VYTAUTAS MAGNUS
UNIVERSITY
AGRICULTURE
ACADEMY

# EFFECT OF BIOLOGICAL PREPARATIONS AND DIFFERENT NITROGEN FERTILIZATION ON SOIL PROPERTIES AND SPRING WHEAT CROP

**Darija Jodaugienė, Rita Čepulienė, Irena Pranckietienė, Rūta Dromantienė**

Vytautas Magnus University Agriculture Academy, Lithuania

IECAG 2021

The 1st International Electronic Conference on Agronomy

03–17 MAY 2021 | ONLINE

# Introduction

- Recently **biological preparations** of different origin are **used more widely in agriculture** with the aim to have a direct and/or indirect impact on the yield amount and quality.
- It is used to **increase** crop residue **decomposition rate**, to **improve moisture** retention capacity and **nutrients balance** in soil.
- Biological preparations also **improve agroecosystems stability** and **persistence** to abiotic environmental factors and **stress**.
- Sole biological preparations or in mixtures with organic fertilisers (slurry) **affects** not only **plants**, but also **soil** properties, and entire **environment**.
- Currently still there is the **lack of the results**, showing how biological preparations change **soil properties** and the crop yield.

# Experimental site

- The investigations were carried out at the Experimental Station of Vytautas Magnus University Agriculture Academy, Lithuania, in 2018–2019, in *Calc(ar)i-Endohypogleyic Luvisol*, a semi-neutral ($pH_{KCl}$ 6.8), highly phosphorous (226.6 mg $kg^{-1}$ $P_2O_5$), mid-potassium-level (105.0 mg $kg^{-1}$ $K_2O$), mid-humus-level (2.33%) soil, in order to evaluate the effect of biological preparations BactoMix2, BactoMix5 and Rhizobacterin on soil properties and spring wheat crop.

# Treatments of the experiment:

**Factor A – biological preparations:**

1) without spraying,
2) BactoMix2 (Enterobacter V-402 D and 409 D), norm 1.0 L $ha^{-1}$,
3) Rhizobacterin (associative nitrogen-fixing bacteria *Klebsiella planticola*), norm 2.0 L $ha^{-1}$,
4) BactoMix5 (*Bacillus subtilis* V-845 D and V-843 D, *Pseudomonas aurantiaca*, *Bacillus megatarium* and *Brevibacillus* sp.), norm 1.0 L $ha^{-1}$.

**Factor B - nitrogen rates:**

1) fertilized with $N_{105}$,
2) fertilized with $N_{165}$.

- Variants were arranged randomly. The size of the initial field was 240 $m^2$, the size of accounting field was 128 $m^2$.

