VYTAUTAS MAGNUS
UNIVERSITY
AGRICULTURE
ACADEMY

EFFECT OF BIOLOGICAL PREPARATIONS AND DIFFERENT NITROGEN FERTILIZATION ON WINTER WHEAT CROP

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Introduction

- Plant fertility and soil quality are determined by many environmental factors. Good quality crops occur when plants are grown with optimal development, nutrition and formation of crop structural elements.
- With the intensification of agricultural production, the use of plant protection products and mineral fertilizers is increasing. This has led to a decrease in the humus content of the soil and to a deterioration of soil quality.
- One of the most effective measures to maintain soil fertility is fertilization with organic fertilizers. Recently, with the declining use of organic fertilizers, a partial solution to the problem may be fertilizers enriched with humus, amino acids, seaweed extracts and other plant nutrition activators.
- Microbiological products strengthen the root system, accelerate the process of photosynthesis, strengthen the plant's immune system, increase resistance to adverse environmental factors and improve soil structure.
- Rising prices of energy resources and the EU ecological policy goals are forcing farmers to seek solutions to reduce production costs and energy resources. At the same time, new and efficient measures are sought to increase soil fertility and quality.

Experimental site

- The investigations were carried out at the Experimental Station of Vytautas Magnus University Agriculture Academy, Lithuania, in 2019–2020, in *Calc(ar)i-Endohypogleyic Luvisol*, a semi-neutral (pH_{KCl} 6.9), high phosphorus (232.6 mg kg^{-1} P_2O_5), mid-potassium-level (111.0 mg kg^{-1} K_2O), mid-humus-level (2.39%) soil, in order to evaluate the effect of biological preparations on winter wheat crop.

Treatments of the experiment:

Factor A – biological preparations:

1) **without spraying,**
2) **2) complex of fulvic and humic acids with microorganisms (biological preparation A) was sprayed (norm 1.0 L ha^{-1}) in autumn,**
3) **3) complex of industrial biological waste (molasses) with microorganisms (biological preparation B) was sprayed (norm 2.0 L ha^{-1}) in autumn.**

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 140 m^2, the size of accounting field was 100 m^2.**

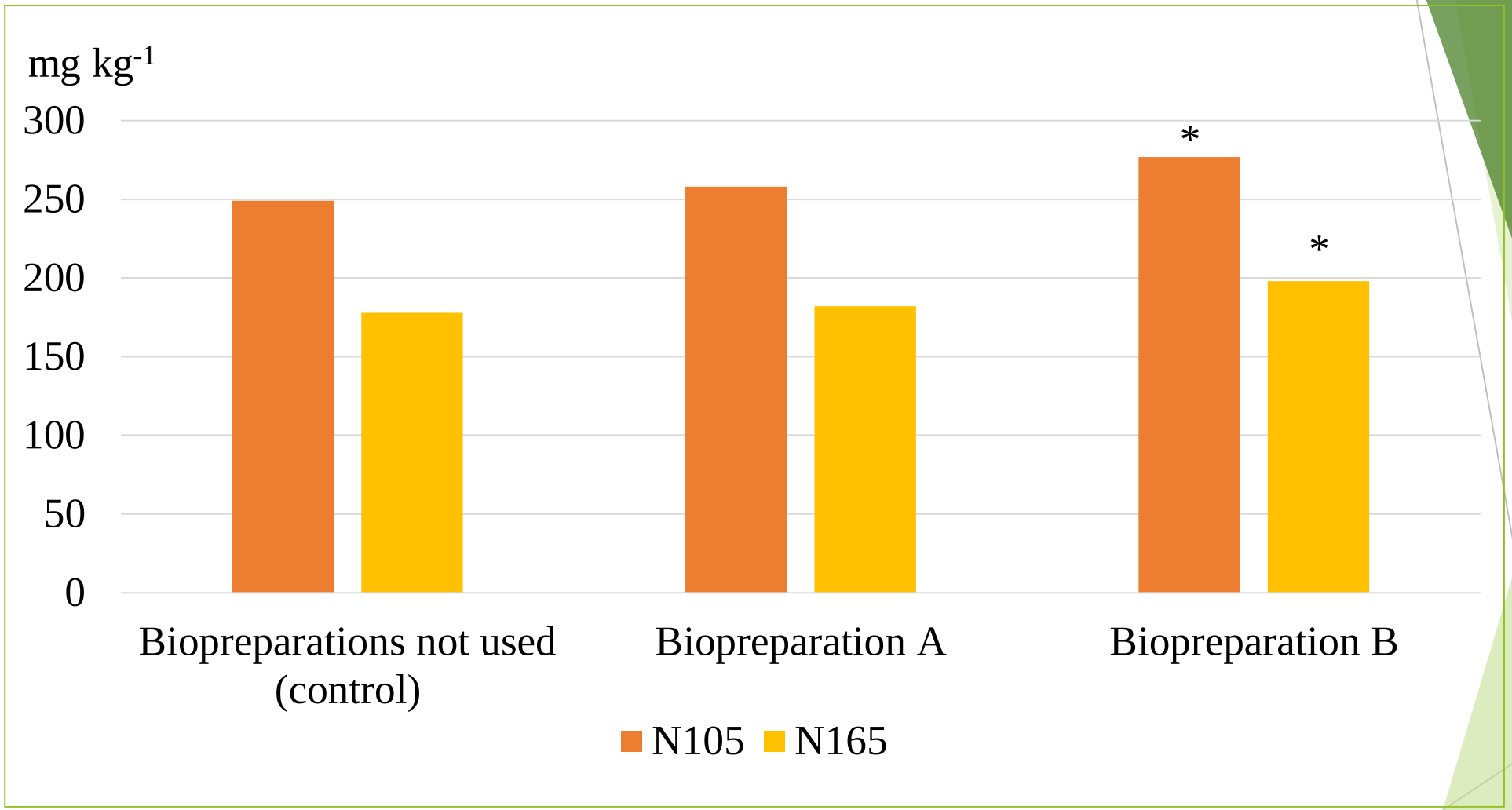

Fig. 1. Effect of biological preparations on available phosphorus content after winter wheat harvesting, 2020

