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INFLUENCE OF LONG-TERM FERTILIZATION ON YIELD AND QUALITY OF SPRING TRITICALE GRAIN IN THE RIGHT-BANK FOREST-STEPPE OF UKRAINE

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Introduction

World production of triticale (*X Triticosecale* Wittmack) is more than 20 million tons per year. Nitrogen fertilizers are one of the biggest factors influencing the formation of grain yield of cereals and its quality. The research did not include the study of grain productivity formation in the field crop rotation with long-term fertilization, which does not allow to determine crop reaction to the level of soil fertility. In addition, the study was conducted with winter wheat, the fertilizer of which differs from spring triticale.

Research Aim

The aim of the work was to study the influence of the long-term application of different fertilizer systems (mineral, organic and organo-mineral) on the yield and grain quality of spring triticale.

Materials and Methods

The research was performed in the field and laboratory conditions of Uman National University of Horticulture during 2007-2009 in the stationary experiment of the Department of Agrochemistry and Soil Science. The efficiency of fertilizer systems was studied on 10 backgrounds (average saturation of crop rotation area with fertilizers) - without fertilizers (control), $N_{45}P_{45}K_{45}$ (M1), $N_{90}P_{90}K_{90}$ (M2), $N_{135}P_{135}K_{135}$ (M3), Manure 9 t (O1), Manure 13.5 t (O2), Manure 18 t (O3), Manure 4.5 t + $N_{23}P_{34}K_{18}$ (OM1), Manure 9 t + $N_{46}P_{68}K_{36}$ (OM2), Manure 13.5 t + $N_{69}P_{102}K_{54}$ (OM3).

Results

The research results show that all fertilizer systems significantly increased the yield of spring triticale grain compared to the variant without fertilizers ($p \leq 0.05$) (Fig. 1). The lowest fertilizer efficiency was established in 2007. Thus, the grain yield of spring triticale under the mineral fertilizer system increased by 1.3–1.7 times (2.7–3.5 t ha⁻¹), and that of the organic system by 1.1–1.2 (2.4–2.6 t ha⁻¹), organo-mineral system - 1.2–1.6 times (2.6–3.3 t ha⁻¹) depending on the level of crop rotation saturation with fertilizers. In 2008, this indicator increased by 1.2–1.5 times (7.7–9.5 t ha⁻¹) depending on the fertilizer system and the level of crop rotation area saturation. A similar tendency in the formation of the spring triticale crop was established in 2009.

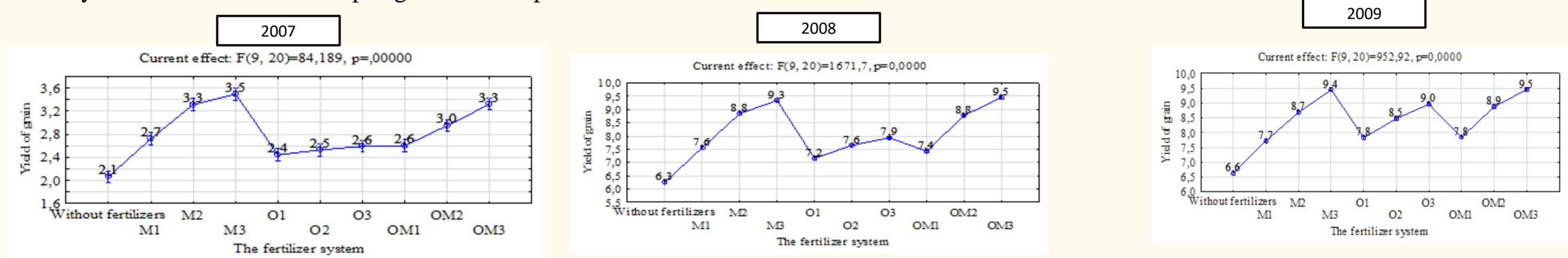


Fig. 1. Spring triticale grain yield depending on fertilizer, t ha⁻¹

The organic fertilizer system had less effect on the protein content, as manure nutrients were first used by sugar beet plants and then by spring triticale. In addition, the nutrients were in organic form. During the earing period - grain maturation, this process was weakened by the lack of moisture in the upper soil layer and high temperature. Under the mineral and organo-mineral system, there was no fertilization of this phenomenon. Statistically significant ($p \leq 0.05$) studied factors (fertilizer system, year) influenced the formation of yield and protein content in spring triticale grain (Fig. 2).

