

STRESZCZENIE W JĘZYKU ANGIELSKIM

Satisfying the nutritional needs of the human population is currently one of the major social and scientific problems. According to the Food and Agriculture Organization of the United Nations, the population will increase to 9.7 billion by 2050. It is estimated that despite the efforts undertaken to increase agricultural production, still one in nine people in the world are starving. One of the solutions to this problem may be the application of biostimulants of plant growth, which in recent years are becoming more popular among scientists, entrepreneurs, farmers, and retail customers. These products are increasingly incorporated into the production of fruits, vegetables, and flowers as a safer agricultural practice aimed at increasing the quantity and quality of crops while reducing: the consumption of fertiliser and plant protection products, and environmental pollution.

Within the doctoral thesis entitled: "The influence of extracts based on higher plants on the growth, yielding, and chemical composition of selected vegetable species", the possibility of using higher plants was assessed for the production of preparations with a potential biostimulating effect. For this purpose, by means of ultrasound-assisted extraction, extracts were prepared based on 26 biomasses: leaves of aloe (*Aloe vera*), fruits of chokeberry (*Aronia melanocarpa*), herb of mugwort (*Artemisia vulgaris*), storage roots of red beet (*Beta vulgaris*), flowers of marigold (*Calendula officinalis*), flowers and leaves of purple coneflower (*Echinacea purpurea*), herb of horsetail (*Equisetum arvense*), fruits of common sea-buckthorn (*Hippophae rhamnoides*), herb of St. John's wort (*Hypericum perforatum*), seeds of red lentil (*Lens culinaris*), flowers of chamomile (*Matricaria chamomilla*), herb of basil (*Ocimum basilicum*), seeds of pea (*Pisum sativum*), herb of broadleaf plantain (*Plantago major*), herb of knotgrass (*Polygonum aviculare*), leaves of common bracken (*Pteridium aquilinum*), leaves of giant goldenrod (*Solidago gigantea*), roots of comfrey (*Symphytum officinale*), flowers, leaves, and roots of common dandelion (*Taraxacum officinale*), flowers of red clover (*Trifolium pratense*), leaves and roots of nettle (*Urtica dioica*), and roots of valerian (*Valeriana officinalis*). The utilitarian properties of the obtained preparations, with concentrations of 0.1%, 0.5%, 1.0% and 2.5%, foliarly applied, were assessed in laboratory tests on white head cabbage seedlings (*Brassica oleracea* L. var. *capitata*). In the harvested plants, the length, fresh and dry weight of the above-ground part and the root system, as well as the cotyledon greenness index (SPAD readings) were determined. In addition, the chemical analyses of

the content of: chlorophyll *a + b*, carotenoids, phenolic compounds were performed, also the antioxidant activity was measured. Based on the obtained results, 7 biomasses (i.e. herb of St. John's wort, leaves of giant goldenrod, flowers and leaves of common dandelion, flowers of red clover, leaves of nettle, and roots of valerian) which extracts showed the most favourable biostimulating properties were selected. Subsequently, their optimal concentration was determined. The raw materials were used to prepare formulations consisting of the active substance (0.5% of plant extracts obtained by ultrasound-assisted extraction or mechanical homogenisation), adjuvant (0.02%), antioxidant (0.15%) and preservative (0.1%). The effect of the prepared formulations, applied as a foliar spray, was assessed in field trials on three model plants: radish (*Raphanus sativus* L. var. *sativus*), celeriac (*Apium graveolens* L. var. *rapaceum*), and white head cabbage (*Brassica oleracea* L. var. *capitata*). The tests in real conditions allowed the determination of the yield, fresh and dry weight, leaf greenness index (SPAD readings), and leaf colour (*L, a, b* values). The appropriate chemical analyses of the content of: chlorophyll *a + b*, carotenoids, vitamin C, phenolic compounds, nitrates, macro- and micronutrients, heavy metals, volatile compounds, fatty acids, sterols, glucosinolates, and sugars in the harvested vegetables were performed. Their antioxidant activity was also measured. The obtained results proved that the foliar application of plant extracts had a diversified influence on the yielding and chemical composition of the model plants. Their use should be tailored to the individual needs of the plants and growing conditions.

The results presented in the doctoral dissertation proved that foliar spraying with extracts based on higher plants enables the achievement of higher yields of higher quality. The beneficial effects of the produced extracts were confirmed in comparison to the effects triggered by the application of a commercial biostimulant. Demonstrated solution opens up new perspectives and will significantly affect progress in science and technology, which is important due to the need to provide the world's population with safe food with pro-health properties, which also proves the utilitarian aspect of my doctoral dissertation.

Keywords: higher plants, extraction of bioactive compounds, yield and chemical composition of vegetable plants, sustainable food production