RESEARCH CONCERNING THE EFFECT OF LOW-FREQUENCY ELECTROMAGNETIC RADIATION ON MOISTURE AND WEIGHT FEATURES IN MAIZE SEEDS

Daniel GROS, Bucur VUKASIN, Florin IMBREA,

Banat's University of Agricultural Sciences and Veterinary Medicine, Faculty of Agricultural Sciences, Timisoara, Aradului Street, no. 119, RO-300645, Romania,
Corresponding author: imbrea_fl@yahoo.ca

Abstract. *Grain moisture at harvest time and weight features of seeds are more or less impacted, depending on agro-technical, climate, etc. factors. Likewise, in agricultural practice, high values of these indicators show that, as far as germination is concerned, seeds have well-developed germs resulting into vigorous plants and into higher wheat yields from a technological point of view. In this study, the authors monitored the effect of different low-frequency wave lengths on moisture, relative volume of 1,000 grains, and hectolitric volume in the maize hybrid PR36V74, developed by Pioneer, and grouped in the maturity class FAO 450. The working method used in the experiment is specific to laboratory determinations, while in the treatment of the seeds we used the generator of electromagnetic radiations of the Faculty of Agriculture of Novi Sad thanks to Professor Branko Marinkovic. We should mention that we used in the treatment of the seeds only frequencies known to stimulate plant growth and measuring between 0 and 100 Hz. Research was carried out in the laboratory of „Agricultural produce quality analysis" of the Department of Agricultural technologies of the Faculty of Agriculture. Results show that electromagnetic radiations produce, depending on their wave length, a positive stimulation on the three monitored indicators compared to the control variant (not stimulated electromagnetically). The results of the present study are part of a research project PN II IDEI Contract nr. 1076/2009, topic code ID_864, financed by the Ministry of Education, Research, Youth and Sport, through the National Council of Scientific Research in Higher Education. The topic of the project is „ A study on the influence of the treatment with low-frequency electro-magnetic waves on yield, and quality in the maize".*

Key words**:** *electromagnetic waves, MMB,MH*

INTRODUCTION

Mass of 1,000 grains is an important quality indicator particularly in choosing the seeding material; from an industrial point of view, it is of interest only in 1st quality maize destined to produce starch, dextrin, glucose, and butane [1, 3, and 5].

Hectolitre volume is used in practice in commercial trades as well as in the technological processing of produce, particularly in the grinding process. Hectolitre volume is strongly impacted by the technology applied and by unfavourable soil and climate, and it depends on grain moisture at the time of measurement. High moisture in maize grains results in a diminution of the hectolitre volume [1, 3, and 5].

MATERIAL AND METHODS

We have used only frequencies known at present to stimulate plant growth and to improve produce quality. Frequency codification under study was done randomly, without observing the increase scale of the determined parameters. Studied frequencies ranged within low-wave frequency, i.e. between 0 and 100 Hz.

The duration of the treatment was 10 minutes. Sowing treated seeds was done right after the treatment was applied, knowing from previous research that seeds thus treated should be sown maximum 7-10 days after the treatment.

In the case of four corn hybrids we monitored the effect of five different wavelengths, compared with control, with the following measurements:

- Mass of 1000 grains (g);
- Hectoliter weight (kg / hl).

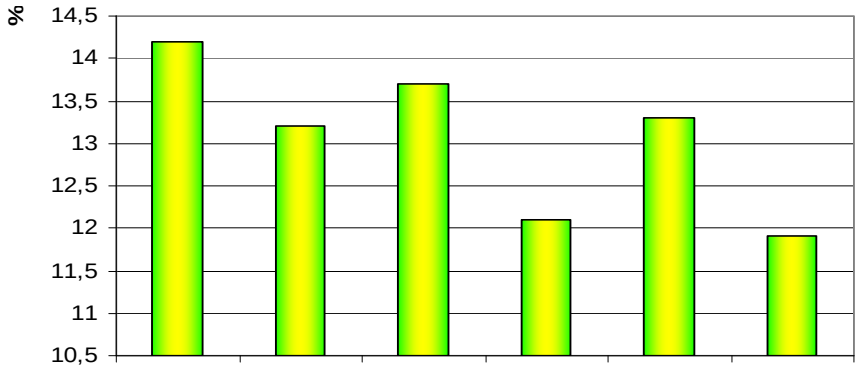
The biological material under study was represented by the maize hybrid PR36V74, a semi-late simple maize hybrid with very good moisture: yield ratio for semi-moist areas, very stable due to tolerance to drought. A medium-size plant, drought tolerant, this maize hybrid looses water very well; it has a good resistance to breaking and fall and it resists very well to corn smut (*Ustilago maydis*).

Determining the indicators under study was done in the laboratory for the *Testing of seed quality and plant material* of the Department of Plant Cultivation Technologies of the Faculty of Agriculture (Banat University of Agricultural Science and Veterinary Medicine in Timisoara, Romania), using last-generation equipment: the SC2 seed counter and the analytical scales to determine the volume of 1,000 grains, and the *Granomat Pfeuffer* analyser to determine moisture and hectolitre volume.

