# MORPHOLOGICAL STUDY OF SELECTED ARACACEAE FAMILY COCONUT PALM(Coco nucifera), QUEEN PALM (Syagrus romanzoffiana), ROYAL PALM (Roystonea oleracea

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# MORPHOLOGICAL STUDY OF SELECTED ARACACEAE FAMILY

[COCONUT PALM *(COCOS NUCIFERA)*, QUEEN PALM *(SYAGRUS ROMANZOFFIANA)*, ROYAL PALM *(ROYSTONEA OLERACEA)*]

BY

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## CERTIFICATION

This is to certify that this project work was carried out by **Abesin Adebukanla Zamathalaih** with matriculation number **07/6/451** of Science Laboratory Department, School of Science, Abraham Adesanya Polytechnic, Ijebu-Igbo, Ogun State.

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_____ _____

***Head of Department*** **Date**

## DEDICATION

This project write-up is dedicated to Almighty Allah, the author and finisher of everything who has made this work a success for me.

Also to my father Alhaji A.O. Abesin who has never let me down.

## ACKNOWLEDGMENT

My appreciation goes to Almighty Allah who has been my strong tower and path-leader throughout the course of my study. I will forever lift and glorify his name Oh! ALLAH (Amen).

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Thanks to my incomparable father Alh. A.O. Abesin, for his financial, moral and spiritual support. Without you, I am nobody. I will never forsake you daddy, and I pray that you reap the fruit of your labour in a sound and good health (Amen).

My appreciation also goes to my Mum, Mrs. K.O. Abesin and My Big mummy Alh. Alake Abesin, you two

has always been there for me both in sorrow and joy. May Allah enlong your life in good health, you are great mum.

My gratitude also goes to the entire family "ABESIN" JAZAKUMLAKHAERAN (Amen). Thanks for your concern and words of encouragement, which is always my watchword.

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## ABSTRACT

Palms belong to family *Aracaceae,* they are evergreen plants. They produce edible vegetable oil, their stems are used extensively in furniture and other household materials. Their other economic important include ornamental raw materials for industries.

Three (3) seedling of genus of palms were planted at the Botanical garden of Abraham Adesanya Polytechnic, which include Coconut Palm (*Cocos nucifera*), Queen Palm *(Syagrus romanzoffiana)* & Royal Palm (*Roystonea oleracea*) and their growth rate were studied.

In height, Coconut Palm *(Cocos nucifera)* grows taller than the Royal Palm *(Roystonea oleracea)* while Royal Palm *(Roystonea oleracea)* grows taller than the Queen Palm *(Syagrus romanzoffiana).* Royal Palm *(Roystonea oleracea)* has the highest number of leave and average size of leave than other two palms. The number of leaves is higher in Coconut Palm *(Cocos nucifera)* than

in Queen Palm *(Syagrus romanzoffiana)* while the average size of leave in Queen Palm *(Syagrus romanzoffiana)* is higher than the Coconut Palm *(Cocos nucifera)*.

The Coconut Palm *(Cocos nucifera)* shows a rapid growth than the two other palms.

# CHAPTER ONE

# INTRODUCTION

## 1.1 BACKGROUND

Palms are evergreen mostly tropical plant in the family *Aracaceae* also known as Palmae. Palms are flowering palnts which belong to the monocot order, Areca.

There are over roughly 112 currently known genera with almost 2600 species, most of which are restricted to tropical, subtropical and possibly warm temperature climates. Most palms are distinguished by their larger component evergreen leaves arranged at the top of an unbranched stem. However many palms are exceptions to this statement and palms infact exhibit an enormous diversity in physical characteristics. As well as being morphologically diverse palms also inhabit nearly every type of habitat within their range from rainforest to deserts.

Palms are among the best known well and extensively cultivated plant. Many common products and foods are derived from palms, and palms are also widely used in landscaping for the exotic appearance making them one of the most economically important plants. In many historical cultures, palms are symbols for each idea as victory, peace and fertility. Today palms remain a popular symbol for the tropics and vacations.

