



THE INFLUENCE OF CYCOCEL IN THE PROCESS OF WHEAT'S IMPROVEMENT AND DEVELOPMENT

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Abstract:

The experimental research that was done aimed at proving that the cycocel had an action on some morphological, physiological and qualitative characteristics, but also on productive capacities of some wheat varieties, cultivated around Lugoj city (Timiș county). This kind of action depends on: the climatic variables (precipitations, temperature), the soil characteristics (type, pH and contents), the applied dose, the number of treatments, the application stage and the quantity of active substance used.

Keywords:

cycocel, growth retarders, quaternary ammonium combinations, wheat

1. INTRODUCTION

As early as the beginning of the last century, it had been inferred that the development of the plants could be chemically influenced [1]. The discovery of vegetal hormones, seven decades ago, represented a new stage in the knowledge and management of plant's development regarding their improvement.

The identification of vegetal hormones had been followed by research that observed the reaction that the plants had to a series of synthetic compounds having the structure and the physiological characteristics similar to the natural hormones.

Nowadays, a great number of researchers confirmed the multilateral action of the growth retarders.

In a more general way, the retarders belong to the group of morpho-regulative substances. By their action, the retarders differ from the stimuli and inhibitors of growth.

The growth retarders cause some morphological and physiological changes by which influence the rhythm of growth, although, through their

action, they do not irreversibly stop the metabolically processes that are vital for the plant, they do not completely suppress the growth and do not affect the formation and the development of the reproductive organs, so that the plant's growth and their fertility potential are not diminished.

The group of retarders contains [2]:

- nicotine derivates;
- quaternary phosphorus combinations;
- quaternary ammonium combinations [3].

Cycocel is a quaternary ammonium combination that has a similar structure to that of the choline.

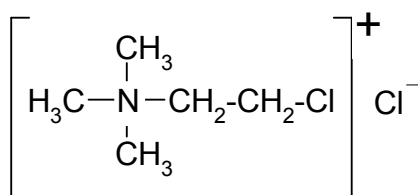


Fig. 1. The structure of cycocel

The cycocel contains a chloride atom placed to the second carbon of the ethylene group, while the choline contains a hydroxyl group. The substitution of the hydroxyl group of the choline with a chloride atom has a great importance in what regards biological processes, because cycocel can not form esters, because it is short of -OH group.

Cycocel, $\text{C}_5\text{H}_{13}\text{Cl}_2\text{N}$, is a yellowish crystalline substance, with density of $1,15 \text{ g / cm}^3$, soluble in water in which forms an acid solution (pH = 5,14), soluble in ethanol and insoluble in ether. It is volatile in proportion of 88 %; it has a molecular mass of 158,11 and melts at 245°C [4, 5].

2.METHODS AND MATERIALS

The cycocel's application can be done using one of the following methods:

- its introduction in the soil in pure state or mixed with ammonium fertilizer;
- the treatment of seeds before the sowing time;
- the sowing splash.

The action of cycocel depends on climatic variables and especially on precipitations.

The average annual quantity of precipitations between 2000 – 2002 had been of 761 mm, which compared to the average quantity of 606 mm registered during a decade, is 115 mm less.

The average annual value of temperature between 2000 – 2002 had been of $10,6^\circ\text{C}$, $0,3^\circ\text{C}$ less than the average value of the temperature registered during ten years ($10,9^\circ\text{C}$), with average annual variations between $10,2 - 11^\circ\text{C}$.

The researches that had been done were placed on the soil of the second terrace of the Timiș river. This soil contains a poor acide pH (4,98 – 5,60) and superior layers of 3,6 % clay. The soil contains an average quantity of nitrogen, mobile phosphor and kallium. The water level is 2 – 3 m underground.

The cycocel used contained 40 % active substance and its administration was done on a foliage way, by adding a quantity of 400 liters water per ha.

With a view for establishing the best dose of active substance, the application stage, there had been different treatments. When it comes to the field experiences, the doses of cycocel were of 3, 6 and 9 kg per ha (1,2, 2,4 and 3,6 kg active substance). The treatment was done in three stuffing stages, when the plants had only 4 – 5 leaves and 10 – 40 cm height.

Table 1. *The characteristics of the wheat varieties, treated with cycocel*

The name of the wheat variety	The keeper of the variety	The year of registration	The length of the straw
Alex	Stațiunea de Cercetări Agricole Lovrin	1994	95 cm
Apullum	Stațiunea de Cercetări Agricole Turda	1992	80 cm
Arieșan	Stațiunea de Cercetări Agricole Turda	1985 (1995)	90 cm
Lovrin 34	Stațiunea de Cercetări Agricole Lovrin	1981 (1999)	87 cm
Lovrin 41	Stațiunea de Cercetări Agricole Lovrin	1987 (1997)	85 cm

3. RESULTS AND DISCUSSIONS

Among the actions of retarders, the most specific one is the shortening of the length of the wheat's straw by which the resistance potential is increased and prevents the falling phenomenon.

