



THE EFFECT OF PHYTOHORMONES APPLICATION ON MORPHOLOGICAL AND BIOLOGICAL PROPERTIES OF *THYMUS PANNONICUS* ALL.

Vladimir M. Filipović¹, Vladan M. Ugrenović², Zoran A. Maksimović³, Snežana M. Dimitrijević¹, Vera M. Popović⁴, Katarina R. Mihajlovski⁵, Marija D. Milić^{5*}

¹Institute for Medicinal Plant Research „Dr Josif Pančić“, Belgrade, Serbia, ²Institute of Soil Science, Belgrade, Serbia, ³Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia,

⁴Institute of Field and Vegetable Crops, Novi Sad, Serbia, ⁵Faculty of Technology and Metallurgy, University of Belgrade, Serbia

*marija.pavlovic@tmf.bg.ac.rs

Introduction

Plants belonging to the family Lamiaceae, such as *Thymus pannonicus* All. cuttings, are highly reputable in a folk medicine and business sector, due to a multiple uses and beneficial effects on human health. It exerts strong inhibitory activity against *Helicobacter pylori*, for gastritis prevention and manifests good antimicrobial activity against many bacteria and fungi, like *Candida albicans*, for mitigation of respiratory diseases.

In order to achieve a faster production and viable yields of plants with standard quality, this study explored the effect of three phytohormones application, based on α -naphthyl acetic acid, named INCIT 1, INCIT 8 and INCIT K, on the root system growing potential and rooting stimulation of *Thymus pannonicus* All. cuttings, whereby the biological activity was monitored, as well.

Material and methods

Plant cultivation

The research was located in Veliko Središte, Vršac (Serbia) and conducted in May, 2021. The cuttings of pannonian thyme (*Thymus pannonicus* All.), grown and propagated at the Institute for Medicinal Plant Research „Dr Josif Pančić“, were dipped in a powdered formulation of phytohormones and placed in plastic containers pre-filled with commercial substrate (Figure 1). The phytohormone-free variant was taken as a control. After 2 months, the cuttings were removed and the morphological and biological properties were measured.

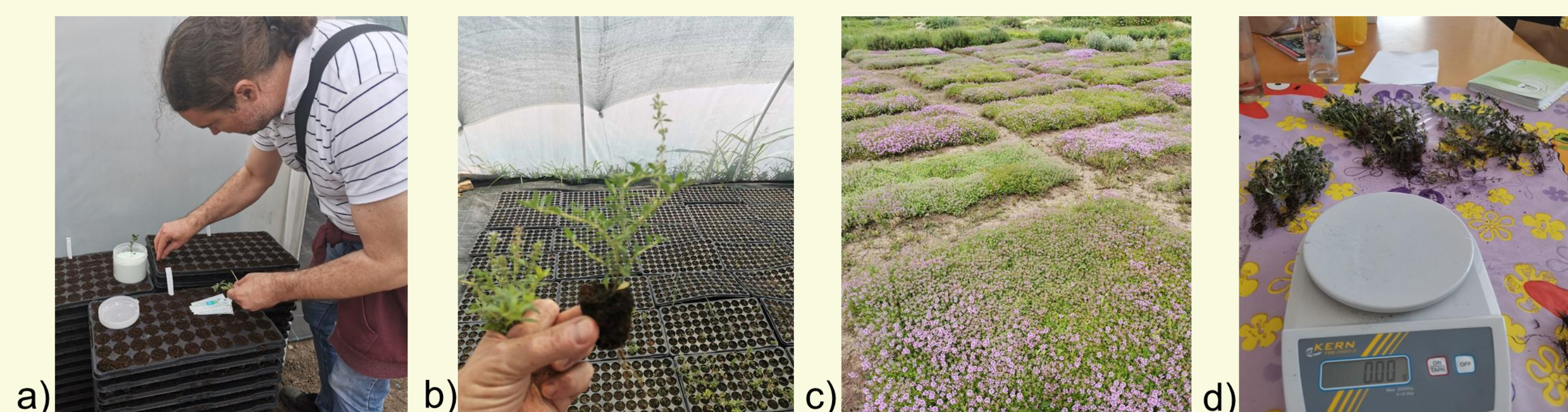


Figure 1. The plant prospect: during cultivation (a,b), before sampling (c), during measuring (d)

Determination of morphological properties

The phytohormone treated samples together with control were subjected to determination of the plant length (cm), including the length of aboveground vegetative part and the length of root, plant weight in grams (including the leaves, stem and roots) and number of roots, by using a ruler, graph paper and analytical balance (Filipovic et al. 2020).

