

THE BEHAVIOUR OF SOME WHEAT VARIETIES EXPERIMENTED UNDER NORMAL AND STRESS CONDITIONS

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ABSTRACT

Under environmental conditions of the Agricultural Research Station, ^aimnic-Craiova, the Romanian wheat cultivars Flamura 85, ^aimnic 30, Aliat and ^aimnic 9124 expressed a combination of two requirements: high yield under normal conditions and low drought sensitiveness index. Under stress conditions, the yield was significantly positively correlated to the yield obtained under normal conditions and with the sensitiveness index, and negatively correlated to the period from seeding to spike appearance, to the weight of 1000 seeds and to the height under stress conditions.

Key words: breeding, drought, sensitiveness, stress, wheat

INTRODUCTION

The yielding ability is a complex character. Its expression is diminished by the environmental conditions which are different from one year to another.

Among the adaptive characteristics showing an antagonism to yielding ability, there are the resistance to excessive temperatures, drought, lack or excess of rainfall, or simply said to temperature and rainfall stress.

The stress can be shown up in many ways, depending on the time it comes out, its duration and intensity (Săulescu, 1984). For the time being, the best indicator of the resistance to drought, used in wheat breeding, is the grain yield measured under good developmental conditions and under stress conditions (Ritchie et al., 1990).

The physiological indicators are very important for breeding this character, but as we have not been able to use it, we are strictly referring to the experimental field results.

MATERIALS AND METHODS

The experiment included three years trials (1995-1997), 1996 being considered with an evident stress on the wheat crop at ^aimnic. The data come from the national network trials and from the local competitive trial with lines created at ^aimnic.

The wheat cultivars consisted of 12 registered varieties, 12 lines created at Fundulea, 19 lines created at ^aimnic, 6 at Albota, 10 at Caracal and 5 at Lovrin. The trials were carried out in 5 and even 6 replications, so that the interpretation is much closer to the reality.

Besides the grain yield, plant height, weight of 1000 grains and number of days from seeding to spike emergence were determined.

The stress sensitiveness of each line or variety was calculated according to Fischer and Maures formula (Gavuzzi et al., 1993), previously calculating the stress intensity. Simple correlations and variance analysis were done.

RESULTS AND DISCUSSIONS

The presentation of thermal and rainfall regime is important in order to understand what exactly the stress consisted in figure 1.

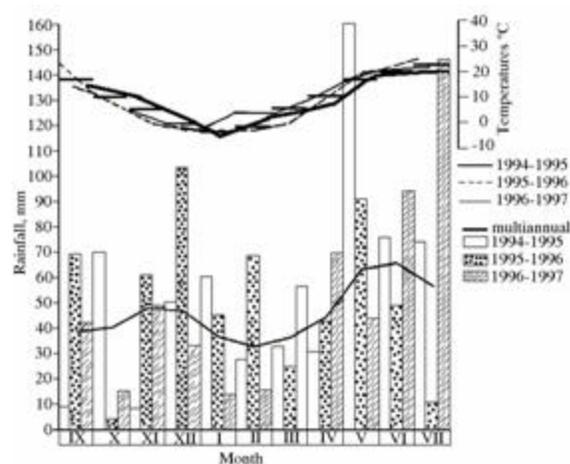


Figure 1. Thermal and rainfall regime at A.R.S. ^aimnic (September 1994 - July 1997)

The years 1995 and 1997 have been considered normal years for the wheat crop. Although the year 1995 started with low rainfall at seeding time, the high rainfall during May and June made the wheat yield to reach about 6-7 t/ha.

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The year 1996 was a particular one from climatic point of view. Since November 1995 till February 1996, wheat was covered by a snow layer (working in the field was possible on April 23-rd, 1996). Then there were the months March, April and June too, having rainfall below the normal. This low rainfall was accompanied by average temperatures higher than the normal ones and maximum temperatures of 38-39°C. In conclusion, the wheat crop was subjected in 1996 to a combined stress, on one hand the winter suffocation and on the other hand the summer drought.

Although 1997 seemed to be a very favourable year for the wheat crop, the rainfall of May, just during the spike appearance, made it only a normal one.

