The influence of biostimulants on yielding and quality of cucumber fruit (*Cucumis sativus* L.)

Janina Gajc-Wolska*, Katarzyna Z. Mazur, Agata M. Metera, Monika M. Niedzińska, Jolanta A. Wtulich, Magda Litwińczuk

Warsaw University of Life Sciences – SGGW
Faculty of Horticulture, Biotechnology and Landscape Architecture
Department of Vegetable and Medicinal Plants
Nowoursynowska 159, Warsaw, Poland
* ✉ janina_gajc_wolska@sggw.pl

INTRODUCTION

Cucumber is a vegetable, the energy value is small, but the taste, nutritional and health-promoting compounds (mainly cucurbitacin) make this plant is one of the most popular in the cultivation and consumption of vegetables in Poland and many other countries of the world.

Diet pro-health in the modern world is becoming increasingly important. This is due to the significant environmental pollution with toxic substances to humans. The research determined the value of vegetables and shows the benefits of their consumption. Number of active substances means to protect vegetables (including cucumber) is significantly reduced. This is because of the environment and improve the quality of foods we produce. It notes the growing trend to greater use of biological methods and the search for preparations of plant origin. Such preparations are characterized by a lack of or low toxicity to humans and the environment, also have a different mechanism of action. For such a group can include organic and mineral fertilizers and biostimulators. The added value of the foliar fertilizers often are extracts from marine algae. Fertilizers such exhibit a biostimulating. Improve systemic transport and nutrient uptake. In the plant improves the size and quality of the yield by increasing the metabolism of chemical compounds. Affect the growth of plants tolerance to stress conditions. Stimulate the growth of root development and improving overall plant health.

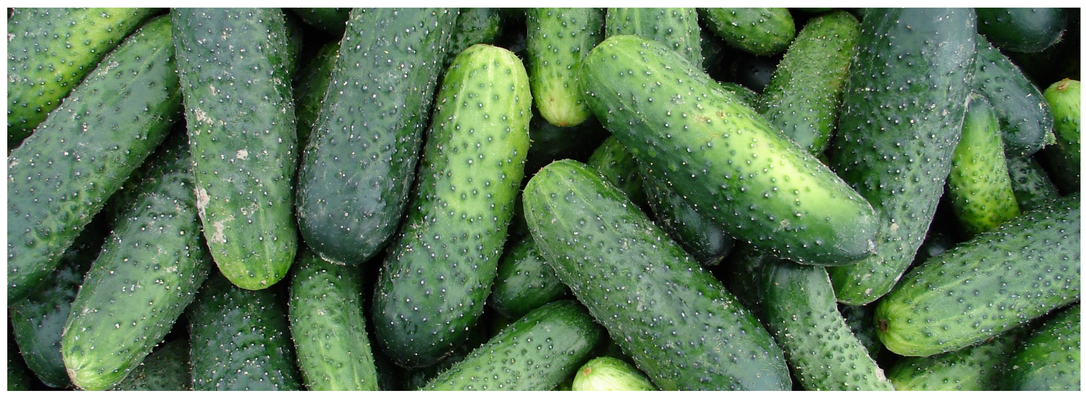
The aim of this study was to assess the impact of organic and mineral fertilizers: Biozyme TF, Asahi SL, and Goëmar BM 86 on yield and fruit quality of three cultivars of cucumber: Octopus F1, Opera F1 and F1 Sonate grown in the field.

MATERIALS AND METHODS

In 2013 experiment was carried out at the experimental field WULS in Wilanów. Three cultivars of cucumber Sonate F_1 and OperaF_1 from Rijk Zwaan Company, and Octopus F_1 from Syngenta Seeds Company were used in this experiment. Cucumber plants grown in 5 combinations: control, Biozyme 0.5 l ha^{-1}, Biozyme 1.0 l×ha^{-1}, Goëmar BM 86 3 l×ha^{-1} and Asahi SL 0.5 l×ha^{-1}. Cucumber seeds were sown in the first decade of May in the peat pots (two seeds in a pot) filled with peat substrate. Seedlings were planted on the field when the plants had 2-3 leaves. Planting density was 30×200 cm. Plants were grown in deep medium-heavy alluvial soil with a 1.9 – 2.3 % content of organic matter. Owing to good texture, the air-water conditions of the soil were satisfactory for plant production and during the period of water shortage plants were T-Tape irrigated. The soil content of N, P, K, and Mg was kept at the optimum level with fertilizers applied to equal the average of 150 kg N×ha^{-1} (60 kg N side dressing), 50 kg P×ha^{-1}. and 190 kg K×ha^{-1}. The harvest of fruit lasted from the middle of July until the middle of September in both years. Marketable fruits were graded according to the Polish standard PN-85/R-75359 into the following two classes: pickling grade: 6-10 cm long with a diameter of 2.5-4.5 cm, pickling grade: 9-15 cm long with a diameter of 4.5-5.5 cm. Chemical analyses of cucumber fruit were performed.

The fruit quality was evaluated by the contents of extract and basic macro-components: extract was determined by rephractometric method, NO_3 determined by the flow method with the wave length of 560 nm, P was determined by the spectrophotometric method with the wave length of 460 nm, K, and Ca by the flame method using the flame photometer.

Statistical analysis was elaborated using a two-way analysis of variance. A detailed comparison of means was performed applying the Tukey's test at the significance level of α=0.05.