RESULTS AND DISCUSSIONS

Moisture upon harvesting depends on the wave length used: it is shown in Figure 1. Though from the point of view of climate and moisture the studied year had values above the multi-annual average – there were, in the Timisoara area, rainfalls of 375 mm – the genetics of the maize hybrid used in the trial and the stimulus by low-frequency electromagnetic waves resulted in a moisture level that allowed grain harvesting on October 12.

Moisture values at the time of harvest ranged between 11.9% in the variant V_5 and 14.2% in the control variant (Figure 1).



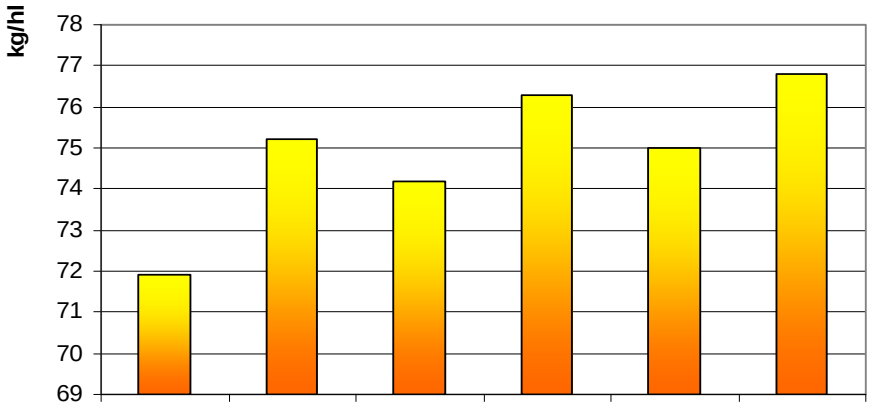
Variant	**MT**	**V1**	**V2**	**V3**	**V4**	**V5**
Moisture (%)	14,2	13,2	13,7	12,1	13,3	11,9
Difference (%)		-1	-0,5	-2,1	-0,9	-2,3

Figure 1. Moisture (%) at harvest time depending on wave length

Figure 2 shows the values of hectolitre volume depending on the treatment variant.

Analysing data shows that compared to the control variant – i.e. 71.9 kg/hl – electromagnetic radiation resulted in values of the hectolitre volume ranging between 74.2 kg/hl in the variant V_2 and 76.8 kg/hl in the variant V_5. Compared to the control variant, the

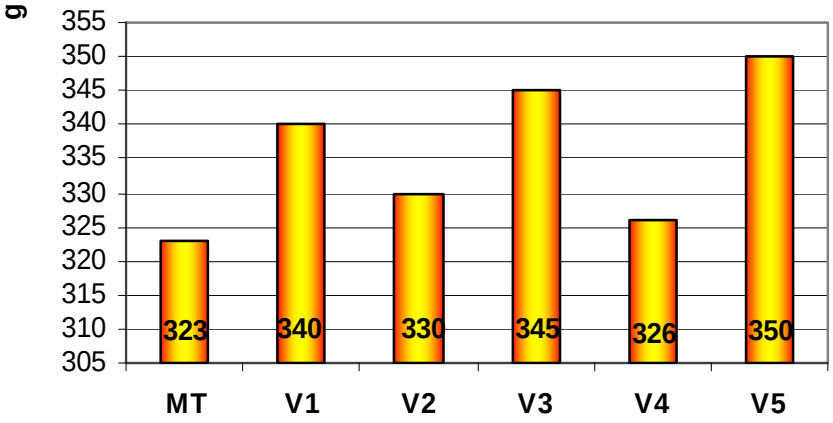
increase was 3% in the variant V_2, 4% in the variant V_4, 5% in the variant V_1, 6% in the variant V_3 and 7% in the variant V_5, an increase that results in differences of 2.3 kg/hl (Figure 2).



Variant	MT	V1	V2	V3	V4	V5
MH (kg/hl)	71,90	75,20	74,20	76,30	75,00	76,80
%	100	105	103	106	104	107
Difference (kg/hl)		3,30	2,30	4,40	3,10	4,90

Figure 2. Hectolitre volume (kg/hl) depending on wave length

Mass of 1,000 grains determined depending on wave length is shown in Figure 3.



Variant	MT	V1	V2	V3	V4	V5
MMB	323	340	330	345	326	350
%	100	105	102	107	101	108
Difference (%)		17	7	22	3	27

Figure 3. Mass of 1,000 grains (g) depending on wave length

In the case of this indicator also, the value of the masse of 1,000 grains was positively impacted, ranging between 323 g in the control variant and 350 g in the variant V_5. The value

of the mass of 1,000 grains compared to that of the control ranged between 3 g in the variant V_4 and 27 g in the variant V_5.

CONCLUSIONS

Experimenting new technologies of cultivation in maize is a first important step meant to optimise the yielding capacity of maize hybrids to be introduced into cultivation.

This study shows the beneficial effect of low-frequency electromagnetic waves on the studied indicators.

Moisture at harvesting time, a very important indicator if we bear in mind the share of maize of cultivated species and crop rotation with winter wheat, together with costs related to drying, ranged between 11.9 and 14.2%, values that allow harvesting as grains.

Analysing the impact of electromagnetic waves on hectolitric volume and of the mass of 1,000 grains shows the positive impact of this type of stimulus on plants, an impact resulting in yield and quality increase.

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