
Nitrogen and Crude Proteins in Beetroot under Different Fertilization Treatments

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Introduction



- vegetable has an important role in human nutrition as a source of:
 - minerals, vitamins
 - **amino acids and proteins**
- vegetable consumption contribute to human health



Introduction



- beetroot as a functional food
 - prevents the emergence and development of cancer
 - anemia, leukemia and malignant tumors



Introduction



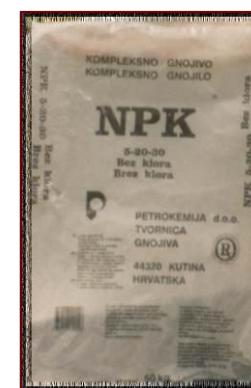
- efficient production of vegetables is based on high investments
 - especially fertilizers
- optimizing crops nutrition
 - achieving satisfactory **yields and quality**



Introduction



- all **essential nutrients** in the soil are necessary to bring to the stage where the plant **constantly** have sufficient amounts of nutrients accessible
- during all phases of growth and development in all conditions



Introduction



- imbalance in the nutrition
 - decreasing of growth
 - increasing imbalance of nutrients in the soil and plant
 - excess of nitrogen
 - especially imbalance of potassium, magnesium and calcium
 - increase the risk of damage from the environment
 - lodging, disease and intolerance to cold temperatures

Introduction



- fertilizers use
 - economicaly
 - to raise the amount of accessible nutrients in the soil
 - meeting the needs of plants for normal growth and development
- proper fertilization
 - leads to an increase of nutrients in the soil and plant
 - reflects to the quality of vegetables and its complete nutritional value

Introduction



- **nitrogen** is integral part of many organic molecules
 - proteins
 - nucleic acids
 - chlorophyll
- plants incorporate nitrogen in organic matter throughout the whole growing season



Introduction



- nitrogen
 - the most important macronutrient in the formation of **yield and quality of vegetables**
- nitrogen fertilization of vegetables
 - increasing protein levels still attracts very little attention
- Lešić et al. (2002)
 - 0.14 to 2.50 % N in dry weight

Introduction



- **crude proteins**
 - important in nutrition of humans and livestock
- however, grains, meat, milk and soybean are always cited as sources of crude proteins
- it is worth mentioning that vegetables are not a negligible source of crude proteins
 - the fact that considerable amounts of vegetables should be consumed daily

Introduction



- Lešić et al. (2002)
 - 11-20 g kg⁻¹ crude proteins in fresh weight

- Wybenga and Lehr (1958)
 - 131-214 g kg⁻¹ crude proteins in beetroot dry weight

Aim



- to determine
 - the influence of different organic and mineral fertilization treatments
 - post-harvest treatments on the content of nitrogen and crude proteins
 - in the edible part of beetroot (*Beta vulgaris* var. *conditiva*)

Materials and methods



- filed fertilizer trial
 - years: 2003-2005
- cultivar Bikor



Materials and methods



- 2 locations
 - Žumberačko gorje - Brašljeвица
 - Lika - Hrvatsko Polje



Materials and methods



- Latin square method
- treatments
 - unfertilized control
 - 50 t stable manure ha⁻¹
 - 500 kg NPK 5-20-30 ha⁻¹
 - 1000 kg NPK 5-20-30 ha⁻¹



trial setting

Materials and methods



insplanted
distance

0.25m

Materials and methods



environment	sowing	harvest	vegetation
Brašljeвица, 2003	22.05.	21.08.	90 days
Hrvatsko Polje, 2004	21.05.	24.08.	94 days
Hrvatsko Polje, 2005	29.06.	28.09.	90 days

storage: 45 days at 5 °C in a fridge without light



beetroot sowing



harvested beetroot

Materials and methods



- taken samples from each plot
 - random: 10-12 beetroots



Materials and methods



- total nitrogen
 - Kjeldahl method
(AOAC, 1995)
- crude proteins
 - $\% N_{\text{total}} \times 6,25$ (Vajić, 1964)

