

## THE INFLUENCE OF FERTILIZATION WITH CHEMICAL FERTILIZERS ACCORDING TO THE APPLICATION PERIOD AND TO THE CROP ROTATION UPON PRODUCTION AT THE ALEX FALL TYPE OF WHEAT IN THE WEST PLAIN

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### Abstract

*The break up of the world energetical crisis and the increase of the price of the raw materials led to the production and use of certain types of chemical fertilizers less processed with a decreased energy consumption as in the case of the liquid fertilizers.*

*The use of liquid fertilizers to the wheat fertilization is determined by the technical and economical advantages that it offers.*

*The use of liquid fertilizers is favored by the mechanization and automation of the transport, storage and administration operations fact which eliminates almost entirely the losses and ensures uniformity when applying and controlling the recommended doses.*

*In order to emphasize the role of the liquid chemical fertilizers we have analyzed the interaction between the type of fertilizer and the epoch of application, the interaction between the type of fertilizer and the culture rotation.*

**Key words:** liquid fertilizers, foliary application, radicular/root application, culture rotation.

### INTRODUCTION

The wheat is a straw cereal that reacts favorably to the administration of chemical and organical fertilizers so the specific consumption of the nutritious elements is reduced. For 100 kg grains+affluent straws the consumption is of 2,3-3,3 kg of N, 1,1-1,8 kg of P<sub>2</sub>O<sub>5</sub> and 1,9-3,7 kg of K<sub>2</sub>O.

The wheat plants have got a maximum consumption of nutritious elements in a short period of time, from the elongation of the straw until ripening when almost 80% from the necessary nitrogen is absorbed, over 80% from the phosphorus necessary and over 85% from the potassium necessary.

In the context of a modern agriculture both the traditional one which must obtain high quantities of production on the unit surface and the ecological one, which at the moment represents a more selective and reduced segment from the production existent on the market, the production activity must be oriented towards developing the types of fertilizers and the strategies of application.

The current tendencies in the chemical fertilization field follow: the increase of the urea production to the disadvantage of nitrogen fertilizers, the differentiated use of the complex phosphorus fertilizers, the ensurance of an efficient fertilization through the increase of the capitalization coefficient of the nutritious elements, the prevention of the pollution in a tight relation to the agricultural fund and vegetation stages using as fertilizers:

- fertilizers with a slow release of the active components;
- extra radicular fertilizers;
- complex mineral and organic chemical fertilizers.

A basic tendency in the structure and production of chemical fertilizers outlined in the last 35 years constitutes the expansion and diversification of the types of liquid fertilizers regardless of the technologies used in agriculture (Sîrbu et al., 2012).

The liquid fertilizers application methods and their assimilation by the plants has led to a conventional separation in liquid fertilizers with radicular application: through soil embedding, through soil injecting, irrigation, spraying, watering through dripping and fertilizers with foliar or extra radicular application.

The use of the extra radicular and of the liquid fertilizers allows a controlled application according to the vegetation stage, to the agricultural fund and to the nutritional defficiencies, having as an aim the decreae of the fertilization costs and the increase of the economical efficiency.

## MATERIAL AND METHODS

The research related to the fertilization with liquid fertilizers at the Alex type of fall wheat have been performed in 2012 at the Bihor county agricultural farm from Les.

The experimental factors analyzed have been:

- A factor - type of fertilizer
  - a<sub>1</sub>-N<sub>100</sub>P<sub>80</sub> – complex solid fertilizers
  - a<sub>2</sub>.N<sub>100</sub>P<sub>80</sub>+Folicare19-11-24+Cu(5kg/ha) – complex solid fertilizers + foliary fertilizer
  - a<sub>3</sub>.N<sub>100</sub>P<sub>80</sub>+ A-300(30%N)-complex solid fertilizers + liquid nitrogen fertilizer
  - a<sub>4</sub>. Fertisol C-411(160g/l N; 40 g/l P<sub>2</sub>O<sub>5</sub>,40g/l K<sub>2</sub>O) – complex liquid fertilizer
- B factor - The application epoque
  - b<sub>1</sub>. autumn
  - b<sub>2</sub>-autumn + spring
- C factor - Culture rotation
  - c<sub>1</sub>— wheat monoculture

c<sub>2</sub>—wheat – corn

c<sub>1</sub>—wheat – corn – pea

The application of complex solid fertilizers was done in autumn before sowing and the liquid fertilizers were applied early in spring when the air temperature is lower than 10°C, with the MET types of installations.

