RESULTS REGARDING THE BEHAVIOR OF NEW VARIETIES OF ALFALFA AT CARACAL AGRICULTURAL RESEARCH AND DEVELOPMENT STATION

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Key words: alfalfa, synthetic cultivars, forage yield, fodder crude protein.

ABSTRACT

In this paper are presented 10 new synthetic cultivars of alfalfa, created at N.A.R.D.I. Fundulea. These are result of alfalfa breeding programme in order to create synthetic cultivars with hight yield potential, high quality and good adaptability to biotic and abiotic environmental conditions. Testing was conducted at C.A.R.D.S. over two years, 2012-2013, under irrigation conditions. In these conditions, new cultivars of alfalfa F 2209-12 and F 2225-12 proved superior to production of fodder and protein per unit area, making an yield of over 15 t/ha dry matter and 3200-3500 kg/ha crude protein.

INTRODUCTION

Alfalfa (*Medicago sativa L*.) is the main fodder plant from Romania. During 1938-2012, area occupied by this species ranged between 136 300 and 442 000 ha, which represented 29.7 to 31.6% of the forage base structure, our country being present in large countries growing alfalfa rankings by U.S.A. , Argentina, Italy.

Alfalfa crop has numerous benefits, namely: it exploits 3-5 years, achieve high yields of forage (14 to 20 tonnes dry matter per hectare in intensive system), has high crude protein content (19-21%), in addition plays an important role in crop rotation as "*ameliorative sola*".

Great importance that he had and has this species for agriculture in general and livestock in particular, led to the development of research in the creation of new varieties and the development of crop technologies for over 55 years.

In the period 2000-2009 were created at N.A.R.D.I. Fundulea 15 alfalfa varieties of which 10 of them are the subject of this paper.

MATERIAL AND METHOD

Genotypes presented in this paper are synthetic varieties created by the polycross method. Cultivars that are the subject of this paper are: Magnat, Daniela, Madalina, Sandra, Catinca, Roxana, F 2209-12, F 2210-12, F 2220-12, F 2225-12 (table 1).

Table 1

10 Alfalfa varieties created at N.A.R.D.I. Fundulea

Variety	Registration year	Variety	Registration year	Applied waterings (60 mm/watering)	
				2012	2013
Magnat	1996	**Roxana**	2009	Cutting I - 0	Cutting I - 0
Daniela	2000	**F 2209-12**	New synthetic varieties that are being tested	Cutting II - 2	Cutting II - 0
Madalina	2002	**F 2210-12**		Cutting III- 3	Cutting III - 2
Sandra	2003	**F 2220-12**			Cutting IV - 1
Catinca	2006	**F 2225-12**			

The trials were carried out by randomized block method with a sown area of 15 sqm / plot and 10 sqm harvested, in irrigated system. Data processing was done by adequate statistical methods (Ceapoiu, 1968).

RESULTS AND DISCUSSIONS

Climate change has been made increasingly felt in recent decades, manifested by alternating high temperature and especially rainfall, lead to disruption of physiological mechanisms of plant, which was found to reduce yields. For these reasons, identification of new genotypes of forage, and especially alfalfa with genetic characteristics that give them a better adaptability, in which production decreases in such climatic conditions are reduced, it is particularly opportun. Of course, the variety or hybrid is known as the most important technological component in increasing yield stability and does not entail additional costs for yield growth. Add to these crop technologies that, under irrigation, can help reduce the impact of climate change. This fact is demonstrated by the results obtained in the period 2012-2013 by testing 4 new varieties of alfalfa with five varieties officially registered in the period 2000-2009 . All is compared with Magnat (Control variety).

Alfalfa is known as a species highly resistant to drought (Petcu and colab., 2010; Maria Schitea, 2010) but use very efficient irrigation water in adverse weather conditions. This is demonstrated by the results obtained from A.R.D.S. Caracal in the three years of testing.

