Plant Archives Vol. 18, Special Issue (ICAAAS-2018), 2018 pp. 19-26 *ISSN 0972-5210*

EFFECT OF GROWING MEDIA ON SEED GERMINATION AND SEEDLING GROWTH OF MARKING NUT (*SEMECARPUS ANACARDIUM*)

S. Sajana, G. R. Munde and A. H. Shirsath

Department of Horticulture, College of Agriculture (V.N. Marathwada Krishi Vidyapeeth), Latur (Maharashtra), India.

Abstract

This study was carried out to explore the effect of growing media on seed germination and seedling growth of marking nut (*Semecarpus anacardium*). The research was conducted at the shade house nursery condition at Department of Horticulture, College of Agriculture, Latur during the year 2015-16. This research was arranged in a complete randomized design with nine treatment combinations and three replications. The treatments were combination between types of media with level of cocopeat. Each treatment had 60 polybags. The results showed that the medium of vermicompost +sand+ pond soil (1:1:1) with 2 cm cocopeat in top of the polybags gave maximum germination percentage (73.50), early germination (22.06 days) and highest germination vigour (0.58). The medium was also found to be the best medium for the growth of marking nut seedlings as it gave the highest parameters in terms of seedling height(18.72cm) ,number of leaves(13.03) , stem girth(1.40cm) , leaf area (22.28cm^2), number of primary roots (30.50), number of primary roots(55.60) , length of tap root(24.05cm) ,fresh weight of seedling (36.48g), dry weight of seedling(15.20g), fresh weight of roots (31.34 g) , fresh weight of shoot(9.60 g) ,dry weight of root (6.96 g), dry weight of shoot (2.86 g), shoot:root ratio on fresh and dry weight basis (0.31 and 0.41), respectively. This treatment also significantly reduces the seedling mortality (8.33%) and produces maximum healthy seedlings (91.67%).

Key words : Marking nut, growing media, seed germination, seedling growth.

Introduction

Use of suitable growing media or substrate is essential for production of quality planting material. It directly affects the development and later maintenance of the exclusive functional rooting system. A good growing medium would provides sufficient anchorage or support to the plant, serves as reservoir for nutrients and water, allow oxygen diffusion to the roots and permit gaseous exchange between the roots and atmosphere outside the root substrate (Abad *et al*., 2002). Nursery potting media influence quality of seedlings produced (Agbo and Omaliko, 2006). The quality of seedling obtained from a nursery influences re-establishment in the field and the eventual productivity of an orchard (Baiyeri, 2006). Marking nut (*Semecarpus anacardium* L.) is one of the important dry land fruit crops belonging to anacardiaceous family. The marking nut orchards are not established on commercial basis. There are no regular orchards of these trees, however trees are found in forest on large scale. It is propagated by seeds and the seed germination is not uniform, making sexual propagation difficult. Seeds have poor viability and it should be sown immediately after harvest. The initial growth of seedling is very slow and it takes 180-240 days to attain the stage of planting.Growing media plays an important role for seed germination. It not only acts as a growing place but also as a source of nutrient for plant growth. Media composition used influences the quality of seedling (Wilson *et al.,* 2001). Generally, media for fruit crop seedling are composed of soil, organic matter and sand. The soil is usually used as basic medium because it is the cheapest and easy to procure. Supplementing of sand is aimed to make media more porous while the organic matter is added so as to enrich adequate nutrients for the seedling. There is better relationship between the manure and rooting rather than conventional soil mix and less susceptibility of the seedling to soil borne pests and diseases (Akanbi *et a*., 2002). Several studies on growth media had been conducted on the various fruit commodities by previous researchers.

The best growth of mangosteen seedling was reached on soil medium as compared to the other media (Jawal *et al*., 1998). Baiyeri (2003) mentioned that the best seedling qualities of African breadfruit (*Treculia Africana* Decne) were obtained when grown in medium formulated with top soil+ poultry manure+ river sand in 1:2:3(v/v/v)ratios. Humic acids (vermicompost) applied in the medium increased plant height,leaf area and dry weight of peppers, tomatoes and marigold (Arancon *et al*., 2004). Ratna *et al*. (2006) working on banana *cv*. Raja Serai proved that soil and sand medium was the most suitable medium for shoot and leaf growth of this banana.