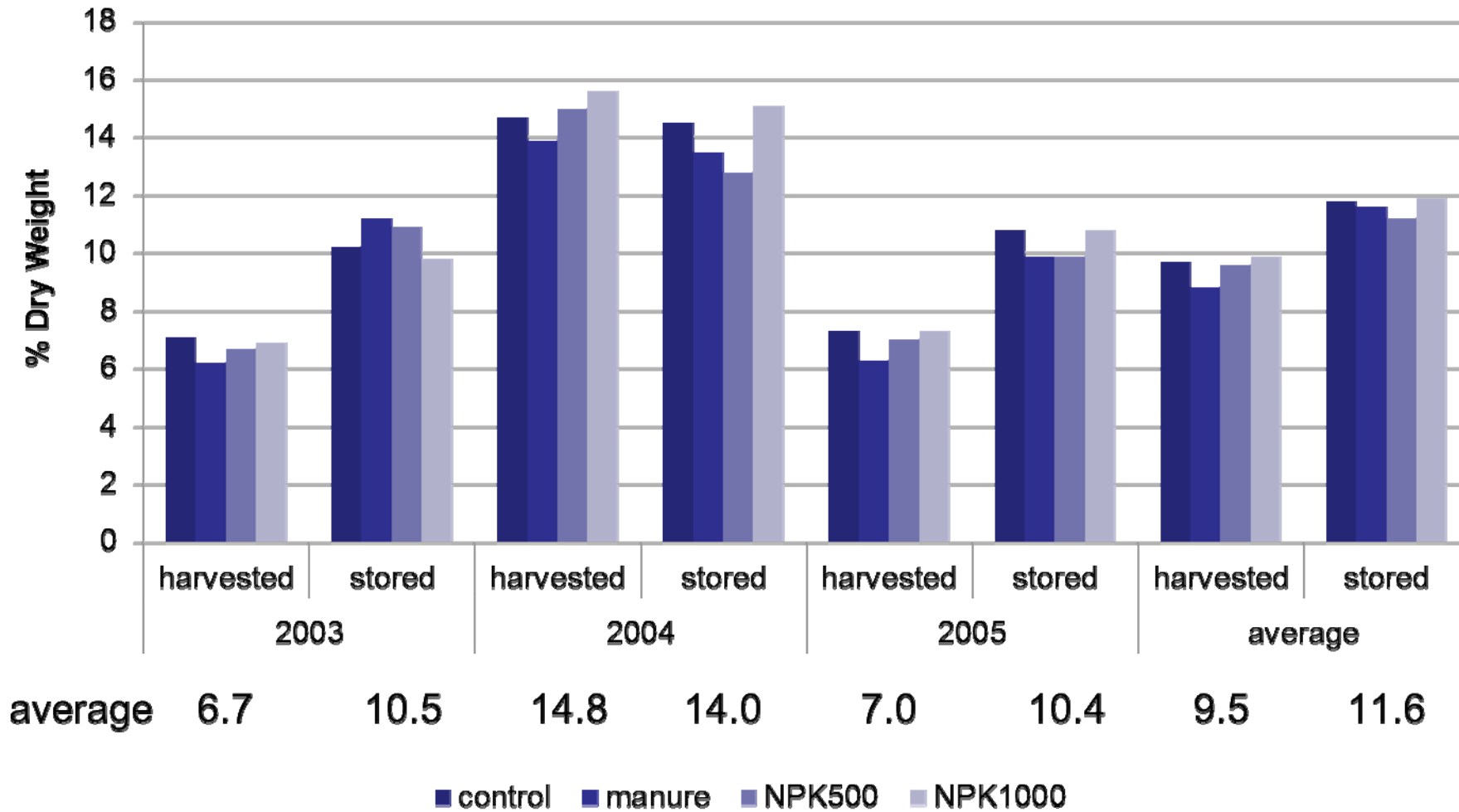


- statistical program SAS System for win Ver. 9.1
- Tukey test multiple comparison (Tukey's HSD)

