

### 3.3 = ALLELOPATHIC EFFECTS OF *CYNARA CARDUNCULUS* VAR. *SYLVESTRIS* LEAF EXTRACTS ON WEED SEED GERMINATION

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It is known that the presence of weeds causes serious losses to the agricultural production, both in quantitative and qualitative terms. Putnam and Duke (1) were the first ones to assess the possibility of using allelopathic crops for weed management in agriculture, minimising the serious problems of environmental impact, improving the toxicological profile of the food plants and ensuring the preservation of biodiversity in cropping systems. Furthermore, there is an increase in the worldwide consumption of products from 'organic agriculture', which does not make use of any synthetic herbicide. As weeds are very good colonizers, reproduce themselves faster, produce a large number of small seeds with very prolonged viability in soil and survive in the most adverse situations (2; 3) becoming part of the persistent soil seed bank (4), they are in general more competitive than other plant species.

Synthetic herbicides are generally used in low concentrations to control weeds. Their indiscriminate use can have a negative impact on the biological communities as well as on the human population. For an integrated weed control approach, the potential use of natural, biodegradable, water soluble and halogen free molecules belonging to the allelochemicals family can have several advantages over synthetic herbicides, i.e. higher activity at low concentrations and reduced negative effects on the environment (5; 6).

The aim of the study was to investigate the effect of allelochemicals of *Cynara cardunculus* var. *sylvestris* (wild cardoon) plants on the seed germination of two common weeds (*Amaranthus retroflexus* L. and *Portulaca oleracea* L.), to simulate some of the factors that could occur in the environment. Germination bioassays were performed using 5 mL of aqueous leaf extract at 40 and 80% (v/v) and distilled water (0% control) to humidify a double layer of sterilized filter papers (Whatman No. 2). Petri dishes were stored in incubators at the optimal temperature of 35°C in continuous darkness. During the counting process, seeds were manipulated under a green safelight (490–560 nm); seeds with a 2-mm radicle elongation were considered as germinated and removed from the Petri dishes. Analysis of variance was performed using an Anova software. Percentage data, before Anova analysis, were square root transformed to increase homogeneity of error variances.

The germination rate dropped by increasing aqueous leaf extract concentration of *C. cardunculus* var. *sylvestris* which also induced significantly greater reductions in seed germination than the control for *A. retroflexus* (37% vs 94%) and *P. oleracea* (17% vs 61%). Reductions in mean germination time (MGT) and substantial improvements in the seed germination of *A. retroflexus* and *P. oleracea* were observed for seeds treated with control and allelochemical solutions (3 and 4 d vs 5 and 8 d). The interaction between the analysed weeds and the aqueous leaf solutions used proved to be less significant. There was no significant difference between the different concentrations (40 and 80%) utilized during biological assays.

On the basis of such results, allelopathy should be further evaluated and used to screen allelopathic plant species. Our research demonstrated that wild cardoon contains substances with inhibitory effect, which could reduce the percentage of germination of two common weed species in laboratory conditions, providing novel and biologically active compounds to control weeds in different agro-ecosystems. Further studies on the phytotoxic activity of natural compounds could lead to the discovery of new herbicidal active ingredients and to the implementation of environmental friendly weed control strategies.

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