Cocopeat is an agricultural by-product obtained after the extraction of fiber from the coconut husk (Abad *et al*., 2002). As a growing medium, cocopeat can be used to produce a number of crop species with acceptable quality in the tropics (Yahya and Mohklas, 1999; Yau and Murphy, 2000). Cocopeat is considered as a good growing media component with acceptable pH, electrical conductivity and other chemical attributes (Abad *et al*., 2002). Cocopeat has good physical properties, high total pore space, high water content, low shrinkage, low bulk density and slow degradation (Evans *et al*., 1996; Prasad, 1997). The results of many experiments revealed that cocopeat used alone, or as a component of soil medium, is suitable for roses (Blom, 1999), gerbera (Labeke and Dambre, 1998) many potted plants (De Kreij and Leeuven, 2001; Novak, 2004) and also for vegetables. Due to usually high initial level of potassium and sodium in cocopeat, the fertilization program should be adjusted carefully to plant requirements.

Keeping in view the influence of media in germination and seedling growth of marking nut, the present investigation was carried out to study the effect of different media viz. sand, soil, FYM, vermicompost and cocopeat on seed germination, seedling growth and vigour of marking nut seedlings.

Materials and Methods

Seed material and treatment

Seed germination and seedling growth experiments of marking nut were carried out at shade net house of Department of Horticulture, College of Agriculture, Latur during the year 2015-16. Experimental treatments comprised of nine treatment combinations consisting of different combination of growth media and cocopeat filling at the top of seedling polybags namely, T_1 -Sand+ pond soil (1:1) without cocopeat, T_2 - Sand + pond soil (1:1) with 1 cm cocopeat, T_3 -Sand + pond soil (1:1) with 2 cm cocopeat, T_4 - FYM + sand + pond soil (1:1:1) without cocopeat, T_5 - FYM + sand + pond soil (1:1:1) with 1 cm cocopeat, T_6 - FYM + sand + pond soil (1:1:1) with 2 cm cocopeat, T_7 - Vermicompost + sand + pond soil(1:1:1) without cocopeat, T_8 –Vermicompost + sand + pond soil (1:1:1) with 1 cm cocopeat and T_9 –Vermicompost + sand + pond soil(1:1:1) with 2 cm cocopeat. The seed sowing was done in the month of July about 1 cm deep in different media as per treatments. The poly bags were irrigated immediately after seed sowing and repeated everyday till the final emergence. After the complete germination, the bags were irrigated once in 2 days.

Experimental design and measured parameters

For seed germination and seedling growth experiments, treatments of the experiment were conducted in complete randomized design with three replications. Each treatment was composed of 60 poly bags seedlings. All the observation on germination parameters were recorded at the time of germination from the 60 seeds sown. Data on germination was recorded from the first germination until no further germination at two days interval, seeds with protruding radicle and plumule were scored as germinated over the time period till the potential germination. The germination percentage was calculated as the percent of germinating seeds starting from the first germination to no further germination. Germination percentage was calculated by number of germinated seedling divided by the total number of seeds sown in poly bags and multiplied by 100. The days required for initiation of germination was calculated by computing the difference between the date of sowing and the date of first plumule emergence and expressed in terms of days. Germination vigour index was computed using the formula.

$$GVI = \frac{X_1}{d_1} + \frac{X_2}{d_2} + \frac{X_3}{d_3} + ... + \frac{X_n}{d_n}$$

Where, X_1, X_2, X_3 ..... X_n were the number of seeds germinated and d_1, d_2, d_3 .... d_n are the days taken for germination, respectively (Kumar *et al*., 2008).

The seedling growth parameters like plant height, stem girth, leaf area were recorded at 30 days interval from date of sowing to 180 days after sowing. The seedling biomass parameters like fresh weight of seedling, dry weight of seedling, number of primary roots, number of secondary roots, length of tap root, fresh weight of roots and shoot and dry weight of roots and shoot were recorded at 180 days after sowing by destructive method of uprooting the plants and taking readings by standard method. Survival percentage was recorded at 180 days after sowing by following formula.

$$\text{Survival percent} = \frac{\text{Total survival of germinated seedlings}}{\text{Total germinated seedlings}} \times 100$$

Ten seedlings per treatment were randomly selected for recording growth parameters. The data obtained in present investigation were statistically analyzed by the method suggested by Panse and Sukhatme (1989).

