RESEARCH REGARDING THE BEHAVIOUR OF SOME MAIZE HYBRIDS UNDER DIFFERENT CONDITIONS OF TECHNOLOGY AND WATER SUPPLYING IN THE SOUTH OF ROMANIA

CERCETĂRI PRIVIND COMPORTAREA UNOR HIBRIZI DE PORUMB ÎN CONDIȚII DIFERITE DE TEHNOLOGIE ŞI ASIGURARE CU APĂ ÎN ZONA DE SUD A ȚĂRII

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Abstract: *The researches were performed at NARDI Fundulea during 2004-2006, as a poly-factorial experiment. At A factors (crop technology) two graduations were tested, at B factor (irrigation regime) six graduations were tested and at C factor (genotype) three graduations were tested. The agricultural year 2004-2005 was excessively rainy, the annual rainfall sum being of 1138.7 while 2005-2006 was droughty, the annual rainfall sum being of 494.5 mm vs. multi-annual average of 584.4 mm. From the temperatures viewpoint, the agricultural year 2004-2005 was normal, the annual average of 10.8 degree C being very close of multi-annual average, 10.6 C and year 2005-2006 was almost normal, annual average exceeding multi-annual one with only 1.2 C. The paper presents the average of the two years of research. The crop technology brings a gain of 20.4 q/ha in variant N180P60, 70,000 pl/ha vs. variant N100P60, 40,000 pl/ha, the gain being statistically ensured as very significant. Among irrigation variants, the highest gain, 14.25 q/ha, was achieved by irrigation variant of 50% active moisture interval on 80 cm depth, with half of norm by sprinkling, vs. non-irrigated variant, the gain being statistically ensured as very significant. Close values of the maximum yield gain were registered by the irrigation variant 50% active moisture interval, on 80 cm depth, whole irrigation norm by overhead irrigation. In this case, the gain was 13.89 q/ha, statistically ensured as very significant. Among tested genotypes, the highest yield gain was given by hybrid Campion, 10.98 q/ha, statistically ensured as very significant.*

Rezumat: *Cercetările efectuate s-au realizat la I.N.C.D.A. Fundulea în perioada 2004-2006, în cadrul unei experienţe polifactoriale . La factorul A (tehnologia de cultură) s-au urmărit 2 graduări , la factorul B (regim de irigare) 6 graduări , iar la factorul C (genotip cultivat) trei graduări . Anul agricol 2004-2005 a fost excesiv de ploios , suma precipitaţiilor anuale fiind de 1138,7 , iar anul 2005-2006 a fost secetos , suma precipitaţiilor anuale fiind 494,5 mm , faţă de media multianuală de 584,4 mm . Din punct de vedere al temperaturilor anul agricol 2004-2005 a fost unul normal , media anuală 10.8 ºC fiind foarte apropiată de media multianuală a temperaturilor şi anume 10,6 ºC, iar anul 2005-2006 unul apropape normal , media anuală depăşind-o pe cea multianuală cu doar 1,2 ºC . Astfel lucrarea prezintă media rezultatelor celor doi ani de cercetare .Tehnologia de cultură a adus un spor de 20,4 q/ha în varianta $N_{180}P_{60}$ 70.000 pl/ha faţă de varianta N_{100} P_{60} 40.000 pl./ha , sporul fiind asigurat statistic (foarte semnificativ) . Dintre variantele de irigare cel mai mare spor 14.25 q/ha l-a adus varianta de irigare 50% IUA pe adâncimea de 80 cm cu jumătate din normă prin picurare , faţă de varianta neirigată , sporul fiind asigurat foarte semnificativ. Valori apropiate ale sporului maxim de producţie s-au înregistrat şi la varianta de irigare 50% IUA pe adâncimea de 80 cm cu normă întreagă prin aspersiune , şi anume 13,89 q/ha. , spor asigurat statistic foarte semnificativ .Dintre genotipurile experimentate , cel mai mare spor de producţie s-a obţinut la hibridul Campion , şi anume 10,98 q/ha , sporul fiind asigurat satistic foarte semnificativ .*

Key words*: limited water supplying, watering rate, genotype, irrigation norm*
Cuvinte cheie*: subasigurare cu apă, normă de udare, genotip cultivat, normă de irigaţie*