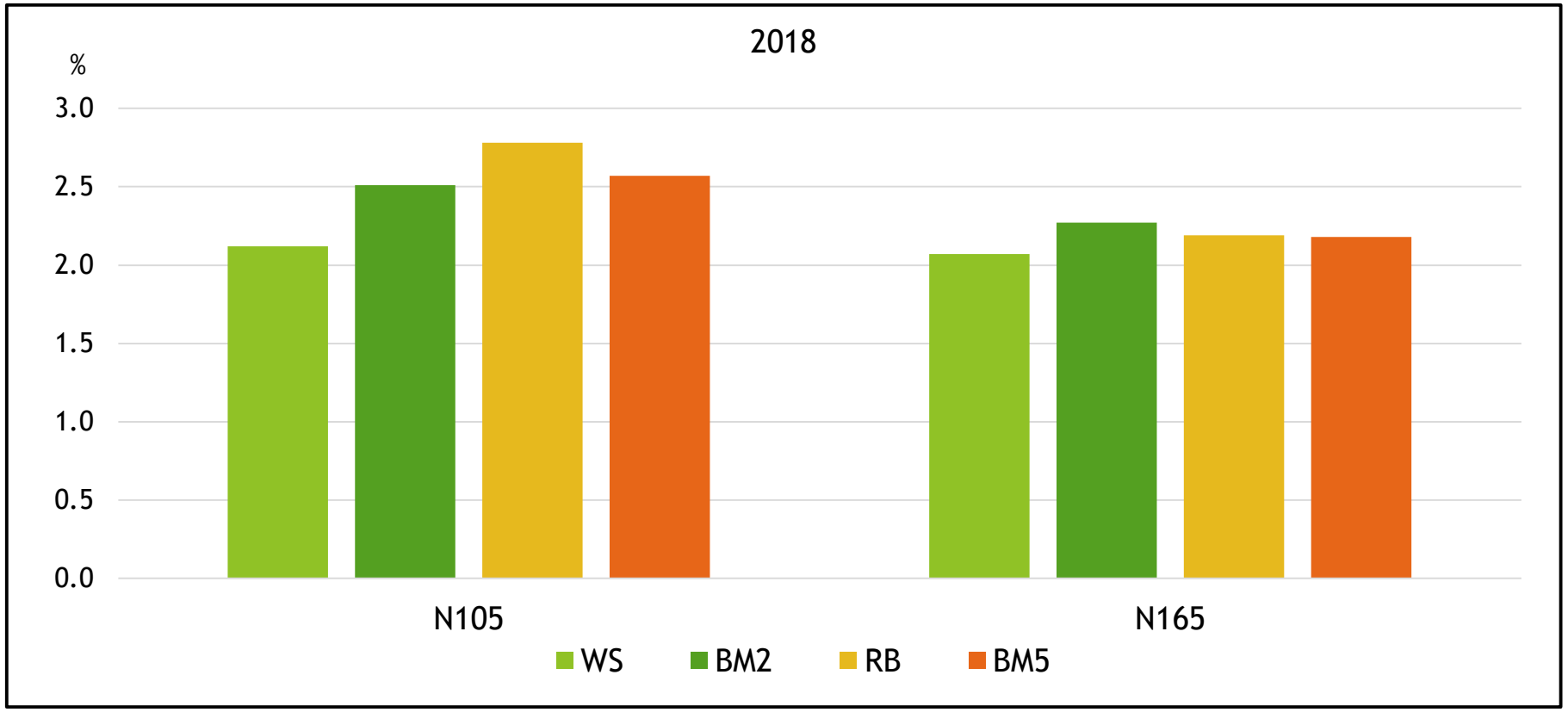


**Fig. 1. Effect of biological preparations on soil humus content after spring wheat harvesting,** *1. WS – without spraying (unused biological preparations - control ); 2. BM2 – BactoMix2; 3. RB - Rhizobacterin; 4. BM5 - BactoMix5, 2018*

