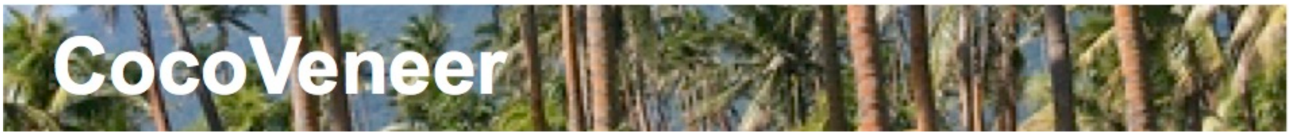

Research Note: Plant growing mediums from coconut palm harvest residues

This research note provides an overview of a series of trials examining the potential use of coconut palm harvesting residues as a growing medium for agricultural products. The trials were conducted by the University of Tasmania's Centre for Sustainable Architecture in Wood (CSAW) and were performed as part of an ACIAR-funded project for research and extension activities, which aim to develop means to sustainably use senile coconut palms for economic development in Fiji, Samoa and the Solomon Islands.

Earlier ACIAR studies (Poulter and Hopewell, 2010), investigating the physical characteristics of coconut harvest residues, had suggested further trial work on stored nutrients was necessary to determine if coconut woodchips could be used as a plant growing medium. Commercial landscape product manufacturers contacted during these trials suggested coconut woodchip could be a suitable feedstock material for composting into a nutrient rich medium and used for improving agricultural crop yields. This could be particularly beneficial in many Pacific Islands, as the modern approach of intensified land-use means more products are removed from the land and therefore the export of nutrients is high. Additionally compost could be beneficial in reducing the amount of expensive imported fertilisers used in intensive farming systems in these island countries.

Introduction

In Fiji, Samoa and the Solomon Islands senile coconut palm logs are being trialled for their potential in veneer peeling. If successful, commercial scale production will generate large volumes of coconut palm harvest residues. Previous studies indicated chipped and ground residues had suitable physical properties for use as a plant growing medium, but the nutrient levels were not examined. If further testing indicates the nutrient base-load availability is favourable, a plant growing material or feedstock for composting, could be produced from these residues. To determine the nutrient status of the coconut wood-chipped residues and examine the materials suitability as a plant growing medium, pot-scale plant growth trials were conducted using radish and sweet corn as growing medium indicators, with the plant material analysed for nutrient uptake.

Figure 1. Plant growth trials using coconut woodchip to compare the germination, growth rates and biomass of radish.

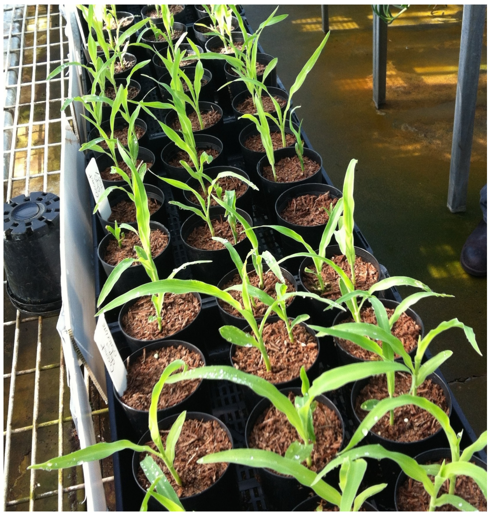

Figure 2. Plant growth trials comparing the growth of sweet-corn in ground coconut woodchip and a commercially available potting mix with a known nutrient status.

Method

Three growing medium treatments were compared: Two samples of coconut woodchips were screened to a particle size of < 3.0 mm and one sample of a commercially available potting mix manufactured to AS 3743-2003 were prepared as plant growing mediums. Ten replicate radish and ten sweetcorn seeds per treatment were sown and their germination rates monitored. During plant growth, to examine and compare plant nutrient uptake, one sample of the coconut woodchip was treated with Hoagland's nutrient solution (Hoagland, D. 1938).

After two weeks growth plant heights were recorded. The radish was removed and the biomass grown in each treatment weighed. At four weeks the sweet corn plants were removed and leaf samples from each treatment were taken. To determine nutrient availability in the growing mediums, the samples were subject to laboratory dry-ash analysis.

Results and discussion

Seed germination rates were very consistent with 8 and 9 out of 10 plants in each treatment growing. At two weeks the average sweet-corn plant heights varied between 5.2 cm for those grown in a ground coconut woodchip medium without nutrient solution, to 9.5 cm for plants grown in a commercial potting mix. Plants grown in woodchip without additional nutrients grew successfully, but at a slower rate than those given additional fertiliser or grown in the potting mix, indicating negligible toxicity was present in the raw woodchip. The leaf analyses showed the nutrients present in coconut woodchip are available to plants and encouragingly, the levels of uptake were similar in the coconut woodchip without additional nutrients and in the potting mix.

Table 1. Plant germination and growth results

Plant	Growing medium	Germination rate	Av. biomass g	Av. height cm
Radish	Coconut woodchip	9 out of 10	9	2.1
Radish	Coconut woodchip + nutrients	9 out of 10	18	2.9
Radish	Potting mix - AS3743-2003	9 out of 10	21	3.1
Sweet corn	Coconut woodchip	8 out of 10	-	5.2
Sweet corn	Coconut woodchip + nutrients	9 out of 10	-	6.3
Sweet corn	Potting mix - AS3743-2003	9 out of 10	-	9.5

Table 2. Results of sweet corn leaf material dry-ash analyses

Nutrient		Coconut woodchip	Coconut woodchip + nutrients	Potting mix - AS3743-2003
Kjeldahl Nitrogen	%	1.11	4.5	1.1
Phosphorus	%	0.30	0.77	0.22
Potassium	%	2.67	5.38	1.57
Calcium	%	0.45	0.85	0.29
Magnesium	%	0.31	0.49	0.20
Sulphur	%	0.15	0.41	0.17
Manganese	mg/kg	55	130	39
Zinc	mg/kg	47	80	29
Copper	mg/kg	8.6	14	9.8
Iron	mg/kg	53	28	38
Boron	mg/kg	6	54	7

Plant growth rates and results from the leaf analyses appeared favourable. CSAW is presently small-scale composting coconut woodchip. Subsequent plant growth trials incorporating the compost, should indicate the potential to use composted coconut woodchip as a plant growing additive, or a broad-scale cropping soil amendment. These trials were conducted at the University of Tasmania's Horticultural Research Centre. Acknowledgement and thanks to Phil Andrews the centre's manager for his advice and support during trial activities.

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This research note is part of the ACIAR-funded CocoVeneer project FST/2009/062: Development of advanced veneer and other product from coconut wood to enhance livelihoods in South Pacific communities.

The project team includes researchers and collaborators from the University of Tasmania, the Queensland Department of Agriculture, and Fisheries (DAFF), the Secretariat of the Pacific Community (SPC), the Fiji Department of Forests; Forest Research and Development Section, Forestry Division, Ministry of Natural Resources and Environment, Samoa; Ministry of Forestry, the Solomon Islands, and industry in Australia and Pacific Islands. The project supports economic development in Fiji, Samoa and the Solomon Islands and includes activity in market and value-chain assessment, log harvesting, veneer production and product manufacture, and the development of viable uses for coconut residues at the harvest site or the production facility. More information about the project is available at www.cocowood.net.

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