Shrubs, trees or vine, palm are limited to two methods of growth. The common representation is of a socitary shoot ending in a gain of leaves. This monopodal behaviour may be exhibited by prostrate, trunkless and trunk-forming members. Some common palms restricted to solitary growth include Washingtania and Roystenea. Palms may instead grow in sparse to intense clusters.

Palms have large evergreen leaves that are either palmately ('fan-leaved') or pinnately ('feather-leaved') compound and spirally arranged at the top of the stem.

The leaves have a tubular sheath at the base that usually splits open on one side at maturity. The flowers are generally small and white, radially symmetric, and can be either uni- or bi-. The sepals and petals usually number three each and may be distinct or joined at the base. The stamens generally number six, with filaments that may be separate, attached to each other, or attached to the pistil at the base. The fruit is usually a single-seeded drupe, but some genera (e.g. *Salacca*) may contain two or more seeds in each fruit. Most palms grow in the tropics. They are abundant in the tropics, and thrive in almost every habitat therein. Their diversity is highest in wet, lowland, tropical forests, especially in ecological "hotspots" such as Madagascar, which has more endemic palms than all of Africa (Dransfield et al., 2005).

A few general trait of each sub-family are listed. Most falls in their subfamily have palmately lobed leaves and solitary flower with tress, sometimes for carpels. The

fruits normally develop from only the carpels.

Subfamily *Calamoideae* includes the climbing palms such as rattans. The leaves are usually pinnate; derived characters (synapomorphies) include spines on various organs, organs specialized for climbing, an extension of the main stem of the leaf bearing reflexed spines, and overlapping scales covering the fruit and ovary. Subfamily Nypoideae contains only one genus and one specie, *Nypa fruticans*, which has large pinnate leaves. The fruit is unusual in floats, and the stem is dichotomously branched, also unusual in palms. Subfamily *Ceroxyloideae* has small to medium-sized flowers that spirally arranged, with a gynoecium of three joined carpels. *Arecoideae* is the largest subfamily with six diverse tribes containing over 100 genera. All tribes have pinnate or bipinnate leaves and flowers arranged in groups of three, with a central pistillate and two staminate flowers.

## 1.2 COCONUT PALM (*COCOS NUCIFERA*)

The coconut (*cocos nucifera*) is an important member of the family *Arecaceae*. It is only accepted specie in the genus cocos and is a large palm, growing to 30m tall, with pinnate leaves 4-6cm longs and pinnae 60-90cm long; old leaves break away clearly, leaving the trunk smooth. The term 'coconut' can be refers to as the entire coconut palm, the seed, or the fruit, which is not a botanical nut.

The coconut palm is grain known throughout the tropics for decoration, as well as for it's many culinary and non-culinary uses; virtually every part of the coconut palm can be utilized by humans in same manner. In cooler climate (but not less than USDA Zone 9), a similar palm, the green palm (*Syagrus ramanzaffiana*) is used in land scaping. Its fruits are very similar to the coconut, but much smaller. The queen palm was originally classified in the genus cocos alloy with the coconut, but

was later reclassified in syagrus.

The flowers of the coconut palm are polygamanoeciars, with both male and female flowers in the same inflorescence, flowering occurs continuously. Coconut palms are believed to be largely cross-pollinated, although some dwarf varieties are self-pollinatory. The endosperm layer, coconuts contain an edible clear liquid that is sweet, salty or both.

The Indian state of Kerala is known as the land of coconut. The name derives from "Kera" (the coconut tree) and "Alarm" (place or earth). Kerala has beaches friged by coconut trees, a hense network of water ways, flanked by green palm grooves and cultured fields. Coconut form a party of daily diets, the oil is used for cooking; coir is used for furnishing and decoration.

## 1.3 QUEEN PALM (COCOS PLUMOSE – SYAGRUS ROMANZOFFIANA)

*Synagrus romanzoffiana* (Queen palm or Cocos Palm) is a palm name of South America, from northern Argentin north to eastern Brazil and west of eastern Bolira. Queen palm is very similar to the coconut palm. It had been classified within the cocos genus as cocos plumose, was assigned to Arecastrun, then moved to Syagrus. As a result of the nomenclature confussion, they often retain a previous, in correct name in popular usage. It is a medium sized palm growing to 15m tall with pinnate leaves.

