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AGRICULTURAL SCIENCE AND TECHNOLOGY PARK

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IMPACT OF MLG-50™ ON WINTER WHEAT

Research Report

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Project Manager

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RESULTS AND ANALYSIS

Natural humic acids should be concentrated in the upper layer of the soil and water, but modern agricultural technologies impoverish soils. It is believed that because of intensive use of chemicals, plants cannot absorb required amounts of humic acids from soil and water for physiological process. Fulvic acids–the biologically active humic acid fraction–demonstrate unique features. Fulvic acids that are in the soil and in the water provide plants with important nutritional elements. Fulvic acids optimize plant growth, improve the absorption of nitrogen and other nutrients and promote food metabolism. Scientists say that fulvic acids reduce the risk of plant disease occurrence.

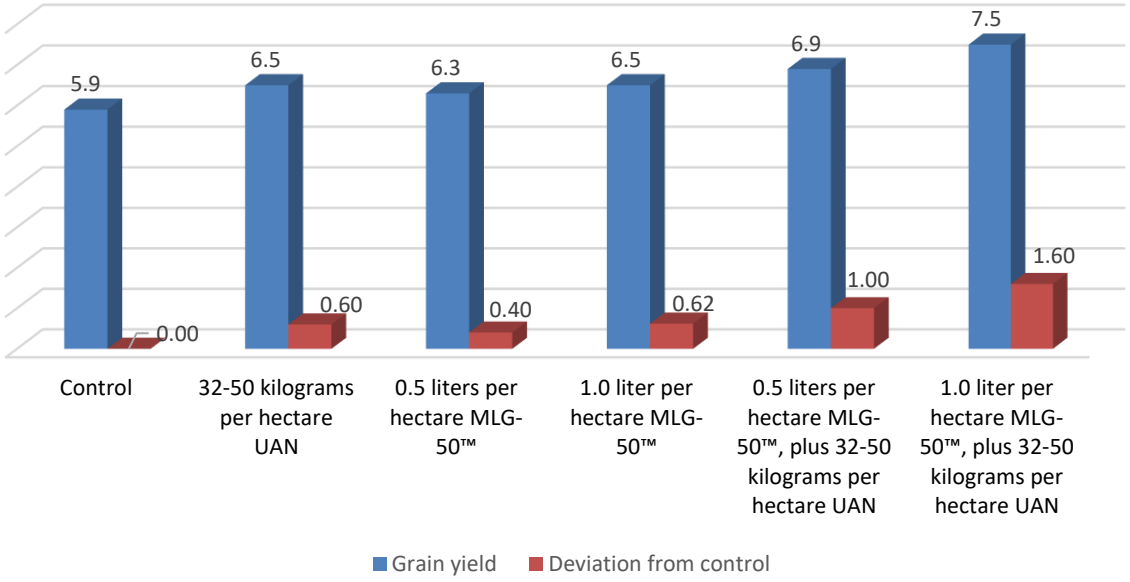
The mineral-rich fulvic acid product MLG-50™ and its combinations with nitrogen fertilizer usually resulted in significant winter wheat yield increases. Three sets of variants were tested, the first of which comprises one foliar application at the stem elongation stage ("Set One"), the second of which comprises one foliar application at the inflorescence emergence stage, or, heading stage ("Set Two") and the third of which comprises two foliar applications, with one application at each of the above-mentioned stages ("Set Three").

Table 1. Impact of foliar spray on winter wheat grain yield
at the early part of the stem elongation stage (or, stages 30-31 on the BBCH-scale for cereals).

Set One.		Grain yield, metric tons per hectare.	Deviations from control.	
			Absolute, metric tons per hectare.	Relative, %
Control (without spraying).		5.90	-	-
Variants, sprayed at the early part of the stem elongation stage (or, stages 30-31 on the BBCH-scale).				
1.	32-50 kg UAN.	6.50	0.60	+10.16
2.	0.5 liters per hectare MLG-50™.	6.30	0.40	+6.77
3.	1.0 liter per hectare MLG-50™.	6.52	0.62	+10.50
4.	0.5 liters per hectare MLG-50™, plus 32-50 kg per hectare UAN.	6.90*	1.00	+16.94
5.	1.0 liter per hectare MLG-50™, plus 32-50 kg per hectare UAN.	7.50*	1.60	+27.11

*when $P \leq 0.05$ (significant differences between particular variant and control at 95% probability level).

