briquettes

potential to utilize the biomass residue efficiently and effectively as an energy sources in agro-based industries.There were several studies related to the valorization of EFB to fuel (pellets, briquettes, bioethanol) and value-added products (charcoal, long fibers, biochemical) as a promising and sustainable alternative to the replacement of fossil fuels and chemical products (Abdulrazik, 2017; Garcia-Nunez, 2016) At present, firewood is the predominantly used source of energy to fuel the flue-curing barns. Some conservative estimates on wood fuel requirement suggest that on an average 5 kg wood is needed for each kg of cured leaf. Assuming that 80% FCV tobacco produced is cured using wood as source of energy, the quantity of wood consumed annually for tobacco curing comes to 1.2 million tons. Such large scale use of wood fuel for tobacco curing can result in deforestation and represents a serious environmental issue. This situation highlights the need for exploring alternative green energy sources on one hand, and integrated and efficient use of all available fuels on the other. In this regard, oil palm empty fruit bunches as well as empty fruit bunch briquettes can be tested as an alternative source of energy for curing. One of the bottlenecks for achieving the higher yields and quality of tobacco is lack of uniformity in the crop due to the poor establishment. Transplanting with tray seedlings will overcome the problem of non-uniformity and helps in improving the yield and quality of tobacco. Tray nursery system can be described as growing tobacco seedlings in plastic trays (having 70-98 cups/cells) by resetting about 20-25 days old healthy seedlings obtained from soil-free organic media (coir pith) for production of sturdy, disease-free and uniform seedlings. In the same way, the oil palm waste can be tested as rooting media for growing tobacco tray seedlings. Taking into consideration above situations experiments were conducted to study the oil palm biomass waste as rooting media for growing tobacco tray seedlings as well as a fuel for curing of FCV Tobacco.

MATERIALS AND METHODS

Rooting media for tray seedlings

Burley tobacco seedlings were raised in trays under three different types of oil palm waste sandals_other respective biochars alone and their combination with coirpith were tested for tray seedling production. The treatments included T1: coirpith (control), T2: oil palm empty fruit bunch (OEFB) biomass, T3: oil palm fronds (OF) biomass, T4: oil palm trunk (OT) biomass, T5: OEFB biomass (50%) + coirpith (50%), T6: OF biomass (50%) + coirpith (50%) + T7: OT biomass (50%) + coirpith (50%), T8: OEFB Biochar, T9: OF Biochar, T10: OT Biochar, T11: OEFB Biochar (50%) + coirpith (50%), T12: OF Biochar (50%) + coirpith (50%), T13: OT Biochar (50%) + coirpith (50%) with three trays as replications for each treatment.

Alternate to wood fuel for curing of FCV tobacco

Readymade oil palm empty fruit bunch briquettes and oil palm empty fruit bunch biomass as such were separately tried as an alternate to wood fuel for curing of FCV tobacco.

RESULTS AND DISCUSSION

Rooting media for tray seedlings

When compared to coir pith the performance of oil palm waste as rooting media was low. It was observed that all the biochar treatments alone and their combination with coir pith were not suitable for growing tobacco tray seedlings as a rooting media. Whereas, oil palm fronds and trunk biomass in combination with coir pith_*viz.,* T6: OF biomass (50%) + coir pith (50%) + T7: OT biomass (50%) + coir pith (50%) shown positive response for growth of the tobacco tray seedlings Fig. 1. Generally all the biochars having high surface area which results in increase in water

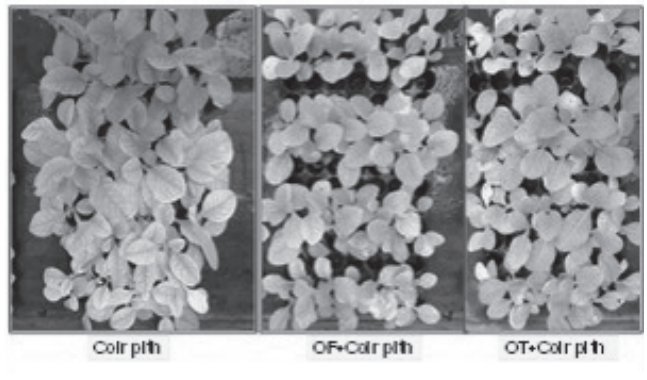

Fig. 1: Effect of oil palm biomass waste as a rooting media for tobacco tray seedling production

holding capacity (Batista *et al.,* 2018). Biochar in potting soil mixtures allegedly increases water storage, nutrient supply, microbial life and disease suppression but this depends on feedstock and the production process (Blok *et al.,* 2017).The excess water holding capacity of these biochar might be the reason for the failure of these oil palm biochars as rooting media. Oil palm empty fruit bunches are huge waste disposed off after subjecting to the vast chemical treatments from the factories. These chemical compounds might be detrimental to the growth of tobacco seedlings. On the other side the oil palm trunk and fronds are the *insitu* waste generated in the orchards and not subjected to the any chemical treatment might be responsible for the positive response for the growth of tobacco tray seedlings when we used in combination with coirpith.

Oil palm Empty fruit bunch briquettes and Oil palm Empty fruit bunches as an alternate fuel for FCV tobacco curing

Oil palm empty fruit bunch biomass briquettes alone and in combination with fuel wood were tested as a source of wood fuel for curing of FCV tobacco at CTRI-RS, Jeelugumilli. Empty fruit bunch biomass briquettes alone will not be able to supply the heat requirement due to less fire holding capacity. However, oil palm briquettes along with wood (581 kg oil palm briquettes+600 kg wood) saves fuel wood by 19%. (Table1). Oil palm empty fruit bunch (OEFB) Biomass alone in comparison with fuel wood was tested as a source of wood fuel for curing of FCV tobacco at BSR Farm, Katheru. OEFB Biomass alone was able to supply the heat requirement for curing of FCV tobacco. The quantity of OEFB Biomass consumed for curing 1kg cured leaf is 4.0kg. Whereas, Fuel wood consumed was 5.6 kg for curing 1kg cured leaf. The equivalent weight of fuel wood with that of OEFB biomass was 1.4kg for curing of FCV tobacco. OEFB can be effectively utilized as a fuel for curing of FCV tobacco. However, the rate of application of OEFB Biomass into the furnace while curing is more compared to the fuel wood (Table 2). Han *et al.,* 2018 reported that Empty fruit bunches can be used as fuel._This biomass can still provide added value to bioenergy products through thermochemical pyrolysis conversion (Rahayu,2021).

Oil palm biomass waste can be effectively utilized as rooting media for tray_seedlings as well as alternate fuel for curing of FCV tobacco.

Table 1: Effect of oil palm empty fruit bunch briquettes as fuel for curing FCV tobacco at CTRI-RS, Jeelugumilli

	Control Barn	Experiment Barn
Green Leaf Weight (kg)	2202	2202
Cured Leaf Weight (kg)	405	369
Fuel type	wood	Oilpalm empty fruit bunch briquettes +wood
Weight of Fuel (kg)	1430	1181 (581 kg Oil palm empty fruit bunch briquettes+ 600 kg wood)
% Wood Saved	NA	19%

Table 2: Effect of oil palm empty fruit bunch biomass as fuel for curing FCV tobacco at CTRI-BSR Farm, Katheru

	Control Barn	Experiment Barn
Green Leaf Weight (GLW)	1972	2500
Cured Leaf Weight (CLW)	304	380
Fuel	wood	oil palm empty fruit bunch biomass
Weight of Fuel (kg)	1700	1500
% Wood Saved	NA	NA

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