INTRODUCTION

The performed experiments had as aim the optimization of crop technology, water supplying and establishment of the most suitable genotype to achieve maximum maize yields in the South of Romania under conditions of economical efficiency and environment protection

MATERIAL AND METHOD

The researches were performed during 2005 - 2006, at NARDI Fundulea, as part of a poly-factorial experiment 2x6x3 type, after subdivided plot method, with the following factors:

A=Crop technology with the graduations:

A_1 – $N_{100}P_{60}$, 40,000 pl/ha

A_2 – $N_{180}P_{60}$, 70,0000 pl/ha

B=Irrigation regime, with the graduations:

B_1 – dryland (non-irrigated)

B_2 – irrigated 50% A.M.I, on 0-80 cm depth, with m=1; overhead irrigation

B_3 – irrigated 50% A.M.I, on 0-80 cm depth, with m=1/2; overhead irrigation

B_4 – irrigated 50% A.M.I., on 0-80 cm depth, with m=1/3; overhead irrigation

B_5 – irrigated 50% A.M.I, on 0-80 cm depth, with m=1/2; sprinkling

B_6 – irrigated 50% A.M.I, on 0-80 cm depth, with m=1/3; sprinkling

C = Genotype, with the graduations:

C_1 – F475 M

C_2 – Paltin

C_3 – Campion

These three hybrids were released and registered by NARDI Fundulea, being recommended for cultivation under both irrigation and dryland due to their good and constant yielding ability.

The data were statistically processed by ANOVA and compared by LSD.

RESULTATS AND DISCUSION

The obtained results are presented in the following tables and figures as two years average.

The influence of crop technology on maize yield during 2005 -2006 is presented in table 1 and figure 1. One can ascertain that the second variant of technology, respectively $N_{180}P_{60}$ - 70,000 pl/ha achieved a gain statistically ensured as very significant.

Table 1

Influence of crop technology on maize yield during 2005 - 2006

A Factor	yield		Vs a_1- $N_{100}P_{60}$ 40.000 pl/ha	
	q/ha	rel. %	Diff .q/ha	significance
a_1 - $N_{100}P_{60}$ 40.000 pl/ha	101.02	100	check	
a_2 - $N_{180}P_{60}$ 70.000 pl/ha	121.42	120.19	20.4	***

LSD 5%=4.79 q/ha LSD 1%=9.12 q/ha LSD 0.1%=20.21 q/ha

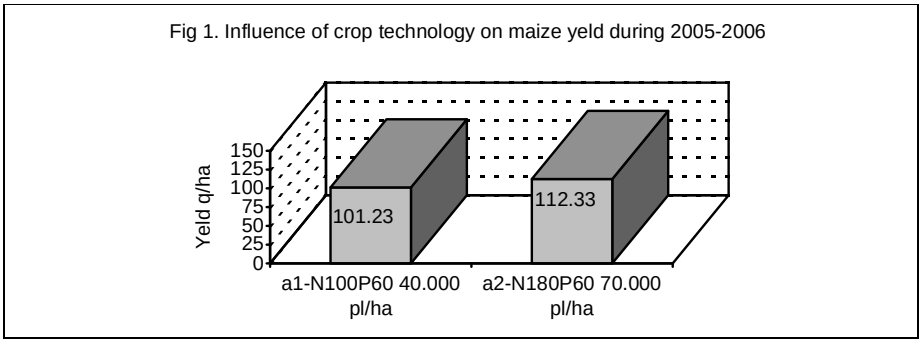

Fig 1. Influence of crop technology on maize yeld during 2005-2006

Table 2

Influence of irrigation regime on maize yield during 2005 -2006

B Factor	yeld		Vs. b_1- drylend	
	q/ha	rel. %	Diff .q/ha	signif.
b_1- dryland	101.43	100	check	
b_2- irrigated 50%IUA over 0-80 cm ,cu m=1 ; sprinkling	115.32	113.69	13.89	***
b_3- irrigated 50%IUA over 0-80 cm ,cu m=1/2 ; sprinkling	113.22	111.62	11.79	***
b_4- irrigated 50%IUA over 0-80 cm ,cu m=1/3 ; sprinkling	110.24	108.69	8.81	***
b_5- irrigated 50%IUA over 0-80 cm ,cu m=1/2 ; dripping	115.68	114.05	14.25	***
b_6- irrigated 50%IUA over 0-80 cm ,cu m=1/3 ; dripping	111.42	109.85	9.99	***