Determination of biological properties

Biological properties of phytohormone treated samples and the control were determined in a 5% aqueous infusions of the samples and included spectrophotometrical analysis of total polyphenols content via Folin-Ciocalteu method and total flavonoid content, followed by measurement of antioxidant activity by DPPH scavenge radical method and FRAP reduction capacity method (Pavlovic et al. 2013).

References:

Filipovic et al. 2020, Selekcija i semenarstvo XXVI (2), doi:10.5937/SelSem2002039F
Pavlovic et al. 2013, Separation and Purification Technology, 118, 503-510

Acknowledgements:

This work was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Contract No. 451-03-9/2021-14/200003, 200011, 200032, 200135) and „Implementation of a new technology for growing wild species of Pannonian thyme (*Thymus pannonicus* All.)“ Innovation voucher number 858 (2021).

Results and discussion

Morphological results revealed that all of treated samples showed improved characteristics in comparison to control, whereby the most suitable phytohormone to stimulate the growth of cuttings was INCIT 8. More specifically, the average length of plant was highest in INCIT 8 and was around 16% greater than control (Figure 2a); the weight of the aboveground vegetative part of the INCIT 8 plant and root mass were higher for more than 60% in relation to the control (Figure 2b,c), whereby the mass of the whole plant was almost 3 times increased (Figure 2c). The number of roots were about 25% higher, regardless to the control (Figure 2d).