Note: * - significant differences at 95% probability level

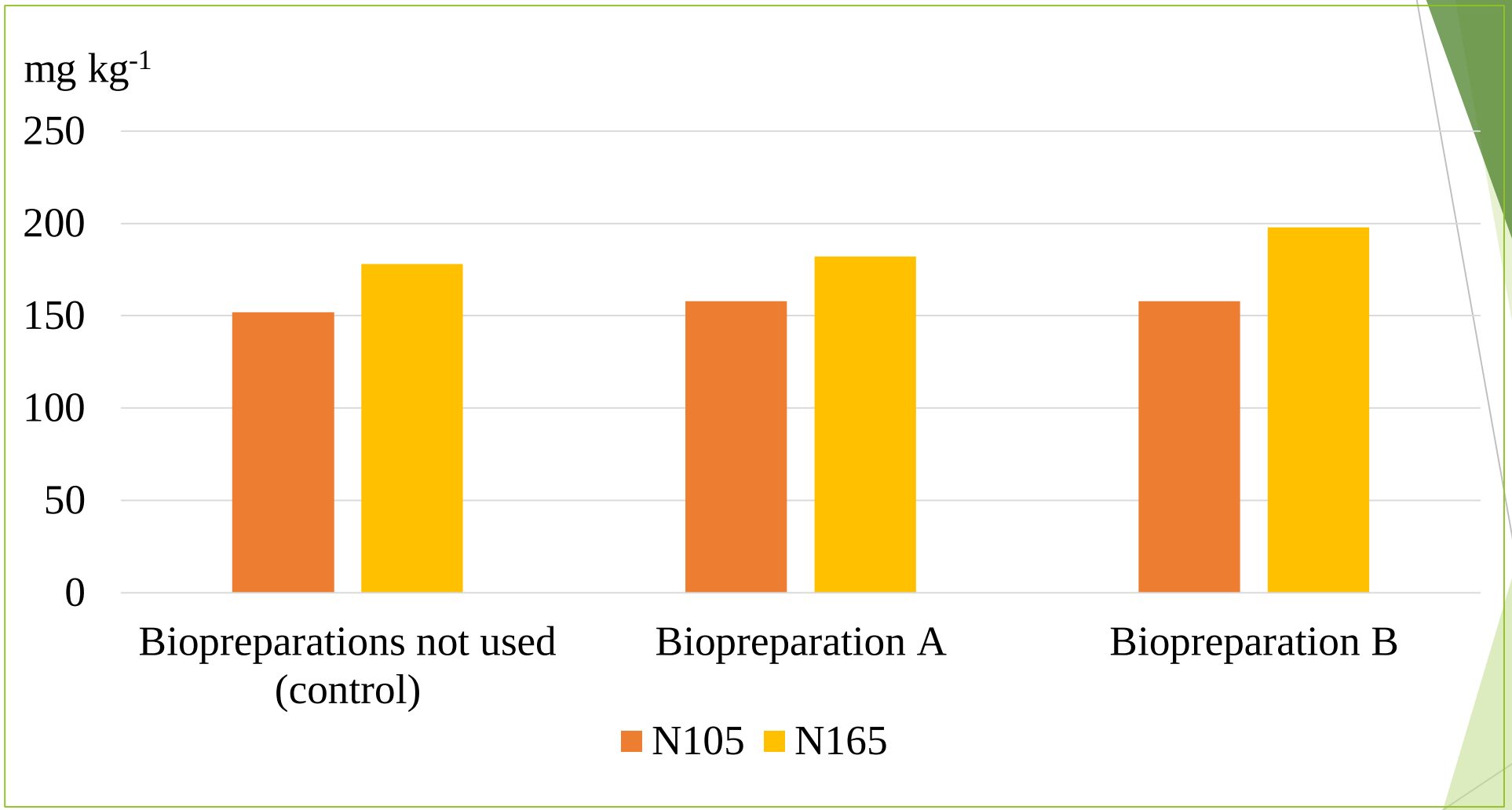

Fig. 2. Effect of biological preparations on available potassium content after winter wheat harvesting, 2020

