

## EFFECT OF SOME HOMEOPATHIC DILUTIONS ON *ASIMINA TRILOBA* DUNAL GERMINATION AND GROWTH - PRELIMINARY STUDY

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### Abstract

*Germination and early growth of paw paw (Asimina triloba Dunal) seedlings were studied in an experiment performed in the greenhouse of USAMV Bucharest, using high dilutions of Natrium muriaticum (NaCl), Silicea and Growth Hormone Release Factor (GHRF) in 7 variants versus a control group: V1- control, V2 - Silicea CH 200, V3 - Silicea CH 30, V4 - Silicea DH 6, V5 - NaCl (Natrium muriaticum) CH 200, V6 - NaCl (Natrium muriaticum) CH 30, V7 - NaCl (Natrium muriaticum) DH 6, V8 - GHRF CH30. The obtained results demonstrated that high dilutions of NaCl, Silicea and GHRF had significant effects on the germination and growth of Asimina triloba Dunal and can be used for further studies regarding seeds invigoration.*

**Key words:** paw paw, Natrium muriaticum, Silicea, Growth Hormone Release Factor.

### INTRODUCTION

The Northern banana or paw paw (*Asimina triloba* Dunal), originated from the Eastern part of USA, is the only representative of the *Annonaceae* family cultivated in the temperate areas (Stănică and Cepoiu, 2003; Stănică, 2012). It was rediscovered at the end of XX century, due to the extraordinary fruits nutraceutical properties. In Romania, the specie was introduced in 1926 by Suci family from Alba County. Extended researches on the plant and new varieties are made at the Faculty of Horticulture within USAMV București, starting with 1995 (Ghena et al, 2004; Cotruț et al, 2005).



Figure 1. *Asimina triloba* fruits

The best paw paw propagation method is by seeds, followed eventually by grafting (Stănică et al, 2002).

The present experiment was designed to study the effect of high dilutions of some homeopathic remedies on the germination and early growth of seedlings of *Asimina triloba* Dunal.

Germination and early seedlings growth represent stages of the ontogenetic cycle of the plant, with major impact on seedlings establishment (Delian, 2013), as well as on the successful overcoming of the negative effects of possible stressors (Delian, 2006).

High dilutions are also known as homeopathic preparations, being defined as diluted and mechanically agitated (potentized) substances prescribed on the principle of similitude.

Depending on the dilution ratio used at each step, there are three scales of homeopathic dilutions, namely the decimal scale D or DH (ratio 1/10), the centesimal scale C or CH (ratio 1/100) and the LM scale (ratio 1/50000).

Recent studies of electron microscopy HRTEM and FESEM demonstrate that all homeopathic dilutions, starting with centesimal 6 (CH 6) or 50-milesimal 1/LM 1 dilution, contain nanoparticles with elements of the original

substance and their effects obey to the rules of nanomedicine (Rajendran, 2015 and 2017).

Other researchers found also nanoparticles in the high homeopathic dilutions and postulated that nanoparticles induce a hormetic activation (Chikramane et al, 2012 and 2017). These findings are confirmed by Wassenhoven, showing that there is a specific material and electronic signal in the high homeopathic dilutions (Wassenhoven, 2018).

The effect on germination and growth of high dilutions on different plants (mainly wheat) was studied from the beginning of last century (Kolisko, 1923). Since then, a multitude of experiments are described in literature, showing the effects of high dilutions on germination and early growth, especially on plants impaired by abiotic stress, the first literature review being published in 1984 (Scofield).

Different studies were performed with high dilutions of substances, including sodium chloride or silica, but until present time, not on *Asimina triloba*.

Carvalho (2004) observed the effects of *Natrium muriaticum* on the growth of feverfew and its chlorophyll and proline content, after stress by water shortage.

Tighe (2005) studied the effect of *Natrium muriaticum* (sodium chloride) 12 CH, 18 CH and 24 CH on cress (*Lepidium sativum*) germination and growth, after the plant was stressed with a sodium chloride solution 1%.

