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DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRRIGATION ENGINEERING

MODIFYING THE PORE STRUCTURE OF COCO-PEAT AS A GROWING MEDIUM FOR HORTICULTURAL CROPS IN GREENHOUSE

By

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ABSTRACT

Soilless culture is a technique for crop production using no soil. It offers earlier growth and higher yield. Lack of suitable soils, disease contamination after repeated use and the desire to apply optimal conditions for plant growth are leading to the worldwide trend of growing plant in media instead of soil. Coco-peat being one of the soilless media is considered as a good growing media component with acceptable pH, electrical conductivity and other chemical attributes but it has been recognized to have high water holding capacity which causes poor air-water relationship, leading to low aeration within the medium, thus affecting the oxygen diffusion to the roots Therefore, the main aim of this work is to investigate the physical properties of improved coco-peat that meets the requirement of plant growth. These properties include: moisture content, water holding capacity and porosity (both total and air-filled).

The moisture content values ranged from 2.9 to 28.3% for different soilless types, the lowest value of moisture content (2.9 %) was found for pumice and the highest value of moisture content (28.3%) was obtained for coco-peat. The water holding capacity values ranged from 12.7 to 85.1% for different soilless media. The porosity values ranged from 43.0 to 91.0 % for different soilless media.

For the mixtures, each material improved the WHC of coco-peat differently and the percentage of WHC for the mix ratio of each combination close to that of soil (52%) was considered the best, 60:40 for both coco-peat to pumice and coco-peat to rice husks with WHC of 53.8% and 56.6% respectively whereas 40:60 for coco-peat to sand gave the desired WHC of 51.0%.

The favorable ratio for both coco-peat to pumice and coco-peat to rice husks is 60:40 while that of coco-peat to sand is 40:60 respectively. Based on economic evaluation, coco-peat and pumice combination proved to the best favorable medium with the highest NPV value, followed by coco-peat and sand and then coco-peat and rice husks being the most expensive among the three.

Results of this research indicated that certain physical properties of coco-peat can be improved through incorporation of rice husks, pumice and sand.

APPROVAL

This Final year project report has been prepared by Mwesigwa Irene under supervision and is now ready for presentation to the Department of Agricultural Mechanization and Irrigation Engineering of Busitema University for an award of a Bachelor's degree with approval of,

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Mr. Igga Huzairu

Signature…… Date……..

DEDICATION

I dedicate this project report to my parents Mr. Bayinomugisha Charles and Mrs. Namusisi Robinah, Fr. Godwin Ogam and Mr. Richard Nesbit for all the financial, moral and spiritual support they have always offered to me whole heartedly to see me through in my education carrier, May God almighty reward and bless them abundantly!

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WHC	Water Holding Capacity
GDP	Gross Domestics Products
EC	Electrical Conductivity
PH	Potential Hydrogen ions
CEC	Cation Exchange Capacity
AFP	Air-filled Porosity

CHAPTER ONE

INTRODUCTION

1.1 Background

In the world of agriculture, planting media is something that is absolutely necessary to be able to perform farming activities because it provides the mechanical and nutrient support important for plant growth. Generally, people are familiar with the soil as growing media, but with the rapid population growth and the high demand of agriculture production contributed to the increasing exploitation of the land to be used as a planting media, especially the upper soil (top soil). The changing and unpredictable climatic condition of the tropics nowadays has led to reduction in the crop yields and thus increased number of indoor farming with the help of soilless media.

Nowadays farmers generally have begun looking for alternative media besides soil. This is because most of the land has been interrupted in that the top soils no longer contain sufficient organic material and nutrients. A number of soilless media such as saw dust, rock wool, vermiculite, peat moss, sand and perlite have been invented and used in the recent past for crop production in controlled environment. The solid waste from coconut fiber (coco-peat) is one of the media that is increasingly being used for indoor farming.

Coco-peat is an agricultural by-product obtained from the extraction of fiber of the coconut husks, (Yahya Awang, 2009). It has been one of the soilless materials widely available in the tropical areas. The use of coco-peat as a planting medium started in the late ‘80s, and moved into the commercial sector in the 90s. Since then its demand has increased day by day in home gardening, commercial roses and vegetable productions, as well as in the hydroponics industry. In 1984 Dutch Pantin carried out research about the possible uses of coco-peat. It was then found to be extremely suitable as a growing medium for raising seedling in horticulture. This resulted in the first practical trials (1985) of various prominent rose growers and institutes in the Netherlands and the UK (Annon, 2013).

Exports in the Ugandan horticulture sector have developed substantially over the last decades. There is still room for further expansion especially in the fresh fruit and vegetables sub sector but a study examining potential impacts on biodiversity suggests that more attention should be paid to the overall effects of land use change. Although entailing additional costs, focusing on growth

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