

Use of alcoholic extract of onion peel (*Allium cepa* L.) to control *Fusarium moniliforme*

Abstract

Background: The present work had as objective the control of the fungus *Fusarium moniliforme* *in vitro*, based on alcoholic extract of onion bark. In preparation of the extract, 150 grams of onion was used, with 1 liter of alcohol. Then placed in a film with a 96 hour film, after which time the extract was filtered with the aid of a sterile gauze, placed in a dark vial and carried a refrigerator where it was held for 72 hours so that the excess alcohol evaporated. The alcoholic extract of onion peel showed control in the mycelial development of the fungus, and we conclude that the onion bark has efficient metabolites for the control of the fungus *Fusarium moniliforme*, and presenting significant results.

Keywords: biological control, organic extract, natural Fungicide, fungicidal activity

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Introduction

The maize (*Zea mays* L.) crop has a great economic and social role in Brazil occupying a cultivated area, in the 2015/16 crop, around 15279.3 million hectares, with a production of 82043.6 tons, presenting a productivity of 5370kg ha⁻¹.¹ The importance of maize cultivation mainly refers to its chemical composition, composed of nutrients such as vitamins, minerals, proteins and carbohydrates, mainly the starch evidenced by its employability in the food industry and renewable fuels, besides the generation of income due to the extensive cultivated area worldwide.^{2,3}

The increase in maize yield depends on several factors, such as yield potential of the genotype and its resistance to diseases, soil fertility, adequate plant density, cropping system (rotation or monoculture), sowing system (conventional or direct), pest and disease management and environmental conditions. In relation to the diseases, corn stem base rot is related to the development capacity of the fungus *Fusarium moniliforme*, and can cause severe damage and is worthy of note due to its economic repercussions. The stem infection compromises the uptake of water and nutrients from the soil to the aerial organs of the plant affecting potential yield and grain quality.^{4,5} The main symptoms observed in the plant are discoloration of the bark, perithecia or picnidia signs on the surface and lower pressure resistance of the stem base in the first and second internodes above the soil surface are indicative of the presence of stem rot.⁶

Located in a tropical area, Brazil presents psychrometric conditions of the air that favor the development of fungi. These microorganisms are widely distributed in the environment, and agriculture in conditions for their multiplication, can contaminate from seed, equipment and storage facilities, causing losses in agricultural production.⁷

In addition, the use of chemical fungicide has shown little efficiency and high contamination index to the ecosystem. Therefore, the stimulation of new control methods and the use of natural fungicides that do not harm the environment are important for the new challenges of modern agriculture.^{8,9} In this context, the onion (*Allium cepa*) presents great production and the bark of its bulbs are generally considered residues of the production, but this genus has

in the literature reports of its fungicide action because they present secondary metabolites, mainly flavonols and because they are rich in sulfur.¹⁰ Therefore, they can be used for maize crop management and avoid the proliferation of microorganisms that cause stem base rot.

Material and methods

Bioassay

The experimental design was completely randomized, consisting of 3 treatments and 10 replicates, totaling 30 Petri dishes.

- Control-containing only 20ml of PDA (potato-dextrose-agar).
- Negative control-20ml of PDA + 10% (0.2ml) of absolute alcohol.
- Treatment-20ml of PDA + 10% (0.2ml) of alcoholic extract of onion peel.

Cultivation of the phytopathogen *Fusarium moniliforme*

Fusarium moniliforme fungus was isolated from corn seeds (*Zea mays*). This fungus was isolated in 10petri dishes, PDA and subsequently kept at 25°C for 7 days.

Obtaining the alcoholic extract of onion peel

For the preparation of the alcoholic extract, onion peels were collected and weighed 150g. They were then crushed with one liter of absolute alcohol. This crude extract was rested on Becker capped with film paper for 96 hours. Subsequently, this extract was filtered on sterile gauze, then placed in a dark vial and taken to the refrigerator where it was held for 72 hours. The vial remained with a gauze on its surface so that excess alcohol evaporated.

Results and discussion

The results presented in Figure 1 demonstrated that the alcoholic extract of onion peel had a positive effect and was efficient in controlling the development of *F. moniliforme*. Treatment with onion peel extract inhibited 100% mycelial fungal development compared to control.

Contrary to Pereira et al.,¹¹ using essential oil of onion peel, and did not observe inhibition of the mycelial development of *Aspergillus*

flavus and *Fusarium* sp. concentrations tested by them. Silva et al.,¹² working with aqueous garlic extract and clove extract showed significant antifungal activity on the mycelial growth of *Fusarium oxysporum*. This difference may be related to the extraction technique, since the essential oil is rich in metabolites of the terpenes class (mono- and sesquiterpenes) of low molecular weight, while alcoholic and aqueous extraction favors the concentration of polar compounds of higher molecular weight, such as those of the class of flavonols which the fungicidal activity of this species is related.¹⁰

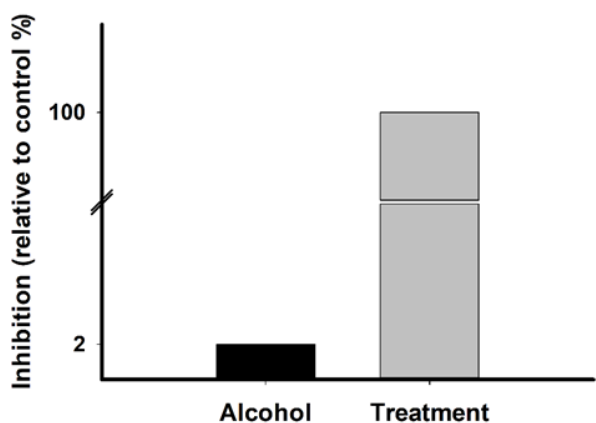


Figure 1 Mean results of *in vitro* inhibition of *Fusarium moniliforme* in the alcoholic control and treatment with alcoholic extract of onion peel at 10%.

Conclusion

In conclusion, the alcoholic extract of onion peel also presents compounds with antifungal activity in its composition and presents efficiency in the inhibition of the mycelial growth of *Fusarium moniliforme in vitro*. Thus, its application can be indicated *in vivo* as a natural alternative to chemical fungicides.

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None.

Conflict of interest

Authors declare that there is no conflict of interest

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