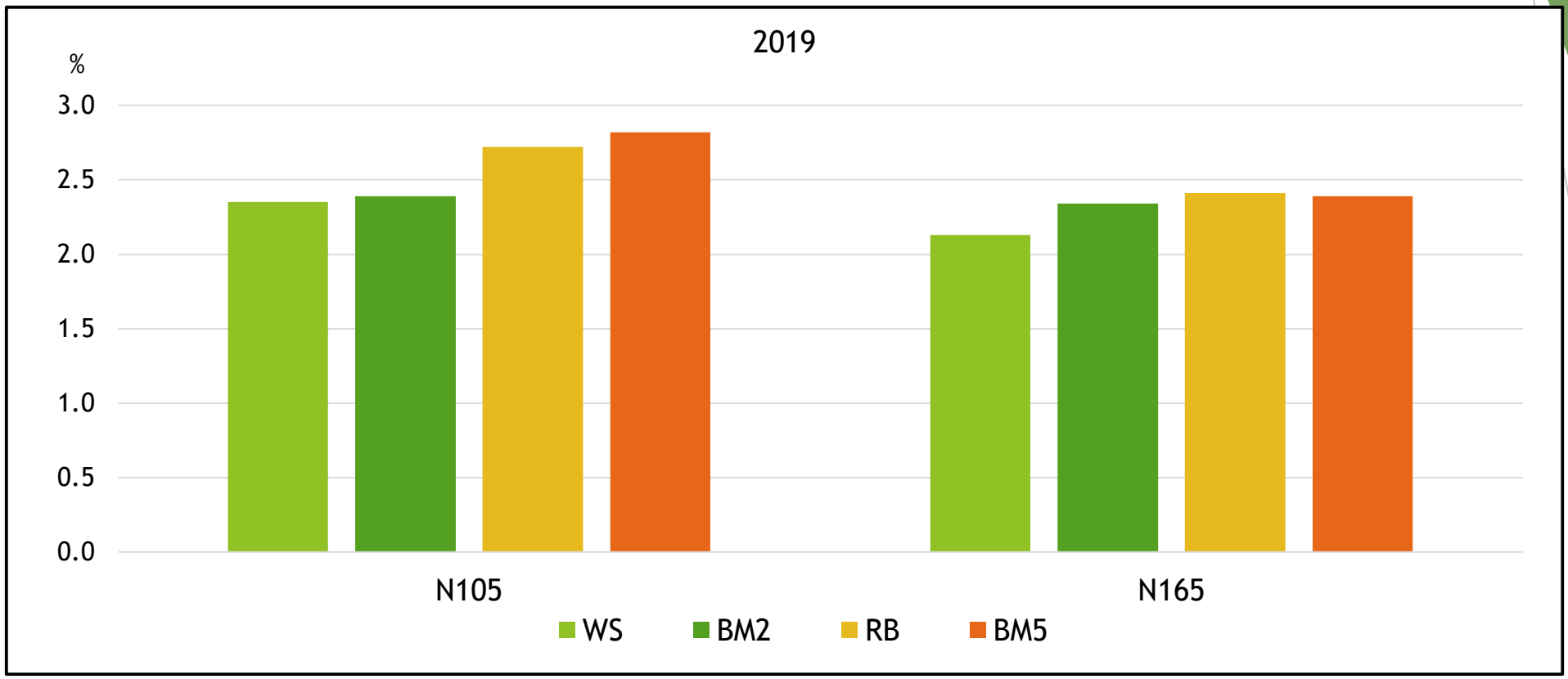


**Fig. 2. Effect of biological preparations on soil humus content after spring wheat harvesting,** *1. WS – without spraying (unused biological preparations - control ); 2. BM2 – BactoMix2; 3. RB - Rhizobacterin; 4. BM5 - BactoMix5, 2019*

