

MICRONUTRIENTS CONCENTRATION IN FIELD GROWN PEPPER (*Capsicum annuum* L.) IN DIFFERENT FERTILIZATION SCHEMES

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Abstract

Pepper is used as vegetables, spice and medicine. It may be consumed fresh, preserved (turkish), dry or dry minced. Due to its wide use, quality of pepper fruit is very important and largely determined by the way of cultivation (fertilization). In this paper, 14 fertilizer schemes, including mineral and organic fertilizers, were applied to two varieties of peppers (Anita and Amfora). All the treatments were performed with and without mulch. The influence of fertilization and mulch on the concentration of micronutrients was analyzed. Concentrations of Cu, Fe, Mn and Zn were significantly changed under applied fertilization schemes as well as the application of the mulch.

Introduction

Cu, Fe Mn and Zn are essential micronutrients, which are necessary for the proper development of plants and are equally important in human diet. Essential trace minerals are necessary nutrients for normal functioning of human metabolism and health. It is widely accepted that these elements are significantly better exploited when introduced into the organism through food than through supplements. Therefore, their concentrations are important features of fruits, including pepper [1] and adjusting fertilization to attain better fruit quality in the sense of biofortification is permanent task.

Experiment was set in the field and the effect of different fertilization schemes (calculated on the basis of nitrogen input) and mulching on the concentration of Cu, Fe, Mn and Zn in fruits of two pepper cultivars was analyzed.

Experimental

Two cultivars of pepper, Anita and Amfora (NS SEME, Novi Sad, Serbia), were grown under 14 fertilization schemes (Table 1), each of which was conducted in two variants - unmulched and mulched with plastic foil. Total amount of added nitrogen was 240 kg/ha.

Table 1. Sources of nitrogen provided to pepper during cultivation (%). The same fertilization schemes were applied in production of Anita and Amfora, with and without mulching.

	Fertilization schemes													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
NPK	-	100	75	50	-	75	50	-	75	50	-	75	50	-
Cattle manure	-	-	25	50	100	-	-	-	-	-	-	-	-	-
Vermicompost	-	-	-	-	-	25	50	100	-	-	-	-	-	-
Fertor	-	-	-	-	-	-	-	-	25	50	100	-	-	-
Pig manure	-	-	-	-	-	-	-	-	-	-	-	25	50	100

Pepper was planted on plots P=17.5 m², 30 plants/plot, each variant in 4 replications.

Concentration of Cu, Fe, Mn and Zn were assessed at harvest, by AAS (Shimadzu 6300). Statistical analysis was performed using STATISTICA 13.3 (StatSoft, University Licence, University of Novi Sad, 2018).

Results and discussion

Mineral composition and concentrations of nutrients in leaf tissues depend of various factors, such as features of a plant (species, cultivar, type of leaves, age), soil, fertilizer, climate, cultivation practices, and pests and diseases [2]. In general, the absorption of nutrients in the majority of crops follows the pattern of the growth curve (accumulation of dry matter) [3]. In these two tested pepper varieties, Anita and Amfora, the Cu concentration was significantly changed in the presence of different fertilizers. Differences are also observed with respect to mulching (Figure 1). In Anita, concentration of Cu varied more due to applied fertilizers, while in Amfora mulching had significantly higher impact on the Cu concentration (in about 50% of applied fertilizers, a statistically significant increase in Cu in fruits was obtained). In Amfora the application of 100% NPK in combination with mulch resulted in the highest Cu concentration of all treatments and it was 42% higher than without mulch.

