THE EEFECT OF THE NITROGEN AND PHOSPHORUS FERTILISERS UPON SOME QUALITIES PROPERTIES AT WINTER WHEAT

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In a 5 years experience made on aluvisol soil at the Vacreni plain in Tulcea district it was followed the efect of the N and P fertilizers upon the production and the quality of the winter wheat at the Dropia variety. The N fertilizers had determined the increase of the weight of 1000 seeds from 41.78 g in the N_0 variant upon the 43.86 g in the N_{160} variant, the increase of the hectolitric weight from the 77.28 kg in the in the N_0 variant upon the 79.34 g in the N_{160} variant and the increase of the proteic contain from 10.66 % in the in the N_0 variant upon the 15,57 % in the N_{160} variant. The P fertilizers had the same growth effect of the quality properties, but much smaller. The interaction between n and P had determined the substantial growth af the quality of the wheat cariopsa. So, the bigger MMB and MH had been obtained at the interaction $N_{160}P_{120}$ where the values were 44.1g and 80.0 kg/hl and the bigger protein contain of 16.43 % has been obtained in $N_{160}P_{160}$ variant. Also it had been observed the positive correlations between the MH and the protein contain.

***Key words**: production ,fertilizer, proteic contain, hectolitric weight*

The researches from all over the world want to obtain high productions at the surface unit without neglecting the qualitative side of this (Badaux, S., 1983; Borcean, I. şi colab., 2000). The obtained production at wheat must ensure the quality and the alimentary safe of the people from any country an Globe. The caryopsis quality can be influenced by the cultivated variety, the used cultivation technology, especially the fertilization and the climatic and pedological conditions (Bădiceanu Lucia şi colab. 2005, Bolling, H., 1974, Borlan, Z., Hera, Gr., 1994). The results which were obtained until now are proving the efficiency of the chemical fertilizers upon the protein content of the wheat caryopsis and the improvement of the technological indices of the preparing of wheat (Borcean, I. şi colab., 2000, Borlan, Z., 1994, Hera, Gr., 1981). In the conditions of SCA Teleorman, the nitrogen fertilizers had a bigger efficiency than the phosphorous fertilizers at the N_{120} dose and his effect had been influenced by the climatic conditions of the year than by the combination with P_{80} (Maria Negrilă şi colab., 1995). The seed content in proteins and starch is genetically influenced. The

varieties with a very high starch contain had the weaker content in wet gluten and reverse, the correlations between the two components being negative.

MATERIAL AND METHOD

The researches were made at S.A. Şoimul SRL from the Vacareni Plain from Tulcea district, in Garvan place. On a aluvisoil with a PH 7.9 (in the 0-17 cm layer, 0,23% total nitrogen, 24, 6 ppm mobile phosphorus and 240 ppm mobile potassium and the report C:N of 11.7.

From the five years of experiences (2001-2006) in two experimental years the registered temperatures were – 4.4 ˚C (2001- 2002) and of - 5˚C (2002-2003), in three years the temperatures were positive in this month. In all the research years the precipitation were bigger than the annual average. In the year 2002-2003 in spring the temperatures were bigger and the precipitations were under the annual average, the year being considered less favorable.

The experience was bifactorial with the significance:

The A variant– the phosphorus fertilization with 5 degrees : a_1 - P_0 , a_2 -P_{40}, a_3 - P_{80}, a_4 - P_{120}, a_5 - P_{160} .

The B variant- nitrogen fertilization with 5 degrees: b_1- N_0, b_2- N_{40}, b_3- N_{80} ($_{40+40}$), b_4- N_{120} ($_{40+40+40}$), b_5- N_{160} ($_{40+80+40}$).

The phosphorus was applied under the basic plough and the nitrogen was applied at the preparing of the germinal bed at the beginning of the spring and in the bladder faze.

In this paper are presented the obtained results through the nitrogen and phosphorous fertilization and the interaction between the two elements, some watching qualities elements at the winter wheat on an average from the 5 experimental years.

RESULTS AND DISCUSSIONS

Because of the climatic differences between the five years where the experiences were made we must make an analysis of the medium results obtained at the different qualities indicatives, results which will reflect better the climatic conditions from the research area and those effects upon the quality in the direct way but also by the their effect upon in the capitalization of the fertilizers. This type of results have a more pronounced generality character and it helps in giving more credible conclusions.