As regards the yields under stress conditions, the varieties F 29, Flamura 85, Alex and ^aimnic 30 yielded more than 3200 kg/ha. Under normal conditions (average of the years 1995 and 1977), Flamura 85 and ^aimnic 30 were very much alike, but Dropia and Delia above the average of 5600 kg/ha.

It is surprising that Dropia variety which had the highest average yield for the last five years, high average yield under normal conditions and high yield in 1993 – the driest year of the Station history (Păunescu et al., 1996), yielded less than the average under stress conditions of 1996. This could be explained by the fact that Dropia variety was largely affected by the winter stress, but less by the summer drought.

The values included in table 1 show the sensitiveness variability from 0.65 at Bezostaia variety to 1.20 at Dropia variety.

What does this index really mean? The less of its value is the difference between the yield under normal conditions and the yield under stress conditions, but it is important to have a high yield under normal conditions.

Under ^aimnic conditions, the varieties ^aimnic, Flamura 85 and ^aimnic 30 meet these two requirements.

Referring to Fundulea lines Aliat, Alcor, Bucur and F 135 U6-1 yielded more than the average of 3600 kg/ha under stress conditions. Under normal conditions, the same lines Aliat, AF 93-3, Admis yielded more than the average yield of 3600 kg/ha.

Table 1. The values Ys, Yn, S, D, H, WTS obtained with commercial wheat cultivars tested at A.R.S. ^aimnic

Cultivars	Ys (t/ha)	Yn (t/ha)	S	D (days)	H (cm)	WTS (g)
Fundulea 29	3.71	5.35	0.70	222	68	34
Flamura 85	3.52	6.04	0.95	219	67	44
Fundulea 4	3.25	5.12	0.83	223	68	38
Lovrin 34	3.05	5.43	0.99	220	69	44
Lovrin 41	3.02	5.75	1.08	221	65	38
Rapid	3.06	6.31	1.17	220	65	42
Dropia	3.00	6.33	1.20	220	69	42
Delia	3.19	5.96	1.00	221	67	36
Alex	3.42	5.64	0.85	220	68	42
^a imnic 30	3.36	6.07	1.01	218	68	46
Trivale	2.51	5.94	1.31	221	77	38
Bezostaia	3.24	4.55	0.65	223	72	41

$$S = 1 - (\bar{P}_s / \bar{P}_n) = 0.44$$

Simple correlations

	Yn	S	D	H	WTS
Ys	r= 0.971***	r= 0.997***	r= -0.996 ⁰⁰⁰	r= -0.997 ⁰⁰⁰	r= -0.954 ⁰⁰⁰

Legend: Ys – Yield under stress conditions
Yn – Yield under normal conditions
S – Stress sensitiveness index
D – Days from seeding to spiking
H – Plant height
WTS – weight of 1000 seeds

The same variability of the sensitiveness was noticed (Table 2). Just as we said before, it is not enough to have a low value of its index, as Aflux line shows: 3600 kg/ha under stress conditions, but only 4500 kg/ha during the two experimental years under normal conditions at the index value of 0.40.

Table 2. The values Ys, Yn, S, D, H, WTS obtained with Fundulea wheat cultivars tested at A.R.S. ^aimnic

Cultivars	Ys (t/ha)	Yn (t/ha)	S	D (days)	H (cm)	WTS (g)
AF 93-2	3.03	4.45	0.96	220	63	36
AF 93-3	3.45	6.36	1.40	221	61	44
AF 94-2	3.36	5.00	0.99	220	63	42
Admis	3.36	5.84	1.28	223	72	46
Aflux	3.62	4.38	0.40	220	64	42
Alcor	3.94	5.21	0.74	220	67	40
Aldea	3.57	5.04	0.88	220	65	40
Aliat	4.02	6.01	1.00	221	62	44
Bucur	3.99	5.29	0.75	218	68	46
F 135 U 6-1	4.11	5.15	0.61	220	62	40
F 135 U 10-1	3.14	4.56	0.95	220	68	46
F 7921 W 1-1	3.75	5.86	1.09	220	62	46

$$S = 1 - (\bar{P}_s / \bar{P}_n) = 0.33$$

Simple correlations

	Yn	S	D	H	WTS
Ys	r= 0.963***	r= 0.988***	r= -0.996 ⁰⁰⁰	r= -0.978 ⁰⁰⁰	r= -0.958 ⁰⁰⁰

Aliat line combines lower value index (1.00) and higher yields (6.01 t/ha) under normal conditions.