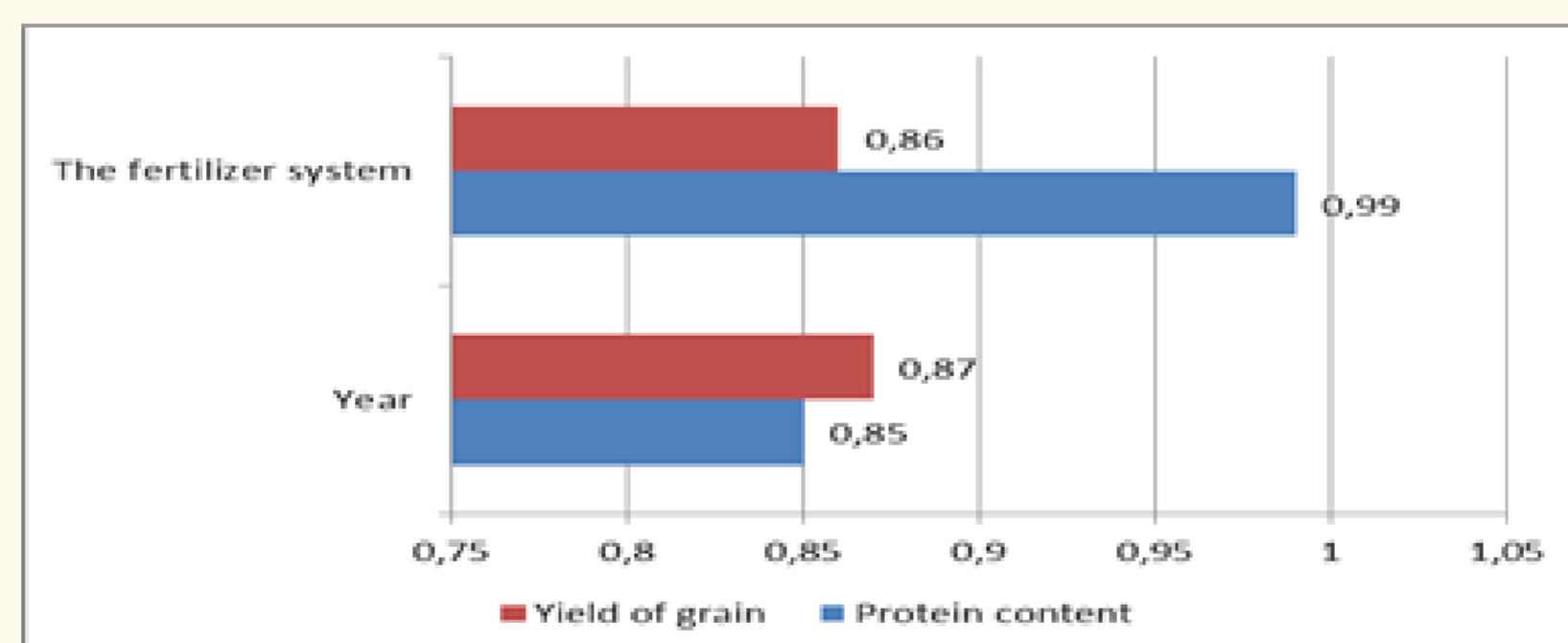


Fig. 2. Effect of factors on yield and protein content in spring triticale grain

Conclusions

The long-term use of fertilizers in the field crop rotation under mineral, organic and organo-mineral systems significantly influenced the formation of spring triticale crop. In conditions of high air temperature and lack of soil moisture, mineral and organo-mineral fertilizer systems are preferred. In conditions with sufficient rainfall, all studied fertilizer systems are highly efficient. Triticale spring (Kharkiv Hlibodar variety) has the high reaction to fertilizers, as grain yield increases from 6.3–6.6 to 9.0–9.5 t ha⁻¹ ($p \leq 0.05$). Mineral and organo-mineral fertilizer systems have the greatest effect on protein content.

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