LSD 5%=3.25 q/ha LSD 1%=4.38 q/ha LSD 0.1%=5.81 q/ha

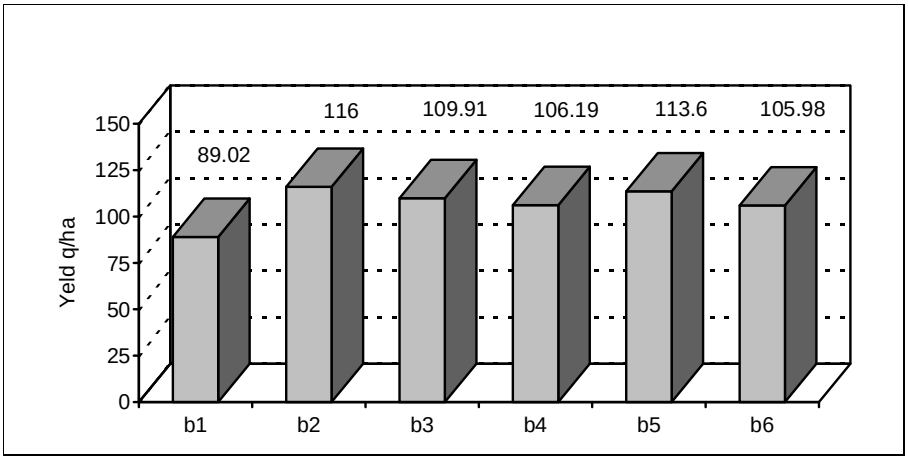

Fig 2. Influence of irigation regime on maize yeld during 2005-2006

Table 2 and figure 2 present the influence of irrigation regime on maize yield. All irrigation variants achieved yield gains statistically ensured (very significant).

So, the highest yield gain (14.25 q/ha) was registered in irrigation variant 50% active moisture interval, on 80 cm depth, with half norm by sprinkling, this gain being statistically ensured (very significant). Close values of maximum yield gain were also registered in irrigation variant 50% active moisture interval, on 80 cm depth, with entire norm by overhead irrigation ,13.89 q/ha respectively, statistically ensured as very significant.

Important value of yield gain, 11.79 q/ha, was also achieved in irrigation variant 50% active moisture interval, on 80 cm depth, with half norm by sprinkling .

Table 3

Influence of genotype on maize yield during 2005 - 2006

C Factor	yield		Vs. c_1- F475M	
	q/ha	rel. %	Diff q/ha	signif.
c_1 - F 475 M	104.29	100	check	
c_2 - Paltin	114.09	109.40	9.8	***
c_3 - Campion	115.27	110.53	10.98	**

LSD 5%=2.09 q/ha LSD1%=2.78 q/ha LDS 0.1%=3.59 q/ha

Among tested genotypes, the highest yield gain was obtained by the hybrid Campion, 10.98 q/ha, gain statistically ensured as very significant. The hybrid Paltin also achieved a very significant yield gain of 9.8 q/ha (table3, figure3 respectively).