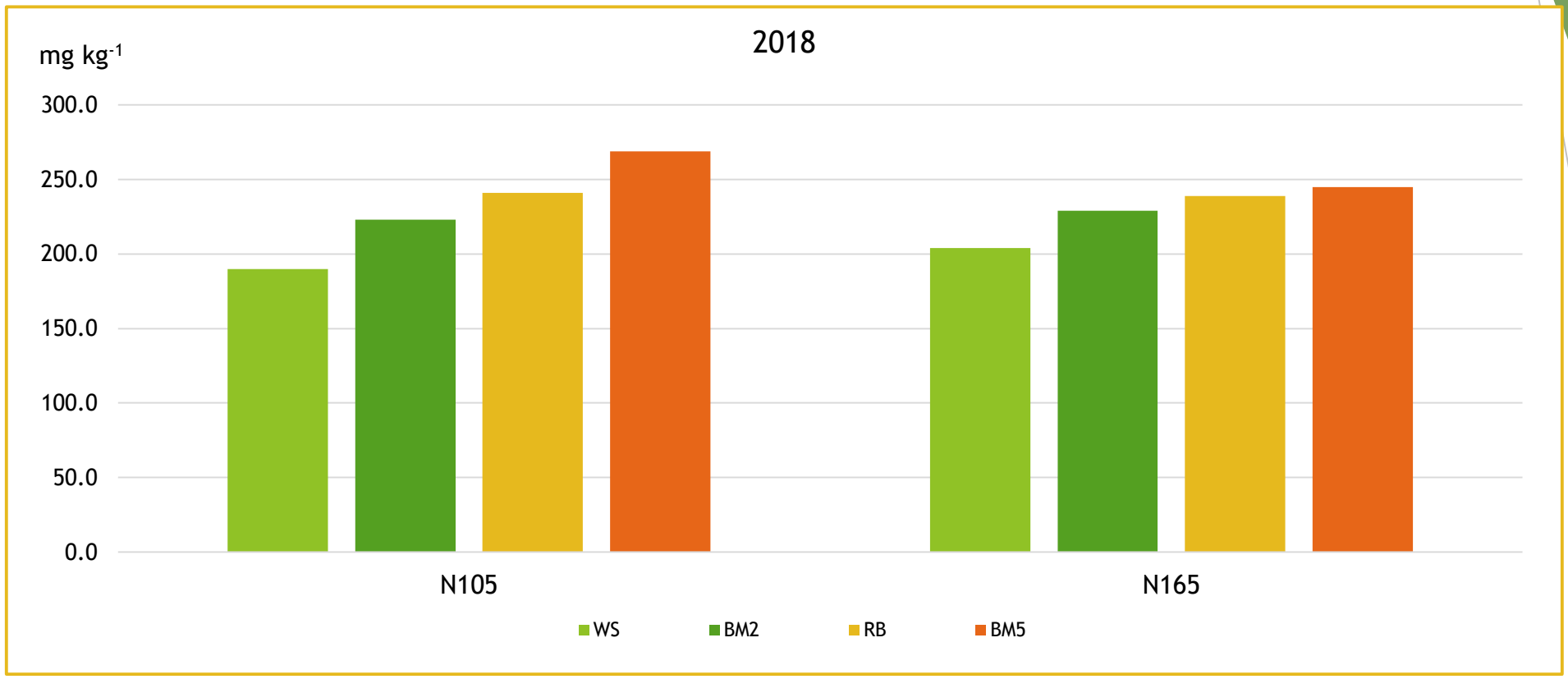


**Fig. 3. Effect of biological preparations on available phosphorus content after spring wheat harvesting,**

*1. WS – without spraying (unused biological preparations - control ); 2. BM2 – BactoMix2; 3. RB - Rhizobacterin; 4. BM5 - BactoMix5, 2018*