## 1.4 ROYAL PALM *(ROYSTONEA OLERACEA)*

The **Royal Palm Tree**, scientific name *Roystonea oleracea*, is native to Cuba and North America. Royal Palm Trees are popular in many warm, coastal landscapes, particularly in southern Florida and parts of

California. There are 10 species of Royal palm around the world.

They can be found in the Caribbean, Central and South American, Florida, Texas and California. The grace and beauty of a Royal palm makes it a popular tree along the streets of many cities. Often they are used in the islands of large parking lots or in medians along the highway. Nothing says "tropical" like the majestic Royal palm.

## 1.5 ECONOMIC IMPORTANCE

*Arecaceae* has great economic importance including coconut products, oils, dates, palm syrup, ivory nuts, carnauba wax, rattan cane, raffia and palm wood. The member of *Arecaceae* is the *Areca* palm in which the fruit and the betel nuts, is chewed with the betel leaf for intoxicating effect. Also belonging to the family of the *Arecaceae* are the Date Palm, harvested for its edible

fruit; Rattans, whose stems are used extensively in furniture and baskets; and the coconut. Palm oil is an edible vegetable oil produced by the oil palms in the genus *Elaeis*. Palm sap is sometimes fermented to produce palm wine or toddy, an alcoholic beverage common in parts of Africa, India, and the Philippians. The Palm Sunday festival uses palm leaves, usually from the Date Palm, to commemorate Jesus' entry to Jerusalem, when palm leaves were strewn on the road before him. Dragon's blood, a red resin used traditionally in medicine, varnish, and dyes, may be obtained from the fruit of *Daemonorops* species. Coir is a coarse water-resistant fiber extracted from the outer shell of coconuts, used in doormats, brushes, mattresses, and ropes. Some indigenous groups living in palm-rich areas use palms to make many of their necessary items and food. Sago, for example, a starch made from the pith of the trunk of the Sago Palm *Metroxylon sagu*, is a major staple food for

lowland people of New Guinea and the Moluccas. Palm leaves are also valuable to some people as a material for thatching or clothing.

Today, palms are valuable as ornamental plants and are often grown along streets in tropical and subtropical cities, and also along the Mediterranean coast in Europe. Further north, palms are a common feature in botanical gardens or as indoor plants. Few palms tolerate severe cold, however, and the majority of the species are tropical or subtropical. The three most cold-tolerant species are *Trachycarpus fortunei,* native of eastern Asia, and *Rhapidophyllum hystrix* and *Sabal minor,* both native to the southeastern United States.

## 1.6 JUSTIFICATION

Like many other plants, palms have been threatened by human intervention and exploitation. The greatest risk to palms is destruction of habitat, especially in the tropical forests, due to urbanization, wood-

shipping, mining, and conversion to farmland. Palms rarely reproduce after such great changes. In the habitat, and palms with a small habitat range are most vulnerable to them. The harvesting of heart of the palm, a delicacy in salads, also poses a threat because it is derived from the apical meristerm of the palm, of which it will never grow another, meaning that this action is fatal. The sales of seed to nurseries and collectors is another threat, as the seeds of popular palms are sometimes harvested directly from the wild. At least 100 palms species are currently endangered, and nine species have reportedly recently become extinct.

However, several factors make palm conservation more difficult. Palms live in almost every type of habitat and have tremendous morphological diversity. Most palm seeds lose viability quickly, and they cannot be preserved in low temperature because the cold kills the embryo. Using botanical gardens for conservation also presents

problems, since they can only have a few plants of any species or truly imitate the natural setting. There is also risk of cross-pollination, which leads to hybrid species.

