Equisetum arvense, P 508, plant protection activity from the lab to the field

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P 508: Overview

Horsetail, Equisetum arvense L. has long been known in botanical folklore as having a preventive effect on fungal plant diseases. The traditional hot water extract from E. arvense has long been used by organic and biodynamic (as P508) farmers (Marchand, 2017). E. arvense water extract is intended to be used as plant strengtheners and preventive treatment of pathogenic fungi. In this way, we are presenting some papers about the effect of the natural silica (silicic acid) used for the control of powdery mildews and fungal diseases in some cultures. E. arvense extract is a foliar stimulator of natural defenses and fungicide for use as a spring post-emergence treatment in all cultivars of grapevine and apple trees. In literature, the described mode of action was based on the high percentage of silica in the plant that works on lowering the impact of moisture. Silicon would reduce the effects of excessive water around plants that would lead to fungus. It would also act as an activator of plant defense mechanisms. Silicon (Si) is a bioactive element associated with beneficial effects on mechanical and physiological properties of plants. Silicon alleviates abiotic and biotic stresses, and increases the resistance of plants to pathogenic fungi. E. arvense extract was also shown to possess a broad spectrum of a very strong antimicrobial activity against all tested strains. The radical scavenging activity of extracts significantly correlated with total phenolic content. The antimicrobial tests showed that ethyl acetate and n-butanol extracts inhibited the growth of tested bacteria.

Plant extracts recipe

The decoction is processed as follows: 200 g of the aerial part of E. arvense dry plant tissues are macerated in 10 l of water for 30 min (soaking) and then boiled for 45 min (Marchand, 2016). After cooling down, the decoction is filtered with a fine sieve or more generally with a stocking and then further diluted by 10 with water. The solvent for extraction and preparation is water (spring water or rainwater) and the optimal pH is 6.5. Decoction is described as the implementing regulation (EU, 2014) and a further “Report Review” is available in EU pesticide database (Marchand, 2015).

Extract composition

The decoction contains flavonoids (0.6 to 0.9%) like apigenin-7-O-glucoside, quercetin-3-O-glucoside, kaempferol-3,7-di-O-glucoside, kaempferol-3-O-sophoroside, luteolin-7-O-glucoside, quercetin-3-O-glucoside; caffeic acid ester (up to 1%) including chlorogenic acid, dihydrocaffeic acid-tartaric acid and silicic acid (3 to 7%) to some extent water soluble.

Agriculture Uses as plant protection means

Field typical suitable concentration is 200 g of active ingredient (a.i.) hl⁻¹. The aqueous extract of horsetail as anantimicrobial activity is intended to be used in fields for plant protection on grapevines (Darnand, 2016) and apple trees and vegetable gardening to control diseases such as mildew, downy mildew and others caused by fungal fungi such as Pythium and Alternaria spp. Horsetail has long been known in the botanical tradition, organic and biodynamic (P508) agriculture as having a preventive effect on fungal diseases of plants. The effect is based on the high percentage of silica in the plant, which helps to reduce the impact of moisture. Silica would reduce the effects of excess water on plants that lead to the growth of fungi. E. arvense decoction shows anti-sporulation activity (Marchand, 2016). It would also be an activator of the defense mechanisms of these plants (elicitor).

Mode of action

The aqueous extract of horsetail shows almost no effect on aquatic organisms: EC50 (Daphnia pulex) = 55 mg/mL and EC50 (Artemia salina) = 8.9 mg/mL compared to chemicals (< 0.05 mg/mL).

Horsetail: Environmentally friendly extract

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Conclusion

Horsetail (E. arvense) decoction, useful in organic and biodynamic (P508) agriculture is the first biological preparation allowed at the general EC 1107/2009 phytopharmaceutical regulation. Our work during the 4P program for assessing the efficacy of diverse plant extract demonstrated the usefulness of biological preparations. Applications in order to legalize them were submitted accordingly.

References

Marchand P.A. 2016. Basic substances under EC 1107/2009 phytopharmacological regulation. Our work during the 4P program for assessing the efficacy of diverse plant extract demonstrated the usefulness of biological preparations. Applications in order to legalize them were submitted accordingly.

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