Most of the experimented lines have a high weight of 1000 seeds (40-46 g) under stress conditions.

For ^aimnic lines, ^aimnic 9124, ^aimnic 9221 and ^aimnic 9271 yielded more than the average of 3200 kg/ha under stress conditions. The lines ^aimnic 9124, ^aimnic 9271 and ^aimnic 9159 yielded about 7000 kg/ha. The sensitiveness variability (Table 3) is much lower for these lines (0.54-1.15).

Table 3. The values Ys, Yn, S, D, H, WTS obtained with ^aimnic wheat cultivars tested at A.R.S. ^aimnic

Cultivars	Ys (t/ha)	Yn (t/ha)	S	D (days)	H (cm)	WTS (g)
^a .9124	5.25	6.95	0.54	223	75	37
^a .9131	2.83	5.43	1.06	220	72	42
^a .9149	2.87	5.78	1.12	222	77	45
^a .9146	3.33	6.17	1.02	222	77	38
^a .9280	3.24	6.60	1.13	221	67	38
^a .9165	2.93	5.51	1.04	221	66	42
^a .9159	3.05	6.26	1.14	221	77	44
^a .9221	3.79	5.27	0.62	219	71	50
^a .9235	3.02	5.73	1.05	220	67	42
^a .9248	2.85	5.90	1.15	220	75	40
^a .9268	3.30	5.46	0.88	219	72	50
^a .9269	2.98	5.79	1.08	221	71	48
^a .9276	3.03	5.67	1.03	220	68	38
^a .9292	3.48	5.80	0.89	220	69	47
^a .92123	3.42	5.98	0.95	223	74	40
^a .92165	2.86	5.48	1.06	222	67	42
^a .9271	3.71	6.33	0.92	221	85	45
^a .9230	2.97	6.04	1.13	219	70	46
^a .9256	3.49	6.04	0.94	220	77	37

$$S = 1 - (\bar{P}_s / \bar{P}_n) = 0.45$$

Simple correlations

Ys	Yn	S	D	H	WTS
r=	r=	r=	r=	r=	r=
0.996***	0.985***	-0.989 ^{ooo}	-0.958 ^{ooo}	-0.958 ^{ooo}	-0.958 ^{ooo}

Among all the experimented wheat varieties and lines, the line ^aimnic 9124 yielding 5200 kg/ha under stress conditions and 7000 kg/ha under normal conditions, shows an obvious accordance between a very low index and a very high yield in normal years. The line

^aimnic 9124 yielded more than the average yield of all experimented lines over the whole experimental period. It should be also mentioned that the lines created at ^aimnic have taller height compared to the other experimented lines and varieties and the lines ^aimnic 9221 and ^aimnic 9268 have even the weight of 1000 seeds of 50 g under stress conditions.

As expected, the correlations between different characters are strong, as the tested material belongs to and advanced breeding programme.

There are strong correlations between the yield under stress and normal conditions on one hand and the sensitiveness index on the other hand.

Strong negative correlations were also remarked between the yield under stress conditions on one hand and the number of days from seeding to spike appearance, height, weight of 1000 seeds, under stress conditions on the other hand.

The stress influence upon the experimented characters is summarized in table 4.

As concerns the origin of the material as A factor having three graduations-varieties, Fundulea lines and ^aimnic lines – and the experimental conditions as B factor having two graduations – stress and normal, the following suggestions could be made:

- under stress conditions, only Fundulea lines have given significant yield increases compared to commercial varieties and ^aimnic lines yielded at the same level. Under normal conditions, no differences between the three categories of experimental material were noticed, but all of them had significant yield increases (more than 2 t/ha) compared to the yield under stress conditions.

