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Allelopathy Potential of Canola Extract on Quinoa Seeds

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Abstract

The canola plant has as one of its jobs, the usage as a cover plant, although substances present in this vegetable, such as glucosinolates, are known for exerting a negative effect in the succession culture. This way, the present work aimed to evaluate the allelopathy effect of aqueous extract of canola (*Brassica napus*) on the quinoa seeds (*Chenopodium quinoa*) *in vitro*; verifying the possibility of a rotation in such species. The used experimental outline was the on e entirely randomized, with four repetitions. The treatments were: concentrations of 1, 2.5, 5 and 10% of aqueous extract of canola and witness with distilled water, conducted in gerbox boxes, containing germitest paper with 25 seeds in each box, under the temperature of 25±1°C. Daily counting of the germinated seeds has been carried out in an eight-day period. At the end of this period, germination speed index, percentage of germination, vigor, average speed of germination and average time of germination were all analyzed. The data were submitted to the Lillifors normality test, not having the need for a transformation, the averages were compared by the Tukey Test (P≤0,05), through the computerized application WinSTAT®. The aqueous extract of canola affected negatively the germination variables of quinoa seeds.

Keywords: Brassica napus, Chenopodium quinoa, germinação

INTRODUCTION

Quinoa (*Chenopodium quinoa*) is considered a pseudo-cereal and a pseudo-oilseed, commonly cultivated in countries such as Peru, Bolivia, Ecuador, Chile, Argentina and the United States (LEÓN; ROSELL, 2007). It is rich in protein, gluten-free in its composition and considered a functional feed, it may be used in both animal and human feeding (SPEHAR et al., 2011).

Yet the Canola (*Brasica napus L.*), is considered a good option for covering the soil, belonging to the family of brassicas for containing substances named glucosinates, that can affect the germination and weed plants establishment (NORSWORTHY, 2003).

This way, the allelopathy effect has been assessed, considering to be an advantage or harmful effect of a given plant on another, through the liberation of chemical compounds in the environment (RICE, 1979), in this case, of canola on quinoa seeds, verifying the possibility of using them in a system of culture rotation.

Thus, this work's goal was to evaluate the allelopathy effect of the aqueous extract of canola on the quinoa seeds *in vitro*; verifying the possibility of rotation with such species.

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MATERIAL AN METHODS

The experiment has been carried out in the Laboratório de Sementes da Universidade Tecnológica Federal do Paraná, Campus Dois Vizinhos (UTFPR-DV), in Dois Vizinhos, PR.

The canola plants that composed the extract, were cultivated in the field and harvested before the flowering phase, as followed, they were dried out under 40°C for 24 hours, posteriorly grounded and weighted.

In the formulation of the concentrations of the extract, 10% weight/volume, that is, 100g of dry and grounded of canola material in 1L of distilled water were used. This solution was poured in glass beakers and left resting for a 24-hour period. At the end of this period, the extract was strained with the aid of a paper filter for elimination of coarse particles, and diluted according to the treatments as followed. From this standard solution, dilutions with distilled water have been carried out in order to obtain the remnant concentrations.

The treatments were composed by the concentrations; 1%, 2.5%, 5% and 10%, besides the witness (distilled water).

The adopted experimental outline was the entirely randomized with four repetitions. The experimental unit was composed by gerbox boxes containing germitest paper at the bottom of the box and also on the lid, in view of avoiding the accumulation of humidity and dripping on the seeds. Each gerbox had 25 quinoa seeds, humidified with 25 times the weight of the germitest paper, as determinated by the RAS (BRASIL, 2009). The seeds were allocated in a germinator, under constant temperature of 25±1°C.

Daily count of the germinated seeds has been carried out, in an eight-day period, considering the germinated seeds the ones which presented root protrusion above 2mm. The considered variables were emergency percentage (%) following the rules proposed by the RAS (Brasil, 2009); emergency speed index (IVE) according to the methodology proposed by Maguire (1962), calculated by the equation IVG= Σ (ni/ti) , in which ni = number of seeds that germinated each day and ti = day in which the seed germinated; (TMG), according to Silva and Nakagawa (1995), calculated by the formula TMG = (Σniti)/Σni, in which ni = number of germinated seeds by day and ti = day that the seed germinated.

The obtained data were submitted by the Lilliefors normality test, not having the need of transformation, the averages were compared by the Tukey Test (P≤0,05), though the computerized application WinSTAT® (MACHADO e CONCEIÇÃO, 2002).

RESULTS AND DISCUSSION

One can realize through Table 1, that there was a significant difference in all the studied variables.

Table 1: Speed of Germination Index (IVG), Germination Percentage (G%), Seedlings Vigor, Average time of Germination (TMG) and Average Speed of Germination (VMG) in quinoa seeds under the allelopathy effect of aqueous extract of canola, Dois Vizinhos – PR, UTFPR-DV, 2019.

Concentrations (%)	IVG	G%	vigor	TMG days^{-1}	VMG
0	53,8 a*	100 a*	100 a*	3,02 a*	0,33 a*
1	54,3 a	100 a	97,5 a	3,00 a	0,33 a
2.5	44,5 b	86,2 b	78,7 b	3,20 a	0,31 a
5	36,3 c	86,2 b	41,2 c	3,70 b	0,26 b
10	12,2 d	73,7 c	0,0 d	6,50 c	0,15 c

* Averages in the same column, followed by the same letters do not differ by the Tukey Test (P≤0,05).

Observing the variable speed of germination index (IVG), it is noticeable that the concentration of 10% was capable of reducing the index in 77%, comparing to the witness, making it evident the negative allelopathy effect that canola exerted on the quinoa.

The same occurs to the remaining studied germination variables, observing that as the extract concentrations increase, there is a gradual reduction of them. Comparing the biggest dose of these variables, of 10%, with the witness, of 0% of extract, one can verify a drop in 26% of the germinated seeds, that is, 26% of the used seeds in the treatment and evaluated ones, did not germinate in the eight-day period, occurring a loss when it comes to planting conditions.

A reduction in 100% in vigor is also evident in the biggest concentration in comparison to the witness; taking doubled time to germinate, considering the average time of germination (TMG). A decrease in 54,5% in the average speed of germination. There is a delay in the time of germination of seeds, due to the loss caused by the allelopathy activity of the canola aqueous extract.

The same damaging effect of canola has been observed by Moraes et al. (2011), in studying the effect of plants mulch on covering the soil, verifying that the bigger the level of canola mulch incorporating the soil, occurs a bigger decrease in the emergency speed index (IVE) and milhã emergency percentage.

Rizzard et al. (2008), also pointed out in experiments that the canola aqueous extract and also its mulch, do not favor the percentage of germination and emergency speed of picão-preto (*Bidens sp.*) and in soy beans.

CONCLUSIONS

It is noticeable that the canola aqueous extract applied in different concentrations on quinoa, harmed the evaluated germination variables, exerting a negative allelopathy effect on them.

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FUTURE WORKS

As a future project, it is intended to verify the effect of the extract applied *in vivo*, this way comparing the obtained results.

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