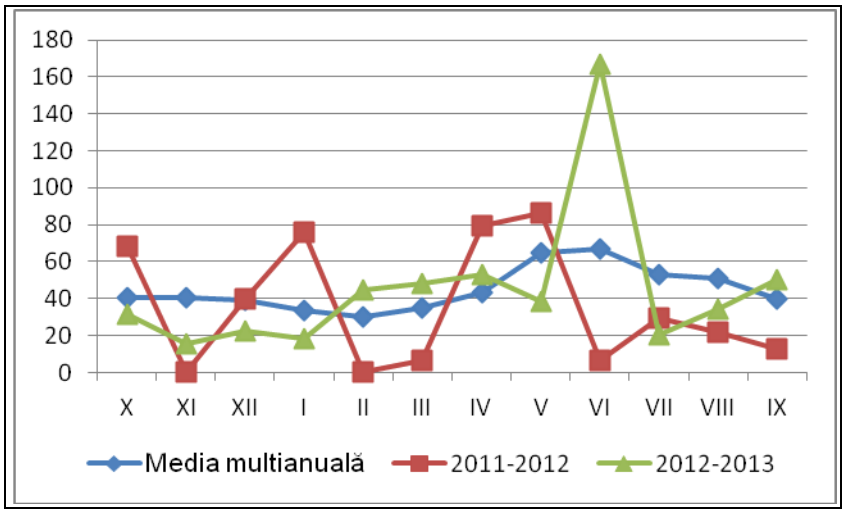

Figure 1. Rainfall recorded at A.R.D.S. Caracal in 2012-2013

In the year 2012, a particularly dry year (Figure 1) due to very high temperatures (Figure 2), applying 2 watering at the cutting I and II, in the first year of vegetation (Table 2), obtained yields were beetwen 51.1 and 60.6 tonnes/ha green mass, respectively 9.7-12.2 tonnes/ha dry matter. Besides Sandra and Madalina varieties, that were noted in previous tests, the new varieties developed at N.A.R.D.I. Fundulea achieved yields between 11.3 and 12.2 tonnes / ha dry matter, exceeding by 16.5 to 25.8% Magnat variety. On top were F 2225-12 and F 2209-12.

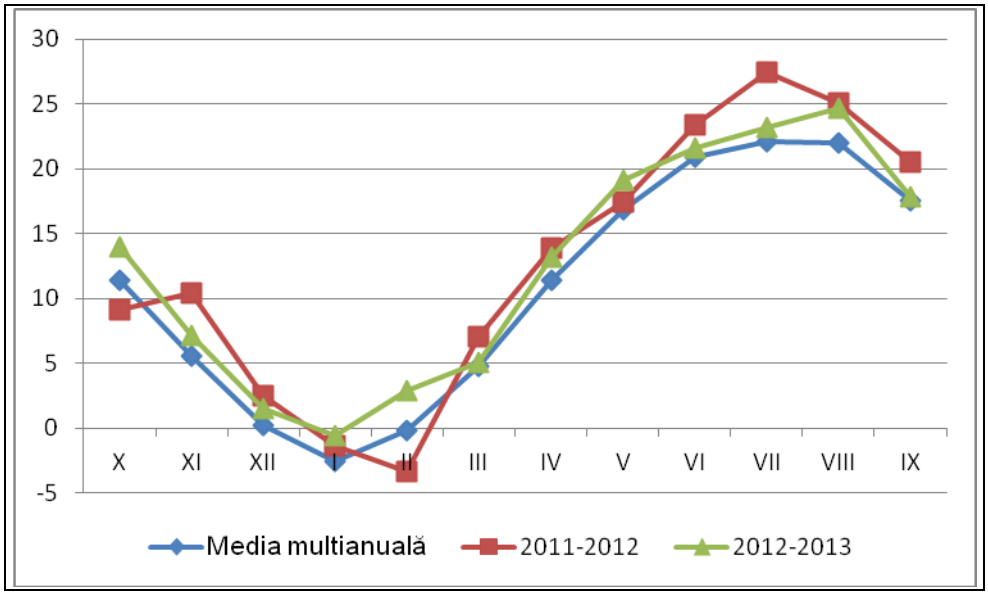

Figure 2. Temperatures recorded at A.R.D.S. Caracal in 2012-2013

In 2013, a year when drought was not so pronounced like in 2012, using two waterings at the cutting III and one watering at the cutting IV, in the second year of vegetation, obtained yields were between 82.2 and 103.3 tonnes / ha green mass, respectively 15.6 to 19.2 tonnes / ha dry matter (Table 3).