Results and Discussion

The results showed that growing media and cocopeat had beneficial effect on seed germination and growth of marking nut seedling.

Seed germination parameters

Seed germination of marking nut as affected by growing media and use of cocopeat are presented in table 1. The treatment T_9 was found to be best followed by T_8 with regard to germination behavior as these media have suitable physical properties and good water holding capacity that supports the germination of marking nut seeds (table 1). Coir dust when mixed with organic manure is the best media as coir dust has good physical (Garcia and Daverede, 1994) and also successfully tested as a growing medium in ornamentals. Germination started at 22.06 days after sowing on vermicompost medium with 2 cm cocopeat (T_9). Highest germination percent (73.50) and highest germination vigour index (0.58) were obtained in Vermicompost + sand + soil (1:1:1) with 2 cm filling with cocopeat of seedling polybags (T_9). The sand + soil (1:1) without cocopeat showed the least results in most cases. The vermicompost medium with 2 cm cocopeat allowed increased germination parameters from the beginning to the end of experiment as compared to other media combination. The reason for the best performance of soil and vermicompost are high organic matter content which increases the water and nutrient holding capacity of the medium, which improve the water utilization capacity of plant. Vermicompost is reported to have bioactive principles which are considered to be beneficial for root growth and this has been hypothesized to result in greater root initiation , higher germination , increased biomass, enhanced growth and development (Bachman and Metzger, 2008) and also balanced composition of nutrients (Zakkerm 2007). The higher available well decomposed organic matter (Vermicompost) may preserve soil humidity, increase nutrient content and improve soil structure which increase water absorption and maintains the cell turgidity, cell elongation and increase respiration at optimum level, leading to favourable seed sprouting. Vermicompost mixed with soil affects properties of soil physics, chemistry and biology, since organic matter acts as glue for soil aggregate and source of soil nutrient (Soepardi, 1983). Vermicompost granules may develop soil aggregate. Soil aggregation will improve permeability and airflow in the polybags. Vermicompost and soil (due to high organic matter) may decrease fluctuation of soil temperature. Further, seed germination and root growth becomes easier to the particular depth so that plant grows well and may absorb more water and nutrient. Organic matter may also improve nutrient availability and improve phosphorous absorption (Jarama and Manwan, 1999). All these factors are favourable for seed germination and ultimate by increasing seed germination percent, germination vigour index and minimizing the days taken for initiation of germination. Combined application of vermicompost and cocopeat in the treatment T_9showed significant effect on germination, seedling growth and plant biomass probably due to the synergistic combination of both factors in improving

Table 1 : Effect of different growing media on seed germination of marking nut.

Treatments	Days taken for germination	Germination (%)	Germination Vigour Index
Sand+ pond soil (1:1) without cocopeat	28.04	51.00	0.47
Sand+ pond soil (1:1) with 1 cm cocopeat	27.21	54.25	0.48
Sand+pond soil (1:1) with 2 cm cocopeat	26.88	58.76	0.50
FYM+ sand+ pond soil (1:1:1) without cocopeat	26.77	59.50	0.48
FYM+sand+pond soil (1:1:1) with 1 cm cocopeat	26.19	63.00	0.52
FYM+sand+pond soil (1:1:1) with 2 cm cocopeat	26.19	68.25	0.52
Vermicompost+sand+pond soil(1:1:1) without cocopeat	23.83	70.00	0.50
Vermicompost+sand+pond soil(1:1:1) with 1 cm cocopeat	22.25	72.50	0.54
Vermicompost+ sand+ pond soil(1:1:1) with 2 cm cocopeat	22.06	73.50	0.58
Mean	**25.49**	**63.41**	**0.51**
SEm	**0.56**	**1.02**	**0.12**
CD @ 0.05%	**1.65**	**2.86**	**0.34**

Table 2 : Effect of different growing media on plant height (cm) of marking nut.