The foliary fertilizers are applied especially in the moment of fraternization and strawing and due to the copper the plant is protected against diseases.

The liquid fertilizers are more accessible to the plants, the average degree of utilization of the liquid nitrogen is of 90-95% in comparison with 40-45% in the case of the solid fertilizers.

The culture technology for the Alex type of wheat has respected the requirements specific to the wheat, on a brown luvisol soil, the sowing being done in the optimum period, 10-20 th of October.

The weather conditions during the study period were different: 2010 and 2011 have been normal years from the point of view of the weather and rainfall and 2012 has been a droughty year with a low level of rainfall and with very high temperatures which have had a negative effect upon the wheat production.

## RESULTS AND DISCUSSION

The research related to the establishment of the efficiency of liquid chemical fertilizers have performed in two variants: according to the type of fertilizer and the application epoch; according to the culture rotation.

In the analysis of the interaction between the type of applied fertilizer (factor A) and the application epoch of the fertilizers (factor B) the variant a<sub>1</sub>- N<sub>100</sub>P<sub>80</sub> has been chosen as a witness and b<sub>1</sub>-autumn (Table 1).

The application of the foliary fertilizers contribute to the improvement of the usage coefficient of the nutritive elements and the complex and liquid nitrogen fertilizers together with the solid complex chemical fertilizers favor the uniform development of the wheat plants and as a consequence an increase in the production which reaches 1160kg/ha (30%) in the case of using liquid complex fertilizers (Fertisol C-411).

The application of foliary fertilizers (Folicare19-11-24+Cu) together with complex fertilizers (N<sub>100</sub>P<sub>80</sub>), determines a production increase of 430-860kg/ha and liquid fertilizers with liquid nitrogen (A-300) together with complex solid chemical fertilizers (N<sub>100</sub>P<sub>80</sub>) increase the production to 760-1050 kg/ha.

According to the application epoch there is a better capitalization of the fertilizers when they are applied in two stages – in autumn and in spring,

with production increases comprised between 860 and 1160kg/ha. When the fertilization dose has been applied only in one stage, in autumn, the production increases are lower (430 – 940kg/ha) the difference being due to the supplementary nitrogen contribution during the vegetation period of the wheat in spring.

*Table 1*

The influence of liquid chemical fertilization and of the application epoques upon the production of the Alex type of wheat in the conditions of the West Field.

Variants	Application epoques	Production obtained		Differences
		Kg/ha	%	
a <sub>1</sub> . N <sub>100</sub> P <sub>80</sub> (Mt)	b <sub>1</sub> .autumn	3800	-	-
a <sub>2</sub> . N <sub>100</sub> P <sub>80</sub> + Folicare	b <sub>1</sub> .autumn	4230	111.31	+430
	b <sub>2</sub> -autumn+spring	4660	122.63	+860
a <sub>3</sub> . N <sub>100</sub> P <sub>80</sub> + A-300	b <sub>1</sub> .autumn	4560	120.00	+760
	b <sub>2</sub> -autumn+spring	4850	127.63	+1050
a <sub>4</sub> . Fertisol C-411	b <sub>1</sub> .autumn	4740	124.73	+940
	b <sub>2</sub> -autumn+spring	4960	130.52	+1160

The use of chemical fertilizers is influenced by the culture rotation, the previously existent culture having an important role, culture which can consume or bring about a contribution of nutritious substances in the soil.

In order to emphasize the role of the ...plant in the economical efficiency of the Alex type of wheat we have analyzed the ordinary production when cultivating this type in monoculture, in a two year rotation: wheat-corn, in 3 year rotation: wheat-corn-pea over a period of 3 years from 2010-2012e and fertilization with N<sub>100</sub>P<sub>80</sub> (Table 2).

