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Evaluation of the Effect of Different Growing Media on Emergence and Seedling Growth of Pawpaw (*Carica papaya*)

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Abstract
A field experiment was conducted at the nursery site of Faculty of Agriculture Bayero University Kano, Kano State with the aim of determining the effect of growth media on the germination and early seedling performance of Carica papaya. The treatments were laid in Complete Randomized Design (CRD) replicated three (3) times. Treatment used were; River sand + cow dung (RC), River sand + Sawdust (RS), River sand + Rice hulls (RH), and River sand (RR) only as a control in the ratio of 2:1. The result obtained from the study shows that media combinations differs significantly as far the growth parameters measured, with River sand + Cow dung (RC) and River sand + Sawdust (RS) having the highest germination percentage. River sand + Rice hulls (RH) followed next as far germination percent is concern. In terms of plant diameters significant difference was observed from 4th, 5th and 6th week after emergence. However, plant height, number of leaves and plant diameter influenced the growth and yield of Carica papaya. From the result obtained the greater plant height, plant diameter and number of leaves were obtained in treatment combination of River sand + Rice hulls (RH) and River sand + Cow dung (RC) medium.

Keywords: evaluation, effect, growing media, seedling, pawpaw

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I. Introduction

Carica papaya is a tropical fruit belonging to the family Caricaceae, Papaya is very wholesome, refreshing and delicious fruit. Papaya has been known as a "Wonder fruit of the tropics", it is also called papaw or pawpaw, an ideal fruit for growing in kitchen gardens, backyards of homes as well as in the field, especially near the cities or big towns and is the only member of its genus Carica (Dayeswari et al, 2016). It is one of the few fruit crops that produce fruits throughout the year giving early and steady returns. Papaya cultivation had its origin in tropical America, perhaps in Southern Mexico and neighboring Central America. Introduced from Philippines through Malaysia to India in the later part of 16th century, papaya cultivation has now spread widely in tropical and subtropical regions of our country (Sakthivel, 2009).

Papaya is mainly propagated by seeds which show a wide variability in germination and seedling growth (Dayeswari et al., 2017). The seedlings can be raised both on raised beds as well as in polythene bags.

The use of suitable growing media or substrates is essential for production of quality horticultural crops. It directly affects the development and later maintenance of the extensive functional rooting system (Kendra et al, 2014). Growing media are an integral part of most horticultural production system. They provide anchorage for the plants roots, air spaces to allow respiration and retain sufficient available water to enable plant growth (Ayoola., 2010; Einert et al., 1973). Different growing media that can be used are cocoa shells, sewage sludge, tobacco waste, sugar waste, vermin compost, saw dust, paper waste, biomass by-product, leaf mould, straw product, loam sea weed, wood waste, spent mushroom compost, lignite, rice hulls, animal waste, food processing waste (Agbo et al., 2006). Growing medium is known to affect plant performance in bare roots and container nursery production (Gajalakshmis 2012).

Nursery medium have been found to influence the emergence and growth of seedling produce and therefore necessary to find a suitable medium that will enhance its vigor (Einert et al, 1975). It is necessary to find suitable soil mixtures that will help to produce vigorous root growth in the nursery before they are transplanted to their permanent site to ensure good seedling for plantation or orchard establishment (Jessica 2012; Agbo et al, 2006).

The use of soilless potting media is a common practice in the developed countries. Commercial potting media are commonly based on sphagnum peat and coir-dust based substrates. Quality of seedlings obtained is

influenced by the composition of the media used. Baiyeri et al, (2006) reported on the relative importance of soilless media for growing potted ornamental plants in Nigeria.