Note: P>0.05 no significant differences

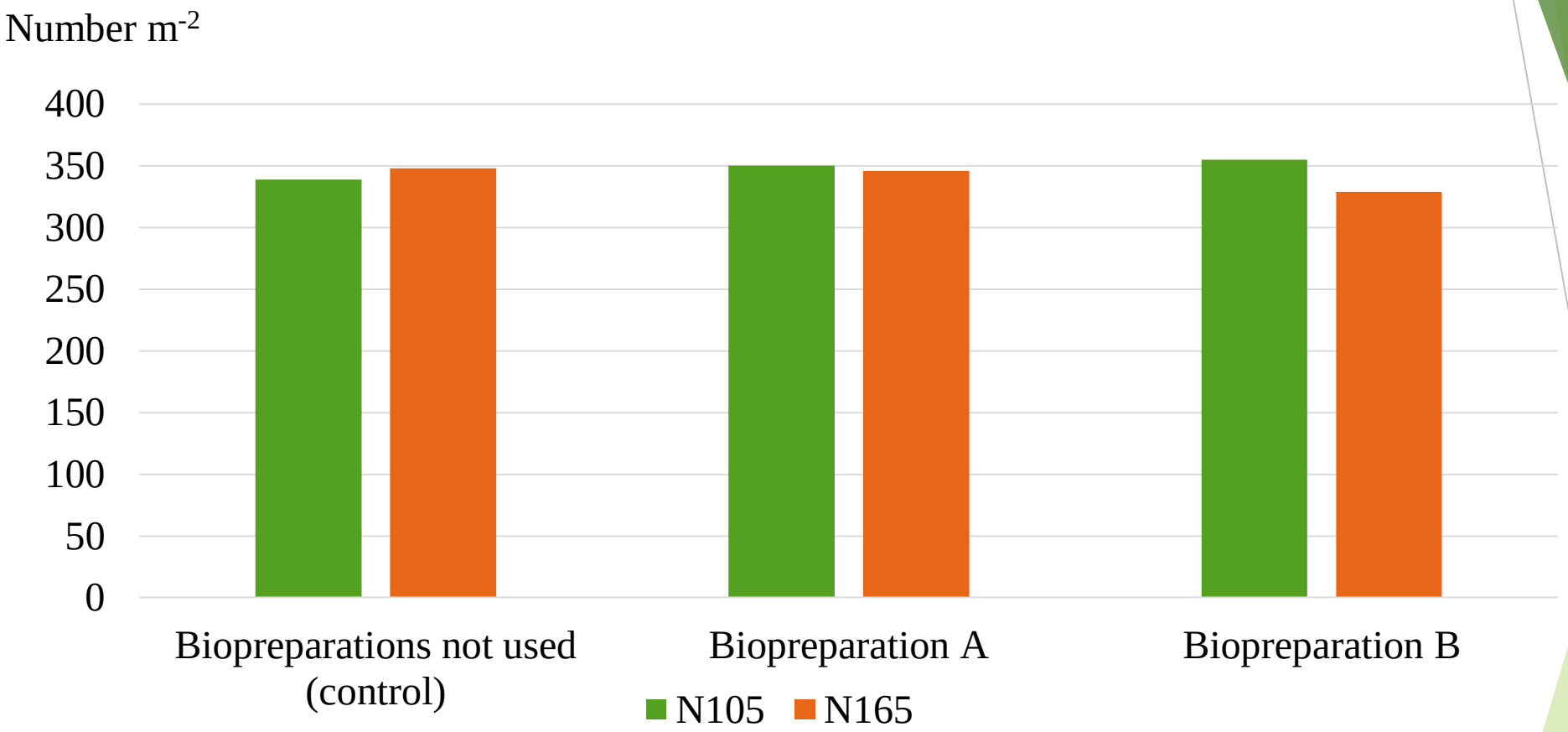

Fig. 3. Effect of biological preparations on germination rate of winter wheat crops, 2019

