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Article

Homeopatic for treatment of cucumber seeds contaminated with auxinic herbicide

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Abstract

The aim of the present study was to investigate the use of homeopathic preparations to reduce the harmful effects caused by auxin herbicide residues on seed germination and early development of cucumber seedlings. The statistical design was completely randomized (DIC) in a 3x5+2 factorial scheme, with four replications. The treatments were the combination of three homeopathic preparations (*Nux vomica*, *Carbo vegetabilis* and *Arsenicum album*), in five centesimal dynamizations (6CH; 12CH; 18CH; 24CH and 30CH), plus two controls (T0= distilled water and TH = herbicide (Artys™) without homeopathic treatment). Each experimental unit consisted of transparent acrylic boxes (Gerbox™) with 25 cucumber seeds, distributed over two sheets of paper for germination and moistened with homeopathic treatments. The experimental units were kept in a BOD germination chamber (in a controlled environment at 25 ºC and 12 ho of light). On the tenth day after the installation of the experiment, the following variables were evaluated: percentage of germination, shoot length, root length, phytointoxication, percentage of dead seedlings and total dry mass. The homeopathic treatment of cucumber seeds contaminated with picloram + 2,4-D herbicide (Artys™) causes positive changes, causing interesting effects on seed germination, but it is not efficient for the total neutralization of the effect caused by the herbicide 2 picloram + 2,4-D and development of early cucumber seedlings. However, for some variables, the results are inconclusive with the preparations (*Nux vomica*, *Carbo vegetabilis* and *Arsenicum album*), and their ultradilutions (6CH, 12CH, 18CH, 24CH and 30CH), requiring more research to evaluate and describe the complexity of properties inherent to homeopathic treatment.

Key words: agroecology, family farming, high dilutions, phytointoxication.

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Introduction

Picloram is an important herbicidal molecule, marketed under various commercial products worldwide and registered for several crops (Batistão *et al*., 2018). This molecule is characterized by being extremely active in dicotyledonous plants, and it is commonly used in mixtures with other herbicides, such as 2,4-D (Rodrigues and Almeida, 2005; Franceschi *et al*., 2017). Picloram can persist in the environment for up to 360 days, causing intoxication in sensitive species grown in succession (Santos *et al*., 2006; Batistão *et al*., 2018). In addition, due to the high leaching potential, it can cause contamination in groundwater (Assis *et al*., 2010).

These herbicides have long periods of residual activity, preventing, in the short and medium term, the cultivation of other agricultural species in environments that previously received treatment with these products (Santos *et al*., 2006), which can make unfeasible the use of areas where the farmer wants to carry out crop-livestock integration (Assis *et al*., 2010).

The intoxication symptoms produced in the leaves of several dicotyledons by auxinic herbicides are easily characterized and, therefore, are used to detect residues of these herbicides (Thill, 2003). one of the best known symptoms is the disorganized growth and epinasty of the leaves and stem twisting (Nascimento and Yamashita, 2009). In this sense, bioassays are carried out to evaluate residues of picloram + 2,4-D, using indicator plants with sensitivity to these compounds, such as cucumber (*Cucumis sativus*) (Barros *et al*., 2014). In this context, there is a need to seek methods that reduce the impacts caused by these pesticides. The use of agroecological practices has become an indispensable tool for family farmers, as it allows them to be autonomous in the field, reducing their dependence on external inputs.

According to Trebbi *et al*. (2016) and Bonato *et al*. (2009), from a sustainability point of view, the application of homeopathy in agriculture can offer potential benefits due to its high dilution, low cost and having few or no ecological side effects. To explain the effectiveness of homeopathy, alternative models have been proposed which, although outside the conventional scope, show strong theoretical coherence (Trebbi *et al*., 2016). According to Yinnon and Elia (2013), the hypothesis is that, as the dynamization process introduces mechanical energy and turbulence into the system, the preparation procedure (dilution and sucussion) can generate long-term changes in high dilutions.

When carrying out research with homeopathy, it is of great importance to choose the appropriate homeopathic preparations and to pay attention to the purpose of the study. According to Casali *et al*. (2002) and Felito *et al*. (2019a), the choice of homeopathic preparation to be used in the plant should be punctuated by the possibilities of analogy with human and animal materia medica. In this sense, the objective of the present study was to investigate the potential use of homeopathic preparations in reducing the harmful effects caused by residues of auxinic herbicide (picloram+2,4-D - Artys™) in the cucumber crop, which could be proposed to practical use in a context of sustainable agriculture.