The quality of the growing media used in containerized seedling production is largely influenced by physical, chemical and biological properties, the growing environment and plant management (Nwofia et al, 2015). Growing media is not only a place where seeds are sown and seedlings raised, but is also a source and reservoir of plant nutrients, (Mathowa et al., 2016). It also anchors the root system and therefore supports the plant (Abad et al., 2005). A good growing media should be composed of mixtures that are tender enough for seeds to easily germinate, retains moisture, drains excessive water and provide sufficient plant nutrients for seedling growth and development (Abad et al., 2002).

II. Review of Some Related Literatures

Origin of Papaya

The pawpaw is believed to be native to southern Mexico and neighboring Central America. It is currently cultivated in Florida, Hawaii, Eastern British Africa, South Africa, Sri-Lanka, India, Canary Islands, Malaysia and Australia. It is now present in every tropical and subtropical country. Pawpaw was first described in 1526 by the Spanish chronicler Oviedo, who found it first on Panamanian and Colombian coasts. The fruit was rapidly propagated in the tropics, most likely due to the abundant and highly viable seeds. The crop has adapted quite well to tropical areas with fertile soils and abundant rainfall. The history of pawpaw spread was initiated approximately in 1500, when the Spanish conquerors carried seeds to Panama and Dominican Republic. During the following century Spanish and Portuguese sailors took the seeds to the Philippines, Malaysia and India. For 1600 the fruit had been produced in warm regions of South and Central America, Southern Mexico, the Antilles, Bahamas, Bermuda Florida. In the same century pawpaw seeds were taken from India to Naples in Italy. The crop reached Hawaii between 1800 and 1820. Until 1900, pawpaw seeds were taken to Florida, probably from Bahamas' plantations. The Solo variety has been cultivated in Hawaii since 1911, probably brought from Barbados and Jamaica (Jorge and Gabriela 2014). The first seeds of the Maradol variety were introduced into Mexico in 1978, through CONAFRUT, in Xalapa, Veracruz (CRFG, 1998). Popular varieties in Nigeria include large maradol, jS.22, pink solo and red royale (Wikipedia, 2019).

BOTANICAL DESCRIPTION

The plant is a fast growing arbores cent herb, with short life, it has single straight or sometimes branched stem reaching 2-10 m height, and the stem is cylindrical spongy fibrous, loose, hollow, gray or gray-brown color, 10-30 cm diameter and toughened by large and protuberant scars caused by fallen leaves and flowers. The leaves are spirally arranged in a terminal cluster, simple, on petioles 30-70 cm long. The leaves are rounded in outline, 60-90 cm in diameter, palmately 7-9 lobed. The margins of the lobes are very variable, and range from entire to undulate to deeply lobed. Three types of plants are recognized based on flower type: female, hermaphrodite, and male.

Female plants always produce female flowers. If no male or hermaphrodite plants are nearby to provide pollen, female plants usually fail to set fruit. Un-pollinated female plants occasionally set parthenocarpic fruits, lacking seeds.

In nature, these plants are dioecious: male and female flowers are found on separate plants. Male flowers are morphologically distinct from female flowers. Male inflorescences are borne in many-flowered panicles of cymes on horizontal or pendent stalks to 1 m long. The flowers are yellowish, 2-4 cm long. The petals are fused into a long tube, have 10 fertile stamens, and a rudimentary, non-functional ovary. Female inflorescences are much shorter -only 3-4 cm long-- and have fewer flowers. Female flowers are larger, usually white or cream in color, with five free petals. There are no stamens, but a large ovary with 5 fan-shaped stigmas.

Flower type is determined by the presence or absence of functional stamens (male parts) and stigma and ovary (female parts). Within varieties, flower type is usually identified by flower size and shape. Female flowers are relatively large and rounded at the base. They have a stigma but lack stamens. They generally must receive pollen in order to set fruit. Pollen can be carried by wind or by insects. Male flowers are thin and tubular. They have perfect structure (i.e., they contain both male and female organs), but the small, vestigial ovary is nonfunctional. Male flowers are usually borne on a long flower stalk (peduncle).

