Ecophysiological studies for boosting commercial production of tuberous roots of *Chlorophytum boriviilianum* Sant et Fernan

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This paper presents ecophysiological studies of tuberous roots of *safed moosli* (*Chlorophytum borivilianum*), a powerful aphrodisiac, for boosting its commercial production. Average weight of tuberous roots produced at the end of growing season from propagule root tubers soaked in 0.75% of potassium sulphate or a mixture (100 ppm) of equal quantities of IAA (indole acetic acid) and kinetin prior to sowing led to three times higher production than control. Pretreatment with potassium salts are only negligibly lower than those produced under very costly hormones, giving higher profits to *safed moosli* cultivators.

**Keywords**: *Chlorophytum boriviilianum*, Ecophysiological studies, Tuberous roots

**Introduction**

*Chlorophytum borivilianum* Sant et Fernan was first reported from Salsette Island1, near Mumbai. In Rajasthan, it was reported2 for the first time from tehsil Jhadol of district Udaipur. Local tribals have used its leaves and especially its tuberous roots (vern. *safed moosli*) as a powerful aphrodisiac3 and selling it to drug collectors from Gujarat. Once the use of *safed moosli* as a powerful aphrodisiac among tribals became well known to progressive farmers of the area, it has been almost uprooted from its natural habitats in Mewar. It has been considered as a rare and highly threatened species and has been included in the “Red Data Book” of Indian plants4. In any case, its large-scale cultivation in Rajasthan, Gujarat, Maharashtra and Madhya Pradesh ensures its *ex-situ* conservation now. Gujarat State Forest Development Corporation5 reported that *safed moosli* as herbal drug is fetching a price up to Rs. 1500/- per kg, which has been the costliest forest product. Since *safed moosli* is a costly herbal drug, thorough experimental studies have been made6–7. It was shown that soaking of propagule root tubers in a number of chemicals prior to sowing considerably boosts up production of the drug8.

This study presents a comparative study of some hormones *vis-a-vis* certain species of potassium salts on production of tuberous roots of *safed moosli*.

**Experimental Section**

Tuberous roots of *C. borivilianum* were purchased from Kanhaiya Gramin Sewa Sanstha, Udaipur. Roots were in a cluster of variable number, attached to the undersurface of a discoid stem, often called as crown, which was vertically cut into pieces in such a manner that a stem piece had one large root or one medium sized and one or two small roots with the *proviso* that all cut stem pieces had more or less equal weight, irrespective of number of tuberous roots remaining attached to their under surface. These propagules had cut surfaces and were dried under diffuse sunlight. Dried propagules were soaked in various concentrations of different species of potassium salts in one set of treatments and of various growth regulators in another set. After soaking for 48 h, root propagules were washed with distilled water for removal of adherent liquid, and then inserted in pot soil. Each treatment was replicated three times. Propagule root tubers soaked in distilled water for 48 h constituted the control. Experiments were set up in first week of July 2008 and crop harvested in last week of March 2009.
Results and Discussion

All pretreatments of propagule root tubers with different species and concentrations of potassium salts gave higher production of tuberous roots than in control (Table 1), whereas tuberous root biomass production was least (11.00 g) under 1% potassium nitrate and maximum (26.33 g) under 0.75% potassium sulphate, which is more than three times that under control. In present work, highest weight (28.0 g) of safed moosli was in the crop from those propagule root tubers, which were pretreated with a mixture of 100 ppm of hormones [IAA (indole acetic acid) and kinetin in equal proportions]. Amount (26.33 g) of tuberous root biomass produced under pretreatment with 0.75% potassium sulphate is marginally less than that produced using kinetin and IAA (28.0 g) (Table 2). However, cost of kinetin and IAA is many more times higher than potassium sulphate and makes their use uneconomical. Less costly mineral (potassium sulphate) pretreatment for augmenting tuberous root biomass production in C. borivilianum is found equally effective than pretreatment of seeds, roots, stem cutting, buds, etc with costly hormones. History of discovery of hormones from auxins to brassinosteroids is rather exciting9. Ever since the first report about increase in the growth and yield of wheat and oats was recorded10 from their seeds soaked in solution of IAA, prior to sowing, various studies on application of hormones (soaking of seeds/ spraying of crops) have given spectacular results are rice11, groundnut12, mung13, blackgram14, late sown wheat and barley15 cotton16 and potato17. However, use of hormones in general crop production can never be profitable because of their exorbitantly high cost. This study clearly shows that higher production can be achieved by managing mineral requirements of the crop. Use of hormones can be restricted for solving special problems such as large-

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Table 1—Effect of certain species of potassium salts on biomass of tuberous roots / plant (values are mean of three replicates)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Production of tuberous roots per plant, g</th>
</tr>
</thead>
<tbody>
<tr>
<td>K₂CO₃</td>
<td>07.33 19.67 14.67 11.67</td>
</tr>
<tr>
<td>KHCO₃</td>
<td>07.33 18.33 12.67 12.33</td>
</tr>
<tr>
<td>KH₂PO₄</td>
<td>07.33 16.33 13.33 13.33</td>
</tr>
<tr>
<td>K₃HPO₄</td>
<td>07.33 16.67 14.33 14.33</td>
</tr>
<tr>
<td>KCL</td>
<td>07.33 13.67 13.33 13.33</td>
</tr>
<tr>
<td>KNO₃</td>
<td>07.33 12.33 11.33 11.00</td>
</tr>
<tr>
<td>K₂SO₄</td>
<td>07.33 20.67 26.33 17.67</td>
</tr>
<tr>
<td>KHSO₄</td>
<td>07.33 17.33 25.33 15.33</td>
</tr>
</tbody>
</table>

CRD ANOVA for weight (g) of tuberous roots / plant

<table>
<thead>
<tr>
<th>S. no</th>
<th>Source of variation</th>
<th>DF</th>
<th>SS</th>
<th>MSS</th>
<th>F</th>
<th>SEM ±</th>
<th>CD (5%)</th>
<th>CD (1%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Treatments</td>
<td>08</td>
<td>1346.222</td>
<td>168.278</td>
<td>177.275*</td>
<td>0.324</td>
<td>0.920</td>
<td>1.226</td>
</tr>
<tr>
<td>2</td>
<td>Concentration</td>
<td>02</td>
<td>130.667</td>
<td>65.333</td>
<td>68.826*</td>
<td>0.187</td>
<td>0.531</td>
<td>0.708</td>
</tr>
<tr>
<td>3</td>
<td>TXC</td>
<td>16</td>
<td>340.000</td>
<td>21.250</td>
<td>22.386*</td>
<td>0.562</td>
<td>1.594</td>
<td>2.124</td>
</tr>
<tr>
<td>4</td>
<td>Error</td>
<td>54</td>
<td>51.259</td>
<td>0.949</td>
<td>1.000</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

GM = 14.59, CV (%) = 6.68 *significant at 1%
scale induction of rooting on stem cuttings of forest trees for aforestation work or induction of fruiting and seed setting in certain species, in which it either does not occur or occurs with difficulty.

Conclusions

Tuberous root biomass (26.33 g) produced under pretreatment with 0.75% potassium sulphate is marginally less than that produced using kinetin and IAA (28.0 g). However, cost of kinetin and IAA is many more times higher than potassium sulphate and makes their use uneconomical. This study shows that firm economic viability of high production of tuberous roots of *safed moosli* can be achieved just by managing potassium nutrition of the plant.

References