## 1.7 OBJECTIVES

The aim of this work is to evaluate the growth rate of three general *Arecaceae* and to investigate the morphology of three general of *Arecaceae* using *Cocos nucifera, Syagrus romanzoffiana and Roystonea oleracea.*

To distinguish and identify these three plants and also to plant. To cultivate the these palms inside in the botanical garden of Abraham Adesanya Polytechnic.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 INTRODUCTION

It is estimated that only 130 palm species grow naturally beyond the tropics, mostly in the subtropics. Palms inhabit a variety of ecosystem. More than two thirds of palm species live in tropical forests, where some species grow tall enough to form pant of the canopy and shorter ones form part of the understory. Some species form pure stands in areas with poor drainage or regular flooding, including *Raphia hookeri* which is common in costal freshwater swamps in West Africa. Other palms live in tropical mountain habitat above 1000 meters, such as those in the genus ceroxylon nature of the Areca. Palms may also live in grass lands and scrublands, usually associated with a water source, and in deserts oases such as the date palm. A few palms are adopted to extremely basic lime soils, while others are similarly

adapted to very acidic serpentine soils (Woodroof 1970, Child 1974).

## 2.2 MONOPHYLETIC GROUP OF PLANTS

Palms are monophyletic group of plants, meaning that the group consists of a common ancestor and all it's decendeness. Extensive taxonomic research on palms, began with botanist H.E. MOARC, who organized palms into fifteen major groups based mostly on general morphological characteristics.

## 2.3 COCONUT PALM

The coconut belongs to the family of palms, *Palmae* included under the lower group of flowering plants known as the monocotyledons.

It occupies a conspicuous position in the vegetable kingdom owing the certain features characteristics of the palms, viz., comparatively slow growth; an unusual thickening at the base of the trunk giving mechanical rigidity; generally unbranched, erect, cylindrical, pillar-

like stem, covered with heavy scars of old leaf bases; a compact magnificent crown of gigantic, feathery, glossy, thick-cuticled leaves sheathed at the base providing firm attachment of the stem, orientated at the top of the trunk rendering a natural beauty and elegance; a branched inflorescence enclosed in a sheath collectively known as the spedix; the absence of tap root and the continually growing terminal bud commonly known as the 'cabbage'.

*Cocos nucifera* or coconut belongs to the palm family, Arecaceae (Palmaceae) which consists of 200 genera and over 2,000 described species (Child 1974). According to Woodroof (1970) the term **coconut** is derived from the Spanish and Portuguese word, "**coco**", which means "**monkey/grotesque face**", but the plant is known in many countries by local names. For example, it has been known as "naryal" in India for millennia and as "nut of India" by Cosmos, the Egyptian traveler, in AD 545. The tree itself has been described as, "man's most

useful tree", "king of the tropical forest", "tree of life", "tree of heaven" and lazyman's crop, *inter alia*. (Woodroof 1970).

Coconut varieties fall under two broad groups, Tall or *typica* and Dwarf or *nana*. Tall and Dwarf coconut types may hybridize to produce intermediate forms (Woodroof 1970, Child 1974). The Tall variety has greater genetic variability as it is usually cross pollinated. The coconut plant is monoecious, producing both male and female flowers. The male flowers are located distally while the female flowers are found proximally on each inflorescence. The type of pollination is determined by the relative maturation times of the male and female flowers. In the Tall varieties the male flowers open before the female flowers, hindering self pollination while, an overlap of the opening phases of male and female flowers in Dwarf plants allows for self pollination and greater tendency toward homozygosity. Coconuts are also named

after areas where they are grown long enough to have developed distinctive characteristics, e.g., Panama Tall, West African Tall and Malayan Dwarf (Woodroof 1970, Child 1974). Maypan variety is a hybrid of the Malayan Dwarf and Panama Tall varieties (Coconut Industry Board [Jamaica] 1973).

The traditional commercial coconuts were the Tall varieties which were preferred above the Dwarf varieties because of the quality and quantity of copra they produce (Woodroof 1970). They normally live for over 60 years, are adaptable to a wide range of soil conditions, fairly resistant to diseases and water stress, and start to bear within six to ten years. The Dwarf varieties come into within three to four years, attain full production by the ninth year and have a life span of about 30 to 40 years. While they show greater susceptibility to some diseases, the Dwarf varieties exhibit greater resistance than the Talls to some viral diseases, including lethal yellowing

(Woodroof 1970, Child 1974).