Treatments	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS
Sand+pond soil (1:1) without cocopeat	6.20	8.25	9.50	12.10	13.60	13.68
Sand+pond soil (1:1) with 1 cm cocopeat	6.95	9.00	10.25	12.85	14.35	14.44
Sand+pond soil (1:1) with 2 cm cocopeat	7.50	9.55	10.80	13.40	14.90	15.02
FYM+sand+pond soil (1:1:1) without cocopeat	8.15	10.20	11.45	14.05	15.55	15.64
FYM+sand+pond soil (1:1:1) with 1 cm cocopeat	8.75	10.80	12.05	14.65	16.15	16.23
FYM+sand+pond soil (1:1:1) with 2 cm cocopeat	9.36	11.41	12.66	15.26	16.76	16.82
Vermicompost+sand+pond soil(1:1:1) without cocopeat	10.85	12.90	14.15	16.75	18.25	18.34
Vermicompost+sand+pond soil(1:1:1) with 1 cm cocopeat	11.02	13.07	14.32	16.92	18.42	18.52
Vermicompost+sand+pond soil(1:1:1) with 2 cm cocopeat	11.20	13.25	14.50	17.10	18.60	18.72
Mean	**8.88**	**10.93**	**12.18**	**14.78**	**16.28**	**16.37**
SEm	**0.31**	**0.68**	**0.88**	**1.00**	**1.22**	**1.38**
CD @ 0.05%	**0.85**	**0.165**	**2.52**	**2.87**	**2.85**	**3.24**

Table 3 : Effect of different growing media on leaf area (cm^2) of marking nut.

Treatments	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS
Sand+pond soil (1:1) without cocopeat	6.80	9.00	11.30	14.02	16.47	18.62
Sand+pond soil (1:1) with 1 cm cocopeat	7.25	9.45	11.75	14.47	16.92	19.07
Sand+pond soil (1:1) with 2 cm cocopeat	7.65	9.85	12.15	14.87	17.32	19.47
FYM+sand+pond soil (1:1:1) without cocopeat	7.95	10.15	12.45	15.17	17.62	19.77
FYM+sand+pond soil (1:1:1) with 1 cm cocopeat	8.20	10.40	12.70	15.42	17.87	20.02
FYM+sand+pond soil (1:1:1) with 2 cm cocopeat	8.55	10.70	13.20	16.00	18.60	20.85
Vermicompost+sand+pond soil(1:1:1) without cocopeat	9.70	11.85	14.35	17.15	19.75	22.00
Vermicompost+sand+pond soil(1:1:1) with 1 cm cocopeat	9.85	12.01	14.56	17.31	19.93	22.16
Vermicompost+sand+pond soil(1:1:1) with 2 cm cocopeat	9.98	12.13	14.63	17.43	20.03	22.28
Mean	**8.43**	**10.61**	**13.01**	**15.76**	**18.27**	**20.47**
SEm	**0.13**	**0.16**	**1.21**	**1.45**	**1.95**	**2.21**
CD @ 0.05%	**0..35**	**0.42**	**2.80**	**3.12**	**4.52**	**5.22**

physical condition of the media and nutritional factors (Sahni *et al*., 2008).

Seedling growth and development parameters

Growth and development of marking nut seedling wassignificantly affected by growing media and cocopeat. Significant differences were observed among the different treatments with regard to seedling growth was observed in T_9 treatment.

The plant height gradually increased from 30 days after sowing up to 150 days and followed consistence height at 180 days after sowing (table 2). It was consistently higher inVermicompost + sand + soil (1:1:1) with 2 cm filling with cocopeat of seedling polybags (T_9) from 30, 60, 90, 120, 150 and 180 days after sowing (11.20, 13.25, 14.50 17.10, 18.65 and 18.72 cm) followed by treatment T_8(11.02, 13.07, 14.32 16.92, 18.42 and 18.52 cm) where cocopeat was not used. Whereas, the lowest plant height was recorded in sand + soil (1:1) without cocopeat (6.20, 8.25, 9.50, 12.10, 13.60 and 13.68 cm) respectively at all the stages of seedling growth.