Figure 1. Foliar fertilizer UAN and MLG-50™ impact on winter wheat yield, metric tons per hectare (spraying at early part of the stem elongation stage, or, BBCH 30-31).



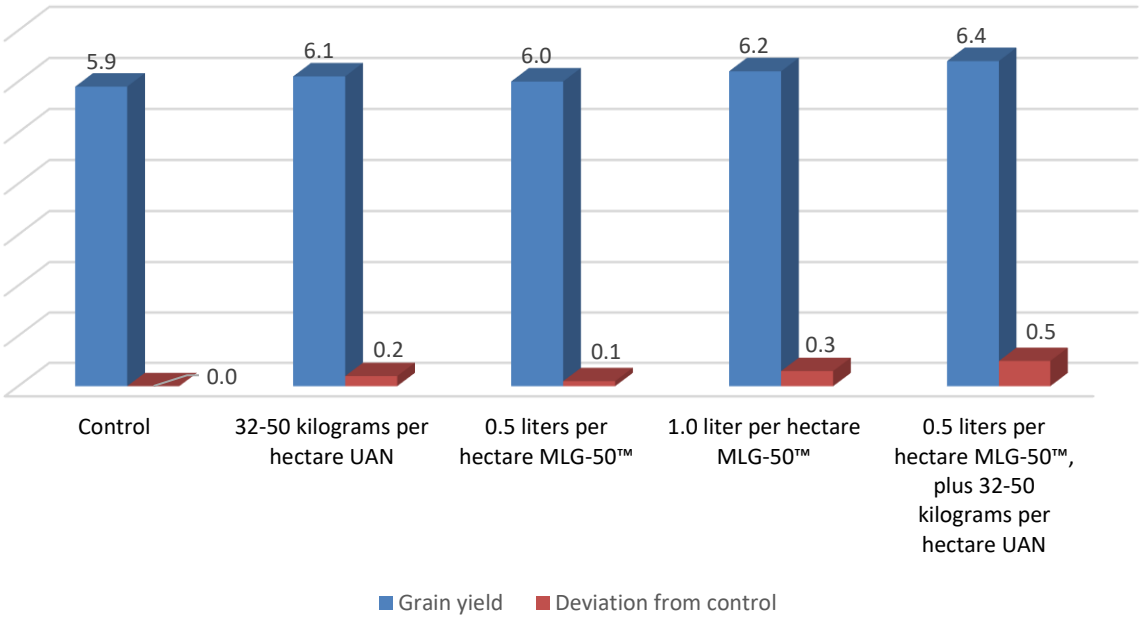
Within the data for Set One (displayed in Table 1), the greatest winter wheat yield increase that was obtained at the early part of the stem elongation stage (or, during stages 30-31 on the BBCH-scale for cereals), at a 1.6 metric tons per hectare increase in yield over the control, resulted from applying 1.0 liter per hectare MLG-50™ in combination with 32-50 kg per hectare UAN. Grain yield for this variant was 27 percent higher than that of the control group. Also, at just 0.5 liters per hectare MLG-50™ with 32-50 kilograms per hectare UAN, the winter wheat grain yield increased by 1.0 metric ton per hectare when compared to the control. Overall, when applied at the early stem elongation stage, MLG-50™ increased grain yield from 0.4 metric tons per hectare to 1.6 metric tons per hectare, or 6.8 to 27.1 percent. From these cases, we can conclude that fulvic acids increased the effectiveness of the nitrogen fertilizers and that fulvic acids that are enriched with minerals, as in the product MLG-50™, initiate the absorption of nitrogen when applied at the early part of the stem elongation stage. Referring to literature, we can also conclude that fulvic acid molecules increase membrane permeability and increase the root cell pore size and, for these reasons, plants can absorb more nutritional elements from the soil.

