

APPLICATION OF SOIL BACTERIUM PREPARATION IN WINTER WHEAT PRODUCTION*Péter Jakab*

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Introduction

According to Karpáti (2000) the technology for different wheat-growing requires the application of high quality nitrogen fertilizer. It is a significant achievement if we can replace it with biological nitrogen use.

Loch and Nosticzius (1992) state that the Rhizobiums living together with the papilionaceae are able to fix 100-140 kg/ha nitrogen a year.

Márton and Daoda (2001) conclude that chemical fertilizers can be replaced by soil bacteria preparations.

In their experiment they increased the average yield with applying Bactofil soil bacterium.

The first fertilizer level ($40 \text{ kg ha}^{-1} \text{ N} + \text{PK}$) had the most pronounced effect on leaf area, which increased to $2.90\text{-}3.84 \text{ m}^2 \text{ m}^{-2}$. The leaf area did not increase so sharply with further increases in the fertilizer rate, but the maximum LAI values of $3.08\text{-}3.92 \text{ m}^2 \text{ m}^{-2}$ were reached at higher fertilizer levels. On the basis of regression analysis, it could be concluded that the effect of the leaf area index (LAI) on yield was very strong (Futó, 2003).

To determine the harmonical 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).

The cropyear 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 (Pépó, 2005).

In the opinion of Nagy (2003), today, the professional use of soil bacteria is regarded to be equal with good or medium sized fertilizer quantities. This fact is enough reason to use bacteria in all fields of plant production.

According to Árvay (2004) the microbial vaccines preliminary ensure nutrient supply and hormones for plant growing and they also decompose row materials.

Bíró (2004) states that we can use vaccines together with manure to improve the quantity and quality of yield.

Methods

The experiment was set in the experimental field of the Department of Crop Production at the College of Szolnok Faculty of Agricultural. The soil of the experiment was calcareous meadow chernozem with approximate neutrality ($\text{pH}_{\text{KCl}} 6.72$). According to the pre-soil tests the nitrogen content was acceptable (Humus% 3.07) the phosphorus content was low but the potassium content was satisfactory (Al-soluble P_2O_5 64 mg kg^{-1} , K_2O 433 mg kg^{-1}).

The growing season in 2003-2004 was favourable for winter wheat. The great humidity in October assisted the germination, inflation and early development of plants. Except in May, there was more humidity in each month than the average which helped the stooling, shooting, blooming and graining of the wheat.

The small-scaled plough experiment was set in three replications, organised as a random block in 2004. I set eight levels of nutrient supply in the experiment: control treatment (without fertilization), control+MicroSoil bacterial manure, N 40+PK, N 40+PK+MicroSoil bacterial manure, N 80+PK, N 80+PK+ MicroSoil bacterial manure, N 120+PK, N 120+PK+ MicroSoil bacterial manure.

The total quantity of potassium and phosphorus and the MicroSoil bacterial manure (MicroSoil 1 lha⁻¹) were released into the soil in autumn. The N-fertilizer was released both in autumn and early spring. The wheat types in the experiment were the Mv Palotás, Mv Marsall, Mv Verbunkos, Buzogány, Mv Csárdás. I measured the yields of winter wheat varieties. I processed the obtained data by single factor variant analysis.

Results and discussion

The yield of early maturing Mv Palotás differed from 4,86 to 5,82 tha⁻¹ on different levels of nutrient. It reached the biggest yield under the Ø+MicroSoil treatment, the bigger portions of nutrient only decreased the yield in tendency. In the case of N 120+PK+MicroSoil treatment the yield of wheat was significantly smaller than under the Ø+MicroSoil treatment since the high fertilizer portion and the favourable year together caused yield depression. Its ability to use natural nutrients is average comparing it to the examined types. Its yield, without fertilization, is 5,71 tha⁻¹ (Table 1).

The yield of the other early maturing type, Mv Marshall, was the biggest it almost exceeded the 6 tha⁻¹ quantity in almost each treatment. The ability to use natural nutrients was also the best of this type as without fertilization it reached 6,81 tha⁻¹. It produced the biggest yield, like Mv Palotás, under the Ø+MicroSoil treatment (6,88 tha⁻¹). Its smallest yield was registered under the N 120+PK+MicroSoil treatment (5,93 tha⁻¹). Treatments with bigger doses than Ø+MicroSoil decreased the yield in tendency but the difference did not reach the significant level (Table 1).

The maximum yield of medium maturing Mv Verbunkos was reached on N 80+PK nutrient level (5,67 tha⁻¹), the biggest nutrient portions did not produce any further increase. Its yield under the Ø and N 80+PK+MicroSoil treatments was significantly smaller than under the N 80+PK (Table 1).

The biggest yield of medium maturing Buzogány was recognised under the Ø+MicroSoil treatment (6,98 tha⁻¹) and the smallest under the N 80+PK (5,58 tha⁻¹). The difference here was significant. The biggest portions than Ø+MicroSoil only decreased the yield in tendency except in the case of N 80+PK treatment (Table 1).

Unlike all the other types, the late maturing Mv Csárdás reached the biggest yield (6,0 tha⁻¹) under the biggest nutrient supply (N 120+PK+MicroSoil). This type is supposed to utilise the big quantity of nutrient the best due to its long growth period.

The yield under N 40+PK treatment (4,87 tha⁻¹) was its minimum yield (Table 1).

Table 1 The effect of nutrient supply on the yield (tha⁻¹) of winter wheat varieties in 20004

Nutrient supply	Mv Palotás	Mv Marsall	Mv Verbunkos	Buzogány	Mv Csárdás
control	5.71	6.81	4.84	6.27	5.51
N 40	5.50	6.18	4.93	6.38	4.87
N 80	5.75	6.18	5.67	5.58	5.13
N 120	5.8	6.58	5.34	6.67	5.31
control+MS	5.82	6.88	5.36	6.98	5.81
N 40+MS	5.14	6.62	5.21	6.18	5.36
N 80+MS	5.16	6.31	4.66	6.07	5.09
N 120+MS	4.86	5.93	5.43	6.32	6.0
LSD 5%	0.8	0.96	0.79	1.18	1.1

MS= MicroSoil bacterial manure 1 lha⁻¹

I examined the effects of fertilization and soil bacterial preparations on the falling number of Mv Csárdás and the gluten content of Mv Palotás in the Ø, Ø+MicroSoil, N 80+PK, N 80+PK+MicroSoil treatments. I can claim that the two types reacted the treatments differently, which is an important practical information. Owing possibly to the good year, the two type reached their best falling number and gluten content even in the Ø as well as the Ø+Microsoil treatment in certain cases. It is important to claim that in the N 80+PK+MicroSoil treatment the quality parameters decreased in all cases especially regarding the gluten content (Table 2).

Table 2 The effect of nutrient supply on the falling number and gluten content of Mv Csárdás and Mv Palotás varieties

Nutrient supply	Falling number (sec)		Gluten content (%)	
	Mv Palotás	Mv Csárdás	Mv Palotás	Mv Csárdás
control	400.5	378.5	38.5	38.75
control+MS	407	397	38.25	41.5
N 80	408	386	37	42
N 80+MS	356	373	26.75	29
LSD 5%	42.2	149.6	13.57	21.67

MS= MicroSoil bacterial manure 1 lha⁻¹

Conclusions

With the use of soil bacterial preparations the quantity of chemical fertilizers can be reduced, which is a possible base for environment friendly farming.

Proper conclusion can be drawn only from the results of several years thus making further examinations is essential.

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