Hermaphrodite flowers are intermediate between female and male flowers in size and shape. They are less bulbous than female flowers, but not as thin as male flowers. They have perfect structure with functional stigma and stamens and usually are self-pollinating.

Generally, the fruit is melon-like, oval to nearly round, somewhat pyriform, or elongated club-shaped, 6 to 20 in (15-50 cm) long and 4 to 8 in (10-20 cm) thick; weighing up to 20 lbs (9 kg). Semi-wild (naturalized) plants bear miniature fruits 1 to 6 in (2.5-15 cm) long. The skin is waxy and thin but fairly tough. When the fruit is green and hard it is rich in white latex. As it ripens, it becomes light- or deep-yellow externally and the thick wall of succulent flesh becomes aromatic, yellow, orange or various shades of salmon or red. It is then juicy, sweetish and somewhat like a cantaloupe in flavor; in some types quite musky. Attached lightly to the wall by

soft, white, fibrous tissue, are usually numerous small, black, ovoid, corrugated, peppery seeds about 3/16 in (5 mm) long, each coated with a transparent, gelatinous aril (Morton, 1987), (De Los Santos, *et al.,* 2000).

ECOLOGY

Pawpaw is well adapted to many soil types; it requires warm area with both sunshine and reflected heat, so the hottest place against the house where nothing else seems happy is an ideal location for pawpaw (Jorge et al., 2014). They also like to be as free from wind as possible, although this is not as critical as their need for sun. Pawpaw can be grown successfully in shade, but the fruit is rarely sweet. They are best planted in mounds or against the foundation of a building where water can be controlled (CRFG, 1998).

Pawpaw needs a light, well-drained soil. They are easily killed by excess moisture. The soil needs to be moist in hot weather and dry in cold weather. Since this is the opposite of California's rain pattern, in addition to good drainage, plastic coverings to prevent over wetting in winter may also being worthwhile. Pawpaws do not tolerate salty water or soil (CRFG, 1998).

While doing best in light, porous soils rich in organic matter, the plant will grow in scarified limestone, marl, or various other soils if it is given adequate care. Optimum pH ranges from 5.5 to 6.7. Overly acid soils are corrected by working in lime at the rate of 1-2 tons/acre (2.44.8 tons/ha). On rich organic soils the pawpaw makes lush growth and bears heavily but the fruits are of low quality (Morton, 1987).

PROPAGATION

Papaya is grown from seed. Dry seed may be stored for a year or more in airtight refrigerated containers. Fresh seeds will usually germinate in 10 to 14 days. Germination can be improved by removing the gelatinous outer seed coat (sarcotesta) before drying.

Seeds are sown either in containers or directly in the ground. Transplanting container-grown plants is usually limited to areas where there is dependable rainfall or supplemental irrigation. When direct-sowing, 10 to 15 seeds are sown 1/4 to 1/2 in (63 to 127 mm) deep in each planting hole. To ensure adequate stands in lava lands, approximately 0.5 cubic feet (14.16 cubic dm) of soil should be placed in each planting hole. The soil helps to retain fertilizer nutrients and moisture (Chia et al., 2010) and (Tripton et al., 2013). Under good conditions the seeds may germinate in about two weeks, but may take three to five weeks. Gibberellic acid can be used to speed up germination in some seasons. Plants usually begin flowering 9-12 months after germination. (Medina et al, 2003).