Material and methods

Preparation of homeopathic solutions

The experiment was conducted from January to June 2016 at the Seed Technology and Matology Laboratory (LaSeM) at the State University of Mato Grosso, Brazil. Cucumber (*Cucumis sativus*) seeds (Isla Seeds) were purchased from a local company (Suprema Agropecuária, Alta Floresta, MT, Brazil) and submitted to a standard germination test (Brasil, 2009), in order to verify their vigor above 90% germination).

The homeopathic preparations of *Nux vomica*, *Carbo vegetabilis* and *Arsenicum album* were chosen based on the results obtained in several preliminary tests (Felito, 2018) Plant Physiology and Homeopathy of the Department of Biology of the State University of Maringá (UEM), according to the instructions contained in the Brazilian Homeopathic Pharmacopoeia (Brasil, 2011).

First, an aliquot was removed from the flask containing the mother tincture (TM), which was placed in another glass containing another 99 parts of water (a procedure called dilution). Then, it was shaken 100 times with rhythmic movements (succussion), with the aid of a mechanical arm dynamizer (Model Denise 50). This was considered the first dynamization (dilution and succussion) which was named 1CH (Centesimal Hahnemannan). To obtain 2CH, 1 part of 1CH was used, which was placed in another glass containing 99 parts of water and successed 100 times, finally obtaining 2CH. The same procedure was adopted to obtain 3CH, 4CH, and so on, until reaching 30CH. After preparing the dilutions, those that would be used in this research were separated, that is, the 6CH aqueous solutions; 12CH; 18CH; 24CH and 30CH. These were kept in hermetically closed amber bottles and stored in a laboratory environment (23 to 26 °C) for use. The experiment was implemented the next day in the morning.

Experimental design

The statistical design was completely randomized (DIC) in a 3x5+2 factorial scheme, with four replications, totaling 84 experimental units. Therefore, the treatments consisted of a combination of three homeopathic preparations (Nux vomica, Carbo vegetabilis and Arsenicum album), five dynamizations in aqueous solutions (6CH; 12CH; 18CH; 24CH and 30CH), in addition to two controls for all treatments (T0 = distilled water; TH = herbicide without homeopathic treatment), repeating four times (four repetitions). Each experimental unit consisted of one Gerbox™ box (11x11x4 cm transparent acrylic container, Prolab, São Paulo, SP, Brazil). Each box was lined with two sheets of Germibox™ paper (blotting paper, 250 mg grammage, 10.5×10.5 cm, Prolab, São Paulo, SP, Brazil), on which 25 seeds of the test species were deposited (cucumber).

Research and development

Before setting up the experiment for the main test, tests were carried out in order to determine the water absorption capacity and speed of cucumber seeds as a function of the time of exposure to the solution, so that the adequate time for absorption of the product could be determined. contaminating agent, without causing the death of the seeds. For the main test, a time of two seconds of exposure of the seeds to the herbicide mixture was determined, subsequently washed in running water for 60 s. The herbicide dose (Artys™) was established at 0.0625 ml for each 100 ml of distilled water, considered a low dose for agricultural use, but which may be enough to cause damage to the initial development of the species. This dose was defined from previous tests and based on research with reduced doses of these herbicides, carried out by the authors, and previously published (Nascimento and Yamashita, 2009; Franceschi *et al*., 2015, 2017; Batistão *et al*., 2018; Felito *et al*., 2019a, 2019b).

The contaminated seeds, after being washed in running water and drained, were neatly distributed in transparent acrylic boxes (Gerbox™), on two sheets of Germibox™ paper, previously autoclaved. In each box, according to the treatments, the leaves were moistened with 15 ml of each homeopathic treatment (prepared with dilution in distilled water). Only the T0 and TH treatments were moistened only with distilled water and in these, the cucumber seeds in T0 were not previously treated in herbicide solution. Subsequently, these foramina were randomly distributed inside the climatized germination chamber type BOD (Biochemical Oxygen Demand, Model EL100, Eletrolab, São Paulo, SP, Brazil), regulated for 12 hours of light and 25 ºC of constant temperature.