Table 2. Impact of foliar spray on winter wheat grain yield at the early part of inflourescence emergence/heading stage (or, stages 50-51 on the BBCH-scale for cereals).

Set Two.		Grain yield, metric tons per hectare.	Deviations from control.	
			Absolute, metric tons per hectare.	Relative, %
Control (without spraying).		5.90	-	-
Variants, sprayed at the early part of inflourescence emergence stage (stages 50-51 on the BBCH-scale).				
1.	50 kg UAN.	6.10	0.20	+3.38
2.	0.5 liters per hectare MLG-50™.	6.00	0.10	+1.69
3.	1.0 liter per hectare MLG-50™.	6.20	0.30	+5.08
4.	0.5 liters per hectare MLG-50™, plus 50 kg per hectare UAN.	6.40	0.50	+8.47
5.	1.0 liter per hectare MLG-50™, plus 50 kg per hectare UAN.	6.50*	0.60	+10.16

*when $P \leq 0.05$ (significant differences between particular variant and control at 95% probability level).

Figure 2. Foliar fertilizer impact on winter wheat yield, metric tons per hectare (spraying at early part of inflorescence emergence stage, or, BBCH 50-51).



Within the group of plants on which MLG-50™ was applied at the early part of the inflorescence emergence/heading stage (or, stages 50-51 on the BBCH-scale for cereals), MLG-50™ significantly increased winter wheat grain yield (Table 2). When applied at the beginning of the inflorescence emergence stage, 1.0 liter per hectare MLG-50™ with 32-50 kilograms per hectare UAN fertilizer resulted in a 0.4 metric tons per hectare yield increase when compared to the yield results from the variant group on which only UAN was applied.

Table 3. Impact of two foliar spray applications on winter wheat grain yield; first spray at the early part of the stem elongation stage (or, stages 30-31 on the BBCH-scale for cereals) and second spray at the early part of the inflorescence emergence stage (or, stages 50-51 on the BBCH-scale for cereals).

Set Three.		Grain yield, metric tons per hectare.	Deviations from control.	
			Absolute, metric tons per hectare.	Relative, %
Control (without spraying).		5.90	-	-
Variants, sprayed at both early part of the stem elongation stage (BBCH 30-31) and at early part of the inflorescence emergence stage (BBCH 50-51).				
1.	0.5 liters per hectare MLG-50™ at BBCH 30-31, plus 0.5 liters per hectare MLG-50™ at BBCH 50-51.	6.45	0.55	+9.32
2.	1.0 liter per hectare MLG-50™ at BBCH 30-31, plus 1.0 liter per hectare MLG-50™ at BBCH 50-51.	6.70*	0.80	+13.55

*when $P \leq 0.05$ (significant differences between particular variant and control at 95% probability level).

Table 3 shows that applying MLG-50™ at two stages results in a significantly higher winter wheat grain yield. The greatest yield increase within Set Three, in which MLG-50™ was applied at both the stem elongation stage and the inflorescence emergence stage, was a 0.8 metric tons per hectare and a 13.55% yield increase, which was obtained from applying 1.0 liter per hectare MLG-50™ at both stages.

Table 4. Impact of additional foliar spray on winter wheat grain yield and yield structural elements at the early part of the stem elongation stage (or, stages 30-31 on the BBCH-scale for cereals).

Set One.		Grain yield, metric tons per hectare.	Yield structural elements.			
			Density, productive stems per square meter.	Number of grains per ear/unit.	1000 grain weight, g.	Ear productivity, g.
Control (without spraying)		5.90	485	25.9	46.8	1.21
Variants, sprayed at the early part of the stem elongation stage (or, stages 30-31 on the BBCH-scale).						
1.	32-50 kg per hectare UAN.	6.50	503	27.1	47.4	1.29
2.	0.5 liters per hectare MLG-50™.	6.30	495	26.9	47.2	1.27
3.	1.0 liter per hectare MLG-50™.	6.52	517	27.2	47.0	1.28
4.	0.5 liters per hectare MLG-50™, plus 32-50 kg per hectare UAN.	6.90*	524	27.5	47.7	1.31*
5.	1.0 liter per hectare MLG-50™, plus 32-50 kg per hectare UAN.	7.50*	567*	27.5	48.0*	1.32*

*when $P \leq 0.05$ (significant differences between particular variant and control at 95% probability level).