Note: P>0.05 no significant differences

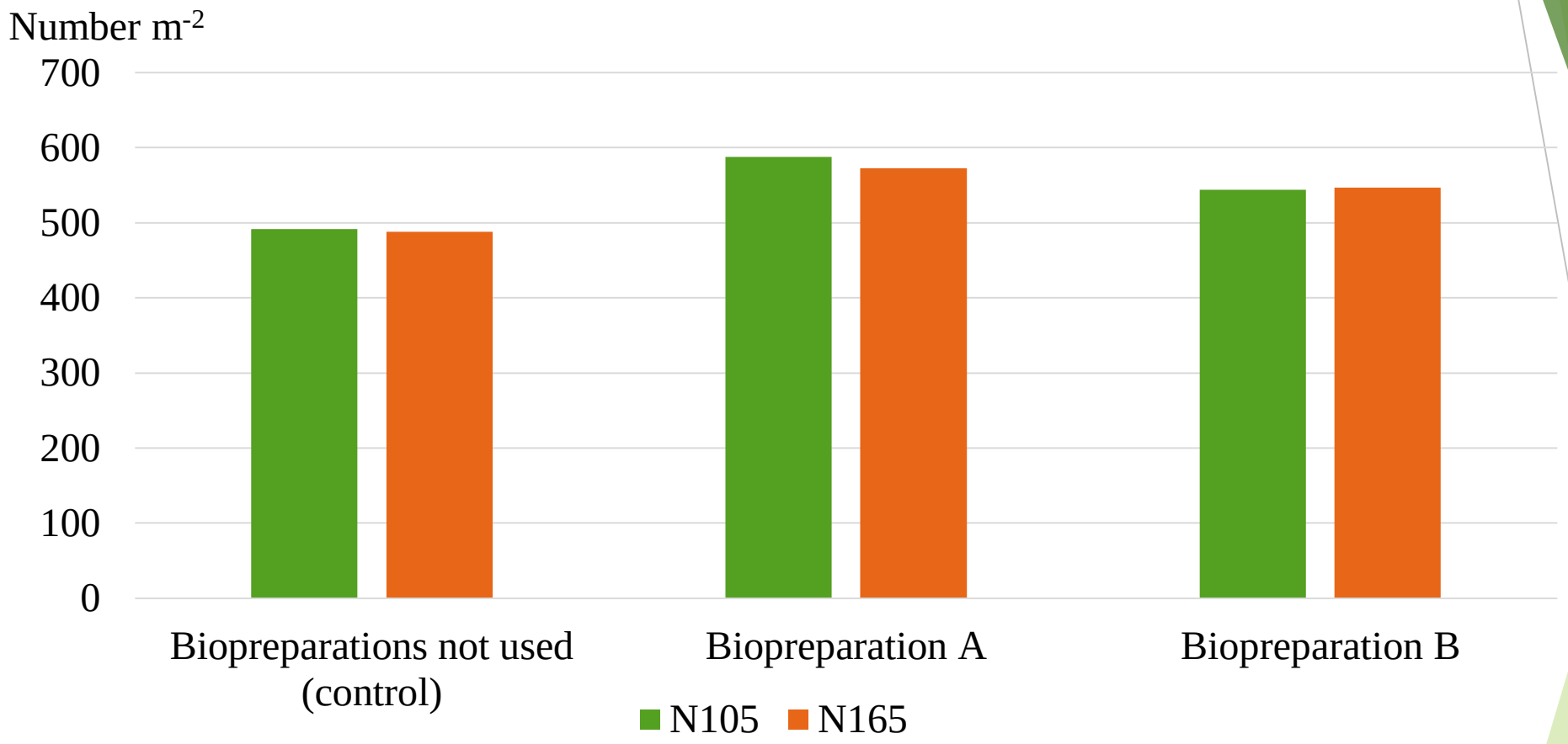

Fig. 4. Effect of biological preparations on quantity productive steams of winter wheat, 2020

Note: P>0.05 no significant differences

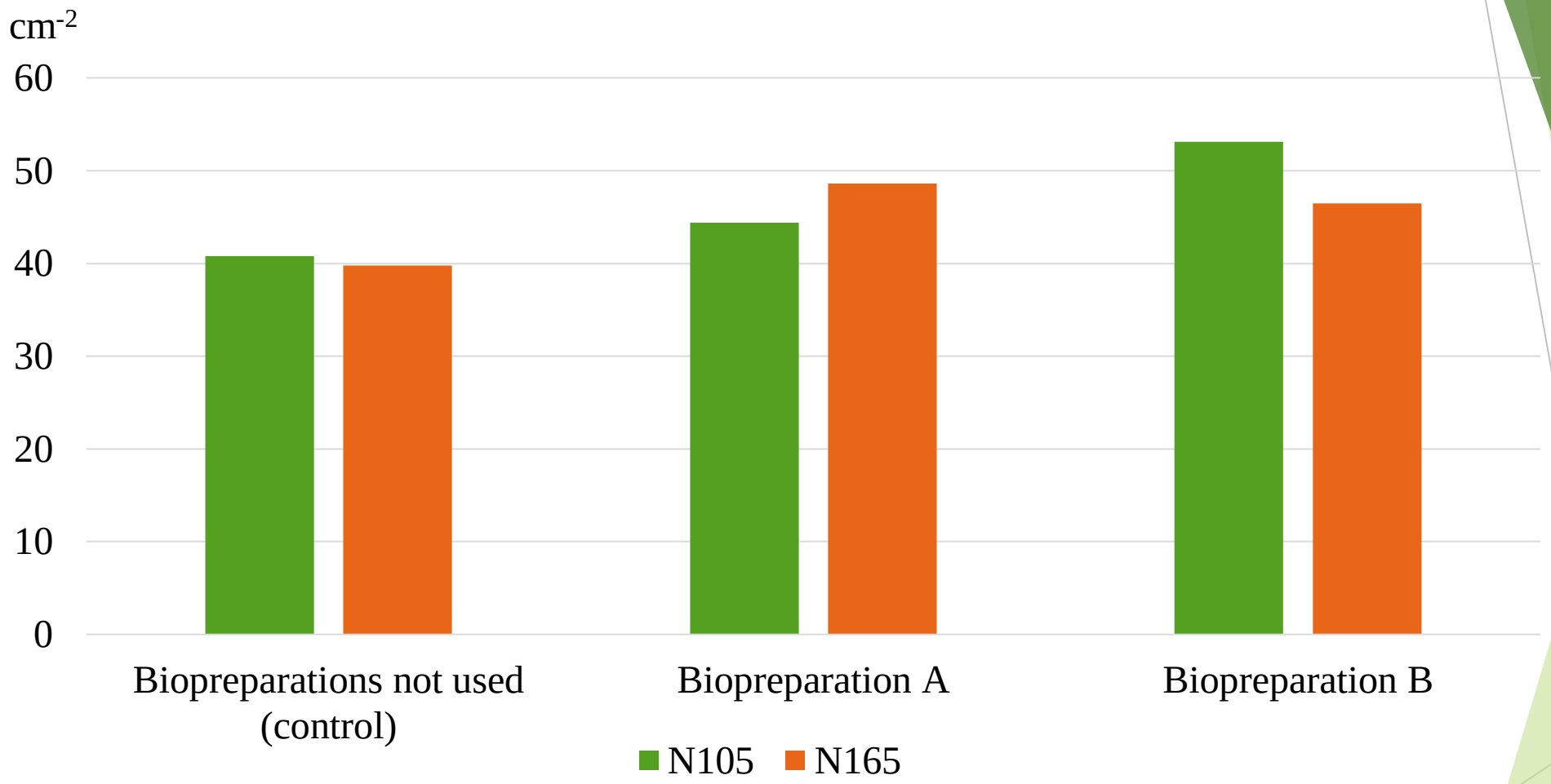

Fig. 5. Effect of biological preparations on assimilation area of winter wheat leaves, 2020

