Effect of Rooting Hormone (4-(Indol-3-y1) Butyric Acid) on Asexual Propagation of A. Petersiana

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1. Introduction
Wild plants are less preferred in cultivation despite their contribution in preference and nutritional benefits hence the need for considerable attention being paid to wild fruit trees (Valvi et al., 2011). Valvi et al. (2011) argues that scientific research studies of wild fruits are crucial for wild fruit trees as wild fruit trees are potential sources of nutrition during time of scarcity and that wild fruit trees can be propagated to meet the food demands for increasing human population. Selection, sound breeding and application of biotechnology have made it possible to develop wild fruit tree into varieties which are more palatable and preferred by man that could be propagated under field conditions.
(Campbell, 1987). There was very limited focusing on African wild fruit trees due to limited knowledge, expertise and unavailability of financial funding of such developmental projects. Domestication of wild plants have influenced human diet since ancient time when man started domestication of plants and this have deviated food diversity and narrowed genetic diversity in cultivated plants. Sankaran et al. (2005) mentioned that domestication results in standardization of agronomic activities to ascertain maximum and quality yield attainment.

2. Review of literature

Priority of wild plants being selected to constitute to cultivated plants was given to wild plants that yield more benefits to man since the ancient period, nevertheless some wild plants like climbing wild apricot have not been given limited attention. This is mainly due to scarcity of the fruit tree, unavailability expertise to carry out research in the fruit tree and unavailability of financial resources to fund domestication programme in African countries where the fruit trees originates (Pye-Smith, 2010). The first collection of climbing wild apricot revealed to the scientific world was done by Professor Wilhelm Peters (1815-1863) of Berlin who made collection of the fruit tree in Mozambique in the early 19th century (Hyde et al., 2013) and from that period there was limited research being done on the fruit tree. Climbing wild apricot’s limited attention maybe attributed to the fact that the wild fruit tree is native to southern African countries (Akinnifesi et al., 2008) like Zimbabwe, South Africa, Mozambique, Zambia and Namibia which have limited resources in developmental projects of developing wild plants into domesticated plants

Climbing wild apricot population is under extinction and its natural propagation in the wild is being jeopardized by natural and man induced extinction. In the wild environment propagation of wild trees is influenced by a number of factors, which are soil moisture, planting depth, pests, and soil structure completion. There is need to take measures to conserve and manage climbing wild apricot tree population which is being threatened by natural and man induced extinction. Ministry of Natural Resources and Tourism (1997) and Ross-Ibarra et al. (1997) argues that extinction of wild trees is mainly caused by changes in climate, invasion by alien species, deforestation and veld fires. Moreover unfavorable edaphic factors of fertility, soil structure and texture are among factors threatening the population of climbing wild apricot. Climbing wild apricot are propagation in the wild is being inflicted hence the wild tree is towards extinction and its popularity and contribution is decreasing to the rural livelihood is decreasing (Akinnifesi et al., 2008).

The whole globe is sorely growing and concentrating virtually on same types of crops in the cropping system with mainly cereals having the highest hectares of production. Some of crops are yielding higher yield in foreign areas as compared to areas of their origin (Hyde et al., 2013). With this accession climbing wild apricot can be propagated in other parts of the globe and attain better productivity. There is need to increase exploitation of important wild fruit trees through identification of propagation methods. Improvements of the wild species to obtain better varieties may be through selection, biotechnology and breeding. In Cameron people are now propagating and domesticating wild fruit trees that are sweet varieties and yield early than their natural counterparts (Pye-Smith, 2010). The domestication programme in Cameroon was made possible through the participation of farmers in selection of better tasting varieties and scientist in breeding and biotechnology application (Pye-Smith, 2010).

Communities are willing to domesticate wild fruit trees that are crucial to their livelihood (Campbell et al., 1987; Wiersum, 1997; Akinnifesi et al., 2006; Pye-Smith, 2010). Major hindrance to domestication of wild fruit trees is knowledge of propagation method(s), poverty and lack of monetary funding for domestication programme, lack of expertise for carrying out relevant researches for perpetuation of the domestication programme (Wiersum, 1997 and Pye-Smith, 2010). Wiersum (1997) mentioned that when community has knowledge of propagation method of crucial wild fruit tree, the community can easily propagate the wild fruit tree to ensure close availability and increased exploitation of the fruit tree.