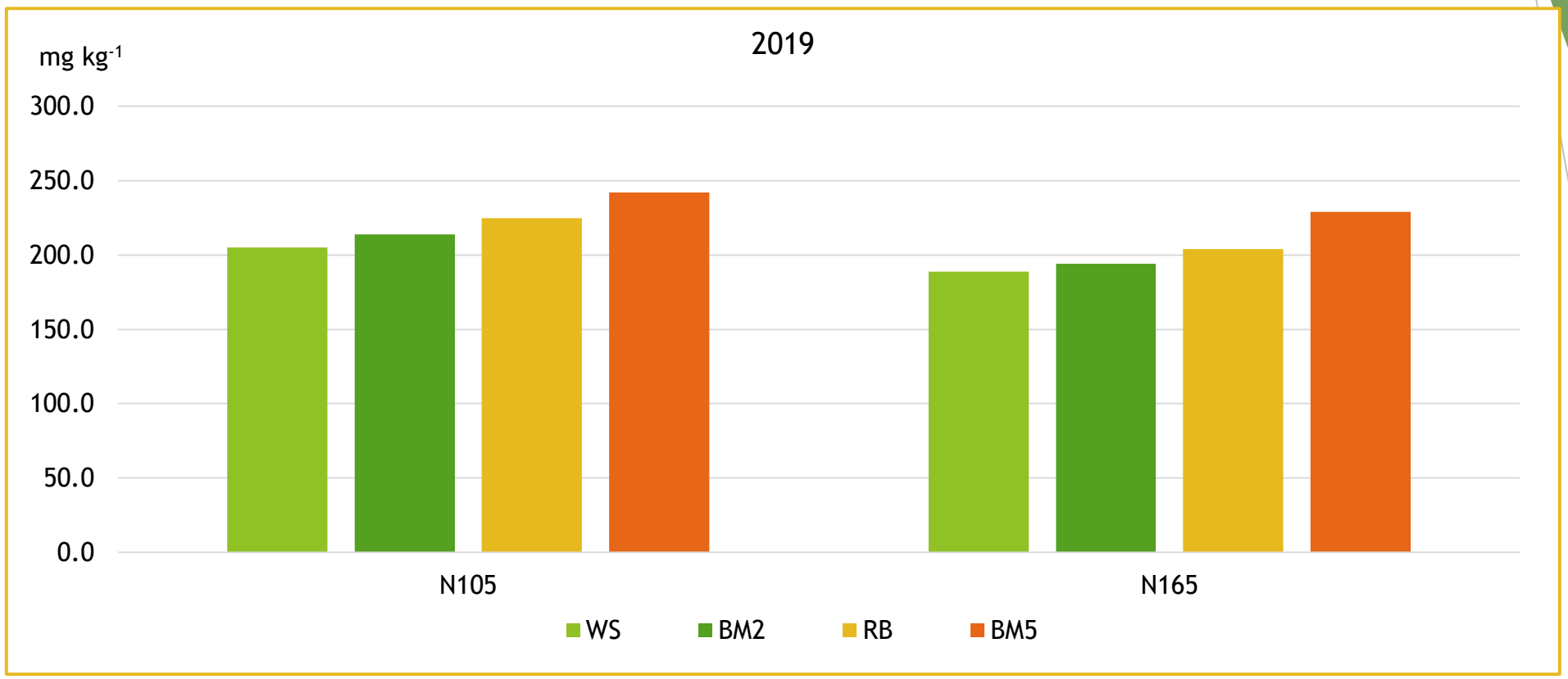


**Fig. 4. Effect of biological preparations on available phosphorus content after spring wheat harvesting,**

*1. WS – without spraying (unused biological preparations - control ); 2. BM2 – BactoMix2; 3. RB - Rhizobacterin; 4. BM5 - BactoMix5,, 2019*

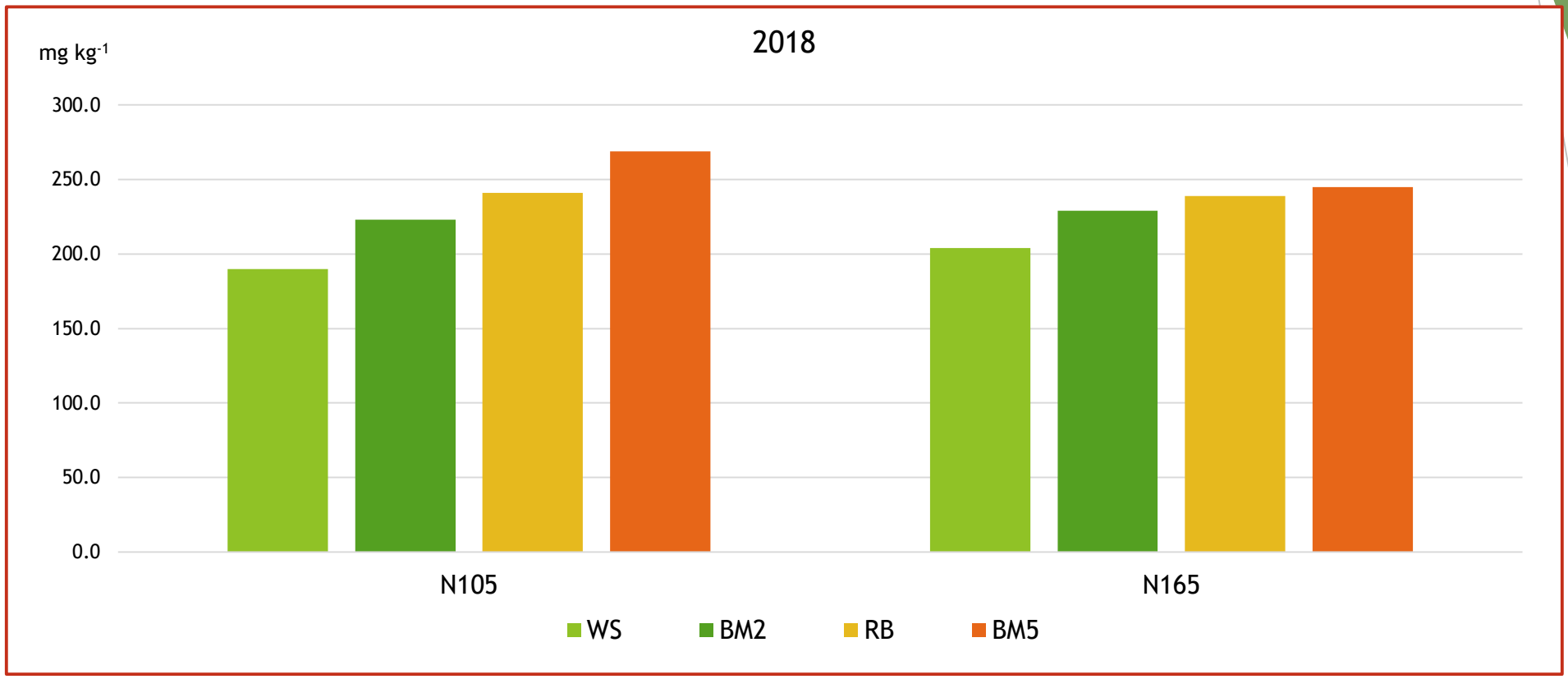


**Fig.5. Effect of biological preparations on available potassium content after spring wheat harvesting,**

*1. WS – without spraying (unused biological preparations - control ); 2. BM2 – BactoMix2; 3. RB - Rhizobacterin; 4. BM5 - BactoMix5,, 2018*

