

Research Paper

Coco Coir Fiber Media as a Growth Performance of Chilli Pepper Seedlings (*Capsicum annum*)

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Many growth media have been introduced into agriculture such as saw dust, coco peat, tissue culture etc. in order to improve crop production and crop breeding. Coco coir is not an exception and is not new to agriculture but has not yet been fully explored in this tropical part of the world. Consequently, the aim of this study was to compare the growth performance of two varieties of chili pepper seedlings in three different used media which were coir, soil and coir + soil (1:1). The objective of the study was to sow the seeds under nursery conditions to determine how they would support pepper growth. Seedlings height, leaf length and leaf width were measured and compared based on the performance in different growth media. The study was carried out at the Crop Production and Horticulture Nursery of Federal University of Technology, Minna, Niger State. Data were collected from 2 WAS to 6 WAS (transplanting stage). The growth media analysis was done

in the Soil Science and Land Management Laboratory of Federal University of Technology, Minna, Niger State and the data were analyzed using the Statistical Analysis System (SAS). The means were separated using the Least Significant Difference (LSD) at 5% level of significance. The results showed significant ($p < 0.05$) differences in the seedlings growth with soil media being the best growth media, followed by the combination of coir and soil and the last was coir. Based on the findings, it is recommended that further research work should be carried out on coir as a growth media and possible nutrient supplements either organic or inorganic should be applied. Also, other vegetables should be grown in coir to check their growth performances.

Keywords: Coco coir fiber, Chili peppers, Growth media

INTRODUCTION

Coco coir fiber is naturally extracted from the husk of coconut and used in products such as floor mats, door mats, brushes and mattresses. Coir is the fibrous material found between the hard, internal shell and the outer coat of a coconut. Brown coir (made from ripe coconut) is used in upholstery padding, sacking and horticulture; white coir (from unripe coconut) is used for

making finer brushes, string rope and fishing nets. Ropes made by Subhajit and cord-age made from coconut fiber have been in use from ancient times. Arab writers of the 11th century AD referred to the extensive use of coir for ship ropes and rigging. A coir industry in the UK was recorded before the 2nd half of the 19th century. Because coir pith is high in Na and K, it is treated before

use as a growth media for plants or fungi by soaking in a Ca buffering solution; most coir sold for growing purposes is said to be pre-treated. Coir does provide a suitable substrate for horticultural use as a soilless potting media. The material's high lignin content is longer-lasting, holds more water, and does not shrink off the sides of the pot when dry allowing for easier rewetting. Peppers belong to the genus *Capsicum* and member of the nightshade family Solanaceae (Greenleaf, 1986; Ortiz et. al., 2010). This genus also called chilli pepper (Joshi, 2012) originated from Central and South America (Grubben and El-Tahir, 2004). There are about 30 species in the genus *Capsicum* and several species have been domesticated to produce many cultivated types which range from mild to hot (Bosland and Votavas, 2000). Peppers are commonly divided into three groups; bell peppers, sweet peppers and hot pepper (Grubben and El-Tahir, 2004). Most popular pepper varieties are seen as belonging to one of these categories or as a cross between them (Pabon-Mora and Litt, 2011). Pepper seeds are notorious for taking their time to germinate, or germinating at different times. To get the most out of the pepper plant, the right growing temperatures and moisture content are very important considerations. One of the most common problems people have while growing pepper is over-watering. Pepper plant needs a lot less water, over watering can inhibit germination, stunt growth, washes away nutrients and invites insect pests and diseases. Pepper (*Capsicum annuum*) is a warm weathered crop, taking a period of 7-14 days for germination under normal growing conditions but can also experience dormancy and slow growth. Coir has been known to provide suitable conditions for seedling production due to its good water-holding capacity, and good aeration. Farmers will benefit from this practice as coco coir has proven best alternative to any growing medium. Its use as a growing medium outperforms any other medium used for growing vegetables, ornamentals and tree plants. Its high water-holding capacity, excellent drainage and air porosity, high potassium content (which is an essential major nutrient for plant growth) and many other qualities have made coir a sustainable seed-starting medium. Its soft structure promotes easy root penetration and healthy growth. Coco coir has the best physical and chemical properties to promote better plant growth. Therefore, with the use of coir for raising pepper seedlings, seed dormancy can be reduced, germination period shortened, and seedling emergence improved. The aim of this study was to check the performance and rate of pepper seedlings in different growth media. The objective of this study was to measure growth parameters such as plant height, leaf length and leaf width of the seedlings.