The effect of the N and P fertilizers, of the interactions upon the qualities expressed in weight of 1000 seeds, HW and protein content

The N fertilizers generally have an advantageous action, but depends of the applied dose (*table 1*).

When it the field is not fertilized with N, the weight of 1000 seeds has values of 41.8g, the HW is -77.3 kg, good values, but the protein content of 10.66 % is almost unsatisfactory (< 10 %) the contain of protein being only 413.6 kg/ha protein. From this kind of reasons the capitalization of the wheat for pannification is greeting difficulties in the agriculture which is practiced on small areas without fertilizers.

With a small dose of N fertilizer (N_{40}) although the qualities indices are significant improving (weight of 1000 seeds, HW and the protein production) or

even distinct significant improving (% of proteins) after this indices the quality becomes better.

When is applied a dose of N_{80} or bigger doses the growth qualities are becoming very significant, the indices levels are growing in the same time with the applied dose until the bigger one (N_{160}) at all the parameters, the wheat being classified as very good.

Table 1

The influence of the nitrogen doses, as average values for all phosphorus doses, on some quality features for autumn wheat caryopses. Average values for 2002-2006

The N dose (kg/ha a.s.)	Weight of 1000 seeds		HW		The protein content			The protein production		
	g	The difference from the v.c. (g) significance	kg/hl	The difference from the v.c. (kg/hl) significance	% from d.s.	% from v.c.	The difference from the v.c. (%) significance	kg/ha	% from the v.c.	The difference from the v.c. kg/ha significance
N_0–v.c.	41.78	Variant compared	77.28	Variant compared	10.66	100	Variant compared	413.6	100	Variant compared
N_{40}	42.62	0.84*	77.98	0.70*	12.34	115.5	1.68**	629.9	150.4	208.3*
N_{80}	43.28	1.50***	78.64	1.36**	13.65	128.0	2.99***	780.0	188.6	366.4***
N_{120}	43.86	2.08***	79.16	1.88***	14.87	139.5	4.21***	892.7	215.8	479.1***
N_{160}	43.76	1.98***	79.34	2.06***	15.57	146.1	4.91***	946.4	228.8	532.8***
DL 5 %		0.73 g		0.61 kg/hl			0.72 %			166.9
DL 1 %		1.12 g		0.94 kg/hl			1.10 %			257.0
DL 0.1 %		1. 70 g		1.43 kg/hl			1.67 %			330.6

The qualities differences between the doses of N_{120} and N_{160} are generally reduced, a some bigger even significant regarding only the protein content, so only the production and the N fertilizers costs (the economically dose efficiency) can decide the optimum dose – economically, the quality class so the capitalization price being the same.

The phosphorus fertilizers had an weaker effect upon the quality than those with N differenced from one quality parameter to another, differenced from one dose to another (*table 2*).

So the phosphor had influenced more and significantly upon the density, the size and the stuffed of the caryopsis which were expressed in weight of 1000 seeds but specially in HW which without phosphor is classified at the good qualificative and with an dose of phosphorus fertilizers applied, even with an P_{40} dose this can be classified at very good qualificative.

Without phosphorus (but on an medium fund of N_{90}) the protein percentage go further at the "very good class" maintaining at very closed values of (13.3 – 13.7 %) no matter of the phosphorus dose applied. Only at the P_{160} dose of phosphorus we can obtain an increase which overdraw the error (0.07 percentage points–5.3% than P_0). Comparing with the low effect upon the caryopsis production, the protein production hadn't grew too much or significant with the growth of the phosphorus dose so at a dose of P_{160} a significant spore it had been obtained of 107 kg/ha (19% from the P_0).

