WFL Publisher
Science and Technology

Meri-Rastilantie 3 B, FI-00980
Helsinki, Finland
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Journal of Food, Agriculture & Environment Vol.13 (2): 256-258. 2015 *www.world-food.net*

Allelopathy effect of *Jatropha curcas* leaf extract on the radite

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Received 10 January 2015, accepted 24 March 2015.

Abstract

The radite (*Hypochaeris chillensis* Hieron), native from Brazil, deserves investigation not only for its nutritional potential as medicinal species. The objective of this work was to verify the influence of different aqueous extract concentrations of *Jatropha curcas* (Pinhão Manso) leaves in radite cultivation. We used jatropha extract concentrations of 0% (control), 5, 10, 20, 40 and 80%, to perform the treatments, considering as pure extract 200 g of green leaves of jatropha in one litre of distilled water. The seeds were sown in trays specific for vegetable seedling production, a manual sprinkler system was used. With the increasing concentration of the aqueous extract of the leaves of *Jatropha curcas*, there was a decreasing tendency in the leaf number, plant height, root size and dry mass, proving the allelopathic effect of *Jatropha curcas* leaf extract on radite cultivation.

Key words: *Jatropha curcas* L., *Hypochaeris chillensis*, allelopathy.

Introduction

The radite *(Hypochaeris chillensis* Hieron) belongs to the Asteraceae family. Radite can be found in researches also by the synonymous *H. brasiliensis* L.[6]. It is a vegetable native from Brazil, broadleaf of seasonal occurrence, being commonly found in winter. It is recognized by many people as food and may even be medicine [1, 11, 12]. It has large leaves, usually sold cut and in bundles, and has bitter taste, very close to the common chicory (*Cichorium intybus* L.) [6]. Its mineral composition is outstanding by high levels of calcium (10 mg/g), sodium (6.2 mg/g), zinc (0.077 mg/g), phosphorus (5 mg/g) and potassium (31 mg/g)[5]. The protein content of radite is 16.1% [2].

Allelopathy is a natural interference whereby certain plant produces substances that, when released into the environment can benefit or harm other organisms [3]. The allelopathic substance directly affects the productivity of crops, can be used to control unwanted plants thus helping to reduce production costs, and therefore giving greater profits to the producer. The costs reduction comes from reducing the use of chemicals to defend the production reducing the impacts they could cause to the environment [8, 9].

Jatropha also known as physic nut is arboreal from Euphorbiaceae family and *Jatropha* genus is widely used in popular medicine, has toxic seeds to humans and animals, and its seed oil is usually directed to the oils and soap production [4].

Lemos *et al.* [7] observed the allelopathic effect of aqueous *Jatropha curcas* extract on germination and early development of lettuce (*Lactuca sativa cv.* Grand Rapids), which indicates that the jatropha extract showed inhibitory effect on the growth, development and germination of lettuce.

The objective of this study was to investigate the influence of superficial irrigation with different concentrations of crude leaf extract of *Jatropha curcas* L. on initial development of radite seedlings.

Materials and Methods

The experiment was conducted in Palotina/Paraná/Brazil. The region is geographically located at 24°29'4" south latitude, 53°84'2" west longitude (Greenwich), with humid subtropical climate. It was conducted in a manner that it was exposed to sunlight mainly in the morning, and not exposed to rain, the other conditions were environmental. The analyses were performed at the Federal University of Paraná/PR Biofuels laboratory.

The experimental design adopted was completely randomized blocks with six treatments and eight replications. From the crude extract (200 g^{-1} L distilled water) dilutions of 80, 40, 20, 10, 5 and 0% (control with only distilled water) were made [13]. The seeds were sown in trays specific for the production of vegetable seedlings in a depth between 0.2 and 0.4 mm, with substrate. The treatments were applied four times a day with manual aspersion about 5 $ml.dia^{-1}$ per cell.

Thirty days after emergence (DAE), the following seedling features were evaluated: seedling height, root length, fresh and dry weight of seedling and root (65ºC to constant weight) and number of leaves.

The averages were analysed by linear regression analysis ($p \leq 0.05$), using the statistical package Assistat® version 7.5 beta[19].

Results and Discussion

The concentrations of the aqueous *J. curcas* extract provided allelopathic effect on all analysed variables ($p \leq 0.05$) (Fig. 1).