Each coconut inflorescence emerges from the base of a leaf and is approximately 120o around from the previous one. After fertilization of the female flowers, each inflorescence develops into a cluster of fruits called a bunch. Occasionally the spikelet of an inflorescence is in direct contact with the spikelet remnants of an older bunch (Hall 1981, Moore and Alexander 1987).

The native habitat for the coconut palm is unknown because coconut is dispersed by water, although human activity could be credited for much of its dispersal (Child 1974). Of all the cultivated trees in the world, the coconut palm has the widest geographical range (Ghai and Wadhi 1983). Ninety percent of the world's coconut acreage lies within 20oN and 20oS of the Equator (Woodroof 1970, Persley 1992). The crop is best grown within 600 ft. above sea level, with over 1,250 mm rainfall or a high water table on a rich silty loam.

Coconut was introduced into the West Indies at the beginning of the 20th Century (Woodroof 1970, Child 1974). The main variety was the Panama Tall found in Guyana, Jamaica, St. Lucia, Venezuela, Trinidad and Tobago. There was also the dwarf variety, with its Yellow, Red (golden), and Green color morphs.

The coconut palm and its fruit are regarded as the most important plant to humans around the world (Child 1974). Among its most important uses coconut is a food source, provides supplement for body fluids and minerals, and acts as an antihelminthic. The liquid endosperm is also a media for *in vitro* storage of semen and a growth regulator of plants (Woodroof 1970). Copra, he dehydrated endosperm of the nut, is next to soybean s a source of oil for food. Coconut oil is also used in osmetics and pharmaceuticals. The material that mains after the oil is expressed from copra is called lcake and is used as animal feed (Woodroof 1970).

Coconut shell is used directly as fuel, filler, extender in the synthesis of plastic, to make activated charcoal, household articles, and to produce various distillation products, such as tar, woodspirit and pitch. Coir, a course fiber from the husk of the nut, has various domestic and industrial uses. Coconut root is brewed and used in folk medicine, for example, as a cure for dysentery (Woodroof 1970).

Coconut accounts for a large part of the national earnings of the Asian and Pacific Coconut Communities (APCC) countries. In 1993 the APCC account for 86% of the world's coconut production. Indonesia, the Philippines, and India accounted for 81% of the coconut produced by the fourteen APCC countries in 1993 and 69% of the World's total. In Jamaica, coconut production has fluctuated over the last 50 years, due to several hurricanes and lethal yellowing disease. Maximum copra production was 19,245 metric tons in 1971 but was

reduced to 8,540 in 1974 and to insignificant amounts in the late 1970's. Coconut production in Jamaica began to recover in the 1980's. Today over 90% of the coconut produced goes toward domestic use and copra is of secondary importance.

Besides pathogens, there are several invertebrates (nematodes, arthropods *etc.*) and vertebrates (rats, birds, *etc.*) which attack various stages of the plant (Lever 1969, Krantz *et. al.* 1978, Red Ring Research Division 1983). At least 750 insect pests of coconut have been recorded from around the world. These pests attack the leaves, stems, flowers, nuts and roots of the coconut plant. In the Caribbean over 26 major pests have been recorded. Among them are two species of mites, 15 species of insects and three species of rodents.

### 4 QUEEN PALM *(SYAGRUS ROMANZOFFIANA)*

Queen palm, also known as cold hardy palms are single-trunked palm crowned by a beautiful head of

glossy, bright green, soft, pinnate leaves forming a graceful, dropping canopy. The ornamental, bright oranges dates are produced in hanging clusters and ripen during the winter months. The dead fronds are persistent and often require pruning to remove. It is popular is commercial or home landscapes planted in rows on 15-foot centers to line a street or walk, in clusters or occasionally as a specimen. The grey trunk is ringed with old leaf scars.

A few decades age the queen palm was assigned the name *Cocos plumose.* During the late sixties and seventies most experts began referring to it as *Arecastrum romanzoffianum.* Now this queen has been placed in the *Genus syagrus,* the species named became *romanzoffiana.*

Queen palm is said to be a native of Brazil, Paraguay and Northern Argentina in South America. This palm is now widely planted as a landscape item. The

Queen palm has a maximum height of about 50 feet.

