



Assessment of the antioxidant activity of the medicinal plant *Arnica montana* L. after application of the abiotic elicitor salicylic acid

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Introduction

Arnica montana (Asteraceae) is an herbaceous plant species that is endemic to Europe. *A. montana* has numerous health benefits due to its anti-inflammatory, immune-modulatory, analgesic, antioxidant, antibacterial, and anticancer properties. The plant is a rich source of secondary metabolites, including sesquiterpene lactones, flavonoids, terpenoids, phenolic acids, and essential oils. Elicitation is an effective method for modulating and generating valuable plant compounds using *in vitro* plant cells or tissue culture. As an abiotic elicitor, salicylic acid alters the expression of genes encoding key enzymes of secondary plant metabolism.

Table 1. Effect of salicylic acid on *in vitro* shoot growth of *Arnica montana* L.

Results

Nutrient medium	Mean number of shoots per explant	Mean height	Fresh weight
control	3.0±0.20 ^b	1.46±0.09 ^a	0.32±0.02 ^a
50 µM SA	2.95±0.23 ^b	1.56±0.11 ^{ab}	0.37±0.03 ^{ab}
100 µM SA	2.6±0.25 ^b	1.96±0.15 ^c	0.47±0.04 ^b
200 µM SA	1.7±0.16 ^a	1.90±0.13 ^{bc}	0.36±0.03 ^a

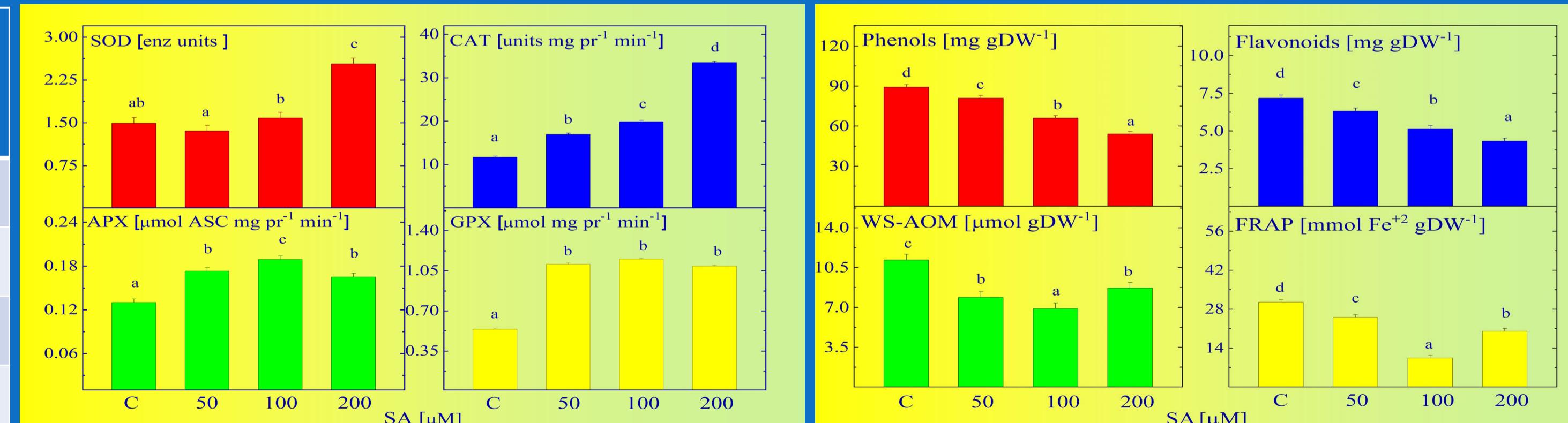
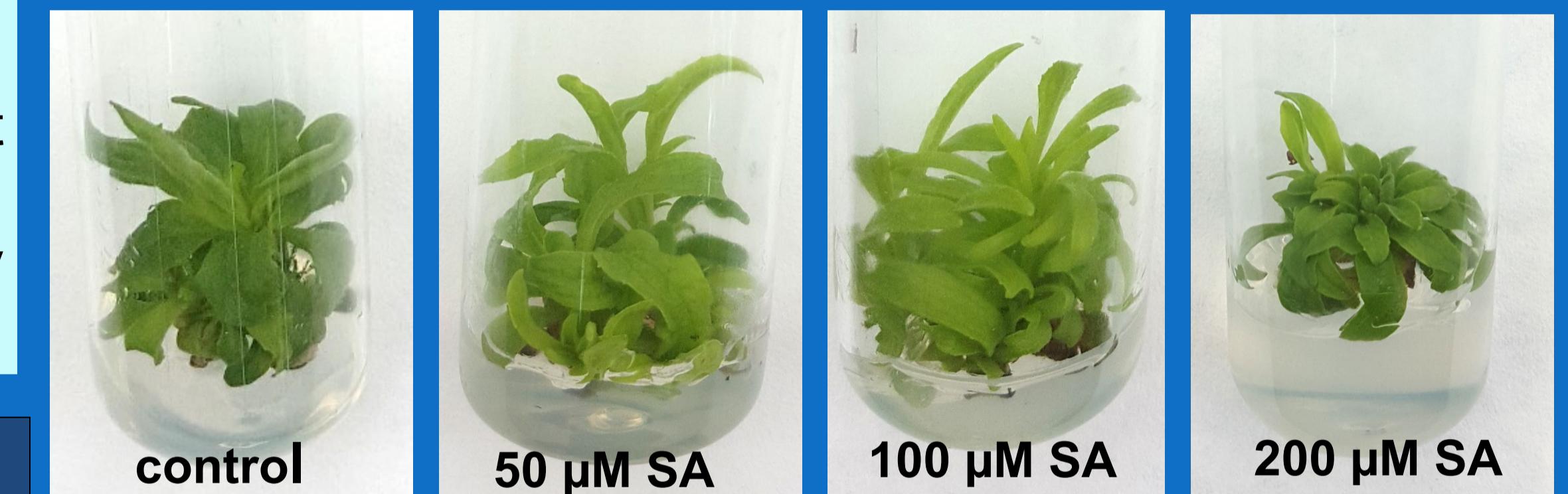


Fig. 1. The activity of antioxidant enzymes superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX), and guaiacol peroxidase (GPX) in *A. montana* *in vitro* shoots grown on MSB medium (control) and on MSB medium supplemented with SA.

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Aim

The aim of this study was to assess the effect of salicylic acid (SA) treatment on the antioxidant activity and growth parameters of *A. montana* shoots grown *in vitro*



The current study demonstrates salicylic acid's beneficial effects on *in vitro* growth and enzyme antioxidant activity against oxidative stress.

The antioxidant activity measured by ferri reducing antioxidant power (FRAP) as well as the content of metabolites with antioxidant power in the shoots of *A. montana* significantly decreased by treatment with SA. During *in vitro* propagation, plantlets are exposed to harmful environmental conditions - high humidity, low light intensity and slow gas exchange which impose oxidative stress..

Fig. 2. The content of metabolites with antioxidant power (total phenols and flavonoids, metabolites with antioxidant capacity) and antioxidant potential (FRAP method).