Out of the results that were obtained to the application of cycocel, it had been noticed that the length of the straw had shortened between 10 cm (Apullum) and 18 cm (Alex). The result was that the straw's length had significantly shortened to all the varieties researched in what regards the doses applied and the application stages of cycocel.

In the case of the wheat varieties that had been studied, it proved that the best dose was of 2,4 kg cycocel (active substance) per ha, applied at the stuffing stage, when the plants had 4 – 5 leaves and 20 – 30 cm height.

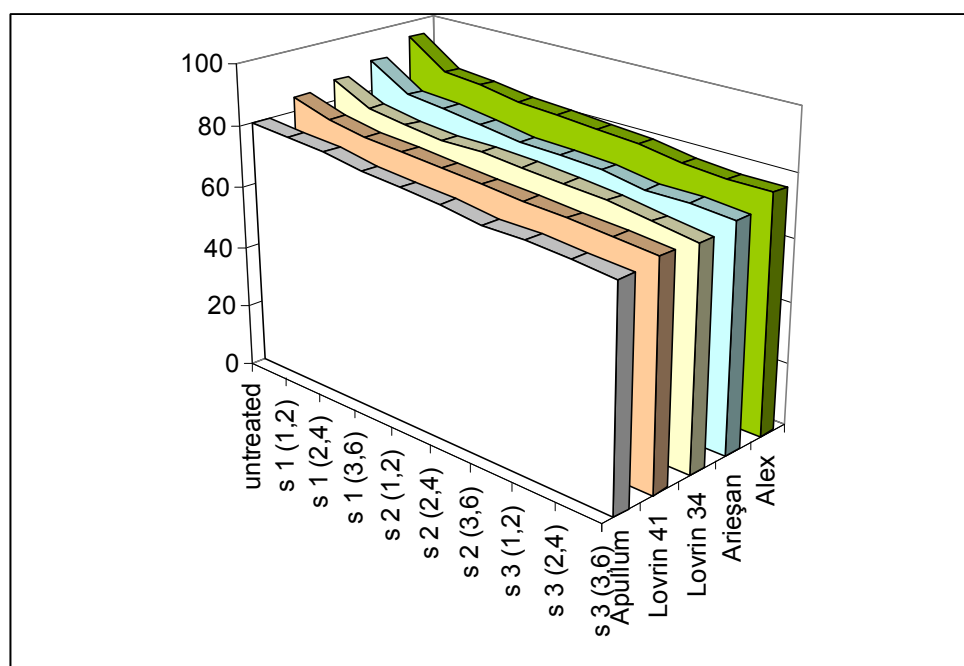


Fig. 2. The influence of cycocel on the shortening of the straw's length regarding the dose and the application stage (s)

When the treatment had been many times repeated, there had been different results depending on the number of treatments. When there was applied only one treatment, the average shortening of the straw's length

Table 2. The wheat production under the influence of cycocel in different doses and application stages

The wheat's variety	The year	The application stage	The dose		
			1,2 kg / ha	2,4 kg / ha	3,6 kg / ha
Lovrin 34	2000 - 2001	1	3,322	4,012	4,087
		2	4,150	3,765	3,970
		3	3,785	3,765	3,790
	2001 - 2002	1	4,367	4,122	4,120
		2	3,762	4,010	4,122
		3	3,847	3,772	3,762
Lovrin 41	2000 - 2001	1	3,500	3,725	3,650
		2	3,725	3,600	3,550
		3	3,650	3,725	3,662
	2001 - 2002	1	3,993	3,845	3,953
		2	3,898	3,881	3,987
		3	3,750	3,857	3,642

was 7,07 cm, when there were applied two treatments was 10,53 cm and to three treatments was 13,8 cm. These results show a high efficiency of the retarders to the shortening of straw's length when the treatment is repeated.

In what regards wheat's production we observed and noticed in table 2 the values for Lovrin 34 and Lovrin 41 varieties. About the qualitative characteristics, we observed the absolute mass of 1000 grains and the gluten content regarding the dose and the application stage and noticed them in figures 3 and 4.