The palm has a smooth straight gray trunk ringed with evenly spaced leaf scars and topped with a large canopy of feathery fronds. The fronds are dark green and have double rows of leaflets. This palm is noted for its spectacular clusters of flowers and fruits. The flower clusters burst from large pods during the summer. In early winter, the green fruit clusters appear. The spherical-shaped fruit eventually turns bright orange, hanging in clusters up to six feet in length. In each fruit there is a single hard seed with three spots.

This stately, single-trunked palm is crowned by a beautiful head of glossy, bright green, soft, pinnate leaves forming a graceful, drooping canopy. The ornamental, bright orange dates are produced in hanging clusters and ripen during the winter months. The dead fronds are persistent and often require pruning to remove. It is popular in commercial or home landscapes planted in

rows on 15-foot centers to line a street or walk, in clusters or occasionally as a specimen. The grey trunk is ringed with old leaf scars.

Growing best in full sun, Queen palm is most suited for acidic, well-drained soils and shows severe mineral deficiencies on alkaline soil. This disfigures the palm by stunting the young leaves and can kill it. Unfortunately, Queen palm is frequently planted in alkaline soil and requires regular preventive applications of Manganese and/or Iron to help keep the fronds green. Potassium deficiency is also displayed on older fronds in well-drained soils. Quick-growing Queen Palm responds well to ample moisture and fertilizer and is slightly salt-tolerant. After planting Queen Palm in the landscape, growth is rapid. This palm is not affected by lethal yellowing disease.

Pruning off too many fronds at one time can cause the palm to decline. Growth often shows with new foliage

aborting to display distorted leaflets. The trunk is also very susceptible to decay. Prevent injury to the trunk by keeping turf well away from the trunk. Propagation is by seed and volunteers will often appear under fruiting trees.

## 2.5 ROYAL PALM

The **Royal Palm Tree**, scientific name *Roystonea oleracea*, is native to Cuba and North America. Royal Palm Trees are popular in many warm, coastal landscapes, particularly in southern Florida and parts of California. There are 10 species of Royal palm around the world.

They can be found in the Caribbean, Central and outh American, Florida, Texas and California. The grace nd beauty of a Royal palm makes it a popular tree along ıe streets of many cities. Often they are used in the lands of large parking lots or in medians along the

highway. Nothing says "tropical" like the majestic Royal palm.

The Royal Palm can reach 50 to 100 feet high with a growth rate of around a foot each year. Fragrant, yellow flowers bloom in the summer. Evergreen leaf-blades reaching 18 to 36 inches top a crown shaft that is long and green.

Purple to black half-inch fruits are showy but not edible. They thrive in gardening zones 10 and 11 but can handle short periods of cold as low as 28 degrees. Royal palms are commonly seen in the landscapes of palm tree enthusiasts. It is often considered a "must-have" tree for those who love different types of palm trees.

This palm prefers full sun to partial shade. Soil can e clay, sand or loam; it doesn't seem to be very picky in is regard. The Royal palm prefers acidic to slightly kaline soil, but be careful not to have too much

alkalinity or the fronds may come out frizzled.

The Royal palm likes lots of water but it is moderately drought tolerant. This makes it a good tree even if you live in a place that has watering restrictions.

While it does love to be watered, it must be well drained. Amazingly though, they not only tolerate, but seem to thrive in the poor soil and drainage of urban environments where other trees tend to do poorly.

The Royal palm is resistant to many pests and diseases; however there are a few that you should be aware of. One potential pest is the Royal Palm bug. This pest feeds on the young leaves of the tree. As the leaves mature they may look scorched. Problems with this bug tend to be worse in the early spring, but improve in the early summer.

Other insect pests can include the palm leaf

skeletonizer which feeds on the leaf tissue between the veins. Giant palm weevil and scales can cause problems as well. Chemical treatments and removal of infected trees are the major control measures of these problems.

Ganoderma butt rot is a fungal disease that will kill infected palms. By the time symptoms are visible, the tree has already been rotted on the inside. Therefore, no treatment is available. Removal of the tree is the only option.