Note: P>0.05 no significant differences

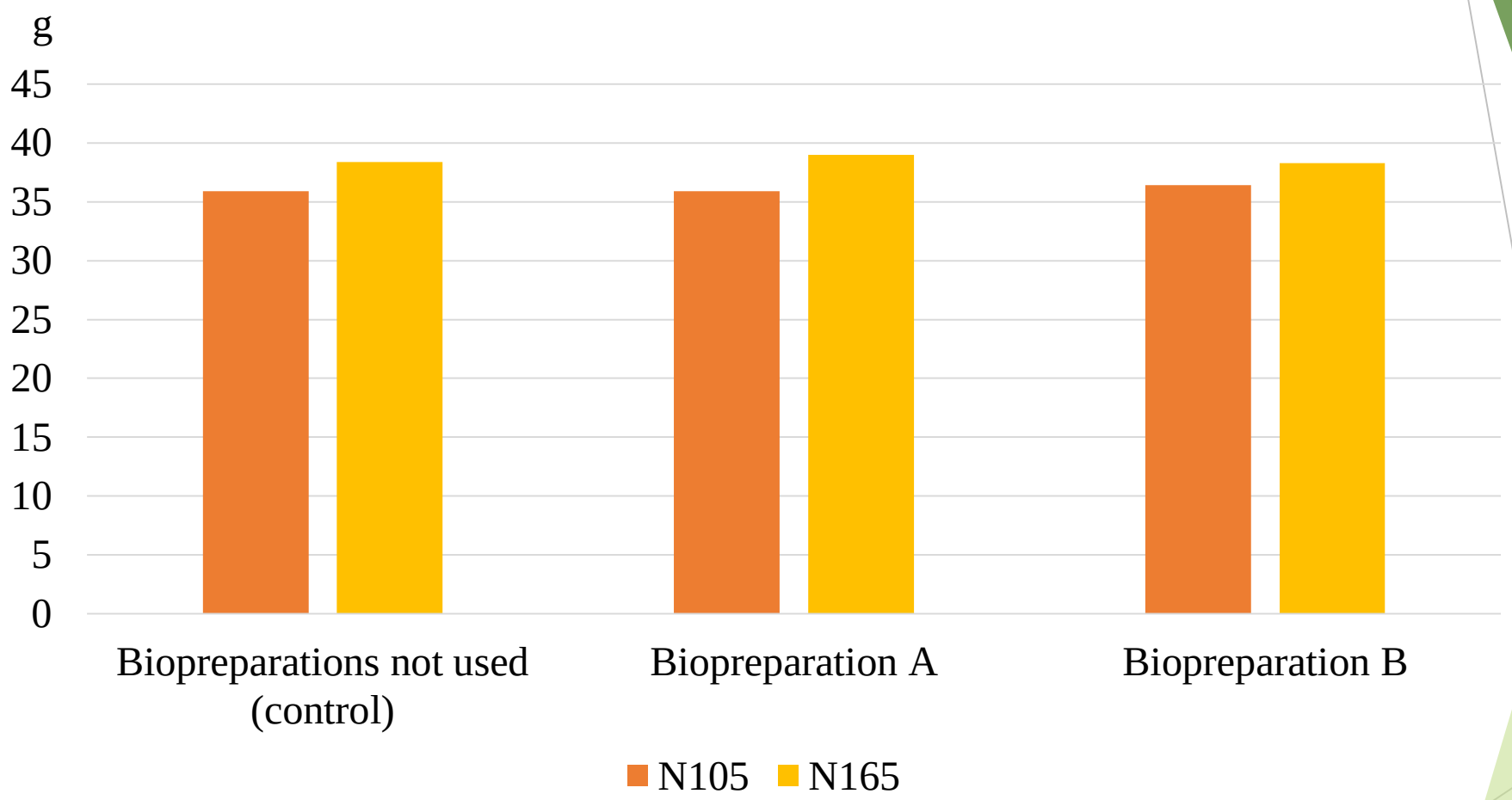

Fig. 6. Effect of biological preparations on weight 1000 grains, 2020

Note: P>0.05 no significant differences

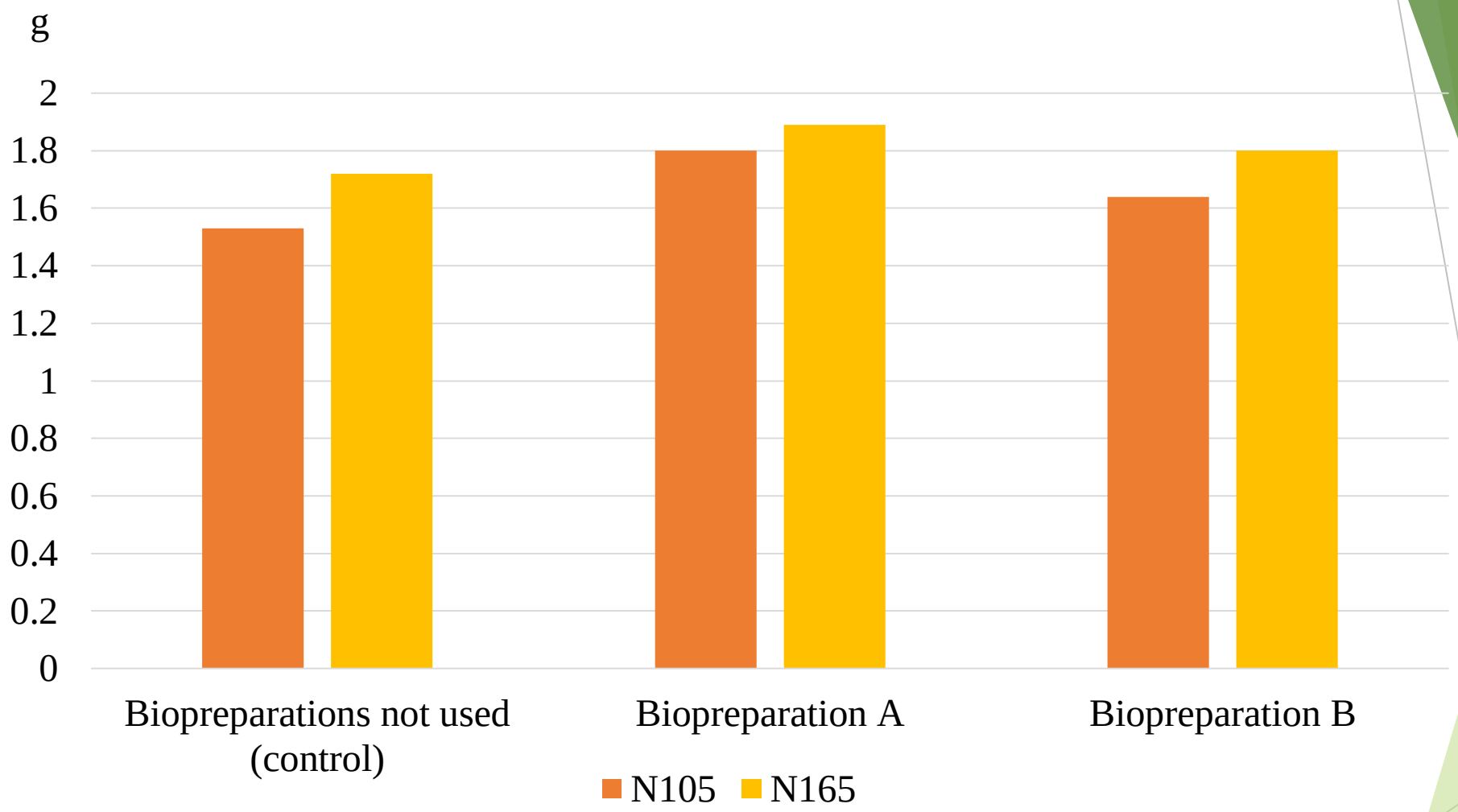