GENERAL USES AND BENEFIT OF PAWPAW

In some developing countries, the traditional use of papaya is being investigated as an alternative to standard treatments for a range of ailments. C. papaya has a wide range of purported medicinal properties for treatment of diabetes, as birth control, as an antiseptic, antimicrobial, or diuretic, to control parasites, reduce inflammation, lower blood pressure, and lower cholesterol. While there are only limited data to support most of these uses, there is some evidence for healing bed sores and other wounds and in treating intestinal worms in humans. (St. Louis et al., 2010)

Nutritional Value of papaya

Nutritional values of papaya help to prevent the oxidation of cholesterol. Papaya is rich in iron and calcium; a good source of vitamins A, B and G and an excellent source of vitamin C (ascorbic acid). The extracts of unripe C. papaya contain terpenoids, alkaloids, flavonoids, carbohydrates, glycosides, saponins, and steroids. Papaya contains several unique protein-digesting proteolytic enzymes including papain and chymopapain. A drug made from chymopapain used to be very popular in treating slipped disk. Both papain and chymopapain can help lower inflammation and improve healing from burns. The alkaloid, Carpaine, slows the heart rate in humans and thus reduces blood pressure. Its action is similar to the drug prescribed for heart patients, digitalis. The alkaloid is reported to be able to kill worms and amoebas. Papaya has an abundSance of cancer fighting lycopene. It is a key intermediate in the biosynthesis of many important carotenoids, such as beta-carotene and xanthophylls (Debjit et al., 2013). Another useful compound not readily found in the plant kingdom is Fibrin. It reduces the risk of blood clots and improves the quality of blood cells, optimizing the ability of blood to flow through the circulatory system. Fibrin is also important in preventing stroke. (Debjit et al., 2013).

Medicinal Value of papaya

The fiber of papaya is able to bind cancer-causing toxins in the colon and keep them away from the healthy colon cells. These nutrients provide synergistic protection for colon cells from free radical damage to their DNA. Protein enzymes including papain and chymopapain and antioxidant nutrients found in papaya; including vitamin C, vitamins E, and beta-carotene, reduce the severity of the conditions such as asthma, osteoarthritis, and rheumatoid arthritis. Vitamin C-rich foods, such as papaya, provide humans with protection

against inflammatory polyarthritis, a form of rheumatoid arthritis involving two or more joints. If you are smoker, or if you are frequently exposed to second hand smoke. Eating vitamin A rich foods, such as papaya, help your lung healthy and save your life. Current research proves that papaya is having an anti-sickling activity, also it has been stated that Men consuming lycopene-rich fruits and vegetables such as papaya, tomatoes, apricots, pink grapefruit, watermelon, and guava were 82% less likely to have prostate cancer compared to those consuming the least lycopene-rich foods (Rozita et al., 2002). Serves as an anticoagulants, Injection of papain extract in a dog increases prothrombin and coagulation threefold. It is also claimed that the enzyme eliminates necrotic tissues in chronic wounds, burns and ulcers. Papain is also of commercial importance in the brewery industry, in the food industry and in the textile industry. (Aravind G et al., 2013).

Cosmetic Benefits of Papaya

Rubbing the white pulp of raw papaya improves pimples as well as wrinkles. Papaya works as a good bleaching agent. It is an important ingredient in bath soaps, astringents, detergent bars and hand washes. Home Recipe for Papaya Skin Lightner Experts suggest that papaya can help in removing dead worn-out skin cells and replace it with healthy new cells, thereby lightening the color of our skin. For this, one can prepare a paste of raw papaya and apply it on the skin once for few days. (Debjit et al., 2013).

PHERMACOLOGICAL ACTIVITY OF C. PAPAYA

Leaves

Papaya leaf has a limitless of benefits. In some parts of Asia, the young leaves of the papaya are steamed and eaten like spinach. Commencing on studies of Dr. Sanath Hettige, who conducted the research on 70 dengue fever patients; said papaya leaf juice helps increase white blood cells and platelets, normalizes clotting, and repairs the liver. Recent research on papaya leaf tea extract has demonstrated cancer cell growth inhibition. It appears to boost the production of key signaling molecules called Th1-type cytokines, which help regulate the immune system. Papaya leaves are made into tea as a treatment for malaria. Antimalarial and antiplasmodial activity has been noted in some preparations of the plant, but the mechanism is not understood and not scientifically proven. The leaves of the papaya plants contain chemical compounds of carpain, Substance which kills microorganisms that often interfere with the digestive function (Debjit et al., 2013).