# CHAPTER THREE

# MATERIALS AND METHOD

## 3.1 EXPERIMENTAL SITE

The experimental was carried out at the Botanical Garden of Abraham Adesanya Polytechnic, Dagbolu/Akanran Road, Ijebu Igbo, Ogun State, Nigeria.

## 3.2 MATERIALS USED AND PROCEDURES

The simple farm tools were used such as cutlass, hoe and rake, water, seedlings and manure.

**Procedures**

The cutlass was used to cut down the bushy grass and the rake is used to pack the grass after drying. The hoe is used to dig the soil and after digging, the manure is first added to the soil before planting the seedling and after dipping the seedling of Royal Palm, Dwarf Coconut Palm, Queen Palm in their different holes. The holes were covered with the soil before adding water into it. The plants were been wet twice in a week.

## 3.3 DATA COLLECTION

The seven (7) weeks old seedlings were gotten from NIHORT REESEARCH CENTRE, Eleyele, Ibadan.

## 3.4 LIMITATION OF THE STUDY

i. Financial constraints on ability to carryout the study.

ii. Time constraints: Palm take a very long time sometimes years to study their morphology.

iii. The palms were planted toward the rainy season. The new root growth is more rapid in warm soil.

# CHAPTER FOUR

# RESULTS

## 4.1 RESULTS

After two weeks of transplanting, number of leaves, average size of leaves and height of the three plants were then taken for seven weeks shown in table 1, 2 and 3

Table 1: Coconut Palm (*Cocos nucifera)*

| Weeks | No. of leaves | Average Size of leaves (mm) | Height of the plant (mm) |
|---|---|---|---|
| 1. | - | - | - |
| 2. | 4 | 16 | 92 |
| 3. | 5 | 16.5 | 94 |
| 4. | 5 | 18 | 100 |
| 5. | 5 | 20 | 115 |
| . | 6 | 21.5 | 120 |
| . | 6 | 22 | 122 |

*Cocos nucifera* hve fan-shaped leaves with the leaflet web together. The leaves have a tubular sluath at the base that usually split open on one side at maturity, showing a pinnately compound leaves.

Table 2: Queen Palm (*Syagrus romanzoffiana)*

| **Weeks** | **No. of leaves** | **Average Size of leaves (mm)** | **Height of the plant (mm)** |
|---|---|---|---|
| 1. | - | - | - |
| 2. | 1 | 23.5 | 34 |
| 3. | 2 | 24 | 34 |
| 4. | 2 | 24 | 36 |
| 5. | 3 | 26 | 38 |
| 6. | 3 | 27.5 | 39.5 |
| 7. | 3 | 29 | 41 |

Table 3: Royal Palm (*Roystonea oleracea*)

| Weeks | No. of leaves | Average Size of leaves (mm) | Height of the plant (mm) |
|---|---|---|---|
| 1. | - | - | - |
| 2. | 3 | 39 | 59 |
| 3. | 3 | 39 | 59.5 |
| 4. | 5 | 39 | 59.5 |
| 5. | 6 | 39 | 60 |
| 6. | 8 | 39 | 60 |
| 7. | 12 | 40 | 61 |

*Syagrus romanzoffiana* and *Roystonea oleracea* both have similarity in the leaves shape. The leaves are feather like (pinnately compound)

# CHAPTER FIVE

# DISCUSSION AND CONCLUSION

## 5.1 DISCUSSION

The experiment conducted shows that *Cocos nucifera* (Coconut Palm) has a very rapid growth than the *Syagrus romanzoffiana* (Queen Palm) and *Roystonea olercea* (Royal Palm) as shown in their height, average size of leave and width of their leaves.

In all the three (3) palm trees, Queen Palm (*Syagrus romanzoffiana*) has a very slow growth rate.

Royal Palm (*Roystonea oleracea*) and Queen Palm (*Syagrus romanzoffiana*) shows a lot of similarity in their morphology, having the same leaves shapes and sizes.

The leaves of the three (3) palms are either palmately or pinnately compound and spirally arranged at the top of the stem, which are in accordance with the classification of palm family by Dransfield et.al (2005).

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