Figure 3. MLG-50™ foliar fertilizer impact on winter wheat density by number of productive stems per square meter (spraying at early part of the stem elongation stage, or, BBCH 30-31).

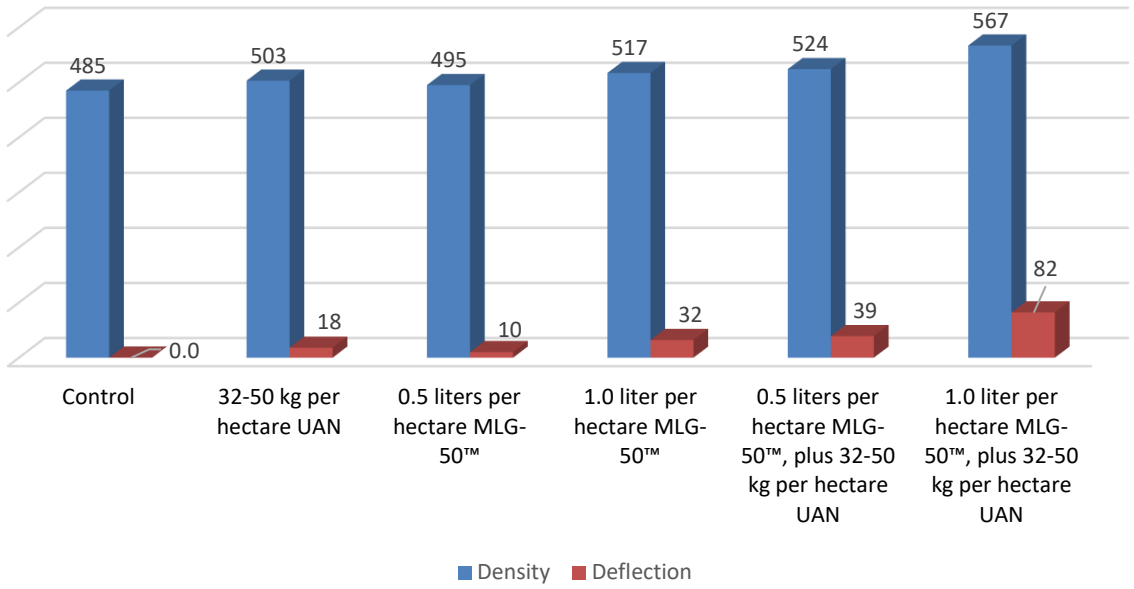
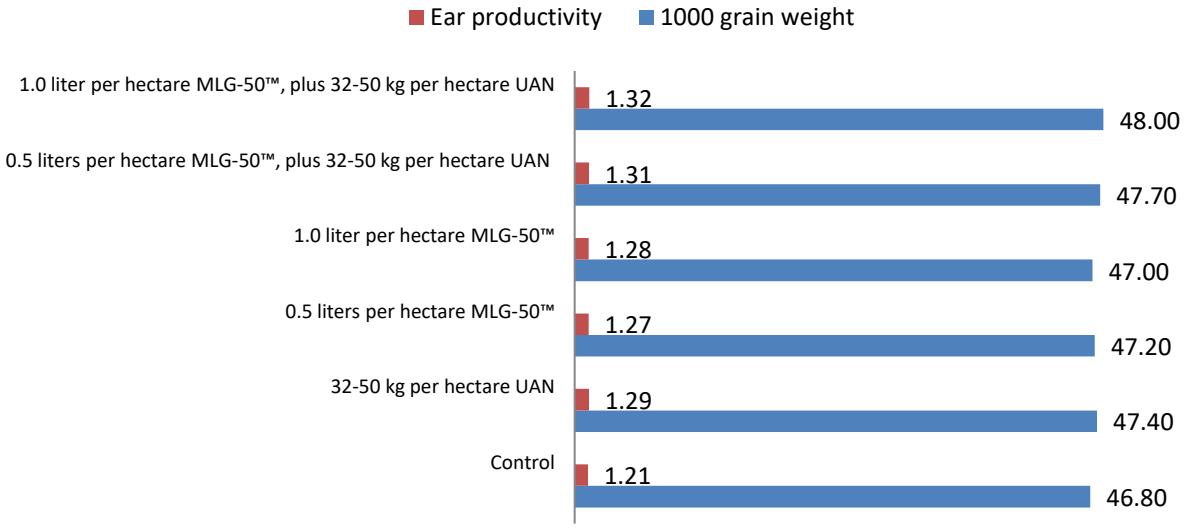