Table 2

The influence of the phosphorus doses, as average values for all nitrogen doses, on some quality features for autumn wheat caryopses. Average values for 2002-2006

The P dose (kg/ha a.s.)	Weight of 1000 seeds		HW		The protein content			The protein production		
	g	The difference from the v.c. (g) significance	kg/hl	The difference from the v.c. (kg/hl) significance	% from d.s.	% from v.c.	The difference from the v.c. (%) significance	kg/ha	% from the v.c.	The difference from the v.c. kg/ha significance
P_0–v.c.	42.80	Variant comparated	77.8	Variant comparated	13.8	100	Variant comparated	667.6	100.0	Variant comparated
P_{40}	42.96	0.16	78.42	0.62*	13.30	101.7	0.22	711.6	106.6	44.0
P_{80}	42.88	0.08	78.74	0.94**	13.41	102.5	0.33	745.5	111.6	77.9
P_{120}	43.24	0.44*	78.92	1.12**	13.55	103.6	0.47	754.9	113.1	87.3
P_{160}	43.30	0.50*	78.52	1.72*	13.74	105.3	0.67*	774.4	116.1	106.8*
DL 5 %		0.42 g		0.59 kg/hl			0.51 %			103.2
DL 1 %		0.64 g		0.91 kg/hl			0.77 %			158.9
DL 0.1 %		0.98 g		1.38 kg/hl			1.17 %			241.6

The interaction between the N dose and the phosphorus doses, in an average on those five years (*table 3*) had determined some favorable effects upon the quality which at the best doses combinations had succeeded those of the maximum important unilateral effects regarding the contain and the protein production.

For example showing that the maximum percentage of the protein content and the maximum spore was recorded at N_{160} (46.1 %) dose and P_{160} (5.3 %) dose, their sum is represent a spore of 51% , but at the same interaction the spore was of 57.7 %, with 6.6 points more than the sum what means that the effect of the interaction and the N and P energy applied simultaneous in this dose proves that for maximum quality it is necessary that the N and P to be applied together in big doses.

Regarding the protein production and the maximum spore obtained through the mentioned interaction the difference is bigger than 30 percentage points: (N_{160} + P_{160} = 44 %, from de N_{160} x P_{160} = 74 % ; difference – 30 % percentage points).

If the effect of the interaction $N_{160}P_{160}$ upon the protein content was of 6 percentage point, the rest of 24 percentage points are returning to the effect of associations NP upon the caryopsis productions of which it depends, four time more the protein production comparing with the content in those substances.

At the interaction N x P, weight of 1000 seeds had grew generally in the same time with the grew of N and P from 41.4 g (N_0P_0) until 44.1 g (at N_{160} x $P_{120-160}$ or $N_{120}P_{160}$) so with maximum 2.7 g more important being the N contribution at all the combinations, but the P dose being differenced depending of the N dose: so it decreased from N_0 la N_{80}, than had grew on the fund of the N_{120} dose with maximum 0.6 g at P_{160} than again decreased at N_{160} and at $N_{160}P_{40}$. On the fund of each dose of N, the phosphorus contribution in the growth of weight of 1000 seeds was insignificant, only at N_0 being significant of 0.7g.

Table 3

The influence of the nitrogen and phosphorus doses' interaction on some quality features for wheat caryopses. Average values for 2002-2006