On the tenth day after the installation of the experiment, the variables germination percentage, shoot length, root length, phytointoxication, percentage of dead seedlings and total dry mass were evaluated. Shoot and root lengths were measured with the aid of a digital caliper and the dry mass with the aid of an analytical balance. To determine the dry mass, the material was dried in an oven with forced air circulation at 65 ºC for 48 h.

For the analysis of plant phytotoxicity, visual assessments were carried out 10 days after sowing, with attribution of notes on a scale from 0 to 10 (methodology adapted from SBCPD, 1995), in which 0 characterized the absence of any symptom of phytotoxicity and 10 , the death of the plant (Table 1). The data after analysis of normality were submitted to analysis of variance by the F test and when significant, the means of the treatments were compared by the Tukey test, at the level of 5% of probability, using the SISVAR software (Ferreira, 2011).

Table 1. Scale of grades used for visual evaluation of phythoxication of picloram + 2,4-D herbicides in cucumber seedlings.

Concept	Grades	Comments
Light	0-1	Weak or little obvious symptoms. Note zero: no changes in plants are observed.
Acceptable	2-3	Pronounced symptoms, however, fully tolerated by the plant.
Worrisome	4-5	Larger symptoms than in the previous category, but still recoverable, and with no expectation of reduction in economic income.
High	5-7	Irreversible damage, expected to reduce economic performance.
Very tall	7-10	Very severe irreversible damage, with a predicted drastic reduction in economic performance. Note 10 for plant death.

Adapted from SBCPD (1995).

Results and discussion

For the germination percentage was not verified effect of the isolated factors nor the interaction between them. For the variables: phytointoxication scores, air length, root length and total dry mass, there was only effect of the isolated factors ($p< 0.05$). Only for the variable percentage of dead plants did the effect of isolated factors and their interaction occur ($p< 0.05$) (Table 2). Despite the contamination of cucumber seeds with the herbicide, the germination process was not affected, with high germination (above 90%), regardless of treatment.

Table 2. Summary of analysis of variance of germination percentage (GER%), phytointoxication notes (PN), air length (AL), root length (RL), mortality variance (MV) and total dry mass (TDM) as a function of *Nux vomica*, *Carbo vegetabilis* and *Arsenicum album* homeopathic dynamizations in herbicide contaminated cucumber seeds.

Treatments	Average squares					
	GER (%)	PN	AL (cm)	RL (cm)	MV (%)	TDM (g)
Homeopathy (H)	4.729 ns	45.799**	8.217**	30.736**	2584.658**	0.0045**
Dinamizations (CH)	5.908 ns	35.887**	7.702**	20.608**	2538.039**	0.0078**
H x CH	5.291 ns	2.247×10^{-2} ns	3.604×10^{-2} ns	2.033×10^{-2} ns	1391.56**	0.0005 ns
Error	5.49	0.016	0.314	0.047	5.019	0.0009
CV (%)	2.37	1.99	11.41	14.41	7.05	18.55

**= significant at 1% probability by the F test; ns = not bsignificant at 5% probability by test F.

However, it is noteworthy that during the experiment, clear symptoms were observed in inhibiting the development of seedlings exposed to herbicide contamination, causing root base atrophy, abnormal air growth and premature exhaustion of seed reserves. According to Oliveira (2011), the growth of plants exposed to the solution with the herbicide is negatively affected due to its hormonal action, acting similar to the natural but more persistent and active auxin. This behavior is considered the main mechanism of action of this herbicide, stimulating the production of 1-carboxylic acid-1-aminocyclopropane (ACC) synthase, the enzyme responsible for the biosynthesis of the hormone ethylene (Queiroz and Vidal, 2014), explaining the symptoms observed in this study.

For aerial length, no difference was verified between the homeopathic preparations and the control composed only of seeds contaminated by the herbicide (TH). However, a difference was observed in relation to the control composed of seeds without contamination (T0). There was a difference in the response to the dynamizations used, with the lowest values of aerial growth being found in 24CH and 12CH, while the highest averages were verified in Control 0 (Table 3).

The plant's response to the application of homeopathic preparations can be negative; however, in other situations they may have a positive effect, depending on the similarity between the product and the plant. In this regard, Kolisko and Kolisko (1978) state that among homeopathic medicines, depending on their similarity with the plant, stimulating, inhibitory effects or even no effect on the metabolism of living beings can be observed. Thus, this variation in response to homeopathic treatment, causing positive or negative changes, which has already been portrayed in other studies (Castro, 2002; Armond, 2003; Duarte, 2003; Andrade, 2004; Felito *et al*., 2019a), is called of pathogenesis (Bonato, 2004; Lisboa *et al*., 2005).