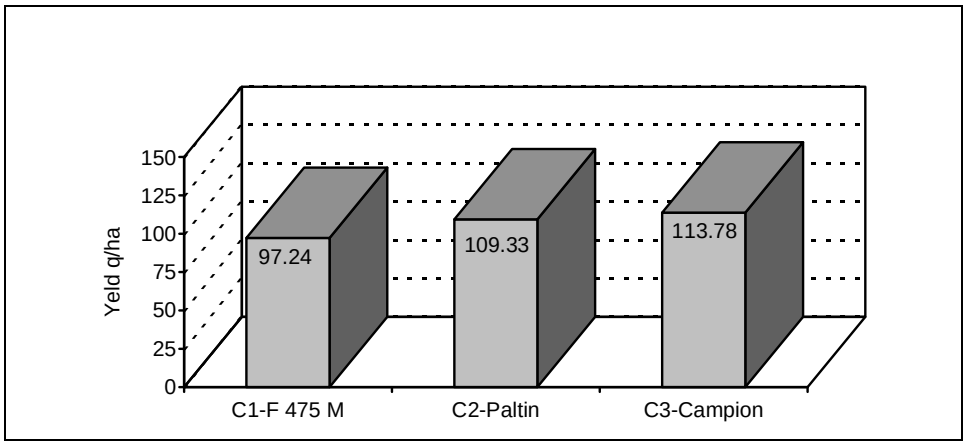

Fig 3. Influence of genotype on moize yeld during 2005 - 2006

The influence of irrigation regime on maize yield, at the same genotype and same technology is presented in table4. The highest yield was registered by hybrid Paltin (136.27 q/ha), under technological variant $N_{180}P_{60}$ – 70,000 pl/ha, respectively irrigated 50% active moisture interval, on 0-80 cm depth, with m=1/2, by sprinkling. The interaction of these factors achieved an yield gain of 20.6 q/ha, statistically ensured as very significant. The second yield was registered by hybrid Campion (133.81 q/ha), under technological variant $N_{180}P_{60}$ – 70,000 pl/ha, with a gain of 19.24 q/ha, statistically ensured as very significant.

Table 4

Influence of irrigation regime on yield at the same genotype and technology during 2005 – 2006

Variant	c_1 - F 475 M			c_2 - Paltin			c_3 - Campion		
	yield q/ha	Diff q/ha	signif	yield q/ha	Diff q/ha	signif	yield q/ha	Diff q/ha	signif
a_1 - $N_{100}P_{60}$ 40.000 pl/ha									
b_1- drzland	87.12	check		94.95	check		100.2	check	
b_2- irrigated 50%IUA over 0-80 cm ,cu m=1 ; sprinkling	102.74	15.62	***	100.06	5.11	-	104.13	3.93	-
b_3- irrigated 50%IUA over 0-80 cm ,cu m=1/2 ; sprinkling e	106.2	19.08	***	102.67	7.72	-	101.83	1.63	-
b_4- irrigated 50%IUA over 0-80 cm ,cu m=1/3 ; sprinkling	98.4	11.28	**	97.74	2.79	-	102.85	2.65	-
b_5-50%IUA over 0-80 cm ,cu m=1/2 ; drip irrigation	99.99	12.87	**	104.91	9.96	*	106.19	5.99	-
b_6- 50%IUA over 0-80 cm ,cu m=1/3 ; drip irrigation	98.81	11.07	**	103.44	8.49	*	106.72	6.52	-
a_2 - $N_{180}P_{60}$ 70.000 pl/ha									
b_1- drzland	96.68	check		115.67	check		114.57	check	
b_2- irrigated 50%IUA over 0-80 cm ,cu m=1 ; sprinkling	111.94	23.86	***	131.26	15.59	***	133.81	19.24	***
b_3- irrigated 50%IUA over 0-80 cm ,cu m=1/2 ; sprinkling e	110.69	14.61	***	126.98	11.31	**	130.96	16.39	***
b_4- irrigated 50%IUA over 0-80 cm ,cu m=1/3 ; sprinkling	110.73	14.65	***	122.5	6.83	-	129.21	14.64	***
b_5-50%IUA over 0-80 cm ,cu m=1/2 ; drip irrigation	116.29	20.21	***	136.27	20.6	***	130.43	15.86	***
b_6- 50%IUA over 0-80 cm ,cu m=1/3 ; drip irrigation	105.09	9.01	*	132.68	17.01	***	122.4	7.83	*

LSD 1% = 7.48 LSD 0.1% = 10.00 LSD 5% = 13.06

Table 5

Influence of genotype on yield at the same irrigation regime same and technology during 2005 – 2006

