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Short Communication

Conversion of masonia tree sawdust and cotton plant by product into feed by white rot fungus (*Pleurotus sajor caju*)

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The influence of fungus treatment on the biochemical composition and degradation patter of sawdust and cotton plant by-products (cotton burns and cotton gin trash) by *Pleurotus sajor caju* were evaluated. Lignin degradation increased as the incubation period progressed while the highest loss of hemicellulose, cellulose, acid detergent fibre, neutral detergent fibre were recorded for treated cotton plant by-product. The nutrient availability was superior in the fungus treated cotton plant by-product substrate compared to the treated sawdust. The process efficiency was highest for the treated sawdust than the treated cotton plant by-product, while the loss of organic matter was similar in the cotton plant by-product and sawdust. Correlation between the dry matter of the treated sawdust and cotton plant by-product gave a positive response. It is concluded that such biodelignification and the concurrent percentages increase in nutrient availability indicate that culturing of *P. sajor caju* on cotton plant by-product ands saw dust may in fact improve the nutritive value of such lignocellulosic waste.

Key words: Sawdust, cotton plant, by-product, *Pleurotus sajor caju* biodelignification, nutrient availability.

INTRODCUTION

The mycelium of white rot fungi (lignin degrading basidiomycetes0 are known to delignify plant materials as well as being edible by humans (Chang and Hayes, 1978). No illness was observed among sheep and goats fed sorghum stover or rice husk that had been incubated with *Trichoderma harzanium* (Belewu and Okhawere, 1998). We have also reported an increase of 20% in *in vitro* dry matter enzymatic digestibility of sorghum stover treated with *Pleurotus sajor caju* (Belewu and Banjo, 1999).

Erndt et al. (1980) reported that cotton plant by-product (CBP) (commonly refer to as cotton gin trash or cotton burns) was as palatable as sorghum stover silage. Pre-treatment of CBP or sawdust could conceivably improve the roughage supply to ruminant animals.

Initial studies in our laboratory showed that *P. sajor caju* grew well on sorghum stover and rice husk. Hence the thrust of this study was to evaluate the incubation of *P. sajor caju* with sawdust and CBP under conditions designed to improve their nutritive value for use in nutrition of ruminant animals.

MATERIAL AND METHODS

The substrates (untreated cotton plant by-product, CBP, untreated sawdust and CBP and sawdust treated with *P. sajor caju*) were placed into separate polythene bags and sterilized at 121ºC for 15 min for solid state fermentation. The *P. sajor caju* was grown for 10 days under static conditions on potato dextrose agar (PDA). All treatments were carried out at ambient temperature for a 60 day period until fungal growth had completely covered the substrate surface. The polythene bags were cut to make hole for mushroom growth. Full grown mushrooms were harvest every 5-7 days from the pinehead formation. About 5-6 croppings of the mushroom were harvested and the spent substrates oven dried at 60ºC in a forced air laboratory dryer.

After drying, all samples were milled and passed through a 0.84 mm sieve. Dry matter decomposition was considered to be the loss in dry weight of substrate resulting from incubation. The proximate

Table 1. Composition (%) of the original and *Pleurotus sajor caju*-treated substrates.

Components	Untreated substrates		*Pleurotus sajor caju*-treated substrates	
	Sawdust	Cotton plant by-product	Sawdust	Cotton plant by-product
Dry matter	93.40	96.70	90.10	83.15
Organic matter	88.90	77.70	75.30	65.10
Nitrogen	0.35	1.25	1.52	2.48
Acid detergent fibre	76.35	43.72	56.42	35.60
Neutral detergent fibre	89.68	70.35	67.74	40.58
Cellulose	31.99	23.72	30.89	21.58
Lignin	44.36	20.00	25.53	14.02
Hemicellulose	13.33	26.63	11.32	4.98
Holocellulose	45.32	50.35	46.21	26.56

composition was determined as prescribed by the methods of AOAC (1980) while cell wall constituent, neutral detergent fibre, acid detergent fibre and permanganate lignin were determined as described by Goering and VanSest (1970). Hemicellulose content was calculated as the difference between neutral detergent fibre and acid detergent fibre. Cellulose was calculated as the difference between acid detergent fibre and permanganate lignin. Percentage decomposition of cellulose, hemicellulose and lignin was considered to be the amount of each constituent lost during the 60 days incubation. Nutrient availability of treated substrates was estimated according to the method of Kamra et al. (1993). The means of all degradability values of the treated substrates were compared using the parametric student's test (Snedecor and Cochran, 1971).

RESULTS AND DISCUSSION

The visual observation of mycelial growth showed *P. sajor caju* colonization on the cotton plant by-product (CBP) was more rapid and was completed within one week. The biological treatments of CBP and sawdust with *P. sajor caju* decreased the neutral detergent fibre (NDF) from 89.68 to 67.74% for sawdust and 70.35 to 40.58% for CBP. The acid detergent fibre (ADF) decreased from 76.35 to 56.42% for sawdust and 43.72% to 35.60% for CBP. While the lignin content decreased from 44.36 to 25.53% for sawdust and from 20 to 14.2% for CBP (Table 1).

The degradation of dry matter and organic matter was most intensive in the treated CBP. The degradation of detergent fibres and hemicellulose was significantly higher in cotton plant by-product ($p<0.005$). Similarly values of detergent fibre degradation (NDF, ADF, and hemicellulose) were found in rice husk (Belewu and Banjo, 1999). The lignin degradability of white rot fungi (*Pleurotus* sp.) as reported by Prins (1987) was confirmed in this experiment with *P. sajor caju*. The nitrogen content of the treatment substrates was higher than the untreated substrates probably due to the addition of fungal protein.

The process efficiency was higher for the treated sawdust (3.36) than CBP (1.84) probably because of the greater percentage of the loss of lignin. *P. sajor caju* used in this study decomposed lignin more than *Trichoderma harza-nium rifai* in our earlier report (Belewu and Okahawere, 1998). The calculated values of nutrient availability were 60.5 and 80.3% for sawdust and cotton plant by-product, respectively. Average value of 43% from sorghum stover was previously reported (Belewu and Banjo, 1999).

The biological treatment of sawdust and cotton plant by-product with fungus *P. sajor caju* was effective. Signifi-cant conversion of various wastes into feed could accrue from the biological treatment of ligninocellulose materials with this fungus, while a rapid overcoming of the effect of environmental pollution could also be solved.

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