

Original Research Article

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Influence of Media and Biofertilizers on Seed Germination and Seedling Vigour of Aonla

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ABSTRACT

Keywords

Aonla, Seedling height, Seedling vigour, Potting mixture, Biofertilizers

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An experiment was conducted at the Regional Horticultural Research and Extension Centre, University of Horticultural Sciences campus, Vidyanarayapura, Bengaluru. This experiment was carried out to study the effect of different potting media components and biofertilizers on the seed germination and growth of aonla seedlings. The results revealed that, the high seed germination per cent (86.11 %), seedling vigour-I (3484.01 cm), seedling vigour-II (264.35 g) seedling height (24.13 cm), root length (16.33 cm), seedling girth (0.63 cm), number of leaves (18.86), fresh weight (26.9 g) and dry weight (3.07 g), were recorded with the combination of regular potting mixture (Red earth, FYM, Sand in 2:1:1 proportion) along with cocopeat and VAM (20g per polybag).

Introduction

Aonla (*Embllica officinalis* Gaertn.) is one of the most important indigenous fruit of arid-tropics and it is also known as Indian gooseberry. It is a rich source of ascorbic acid next to Barbados cherry and has high nutritional and medicinal values. The plant is winter hardy and can be grown successfully in arid and semi-arid regions and in soils with high pH and on waste lands. Aonla is mainly used in processing industries for preparation of value added processed products and also used in herbal and cosmetic products manufacturing. The maximum area under

aonla cultivation is distributed in Uttar Pradesh but recently, its cultivation is expanded to different parts of country, particularly in Maharashtra, Madhya Pradesh, Chhattisgarh, Rajasthan, Gujarat, Karnataka, Andhra Pradesh, Orissa, Himanchal Pradesh, Delhi, Haryana and Punjab. Due to large expansion of area, there is a high demand for quality planting materials. Aonla is mainly propagated by patch budding. The quality rootstocks are very important for success of budding. The growth of aonla seedlings are very slow and take more time to attain buddable stage. The amount of information available on the possibility of improving

growth of aonla through application of biofertilizers at nursery conditions is scanty. Little work has been made so far to systematically screen and select efficient media and biofertilizers for aonla. Therefore, present experiment was planned to study the influence of rooting media and biofertilizers on seedling growth of aonla. This study helps to identify better rooting media combination and biofertilizers to improve the seedlings growth.

Materials and Methods

The study was conducted at the Regional Horticultural Research and Extension Centre, University of Horticultural Sciences campus, Vidyananyapura, Bengaluru. The present experiment was carried out to study the effect of media and biofertilizers on seed germination, growth and vigour of aonla seedlings.

Treatment details and statistical analysis

The experimental design was CRD and there were ten treatments which are replicated thrice. The treatment details are T₁-Regular potting mixture *i.e.*, Red earth, FYM, Sand (2:1:1), T₂-Regular potting mixture + Cocopeat (1:1), T₃-Regular potting mixture + VAM (20g/polybag), T₄-Regular potting mixture + Cocopeat + VAM (20g/polybag), T₅-Regular potting mixture + *Pseudomonas fluorescens* (20g/polybag), T₆- Regular potting mixture + Cocopeat + *Pseudomonas fluorescens*, T₇-Revised potting mixture *i.e.* Red earth, FYM, Granite powder (2:1:1), T₈- Revised potting mixture + VAM (20g/polybag), T₉- Revised potting mixture + Cocopeat + VAM (20g/polybag) and T₁₀- Revised potting mixture + *Pseudomonas fluorescens* (20g/polybag). The biofertilizers inoculum was applied at the rate of 20 g per polythene bag at 1 cm below the soil surface at the time of sowing and then watering was

done immediately. The observations were recorded for germination percentage, seedling vigour-I, seedling vigour-II, plant height (cm), stem diameter (cm), number of leaves, fresh weight (g), dry weight (g) and days taken for attaining graftable size from 15 plants which were labeled. The experimental data collected relating to different parameters were statistically analyzed by Completely Randomized Design (CRD) and results were analyzed as per the guide lines suggested by Panse and Sukhatme (1967).

Results and Discussion

The present study revealed that, aonla responds very well to different types of media and biofertilizers at nursery stage (Table 1). The media and biofertilizers composition showed significant differences with respect to germination per centage. The highest germination (86.11 %) was recorded with regular potting mixture + cocopeat + VAM media treatment (T₄).

