THE INFLUENCE OF FACTORS: CROP ROTATION PLANT, FERTILISATION LEVEL AND HERBICIDES ON PRODUCTION IN WINTER WHEAT CULTIVATED ON LUVOSOILS

Bandici Gheorghe*, Domuţa Cornel, Ardelean Ileana

* *University of Oradea, Faculty of Environmental Protection, 26 General Magheru St., 410048 Oradea,Romania, e-mail: gbandici@yahoo.com*

Abstract

The influence of plant cultivation technologies is exprssed in the yield obtained per ha. At present, this quantification is irrelevant due to the fact that products'prices oscillate dramatically as a consequence of the inflation which is a characterisic of the present period. This indicator is a more realistic with respect to the investments and benefits of a cultivated crop and makes possibible the application of adequate measures leading to production increase per surface unit.

Key words: crop rotation, monoculture, mixed fertilisation, fertilisation level, herbicides

INTRODUCTION

The forerunner plant is a decisive factor influencing growth and development of wheat. The role of forerunner plant on wheat growth and development is stressed out by: Zăhan, Zăhan,1989.

The choice of an appropriate forerunner plant-legumes, for instance maintains a normal C/N ratio of 40-70 (assimilative C versus assimilative N –Bacterial N fixation in soil and a normal C/N ratio are conditions that confer to the forerunner plant ameliorative properties (Popescu, 1980)

Forerunner plant together with other appropriate agricultural practices contribute to the favourableness of growth and development conditions of wheat root system, to an improved synthesis of specific organic compounds and their improved translocation to plant's organs (Lazany, 2000; 2003). Finally, all the enumerated conditions lead to improved efficiency per area unit. Plant growth is fundamental in obtaining yield and is related vegetation and technological factors, the level of yield being reflected in the intensity of production (Dincă, 1982; Bîlteanu,1993)

In the majority of cases, total growth of green mass is considered on the assumption that a maximum yield is obtained by increasing total production and by a favourable repartition of it among plant's organs (Bandici, 1997; 2001). However, as a known fact roots are not only absorbing water and nutrients from soil but play a key role in plant's general metabolism. Roots harbour the biosynthesis of some essential compounds for the rest of the plant to which they send the biosynthetic products (Zamfirescu, 1977). The importance of rationale fertilisation and of the forerunner plant on growths and development of plants is stated by many authors: Zăhan, Zăhan,1989.

MATERIAL AND METHODS

A multifactorial experiment (subdivised plots method) was set at S.C.D.A. Oradea, on a brown luvic soil, during a period of years, 2004-2006. The effect of the crop rotation and fertilisation level on the production in winter wheat, Delia cultivar, cultivated on brown luvic soils, under different climatic conditions was considered.

Experimental results'interpretatio was performed with ANOVA. Production was wpressed as q/ha at 14% humidity.

RESULTS AND DISCUSSION

Tables 1 and 2 reflect average yield results as function of the investigated factors (2004-2006). It is worth to mention that the influence of weeding on wheat yields represent the average of 2 yr. research, totally different with respect to climatic factors. The influence of investigated factors (crop rotation plant, agrofund, weeding) on wheat yield is presented in table 1. The analysis of crop rotation plant shows that, compared to wheat monoculture as blank alternative, with an average of yield of 29.2 q/ha, wheat cultivated after corn or pea reaches average increment of the yield about 6.1-16.7 q/ha, representing significant figures. It is remarkable that highest yield increments were obtained after pea (16.3-16.7 q/ha) and lowest after corn (6.1 q/ha)

Concerning the created fertilisation level, table 1 shows that mineral fertilization ($N_{120}P_{80}$) and mixed fertilization ($N_{120}P_{80}$+ 10t/ha manure) determined significant yield raises that oscillated between 17.8-20.8 q/ha as compared to unfertilized alternative of an average yield around 26.1 q/ha. Remarkably, highest yield increments were obtained under complex fertilization (20.8 q/ha) which surpassed mineral fertilization alternative with 3.0 q/ha.

Concerning weeding, the average of investigated interval (2004-2006), shows distinctively significant yield increments in alternatives treated with herbicides (Puma super + Icedin super 1 + 1 l/ha and Arelon super 2 l/ha) as compared to untreated alternatives (mt). Obtained yield was of 35.9 q/ha in case of untreated alternatives and yield increments in treated alternatives raised the yield with 2.3-2.5 q/ha.

The influence of factors interaction, crop rotation plant x fertilisation level on wheat yield is displayed in data from table 2. The averages obtained during the investigation period show that regardless to crop rotation plant, mineral or mixed fertilization very significant yield increments were obtained, between 14.2-27.9 q/ha. It is worth to remark that average yield increments were higher in the case of weaker crop rotation plants.

