Study upon Seed Germination of 
Chrysanthemum Cinerariaefolium (Trev.) Vis.

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Abstract. Chrysanthemum cinerariaefolium (Trev.) Vis is a species known for its usage in natural control of insects, inside the house and in biologic agriculture, as well as for its usage in treatment of different affections of the human and animal body.

Aspects regarding seed germination of this species are known as being a difficult problem, specialized literature presenting different values, generally reduced.

The present study establishes germination of 1, 2 and 3 years old seeds by using classical methods in blotting paper envelopes and blotting paper layer, in Linhardt dishes.

In order to identify solutions that would contribute to the growth of germinating values, stimulating methods were tested by exposing seeds to darkness or light or by subduing them to a KNO₃ and energized water treatment.

Results show a low germinating percent, between 20% and 30% for all the ages of the studied seeds. Stimulating methods do not induce an appreciable germination increase, the highest percentage (31%) being obtained by using the Linhardt dish method combined with darkness exposure and application of KNO₃, 0.2% solution and by using energized water (31.75%). When coming to stimulation, best results were given by energized water treatment.

Keywords: pyrethrum, germinating ability, germinating energy, germinating methods, stimulating germination.

INTRODUCTION

Pyrethrum - Chrysanthemum cinerariaefolium (Trev.) Vis is the most important botanical insecticide and it is estimated that over 60% of all the pyrethrum ever used was applied on or near man or food.

Pyrethrins are natural products, derived from pyrethrum flowers that have been used safely and effectively as an insecticide for over a century (Maciver et al., 1997). They are short residual and biodegradable. These characteristics provide an advantage in safety, but also limit the conditions under which it is most effective.

Products based on pyrethrins have a very powerful and rapid action against all of the major public health pests, such as mosquitoes, cockroaches, flies, fleas, bugs, lice, mites and ticks (Maciver et al., 1997) and they are also widely used in organic agriculture.

It must be also taken into consideration the presence of pyrethrum extract in different products used to control enteric parasites, both on humans and animals.

Starting a pyrethrum crop is greatly influenced by the plant’s possibilities of multiplication. Obtaining it from seed is a preferred option, due to a better rooting and fastening.
The controversy appears when it comes to seed germination. Păun (1988), quoting Ilieva, shows that seed germination decreases from 76% in the first year after harvesting, to 62% in the second year and 53-36% in the third and fourth year, while, Munteanu et al. (2007) indicate a germination of 50%-60%, Chandler (1956) one of 35%, Mohandass and Sampath (1983) a germination of 58% and a germinating energy of 9.5%.

Taking these aspects into consideration, the results exposed in this paper concern germination values (germinating ability and energy) of pyrethrum seeds harvested in 2007, 2008 and 2009, seed age influence upon these percentages and the efficiency of some methods used to increase these values.

As germinative capacity of seeds does not imply a success in emergence, this study also concerns the determination of emergence percentage, for all the three ages of the seed.

MATERIALS AND METHODS

In order to determine germinating ability and energy, the following classic methods were used: Linhardt dishes and blotting paper envelopes. Seeds were laid in 4 repetitions of 100 pieces each, for each provenance year (2007, 2008 and 2009) and for each method.

Trials regarding germinative values increase were done by applying KNO$_3$ treatment (when KNO$_3$, 0.2% was used instead of water), for both Linhard dishes and blotting paper envelope methods by exposing water and KNO$_3$ dishes to light and darkness and by moistening blotting paper envelopes into energized water (unconventional method used for all the three ages of seeds). Running water was energized with a DEA device, left under the plastic bottle recipient for a few hours.

According to the inventor, by leaving the device under the water recipient between 3 and 5 minutes, it eliminates instantaneously the carbon dioxide, rises the water pH, neutralizes the nitrites, eliminates the residual chlorine and polarizes the water molecule by modifying the angle between the oxygen and hydrogen molecule (Dincă, 2004).

All the assays were kept at the constant temperature of 20°C.

In order to determine the emergence percentage, 4 repetitions of 100 seeds each and for all the 3 ages, were sowed in black peat with a pH of 6 and a NPK proportion of 14:16:18.

Germinating energy was determinate at 7 days from emergence and germinating ability at 21.

RESULTS AND DISCUSSION

As it can be seen in Tab. 1, pyrethrum has a germinating ability between 20% and 30%, the last value not being reached, in any of the cases.

No major differentiation can be deduced between the 3 ages of the seed. Values remain approximately between the same limits, seeds of 2009 having the best germination (29.75%), when determined through Linhardt dish method, but also the lowest one (18%), when determined through envelope method.