Lensi et al (2010), studied the effects of *Natrium muriaticum* (sodium chloride) in 6 CH and 30 CH dilutions, compared with NaCl 5% on the growth of *Phaseolus vulgaris* and observed a positive effect.

Mondal used seeds of *Vigna unguiculata* pre-treated with *Natrium muriaticum* and then stressed with NaCl, with increased germination in the pre-treated group (Mondal et al, 2012).

Chapman (2004) noticed the positive influence of high dilutions of *Silicea* and *Sulphur* on the growth of lettuce in a double blind placebo controlled study performed on lettuce plants.

In 2014, Pawan and Archana used a preparation of homeopathic *Silicea* (*Silesia* 12 C) in *Chrysanthemum* to fight stress conditions induced by wet weather and observed that the study group remained unaffected while the

control group wilted and died in a proportion of 82%.

Our study is the first experiment performed with high homeopathic dilutions used to study the effects on the germination and early growth of *Asimina triloba* Dunal.

## MATERIALS AND METHODS

The experiment took place at the Faculty of Horticulture, USAMV București, in the greenhouse using with seeds of paw paw, planted on 23<sup>rd</sup> of January, 2018.

The biological material consisted of two groups of 8 germination trays each, where an equal number of *Asimina* seeds were sowed.

The dimensions of the germination trays were the following: length of 60 cm; width of 30 cm and height of 7 cm and the substratum consisted of Kekkila DSM W/Brown peat with perlite.

The seeds planted in the trays were treated with homeopathic dilutions, beginning with 1<sup>st</sup> of March 2018, in 8 variants with 2 repetitions, namely:

Variant V1: Trays 7 and 15 - Control group (treated with simple water);

Variant V2: Trays 1 and 9 - *Silicea* CH 200;

Variant V3: Trays 3 and 11 - *Silicea* CH 30;

Variant V4: Trays 6 and 14 - *Silicea* DH 6;

Variant V5: Trays 2 and 10 - *Natrium muriaticum* (NaCl) CH 200;

Variant V6: Trays 4 and 12 - *Natrium muriaticum* (NaCl) CH 30;

Variant V7: Trays 5 and 13 - *Natrium muriaticum* (NaCl) DH 6;

Variant V8: Trays 8 and 16 - Growth Hormone Release Factor (GHRF) CH 30.



Figure 2. Germination trays on 1<sup>st</sup> March 2018

For each tray we used 500 ml of solution with water in which were added 10 drops of the homeopathic dilutions. The homeopathic preparations were obtained from Farmatop Pharmacy București. The rhythm of watering was at three days in the first month and weekly in the second month, during an interval from 1<sup>st</sup> of March till 15<sup>th</sup> of April 2018.

The data obtained daily by observation were recorded and compared, taking into consideration the number of seeds that germinated and the length of stems, with an evaluation at intervals of 2 weeks.

## RESULTS AND DISCUSSIONS

In a first step, we noticed the number of plants that germinated, as can be seen from table 1, where average values for the two repetitions are mentioned.

Table 1 - Evolution of paw paw (*A. triloba* Dunal) seeds germination under the influence of the homeopathic preparations.

| Day   | Ctrl | Sil C 200 | Sil C 30 | Sil D 6 | Nat C 20 | Nat C 30 | Nat D 6 | GHRF C 30 |
|-------|------|-----------|----------|---------|----------|----------|---------|-----------|
| 17.03 | 1.0  | 0         | 4.5      | 3.5     | 2.0      | 2.5      | 3.0     | 6.0       |
| 30.03 | 10.0 | 2.5       | 19.0     | 14.0    | 8.5      | 16.0     | 16.5    | 8.5       |
| 15.04 | 29.5 | 17.5      | 59.5     | 41.0    | 54.5     | 44.0     | 36.0    | 24.5      |

Seeds treated with *Silicea* CH 200 germinated later and in the smallest number while the seeds treated with *Silicea* CH 30 germinated in the highest number in all the determinations made. The following values as order of magnitude were recorded with *Natrium muriaticum* CH 200 and CH 30 where a higher number of seeds was observed at CH 200 dilution in the end of the study.

