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RESEARCH ARTICLE **(Open Access)**

The Effect of Herbagreen Fertilizer Nanoparticles in Wheat Productivity Through Leaf Pulverization

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Abstract

The purpose of this research is to further establish a possible significant influence of TMA calcite treatment (Herbagreen organic leaf fertilizers) on improvement of physical properties and productivity in crops (wheat). This fertilizer is produced through the Tribomechanic Micronization and Activation processes (TMA). The calcite TMA is performed in a specially built machine called Activator; machine invented and patented by the scientist Tihomir Lelas. The calcite particles are grinded in nano dimensions and ion charged increasing benefits for the treated plant.Herbagreen is 100% bio nutrient (containing Calcium oxide CaO 35,9%, magnesium oxide (MgO) 1,9%, Silicium dioxide SiO2 18,1%, Phosphorus P2O5 0,28%, potassium oxide (K2O) 0,1%, Sulfur (S) 0,52% and some others microelements in 1 µm granules). Once nanoparticles of Herbagreen are absorbed by leaf stomas, calcite particles split into CO_2 (carbon dioxide) and CaO (calcium oxide) generating additional sources of calcium for the plant. The calcium, which is the most relevant element in Herbagreen, is essential for strengthening the structure and healthy growth of plants. After the split of calcite particles absorbed by the treated plant, we provide additional (CO2) supplement which increases photosynthesis and reduces photorespiration by limiting unnecessary evaporation. Based on researches on this argument carried out in several countries and referring to results of our experiment, we conclude that Herbagreen increases the productivity of plants by about 30% compared to "classical" fertilization.

Keywords: Herbagreen, nano-particles, calcium, photosynthesis, productivity.

1. Introduction

Currently the environmental issues are in focus worldwide. They regard heavy industries leaching toxic and chemical materials into rivers, lakes, seas and air. The increasing political attention these issues are obtaining on national level are becoming relevant part also of international political agendas. The above environmental issues affect also the agriculture on the use of chemicals for yield increase and parasites resistance. Long –term risks related to improper and disproportioned chemicals use, have pushed researches on alternative, efficient, eco-friendly treatments for a sustainable agriculture. Natural minerals have been used widely in biological agriculture for ages, many researches tried to improve the activation techniques of these minerals in order to increase the positive effects of their utilization [6].

The researcher Tihomir Lelas is one of the pioneers in this field. His TMA (Tribomechanic Micronization and Activation equipment patented in the year 1998 at the International Bureau of the WPO PCT Receiving Office in Geneva Switzerland, under number PCT/1B 99/00757) [9] allows having a sensibly improved granularity of calcite particles through a mechanical process [8, 5]. The TMA equipment is made up of housing and two rotor discs placed against each other. Each disc is furnished with 3–7 concentric circles-rings of teeth projecting from the surface of the disc—with specially constructed hard metal elements. The discs rotate in opposite directions at the same angular rate. The starting material enters the equipment through the central part of the rotor system by ventilator air streaming.

Therefore, the particles are accelerated and, because of repeated changes in the direction of motion, collide, causing friction over short time intervals (less than 0.001 s) [10]. These, ion charged nano-active particles of mineral (Herbagreen) provide significant benefits in plants. They play a major role

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in photosynthesis and other important processes in plant growth [7, 3].

After the TMA treatment, the activated particles are of very small dimensions (20 microns); this enables them to penetrate the stomas of the plant [11,15]. Inside the leaf calcite particles split into CO2 (carbon dioxide) and CaO (calcium oxide), generating in this way a free additional source of calcium for the plant to grow healthy **[3,12,16].** It has some important roles as:

- participates in metabolic processes for other nutrient uptake (ammonium)
- strengthens wall structure
- participates in enzymatic and hormonal processes
- improves stoma function
- helps in protecting the plants against heat stress

Carbon dioxide (CO2) on the other hand is absorbed immediately in the photosynthesis process. The intensity of this process depends on the intensity of light and concentration of the CO2**.** Herbagreen supplies to the plant a relevant amount of CO2, and thus increases and accelerates the photosynthesis [15,17]. Afterwards, the other parts of Herbagreen involve calcium oxide, help and intensify primary and secondary metabolic process and other important physiological processes in the plant [1, 3, 4].

The figure below shows how Herbagreen nanoparticles enter the leaf of the plant and are activated.