Variant	c_1 – F 475 M	c_2 – Paltin	c_3 – Campion	c_2-c_1		c_3-c_1		c_3-c_2	
	yield q/ha	yield q/ha	yield q/ha	Diff q/ha	signif	Diff q/ha	signif	Diff q/ha	signif
a_1 - $N_{100}P_{60}$ 40.000 pl/ha									
b_1- driland	87.12	94.95	100.2	7.83	*	13.08	***	5.25	-
b_2- irrigated 50%IUA over 0-80 cm , m=1 ; sprinkling	102.74	100.06	104.13	-2.86	-	1.39	-	4.07	-
b_3- irrigated 50%IUA over 0-80 cm , m=1/2 ; sprinkling	106.2	102.67	101.83	-3.53	-	-4.37	-	-0.84	-
b_4- irrigated 50%IUA over 0-80 cm , m=1/3 ; sprinkling	98.4	97.74	102.85	-0.66	-	4.45	-	5.11	-
b_5-50%IUA over 0-80 cm ,m=1/2 ; drip irrigation	99.99	104.91	106.19	4.92	-	6.2	-	1.28	-
b_6- 50%IUA over 0-80 cm , m=1/3 ; drip irrigation	98.81	103.44	106.72	5.25	-	8.53	*	3.28	-
a_2 - $N_{180}P_{60}$ 70.000 pl/ha									
b_1- driland	96.68	115.67	114.57	19.59	***	18.49	***	-1.1	-
b_2- irrigated 50%IUA over 0-80 cm , m=1 ; sprinkling	111.94	131.26	133.81	11.32	**	13.87	***	2.55	-
b_3- irrigated 50%IUA over 0-80 cm , m=1/2 ; sprinkling	110.69	126.98	130.96	16.29	***	20.27	***	3.98	-
b_4- irrigated 50%IUA over 0-80 cm , m=1/3 ; sprinkling	110.73	122.5	129.21	11.77	**	18.48	***	6.71	-
b_5-50%IUA over 0-80 cm ,m=1/2 ; drip irrigation	116.29	136.27	130.43	19.98	***	14.14	***	-5.84	-
b_6- 50%IUA over 0-80 cm , m=1/3 ; drip irrigation	105.09	132.68	122.4	27.59	***	17.31	***	-10.28	00

LSD 1% = 7.22 LSD 0.1% = 9.61 LSD 5% = 12.44

The influence of genotype on yield, at the same irrigation regime and technology is presented in table 5. The highest yield gain of cultivated genotype is registered by variant $N_{180}P_{60}$ – 70,000 pl/ha, respectively irrigated 50% active moisture interval, on 0-80 cm depth, with m=1/3, by sprinkling, of 27.59 q/ha. This yield gain achieved by hybrid Paltin vs. F475 M was statistically ensured as very significant.

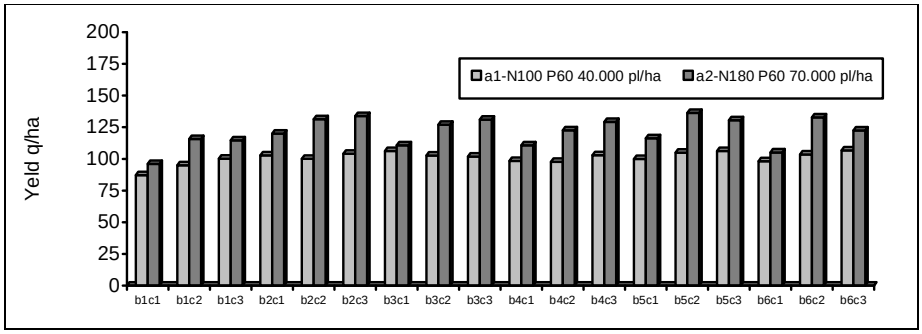

Fig. 4 Result synthesis regarding the influence of crop technology , irrigation regime and genotype on maize yeld during 2005-2006

Figure4 presents the result synthesis regarding the influence of crop technology, irrigation regime and genotype on maize yield during 2005-2006. One can notice that the variant $N_{180}P_{60}$ – 70,000 pl/ha brings yield gains vs. variant a1 – $N_{100}P_{60}$ – 40,000 pl/ha.

CONCLUSIONS

Based on results, we present the following conclusions:

- Optimum density of maize crop is about 70,000 pl/ha and the recommended fertilization is $N_{180}P_{60}$ under both irrigation and dryland.
- In the South of Romania, the most adequate hybrids under irrigation are Campion and Paltin respectively.
- As irrigation methods, is recommended irrigation 50% active moisture interval, on 0-80 cm depth, with half norm by sprinkling, method which brings yields close to irrigation with entire norm.
- As long-term irrigation method, could be also considered irrigation 50% active moisture interval, on 0-80 cm depth, with half norm by sprinkling. Practically, this irrigation method brings the highest yield gains and achieves a great economy of water vs. overhead irrigation with entire norm.
- The future researches will establish the both economical efficiency and water use efficiency indicators, for each irrigation variant, to precisely recommend the optimum irrigation variant.

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