Fig. 7. Effect of biological preparations on mass of grain per spike, 2020

Note: P>0.05 no significant differences

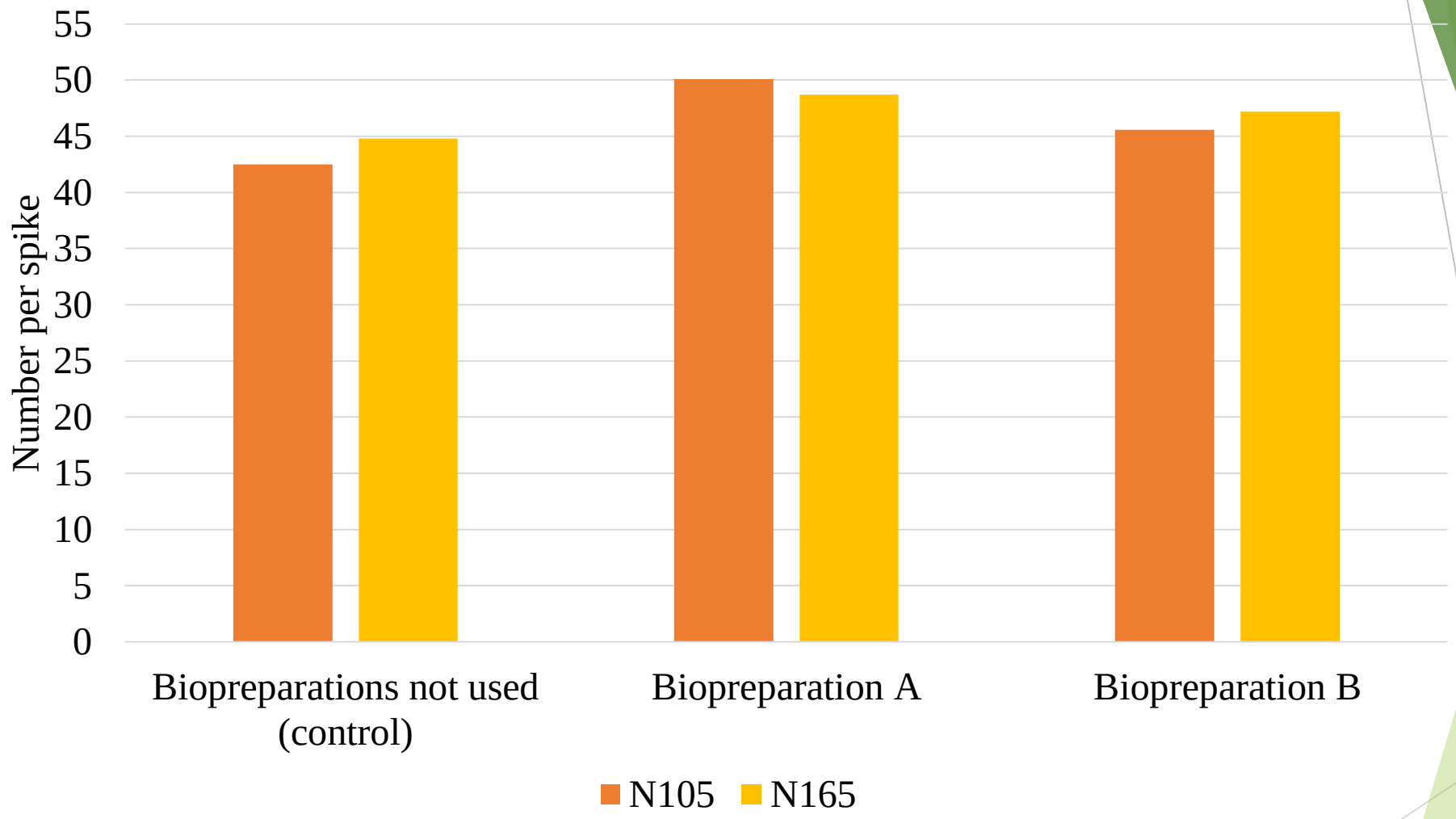

Fig. 8. Effect of biological preparations on quantity of grain per spike, 2020

Note: P>0.05 no significant differences