Table 4. Stress influence on the investigated characters

Factor A	Factor B	Yield (t/ha)	Plant height (cm)	WTS (g)	Days from seeding to spiking
Commercial cultivars	Stress	3.17	68.5	40.4	221
	Normal	5.74***	83.8***	46.0***	226***
Perspective Fundulea cultivars	Stress	3.59**	69.5	43.4***	220
	Normal	5.70***	79.7***	43.6***	226***
Perspective ^a imnic cultivars	Stress	3.28	72.5	42.7**	221
	Normal	5.93***	84.6***	43.9***	220
LSD factor A	5% =	0.33	4.83	1.57	0.97
	1% =	0.48	7.99	2.60	1.42
	0.1% =	0.73	14.95	4.86	2.13
LSD factor B	5% =	0.31	4.25	1.38	0.92
	1% =	0.44	6.44	2.10	1.29
	0.1% =	0.62	10.35	3.37	1.82
LSD factor AxB	5% =	0.27	4.37	1.24	2.00
	1% =	0.39	6.61	1.88	2.81
	0.1% =	0.55	10.62	3.02	3.97

As regards the height, either under stress or not, there are no differences between varieties and lines, but the stress reduced the height very much. In normal years the height is 10-15 cm taller, the differences being very significant.

A special situation for the weight of 1000 seeds was observed. The varieties under normal conditions as well as the lines experimented under both conditions have had the weight of 1000 seeds higher than the varieties under stress, the differences being statistically assured.

Fundulea varieties and lines have the time

till tillering by 5-6 days longer than under stress conditions, statistically assured, which is normal, while ^aimnic wheat lines, generally known for their earliness, show no differences between the stress and normal conditions. Discussing about the yield obtained in the two averages depending on the origin of the experimented material (Table 5), one may say that under stress conditions Fundulea lines show a superiority statistically assured, as well as the lines from Caracal.

While, under 1997 conditions, Fundulea lines produced lower yields compared to the control, the Caracal lines had significant yield

Table 5. Wheat yield as a function of the source of the experimental material (1995-1997)

Sources	Yields											
	1995			1996			1997			average 3 years		
	average yield, t/ha	%	diff.	average yield, t/ha	%	diff.	average yield, t/ha	%	diff.	average yield, t/ha	%	diff.
Commercial cultivars (Check)	5.92	100	-	3.17	100	-	5.56	100	-	4.88	100	-
Perspective cultivars Fundulea	6.25	105	0.33	3.59	113	0.42*	5.16	93	-0.40 ^{oo}	5.00	102	0.12
Perspective cultivars ^a imnic	6.14	104	0.22	3.28	103	0.11	5.72	103	0.16	5.05	103	0.17
Perspective cultivars Albota	5.89	99	-0.03	3.27	103	0.10	5.69	102	0.13	4.95	101	-0.07
Perspective cultivars Caracal	4.47	75	-1.45 ^{ooo}	3.53	111	0.36*	5.90	106	0.34**	4.63	95	-0.25
Perspective cultivars Lovrin	6.22	104	0.30	3.07	97	-0.10	4.85	89	-0.71 ^{ooo}	4.71	97	-0.17
	LSD 5%	0.35		LSD 5%	0.35		LSD 5%	0.25		LSD 5%	0.32	
	1%	0.47		1%	0.47		1%	0.33		1%	0.42	
	0.1%	0.64		0.1%	0.65		0.1%	0.45		0.1%	0.58	