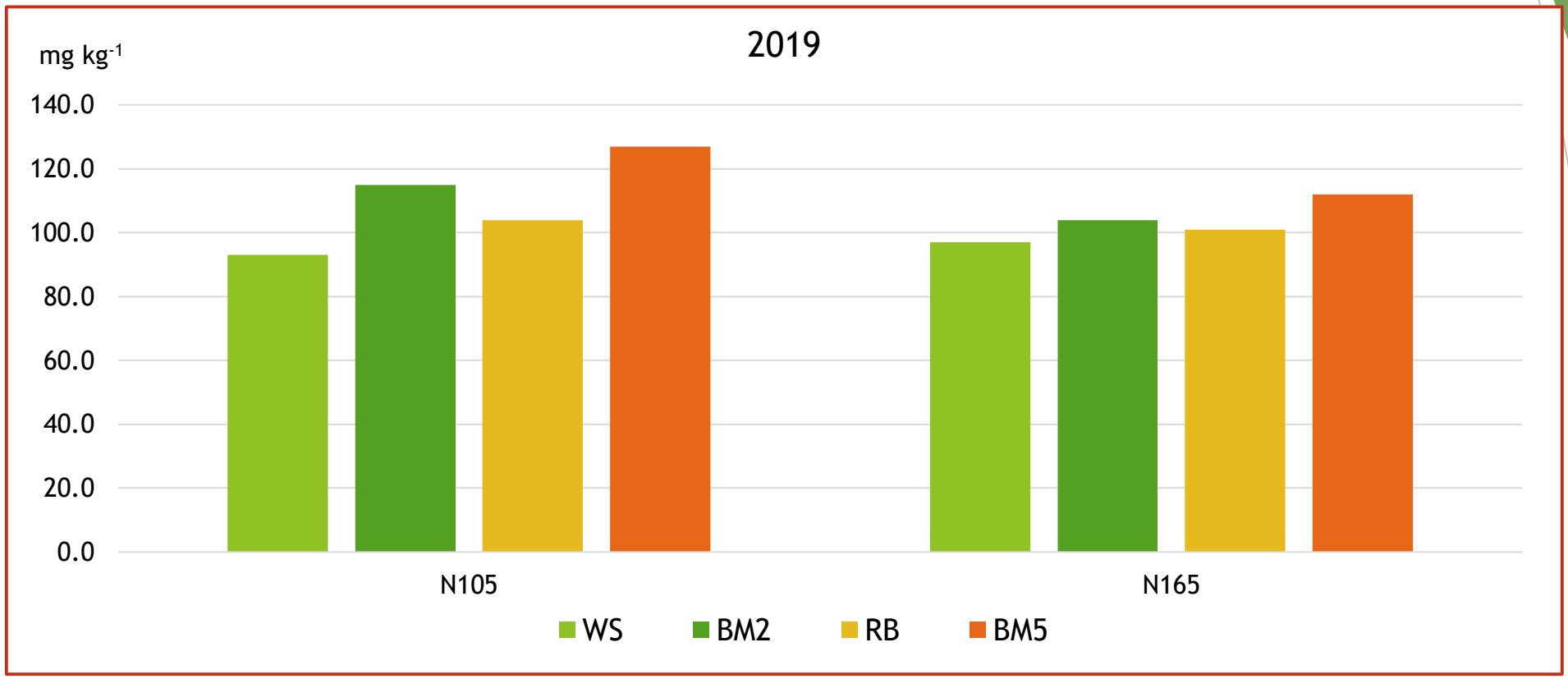


**Fig. 6. Effect of biological preparations on available potassium content after spring wheat harvesting,**

*1. WS – without spraying (unused biological preparations - control ); 2. BM2 – BactoMix2; 3. RB - Rhizobacterin; 4. BM5 - BactoMix5,, 2019*

