Seed germination improvement in Andrographis paniculata

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Abstract: The aim of this paper was to find an easy and low cost method to stimulate the germination of Andrographis paniculata (Burm.f.) Wallich ex Nees which is traditionally used for the cure of malaria, jaundice, anemia, bowel complaints and loss of appetite, dysentery, bronchitis, fever, cough, cholera and most prominently in diabetes. Present communication provides information on herbal uses, and effect of phytohormones (GA3 and IAA) and soil (with different type of compost) on the seed germination improvement. The highest seed germination was observed in Garden soil + Dry leaves manure, whereas the maximum seed germination was observed in GA3 hormones.

Keywords: Andrographis paniculata; Germination; GA3; IAA.

Introduction

Andrographis paniculata (Burm. f.) Wallich ex Nees (family Acanthaceae) commonly known as Kalmegh, is an important medicinal plant also known as the king of the bitter. This species is selected for the present study because, it has high medicinal value and recommended for cultivation by National Medicinal Plant Board (CIMAP 2004). It is a source of several diterpenoids of which andrographolide (alkaloid) is important. The drug is using for treating general debility, fever, jaundice, skin diseases (Osmaston 1927; Rawat and Vasistha 2011). Some scientists have observed that andrographolide has the potential to be included in the cocktail vaccine against AIDS by virtue of its antagonistic property with HIV II (Weibo 1995). It has been already used for treating cancer as it promotes cell differentiation in tumour cell (Matsuda et al. 1994).

The propagation of Andrographis paniculata generally occurs through seeds, although it has many germination problems. The plant grows wild in tropical, moist and deciduous forests and widely cultivated in southern Asia, where it is used as medicine. Kalmegh can be grown on a variety of soil. In the natural habitat, it is found growing in clay to sandy loamy soil rich in organic matter is good for its growth and yield (Farooqui and Sreeramu 2001). Mulikela and Kalianagle (1995), and Chauhan et al. (2001) have studied the improvement of seed germination of the Andrographis paniculata. The propagation of Andrographis paniculata through seed is somewhat difficult which may be due to various germination problems. In view of the above, the present investigation conducted with an objective to assess the improvement of seed germination in Andrographis paniculata.

Material and methods

Seed germination was studied in laboratory and field condition by adopting the method of Heartment and Kester (2002). Seeds were collected from Sushila Tiwari Herbal Garden, Rishikesh, Uttarakhand, India and stored for six months at optimum temperature. Seed germination was studies in different soils viz. garden soil (G), garden soil + farm yard compost (G+FYC), garden soil +green leaves manure (G+GLM), garden soil + dry leaves manure (G+DLM). The soil analysis of different soil compositions used under present study was carried out at Regional Soil Testing Laboratory, Uttarakhand, India. After collection of seeds, thermacol cups filled with different type of soil. Seeds are sown in soil, all sown seeds were irrigated regularly depending upon the moisture condition of soil media, examined daily and seed germinated were counted over a period of 3-3 days respectively.
In laboratory seed germination was studied in Petri dishes with treatment of phytohormones viz., \( \text{GA}_3 \) and IAA in different concentration. Before germination study seed were washed with 0.1% mercuric chloride for 5 minute followed by 70% alcohol for 1 min. The sterilized seed were thoroughly rinsed with distilled water and subjected for various treatments viz., 50 ppm, 75 ppm and 100 ppm of IAA and \( \text{GA}_3 \) in 9 cm plastic Petri dishes with two layer of Whatman no 1 filter paper. In each Petri dishes 5 ml test solution or simple distilled water (control) was added to provide suitable moisture. Each Petri dish contained 30 seeds in three replications. The study on seed germination was carried out under laboratory conditions at constant temperature. Petri dishes were then kept in incubator in 28°C temperature. Filter papers in Petri dishes were replaced at weekly interval to avoid any fungal growth on the seeds. Petri dishes were examined daily. The germination percentage was calculated at the completion of test period after seed sowing percentage of the total seeds sown.

Results and discussion

Seed germination was started within 3 days in hormones, number of seeds germination was counted daily. Germination result is presented in Figure 1. In control condition seed germination was 32%. Significant effect of phytohormones on seed germination (more then 80%) was registered in laboratory in Petri dish. \( \text{GA}_3 \) treatment improved the germination percent compared to the control. The maximum germination percent was observed in \( \text{GA}_3 \) 75 ppm (82%) and rest two ppm was showed 80% germination. However, in IAA hormones the germination percentage range was observed between 50-55%.

In the second hand seed germination was started within 5 days in soil medium (Figure 2). In soil condition G+DLM is the best for seed germination, it showed maximum seed germination 75% then Garden soil 61.6% and minimum seed germination observed in rest two soils medium respectively.

The results of soil testing are presented in Table 3. The results indicate the variation in soil parameter viz. organic carbon, phosphate and potassium in different soil. Germination results varied in different soil types. The maximum seed germination was observed in G + DLM. These soils also have highest desirable soil properties such as organic carbon 0.795 and 0.795, potassium 280.00 phosphate 30.488 and soil pH 6.8 respectively.

![Figure 1](http://www.openaccessscience.com)

**Figure 1:** Effect of phytohormones on seed germination.

![Figure 2](http://www.openaccessscience.com)

**Figure 2:** Effect of soil medium (with different compost) on seed germination.

Among the phytohormones tested viz. \( \text{GA}_3 \) and IAA, the promotion in seed germination was found by \( \text{GA}_3 \), (80-82%). In the various kinds of soil tested viz. G, G + FYC, G + GLM, G + DLM, the best result for seed germination was observed in the soil comprising the 1:1 mixture of G + DLM. The present study recommended \( \text{GA}_3 \) and G + DLM both are the best treatment for increase the seed germination of the *Andrographis paniculata*.

<table>
<thead>
<tr>
<th>Soil type</th>
<th>pH</th>
<th>Organic carbon</th>
<th>Phosphate</th>
<th>Potash</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>7.1</td>
<td>0.630</td>
<td>20.720</td>
<td>224.00</td>
</tr>
<tr>
<td>G+FYC</td>
<td>7.3</td>
<td>0.780</td>
<td>26.344</td>
<td>271.04</td>
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<tr>
<td>G + GLM</td>
<td>6.5</td>
<td>0.660</td>
<td>29.304</td>
<td>263.20</td>
</tr>
<tr>
<td>G + DLM</td>
<td>6.8</td>
<td>0.795</td>
<td>30.488</td>
<td>280.00</td>
</tr>
</tbody>
</table>

Table 1: Soil analysis of various soil samples.
Conclusion

From the above finding it may be summarized that the GA$_3$ hormones can be recommended for the improvement of seed germination. If the phytohormones are not available it can be replaced by G + DLM.

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References