Figure 4. MLG-50™ foliar fertilizer impact on 1,000 grain weight and ear productivity of winter wheat in grams (spraying at early part of the stem elongation stage, or, BBCH 30-31).



The analysis of the winter wheat yield structural elements indicates that the greatest winter wheat productivity increase resulted from applying 1.0 liter per hectare MLG-50™ plus 32-50 kg per hectare UAN, at 567 productive stems per square meter.

Fulvic acids are shown in scientific literature to improve blossom fertilization. In this study, significant effects on blossom fertilization were not obtained; however, fulvic acids were observed to increase the number of grains per ear.

Applications at the early stem elongation stage (BBCH 30-31) resulted in an increase in 1,000 grain weight as compared to the control only when MLG-50™ was applied in combination with UAN. We can conclude that examined fulvic acid foliar sprays increased nitrogen absorption, because the use of UAN alone did not result in any significant change in 1,000 grain weight when compared with the control.

Using 0.5 liters per hectare MLG-50™ plus 32-50 kg UAN was sufficient to significantly increase winter wheat ear productivity. The greatest winter wheat ear productivity (1.32 g) in the early stem elongation stage application set was obtained when applying 1.0 liter per hectare MLG-50™ plus UAN. We can conclude that using MLG-50™ in combination with a nitrogen fertilizer in order to increase winter wheat ear productivity is beneficial.

Table 5. Impact of additional foliar spray on winter wheat yield and yield structural elements at the early part of inflourescence emergence/heading stage (or, stages 50-51 on the BBCH-scale for cereals).

Set Two.		Grain yield, metric tons per hectare.	Yield structural elements.			
			Density, productive stems per square meter.	Number of grains per ear/unit.	1000 grain weight, g.	Ear productivity, g.
Control (without spraying).		5.90	485	25.9	46.8	1.21
Variants, sprayed at the early part of inflourescence emergence stage (stages 50-51 on the BBCH-scale).						
1.	32-50 kg per hectare UAN.	6.10	470	27.1	47.6	1.29
2.	0.5 liters per hectare MLG-50™.	6.00	490	26.0	47.0	1.22
3.	1.0 liter per hectare MLG-50™.	6.20	494	26.5	47.1	1.25
4.	0.5 liters per hectare MLG-50™, plus 32-50 kg per hectare UAN.	6.40	485	27.3	47.9	1.31
5.	1.0 liter per hectare MLG-50™, plus 32-50 kg per hectare UAN.	6.50*	491	27.3	48.4*	1.32*

*when $P \leq 0.05$ (significant differences between particular variant and control at 95% probability level).

Applying MLG-50™ on winter wheat at the early inflorescence emergence stage (BBCH 50-51) usually resulted in significant 1,000 grain weight and ear productivity increases, compared with results from the stage BBCH 30-31 applications.

Figure 5. MLG-50™ foliar fertilizer impact on winter wheat density by number of productive stems per square meter (spraying at early part of inflorescence emergence stage, or, stage BBCH 50-51).