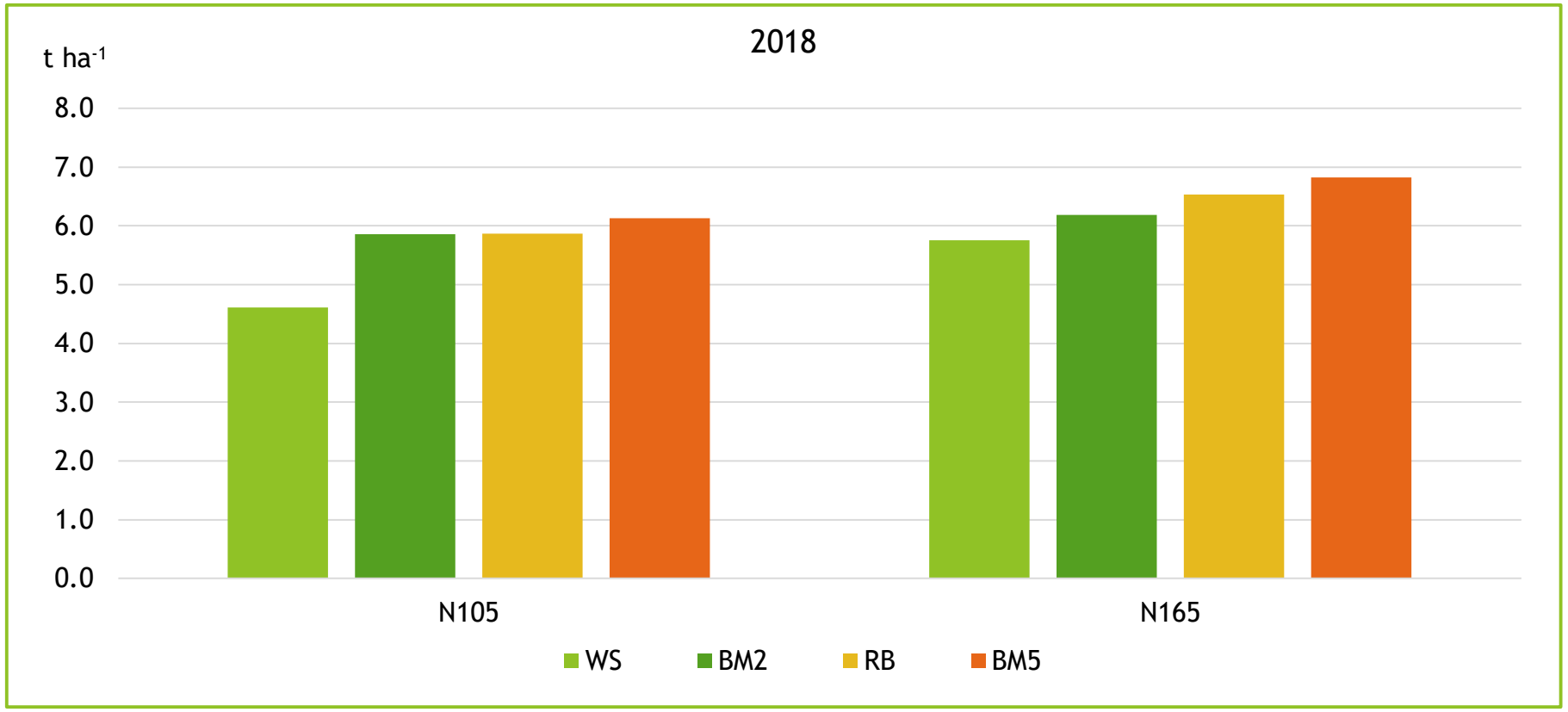


**Fig. 7. Effect of biological preparations on spring wheat yield,**
*1. WS – without spraying (unused biological preparations - control ); 2. BM2 – BactoMix2; 3. RB - Rhizobacterin; 4. BM5 - BactoMix5, 2018*