Leaf area exhibited significant differences due to different growing media used for growing marking nut seedlings (table 3). The maximum leaf area was recorded in treatment $T_9$from 30, 60, 90, 120, 150 and 180 days after sowing (9.98, 12.13, 14.63, 17.43, 20.03 and 22.28 cm^2) followed by T_8(9.85, 12.01, 14.56, 17.31, 19.93 and 22.16 cm^2).Whereas, minimum leaf area was recorded in treatment T_1 (6.80, 9.00, 11.30, 14.02, 16.47 and 18.62 cm^2), respectively.

The influence of different growing media significantly increased the fresh weight of the seedling and is presented (table 4). The maximum fresh weight of seedling (36.48 g) was recorded in treatment (T_9) followed by treatment T_8 (35.20 g). Minimum fresh weight of seedlings (22.55 g) was recorded in treatment T_1.

The dry weight of seedling was significantly

Table 4 : Effect of different growing media on seedling characters of marking nut.

Treatments	Fresh weight of seedlings (g)	Dry weight of seedlings (g)	Per cent survival of seedlings	Mortality (%)
Sand+pond soil (1:1) without cocopeat	22.55	7.80	63.33 (65.52)	36.67 (38.25)
Sand+pond soil (1:1) with 1 cm cocopeat	24.63	8.48	65.00 (66.33)	35.00 (36.30)
Sand+pond soil (1:1) with 2 cm cocopeat	27.12	9.65	66.67 (66.66)	33.33 (33.33)
FYM+sand+pond soil (1:1:1) without cocopeat	28.45	10.02	68.33 (72.55)	31.67 (33.15)
FYM+sand+pond soil (1:1:1) with 1 cm cocopeat	29.65	10.38	70.00 (71.68)	30.00 (31.25)
FYM+sand+pond soil (1:1:1) with 2 cm cocopeat	30.05	10.75	71.67 (71.66)	28.33 (30.00)
Vermicompost+sand+pond soil(1:1:1) without cocopeat	34.35	13.28	83.33 (85.65)	16.67 (24.35)
Vermicompost+sand+pond soil(1:1:1) with 1 cm cocopeat	35.20	14.45	88.33 (92.45)	11.67 (7.92)
Vermicompost+sand+pond soil(1:1:1) with 2 cm cocopeat	36.48	15.20	91.67 (93.15)	8.33 (8.65)
Mean	**29.83**	**11.11**	**74.25**	**25.74**
SEm	**0.87**	**0.42**	**1.48**	**0.21**
CD @ 0.05%	**2.57**	**1.20**	**4.38**	**0.60**

Table 5 : Effect of different growing media on root characters of marking nut.

Treatments	Number of primary roots/ plant	Number of secondary roots/ plant	Length of tap root (cm)
Sand+pond soil (1:1) without cocopeat	18.45	21.62	13.65
Sand+pond soil (1:1) with 1 cm cocopeat	19.80	24.30	14.50
Sand+pond soil (1:1) with 2 cm cocopeat	20.65	26.85	15.35
FYM+sand+pond soil (1:1:1) without cocopeat	21.35	30.75	15.90
FYM+sand+pond soil (1:1:1) with 1 cm cocopeat	22.30	34.62	16.35
FYM+sand+pond soil (1:1:1) with 2 cm cocopeat	23.16	38.28	16.80
Vermicompost+sand+pond soil(1:1:1) without cocopeat	28.25	49.50	22.30
Vermicompost+sand+pond soil(1:1:1) with 1 cm cocopeat	29.10	53.30	23.20
Vermicompost+sand+pond soil(1:1:1) with 2 cm cocopeat	30.50	55.60	24.05
Mean	**23.72**	**37.20**	**18.01**
SEm	**0.10**	**0.15**	**0.37**
CD @ 0.05%	**0.30**	**0.44**	**1.08**

influenced by different growing media (table 4). The maximum dry weight of seedling (15.20 g) was recorded in treatment (T_9) followed by treatment T_8 (14.45 g). While, minimum fresh weight of seedlings (7.80 g) was recorded in T_1.