Table 6. "^aimnic" wheat perspective cultivars

Cultivars	1995			1996			1997				
	Yield q/ha	diff. and signif. compared to			Yield q/ha	diff. and signif. compared to			Yield q/ha	diff. and signif. compared to	
		check 1	check 2	check 3		check 1	check 2	check 3		check 1	check 2
Flamura (check 1)	66.58	-	4.52	12.56***	28.28	-	3.84	-6.70	47.30	-	-6.30
Dropia (check 2)	62.06	-4.52	-	8.04**	32.12	3.84	-	-2.86	-	-	-
^a imnic 30 (check 3)	54.02	-12.56 ^{ooo}	-8.04 ^{oo}	-	34.98	6.70**	2.86	-	53.60	6.30*	-
^a imnic 9124	69.06	2.48	7.00**	15.04***	52.30	24.02***	20.18***	17.32***	69.84	22.54***	16.24***
^a imnic 9146	67.44	0.86	5.38*	13.42***	33.26	4.98	1.14	-1.72	56.00	8.70***	2.40
^a imnic 9256	62.62	-3.96	0.56	8.60**	34.94	6.66*	2.82	-0.04	58.12	10.82***	4.52
^a imnic 9292	59.84	-6.74	-2.22	5.82*	34.84	6.56*	2.72	-0.14	56.38	9.08***	2.78
^a imnic 9271	72.00	5.42*	9.94***	17.98***	37.10	8.82***	4.98	2.12	52.66	5.36*	-0.94
^a imnic 9280	71.50	4.92	9.44***	17.48***	32.32	4.04	0.20	-2.66	60.50	13.20***	6.90**
^a imnic 9159	68.86	2.28	6.80**	14.84***	30.48	0.98	-1.64	-4.50	56.38	9.08***	2.78
^a imnic 9269	58.64	-7.94 ^{oo}	-3.42	4.62	29.84	1.56	-2.28	-5.14 ^o	57.12	9.82***	3.52
^a imnic 9230	59.14	-7.44 ^{oo}	-2.92	5.12*	29.74	1.46	-2.38	-5.24 ^o	61.80	14.50***	8.20**
^a imnic 9221	56.24	-10.34 ^{ooo}	-5.84 ^o	2.22	37.74	9.46***	5.62*	2.76	49.22	1.92	-4.38
	LSD 5%	5.03			LSD 5%	5.07			LSD 5%	4.85	
	1%	6.65			1%	6.70			1%	6.41	
	0.1%	8.60			0.1%	8.65			0.1%	8.28	

increases. The Caracal lines as well as Lovrin lines produced very significant negative yields in 1995, which might be explained by the change of their structure from one year to another.

aimnic lines, as well as Albota ones are at the level of the experimented wheat varieties, regardless the experimental conditions. On a three year average, none of the categories shows increases compared to varieties. As concerns the wheat lines created at aimnic, it is evident that under stress conditions, the lines aimnic 9124, 9292, 9256, 9271 and 9221 showed significant increases compared to Flamura 85.

In 1995, the number of lines having yielding performances was higher compared to the varieties Dropia and aimnic 30 and in 1997 compared to the variety Flamura 85. During the three years, compared to three and respectively two controls, the lines aimnic 9124, aimnic 9271 and aimnic 9280 produced yield increases statistically assured, as they are perspective lines for the Station area.

CONCLUSIONS

The experimental data provided by this study underline the large variability of the stress sensitiveness index (0.40-1.40).

Under aimnic conditions the varieties Flamura 85, aimnic 30, the line Aliat and the

line aimnic 9124 showed a combination of the two requirements – high yield under normal conditions and low sensitiveness index.

Under stress conditions, the yield is significantly positively correlated to yield under normal conditions (Table 6) and with the sensitiveness index and negatively correlated to the period from seeding to spike appearance, to the weight of 1000 seeds and to the height under stress conditions.

The wheat lines Fundulea and aimnic didn't show any modifications of the weight of 1000 seeds under stress conditions, the latter varieties didn't show either any modifications of the period from seeding to spike appearance. The yields of the lines experimented for three years, regardless their origin, reached the same level as the variety yields.

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Table 1. The values Y_s , Y_n , S , D , H , WTS obtained with commercial wheat cultivars tested at A.R.S. ^aimnic

Cultivars	Y_s t/ha	Y_n t/ha	S	D days)	H (cm)	WTS (g)
Fundulea 29	3.71	5.35	0.70	222	68	34
Flamura 85	3.52	6.04	0.95	219	67	44
Fundulea 4	3.25	5.12	0.83	223	68	38
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Lovrin 41	3.02	5.75	1.08	221	65	38
Rapid	3.06	6.31	1.17	220	65	42
Dropia	3.00	6.33	1.20	220	69	42
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^a imnic 30	3.36	6.07	1.01	218	68	46
Trivale	2.51	5.94	1.31	221	77	38
Bezostaia	3.24	4.55	0.65	223	72	41

$$S = 1 - (\bar{P}_s / \bar{P}_n) = 0.44$$

Simple correlations

	Y_n	S	D	H	WTS
Y_s	$r=0.971^{***}$	$r=0.997^{***}$	$r=-0.996^{000}$	$r=-0.997^{000}$	$r=-0.954^{000}$