MATERIALS AND METHODS

The research was carried out at the Crop Production and

Horticultural Nursery (Latitude 09° 31' 49.8' N; Longitude 06° 26' 59.29' E) of the Federal University of Technology, Minna, Niger State. Minna falls under the southern guinea savannah agro-ecological zone of Nigeria and its climate is sub-humid with rainfall of 1,284 mm and a district dry season of about 5 months occurring from November to March. Two varieties of chilli pepper, "shombo" and "atarodo" were obtained from the market and the seeds were extracted and dried under shade for three days. Five seeds of each variety were sown in each poly-pot. Three growth media were used namely: coir, soil and coir + soil (1:1). Each pepper variety was replicated twice with four poly-pots in each replicate. Poly-pots of size 15 × 20 cm were filled with different growth media (M1 = Coir (2 Kg), M2 = Soil (2 kg) and M3 = Coir + Soil (1Kg coir and 1Kg soil)). The nursery pots were mulched using a sack laid on a wooden framework of size 1 × 3 m to protect the seedlings from direct sun effect and rainfall. Well water was used for watering using a measuring cylinder of 150 ml per pot, thrice a week (evening only) until seedlings were ready for transplanting. Samples of coir, soil and coir + soil (1:1), were taken to the Soil Science and Land Management Laboratory of the Federal University of Technology, Minna, Niger State for analysis. The following analyses were carried out: total N, P, K, OC, pH (using water), Na, particle size and Mg. Plant height was done by measuring the height of one plant in each pot from the base of the plant to the tip of the highest leaf at 2 weeks after sowing (WAS). All the measurements in each pot were summed up and divided by 4 and the mean plant height was determined and recorded. The length of each leaf was measured from the leaf petiole to the tip of the leaf (using a measuring tape). All measurements were done in centimetres, summed up and the mean was determined and recorded. The width of each leaf was measured across the widest leaf base (using a measuring tape). All measurements were taken in centimetres, summed up and the mean was determined and recorded. All data collected subjected to analysis of variance (ANOVA) using a SAS statistical package. The means were separated by the Least Significant Difference (LSD) at 5% Level of probability.

RESULTS AND DISCUSSION

Results of the plant height, leaf length and leaf width, respectively were presented in (Tables 1 – 3) which show the effects of different growth media on pepper seedlings (2-6 weeks after sowing). Table 1 shows that there was no significant ($p>0.05$) difference in the plant height of the two pepper varieties (shombo and atarodo). Both varieties did best in the soil media followed by the coir and soil combination and then the coir medium. Also, it was observed that at 2 weeks after sowing there was no significant ($p>0.05$) differences among the seedlings

Table 1. Effect of growth media on plant height of pepper seedlings (*Capsicum annuum*) 2-6 WAS.

Treatment	Plant height (cm)				
Variety (V)	2 wks	3 wks	4 wks	5 wks	6 wks
Shombo	3.55 ^a	2.86 ^a	3.32 ^a	2.36 ^a	0.80 ^a
Atarodo	3.27 ^a	2.13 ^a	2.43 ^a	3.03 ^a	3.07 ^a
SE ±	0.47	0.89	0.96	1.66	1.60
LSD Media (M)	NS	NS	NS	NS	NS
1	2.91 ^a	0.03 ^b	2.84 ^a	0.90 ^a	0.00 ^b
2	3.60 ^a	5.80 ^a	3.31 ^a	4.44 ^a	5.80 ^a
3	3.71 ^a	0.00 ^b	2.48 ^b	2.74 ^a	0.00 ^b
SE ±	0.54	1.11	1.21	1.32	0.74
LSD	NS	3.40	NS	NS	3.37
Interaction (V × M)	NS	*	*	NS	NS

Table 2. Effects of growth media on leaf length of pepper seedlings (*Capsicum annuum*) 2-6WAS .

Treatment	Leaf length (cm)				
Variety (V)	2 wks	3 wks	4 wks	5 wks	6 wks
Shombo	0.78 ^b	0.49 ^a	0.59 ^a	0.40 ^a	0.23 ^a
Atarodo	0.91 ^a	0.42 ^a	0.61 ^a	0.63 ^a	0.81 ^a
SE ±	0.09	0.17	0.19	0.23	0.33
LSD Media (M)	0.08	NS	NS	NS	NS
1	0.93 ^a	0.53 ^{ab}	0.53 ^b	0.14 ^b	0.00 ^b
2	1.01 ^a	0.65 ^a	0.96 ^a	1.03 ^a	1.56 ^a
3	0.59 ^b	0.19 ^b	0.31 ^b	0.39 ^b	0.00 ^b
SE ±	0.39	0.19	0.21	0.24	0.20
LSD	0.08	0.35	0.34	0.73	0.92
Interaction (V × M)	NS	*	**	NS	NS

Table 3. Effect of growing media on leaf width of pepper seedlings (*Capsicum annuum*) 2-6WAS.