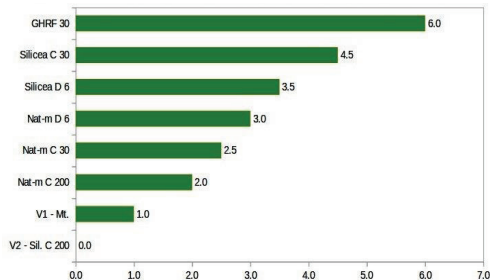


Figure 3. The influence of homeopathic preparations on the germination of asimina seeds on 17.03.2018

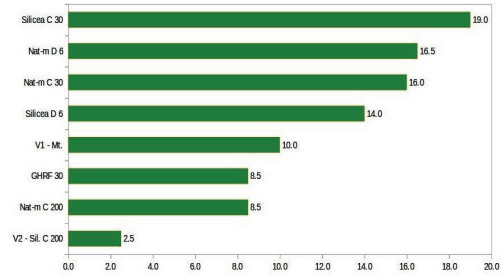


Figure 4. The influence of homeopathic preparations on the germination of asimina seeds on 30.03.2018

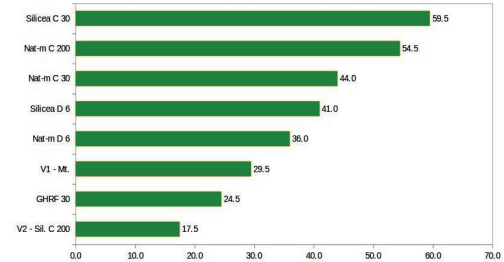


Figure 5. The influence of homeopathic preparations on the germination of asimina seeds on 15.04.2018

Growth Hormone Releasing Factor (GHRF) gave very good results with the highest number of seeds germinated on March 17, but this numerical advantage was not sustained later, finally arriving at a number of plants comparable to the control.

Calculating the Spearman coefficient for rankings comparing 17.03 vs 30.03 ( $r = 0.52$ ) and 30.03 vs 15.04 ( $r = 0.57$ ), there is no significant correlation between ranks, meaning there are important differences between the rankings, as shown in figure 7.

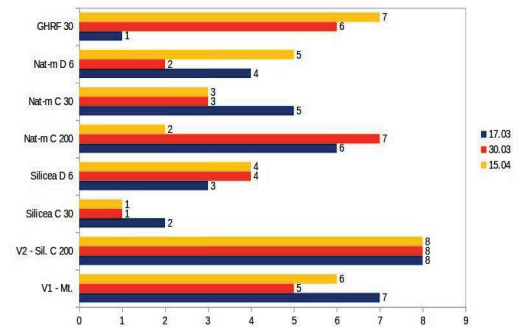


Figure 6. The ranking of the variants according to the number of germinated seeds of paw paw during the study

The maximum height (mm) of paw paw seedlings during the studied period is shown in

Table 2, with average values mentioned for the two repetitions.

Table 2 - Evolution of seedlings height (mm) of *Asimina triloba* Dunal under the influence of homeopathic preparations

| Day    | Ctr  | Sil C200 | Sil C30 | Sil D6 | Nat C200 | Nat C30 | Nat D6 | GHRF C30 |
|--------|------|----------|---------|--------|----------|---------|--------|----------|
| 17.03. | 10.0 | 0        | 3.0     | 12.5   | 3.0      | 12.5    | 7.5    | 21.5     |
| 30.03  | 45.0 | 11.5     | 35.0    | 55.5   | 40.0     | 50.0    | 60.0   | 55.0     |
| 15.04  | 85.0 | 95.0     | 80.0    | 80.0   | 80.0     | 80.0    | 90.0   | 105.0    |