Legend: Y_s – Yield under stress conditions

Y_n – Yield under normal conditions

S – Stress sensitiveness index

D – Days from seeding to spiking

H – Plant height

WTS – weight of 1000 seeds

Table 2. The values Y_s , Y_n , S , D , H , WTS obtained with Fundulea wheat cultivars tested at A.R.S. ^aimnic

Cultivars	Y_s t/ha	Y_n t/ha	S	D (days)	H (cm)	WTS (g)
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AF 93-3	3.45	6.36	1.40	221	61	44
AF 94-2	3.36	5.00	0.99	220	63	42
Admis	3.36	5.84	1.28	223	72	46
Aflux	3.62	4.38	0.40	220	64	42
Alcor	3.94	5.21	0.74	220	67	40
Aldea	3.57	5.04	0.88	220	65	40

Aliat	4.02	6.01	1.00	221	62	44
Bucur	3.99	5.29	0.75	218	68	46
F 135 U _{6.1}	4.11	5.15	0.61	220	62	40
F 135 U _{10.1}	3.14	4.56	0.95	220	68	46
F 7921 W _{1.1}	3.75	5.86	1.09	220	62	46

$$S = 1 - (\bar{P}_s / \bar{P}_n) = 0.33$$

Simple correlations

	Y _n	S	D	H	WTS
Y _s	r=	r=	r=	r=	r=
	0.963***	0.988***	-0.996 ^{ooo}	-0.978 ^{ooo}	-0.958 ^{ooo}

Table 3. The values Y_s, Y_n, S, D, H, WTS obtained with ^aimnic wheat cultivars tested at A.R.S. ^aimnic

Cultivars	Y _s t/ha	Y _n t/ha	S	D (days)	H (cm)	WTS (g)
^a .9124	5.25	6.95	0.54	223	75	37
^a .9131	2.83	5.43	1.06	220	72	42
^a .9149	2.87	5.78	1.12	222	77	45
^a .9146	3.33	6.17	1.02	222	77	38
^a .9280	3.24	6.60	1.13	221	67	38
^a .9165	2.93	5.51	1.04	221	66	42
^a .9159	3.05	6.26	1.14	221	77	44
^a .9221	3.79	5.27	0.62	219	71	50
^a .9235	3.02	5.73	1.05	220	67	42
^a .9248	2.85	5.90	1.15	220	75	40
^a .9268	3.30	5.46	0.88	219	72	50
^a .9269	2.98	5.79	1.08	221	71	48
^a .9276	3.03	5.67	1.03	220	68	38
^a .9292	3.48	5.80	0.89	220	69	47
^a .92123	3.42	5.98	0.95	223	74	40
^a .92165	2.86	5.48	1.06	222	67	42
^a .9271	3.71	6.33	0.92	221	85	45

a. 9230	2.97	6.04	1.13	219	70	46
a. 9256	3.49	6.04	0.94	220	77	37

$$S = 1 - (\bar{P}_s / \bar{P}_n) = 0.45$$

Simple correlations

	Yn	S	D	H	WTS
Ys	r=	r=	r=	r=	r=
	0.996***	0.985***	-0.989 ⁰⁰⁰	-0.958 ⁰⁰⁰	-0.958 ⁰⁰⁰

Table 4. Stress influence on the investigated characters

Factor A	Factor B	Yield (t/ha)	Plant height (cm)	WTS (g)	Days from seeding to spiking
Comercial cultivars	Stress	3.17	68.5	40.4	221
	Normal	5.74***	83.8***	46.0***	226***
Perspective Fundulea cultivars Perspective ^a imnic cultivars	Stress	3.59**	69.5	43.4***	220
	Normal	5.70***	79.7***	43.6***	226***
	Stress	3.28	72.5	42.7**	221
	Normal	5.93***	84.6***	43.9***	220
LSD factor A 5% =		0.33	4.83	1.57	0.97
1% =		0.48	7.99	2.60	1.42
0.1% =		0.73	14.95	4.86	2.13
LSD factor B 5% =		0.31	4.25	1.38	0.92
1% =		0.44	6.44	2.10	1.29
0.1% =		0.62	10.35	3.37	1.82
LSD factor AxB 5% =		0.27	4.37	1.24	2.00
1% =		0.39	6.61	1.88	2.81
0.1% =		0.55	10.62	3.02	3.97