Perusal data on number of primary and secondary roots varied significantly due to different growing media used for growing marking nut seedlings (table 5). The maximum number of primary and secondary roots (30.50 and 55.60) recorded in treatment T_9 followed T_8 (29.10 and 53.30), respectively. The minimum numbers of primary and secondary roots (18.45 and 21.62) were recorded in treatment T_1.

Significant differences were observed for length of tap root among all the treatments due to different growing media combinations (table 5). The maximum length of tap root (24.05 cm) was recorded in treatment T_9 followed by T_8 (23.20 cm). The minimum was length of tap root registered in T_1(13.65 cm).

The significant variation in fresh weight of shoot and roots were noticed due to different combinations of growing media (table 6). The maximum fresh weight of shoot and roots (9.60 and 31.34 g) were recorded in treatment T_9.

The significant variation in dry weight of shoot and roots were noticed due to different growing media used (table 7). The maximum dry weight of shoot and roots (2.86 and 6.96 g) were recorded in treatment T_9.

Significant difference was noticed among the treatments for shoot to root ratio (both fresh and dry weight basis) due to different growing media (tables 6 and 7). The treatment T_9 has recorded the maximum

Table 6 : Effect of different growing media on fresh weight of root and shoot of marking nut.

Treatments	Fresh wt. of roots (g)	Fresh wt. of shoot (g)	Shoot: root ratio (fresh wt. basis)
Sand+pond soil (1:1) without cocopeat	23.49	4.25	0.18
Sand+pond soil (1:1) with 1 cm cocopeat	24.29	5.10	0.21
Sand+pond soil (1:1) with 2 cm cocopeat	24.84	5.55	0.22
FYM+sand+pond soil (1:1:1) without cocopeat	26.59	7.10	0.26
FYM+sand+pond soil (1:1:1) with 1 cm cocopeat	27.04	7.45	0.27
FYM+sand+pond soil (1:1:1) with 2 cm cocopeat	27.74	7.80	0.28
Vermicompost+sand+pond soil(1:1:1) without cocopeat	29.79	8.60	0.29
Vermicompost+sand+pond soil(1:1:1) with 1 cm cocopeat	30.49	9.15	0.30
Vermicompost+sand+pond soil(1:1:1) with 2 cm cocopeat	31.34	9.60	0.31
Mean	**27.29**	**7.17**	**0.25**
SEm	**2.14**	**0.13**	**0.06**
CD @ 0.05%	**6.15**	**0.37**	**0.18**

Table 7 : Effect of different growing media on dry weight of root and shoot of marking nut.

Treatments	Dry wt. of shoot (g)	Dry wt. of root (g)	Shoot :root ratio (dry wt. basis)
Sand+pond soil (1:1) without cocopeat	0.85	3.35	0.25
Sand+pond soil (1:1) with 1 cm cocopeat	1.02	3.64	0.28
Sand+pond soil (1:1) with 2 cm cocopeat	1.15	3.92	0.29
FYM+sand+pond soil (1:1:1) without cocopeat	1.78	5.50	0.32
FYM+sand+pond soil (1:1:1) with 1 cm cocopeat	1.90	5.98	0.31
FYM+sand+pond soil (1:1:1) with 2 cm cocopeat	2.05	6.36	0.32
Vermicompost+sand+pond soil(1:1:1) without cocopeat	2.38	6.75	0.35
Vermicompost+sand+pond soil(1:1:1) with 1 cm cocopeat	2.54	6.82	0.37
Vermicompost+sand+pond soil(1:1:1) with 2 cm cocopeat	2.86	6.96	0.41
Mean	**1.83**	**5.47**	**0.32**
SEm	**1.12**	**0.66**	**0.06**
CD @ 0.05%	**3.10**	**1.85**	**0.17**

shoot to root ratio (0.31and 0.41) on fresh weight and dry weight basis, respectively.