Enhancement of rooting of cutting and ground layered stems has been done through use of rooting hormone. Rooting hormone is applied on propagation material and it function in stimulating formation of roots on propagation material. Enhancement of the proliferation of roots increases the
chance of success of propagation material into individual plants or plantlets that can be transplanted (Blythe and Sibley, 2003; Cerveny and Gibson, 2005; Kroin, 2010 and Kroin and Hortus, 2013). There are various rooting hormone formulations and are found in different forms of liquid, gel and powder (Blythe and Sibley, 2003 and Cerveny and Gibson, 2005). Moreover there are different methods of applying rooting hormones to propagation material, which are spray drip down, total, immerse, dry dip, basal long soak and basal quick dip (Blythe and Sibley, 2003, Cerveny and Gibson, 2005). Each different rooting hormone type accompanied by application method is suitable for different tree species (Kroin, 2010 and Kroin and Hortus, 2013). This present study is going to ascertain efficacy of seradix (4-(Indol -3-yl) Butyric acid) on the rooting of cuttings and ground layered stems in establishment of individual plants that can be transplanted.

3. Materials and Method

3.1 Study area

The study was done at Masvingo Polytechnic College in Masvingo District in Masvingo Province of Zimbabwe. Masvingo Polytechnic College is in Masvingo town and on the east side along Masvingo-Beitbridge road 20°51’S and 30°51’E and the study site is on altitude of 1240 m above sea level. Masvingo Polytechnic College is in agro-ecological region IV (Thomas and Vincent, 1961). It is dominated by Savannah and Miombo. Mugandani et al. (2012) found out that the study area has a mean minimum temperature range of 11-20 ºC; mean maximum temperature range of 19-26ºC and a mean annual temperature range of 18-24ºC. Annual rainfall ranges from 450- 650 mm. Most of the rainfall is received in summer from October up to March. The soil is of the fersiallistic group, brown sandy soil derived from granite. The terrain generally ranges from moderate to steep slopes with shallow soils and of poor structure. Below is a map showing the location of Masvingo Polytechnic College in relation to Masvingo District.

![Location of Masvingo Polytechnic College in Masvingo District](image)
Preliminary studies done showed that when a crawling stem of climbing wild apricot is covered with moist soil together with appropriate time period given it may develops roots. When the rooted stem is cut, the cut part would develop shooting and develop into an individual plant. Below is a stem which have been covered with moist soil and after sometime roots developed and later shooting into individual plant.

![Stem with developed roots and young shoot](image)

**Fig 2:** Stem which has developed roots after being covered with moist fertile soil on picture A and young shoot produced from ground layering on picture B

The study identified the effect of rooting hormone seradix B₂ and seradix B₃ on the rooting of ground layered stems and cuttings to develop into young plants that can be transplanted. The research was done in 2011. Creeping stem vines approximately ranging from 0.3-0.5 cm thick were ground layered and cuttings. A total of 450 cuttings and creeping stems were ground layered using soil media found where the tree naturally exists. Ninety cuttings were planted and ninety creeping stems were ground layered at a given time. Each of the thirty propagation material of different propagation method (cuttings and ground layering) was under a different treatment (seradix B (4-(Indol -3-y1) Butyric acid) No 2, No 3 and no rooting hormone). This was repeated five times in one year.

### 3.2 Experimental design

The experiment was laid out in a RCBD with 2 x 3 factorial treatment structure with two levels of vegetative propagation method (Layering and cutting) and three levels of rooting hormone seradix B (4-(Indol -3-y1) Butyric acid) No 2, No 3 and no rooting hormone. The experiment was replicated five times.

### 3.3 Data collection

Data collected include shooting percentage of layered stems and cuttings and development into individual young plants that could be transplanted or depended on their own and this was termed success. Number of plants that become independent after cutting from mother plant on ground layering and number of successful cuttings that become independent in a time period of 90 days was counted.