Table 5. Wheat yield as a function of the source of the experimental material (1995-1997)

Sources	Yields 1995			1996			1997			average 3 years		
	average yield t/ha	%	diff.	average yield t/ha	%	diff.	average yield t/ha	%	diff.	average yield t/ha	%	diff.
Comercial cultivars (Check)	5.92	100	-	3.17	100	-	5.56	100	-	4.88	100	-
Perspective cultivars Fundulea	6.25	105	0.33	3.59	113	0.42*	5.16	93	-0.40 ^{ab}	5.00	102	0.12
Perspective cultivars ^a imnic	6.14	104	0.22	3.28	103	0.11	5.72	103	0.16	5.05	103	0.17
Perspective cultivars Albota	5.89	99	-0.03	3.27	103	0.10	5.69	102	0.13	4.95	101	-0.07
Perspective cultivars Caracal	4.47	75	-1.45 ^{ooo}	3.53	111	0.36*	5.90	106	0.34**	4.63	95	-0.25
Perspective cultivars Lovrin	6.22	104	0.30	3.07	97	-0.10	4.85	89	-0.71 ^{ooo}	4.71	97	-0.17
	LSD 5%	0.35		LSD 5%	0.35		LSD 5%	0.25		LSD 5%	0.32	
	1%	0.47		1%	0.47		1%	0.33		1%	0.42	
	0.1%	0.64		0.1%	0.65		0.1%	0.45		0.1%	0.58	

Table 6. "^aimnic" wheat perspective cultivars

Cultivars	1995				1996				1997			
	Yield q/ha	diff. and signif. compared to			Yield q/ha	diff. and signif. compared to			Yield q/ha	diff. and signif. compared to		
		check 1	check 2	check 3		check 1	check 2	check 3		check 1	check 2	
Flamura (check 1)	66.58	-	4.52	12.56***	28.28	-	3.84	-6.70	47.30	-	-6.30	
Dropia (check 2)	62.06	-4.52	-	8.04**	32.12	3.84	-	-2.86	-	-	-	
^a imnic 30 (check 3)	54.02	-12.56 ^{ooo}	-8.04 ^{oo}	-	34.98	6.70**	2.86	-	53.60	6.30*	-	
^a imnic 9124	69.06	2.48	7.00**	15.04***	52.30	24.02***	20.18***	17.32***	69.84	22.54***	16.24***	
^a imnic 9146	67.44	0.86	5.38*	13.42***	33.26	4.98	1.14	-1.72	56.00	8.70***	2.40	
^a imnic 9256	62.62	-3.96	0.56	8.60**	34.94	6.66*	2.82	-0.04	58.12	10.82***	4.52	
^a imnic 9292	59.84	-6.74	-2.22	5.82*	34.84	6.56*	2.72	-0.14	56.38	9.08***	2.78	
^a imnic 9271	72.00	5.42*	9.94***	17.98***	37.10	8.82***	4.98	2.12	52.66	5.36*	-0.94	

ROMANIAN AGRICULTURAL RESEARCH

^a imnic 9280	71.50	4.92	9.44***	17.48***	32.32	4.04	0.20	-2.66	60.50	13.20***	6.90**
^a imnic 9159	68.86	2.28	6.80**	14.84***	30.48	0.98	-1.64	-4.50	56.38	9.08***	2.78
^a imnic 9269	58.64	-7.94 ^o	-3.42	4.62	29.84	1.56	-2.28	-5.14 ^o	57.12	9.82***	3.52
^a imnic 9230	59.14	-7.44 ^o	-2.92	5.12*	29.74	1.46	-2.38	-5.24 ^o	61.80	14.50***	8.20**
^a imnic 9221	56.24	-10.34 ^{ooo}	-5.84 ^o	2.22	37.74	9.46***	5.62*	2.76	49.22	1.92	-4.38
		LSD 5%	5.03			LSD 5%	5.07			LSD 5%	4.85
		1%	6.65			1%	6.70			1%	6.41
		0.1%	8.60			0.1%	8.65			0.1%	8.28