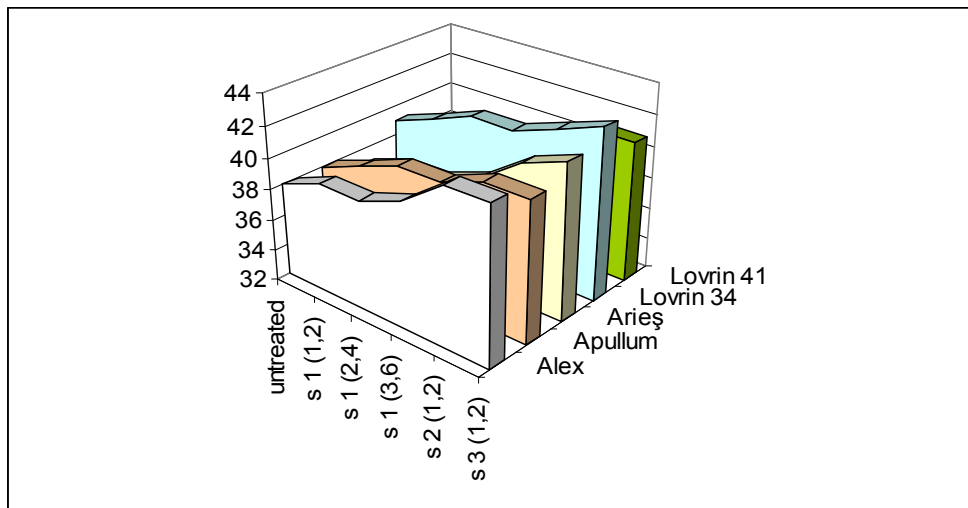


Fig. 3. The influence of cycocel on the absolute mass of 1000 grains regarding the dose and the application stage (s)

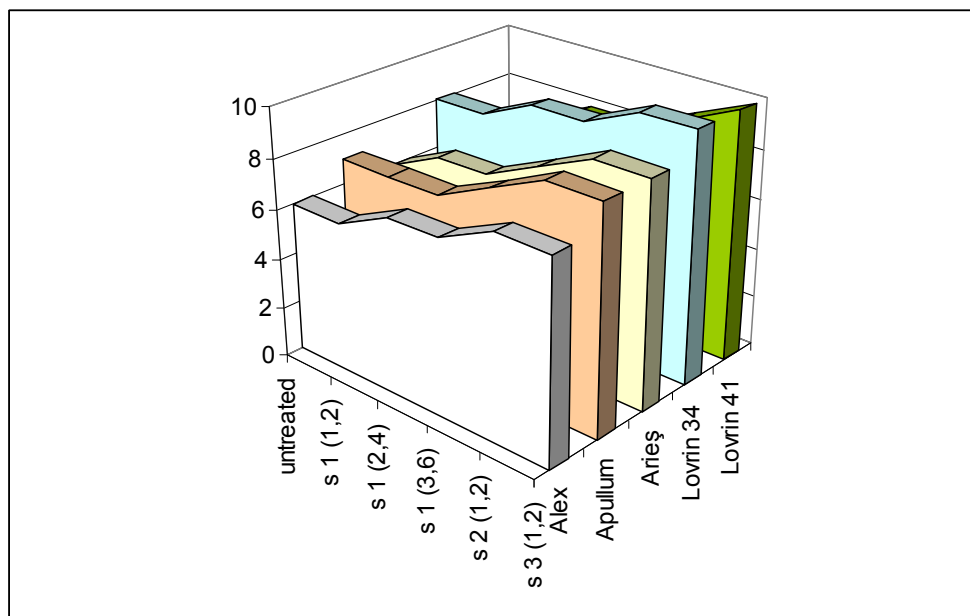


Fig. 4. The influence of cycocel on the gluten content regarding the dose and the application stage (s)

In our researches, the influence of cycocel on the wheat's resistance to hibernation and its tolerance to frost had been observed using doses of 1,2 and 2,4 kg per ha and the number of viable plants had registered an increase of 2 and 2,1% in comparison to the plants that were not treated with cycocel. These indicate a poor action of the retarder on the wheat's resistance to hibernation.

In what regards its resistance to drought, during springtime, when the plants are at the stuffing stage, they were given drought conditions for 45 days. The resistance to drought had been appreciated depending on the number of viable plants compared to those not treated with cycocel.

4. CONCLUSIONS

The results that we obtained after this research, allow us state that:

- The most evident action of the cycocel is that of the effect it has on the shortening of the straw's length by modifications of the anatomical structure.
- The action done by cycocel influences only in a little degree the technological quality of the wheat.
- The shortening of the straw's length influences indirectly the resistance capacity to drought by modifying the transpiration coefficient.

5. REFERENCES

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