Table 2

Yield of green mass and dry matter obtained by alfalfa varieties in the first year -2012

Variety	Green mass yield (t/ha)					Dry matter yield (t/ha)				
	Cutting I	Cutting II	Cutting III	Total (t/ha)	% Control	Cutting I	Cutting II	Cutting III	Total (t/ha)	% Control
F 2225-12	19,8	23,5	17,3	60,6	**118,6**	3,7	4,7	3,8	12,2	**125,8**
F 2209-12	19,3	23,0	16,5	58,8	**115,1**	3,6	4,6	3,6	11,8	**121,6**
F 2220-12	18,5	23,3	17,0	58,8	**115,1**	3,5	4,6	3,7	11,8	**121,6**
SANDRA	18,8	23,5	16,5	58,8	**115,1**	3,5	4,6	3,6	11,7	**120,6**
MADALINA	18,5	23,0	15,5	54,0	**105,7**	3,4	4,5	3,4	11,3	**116,5**
F 2210-12	18,3	22,8	16,0	57,1	**111,7**	3,5	4,4	3,4	11,3	**116,5**
CATINCA	17,5	22,5	15,5	55,5	**108,6**	3,2	4,4	3,4	11,0	**113,4**
ROXANA	19,5	21,8	14,8	56,1	**109,8**	3,6	4,1	3,3	11,0	**113,4**
DANIELA	18,3	21,5	14,5	54,3	**106,3**	3,4	4,1	3,1	10,6	**109,3**
MAGNAT	17,3	20,3	13,5	51,1	**100,0**	3,0	3,9	2,8	9,7	**100,0**
Average	**18,6**	**22,5**	**15,7**	**56.5**	**110,6**	**3,4**	**4,4**	**3,4**	**11,2**	**115,9**
DL 5 %				2,6	5,0				0,6	5,7
DL 1 %				3,6	7,1				0,7	7,2
DL 0,1 %				4,9	9,5				0,9	9,6

Table 3

Yield of green mass and dry matter obtained by alfalfa varieties in the second year -2013

Variety	Green mass yield (t/ha)					Rel. yield %	Dif. t/ha	Sem	Dry matter yield (t/ha)					Rel. yield %	Dif. t/ha	Sem
	Cutting				Total				Cutting				Total			
	I	II	III	IV					I	II	III	IV				
Magnat	31.0	17.7	18.0	15.5	82.2	100	Mt.	-	5.7	3.3	3.5	3.1	15.6	100	Mt.	-
Daniela	36.0	17.7	18.3	16.0	88.3	107	6.1	X	6.6	3.3	3.5	3.0	16.4	105	0.8	-
Madalina	35.0	17.3	20.7	16.0	89.0	108	6.8	XX	6.4	3.2	3.9	3.1	16.6	106	1.0	X
Sandra	36.0	19.3	21.3	17.7	93.3	113	11.1	XXX	6.6	3.4	4.0	3.5	17.5	112	1.9	XXX
Catinca	32.3	17.3	19.3	15.7	84.6	103	2.4	-	6.0	3.2	3.6	3.1	15.9	102	0.3	-
Roxana	37.0	19.0	21.0	17.3	94.3	115	12.1	XXX	6.8	3.5	3.9	3.4	17.6	113	2.0	XXX
F 2209-12	41.3	21.7	22.0	18.3	103.3	126	21.1	XXX	7.5	4.0	4.1	3.6	19.2	123	3.6	XXX
F 2210-12	35.0	19.0	19.6	17.0	90.6	110	8.4	XXX	6.3	3.5	3.7	3.3	16.8	108	1.2	XX
F 2220-12	35.6	18.6	20.0	17.3	88.2	107	6.0	X	6.5	3.4	3.7	3.4	17.0	109	1.4	XX
F 2225-12	37.7	21.0	21.7	17.7	98.1	119	15.9	XXX	6.9	3.9	4.0	3.5	18.3	117	2.7	XXX
DL 5 %					*4.7 5.7*								*1.0 6.4*			
DL 1 %					*6.2 7.5*								*1.3 8.3*			
DL 0.1 %					*8.1 9.9*								*1.6 10.3*			