Results



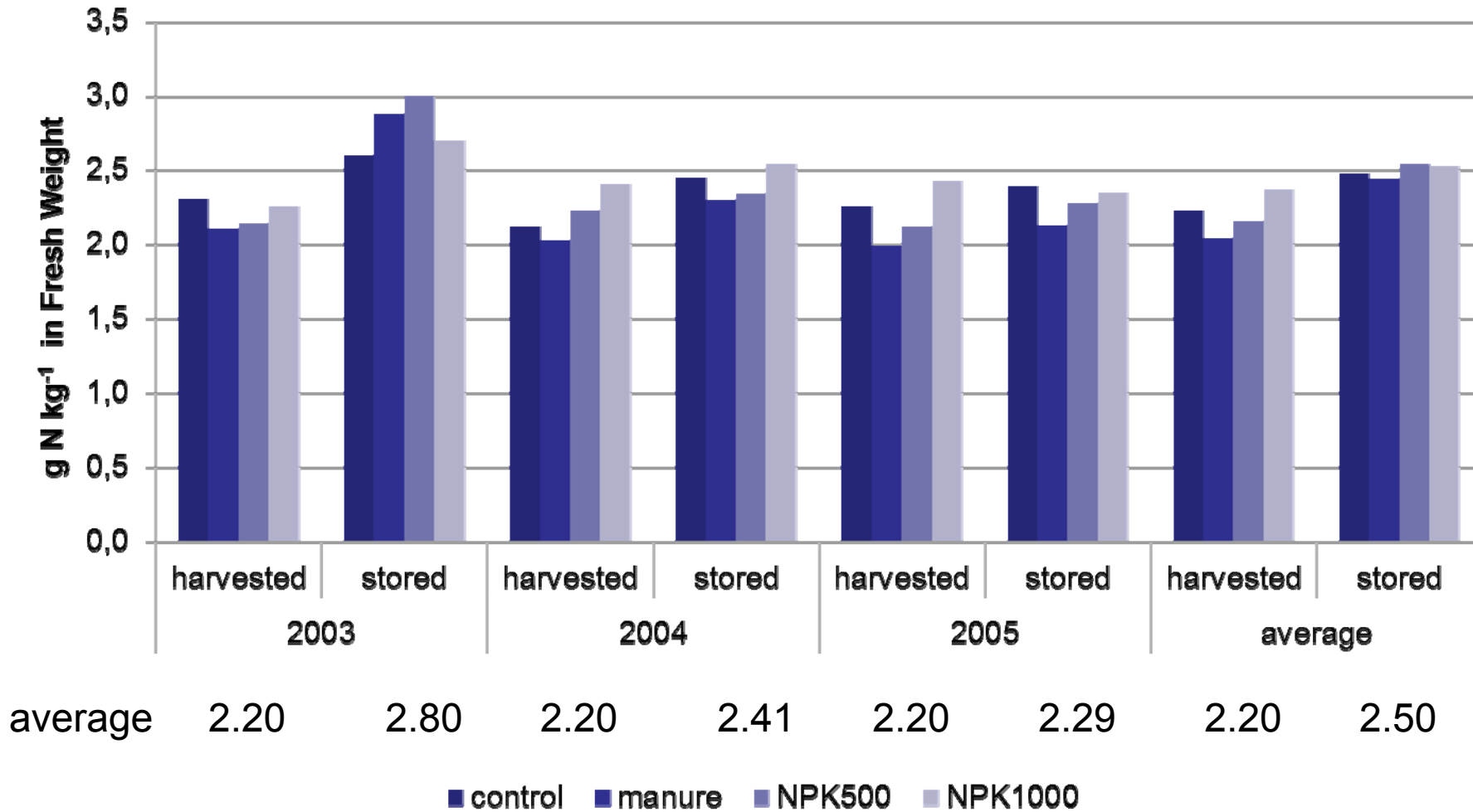
Dry weight (in %) in beetroot



Results



g N kg⁻¹ in Fresh Weight in beetroot

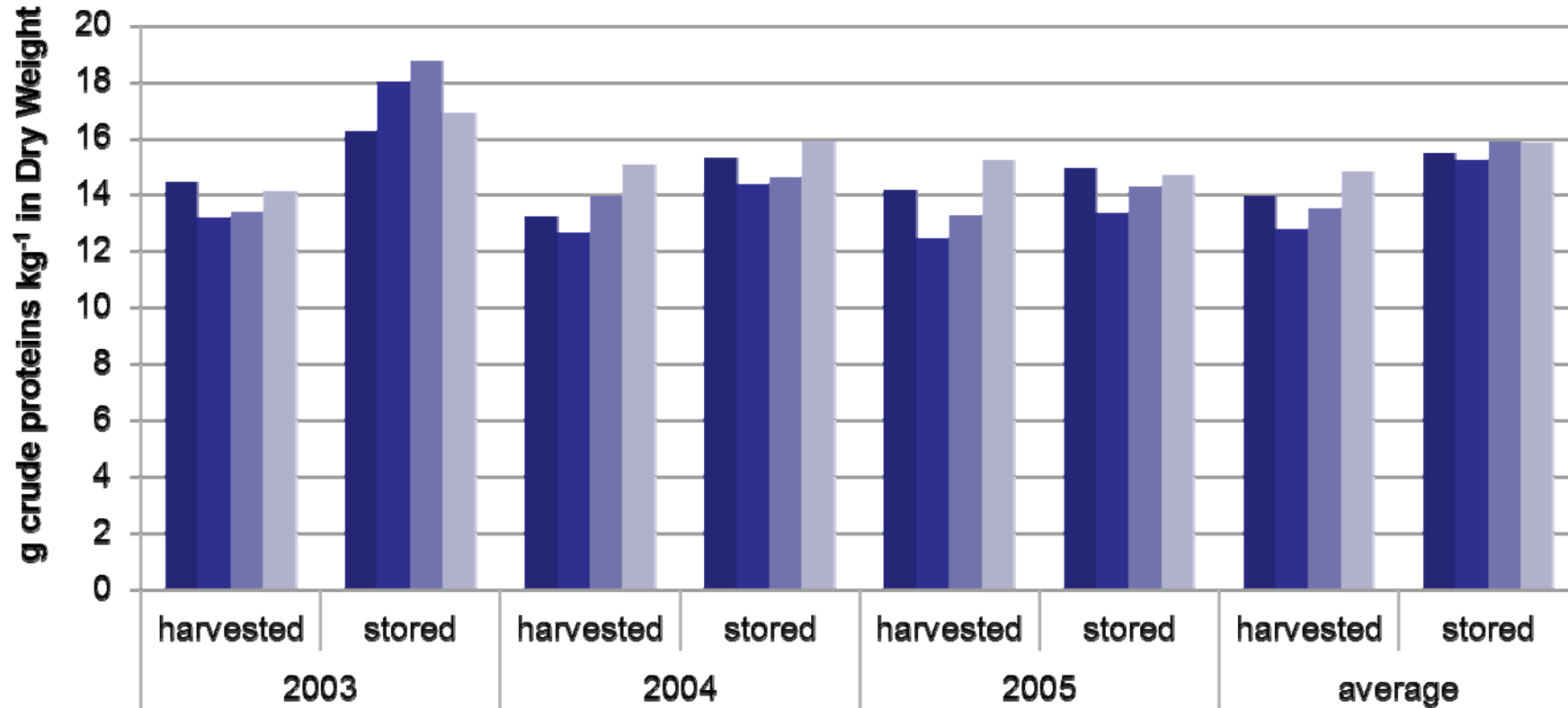


average 2.20 2.80 2.20 2.41 2.20 2.29 2.20 2.50

Results



g crude proteins kg⁻¹ in Fresh Weight in beetroot



average 13.78 17.47 13.73 15.04 13.76 14.30 13.76 15.61

■ control ■ manure ■ NPK500 ■ NPK1000

Conclusions



- the highest content of crude proteins in fresh weight was obtained in 2004 and 2005
 - in fertilization treatment with 1000 kg ha⁻¹ NPK 5-20-30
- the crude protein content was higher in stored beetroot because of its decreasing water content (12 % average loss)
- this one of the factors that can increase the nutritional quality of beetroot as a functional food

Thank you!



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