Effect of Growing Media on Germination and Seedling Vigour of Custard Apple

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ABSTRACT

This investigation was conducted at Horticulture Farm, Department of Horticulture, Rajasthan College of Agriculture, MPUAT-Udaipur (Raj.) during 2020-21 to 2021-22 under greenhouse. The experiment comprised of 5 treatments {G₀-Soil + FYM (1:1), G₁-Soil + Cocopeat (1:1), G₂-Soil + Cocopeat + Sand (1:1:1), G₃-Soil + Cocopeat + FYM (1:1:1), G₄-soil + Cocopeat + Sand + FYM (1:1:1:1)} with 2 experimental unit (Poly bags and seed beds) with four replications were conducted over a two-year period. Among the various treatments, G₄ was superior in respect to days taken for first germination (14.51 and 16.79 days), seed germination percent at 90 days (67.39 and 64.18 %), germination duration (74.87 and 81.69 days), seed vigour index (8.54 and 7.51), seedling length (12.67 and 11.62 cm), germination index (0.90 and 0.79) and number of leaves per seedling (14.95 and 15.18) as compare to other treatments.

Key words: Custard apple seed, Growing media, Polybags and green house.

Introduction

Custard apple is a delicious fruit, belongs to the family Annonaceae, is one of the best tropical and sub-tropical fruits and believed to be a native of the West Indies (Ojha et al., 2005). Growing media is one of the important environmental factors, which plays an important role in growth and survival of seedlings. Several growing media or their combinations are being used for raising the seedling. Different growing media like soil, sand, farm yard manure (FYM) and Vermicompost either alone or in different proportion have been found beneficial to influence germination and growth of seedling. Seed germination of custard apple is uneven and irregular making sexual propagation difficult. Much experimental evidences support the concepts that specific endogenous growth promoting and inhibiting compounds are involved directly in the control of seed development, dormancy and germination (Black, 1980). Custard apple requires 35-50 days for potential germination (Hernandez, 1983). Only limited work has been carried out this type of aspect in India as well as in Rajasthan.

Materials and Methods

This work was carried out at Horticulture Farm, Udaipur, situated under agro-climatic condition of the sub-humid southern plain of Rajasthan state (India). The research work was subjected to Control Randomized Design with four replication. The different growing media were prepared according to portion of various soil, cocopeat, sand, FYM (farm
yard manure) and filled in 15 X 20 cm black polythene bags as well as nursery beds. The seeds were sown in poly bag and seed bed at a depth of 2 centimetres under the greenhouse. One seed per polybag was sown. Polythene bags were subsequently arranged in a systematic manner, forming neat and orderly rows. The growth parameters were recorded at 90 days after sowing and five plants were randomly selected for observation and mean value was computed. The data were analyzed using standard statistical methods (Panse and Sukhatme, 1985). All the cultural practices were performed uniformly viz. irrigation, weeding and hoeing.

Observation recorded

Observations were recorded on five randomly selected seedling plants.

**Days taken to first germination** - The number of days taken by the seeds for emergence of plumule was counted manually and recorded.

**Seed germination (%)** - The daily estimation of the total count of germinated seeds was conducted for each treatment, commencing from the initial emergence of the seed and continuing until the point of full completion of seed germination. The percentage of seed germination was determined using the following formula:

\[
\text{Seed germination} \% = \frac{\text{Total germinated seeds}}{\text{Total seeds sown}} \times 100
\]

**Seedling length** - The vertical length of five seedlings, which were chosen in a random manner and labelled accordingly, was measured by scale 90 days after the process of sowing. Subsequently, the average length of the seedlings was determined and expressed in centimeters.

**Germination duration** - The days taken by seeds from initial plumule emergence to the point of full complete growth of radical and plumule of the seeds were observed and recorded.

**Seed vigour** - Seed vigour was determined in terms of Vigour index. It was calculated according to the following formula as suggested by Dezfuli et al. (2008):

\[
\text{Seed vigour index} = \frac{\text{Germination} \% \times \text{Seedling length (m)}}{\text{Germination index}}
\]

\[
\text{Germination index} = \frac{c_1}{r_1} + \frac{c_2}{r_2} + \frac{c_3}{r_3} + \ldots + \frac{c_n}{r_n}
\]

