Antioxidant properties of California poppy (*Eschscholzia californica Cham*) plants biofortified with iodine

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Introduction

Biofortification is a method of increasing the nutritional and health-promoting properties of plants through enriched fertilization. Iodine is a trace element whose deficiency impacts human health. Iodine's function is participation in the synthesis of thyroid hormones. It has also therapeutic potential in counteracting oxidative stress by increasing antioxidant potential. Biofortification is one of the most promising methods for enriching plants with this element

Fig. 1 *E. californica* during cultivation in a greenhouse.

Methods

The aim of the study was to determine the effect of biofortification with mineral (KI) and organic forms of iodine: 5-iodosalicylic acid (5-ISA) and 3,5-diiodosalicylic acid (3,5-diISA) on the antioxidant properties of *Eschscholzia californica* grown in a hydroponic system (Fig 1). The following combinations were tested: (1) Control; (2) KI; (3) 5-ISA; (4) 3,5-diISA, as shown in Fig. 2.
For the determination of antioxidant activity ethanol extracts (80% v/v) of California poppy plants were prepared. These parameters were determined using a free DPPH radical, ABTS radical, FRAP and CUPRAC method.

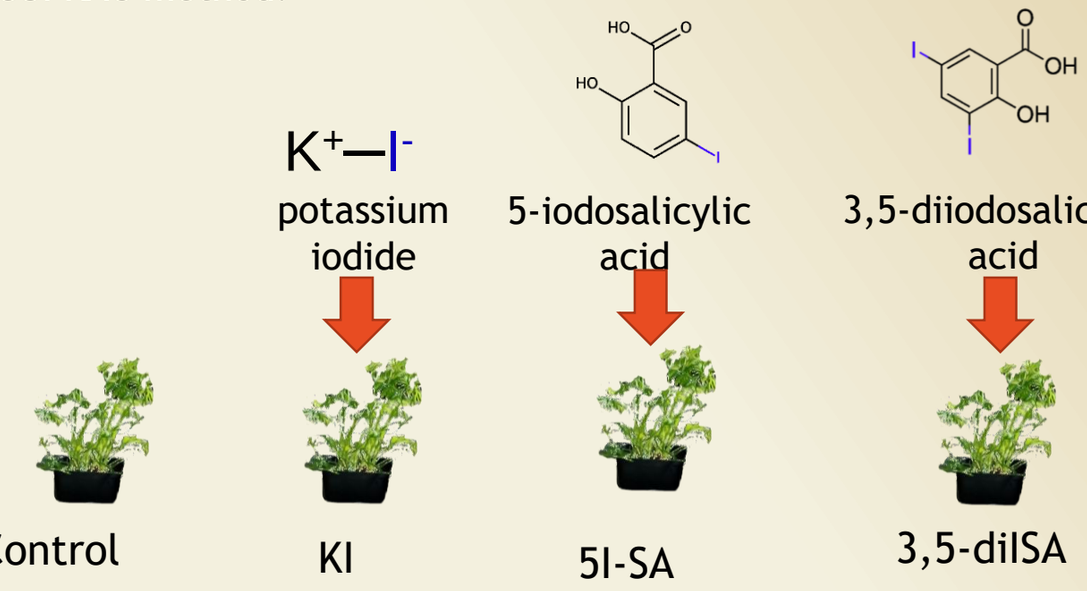

Fig. 2 Graphical representation of iodine supplementation in experimental groups

Results

Each biofortification process negatively affected the anti-free radical activity determined using the DPPH method. However, differences are not statistically significant. The antioxidant potential determined against the ABTS increased after the use of KI and 5-ISA, while it decreased after the use of 3,5-diISA. The same trend was observed for each combination using the CUPRAC method. However, these differences were not significant. The only statistically significant differences between the combinations were observed when FRAP method were used. The greatest increase in potential was observed after use of 5-ISA (approx. 17.5%), while a lower increase was observed for KI (approx. 9.0%). The increase in activity after use of 3,5-diISA was not statistically significant (Table 1)

Table 1. Antioxidant activity of Eschscholzia californica plants biofortified with iodine

Combination	DPPH	ABTS	FRAP	CUPRAC
	mmol Tx 100 g^{-1} DM			
Control	4,42±0,07^{a}	12,85±0,36^{a}	7,80±0,19^{a}	10,80±0,37^{a}
KI	4,06±0,19^{a}	13,93±0,56^{a}	8,51±0,14^{ab}	11,37±0,46^{a}
5-ISA	4,18±0,17^{a}	13,36±0,41^{a}	9,16±0,30^{b}	11,02±0,37^{a}
3,5-diISA	4,14±0,17^{a}	12,72±0,30^{a}	7,99±0,19^{a}	9,96±0,16^{a}

Mean value of four replication ± standard deviation.
Mean values signed the same letters in particular columns are non-significant different at 0.05 level of confidence

Conclusions

In this study, the lack of an increase in oxidative potential in response to the treatments applied can be attributed to the lack of stress, which could have been induced in plants by poorly selected concentrations of iodine compounds.

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