A small difference can be observed between the 2 methods, the Linhard dish being a bit more efficient, probably because of a better aeration.

Though fresh seeds seem to have a better germination, which decreases from one year to another in small steps, they also have a weaker germinating energy, which seems to increase together with the age.
Seed germination determined through different methods

<table>
<thead>
<tr>
<th>Germinating energy</th>
<th>Provenance year of the seeds</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>envelopes</td>
<td>5%</td>
<td>7.50%</td>
<td>1.75%</td>
<td></td>
</tr>
<tr>
<td>Linhardt dishes</td>
<td>5%</td>
<td>3.75%</td>
<td>1.50%</td>
<td></td>
</tr>
<tr>
<td>Germinating ability</td>
<td>envelopes</td>
<td>20.25%</td>
<td>25.50%</td>
<td>18%</td>
</tr>
<tr>
<td>Linhardt dishes</td>
<td>21.75%</td>
<td>26.50%</td>
<td>29.75%</td>
<td></td>
</tr>
</tbody>
</table>

Germinating percentages remain approximately between the same values even when applying classical methods of stimulation (Tab 2). Light or darkness doesn’t seem to influence pyrethrum seed germination. When water as a factor remains constant, 26% of the seeds germinate while exposed to light, 12% while exposed to darkness in Linhardt dishes and 25% in envelopes. By exposing the Linhardt dish to light, a certain efficiency is obtained when compared to darkness exposure.

The best stimulating method proved to be the combination darkness- KNO₃- Linhardt dish. Germination reached the 31% percentage for the germinating ability and 8% for the germinating energy, these being the highest percentages obtained in testing and stimulating germination for these seeds, through classical methods.

The lowest values for germinating ability were obtained when using the combination Linhardt dish- water- darkness exposure, while for germinating energy, when using the combination Linhardt dish- KNO₃- light exposure.

| Stimulating germination by light-darkness exposure and KNO₃ treatment |
|-------------------------------------------------|-----------------|--------------|
| Envelopes, darkness                             | Germinating energy | Germinating ability |
| water                                           | 5%               | 25%          |
| KNO₃                                            | 2%               | 26%          |
| Linhardt dishes                                 | darkness         | water        |
|                                                 | 1%               | 12%          |
|                                                 | KNO₃             | 8%           | 31%          |
|                                                 | light            | water        |
|                                                 | 6%               | 26%          |
|                                                 | KNO₃             | 0%           | 24%          |

As it can be seen in Fig. 1 and Fig. 2, the unconventional stimulating method for germination (energized water used instead of running water), brought an increment of several percentages to both germinating energy and ability, for all the 3 years of seed provenance.

Percentages still remain between the 20%- 30% limit for the germinating ability, fresher seeds (from 2009) reaching 31.75%; 2008 seeds had the highest percentage for germinating energy (12.25%), while 2009 seeds had the lowest one, for this method.
The emergence percentage for peat underlayer (Tab. 3) show an emergence delay for fresher seeds (from 2009) which can be correlated with their lower germinating energy. Still, the same seeds, having a generally higher germinating ability, make up for the late emergence at 21 days from sowing and attain the highest values: 23.25%.

The 2007 seeds prove to have the fastest germination, reaching a percentage of 7.5% at 9 days from sowing, but they also turn out to register the lowest percentage of emerged plants at 21 days (18%).

<table>
<thead>
<tr>
<th>Days after sowing</th>
<th>Emergence percentage according to the year of provenance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
</tr>
<tr>
<td>9</td>
<td>7.50</td>
</tr>
<tr>
<td>14</td>
<td>18.50</td>
</tr>
<tr>
<td>16</td>
<td>18.25</td>
</tr>
<tr>
<td>21</td>
<td>18</td>
</tr>
</tbody>
</table>

Tab. 3

Fig. 1. Comparative study of the germinating energy: water- energized water

Fig. 2. Comparative study of the germinating ability: water- energized water

Percentage of emergence on peat underlayer
CONCLUSIONS

Pyrethrum seeds have a weak germination, comprised between 20% and 30%, achieved in a relative long period of time (3 weeks) that is why it is recommended the usage of seed beds or other methods of obtaining plants in order to start a special crop.

Trials meant to improve germination did not give favorable results, the 30% value being topped only by 1 up to 2 percentages, without shortening the time span.

Seeds ageing up to 3 years do not determine an important decrease of the germinating capacity.

The increase of germinative values under the influence of energized water whose effects are not fully known, for now, requires profound studies.

REFERENCES