The reason for highest seed germination may be due to the influence of cocopeat, it might have helped the media to acquire good physical and chemical properties by decreasing compactness and increasing the porosity of the medium. Vesicular Arbuscular Mycorrhiza fungi attributed for creating favourable conditions such as, optimum moisture retention, temperature, secretions of vitamins, growth promoting substances and water absorption. The results are in line with those obtained by Aseri and Rao (2004) in aonla seedlings and Thoke *et al.*, (2011) in Jamun seedlings.

The treatment with regular potting mixture + cocopeat + VAM media (T₄) has recorded highest vigour index-I (3484.01 cm) and vigour index II (264.35 g). This was significantly superior over all other treatments. The least vigour index-I (1334.02 cm) and

vigour index-II (67.02 g) was noticed in control. The reason for highest seedling vigour may be due to the reason that, cocopeat portion of the medium helped in meeting immediate requirement of nutrients, along with availability of balanced nutrition and optimum quantity of VAM, which is required for proper colonization. Application of VAM helps in nutrient and water uptake and also maintenance of good physical and chemical properties of the media. The results were in conformity with the observation made by Geetha *et al.*, (2007) in mango and Parameswari *et al.*, (2001) in tamarind

The treatments effect on seedling height indicated that the treatment with regular potting mixture + cocopeat + VAM media (T₄) recorded maximum seedling height (24.13 cm) as shown in table 1. The reason for getting maximum seedling height in medium of regular potting mixture (2:1:1) + cocopeat + VA mycorrhiza may be due to combined effect of potting mixture, cocopeat and VAM fungi. Cocopeat along with red earth, FYM and sand, provided good media mixture for seedling growth.

It served as nutrient source, helped in providing good physical and chemical characteristics to media. Good growth in the form of seedling height was recorded where cocopeat and VAM was used. VAM helps in uptake of nutrients like P, Zn, Cu, Fe and or due to the production of growth promoting substances.

It also helps in water uptake and maintains good physical property of soil. The influence of media component was due to the combined effect of the entire component used in media, and each component favoured the seedling growth in its own way. These results are in conformity with Muralidhara *et al.*, (2014), Geetha *et al.*, (2007), Venkata (2002) in mango, Bisla *et al.*, (1984) in ber, Herle

(1998) and Maksoand *et al.*, (1994) in Tamarind, Kumar (1997) in Cashew. The combination of granite powder with potting media, as evident, produced better porosity, rich in nutrient has resulted in production of roots which reflected on more number of leaves and increase in plant height. Similar results were reported by Thankamani *et al.*, (2008). It is reported that Farm Yard Manure contains significant amount of ammonium and nitrate that are readily available to crops. It is also reported that FYM supported higher density of microbial biomass, soil aggregation, organic carbon, and total nitrogen and improve the quality and growth of crops (Agele *et al.*, 2005)

The result on seedling girth was influenced by media and biofertilizers. All the treatments were superior over the control (Table 1). The treatment with regular potting mixture + cocopeat + VAM media (T₄) recorded significantly maximum stem diameter (0.63 cm). The minimum seedling girth (0.39 cm) was recorded in the control treatment (T₁). The reason for the best performance of treatment of regular potting mixture (2:1:1) + cocopeat + VAM could be due to combined effect of red earth, FYM, sand, cocopeat and VAM with good drainage qualities of the medium.

The cocopeat portion of the medium helped in meeting immediate requirement of nutrients, along with availability of balanced nutrition and optimum quantity of VAM, which is required for proper colonization. Application of VAM helps in nutrient and water uptake and also maintenance of good physical and chemical properties of the media.

Similar differences in seedling diameter were reported by Muralidhara *et al.*, (2014) in mango, Kumar *et al.*, (1998) in cashew, Salem *et al.*, (1995) in sour orange and Vinayak and Bagyaraj (1990) in citrus.

Table.1 Effect of media and biofertilizers on germination percentage and Seedling vigour in aonla

Treatments	Germination percentage	Seedling vigour-I (cm)	Seedling vigour-II (g)	Seedling height (cm)	Seedling girth (cm)	No. of leaves	Root length (cm)	Fresh weight (g)	Dry weight (g)
T ₁	52.77	1334.02	67.02	15.2	0.39	9.22	10.09	16.73	1.27
T ₂	63.89	1893.50	123.30	18.00	0.45	14.80	11.73	17.23	1.93
T ₃	61.11	1914.57	124.05	20.33	0.46	15.14	11.00	19.40	2.03
T ₄	86.11	3484.01	264.35	24.13	0.63	18.86	16.33	26.90	3.07
T ₅	61.11	2008.07	160.71	20.00	0.45	16.09	12.87	21.80	2.63
T ₆	55.55	1825.37	148.33	20.87	0.47	16.04	12.00	21.93	2.67
T ₇	58.33	1570.82	110.83	16.00	0.44	9.81	10.93	17.33	1.90
T ₈	66.66	1767.82	115.33	16.27	0.48	11.40	10.27	18.50	1.73
T ₉	77.78	2779.07	217.00	21.53	0.57	16.58	14.20	24.00	2.79
T ₁₀	58.33	1780.23	146.99	17.47	0.45	13.40	13.07	19.67	2.52
F test	*	*	*	*	*	*	*	*	*
SEm±	6.32	2.30	1.71	0.83	0.01	0.38	0.40	0.54	0.12
CD (0.05)	18.96	6.9	5.13	2.49	0.03	1.14	1.2	1.62	0.36