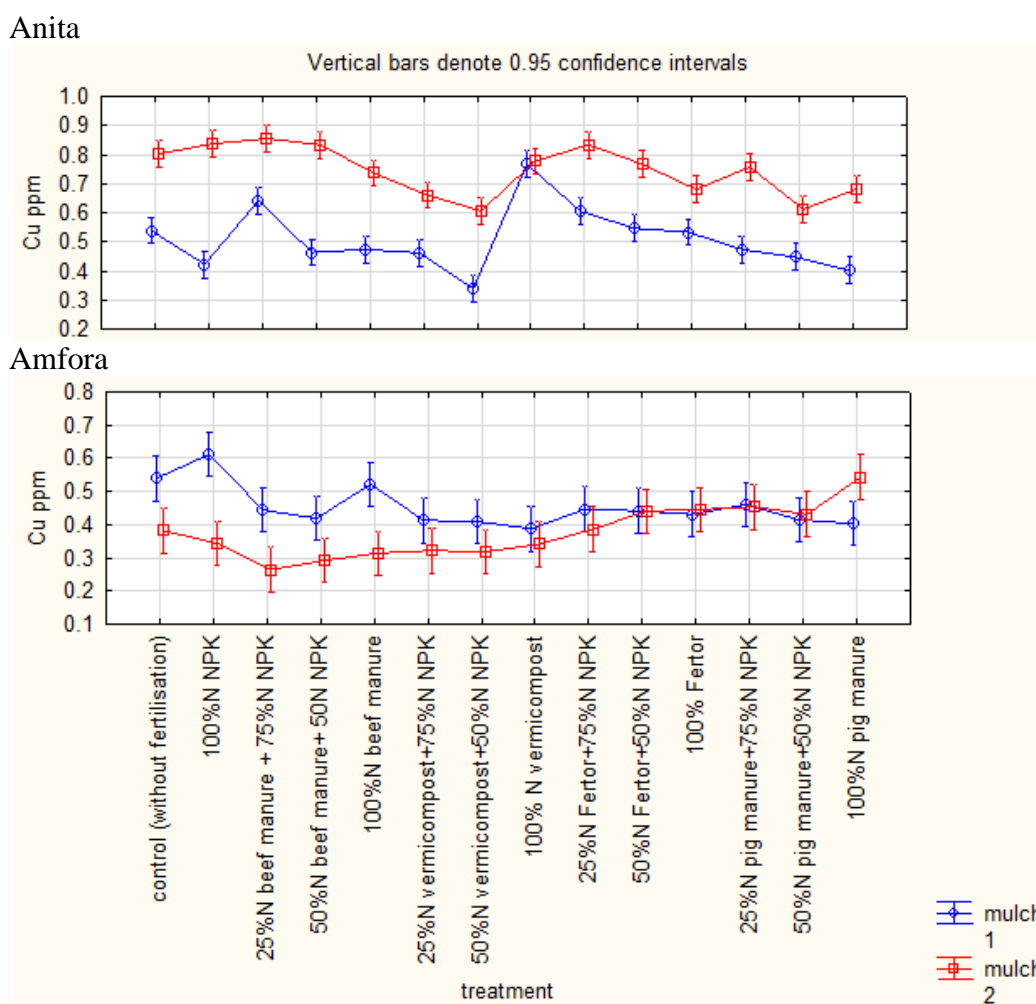
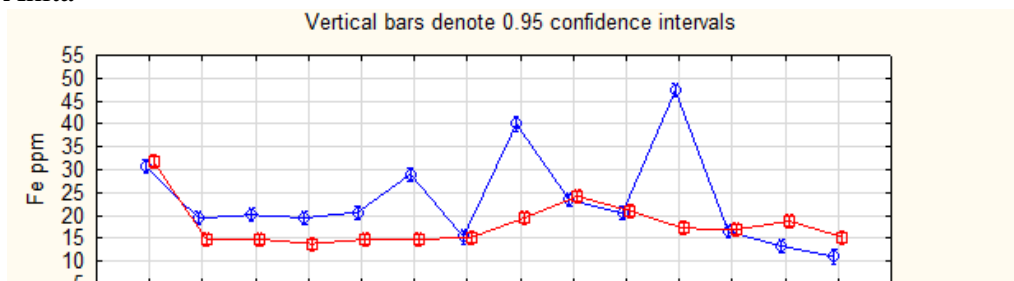


Figure 1. Concentration of Cu in fruits of two pepper cultivars produced under 14 fertilization schemes, with (mulch 1) or without (mulch2) mulching

The results show that mulching significantly reduced concentration of Fe in pepper (Figure 2). The significantly lower Fe concentrations were found at Amfora compared to Anita. It can

be observed that when applying [50%N Fertor + 50%N NPK] and [25%N pig manure + 75%N NPK], the Fe concentration didn't change regardless of the mulching. Accordingly, some authors conclude that accumulation of mineral nutrients in the leaves and the fruit of pepper were not significantly affected by plastic mulches [4].