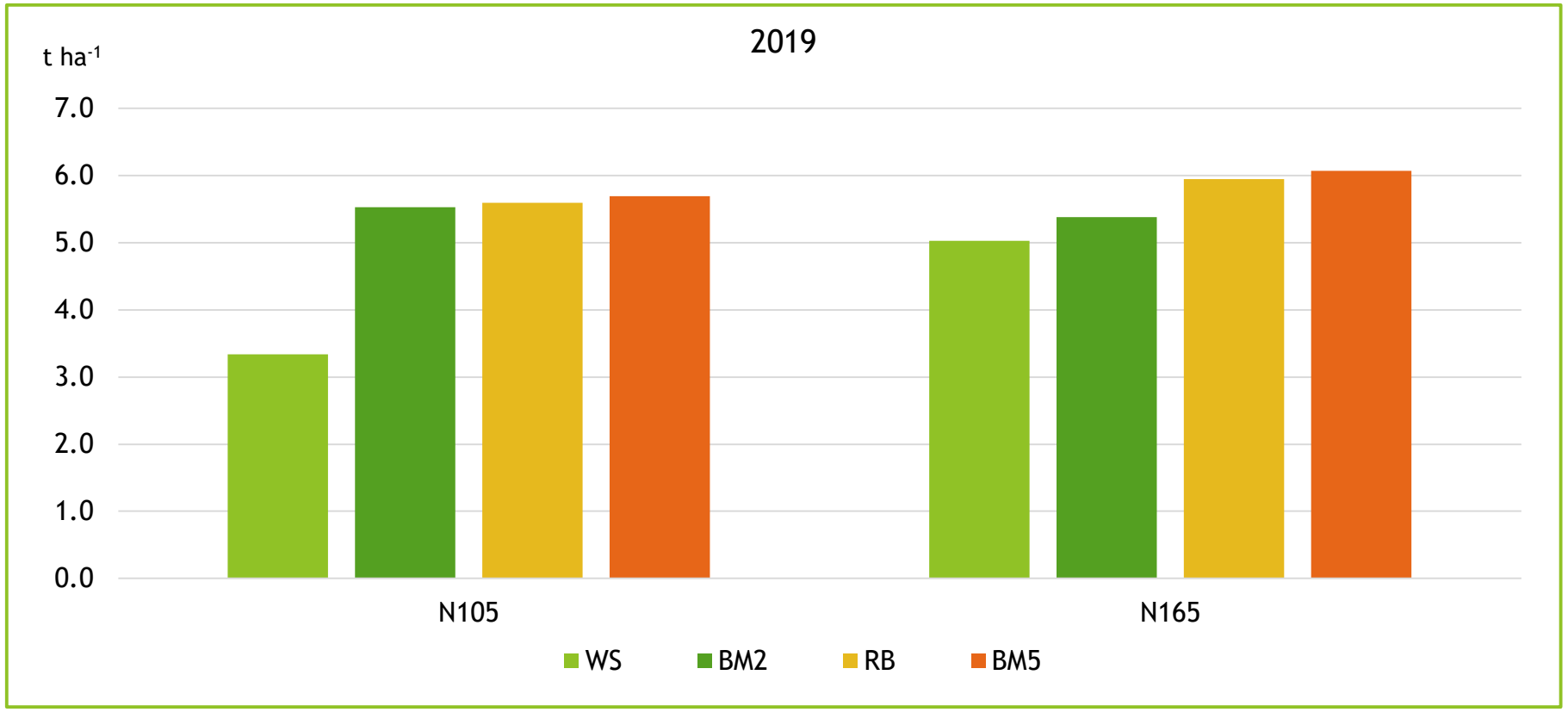


**Fig. 8. Effect of biological preparations on spring wheat yield,**
*1. WS – without spraying (unused biological preparations - control ); 2. BM2 – BactoMix2; 3. RB -* Rhizobacterin*; 4. BM5 - BactoMix5, 2019*

# Conclusions

- The use of biological preparations had positive influence on the agrochemical soil properties. Biological preparations significantly ($P$ <0.05) increased available phosphorus, potassium, nitrogen and humus content. Fertilization with a lower nitrogen rate (N105) showed a better effect of biological preparations on soil properties. In general, the use of biological preparation had positive effect on soil agrochemical properties, especially the use of BactoMix5.
- Application of biological preparation significantly (P≤0.05) increased grain yield of spring wheat when fertilization rate was $N_{105}$. When fertilization rate $N_{165}$ was used significantly (P≤0.05) higher yield of spring wheat grain was harvested in plots sprayed with biological preparation BactoMix5 compared with yield of unsprayed plots.