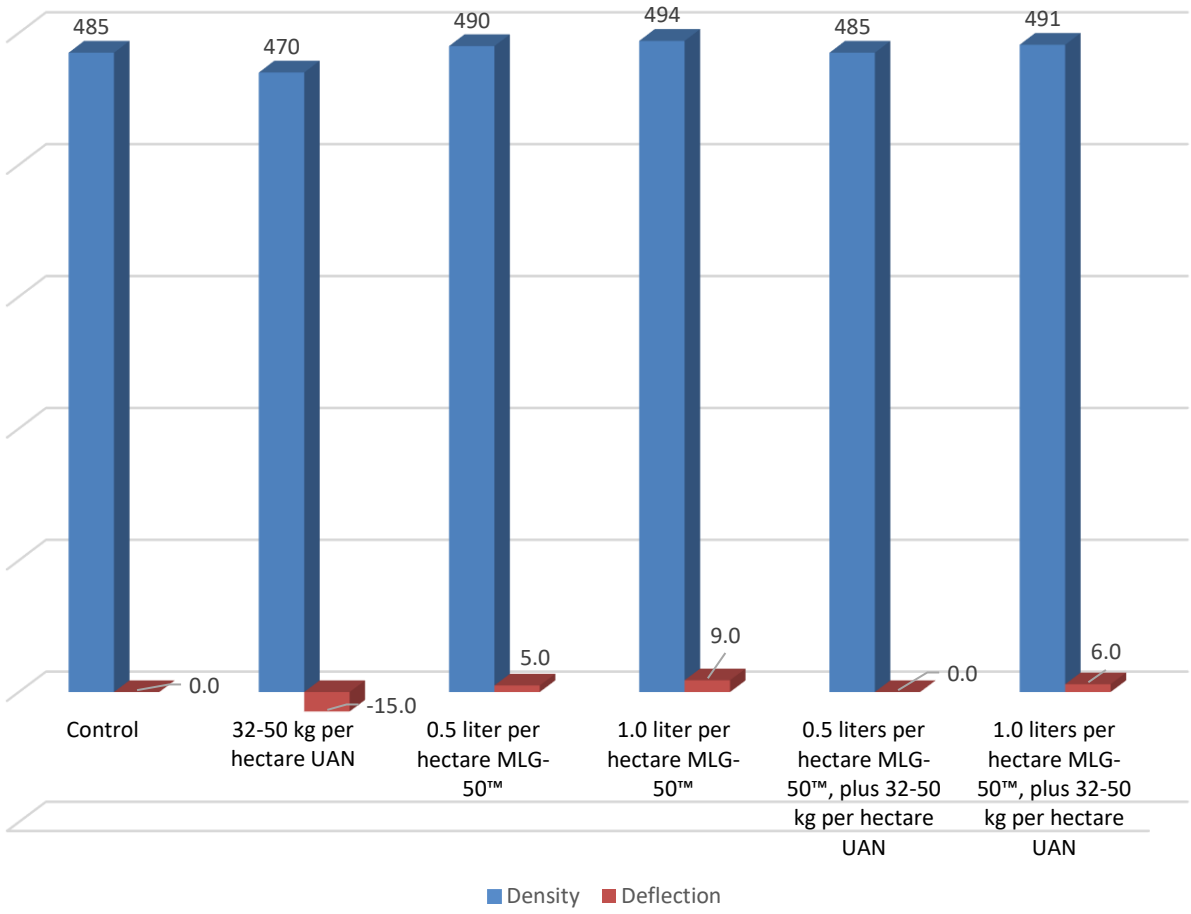


Figure 14. MLG-50™ foliar fertilizer impact on 1,000 grain weight and ear productivity of winter wheat in grams (spraying at early part of inflorescence emergence stage, or, BBCH 50-51).