Manure (Vermicompost) provides adequate nutrients and enhances both the physical properties and the water holding capacity (Soegiman, 1982). Similar result was reported by Supriyanto *et al*. (1990) working on orange seedling where media containing saw dust and rice hulk. (Purbiati *et al*., 1994) proved that soil + manure (1:1) was the best medium for the growth components of salacca *cv*. Pondoh and Bali. Combined application of vermicompost and cocopeat in the treatment T_9 showed significant effect on seedling growth parameters and plant biomass probably due to the synergistic combination of both factors in improving the physical conditions of the media and nutritional factors (Sahni *et al*., 2008). This result is akin to the findings of Abirami *et al*. (2010), who suggested that since coir dust is low in nutrients when mixed with vermicompost, provides a better growth medium for plant establishment. However, the air filled porosity (AFP), easily available water (EAW) and aeration of vermicompost and FYM were not at the recommended level which in turn limit the root growth and lowered the water holding capacity. Therefore, the medium with vermicompost and cocopeat is more suitable than vermicompost alone because of the better physical properties and enhanced nutrient level.

This treatment combination produced highest survival percent of seedling (91.67). Vermicompost with cocopeat may improve soil porosity, water content, pore of drainage, soil permeability and water availability, whereas weight of soil may decrease. This may develop soil aggregation , and moreover it improves permeability and air flow in the soil, this type of condition provide support to fast growth of the seedling due to availability of better nutrition

with water and air in root zone. It seems that good physical and biological conditions in cocopeat and vermicompost had positive effect on root development, which is helpful in increased survival percent of seedling at 180 days after sowing. Beneficial effect of cocopeat on rootsystem was observed on nutmeg seedling by Agbo and Omaliko, 2006), viola by Pickering (1997) and impatiens by Smith (1995).

Conculsion

In conclusion, presented results showed that vermicompost and cocopeat, due to suitable physical, chemical and biological properties could be used successfully in preparation of marking nut seedling. On the basis of results obtained from this study, it is concluded that growing media significantly influenced the germination, growth and development parameters of marking nut seedling in which medium of vermicompost + soil + sand (1:1:1) with 2 cm cocopeat filling of poly bags was the best media since the germination,seedling growth and development parameters were higher than those on the other media. The overall results revealed that media supplemented with cocopeat gave higher parameters of germination, growth and development of marking nut seedling as compared to media without cocopeat. Therefore, this result suggested that vermicompost, soil and sand with cocopeat should be used as growing media for higher germination percent and good growth of marking nut seedlings.

References

Abad, M., P. Noguera, R. Puchades, A Maqueira and V. Noguera (2002). Physico-chemical and chemical properties of some coconut dusts for use as peat substitute for containerized ornamental plants. *Bio- res. Tech*., **82** : 241-245.

Agbo, C. U. and C. M. Omaliko (2006). Initiation and growth of shoots of *Gongronema latifolia* Benth stem cuttings in different rooting media. *African J. Biotech*., **5** : 425–428.

Abirami, K., J. Rema, P. A. Mathew, V. Srinivasan and S. Hamza (2010). Effect of different propagation media on seed germination, seedling growth and vigour of nutmeg (*Myristica fragrans* Houtt.). *J. Med. Pl. Res*., **4** : 2054-2058.

Akanbi, W. B., A. O. Togun, T. A. Adediran, O. S. Olabde and J. O. Olanivi (2002). Effect of split application of organo-mineral fertilizer on okra growth, nutrient uptake and fruit yield. *Crop Research*, **29 (2)** : 223-239.

Arancon, N. Q., C. A. Edwards, P. Bierman, C. Welch and J. D. Metzger (2004). Influences of vermicomposts on field strawberries-1. Effects on growth and yields. *Bioresour. Technol*., **93 (2)** : 145-153.

Bachman, G. R. and J. D. Metzger (2008). Growth of bedding plants in commercial potting substrate amended with vermicompost. *Biores Tech*., **99** : 3155-3161.

Baiyeri, K. P. (2003). Evaluation of nursery media for seedling emergence and early seedling growth of two tropical tree species. *Moor J. Agric. Res*., **4(1)** : 60-65.

Baiyeri, K. P. (2006). Seedling emergence and growth of pawpaw (*Carica papaya*) grown under different coloured shade polyethylene. *Int'l Agrophysics*, **20** : 35-39.

Blom, T. J. (1999). Coco coir versus granulated roockwool and 'arching' versus traditional harvesting of roses in a recirculating system. *Acta Hort*., **481** : 503-507.

De Kreij, C. and G. J. L. Leeuven (2001). Growth of pot plants in treated coir dust as compared to peat. *Comm. Soil Sci. Pl. Anal*., **32** : 2255-2265.

