

THE EFFECT OF DIFFERENT FERTILIZER TREATMENTS ON THE YIELD AND QUALITY OF WINTER WHEAT

PÉTER JAKAB, DÁVID FESTŐ, GÁBOR ZOLTÁN, LEVENTE KOMAREK

University of Szeged, Faculty of Agriculture
Andrássy út 15, 6800 Hódmezővásárhely, Hungary
jakabpeter@mgk.u-szeged.hu

ABSTRACT

The effect of fertilization on the yield and quality of winter wheat was studied on meadow soil in 2015-2016 years in Hódmezővásárhely. The experiment was set up on the area of SZTE Tangazdaság Ltd, in three replications. The preceding crop was alfalfa. Four fertilizer steps were applied besides the control: N80PK30, N100PK30, N120PK0, N120PK30 kg/ha active ingredients. The year 2015-2016 was favourable for winter wheat production. The amount of precipitation in the vegetative period of winter wheat was higher by 92.8 mm than the average. We processed the obtained data by single factor variant analysis. In control treatment the yield was 5.70 t/ha. We obtained the maximum yield 7.37 t/ha in N80PK30 kg/ha fertilizer treatment. The yield difference between the two treatments was statistically justified. The nutrient doses higher than N80PK30 did not increase the yield of wheat. The examined quality parameters (gluten content, crude protein content, Zeleny number) reached the highest value in N80PK30 treatment. Our scientific results proved, that in the case of good preceding crop we can reduced the amount of fertilizer, which is important in environmentally and economical point of you.

Keywords: winter wheat, fertilization, yield, gluten content, crude protein content

INTRODUCTION

To determine the harmonious nutrient supply is crucial as it has a considerable effect not only on the volume and quality of yields and the environment but also on the effectiveness of production (SÁRVÁRI, 1984, JAKAB ET AL., 2016).

The crop-year basically determined the dry matter production, assimilation area and yield of winter wheat; these effects were modified by fertilization. The effects of genotypes were moderated (PEPŐ, 2005).

The low yield averages in winter wheat production can be due to the fall-back of chemical fertilization; this is why the use of fertilizers must be increased in order to reach higher and more consistent amounts of crop (KOMAREK 2007, 2008).

Nowadays more and more farmers use different soil bacterium preparations besides the fertilizers. These products contain different bacteria which can improve the nutrient supply of plant. With the application of these products we can reduce the amount of fertilizers, which enables the environmentally friendly and economical production. They improve the physical properties of the soil, thereby improving physical and chemical properties of the soil, and maintain the soil fertility (JAKAB ET AL., 2004, JAKAB 2006a; JAKAB 2006b; JAKAB 2010).

The yield and quality fluctuation the years can reduce the application of good variety and professional agro-technical methods (GYŐRI, 2006).

TANÁCS ET AL. (2000) studied the effect of fungicides and foliar fertilizers on the quality of winter wheat. They stated, that the variety x fungicide treatments caused significantly changes in examined quality parameters (gluten content, falling number), but the effect of foliar fertilizers was lower.

In a dry year the effect of fungicide treatments was not significant for the baking industry parameters (wet and dry gluten content, falling number (TANÁCS AND GERŐ, 2002).

TANÁCS ET AL. (1997) examined the effect of NPK fertilization on the amino acid composition of winter wheat grain yield. They established that the highest amino-acid value was in N 180 kg/ha fertilizer dosage except the ARG and HIS.

The fertilization had positive effect on the baking parameters of winter wheat. Among the macro-elements the nitrogen had the highest effect on the quality parameters of winter wheat (JOLÁNKAI ET AL., 1990; RAGASITS AND SZABÓ, 1992; TANÁCS ET AL., 1993, TANÁCS, 2005).

MATERIAL AND METHOD

The experiment was set in three replications on the area of SZTE Tangazdaság Ltd. The soil was meadow soil. The soil analysis data showed, that it had proper nitrogen, low phosphorus and very good potassium content (*Table 1*).

Table 1. Main properties of the experimental field area

pH (KCL)	P ₂ O ₅ (mg/kg)	K ₂ O (mg/kg)	Humus (%)	Soil plasticity value (K _A)
7.17	336	620	3.39	48

Source: HL-LAB Ltd., 2016

The year 2015-2016 was favourable for winter wheat production. The amount of precipitation in the vegetative period of winter wheat was higher by 92.8 mm than the 50 year average (*Table 2*).

Table 2. The distribution of precipitation in the vegetative period of winter wheat in 2015-2016

Month	Rainfall (mm)	50 year average rainfall (mm)	Difference (mm)
October	88.3	34.7	53.6
November	34.3	41.1	-6.8
December	7.3	43.0	-35.7
January	48.4	30.6	17.8
February	84.2	30.1	54.1
March	21.1	29.8	-8.7
April	19.4	39.9	-20.5
May	38.8	58	-19.2
June	86.0	75.3	10.7
July	106.0	58.7	47.3
Total amount of rainfall (mm)	533.8	441.0	92.8

Source: SZTE Tangazdaság Ltd.