Anita



Amfora

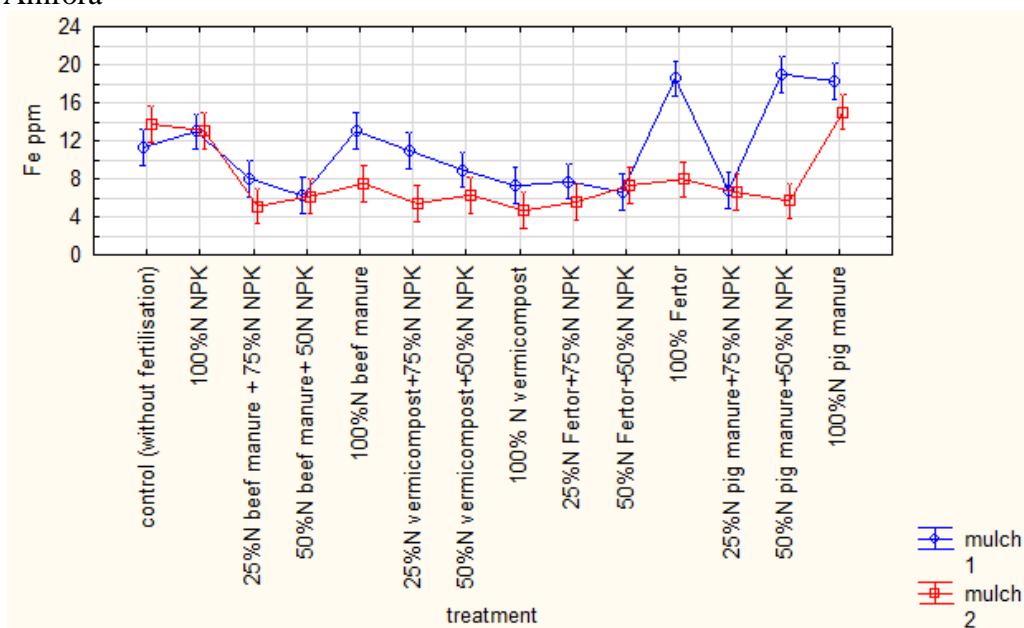


Figure 2. Concentration of Fe in fruits of two pepper cultivars produced under 14 fertilization schemes, with (mulch 1) or without (mulch2) mulching

The concentration of Mn was reduced by mulching (Figure 3). Applied fertilization regimes didn't cause a significant increase in the concentration of Mn in relation to non-fertilized control. In Amfora, there are particularly small variations in the Mn concentration.

There are statistically significant differences between Anita and Amfora with respect to the average concentration of Zn (Figure 4). Generally, in Anita significantly higher concentration of all analyzed elements was recorded. Concentration of Zn was strongly affected by the use of different fertilizers, whereas mulching had less pronounced effect. Certainly the kind of mulch can play an important role also. In potato, the use of colored mulches were found to be associated with differences in the concentrations of Cu and Zn in the leaves and the tubers [5].

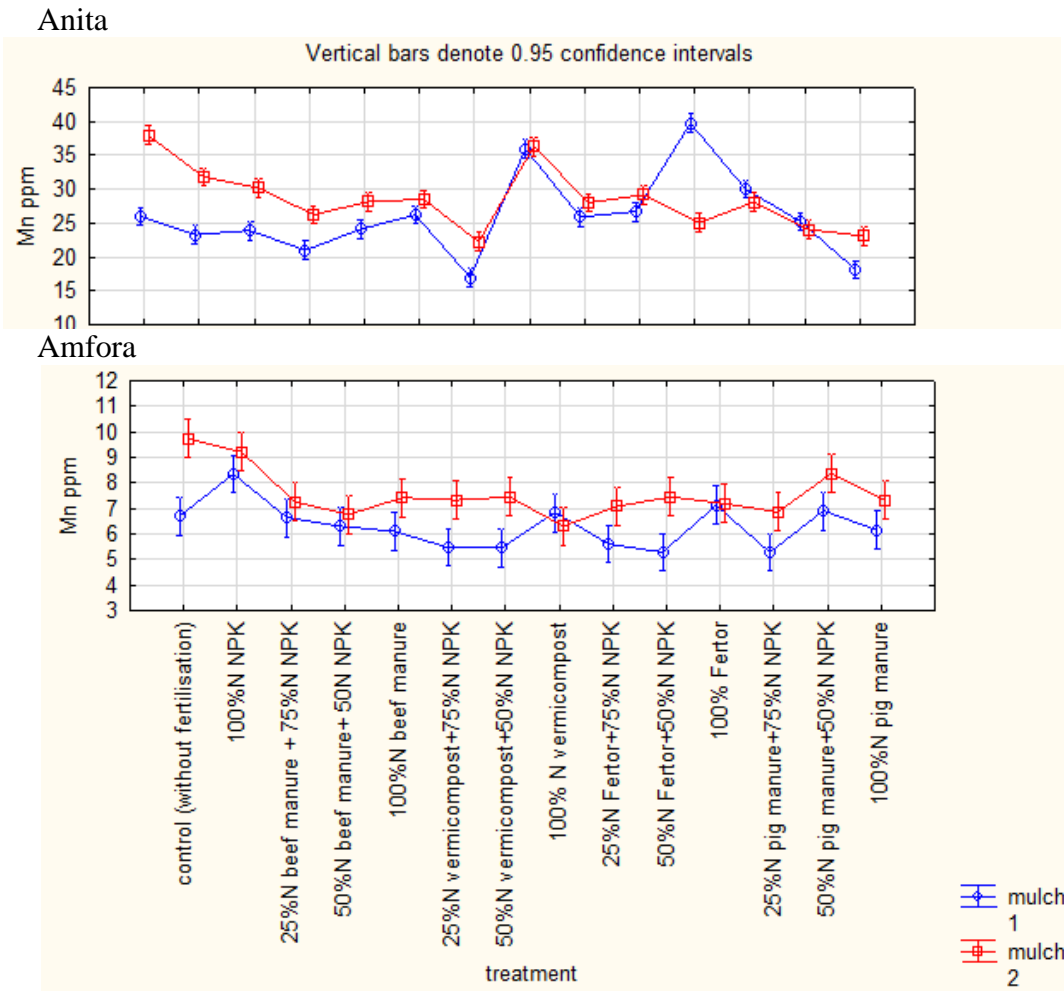
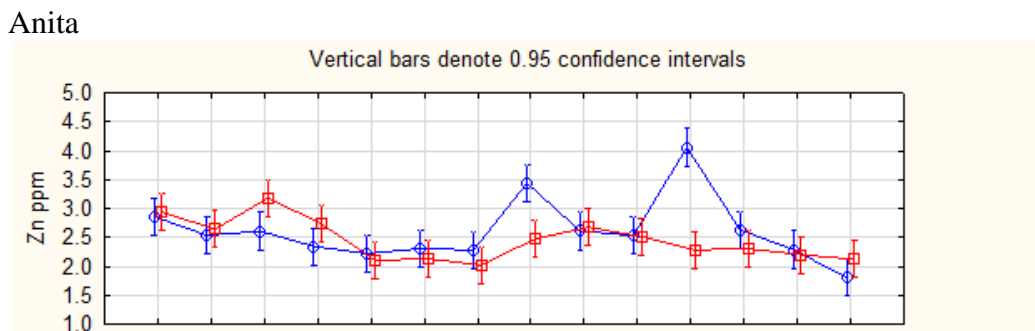