Table 3. Aerial length of cucumber seedlings in study on neutralizing potential of homeopathic dynamizations of *Nux vomica*, *Carbo vegetabilis* and *Arsenicum album* in herbicide contaminated cucumber seeds.

Homeopathic Preparations	Aerial length (cm)	Root length (cm)	Phytointoxication	Total dry mass (g)
Witness 0	7.65 A	6.88 A	0.15 A	0.222 A
Witness H	4.93 B	1.17 B	8.45 D	0.182 AB
Nux vomica	4.57 B	1.14 B	6.95 C	0.152 B
Carbo vegetabilis	4.8 B	1.16 B	6.83 C	0.165 B
Arsenicum album	4.81 B	1.2 B	6.64 B	0.171 B
DMS Tukey 5%	0.809	0.31	0.187	0.044
		Dinamizations (CHs)		
Witness 0	7.65 A	6.88 A	0.15 A	0.222 A
Witness H	4.93 B	1.17 BC	8.45 G	0.182 ABC
6 CH	4.99 B	1.35 B	5.52 B	0.186 ABC
12 CH	4.39 BC	1.13 BC	6.86 D	0.147 BC
18 CH	5.21 B	1.19 BC	7.38 E	0.195 AB
24 CH	3.94 C	1 C	7.66 F	0.144 C
30 CH	5.1 B	1.16 BC	6.6 C	0.14 C
DMS Tukey 5%	0.881	0.34	0.203	0.048
CV (%)	11.41	14.41	1.99	18.55

Means followed by the same letter in the column do not differ significantly from each other by the Tukey test at 5% probability.

Another factor related to plant response to the tested homeopathic preparations may be due to the level of stress to which the plants were exposed (soaking in herbicide solution), which may have caused them irreversible damage in the normal resumption of seed germination. Homeopathy contributes as a detoxification treatment, but the response time of living organisms to homeopathic medicines occurs according to the degree of intoxication to which they are submitted (Lisboa *et al*., 2005).

Felito *et al*. (2019b) found that homeopathic preparations of *Nux vomica*, *Carbo vegetabilis* and *Arsenicum album* reduced the toxicity of 2,4-D + picloram in cattle manure, but there was no complete neutralization of the herbicide action in the early development of cucumber plants. Thus, plant responses to stress depend on duration, severity, number of exposures and combination of stressors (Bonato, 2007b), which may explain the results found in the present study.

Root development was also impaired by the action of the product, as the plants showed characteristic symptoms of intoxication caused by auxinic herbicides, with the formation of tumors and thickening at the base of the stem and root being verified during the experiment. These symptoms are common and are considered the most obvious alterations caused by auxinic herbicides (Silva *et al*. 2005). Among the studied homeopathic treatments and dynamizations, only Witness 0 presented higher values for the root length variable, statistically different from the others. The 24CH dynamization promoted lower averages than the other treatments, even when compared with Control H (Table 3), with no positive effect of homeopathic treatments on decontamination.

This harmful result of some dynamizations, observed in the present work, is commonly found in experiments with homeopathic preparations, being described by Espinoza (2001) as a 'zigzag' effect, which occurs when a substance in different dynamizations manages to revert its effect to certain characteristics.

In homeopathy, the same medicine often causes different effects depending on the dynamization applied. In certain dynamizations an increase may occur, while in other inhibitions may be reported within a specific physiological variable (Bonato, 2007a). Thus, this possible inversion of dynamization results may have been the cause and effect verified in the evaluations of this variable. The homeopathic preparation *Arsenicum album* had lower scores, demonstrating better results regarding the symptoms caused by the herbicide, followed by *Nux vomica* and *Carbo vegetabilis*, which did not differ from each other. However, it is worth noting that, despite the significant difference, the average scores were not as expressive.

The dynamizations also influenced the intensity of symptoms, with 6CH, 30CH and 12CH promoting better plant development (Table 3). Alterations in the phytointoxication analysis were differentiated according to the homeopathic preparations and dynamizations used. These results highlight the principle of specificity of action of homeopathic medicines, that is, each ultradilution manifests different characteristics (Figueiredo, 2009).