The small-scaled plough experiment was set in three replications, organised as a random block in 2015. Beside the control we applied four fertilizer treatments: N80PK30, N100PK30, N120PK0, N120PK50 kg/ha active ingredients. The preceding crop was alfalfa. Fall tillage involved deep ploughing at 30 cm depth. The variety was Lucullus. Apart from fertilization the parcels received the same agro-technology. We processed the obtained data by single factor variant analysis.

RESULTS

Without any fertilizers the yield was 5.7 t/ha. In N80PK30 treatment we reached the maximum yield amount, 7.37 t/ha, which was significantly higher compared the control. The higher fertilizer doses did not increase the yield compared the N80PK30 treatment. Alfalfa was favourable fore-crop, therefore the maximum yield was in the least (N80PK30) fertilizer treatment (*Figure 1*).

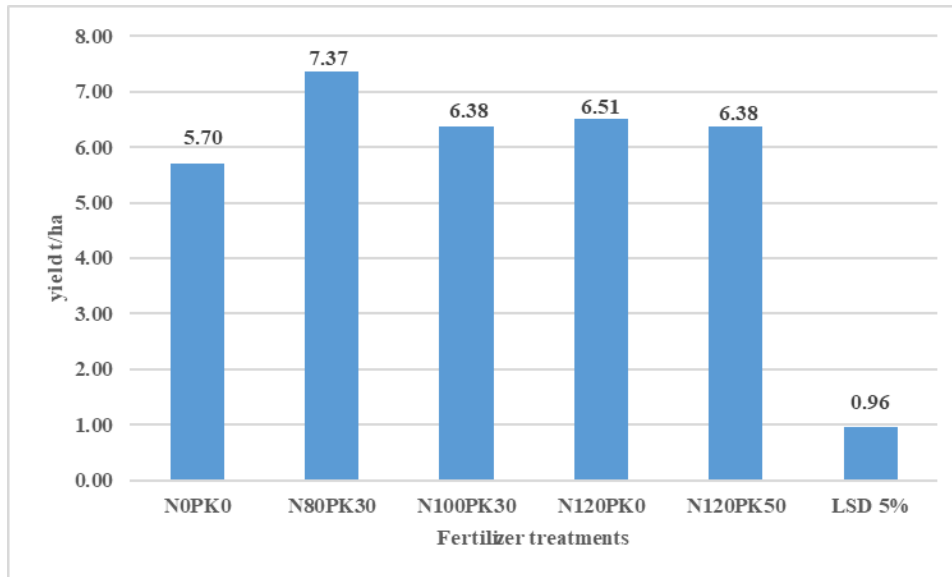


Figure 1. The effect of fertilization on the yield of winter wheat

We examined the effect of fertilization on the quality parameters (crude protein content, gluten content, Zeleny number) of winter wheat. The gluten content was 36.50% in non treated plot. In the N80PK30 treatment reached the highest value 40.60%, which was significantly higher compared the control value. In the other treatments decreased the gluten content compared to N80PK30 treatment (*Figure 2*).

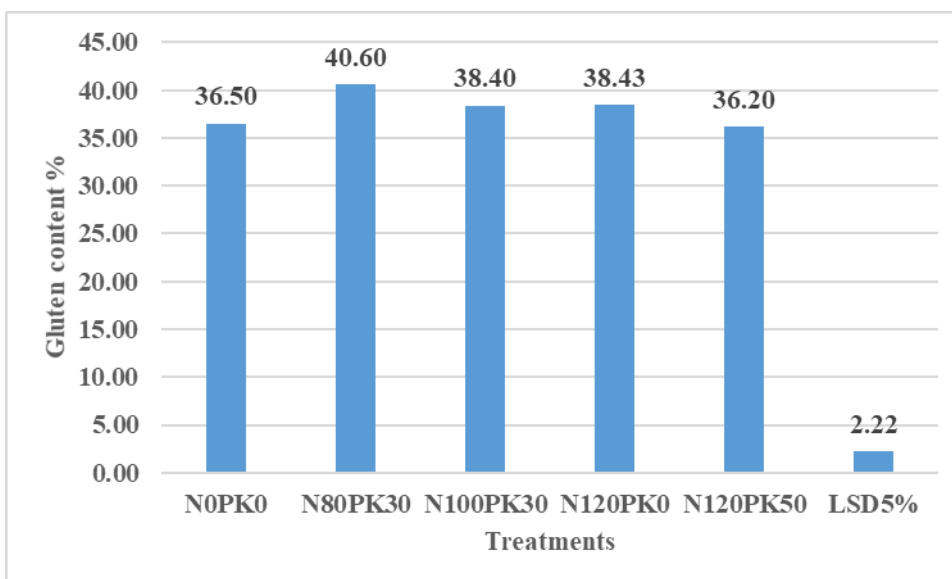


Figure 2. The effect of fertilization on the gluten content of winter wheat

We measured 15.57% crude protein content in N0PK0 treatment. The highest content of crude protein (17.30%) was in the N80PK30 treatment, which was statistically justified higher compared with the control and the other treatments (*Figure 3*).