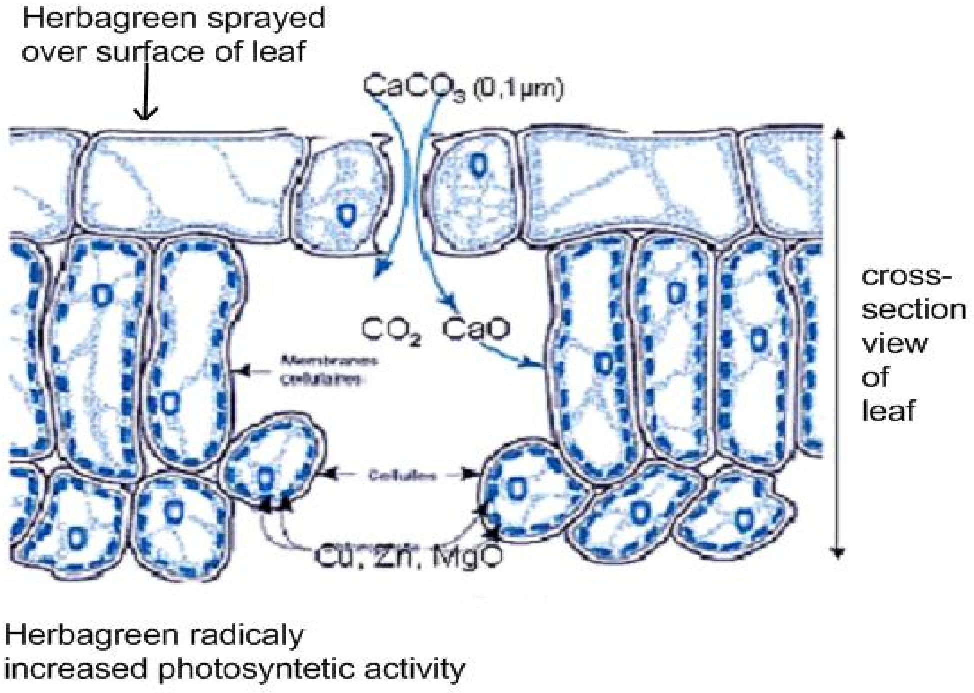


Figure 1. Calcite (Herbagreen) nanoparticles penetrating to the leaf through the stomata. These particles decompose into calcium oxide and carbon dioxide. Those compounds are included immediately in the process of photosynthesis which is the most important process in the plant's life. These micro particles are also involved in other processes in primary and secondary metabolism [7].

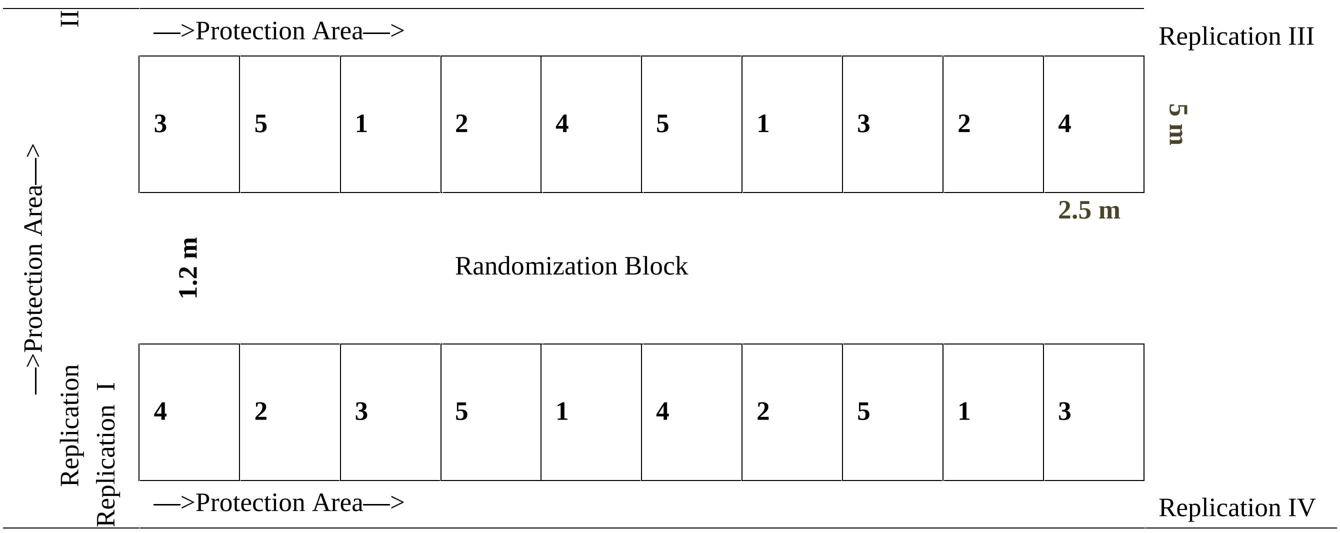
2. Material and Methods

The research is performed in the fields of the experimental station (EDE) of the Agricultural University of Tirana, Albania. The experiment was set up with five variants with four replications per each variant. In order to guarantee the safety and reliability of the results, the experiment is repeated for two consecutive years on wheat plant, according to randomization block. The name of cultivar in experiment was Progress 2000 (an autochthon cultivar that EDE uses widely). The scheme of experiment is the following [2]:

1. First variant is (control with no additional fertilization of soil).
2. Second variant is with the optimal doses of fertilization in use (EDE) which corresponds to 3 KV/ HA DAP (Di-ammonium phosphate), 4 KV/ HA Urea and 2 KV/ HA K_2SO4 (potassium sulfate).
3. Third variant is with 30% less of optimal fertilization scheme of EDE.