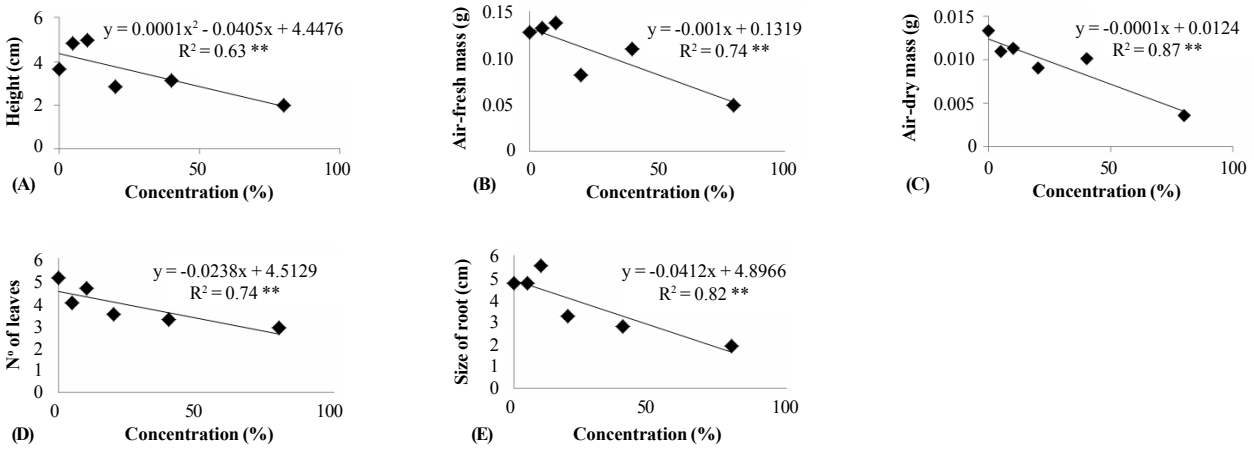

Figure 1. Height of radite (A), air-fresh mass (B), air-dry mass (C), number of leaves (D) and size of root (E).

The increasing concentrations of aqueous extract reduced seedling height (Fig.1A), agreeing with Reichel *et al.* [14], who observed negative effect of the application of unsterilized *J. curcas* crude aqueous extract, with 73.3% reduction of the wheat seedlings aerial part length. Sanderson *et al.* [15] found that when concentrations of aqueous *J. curcas* extract went from 0 to 20%, there was no allelopathic effect in the plant aerial part; however, decreasing propensity was noted. Abugre and Sam [16] found growth reduction of *Z. mays* seedlings exposed to high concentrations of the radicular *J. curcas* extract. Rejila and Vijayakumar [18] also observed inhibitory effect of the extract on the growth of green pepper (*Capsicum annum* L.).

The fresh and dry mass of the aerial part of the seedlings (Fig. 1B and C) as well as other characteristics of seedlings were negatively influenced due to the concentrations, showing allelopathic effect. Several studies indicate that extracts of *J. curcas* root and stem also show allelopathic properties on some cultivated species [17, 18].

Irrigation with *J. curcas* extract significantly influenced the number of leaves per plant (Fig. 1D), adjusting according to the regression equation to decreasing linear form, indicating allelopathic effect. Reichel *et al.* [14] also observed negative effect of *J. curcas* leaf extracts in the early development of wheat (*Triticum aestivum* L.).

The seedling radicular system suffered negative interference of concentrations (Fig. 1D). We observed a decreasing linear effect due to increasing extract concentrations, agreeing with Lemos *et al.* [7], who when working with concentrations from 0 to 100% of *J. curcas* aqueous extract observed negative effect, in addition to morphological root changes with thickening and absence of absorption zone. Sanderson *et al.* [15] showed no allelopathic effect of *J. curcas* aqueous extract on radicular lettuce system but with lower concentrations (0, 1, 5, 10 and 15%) compared to this study. Reichel *et al.* [14] found that concentrations of the aqueous extract (*J. curcas*) at 20, 25, 30 and 35% stimulated root growth of wheat CD104. Abugre and Sam [16] found inhibition of seedling growth of *Z. mays* when exposed to high concentrations of the radicular extract of *J. curcas*. Bonamigo *et al.* [20] reported allelopathic effect of the root aqueous extract in the early development of soybean and canola.

Conclusions

It can be concluded that the aqueous extract of *Jatropha curcas* inhibited the development of radite seedlings proportionally to the concentration used.

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