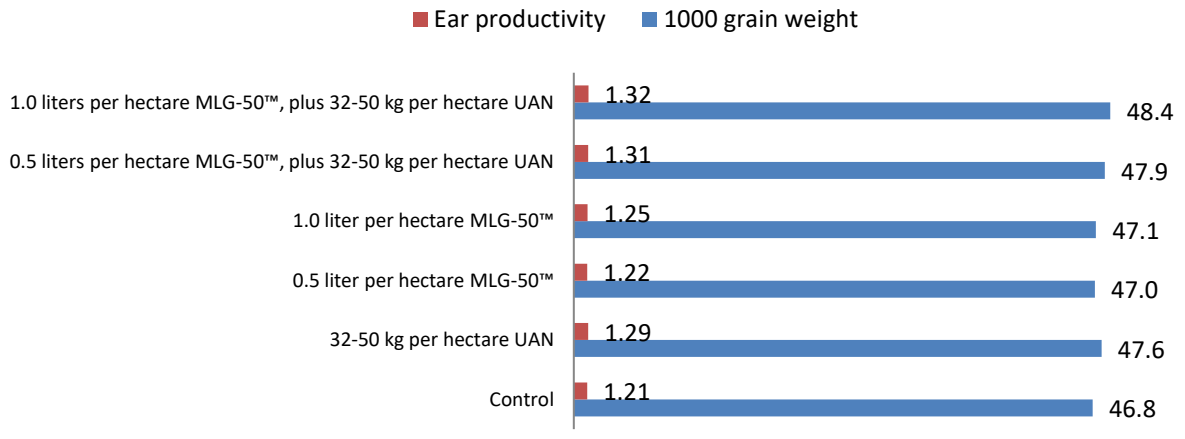


Table 6. Impact of MLG-50™ foliar spray on winter wheat grain yield and yield structural elements; first spray at the early part of the stem elongation stage (or, stages 30-31 on the BBCH-scale for cereals) and second spray at the early part of the inflorescence emergence stage (or, stages 50-51 on the BBCH-scale for cereals).

Set Three.		Grain yield, metric tons per hectare.	Yield structural elements.			
			Density, productive stems per square meter.	Number of grains per ear/unit.	1000 grain weight, g.	Ear productivity, g.
1.	Control (without spraying).	5.90	485	25.9	46.8	1.21
Variants, sprayed at both early part of the stem elongation stage (BBCH 30-31) and at early part of the inflorescence emergence stage (BBCH 50-51).						
2.	0.5 liters per hectare MLG-50™ at BBCH 30-31, plus 0.5 liters per MLG-50™ at BBCH 50-51.	6.45	503	27.4	46.8	1.28
3.	1.0 liter per hectare MLG-50™ at BBCH 30-31, plus 1.0 liter per hectare MLG-50™ at BBCH 50-51.	6.70*	500	28.4*	47.2	1.34*

CONCLUSIONS

Trials results with foliar fertilizers on winter wheat:

1. The greatest winter wheat yield increase (7.5 metric tons per hectare) that was obtained from applying MLG-50™ at the stem elongation resulted from the application of 1.0 liter per hectare in MLG-50™ in combination with 32-50 kg per hectare UAN.
2. Amongst results from the set in which foliar fertilizer was applied at both stage BBCH 30-31 and stage BBCH 50-51, the greatest yield resulted from spraying 1.0 liter per hectare MLG-50™ at each stage.
3. While evaluating yield structural elements, the greatest number of productive stems per square meter obtained amongst all three sets resulted from applying 1.0 liter per hectare MLG-50™ along with 32-50 kg per hectare UAN at stage BBCH 30-31.
4. Significant 1,000 grain weight and ear productivity increases were obtained by applying 1.0 liter per hectare MLG-50™ in combination with UAN.
5. Applying MLG-50™ twice on winter wheat had no significant effect on productive density (number of stalks per meter squared). Significant changes in number of grains per ear resulted from applying 1.0 liter per hectare MLG-50™ at stage BBCH 30-31 plus 1.0 liter per hectare MLG-50™ at stage BBCH 50-51.
6. A significant change was noted to have occurred on ear productivity as a result of applying 1.0 liter per hectare MLG-50™ 1.0 at stage BBCH 30-31 plus 1.0 liter per hectare MLG-50™ 1.0 liter per hectare at stage BBCH 50-51.