- Additional Benefits of Papaya Leaves are: serve as an acne medicine, Increase appetite, Ease menstrual pain, Meat tenderizer, Relieve nausea e.t.c

Fruit

Papaya fruit is a rich source of nutrients such as provitamin A, carotenoids, vitamin C, B vitamins, lycopene, dietary minerals and dietary fibre. Danielone is a phytoalexin found in the papaya fruit. This compound showed high antifungal activity against Colletotrichum gloesporioides, a pathogenic fungus of papaya. Ripe papaya fruit is laxative which assures of regular bowel movement. The milky juice which is tapped from the green, mature fruit while still in the tree contains an enzyme known as "papain". People use this in the preparation of different remedies for indigestion. The folic acid found in papayas is needed for the conversion of homocysteine into amino acids such as cysteine or methionine. If unconverted, homocysteine can directly damage blood vessel walls, is considered a significant risk factor for a heart attack or stroke (Debjit et al., 2013).

Seeds

The black seeds of the papaya are edible and have a sharp, spicy taste. They are sometimes ground and used as a substitute for black pepper. In Wister rat's nephro-protective activity was observed in dose related manner. Concentration of urine and creatinine were evaluated. The papaya seeds are very pungent and peppery, making them almost unpalatable. However the seeds seem to have more potent medicinal values than the flesh (Debjit et al., 2013).

- Papaya seeds have antibacterial properties and are effective against E.coli, Salmonella and Staphylococcus infections.
- Papaya seeds may protect the kidneys from toxin induced kidney failure.
- Papaya seeds can eliminate intestinal parasites.
- Papaya seeds help detoxify the liver
- As a skin irritant to lower fever
- Cure for piles and typhoid
- anti - helminthic and anti-amoebic properties

Peel

Papaya peel is often used in cosmetics. The papaya peel can also be used in many home remedies. Sunscreen And Soothing Slave, the presence of vitamin A helps to restore and rebuild damaged skin. Applied

papaya peel used as skin lightening agent. When peel mixed with honey and applied it can act as soothe and moisturizers the skin. The papaya vinegar with lemon juice can be applied to the scalp for 20 minutes prior to shampooing to fight dandruff. Adding papaya oil and vinegar to bath water, along with essential oils like lavender, orange and rosemary can be nourishing, refreshing and relaxing, and can work as a pain reliever and muscle relaxant. (Debjit et al., 2013)

Roots

Juice from papaya roots is used in some countries of Asia to ease urinary troubles. Papaya leaf when dried and cured like a cigar, is smoked by asthmatic persons. An infusion of fresh papaya leaves is used by person to expel or destroy intestinal worms. Fresh young papaya are also used to remedy colic, a certain stomach disorder or cramp. A decoction formed by boiling the outer part of the roots of the papaya tree in the cure of dyspepsia. (Debjit et al., 2013)

Latex

The milky sap of an unripe papaya contains Papain and chymopapain. Chymopapain was approved for intradiscal injection in patients with docum ented herniated lumbar intervertebral discs and who had not responded to "conservative therapy". Vitamins and traces of an alkaloid called Capaine have also been found in the latex. Apart from natural oils, the seeds of the fruit also contain carbohydrates, carpasemine, benzyl senevol and a glycosides. Papain is also used to treat commercial beer, to degum natural silk, as a meat tenderizer and in the production of chewing gums. Cosmetically it is used in Shampoos and in a number of face-lifting operations. In humans capaine slows down the heart and thus reduces blood pressure. (Debjit et al., 2013).

III. Methodology

Experimental Site

The study was conducted at the nursery site of Department of Agronomy, Faculty of Agriculture, Bayero University, Kano. The nursery is located within latitude 13^0 53^1 N- 10^0 25^1 N and longitude 7^0 40^1 E – $10^0 53^1$ E situated in the Sudan savanna, ecological zone of Nigeria, this location is characterized by distinct dry and wet seasons. Rainy season usually started around May/June, and terminates in September /October. The dry season started from November to April with occurrence of harmattan in November/January.