**Table 1. Effect of Growing Media on first germination, germination %, germination duration and seed vigour of Custard Apple**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Days taken for first germination</th>
<th>Germination % at 90 days</th>
<th>Germination Duration</th>
<th>Seed Vigour</th>
</tr>
</thead>
<tbody>
<tr>
<td>G0: Soil + FYM (1:1)</td>
<td>24.95 27.35 26.15 52.73 52.26</td>
<td>91.20 99.26 95.23 52.66 52.26</td>
<td>91.20 99.26 95.23 52.66 52.26</td>
<td>3.85 3.69 3.77</td>
</tr>
<tr>
<td>G1: Soil + Cocopeat (1:1)</td>
<td>19.89 25.05 22.47 55.30 55.04</td>
<td>95.10 91.91 90.09 88.73 88.73</td>
<td>95.10 91.91 90.09 88.73 88.73</td>
<td>4.36 4.22 4.29</td>
</tr>
<tr>
<td>G2: Soil + Cocopeat + Sand (1:1:1)</td>
<td>16.29 22.02 19.16 58.73 58.27</td>
<td>83.77 85.19 82.08 78.57 78.57</td>
<td>83.77 85.19 82.08 78.57 78.57</td>
<td>5.44 5.61 5.53</td>
</tr>
<tr>
<td>G3: Soil + Cocopeat + FYM (1:1:1)</td>
<td>16.79 19.18 17.99 58.73 58.27</td>
<td>83.77 85.19 82.08 78.57 78.57</td>
<td>83.77 85.19 82.08 78.57 78.57</td>
<td>7.11 7.11 7.11</td>
</tr>
<tr>
<td>G4: Soil + Cocopeat + Sand + FYM (1:1:1:1)</td>
<td>14.51 16.79 15.65 67.39 65.79</td>
<td>74.87 78.28 75.10 67.39 65.79</td>
<td>74.87 78.28 75.10 67.39 65.79</td>
<td>8.54 8.54 8.54</td>
</tr>
</tbody>
</table>
Where, $G_1$ = number of seeds germinated on first day.
$G_2$ = Number of seeds germinated on 2nd day.
$G_n$ = Number of seeds germinated on $N$th day

**Results**

The data of several parameters recorded at 90 days of custard apple crop grown under green house (Polybags and seed bed) were significantly influenced by different growing media at 5 % level of significance during both the years of study i.e. 2020-21 & 2021-22 as well as in pooled analysis. Notably, the best treatment with having the desirable highest values of parameters during 2020-21, 2021-22 and in pooled analysis viz., days taken to first germination (14.51, 16.79 & 15.65 days), germination percentage (67.39, 64.18 & 65.79 %), germination duration (74.87, 81.69 & 78.28 days), seed vigour (8.54, 7.51 & 8.02), seedling length (12.67, 11.69 & 12.18 cm), germination index (0.90, 0.79 & 0.84) and leaves per seedling (14.95, 15.18 & 15.07) was recorded under treatment $G_4$ {Soil + Cocopeat + Sand + FYM (1:1:1:1)} in comparison of all other treatments (Table 1 to 2).

**Discussion**

The treatment $G_4$ {Soil + Cocopeat + Sand + FYM (1:1:1:1)} was found superior of this study indicates that the different growing media has notable impact on the various parameters that was examined across all treatments. Germination of seeds depends on inherent genetic factors of the seed along with environment condition. All the growth mediums may have provided a suitable microenvironment for seeds to germinate timely and uniformly reported by Hasan et al., (2010). Influence of growing media was found significant effect on germination % and germination duration, The FYM, Sand, soil and cocopeat may have provided a synergistic combination for proper retention of moisture and nutrients for the seeds to have a conducive microenvironment for early germination and germination percentage reported by Bhardwaj (2013), Vikas et al., (2015), Tanwar et al., (2017), and Dayeswari et al. (2018) on papaya. Influence of growing media was found significant effect on seed vigour, the enzymatic and hormonal mechanisms are responsible for stimulating metabolic processes, including sugar mobilisation, protein hydrolysis, and oxidation. These processes ultimately result in an increase in root length; shoot length, and seedling dry weight, thereby enhancing seedling vigour. The current findings align with the findings of Karthikeyan et al. (2006) and Gurung et al. (2014).

FYM with cocopeat has the potential to retain soil moisture, enhance nutrient levels, and enhance soil structure. This, in turn, facilitates improved water absorption and sustains cellular turgidity, elongation, and respiration at optimal levels. Consequently, these factors contribute to favourable seed germination and in turn maximize the germination index. The current findings align with the findings of Karthikeyan et al. (2006), Bhardwaj (2013) and Vikas et al. (2015). Influence of growing media was found to have significant effect on the Number of leaves per seedling of custard apple. Similar results were obtained by Indriyani et al., (2011) in Pineapple, Parasana et al., (2013) in Mango and Vikas et al. (2015) in papaya. Influence of growing media was found to have significant effect on the seedling length of custard apple. Similar results were obtained by Vikas et al., (2015) in papaya.

**Conflict of Interest**

The authors declare that there is no conflict of interest.
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