Doses (kg/ha a.s.)		Weight of 1000 seeds		HW		Protein content			Protein production		
N	P	g	The difference from the v.c.(g) significance	kg/hl	The difference from the v.c. (kg/hl) significance	% from d.s.	% from v.c.	The difference from the v.c.(%) significance	kg/ha	% from de v.c.	The difference from the v.c. kg/ha significance
N_0	P_0	41.4	-	76.7	-	10.42	100.0	Mt.	368.3	100.0	Mt.
	P_{40}	41.7	0.4	77.4	0.7	10.64	102.1	0.22	401.1	108.9	32.8
	P_{80}	41.8	0.4	77.5	0.8	10.58	101.5	0.16	420.0	114.0	51.7
	P_{120}	41.9	0.5	77.6	0.9*	10.70	102.7	0.38	415.8	112.9	47.5
	P_{160}	42.1	0.7*	77.2	0.5	10.98	105.4	0.56	463.0	125.7	94.7
N_{40}	P_0	42.5	1.1**	77.5	0.8	11.90	114.2	1.48**	546.8	148.5	178.5*
	P_{40}	42.4	1.0*	78.1	1.4**	12.53	120.2	2.11***	623.0	169.1	254.7**
	P_{80}	42.6	1.2**	78.1	1.4**	12.89	123.7	2.47***	663.3	180.0	295.0**
	P_{120}	42.7	1.3**	78.3	1.6**	12.33	118.3	1.91***	640.2	173.8	271.9**
	P_{160}	42.9	1.5**	77.9	1.2**	12.06	115.7	1.64**	636.3	172.8	268.0**
N_{80}	P_0	43.0	1.6***	78.1	1.4**	13.00	124.8	2.58***	690.1	187.3	321.8**
	P_{40}	43.4	2.0***	78.7	2.0***	13.54	129.9	3.12***	764.0	207.4	395.7***
	P_{80}	43.2	1.8***	78.8	2.1***	13.46	129.2	3.04***	787.0	213.6	418.7***
	P_{120}	43.5	2.1***	79.0	2.3***	14.00	134.3	3.58***	819.4	222.5	451.1***
	P_{160}	43.3	1.9***	78.6	1.9**	14.26	136.8	3.84***	836.6	227.1	468.3***
N_{120}	P_0	43.5	2.1***	78.3	1.6**	14.62	140.3	4.20***	832.8	226.1	464.5***
	P_{40}	43.9	2.5***	79.1	2.4***	14.55	139.6	4.13***	854.5	232.0	486.2***
	P_{80}	43.8	2.4***	79. 4	2.7***	14.91	143.1	4.49***	917.1	249.0	548.8***
	P_{120}	44.0	2.6***	79.7	3.0***	15.18	145.7	4.76***	735.5	244.2	567.2***
	P_{160}	44.1	2.7***	79.3	2.6***	15.13	145.2	4.71***	923.6	250.6	555.3***
N_{160}	P_0	43.6	2.2***	78.4	1.7*	15.45	148.3	5.03***	900.1	244.6	531.8***
	P_{40}	43.4	2.0***	78.8	2.1***	15.25	146.3	4.83***	915.6	248.6	547.3***
	P_{80}	43.6	2.2***	79.9	3.2***	15.21	146.0	4.79***	940.3	255.4	572.0***
	P_{120}	44.1	2.7***	80.0	3.3***	15.52	148.9	5.10***	963.8	261.7	595.5***
	P_{160}	44.1	2.7***	79.6	2.9***	16.43	157.7	6.01***	1012.5	274.9	644.2***
DL 5 %			0.68g		0.83 kg/hl			0.71 %			169.5 kg/ha
DL 1 %			1.05 g		1.28 kg/hl			1.09 %			261.0 kg/ha
DL 0.1 %			1.59 g		1.94 kg/hl			1.66 %			396.8 kg/ha

The HW value had grown up more then the weight of 1000 seeds value under the influence of the interaction of N x P, from de la 76.7 kg/ha (N_0P_0) until 80 kg/hl ($N_{160}P_{120}$) with a very significant difference of 3.3 kg/hl. The effects almost equals had been obtained with the interactions: $N_{160}P_{80}$, $N_{120}P_{120}$, $N_{160}P_{160}$, $N_{120}P_{80}$.

On a fund without N, only the P_{120} dose had determined a significant growth of MH, but the values had remained under 78 kg/hl, meaning good as well as at the $N_{40}P_0$; $N_{40}P_{160}$ doses. On a fund of N_{40} the doses of $P_{40} \rightarrow P_{120}$ had determined the same effect with a growth of HW at very good qualification at P_{160}.

At N_{80} doses the interaction with all the phosphorus doses had determined the growth of the HW values over 78 kg/hl (very good) the bigger one being at $N_{80}P_{120}$. At values under 79 kg/hl, the HW was classified also at the big N doses (N_{120} and N_{160}), when the phosphor was not applied or at the $N_{160}P_{40}$, but when the P doses were bigger, the phosphorus effect was amplified.

The positive effect of the many interactions of doses N x P upon HW, is as important as, at all the interactions in the five years has been found a positive and very significant correlation between HW and the protein content of the grain (fig.1), mentioned by other researchers too, but denied by the others which are telling that differences had been showed at a unfertilized or in what fertilized conditions.