Treatments and Experimental Design

The Experiment was comprised of four treatment combinations of different media mixture. The media used were; mixture of River sand + Cow dung (RC), River sand + Sawdust (RS), River sand + Rice hulls (RH), and River sand only (RR) as control, all in the ratio of /2:1/. 360 standard perforated poly bags were used for the experiment and three (3) replications were employed. After the mixture, the media were bagged in the polybags and arranged in clusters of ninety (90) per treatments in three (3) replicates in a Completely Randomize Design (CRD). The filling of the polybags was done by the use of hand trowel and shovel. The polybags were irrigated for 1 week to obtain a homogenous media before the seeds are sown. 720 seeds were used; each polybag was sown with two (2) seeds at about 1 cm deep. The seeds were sourced from Department of Agronomy. The seeds were soaked in water for two (2) days to obtain clean and viable seeds. The polybags were irrigated daily until final emergence, and later at two (2) days intervals. After emergence the seedlings were thinned to one per poly bag, for accurate data collection.

Land preparation

The land was cleared of all plant debris, the soil was loosen using hoe and nursery bed was formed.

Potting Mixture

Polythene bags of 8” x 6” size having 150 gauge thickness was used for sowing of papaya seeds. The polythene bags were filled with media as per the sub treatments.

Layout

The bags were placed under Randomize Complete Block Design.

Sowing and Irrigation

The seeds were sown at the rate of 2 seeds per polythene bag. Observation on seed germination and seedling growth were recorded at 7 days interval. The polybags were irrigated daily until final emergence, and later at two (2) days intervals.

Thinning and weeding

Thinning was carried out by the removal of weaker seedlings, only one healthy seedling was retained per polythene bag. Regular weeding and plant protection operations were attended.

Measured Parameters

Days to first emergence

The number of days taken for the appearance of first seedling in each treatment was considered as days taken for commencement of germination.

Days to 50 percent germination

The number of days taken to reach 50 percent of the final germination was computed in each treatment during the course of the experiments.

Plant height (cm)

The plant height was measured from five plants, which were selected randomly from each replication for recording observations regularly. Height from the collar region to the base of the last fully opened leaf on the main stem was recorded at every one weak interval for papaya with the aid of the meter rule. The mean plant height was calculated. This practice was done at 3, 4, 5, 6, 7, and 8 WAS.

Plant diameter (cm)

From the same five labeled plants, girth of the stem was measured at a marked point about one centimeter above the soil at every one weak interval for papaya.

Number of leaves per plant

The number of leaves per plant in each treatment was recorded in five randomly selected plants at every one week interval for papaya. The mean of number of leaves were calculated.

Days taken to complete the seed germination

The number of days taken to complete the germination was recorded in each treatment during course of experiment.

Germination percentage

Germination percentage was calculated in each treatment after the completion of seed germination.

Data Analyses

The experiment was subjected to general Anova, The data collected were analyzed using Duncan Multiple Range Test. The analytical software used was Statistical Package of Social Sciences (SPSS)

IV. Results

Days to first emergence and 50% germination

The result showed in table 1 and 2 shows that growth media had beneficial effect on the germination and seedling growth of Carica papaya. The seedlings started emerging at the 2nd week after sowing (WAS) and reached 50% germination at 4th week after sowing (WAS). Maximum speed of emergence occurs in treatment combination of Sawdust + River sand which emerged at 12 days after sowing, followed by treatment combination of River sand + Rice hulls (RH) and River sand + Cow dung (RC) with the highest germination percent (25.0%). The control (RR) gives the least results in germination parameters.