Treatment	Leaf width (cm)				
Variety (V)	2 wks	3 wks	4 wks	5 wks	6 wks
Shombo	0.55 ^a	0.44 ^a	0.44 ^a	0.24 ^a	0.08 ^a
Atarodo	0.43 ^b	0.26 ^a	0.28 ^a	0.31 ^a	0.23 ^a
SE ±	0.02	0.10	0.11	0.11	0.14
LSD	0.04	NS	NS	NS	NS
Media (M)					
1	0.45 ^b	0.41 ^a	0.40 ^a	0.10 ^a	0.00 ^a
2	0.49 ^{ab}	0.31 ^a	0.36 ^a	0.39 ^a	0.46 ^a
3	0.53 ^a	0.33 ^a	0.33 ^a	0.34	0.00 ^b
SE ±	0.03	0.13	0.14	0.13	0.06
LSD	0.05	NS	NS	NS	0.29
Interaction (V × M)	NS	*	*	NS	NS

grown in all media, but at 3 and 4 weeks after sowing, there was a higher growth rate of soil seedlings

compared to the seedlings in the other two media. At 5 and 6 weeks after sowing, there was no sign of growth in

the seedlings planted in the coir media and the coir + soil media, but there was a good steady growth in the seedlings planted in soil. This could be as a result of the rapid leaching out of nutrients in the coir media and the high N level in the soil. The leaf lengths of “shombo” and “atarodo” varieties showed significant ($p < 0.05$) difference at 2 weeks after sowing, but no significant ($p > 0.05$) difference was recorded from 3-6 weeks after sowing. Wilting was observed at 5 and 6 weeks after sowing on seedlings sown in the coir and coir + soil media showing a reduction in the leaf lengths of the seedlings, but the seedlings in coir were sustained up to transplanting stage. The Table shows a significant ($p < 0.05$) difference at 2 weeks after sowing and highly significant difference at 4 weeks after sowing. There was no significant ($p > 0.05$) difference at 5–6 weeks after sowing. Table 3 shows the significant ($p < 0.05$) difference in seedlings leaf width of the pepper varieties at 3 and 4 weeks after sowing. It was observed that both varieties did best in the coir media at 2-4 weeks after sowing but there was no increase in the leaf width at 5-6 weeks after sowing. Performance was good in soil and then in coir + soil media, but soil did best to the end of the seedling stage. This is close to the findings of Pabon-Mora and Litt (2011).

developmental analysis of dry and fleshy fruits of Solanaceae, *American Journal of Botany*, 98(9):1415–1436.

Conclusion

The combination of coir and soil as a growing media did better than just pure coir. Soil on the other hand was the best growing media amongst the three growing media, it sustained the seedlings up to the transplanting stage even when no nutrient supplement either inorganic fertilizer or organic manure was added, its only challenge was that it clods easily.

Recommendations

The recommendations could be drawn from the current study that nutrients should be supplemented either organic or inorganic to coir and other types of vegetables should be grown in coir to check its effect and their performances.

REFERENCES

- Bosland PW, Votava (2000). Peppers; vegetable and spice capsicums. CABI Publishing, Wallingford, United kingdom. p. 204.
- Greenleaf WH (1986). Breeding vegetable crops, Chapter 3. Pepper breeding. Basset MJ (ed.). The AVI Publishing Company Inc. Westport, Connecticut. Pp. 67-134.
- Grubben GJH, El Tahir IM (2004). *Capsicum annum* L. In: Grubben GJH, Denton OA (Eds.). PROTA 2: Vegetables/Legumes. [CD-Rom]. PROTA, Wageningen, The Netherlands.
- Ortiz R, De La Flor FD, Alvarado G, Crossa J (2010). Classifying vegetable genetic resources. A case study with domesticated *Capsicum* spp. *Scientia Horticulturae* 126:186-191.
- Pabon-Mora N, Litt A (2011). Comparative anatomical and

Appendix

Table 4. Physical and chemical properties of growth media.

Parameters	Coir	Soil	Coir + Soil
Sand (g kg ⁻¹)	-	735	-
Silt (g kg ⁻¹)	-	75	-
Clay (g kg ⁻¹)	-	190	-
pH :2:5 (H ₂ O)	7.68	7.79	7.62
O C (g kg ⁻¹)	221.88	9.69	37.50
Total N (g kg ⁻¹)	13.72	13.86	5.46
Available P (mg kg ⁻¹)	3891	23	3584
K (cmol kg ⁻¹)	5.13	0.62	2.05
Mg (cmol kg ⁻¹)	144.00	15.20	152.00
Ca (cmol kg ⁻¹)	148.00	6.00	164.00

**Figure 1.** Experimental layout of study.



Figure 2. A - Coir treatment B - Soil C - Coir + Soil



Figure 3. Effect of growth media (Coir + Soil) on plant height of pepper seedlings (*Capsicum annuum*) 6WAS [A -. Shombo, B – Atarodo].