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An investigation of the effectiveness of locally available materials as oil spill sorbents for Sri Lanka

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The effectiveness of seven locally available natural organic materials as oil spill sorbents was tested. The study specifically focused on determining, the behaviour of loose material on a layer of oil, oil sorption capacity of different types of materials and the viability of using them under actual field conditions. The seven natural organic materials were chosen based on their availability and cost. The amount of oil sorption by each was determined by the gravimetric method and the rate of sorption was determined. A commercially available synthetic oil sorbent, polyurethane, was used as the positive control. Out of the seven natural organic materials tested, human hair was found to be the most effective sorbent. Compared to the positive control, Polyurethane, there was no significant difference with respect to the oil sorption capacity of human hair. Therefore, all the subsequent experiments were carried out using human hair only. As hair has a tendency to sink in sea water after oil sorption, hair was compacted in to pillows to facilitate the recovery after sorption. First, the affect of the pillow thickness on the oil sorption capacity was tested. Oil sorption capacity increased significantly as the thickness of the pillow increased and a thickness of 1cm was found to yield the most efficient sorption. Then sorption capacity of oil by pillows was compared on a sea water oil interphase, only on oil and oil on sand. No significant difference was detected in the oil sorption capacity of hair filled pillows under these three conditions. Finally, a field trial was conducted where pillows were developed up to the size of commercially available synthetic pillows and placed on an artificially created oil spill and tested the oil sorption capacity under actual field conditions. A total of four pillows were used for the field trial and the pillows were removed at different time intervals after placing it on the artificial oil slick. The results of this experiment were not conclusive as amount of oil absorbed by all four pillows did not reach the expected value calculated based on results obtained during laboratory experiments, due to several shortcomings in the experimental design. The results of this study clearly demonstrate that human hair can be used as an effective oil sorption material. As waste human hair is cheap and readily available, it is a much more viable alternative to expensive synthetic organic material available in the market.

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Studies on utilization of sewage waste water for greening wastelands through afforestation

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One of the major burning problems in urban areas is the disposal of sewage water, which degrades the environment, and as well as creates health hazards to human beings. One opening to this bottleneck is that this sewage water could be diverted for irrigation purpose especially for afforestation purpose. Sewage water provides nutrients and using it for irrigation has been found to enrich soil, improve uptake of plants and ameliorate degraded soils. It was found that sewage water irrigated tree species recorded maximum height and basal diameter when compared to bore well water irrigation. It showed that it boosted the growth of tree species. Hence the utilization of sewage water as irrigation water for tree crops is the one of best option for increasing biomass and protecting environment deterioration from deforestation of land and water by sewage water.

In this context, a field experiment was conducted at sewage farm and the following tree species viz., *Eucalyptus tereticornis*, *Tectona grandis*, *Casuarina equisetifolia*, *Azadirachta indica* and *Acacia nilotica* were planted and irrigated with sewage water at 2 weeks interval. The same 5 species were also planted near the sewage farm and irrigated with bore well water. The growth parameters viz., height and basal diameter were recorded at periodical interval. The results revealed that the height and basal diameter of all the five selected tree species were higher under sewage water irrigation when compared to bore well water irrigation. The results inferred that at 3 MAP, the percent increase in height and basal diameter respectively was 15 % and 18 % for *Casuarina equisetifolia*, 39 % and

20 % for *Tectona grandis*, 17 % for *Acacia nilotica*, 24 % and 20 % for *Azadirachta indica*, 23 % and 18 % for *Eucalyptus tereticornis* over bore well water irrigation. At 6 MAP, the percent in height and basal diameter was 7 % each for *Casuarina equisetifolia*, 13 % and 6 % for *Tectona grandis*, 13 % and 6% for *Acacia nilotica*, 15 % and 9 % for *Azadirachta indica*, 14 % and 12 % for *Eucalyptus tereticornis* under sewage water irrigation over bore well water irrigation.

At 9 MAP, the increase in height and basal diameter was 8 % each for *Casuarina equisetifolia*, 9 % and 6 % for *Tectona grandis*, 12 % and 9 % for *Acacia nilotica*, 10 % and 4 % for *Azadirachta indica*, 21 % and 11 % for *Eucalyptus tereticornis* over bore well water irrigation. At 12 MAP, increase in height and basal diameter was 7 % and 4 % for *Casuarina equisetifolia*, 7 % and 4 % for *Tectona grandis*, 6 % and 4 % for *Acacia nilotica*, 47 % and 4 % for *Azadirachta indica*, 8 % and 7 % for *Eucalyptus tereticornis* over bore well water irrigation. At 15 MAP under sewage water irrigation, the percent increase was 4% each for *Casuarina equisetifolia*, 5 % and 3 % for *Tectona grandis*, 6 % and 5 % for *Acacia nilotica*, 7 % and 5 % for *Azadirachta indica*, 10 % and 8 % for *Eucalyptus tereticornis* over bore well water irrigation.

From the study, it was found that sewage water can be better used for raising tree plantation on relatively unfertile wastelands through afforestation, urban forestry plantation, social forestry plantation to safeguard the planet earth from global warming, severe drought, adverse climatic condition, pollution etc.

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Utilization of oil palm waste as a low cost feed ingredient for growing pigs to reduce the environmental pollution

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Oil palm is the one of the most popular oil crop in many regions of the world and it plays an important role as a component of animal feed and as a cooking material in an industrial sector. However, every ton of oil produced generates tons of effluent and this cannot be released to the environment directly as it causes environmental pollution due to its high biological and chemical oxygen demand. Therefore, an experiment was conducted to investigate the potential use of oil palm decanter cake as an ingredient to prepare a low cost ration for 36 cross bred pigs (Land race* Large white) using complete randomized statistical design. Four different ration such as 1:1 poultry offal and decanter cake (T1), 3:1 poultry offal and decanter cake (T2), commercial ration (T3) and mixed feed (poultry offal, decanter cake, rice bran and beer pulp; T4) were fed to pigs during growing stage. Growth performances; daily intake (DI), daily weight gain (DWG) and feed conversion ratio (FCR) were determined during the experiment and carcass quality parameters; carcass depth, carcass length, back fat thickness (BFT) and dressing percentage were measured at the end of the experiment.

Results demonstrated that the daily intake was highest (4.2 ± 0.15 kg/day) in pigs fed with T4 ration compared to the other rations due to nutrient imbalance with deficient residue composition. Although commercial ration shown that lowest intake and FCR (1.99 kg/day and 3.57 ± 0.27) together with highest weight gain (562.5 ± 44 g/day) mainly due to proper nutrient balance. Live weight, carcass weight and carcass depth of the pigs fed with T1, T2, and T3 rations were significantly different ($P < 0.05$) than T4 which have the lowest value (81 ± 5.17 kg, 62.33 ± 4.64 kg and 33.33 ± 0.67 cm). However, carcass length of the animals was not significantly different ($P < 0.05$) between four-treatment because the length mainly depends on genetic factors. Pigs fed with commercial ration shown that highest back fat thickness of 4.47 ± 0.39 cm. Since, there is no significant difference ($P < 0.05$) of the BFT among the treatments.

The results suggest that, in spite of the DWG and high FCR observed with T1 and T2, the carcass characteristics are not different as compared with pigs fed with commercial ration. Therefore, the results of this study conformed that decanter cake could be used as a substitute in pig rations to reduce the cost and also to utilize by product of oil palm effluent to minimize environmental pollution.