Table 1: Effect of Treatments to First Emergence

Treatments	Days to germination	Germination percentage (%)
Control	16	20.5
RH+RS	14	22.2
SD+RS	12	23.3
CD+RS	13	25.0
Mean	13.75	22.75

Table 2: Effect of Treatments on 50% Germination

Treatments	Days to 50% germination	Percentage
Control	19	28.79
RH+RS	17	25.76
SD+RS	14	21.21
CD+RS	16	24.24
Total		100

Plant height

The above table 3 shows a very high significant difference. The growing Medias have significant effect in the plant heights. The maximum plant height was (36.06cm) observed at treatment combination of RH+RS, followed by combination of CD+RS with maximum number of (34.18cm) at 8 weeks after germination. The minimum plant height was observed at combination of SD+RS having minimum number of (12.16cm) at 8 weeks after sowing.

Table 3: EFFECT OF TREATMENTS ON PLANT HEIGHT

Treatments	3 WAS	4 WAS	5 WAS	6 WAS	7 WAS	8 WAS
RH+RS	6.36a	9.42c	16.39c	24.36d	27.06d	34.09c
SD+RS	6.82a	6.40a	5.93a	9.28a	8.88a	10.5a
CD+RS	8.96b	9.99c	15.33c	20.61c	24.30c	32.66c
CTRL	6.27a	8.64b	11.72b	13.62b	14.49b	16.15b
Mean	7.10	8.61	12.34	16.97	18.68	23.35
Std. D	1.33	1.46	4.35	6.23	7.74	10.81
Std. E	0.38	0.42	1.25	1.79	2.23	3.12

Mean separate by same letter are not significantly different at 5% level
Std. D= standard deviation
Std. E= standard Error
Was= week after sowing
RH= Rice Hulls
SD= Saw Dust
CD= Cow Dung
CTRL= Control.

Number of Leaves

At week 3, the treatment shows no significant difference (0.537) for the plant parameter in view. But there is very high significant difference (0.00) at week 4 to week 8. However
The maximum number of leaves is (13.90cm) observed in treatment combination of RH+RS and the minimum number of leaves is (6.60cm) observed in combination of SD+RS

Table 4: Effect of Treatments on Number of Leaves

Treatments	3 WAS	4 WAS	5 WAS	6 WAS	7 WAS	8 WAS
RH+RS	4.06a	6.60c	9.53c	11.80c	11.80c	12.90c
SD+RS	3.86a	4.16a	4.46a	5.26a	5.00a	5.96a
CD+RS	4.60a	5.80b	8.46b	11.80c	11.93c	12.33c
CTRL	4.06a	5.66b	7.80b	8.00b	7.73b	8.20b
Mean	4.15	5.55	7.56	9.21	9.11	9.85
Std. D	0.59	0.97	2.01	2.94	3.11	3.08
Std. E	0.17	0.28	0.58	0.85	0.89	0.88

Mean separate by same letter are not significantly different at 5% level
Std. D= standard deviation
Std. E= standard Error
Was= week after sowing
RH= Rice Hulls
SD= Saw Dust
CD= Cow Dung
CTRL= Control

Plant Diameter

In terms of plant diameters there is no significant difference at 3rd, 7th, and 8th weeks after emergence. However high significant difference was observed at 5 and 6 weeks after emergence with combination of CD+RS having the maximum of (3.50cm and 3.99cm), and combination RH+RS with maximum number of (3.49cm and 4.00cm), Also there is slightly significant difference at 4 weeks after emergence with treatment combination of CD+RS having the maximum number of plant diameter of (3.00cm) and RH+RS (2.98). Combinations of SD+RS have the minimum number of plant diameter of (2.15cm).