### 3.4 Data analysis

To achieve normal distribution, data of success of layered stems and cuttings to become individual plants was square root transformed. Analysis of variance (ANOVA) using GenStat statistical package version 14 was used to analyse the difference among the propagation methods and treatments. Least significant difference (l.s.d) was used to separate the means of treatments of three levels of rooting hormone seradix B (4-(Indol -3-y1) Butyric acid) No 2, No 3 and no rooting hormone at 5% level of significance. Standard error of differences of means (s.e.d) was used to separate the means of two asexual propagation methods of using cuttings and ground layering at 5% level of significance.
4. Results

4.1 Effects of rooting hormone on percentage success of *A. petersiana* asexual Propagation

There was low success percentage of asexual propagated material and that rooting hormone had no significant effects on the rooting and success of asexual propagation material. Table 1 below shows effect of rooting hormone on percentage success of *A. petersiana* asexual propagation material of ground layering and cuttings.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Success rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB2</td>
<td>22.4a (3.93)</td>
</tr>
<tr>
<td>SB3</td>
<td>21.5a (3.81)</td>
</tr>
<tr>
<td>Control</td>
<td>23.1a (3.92)</td>
</tr>
</tbody>
</table>

Table 1: Effects of rooting hormone on percentage success of *A. petersiana* asexual propagation

Means followed by a same superscript latter were not significantly different at (P<0.05). Numbers in parenthesis were square root transformed hence the F-prob, LSD and CV% values used were those of transformed data.

4.2 Effect of propagation method and rooting hormone on percentage success rate of *A. petersiana*

Ground layering had higher success rate percentage than use of cuttings. There was no significant interaction between asexual propagation methods (ground layering and cuttings) and rooting hormone on the success rate of propagating *A. petersiana*. Figure 3 shows interaction effect of propagation method and rooting hormone on percentage success rate of *A. petersiana*.

Fig 3: Effect of propagation method and rooting hormone on percentage success rate of *A. petersiana*
Effect of asexual propagation method of *A. petersiana* on percentage success rate

There was high success of propagation when using ground layering than when using cuttings. Table 2 below shows effect of asexual propagation method of *A. petersiana* on percentage success rate.

**Table 2: Effect of asexual propagation method of *A. petersiana* on percentage success rate**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Success rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuttings</td>
<td>2.10 a (1.35)</td>
</tr>
<tr>
<td>Ground layering</td>
<td>42.6 b (6.42)</td>
</tr>
<tr>
<td>Grand mean</td>
<td>22.3 (1.35)</td>
</tr>
<tr>
<td>Fprob</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lsd</td>
<td>0.436</td>
</tr>
<tr>
<td>CV%</td>
<td>14.7</td>
</tr>
</tbody>
</table>

Means followed by different superscript letter were significantly different at (P<0.05). Numbers in parenthesis were square root transformed hence the F-prob, LSD and CV% values used were those of transformed data.

5. Discussion

The study revealed that seradix B (4-(Indol-3-yl) Butyric acid) No 2 and No 3 have no effect on the rooting and success of cuttings and ground layered stems. There is need to change rooting hormone and or change the application method as measures to enable increased rooting of climbing wild apricot propagation materials. Blythe and Sibley (2003) argued that they are various rooting hormones that are suitable for different plant species. Climbing wild apricot propagation material of cuttings and stems may be are not compatible with seradix. Perhaps there is need to increase the percentage composition of active ingredient of 4-(Indol-3-yl) Butyric acid in seradix rooting hormone as a measure to enable increased rooting of the propagation material. Cerveny and Gibson (2005) mentioned that increasing the concentration of the active ingredient can increase the rooting of propagation material or decrease the rooting to complete rooting failure due to rooting hormone active ingredient inhibiting the rooting. Thus there is appropriate concentration of the active ingredient which should be attained to enable stimulation proliferation of rooting on propagation material (Kroin, 2010 and Kroin and Hortus, 2013).

6. Conclusion and Recommendation

Seradix B (4-(Indol-3-yl) Butyric acid) No 2 and No 3 have no effect on propagation of cuttings and ground layering of climbing wild apricot stems. Ground layering is a better asexual method to use when propagating climbing wild apricot when compared to use of cuttings. The use of rooting hormone SB2 and SB3 does not show any difference with the control hormone and this means these hormones have similar effects on propagation of Wild Apricot. Ground layering was seen as the best method for propagating Wild Apricot asexually. The use of cuttings does not show a positive result as a method of propagating wild apricot. Farmers are recommended to use ground layering for propagating wild apricot and they can use any of the rooting hormones as they have same effect.

7. References