For the homeopathic medicine *Nux vomica*, the dynamizations that provided lower mortality were 6CH and 12CH; *Carbo vegetabilis* had a better response in 30CH and *Arsenicum album* had the lowest mortality rate among all treatments and dynamizations, with only 6% mortality in 6CH (Table 4).

For 6CH and 12CH of *Nux vomica* treatment tested in this research, it was found that these low dynamizations provided reduction in mortality of contaminated plants, being an indication of the possible degradation of herbicide compounds that became toxic to seedlings. This consequence demonstrates the action and efficacy of homeopathy for the studied treatment and, according to Andrade and Casali (2011), low dynamizations are efficient in the degradation of intoxicating compounds to the organism and provide efficacy in the reestablishment of the organism caused by several imbalances, causing the self-regulation of metabolic processes vital to the body.

Table 4. Cucumber seedling mortality (%) in a study on neutralizing potential of homeopathic dynamizations of *Nux vomica* (NV), *Carbo vegetabilis* (CV) and *Arsenicum album* (AA) in herbicide-contaminated cucumber seeds.

Dinamizations (CHs)	Homeopathic preparations		
	NV	CV	AA
6 CH	10 Ba	26 Cc	6 Aa
12 CH	14 Aa	30 Bc	38 Cb
18 CH	46 Bb	18 Ab	58 Cc
24 CH	70 Bd	18 Ab	74 Cd
30 CH	62 Cc	10 Aa	34 Bb
Witness 0		0	
Witness H		26	
CV (%)		7.05	

Means followed by the same uppercase letter in the row and lowercase in the column do not differ significantly from each other by the Tukey test at 5% probability.

It can be inferred that these results are consistent with the Law of Similitude, in which the toxic dose substance that generates several symptoms in the healthy living being, when given to the patient with the same symptoms, causes the state of balance (Moreno, 2000). that is, when receiving similar information, the environment is stimulated to the reaction (Casali *et al*., 2006). As observed in this study, Bonato (2007a) argues that when the homeopathic preparation that would be capable of producing the same symptoms in the plant is applied, the result was the minimization of the harmful effects caused by the biotic and abiotic factors, which in this case was the action of the herbicide.

The application of homeopathy may have triggered the secondary metabolism of seeds, establishing their defense mechanism, which reacted to external factors (herbicidal action of the chemical compound) seeking their survival by self-regulation. These results, as argued by Queiroz (2015), confirm that homeopathic preparations, governed by immateriality, when administered by similitude, access and strengthen the vitality of all living beings. The percentages obtained for seedling mortality observed throughout the evaluations show the beneficial effects of the application of homeopathic preparations to the seedlings, since low values were accounted for *Arsenicum album* treatments at 6CH dynamization with average of 6% followed by *Nux vomica* in the same dynamization with only 10% mortality.

It is worth mentioning the high mortality rate of *Nux vomica* and *Arsenicum album*, verified from 18CH and 12CH, respectively. Such results may be due to the pathogenesis reaction, that is, the antagonistic effect in similarity studies with plant homeopathy. This antagonism implies the opposition of incompatible systems, causing actions and reactions in the opposite direction, even if temporarily (Castro, 2002; Bonato, 2004; Lisboa, 2006). In the same way that homeopathic treatment can result in plant healing symptoms, the final result of this antagonism can be converted into negative effects, through physiological modifications that act on the vital force of the plant, changing its state and physiologically impairing its metabolism (Bastide, 1998). According to studies by Arruda *et al.* (2005) and Lisboa *et al.* (2005), this alteration, called pathogenesis, portrays the resonance between the opposite energies involved.

Thus, the ultradilutions used in this study with different homeopathic preparations (*Nux vomica* and *Arsenicum album*) provoked weak signals, but which caused great responses in the physical systems, as is the case of the mortality rate of the plants, due to the amplification mechanisms triggered by stochastic systems or ion channels (Galvanovskis *et al*., 1996). According to Casali *et al*. (2006), in several situations, the effect over time tends to come into balance, with oscillation within a certain range of dilution, due to the greater or lesser plasticity (morphological and physiological) of the plant species, when adapting to new conditions. energy and informational properties acquired by ultradilutions, generating the plant's capacity for self-regulation.