Table 5: Effect of Treatment on Plant Diameter

Treatment	3 WAS	4 WAS	5 WAS	6 WAS	7 WAS	8 WAS
RH+RS	2.11ab	2.80b	3.40c	3.90c	3.98a	4.93b
SD+RS	1.85a	2.07a	2.57a	3.10a	3.63a	4.13a
CD+RS	2.42b	2.79b	3.29c	3.79c	4.42a	4.96b
CTRL	2.03ab	2.44b	2.94b	3.48b	3.98	4.61b
Mean	2.10	2.52	3.05	3.57	4.00	4.66
Std. D	0.28	0.35	0.37	0.35	0.48	0.40
Std. E	0.08	0.10	0.10	0.10	0.13	0.11

Mean separate by same letter (s) are not significantly different at 5% level
Std. D= standard deviation
Std. E= standard Error
Was= week after sowing

RH= Rice Hulls
SD= Saw Dust
CD= Cow Dung
CTRL= Control

V. Discussion

From the result of the analysis, the different media used in this study had significant impact on some of the selected parameters of growth and seedling performance. River Sand + Sawdust (RS) mixture have been found to be the best medium. In terms of Germination parameters, it was the first to emerge and gave 50% germination earlier than the rest of the media. This agrees with the finding of (Peter-Onah et al., 2014).

River Sand + Rice Hulls (RH) also gave the highest values in terms of plant height and number of leaves, which were significantly higher than the rest of the media. Followed by River Sand + Cow Dung (RC). These soil mixtures have been found to influence seedling production due to suitable biological properties which seemed to be the appropriate growth medium for the nursery of tree plant. Agbo, 2006 stated that Rice Hulls and Top Soil performed the same way in contrast to this research. This is in line with the research of (Bachman and Metzger., 2008) which stated that Rice Hulls and Cow Dung manure have bioactive principles considered to be beneficial for root growth, root initiation, germination and growth of the plant and balanced nutrients.

Furthermore, as far the data collected on plant diameter the differences due to media were not significant from 3rd, 7th, and 8th weeks after emergence. However high significant difference was observed at 5 and 6 weeks after emergence with combination of CD + RS, therefore, the role of the media tested seems to be unimportant in this regard.

The performance of Rice Hulls + River Sand and River Sand + Cow Dung medium in terms of Germination percentage, plant height and number of leaves signifies its superiority over the rest of the media used because, the high the rate of growth development and number of leaves, the more the profit to farmers.

VI. Conclusion

In conclusion, the results obtained showed that growth media had a beneficial effect on seed germination and seedling growth of papaya. River sand + Rice hulls (RH) and River sand + Cow dung (RC) due to suitable biological properties seemed to be the appropriate growth medium for the nursery of tree plants. Agbo, 2006 stated that rice hulls and top soil performed the same way was in contrast to this research. During the research, it was noticed that rice hulls had micro-organisms more than other media which help to break down litter and release nutrients. Rice hulls had organic matter and improve the structure of the soil. Rice hulls and cow dung manure is reported to have bioactive principles considered to be beneficial for root growth, root initiation, germination and growth of the plant and a balanced nutrients (Bachman and Metzger., 2008). Rice Hulls and Cow dung mixed with River Sand affects physical, chemical and biological properties of the soil, this could be due to the fact that Rice Hulls and Cow dung have high organic matter which increases water and nutrients holding capacity of the medium for supply to the plant. It is concluded that growing media significantly influenced the germination, growth and development parameters of pawpaw seedlings. Therefore, this study showed that the treatment combination of River sand + Rice hulls (RH) and River sand + cow dung (RC) facilitates seedling vigor which determines field establishment.

VII. Recommendation

Based on the findings of this research, River sand + Rice hulls (RH) and River sand + Cow dung (RC) are the best recommended growth medium for seedling establishment of tree plants. The sawdust was found to favour the early germination of seeds, but lacks sufficient nutrients for continuous growth and development. So it will be advisable that after seedling has emerged, addition of Cow Dung or Rice Hulls will promote further establishment of papaya plant. However there is need to conduct more researches on growth media so as to evaluate the overall best medium for seedling growth and development of tree plants.

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