Figure 3. Concentration of Mn in fruits of two pepper cultivars produced under 14 fertilization schemes, with (mulch 1) or without (mulch2) mulching



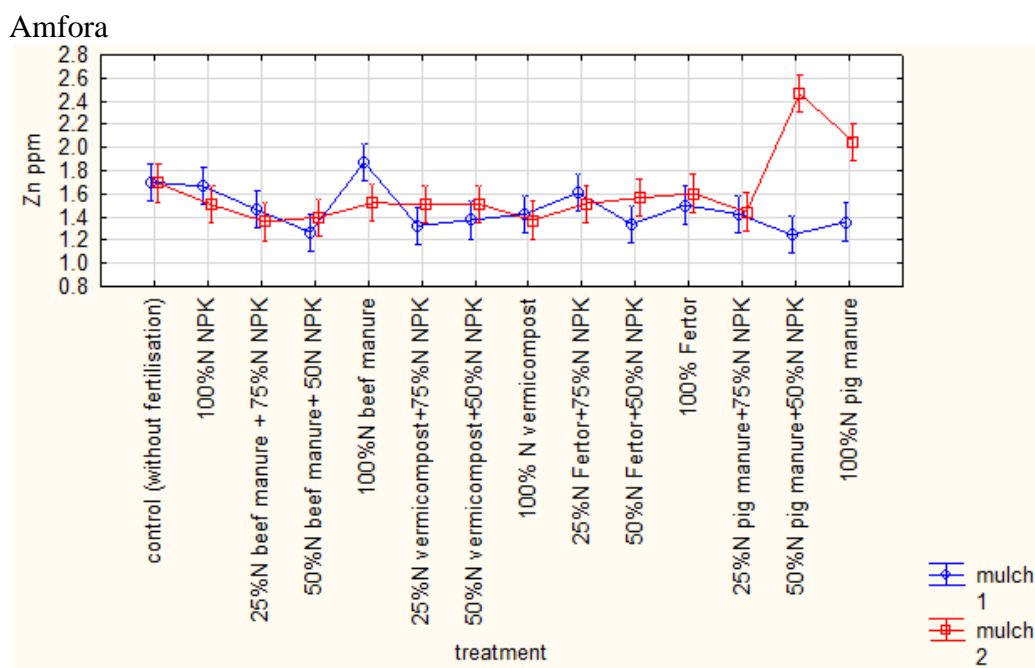


Figure 4. Concentration of Zn in fruits of two pepper cultivars produced under 14 fertilization schemes, with (mulch 1) or without (mulch2) mulching

Conclusions

Under applied fertilization schemes concentrations of Cu, Fe, Mn and Zn were significantly changed. Moreover, significant differences between two pepper cultivars (Anita and Amfora) were detected as well. Concentration of Cu was altered the most in response to on mulching, of the four analysed micronutrients.

Acknowledgements

We thank Ministry of Education, Science and Technological Development of the Republic of Serbia, TR 31036, for financial support.

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