By cultivating the wheat in a monoculture and by fertilizing with solid chemical fertilizers we have obtained an average production of 3670kg/ha, then for the rotation culture of wheat-corn we got a production of 3850kg/ha and for the wheat-corn-pea rotation the average production has been of 4060kg/ha.

By applying the foliary fertilizers and the liquid fertilizers during the vegetation period we obtain significant production increases. By applying foliary fertilizers together with solid complex fertilizers the average production is of 3800 kg/ha in monoculture, of 3950 in a 2 year rotation and of 4220kg/ha in a 3 year rotation where there is also a leguminous plant.

The application of liquid chemical fertilizers bring a supplementary contribution of nutritious elements during the vegetation period which being combined with the nutritive elements existent in the soil from the previously plants have determined higher average productions, of 4050kg/ha through

fertilization with Fertisol C-411 in monoculture, of 4200 at the 2 year rotation and of 4590kg/ha at the 3 year rotation.

*Table 2*

The influence of liquid chemical fertilizers and of the culture rotation upon the production of the Alex type of wheat in the conditions of the West Field.

Variants	Culture rotation			
	Production obtained			Average production (2010-2012)
	2010	2011	2012	
C <sub>1</sub> .Monoculture-wheat				
a <sub>1</sub> . N <sub>100</sub> P <sub>80</sub> (Mt)	3650	3720	3640	3670
a <sub>2</sub> . N <sub>100</sub> P <sub>80</sub> +Folicare	3840	3800	3760	3800
a <sub>3</sub> . N <sub>100</sub> P <sub>80</sub> +A-300	3960	3950	3850	3920
a <sub>4</sub> . Fertisol C-411	4150	4060	3940	4050
Average production according to fertilization	3900	3882.5	3797.5	-
C <sub>2</sub> . Wheat-corn				
a <sub>1</sub> . N <sub>100</sub> P <sub>80</sub>	3850	3950	3750	3850
a <sub>2</sub> . N <sub>100</sub> P <sub>80</sub> +Folicare	3980	4050	3820	3950
a <sub>3</sub> . N <sub>100</sub> P <sub>80</sub> +A-300	4140	4260	3870	4090
a <sub>4</sub> . Fertisol C-411	4250	4370	3980	4200
Average production according to fertilization	4055	4157.5	3855	-
C <sub>3</sub> .Wheat-corn-pea				
a <sub>1</sub> . N <sub>100</sub> P <sub>80</sub>	4120	4250	3820	4060
a <sub>2</sub> . N <sub>100</sub> P <sub>80</sub> +Folicare	4310	4460	3890	4220
a <sub>3</sub> . N <sub>100</sub> P <sub>80</sub> +A-300	4560	4630	3920	4370
a <sub>4</sub> . Fertisol C-411	4850	4940	3980	4590
Average production according to fertilization	4460	4570	3902.5	-

In what the 3 years of study are concerned it can be noticed that the highest production has been realized in 2011 through fertilization with Fertisol C-411 and in a 3 year rotation reaching 4940 kg/ha and the lowest production has been obtained in 2012 through fertilization with N<sub>100</sub>P<sub>80</sub> and monoculture.

## CONCLUSIONS

The wheat is pretentious to fertilization due to the poorly developed radicular system, it explores a reduced volume of soil and it has a lower power of solubilization and absorption of nutritious elements from the soil. The highest consumption of nutritious elements takes place in a short period of time, from the elongation of the straw until the ripening, reason for which the wheat must have at its disposal the necessary quantities of nutritious substances under accessible forms.

The advantages of the liquid fertilizers are multiple: the unlimited capacity of mixture and combination between them; the possibility to realize the most favorable reports between the elements, capable to satisfy the necessary of nutritious elements of a certain culture, differentially during the whole period of vegetation.

By associating the liquid chemical fertilizers and the pesticides one can simultaneously realize more works from the culture technology through a single passing of the machines and devices on the field thus determining a decrease of the energy consumption.

The highest production has been realized by applying the liquid complex fertilizer Fertisol C- 411 which has brought a production increase of 1160 kg/ha (30.52%) in comparison with the solid complex fertilizers.

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