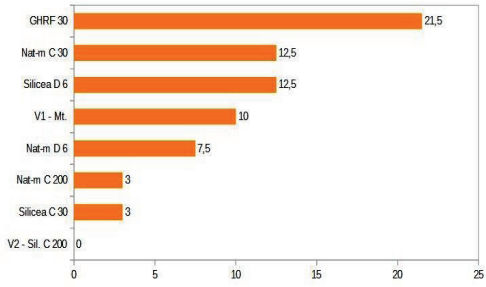


Figure 7. Height (mm) of paw paw seedlings under the influence of homeopathic preparations on 17.03.2018

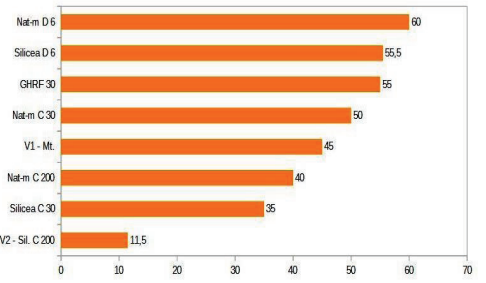


Figure 8. Height (mm) of paw paw seedlings under the influence of homeopathic preparations on 30.03.2018

It was observed that the highest initial increases were recorded in the GHRF-treated group followed by maximum heights in the treatments with the dilutions of *Natrium muriaticum* DH 6. *Silicea* DH 6 and *Natrium muriaticum* CH 30.

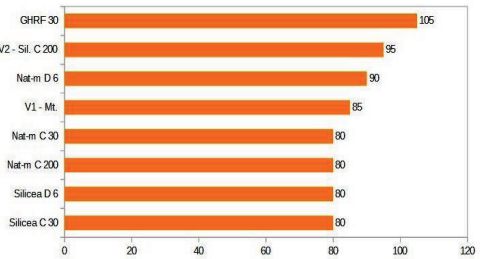


Figure 9. Height (mm) of paw paw seedlings under the influence of homeopathic preparations on 15.04.2018

At the end of the study period, it was observed that the highest growth of strains was found in GHRF CH30 treated plants followed by *Silicea* CH 200 where germination occurred later, but in the end, a significant increase was obtained. Calculating the Spearman coefficient for rankings comparing 17.03 vs 30.03 ( $r = 0.69$ ) and 30.03 vs 15.04 ( $r = 0.14$ ), there is no significant correlation between ranks, meaning there are important differences between the variants. On the other hand, it can be noticed that between 30 March and 15 April we have a much weaker correlation than in the first period. showing that in the second period we have bigger changes in the rankings.

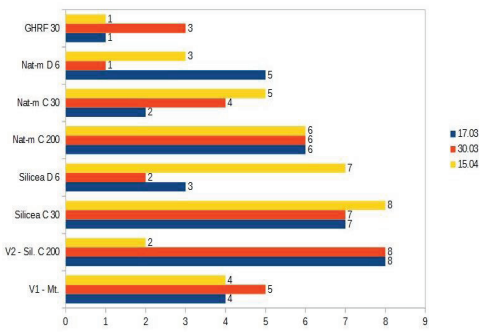


Figure 10. The ranking of the variants according to the height of seedlings of paw paw during the study

CONCLUSIONS

In conclusion. it can be stated that the used homeopathic dilutions had significant effects on the germination and growth of *Asimina triloba* Dunal and that *Silicea* CH 200 was most useful for obtaining plants of higher height, although they germinated later. The plants treated with *Silicea* CH 30 germinated in the largest number. An important effect on seedlings growth was also obtained with the GHRF CH 30, without the number of germinated seeds being significantly influenced. Further studies are needed on a larger number of repetitions to confirm the initial results.





Figure 11. Germination of paw paw seeds 90 days after sowing under the influence of *Silicea* CH 200



Figure 12. Germination of paw paw seeds 90 days after sowing under the influence of GHRF CH 30



Figure 13. Germination of paw paw seeds 90 days after sowing under the influence of *Natrum muriaticum* CH 30

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