# Conversion of oil palm Waste/residue into a light weight potting media for ornamental plants

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## Introduction

Currently, very limited choices of potting media are available in the market, limited mainly to peat and red clay soils. As more city dwellers are living in condominiums and flats, and even landed house owners do not have time to manage their gardens, planting or potting media with complete slow release nutrients would in demand. Garden plant also require regular watering. Thus potting media that acts as a slow release source of nutrients and as high water retention capacity would be very desirable.

Most of oil palm waste, particularly the fronds and empty fruit bunches (EFB), are currently recycled as organic mulches in in the oil palm plantations. Our past research work on EFBs showed that the EFB is rich in nutrients, i.e., 0.76-0.96% N, 0.13-0.19% K, 0.36-0.60% Ca and 0.22-0.51% Mg. The EFB decomposes and release the nutrient slowly because of the high C/N ratio of 71-90) except for K, which leaches out easily. The EFB can also sponge and retain water up to 60-70% moisture content. Therefore, it could be a high potential organic matrix for potting media, particularly for ornamental plants. However, investigations are needed in composting the oil palm waste and developing an appropriate to be used a potting medium ornamental plants which also serves as a nutrient source formulation of the oil palm waste compost with other materials.

In this project, composting of oil palm trunk, fronds, EFB and mesocarp were carried out. The quality of the composts in terms of plant growth and nutrient uptake were tested with laboratory germination techniques in some cases, as well as planting of potted chrysanthemum (as the test plant) and vegetables.

## Materials and Methods

(i) Phase I (Composting)

A series of composting experiments were conducted testing various oil palm waste, i.e. fronds, EFBs, oil palm trunk and pressed mesocarp. Most of the materials were provided by Dusun Durian Estate, Golden Hope Plantation Malaysia Bhd, Banting. The fronds were taken from the field after harvesting; the EFBs have pressed mesocarp from the palm oil mill; the oil palm trunk from replanting area. The composting was induced in polystyrene boxes, 56cm x 43cm x 30cm. Six composting experiments were conducted: The experiments investigate various composting blends, i.e.
different oil palm wastes i.e, EFBs, fronds, and oil palm trunk (shredded) with sewage sludge (another organic waste)
pulverized oil palm trunk with urea, sewage, chicken manure, and effective micro-organisms (EM- 4)
mesocarp with chicken dung and EM-4

(ii) Phase II (Plant Growth Performance)

A series of plant growth performance experiments of compost produced in Phase I was carried out with chrysanthemum. The compost were compared with the traditional potting medium, i.e, peat. Fertilization treatments were also included to investigate. If the recommended fertilizers and application rates could be reduced to reduce fertilization cost. Total dry matter weight, day of first visible flower bud, number of flower size were recorded.

## Results and Discussion

Results of the composting study show that oil palm trunk and pressed mesocarp produced mature compost faster than frond and EFB. The EFB has long lignified fibres which took longer to breakdown. The pressed mesocarp has short

fibres and this did not require shredding before composting. However the kernels remained in the compost and need to be sieved out. Sewage sludge, chicken dung and goat dung were found to be good materials of N-source that can be co-composted with oil palm trunk and mesocarp. Increasing the amount of sewage sludge or chicken dung which contained heavy metals increased the heavy metal concentrations, particularly Zn, Cu and Fe in the composts. The optimum ratio of oil palm waste to chicken dung or sludge were 4:1 and 5:1. In one experiment with chicken dung, results show that the effective micro-organisms, EM-4$^{TM}$ did not hasten the composting of mesocarp but in another experiment with oil palm trunk and sewage blend, the EM- 4 decreased the period for compost maturity. The compost contained 0.9-2.2% N, rich in micronutrients and has a pH of 7-8, without the addition of lime due to the alkaline nature of the palm tissue. (high in Ca, Mg and K)

In plant growth performance, experiment with spinach show that compost blend of oil palm trunk + sewage sludge (4:1) produced high fresh weight of spinach on sandy soil. With chrysanthemum , when compared to peat potting medium, compost blend of palm trunk + chicken dung , palm trunk + sewage sludge, mesocarp + chicken dung (5:1) and mesocarp + sewage sludge produced flower buds earlier. The number of flowers at full bloom were also higher than the control (peat) medium. The fertilization rate treatments also indicate that the recommended show released fertilizer (Agroblend) could be used alone without the recommended foliar fertilizer, Agrofas (containing micronutrients). This could be attributed to the compost which was contained higher available macro and micronutrients than peat.Do not include figures

## Conclusions

Oil palm trunk which is available in bulk during replanting, preferably in the pulverised form, from the palm oil mill are ideal materials for co-composting with chicken dung, goat dung or sewage sludge. The compost produced were rich in plants nutrients and had pH of 7-8, without adding lime.
The composts when used as a soilless potting media produced better plant growth and higher number of flowers than peat. Further more, fertilization could also be reduced, thus reducing fertilizer cost.

## Benefits from the study

- Optimum blend for composting oil palm waste
- A value – added produced from oil palm wastes which otherwise are left in the field as mulch only
- Organisation Outcomes
    1. Expertise development:
        - 5 Bachelor degrees
        - M. Sc. degrees
        - 4 research staffs experiment in composting
    2. Information network on recycling of organic wastes
- National Impacts
    1. Conversion of wastes into value added products, thus reducing national environmental problems, through zero wastes, particulary in oil palm industry
    2. Improve health by introducing organic fertilizers and amendments and reducing chemical fertilizers

## Patent(s), if applicable :

Nil

## Stage of Commercialization, if applicable :

Nil

## Project Publications in Refereed Journals:

Nil

## Project Publications in Conference Proceedings:

Nil

*Graduate Research*

| Name of Graduate | Research Topic | Field of Expertise | Degree Awarded | Graduation Year |
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|---|---|---|---|---|
| Kala Devi Ramahsamy | Conversion of empty fruit bunches in to a soil less potting media for ornamental plants | Soil chemistry and plant nutrition | M.Sc. | |
| Siti Mardiah Mohd Yusop | "Kompos batang kelapa sawit dengan menggunakan tahi ayam dan urea", | Soil chemistry and plant nutrition | B.S. BioIndustry | 2000 |
| Nga Shee King | Composting of oil trunk with chicken dung | Soil chemistry and plant nutrition | B.S. BioIndustry | 2001 |
| Mazlina Bt Ibrahim | Growth of mini chrysanthemum in an oil palm compost soilless media | Soil chemistry and plant nutrition | B.S. BioIndustry | 2001 |
| Hamidah Abdul Aziz | "Penghasilan kompos dari mesokarpa kelapa sawit" | Soil chemistry and plant nutrition | B.S. BioIndustry | 2002 |

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