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## Effect of phosphorus fertilization on technological and geometric grain properties of winter wheat grown in Poland\*

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### Abstract

The aim of wheat cultivation is to achieve high grain yield while ensuring food quality and adopting environmentally sustainable practices, including the use of alternative phosphorus fertilizers. Grain size and shape are critical parameters influencing technological and industrial processing. This study aimed to evaluate the effects of two phosphorus fertilizers – struvite and superphosphate – on the yield and geometric traits of two winter wheat (*Triticum aestivum* L.) cultivars, Activus and Chevi-gnon, under field conditions. The results demonstrated significant differences between cultivars in grain physical characteristics, including grain density and the proportion of grains >2.5 mm, with Activus exhibiting more favorable traits. Grain width, thickness, and dimension ratios varied significantly depending on both the cultivar and fertilization method. Activus showed higher values of thickness and kernel width index (Kw) under superphosphate fertilization. Conversely, Chevi-gnon exhibited greater grain width, particularly under superphosphate treatment. The cultivar type significantly influenced key geometric parameters, including arithmetic (Da), geometric (Dg), and equivalent (Dp) mean diameters, aspect ratio (Ra), and ellipsoid shape factor (Fz), with higher values observed for Chevi-gnon. Phosphorus fertilization, particularly with superphosphate, positively affected Dg, Dp,  $\Phi$ , and Ra, suggesting greater effectiveness in enhancing grain morphology. Struvite fertilization resulted in an increase in grain thickness and the sphericity coefficient compared to the control treatment. At the same time, struvite application led to a reduction of the Ra index relative to the control, accompanied by a slight increase in grain volume. Struvite fertilization did not have a significant effect on wheat grain color, therefore further research is needed to examine this trait in an expanded analysis.

**Keywords:** winter wheat, cultivar, phosphorus fertilization, struvite, grain geometry, technological and physical properties

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