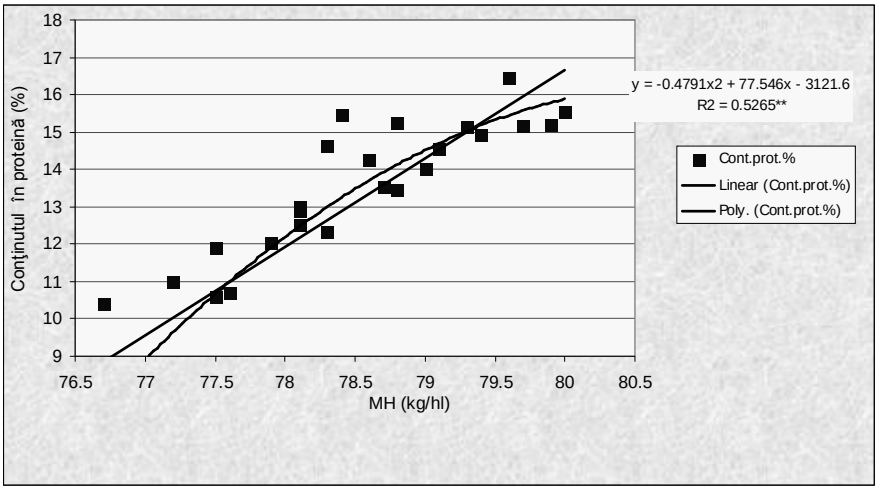

Figura1 **Correlations between the hectoliter mass (kg/hl) and the protein content (%) for nitrogen and phosphorus doses' interaction. Average values for 2002-2006**

The fact that in the conditions where we worked it was found such correlation, this becomes important in the practice of graduate the wheat on quality, because the HW can be determined easy, while the protein content is more difficult to determine, takes time and costs money and this is making hard the graduation process of the grain, making it late or without a essential parameter. With the mentioned equation the protein percentage can be calculated programming an the PC the mathematic model.

The protein percentage had suffered the most intense positive interactions of the N doses with P doses especially at the doses of 80 kg/ha and bigger than this dose where the phosphorus dose had increase constant with the phosphorus dose until P_{120}, becoming maximum at $N_{160}P_{160}$ of 16.43 % than only 10.42 % at N_0P_0. Only at this N dose (N_{160}), the maximum dose of P was efficiently the those of P_{120}, at the N doses of N_{120} – N_{80} the two extremely phosphorus doses having an equal contribution and at N_{40} the P_{160} dose had an negative effect, the best combination being the combination $N_{40}P_{80}$.

Without nitrogen the protein content was between 10.42 and 10.98%, the raise of the phosphorus dose having an insignificant spore but with all the annual fluctuations, the values were satisfactory like $N_{40}P_0$ where the spore was 1.48 percentage points, distinct significant.

In the case of N_{40} dose, all the P doses increased the protein level from good, but the bigger content had been obtained with $N_{40}P_{80}$.

Starting with the dose of N_{80} even without phosphorus, the protein content became very good (over 13%) and increased with over 1 percentage point at the doses P_{120} and P_{160} than $N_{80}P_0$ getting over 14% so, the protein production got over 820 kg/ha increasing twice than N_0P_0.

At N_{120} only the doses of P_{120} and P_{160} increased the protein level over 15% the combination of $N_{120}P_{120}$ being upper like the level of protein production.

At the dose of N_{160} together with the dose between 40-120 kg/ha hadn't the same effect than N_{120} dose, the combination of P_{120} or P_{160}, but the action with P_{160} was amplified. At this variant the percentage and the protein production where maximum with high values at the weight of 1000 seeds and HW and a high caryopsis production.

CONCLUSIONS

All the parameters of the wheat caryopsis qualities which were analyzed (weight of 1000 seeds, HW the protein content, the protein production) had suffered important changes under the influence of the climatic conditions of the year an the N and P fertilized applied in combination or single.

The weight of 1000 seeds have the biggest values in unfertilized conditions in the 5 years with annual fluctuation, but was strong influenced by fertilizers, especially the N one, less by the P dose and the biggest by the interaction of the N and P doses.

The most favorable effect upon the MH had the nitrogen, especially the N_{120} and N_{160} dose. The interaction between N and P had the strongest positive effect especially the doses $N_{120}P_{80}$ şi $N_{120}P_{120}$.

The protein content of the wheat caryopsis varied in big limits at the interaction of the climatic years with the N ad P and their combinations, from unsatisfying values of 19.2% or closer in very wet year and without fertilization, until 18.68% in a droughty year in some spring month at the biggest fertilizes doses ($N_{160}P_{160}$).

We conclude that at production which go upper 6200 kg/ha the protein percent rare get over 15.5 (only 2 points are at this level) very unsure and rare because in a combination case getting ovet 16% (in an average on the 5 years) different under the climatic conditions.

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