Table 1

The influence of crop rotation plant, fertilisation level and weeding on winter wheat yield, cultivated on luvosoils, Oradea 2004-2006

Investigated factor	Production		± Difference	Significance
	q/ha	%	q/ha	
a. Crop rotation plant				
Monoculture (Mt)	29.2	100	-	-
Wheat-corn (W-C)	35.3	120.9	+ 6.1	***
Pea-wheat-corn (P-W-C)	45.5	155.8	+ 16.3	***
Pea-wheat-corn - corn (P-W-C-C)	45.9	157.2	+ 16.7	***
DL 5% DL 1% DL 0.1 %			2.5 3.6 5.3	
b. Fertilisation level				
N_0P_0 (Mt)	26.1	100	-	-
$N_{120}P_{80}$	43.9	168.2	+ 17.8	***
$N_{100}P_{80}$+ 10 t/ha manure	46.9	179.7	+ 20.8	***
DL 5% DL 1% DL 0.1 %			1.8 2.5 3.3	
c. Weeding				
No herbicides (Mt)	35.9	100	-	-
Arelon super 2 l/ha	38.4	106.9	+ 2.5	**
Assert + Icedin super 2.5 + 1 l/ha	35.3	98.3	- 0.6	-
Puma super +Icedin super 1+1 l/ha	38.2	106.4	+ 2.3	**
DL 5% DL 1% DL 0.1 %			1.6 2.1 2.7	

In wheat cultivated after wheat or after corn increments oscillated between 18.2-27.9 q/ha as compared to unfertilized alternative (Mt). In wheat cultivated after pea increments were lower, between 14.2-20.1 q/ha. Regardless to crop rotation plant, yield maximal levels were obtained in mixed fertilization alternative.

Table 2

The interaction of factors: crop rotation plant x fertilisation level on winter wheat yield cultivated on luvosoils, Oradea 2004-2006

Fertilisation level	Production		±Difference	Significance
	q/ha	%	q/ha	
a. Monoculture – wheat (Mt)				
N_0P_0 (Mt)	17.0	100	-	-
$N_{120}P_{80}$	35.3	207.6	+ 18.3	xxx
$N_{100}P_{80}$ + 10 t/ha manure	35.2	207.0	+ 18.2	xxx
b. Crop rotation – 2 years (W - C)				
N_0P_0 (Mt)	18.9	100	-	-
$N_{120}P_{80}$	40.3	213.2	+ 21.4	xxx
$N_{100}P_{80}$ + 20 t/ha manure	46.8	247.6	+ 27.9	xxx
c. Crop rotation - 3 years (P - W - C)				
N_0P_0 (Mt)	35.1	100	-	-
$N_{120}P_{80}$	49.3	140.4	+ 14.2	xxx
$N_{100}P_{80}$+ 30 t/ha manure	52.0	148.1	+ 16.9	xxx
d. Crop rotation - 4 years (P - W - C - C)				
N_0P_0 (Mt)	33.5	100	-	-
$N_{120}P_{80}$	50.7	151.3	+ 17.2	xxx
$N_{100}P_{80}$+ 40 t/ha manure	53.6	160.0	+ 20.1	xxx
DL 5% DL 1% DL 0.1 %			3.6 4.9 6.6	

CONCLUSION

The crop rotation plant shows that, compared to wheat monoculture as blank alternative, with an average of yield of 29.2 q/ha, wheat cultivated after corn or pea reaches average increment of the yield about 6.1-16.7 q/ha, representing significant figures.

Concerning the created fertilisation level, table 1 shows that mineral fertilization and mixed fertilization determined significant yield raises that oscillated between 17.8-20.8 q/ha as compared to unfertilized alternative of an average yield around 26.1 q/ha.

Concerning weeding, the average of investigated interval (2004-2006), shows distinctively significant yield increments in alternatives treated with herbicides (Puma super + Icedin super 1 + 1 l/ha and Arelon super 2 l/ha) as compared to untreated alternatives (mt).

REFERENCES

1. Bandici, G., E., 1997, Contribuţii la stabilirea influenţei premergătoarei şi a fertilizării asupra dinamicii acumulării biomasei, la grâul de toamnă, cultivat pe soluri cu exces temporar de umiditate, în centrul Câmpiei de Vest a României. Doctoral thesis. University of Agriculture Sciences and Veterinary Medicine Cluj-Napoca, Romania [in Romanian], p.158.
2. Bandici, G.,,E., P., Guş, 2001, Dinamica acumulării de biomasă la grâul de toamnă. University of Oradea Press, p.107.
3. Bîlteanu, G., 1993, Fitotehnie, Ceres Printing House. Bucharest, p.457.
4. Dincă, D., 1982, Asolamentele agriculturii moderne. Ceres Printing House, Bucharest, p.257.
5. Lazany, J., 2000, Soil fertility management in Westik's crop rotation experiment. Role of fertilizers in Sustainable Agriculture. CIEC Conference. p.77-80, p.255.
6. Lazany, J., 2003, Differences in soil carbon content in the treatments of Westik's crop rotation experiment. Natural resources and sustainable development. International scientific session and reviewed papers. Oradea-Debrecen, p.119-120, p.288.
7. Popescu, Ana, 1980, Procesul de fixare biologică a N atmosferic şi factorii care îl condiţionează, Probleme de Agrofitehnie, teorie şi practică, nr.1, vol. II, p. 35-45, p.125.
8. Zamfirescu, N., 1977, Bazele biologice ale producţiei vegetale. Ceres Printing House, Bucharest, p.337.
9. Zăhan, P., R., Zăhan, 1989, Cercetări privind influenţa plantei premergătoare şi a fertilizării asupra dinamicii de acumulare a masei vegetale la grâul cultivat pe soluri podzolice cu exces temporar de umiditate din Câmpia de Vest a ţării (I). Probleme de agrofitotehnie teoretică şi aplicată nr. 1, vol. XI, p.97-102, p.300.
10. Zăhan, P., R., Zăhan, 1989, Cercetări privind acumularea biomasei vegetale radiculare şi calitatea recoltei obţinute, sub influenţa plantei premergătoare şi a fertilizării la grâul cultivat pe soluri podzolice cu exces temporar de umiditate din Câmpia de Vest a ţării (II). Probleme de agrofitotehnie teoretică şi aplicată, nr. 1, vol. XI, p.237-240, p.300.