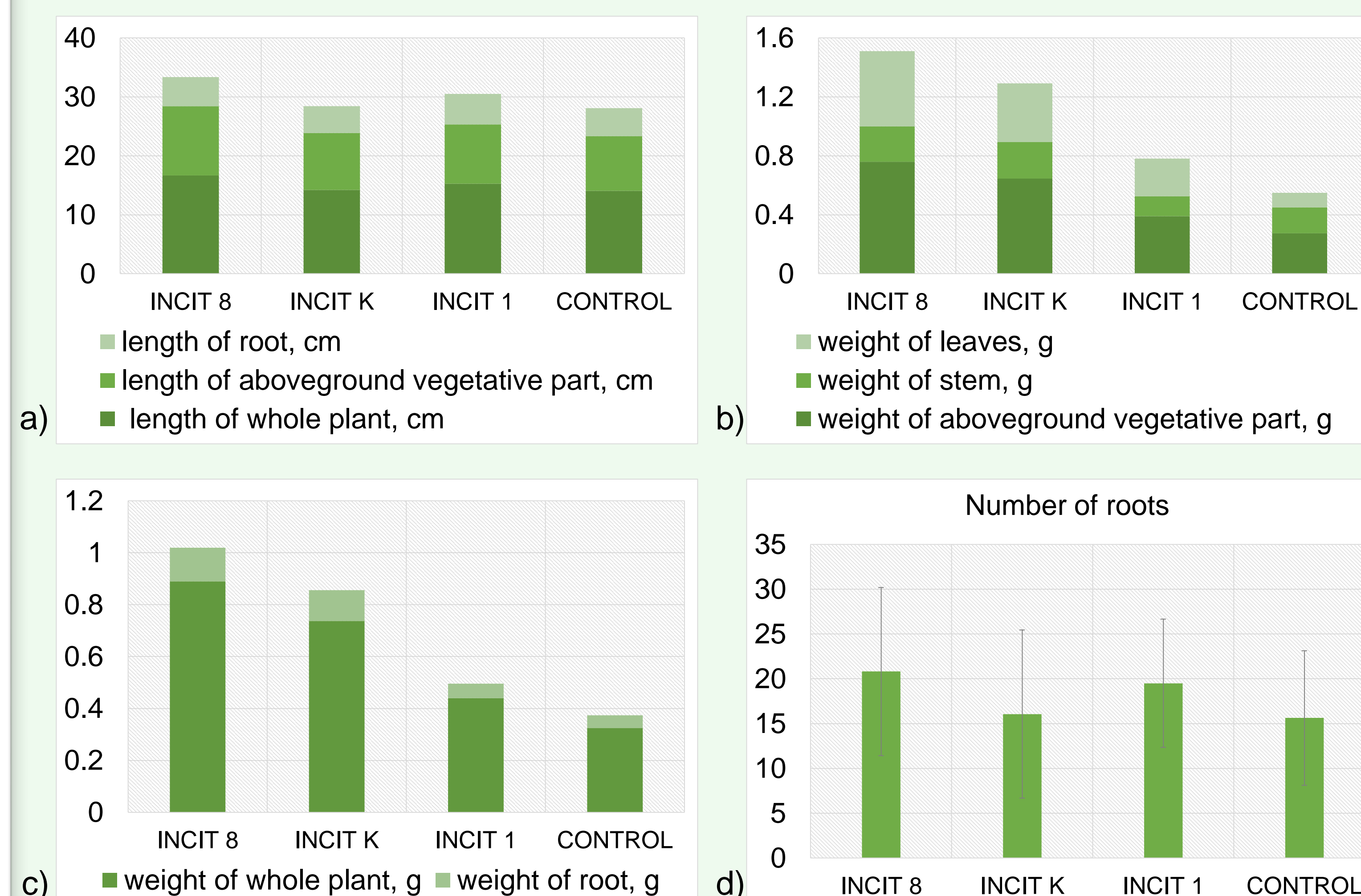


Figure 2. Morphological characteristics of plants: length (a), weight (b,c) and number of roots (d)

Polyphenols and flavonoids content were lowered in treated samples, with relation to the control (Figure 3a). On the other side, the sample INCIT 8 expressed an improved antioxidant activity than control, where the FRAP value was slightly increased, while the inhibition of DPPH radicals was higher by around 15% (Figure 3b). Other INCIT samples exhibited lower reduction capacity, but higher radical inhibiting activity, in comparison to the control (Figure 3b).

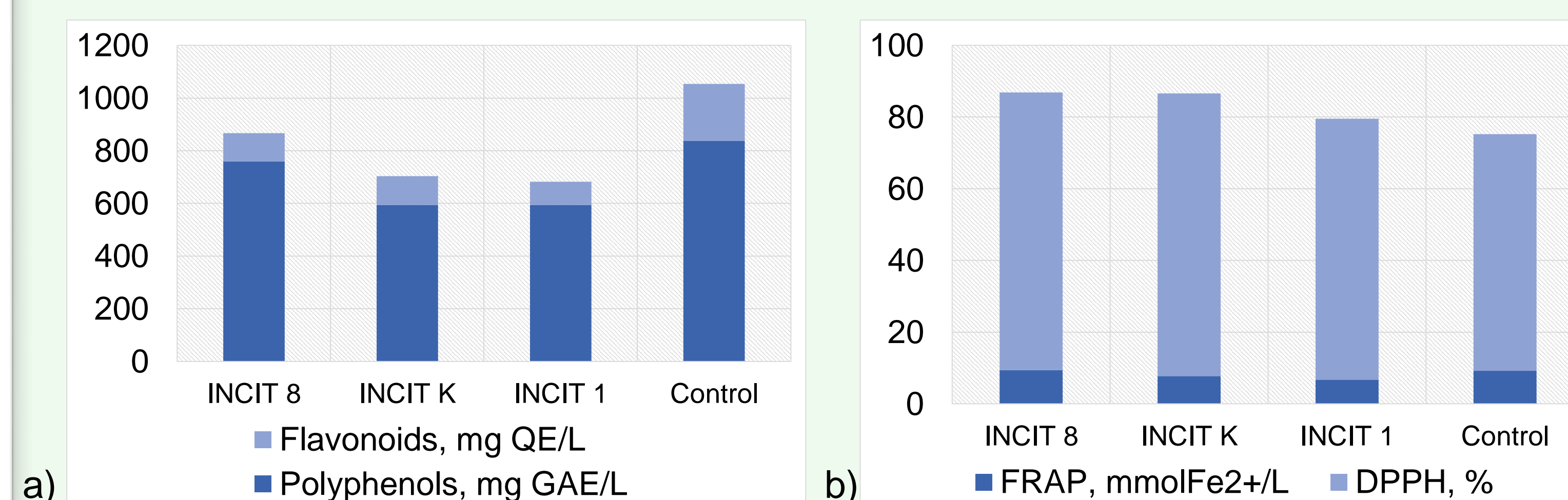


Figure 3. Biological characteristics of plants infusions: total polyphenol and flavonoid content (a) and antioxidant activity measured by DPPH radical and FRAP method (b)

Conclusions

The applied phytohormone treatment may ensure economically viable yields of standard or even improved plant quality. In the following period, it is expected that all of treated adult plants will have a higher content of biologically active substances.