4. The fourth variant is with 30% less of optimal fertilization scheme, and one foliar treatment with Herbagreen nutrient.
5. The fifth variant is with 30% less of optimal fertilization scheme of EDE and two foliar treatments with Herbagreen nutrient.

The Herbagreen powder (TMA calcite) is mixed with water and sprayed in fine mist on the plants. The average concentration rate for most field crops is 2-2.5 kg/ha. For small applications the rate is 3-g/lt. The preparation is done by gradually mixing the powder with a little water manually with a spoon to obtain at first a creamy composition and then gradually adding the rest of the water to have a regular distribution of the concentration [7, 13, 14].



The area of experiment zone is360 m² and together with protection zone 490 m²

Figure 2. Planting scheme according the variants of the study.

3. Results and discussion

Table 1. Summary data on production of variants of the study

Variants	Replications				Σ	Σ	Squaring				Σ	Average yield
	I	II	III	IV			PI	PII	PIII	PIV		
1	20.3	21	22	18	81.3	6609.69	412.09	441	484	324	1661.09	20.3
2	21	18	19	17	75	5625	441	324	361	289	1415	18.75
3	26	28	25	22	101	10201	676	784	625	484	2569	25.25
4	28	30	29	24	111	12321	784	900	841	576	3101	27.25
5	35	32.5	30	32	129.5	16770.25	1225	1056.25	900	1024	4205.25	32.37
Σ	130.3	129.5	125	113	497.8	51526.94	3538.09	3505.25	3211	2697		
p²	16978.09	16770.25	15625	12769	247804.84						12951.34	
Σp²	62142.34											

Table 2. Analysis of variance

Source of change	Freedom scale	The Amount quadratic	Variation	Fn Vales		
				Factual	Theoretical	
					0.05	0.01
Repetition P	3	38.22	12.74	4.88	3.49	5.95
Variant V	4	491.49	122.87	47.07	3.26	5.41
Error	12	31.39	2.61			
Amount	19	561.1				

$Fk = \frac{(SV^2)}{n \times p} = \frac{(497.8)^2}{5 \times 4} = \frac{247804.84}{20} = 12390.24$

SKT=$(V1^2 + V2^2 + \cdots V5^2) - Fk = 12951.34 - 12390.24 = 561.10$

SKV=$\frac{\Sigma^2 V}{P} - Fk = \frac{51526.94}{4} - 12390.24 = 491.49$

SKP=$\frac{\Sigma^2 V}{n} - Fk = \frac{62142.34}{5} - 12390.24 = 38.22$

SKE=SKT-$(SKV + SKP) = 561.10 - 529.71 = 31.39$

Ed=$\frac{\sqrt{VarE \times 2}}{p} \frac{\sqrt{1.14 \times 2.}}{4} = 1.14$

DMV0.05=1.14 × 2.2=2.51 kv/Ha
DMV001=1.14 × 3.05=3.50 kv/Ha

As it can be deducted from the above cumulative Table 1 detailing the productivity in kv/ha per each variant, the best performance in these terms is the one of the 5th variant respectively with 32, 37 kv/ha. Second is listed the 4th variant with 27,25 kv/ha. The statistical data processing demonstrates that there are statistically proved differences for the probability levels of to =95 and to =99 between 5th Variant and the others (Table 2).

Also between 4th Variant and the others, there are statistically proved differences with Variants 1, 2 and 3.

The average yield of the experimental field results x average 24,20 kv/ha, this value is below the average yield of the Variant 3, 4 and 5 and above the Variant 1 and 2.

Only the 5th Variant is above the experiments average values regarding the two statistical parameters DMV = 0,95 and DMV = 0,99.

4. Conclusions

Herbagreen as an organic fertilizer, which is considered an innovation input in agriculture provided proved increased average yield values of wheat plants without harming the ecosystem and without contaminating the soil and groundwater.

The 5th Variant has the highest yield rate with 32,37kv/ha providing statistically proved differences for the two probability levels when compared to all the other variants considered in this experimental study.

The 4th Variant has statistically proved differences for the two probability levels when compared to Variant 1 and 2, and unverified statistically differences compared to 3rdVariant.

The average yields of the experimental field of 24,20 kv/ha is higher than the production rates of Variants 1 and 2 for both probability levels.

By analyzing the economical and financial turnout of the experiment, it can be considered successful. We can state that by using Herbagreen the farmers sensibly increase their financial turnout and this makes irrelevant the costs of the treatment itself.

In addition this Bio treatment does not pollute the soil and environment; it is a safe step to sustainable development and sustainable agriculture.

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