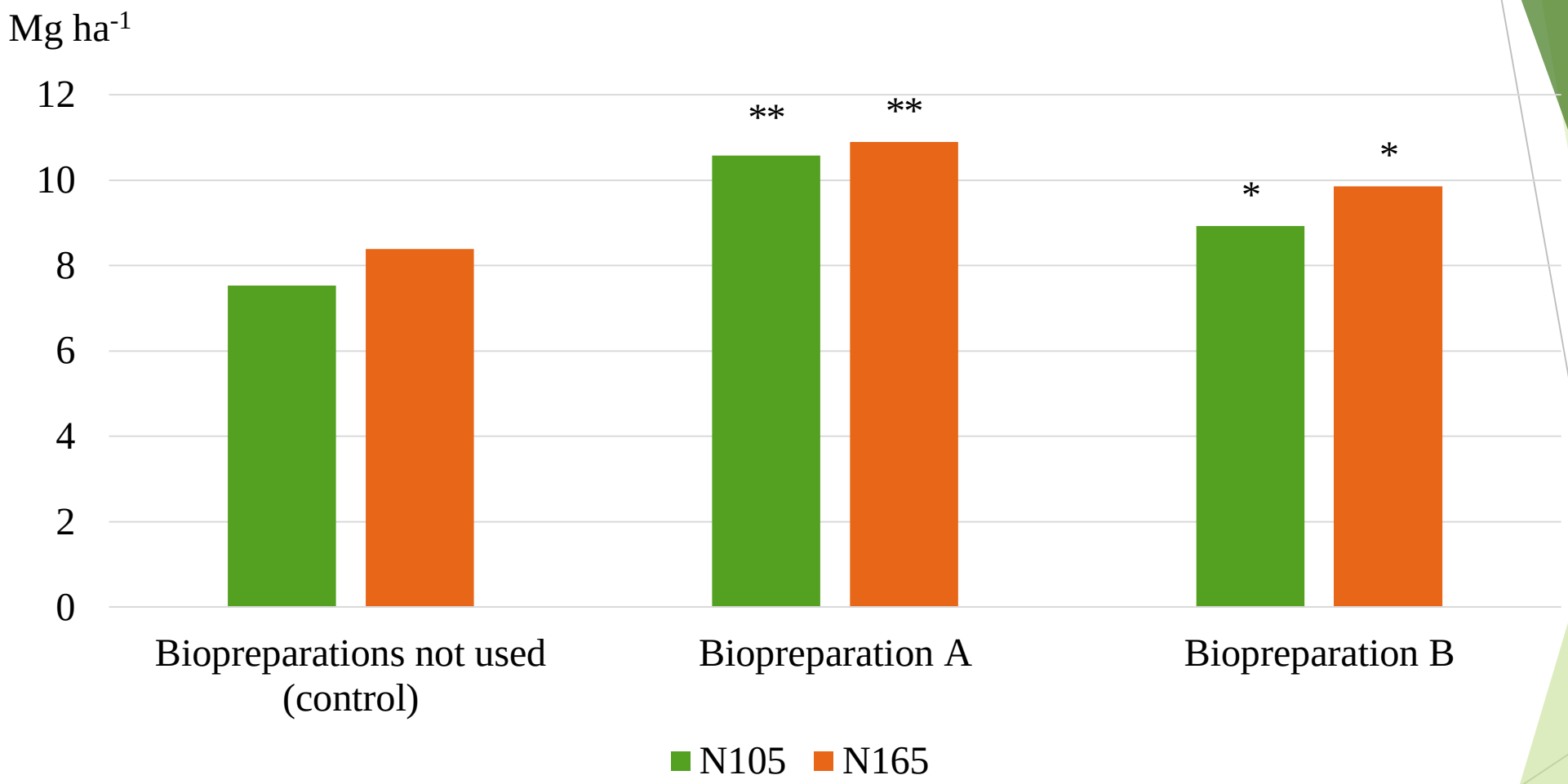

Fig. 9. Effect of biological preparations on winter wheat yield, 2020

Note: * - significant differences at 95% probability level; ** - significant differences at 99% probability level