No significant difference was found for the determination of the total dry mass accumulation among homeopathic drugs, except for Witness 0, whose treatment promoted the production of higher values of this variable; however, there was no difference between the witnesses. Among the dynamizations, 18CH and 6CH were the ones that provided the largest dry mass accumulation, but not differing from the W control. Therefore, according to the dynamization used, the effect in response to stress caused by the herbicide can be opposite to the expected and may harm the body more than provide benefits (Table 4). This is another response that can be considered pathogenesis, as seen in the seedling mortality rate reported earlier.

Despite the dynamization behavior acting at random, better results were found in lower dynamizations for this variable (Table 3). Positive responses found due to lower dynamizations are also reported by other authors, such as Felito *et al*. (2019a), studying *Nux vomica* homeopathic preparations at 6CH, 12CH, 18CH, 24CH and 30CH, which provided increased dry mass in cucumber. Queiroz (2015) also observed that treatments with *Nux vomica* in the 3CH and 6CH dynamizations stimulated the production of lettuce dry mass when planted in soil without previous cultivation. This behavior may be due to low dynamization homeopathic preparations being denser and more molecular and may act on the physical body due to the resonance frequencies (Vithoulkas, 1980).

Krainer and Cuéllar (2009) reported that the dry mass of lettuce shoots treated with *Carbo vegetabilis* 12CH homeopathic preparation provided increase compared to other treatments. Bonato *et al*. (2009) report that 24CH and 30CH dynamizations of *Arsenicum album* promoted increase of *Mentha arvensis* fresh biomass when compared to the control and other analysis dynamics, however the dry biomass of the shoot and root system did not increase. was affected by *Arsenicum album*.

In homeopathic science these described behaviors occur frequently, since the same medicine can cause different effects on living beings, depending on the dynamization applied (Castro, 2002; Bonato and Silva, 2003). In some dynamizations promote stimulation and in other situations, an inhibition is verified (Armond, 2007). The wave event is common in nature and in living beings (Kent, 1996). Casali *et al*. (2006) describe those plants, in their immobility (autotrophic beings), respond with great intensity through their self-regulation. This regulation will move the secondary metabolism of the plant, seeking return to the balance of its physiological functions, vital for its survival in the midst and subsequent perpetuation of the species.

However, the modes of action by which the life force keeps the organic constituents in life and promotes the integrity of the living organism has still been studied aiming at the elucidation and understanding of the whole process (Bonato, 2004). The behavior observed in this study, as well as similar results in several other studies with the use of plant-applied homeopathy, demonstrates a different behavior from those described in Organon (Lisboa *et al*., 2005), in which increased dynamization does not elicit progressive physiological responses (Bonato, 2004). Each homeopathic preparation produces in the healthy plant peculiar symptoms according to its own wave frequency (Armond, 2007).

The action of homeopathic solutions under different study conditions, as was the case of this research, has been studied by Zacharias (2006) states that these effects are based on three models. Structural structures in which dynamization alters the molecular structure of the solvent and acts as a drug agent, the informational models in which the molecular structure is replaced by the informational structure the homeopathic medicine acting as a controlling element of the organism dynamics and finally the phenomenological models which after the dynamization process the agent becomes the organism's own response to some stimulus.

Moreover, another hypothesis, presented by Bonamin (2007) to explain the activity of homeopathic medicines, is that attributed to the 'side effect', that is, in a given substance, when in ultra diluted doses, it would be devoid of its primary effects on the sensitive organism but would retain its side effects. In this sense, the results observed in the different dynamizations in cucumber seedlings can be attributed to this side effect, whose symptoms occurred due to their overlap with the primary effects in this species and the studied dilutions.

The finding of specific properties of dynamized systems and the difficulty in designing experimental models and explanatory theories that can clarify these properties indicate the need to retreat expectations and, instead of seeking explanation for a probable mechanism of action of ultradilutions, from an even more fundamental basis: the description of their properties (Bonamin, 2007).

Conclusions

Homeopathic treatment of cucumber seeds contaminated with picloram + 2,4-D herbicide causes positive changes, causing interesting effects in herbicide neutralization. However, for some variables, the results are inconclusive with the preparations (*Nux vomica*, *Carbo vegetabilis* and *Arsenicum album*), and their ultradilutions (6CH, 12CH, 18CH, 24CH and 30CH), requiring further research in order to evaluate and describe the complexity of properties inherent to homeopathic treatment.

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