* Significant at 5%

Table.2 Influence of media and biofertilizers on seed germination and seedling vigour

Treatment	Germination (%)	Seedling vigour-I (cm)	Seedling vigour-II (g)	Seedling height (cm)	Seedling girth (cm)	No. of leaves	Root Length (cm)	Fresh weight (g)
Germination (%)	1.00							
Seedling vigour-I (cm)	0.95	1.00						
Seedling vigour-II (g)	0.87	0.97	1.00					
Plant height	0.70	0.87	0.89	1.00				
Plant girth	0.96	0.97	0.94	0.82	1.00			
No. Of leaves	0.65	0.81	0.85	0.96	0.74	1.00		
Root Length (cm)	0.79	0.92	0.96	0.83	0.85	0.81	1.00	
Fresh weight	0.77	0.91	0.96	0.92	0.89	0.85	0.91	1.00

The treatment with regular potting mixture + cocopeat + VAM media (T₄) recorded maximum number of leaves (18.86) which are given in table 1. This was significantly superior over all other treatments.

The minimum number of leaves (9.22) was found in control treatment (T₁). The probable reason for maximum number of leaves in case of treatment regular potting mixture (2:1:1) + coco peat + VAM may be due to the influence of proprietary compound which might have

decomposed and released nutrients that helps in production of more number of leaves. It is evident from the results that cocopeat and VAM in medium combination had helped in the better growth of seedlings.

Similar observations on number of leaves were observed by Devachandra *et al.*, (2008) in jamun, Muralidhara *et al.*, (2014) and Venkata (2002) in mango, Nasir *et al.*, (1990) in Orange, Shetty and Melanta (1990) and Ramesh (1997) in Cashew.

Maximum root length (16.33 cm) was noticed with the regular potting mixture + cocopeat + VAM media treatment (T₄). This was significantly superior over all other treatments. The minimum of 10.09 cm was recorded in the control treatment (T₁). The increase in root length may be due to the production of hydrolytic enzymes that release nutrients in basal media, production of natural chelates to enhance nutrient uptake and enhanced root systems. In similar studies, Vesicular Arbuscular Mycorrhiza fungi enhanced the root growth, biomass and nutrient uptake of black pepper (Bopaiah and Khader 1989; Kandiannan *et al.*, 2000).

Fresh weight and dry weight per plant showed significant difference among the treatments (Table 1). Regular potting mixture + cocopeat + VAM media (T₄) had higher fresh and dry weight of seedling (26.90g and 3.07g). While the minimum fresh weight and dry weight per plant (16.73 g and 1.27g) was found in the control (T₁). The maximum fresh and dry weight is mainly due to the reason that, the application of cocopeat and VAM increases the water holding capacity and release of available nutrients to the growing plant which increases the production of auxin, gibberellins, cytokinins and hence inoculated roots had larger proportion of younger roots and root elongation resulting in increased size and number of hairs. The results are in accordance with Muralidhara *et al.*, (2014), Parmeshwari *et al.*, (2001) and Kumudha (2008).

There is a positive correlation between the different growth parameters like germination percentage, seedling vigour-I, seedling vigour-II, seedling height, seedling girth, number of leaves, root length and fresh weight (Table 2). It is observed that, the higher germination percentage resulted in the higher values of seedling vigour-I, seedling vigour-II, seedling height, seedling girth,

number of leaves, root length and fresh weight. Hence, the higher germination percentage can be considered as important criteria in aonla for raising the healthy seedlings. Increase in the germination percentage, seedling vigour-I and seedling vigour-II increased the seedling girth. Similarly higher number leaves resulted in more seedling height and seedling girth. The seedling vigour-I, seedling vigour-II, seedling height, seedling girth and number of leaves increased due to the increase in the root length. In conclusion, use of regular potting mixture (Red earth, FYM, Sand in 2:1:1 proportion) along with cocopeat and VAM (20g per polybag) as rooting media will help to produce healthy aonla seedlings in short duration.

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