RESULTS

Table 1. The marketable yield of cucumber depending on preparation used and cultivar [kg×m^{-2}]

Cultivar	Preparations: Control	Biozyme 0.5 l×ha^{-1}	Biozyme 1 l×ha^{-1}	BM 86 3 l×ha^{-1}	Asahi 0.5 l×ha^{-1}	Mean for cultivar NIR(B)=0.76
Octopus F_1	3.94	4.84	4.01	4.50	4.76	**4.41**
Opera F_1	5.71	5.74	5.03	5.53	5.20	**5.44**
Sonate F_1	6.05	6.58	6.13	5.29	5.95	**6.00**
Mean for preparations NIR(A)=1.15	**5.23**	**5.72**	**5.06**	**5.11**	**5.30**	

NIR(A/B)=2.00; NIR(B/A)=1.70

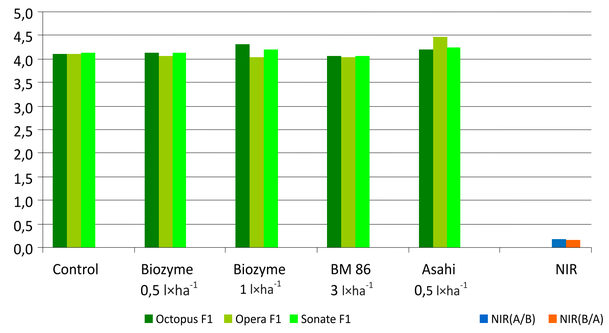


Figure 1. The content of extract in the cucumber fruit depending on the preparation used and cultivar [%]

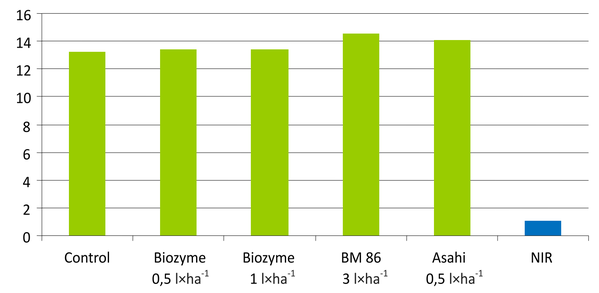


Figure 2. The content of nitrates in the cucumber fruit depending on preparation used [mg×100 g^{-1} f.m.]

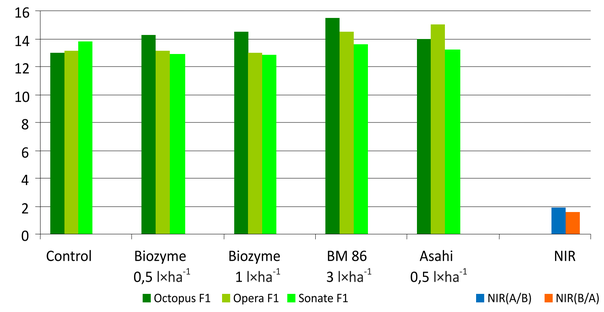


Figure 3. The content of nitrates in the cucumber fruit depending on preparation used and cultivar [mg×100 g^{-1} f.m.]

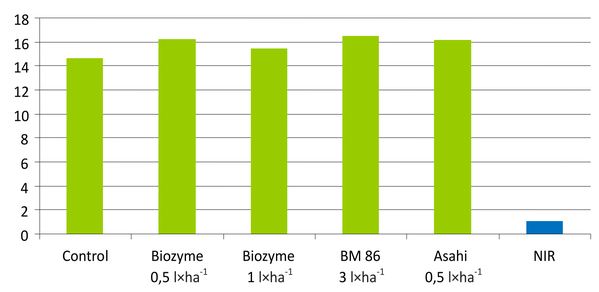


Figure 4. The content of phosphorus in the cucumber fruit depending on preparation used [mg×100 g^{-1} f.m.]

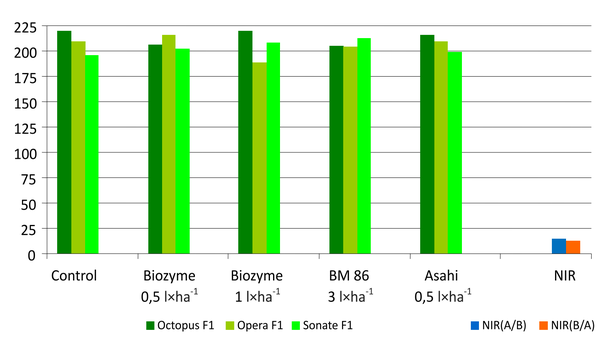


Figure 5. The content of potassium in the cucumber fruit depending on preparation used and cultivar [mg×100 g^{-1} f.m.]

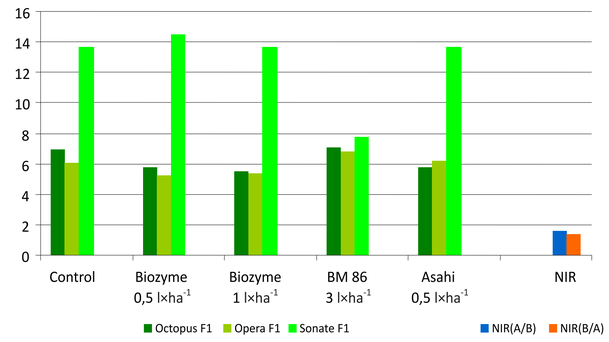


Figure 6. The content of calcium in the cucumber fruit depending on preparation used and cultivar [mg×100 g^{-1} f. m..]

CONCLUSION

Introduction to the cultivation of biostimulators significantly affect on the chemical composition of cucumber. Asahi formulation at 0.5 l×ha^{-1} and Biozyme at 0.5 l×ha^{-1} increase the extract content. Preparation BM 86 at a dose of 3 l×ha^{-1} influences the increase in the content of nitrates and calcium and phosphorus. Preparation Biozyme l×ha^{-1} dose of 0.5 and 1 l×ha^{-1} results in an increase of potassium and calcium content.

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