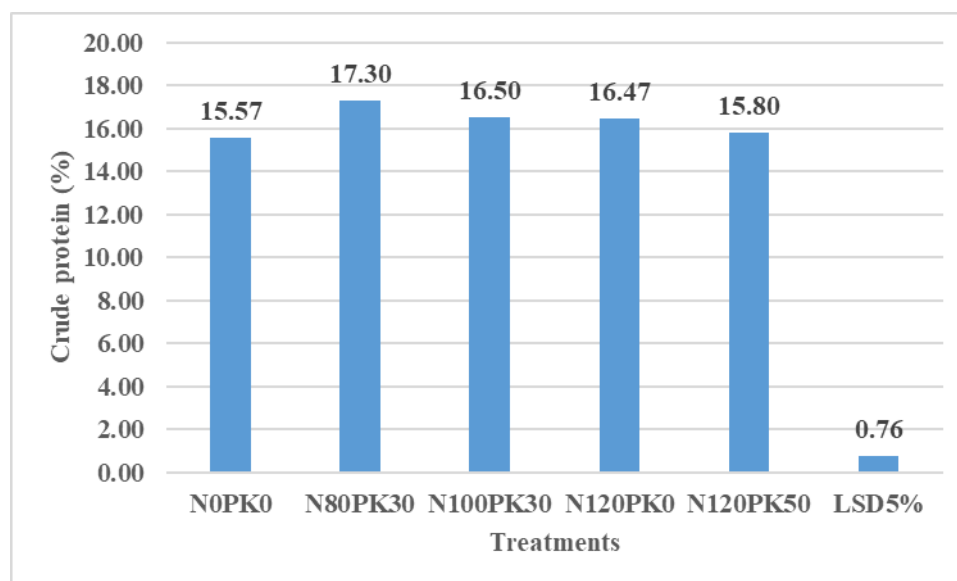


Figure 3. The effect of fertilization on the crude protein content of winter wheat

The Zeleny number was 64.1 ml in control treatment. In N80PK30 treatment it reached the maximum value, 73.07 ml. The difference was statistically justified. In N100PK30 treatment we measured significantly higher result (69.63 ml) compared the N0PK0 treatments too (*Figure 4*).

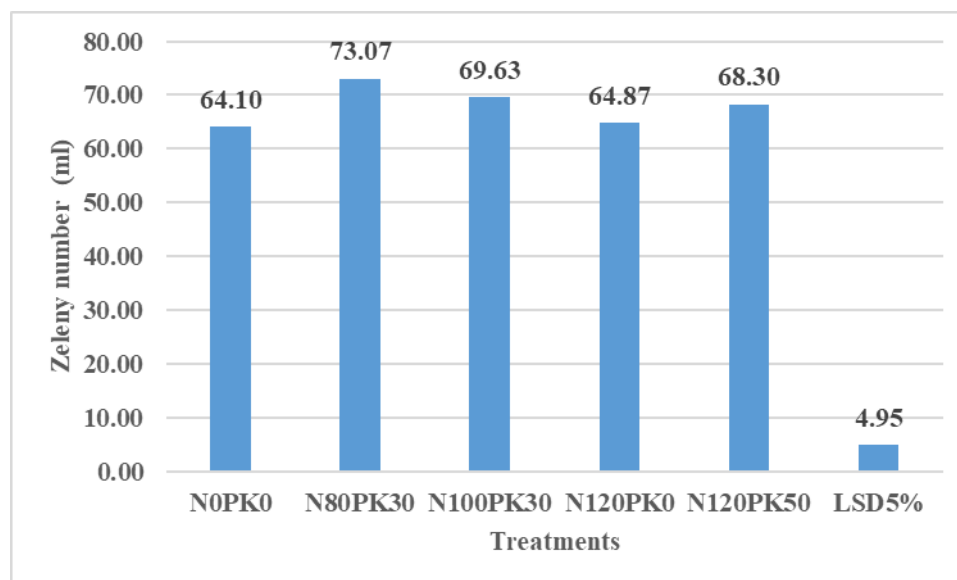


Figure 4. The effect of fertilization on the Zeleny number of winter wheat

CONCLUSIONS

Due to the favourable preceding crop (alfalfa) and the amount of precipitation in the vegetation period of winter wheat we measured the highest yield in the lowest fertilizer treatment. Nowadays the application of mineral fertilization is very important economical

and environmental protection issue. Therefore, it is of high importance to determine the optimum fertilizer amount of winter wheat. This is relevant in order to improve the efficiency of fertilizer application, just as to decrease environmental contamination. Our scientific results proved, that in the case of good preceding crop we can decrease the amount of fertilizer, which is important in environmental and economical point of view.

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