Evans, M. R., S. Konduru and R. H. Stamps (1996). Source variation in physical and chemical properties of coconut coir dust. *Hortscience*, **31** : 965-967.

Garcia, M. and C. Daverede (1994). Dust from coir fibres: new substrate for soilless culture. *PHM Revue Horticole*, **348** : 7-12.

Jawal A. S., S. Hadiati, A. Susiloadi and dan N. L. P. Indriyani (1998). Pengaruh Media Tumbuh terhadap Pertumbuhan Semai Manggis (*Garcinia mangostana* L.). *J. Stigma*, **6(2)** : 213-218.

Karama, A. S. and I. Manwan (1990). Penggunaan pupuk organic pada tanaman pangan. Makalah pada Lokakarya Nasional Efisiensi Penggunaan Pupuk. Cisarua Bogor.

Kumar, H. S., G. S. Swami, K. Kanmad, V. C. Kumar and B. N. Sowmya (2008). Effect of organics and chemicals on germination, growth and graft - take in mango. *The Asian J. of Hort*., **3(2)** : 336-339.

Labeke ,V. M. C. and V. P. Dambre (1998). Gerbera cultivation on coir with recirculating of the nutrient solution : a comparison with rockwool culture. *Acta Hort.*, **458** : 357-362.

Novak, J. (2004). The effect of rooting media and CO_2 enrichment, P–nutrition and micorrhizal inoculation on rooting and growth of Osteospermum. *Acta Hort*., **644** : 589-593.

Panse, V. G. and P. V. Sukhatme (1989). *Statistical Methods for Agricultural Workers*. ICAR, New Delhi.

Prasad, M. (1997). Physical, chemical and biological properties of coir dust. *Acta Hort.*, **450** : 21-29.

Purbiati, T., Q. D. Ernawanto and S. R. Soemarsono (1994). Pengaruh Komposisi Media Tumbuh dan Ukuran Pot terhadap Keberhasilan dan Pertumbuhan Tunas Anakan Salak yang Diperbanyak secara Vegetatif. *Penel. Hort*., **6(2)** : 1-12.

Pickering, J. S. (1997). An alternative to peat. *The Garden*, **122** : 428-429.

Ratna, T. E., H. Awaludin and A. Sutanto (2006). Pergaruh media terhadap Pertumbuhan Bibit Pisang Susu Asal Bonggol di Sambelia. *J. Hontikultura*, **1** : 15-22.

Sahni, S., B. K. Sharma, D. P. Singh, H. B. Singh and K. P. Singh (2008). Vermicompost enhances performance of plant growth promoting rhizobacteria in *Cicer arietinum* rhizosphere against *Sclerotium rolfsii*. *Crop Prot.*, **27** : 369-376.

Soepardi, G. (1983). Sifat dan cirri tanah. Department Ilmu-Ilmu Tanah, IPB,Bogor.

Soegiman (1982). Ilmu Tanah. Bhratara Karya Aksara. Jakarta.

Smith, C. (1995). Coir : a viable alternative to peat for potting. *Horticulturist*, **4** : 25-28.

Supriyanto, A., Q. D. Ernawanto and D. Setiono (1990). Media Tumbuh Pembibitan Jeruk. *Penelitian Hortikultura*, **5(1)** : 1-8.

Yahya, A. and M. S. Mohklas (1999). Growth and flowering responses of potted chrysanthemum in a coir dust-based medium to different rates of slow released-fertilizer. *J. Trop. Agric. Food Sci*., **27** : 39-46.

Wilson, S. B., P. J. Stoffella and D. A. Graetz (2001). Use of compost as a media amendment for containerized production of two subtropical perennials. *J. Env. Hort*., **19** : 37-42.

Yau, P. Y. and R. J. Murphy (2000). Biodegraded cocopeat as a horticultural substrate. *Acta Hort*. (ISHS), **517** : 275-278.

Zaller, J. G. (2007). Vermicompost as a substitute for peat in potting media : Effects on germination, biomass allocation, yields and fruit quality of three tomato varieties. *Sci. Hort*., **112** : 191-199.