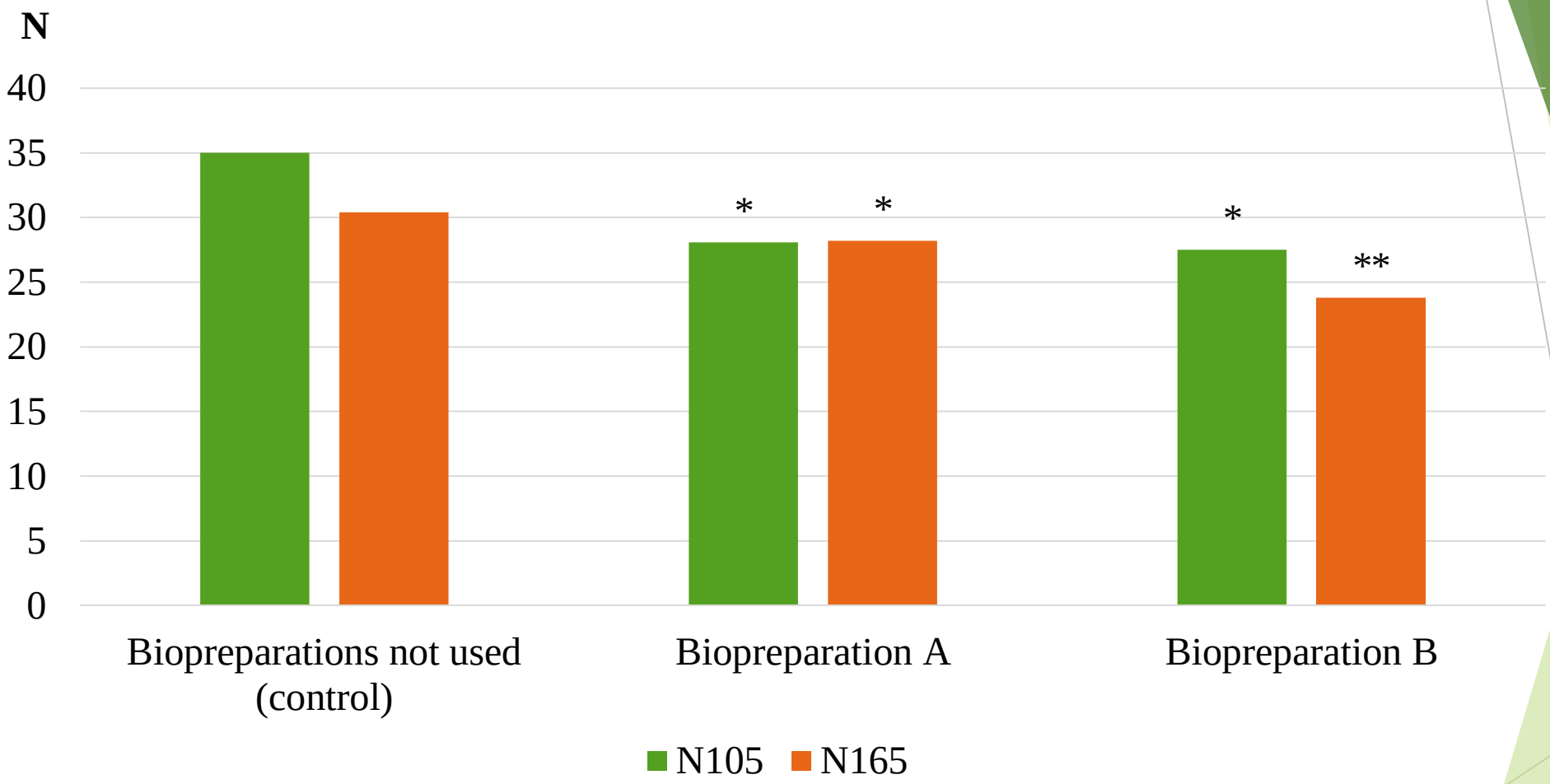

Fig. 10. Effect of biological preparations on force required to break the straw, 2020

Note: * - significant differences at 95% probability level; ** - significant differences at 99% probability level

Conclusions

- Available phosphorus content was significantly higher in the soil where was applied biological preparation B at both levels of nitrogen fertilization. Biological preparation A increased available potassium content in the soil where the higher amount of nitrogen rate was used compared with the control.
- The use of biological preparations did not have a significant effect on the germination of winter wheat but tended to promote the tillering of winter wheat and increase the number of productive stems. The use of biological preparations tended to increase the assimilation area of winter wheat leaves, the weight of 1000 grains, quantity of grain per spike, mass of grain per spike and significantly ($P \leq 0.05$) increased winter wheat yield to compare with the control.
- Application of biological preparations significantly ($P \leq 0.05$) increased the decomposition of winter wheat straw.