This year, in addition to varieties Sandra and Roxana, new varieties were noted by the green mass yield between 88.8 and 103.2 tonnes / ha, respectively 16.8 and 19.2 tonnes / ha dry matter, exceeding control variety by 8-23%. On top were situated F 2225-12 and F 2210-12

In the figures 3 and 4 we can see the superiority of the new alfalfa varieties toward Magnat variety, both at green mass yield as well as dry matter yield.

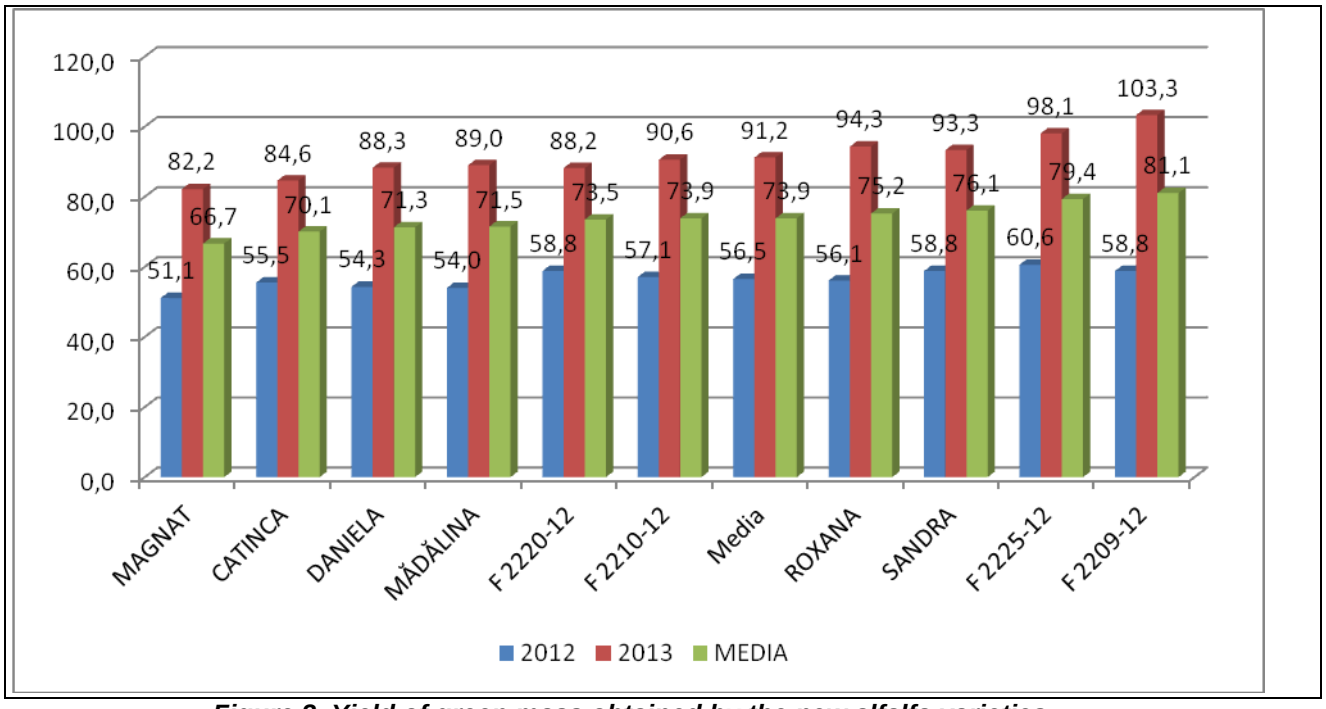

Figure 3. Yield of green mass obtained by the new alfalfa varieties, A.R.D.S. Caracal 2012-2013

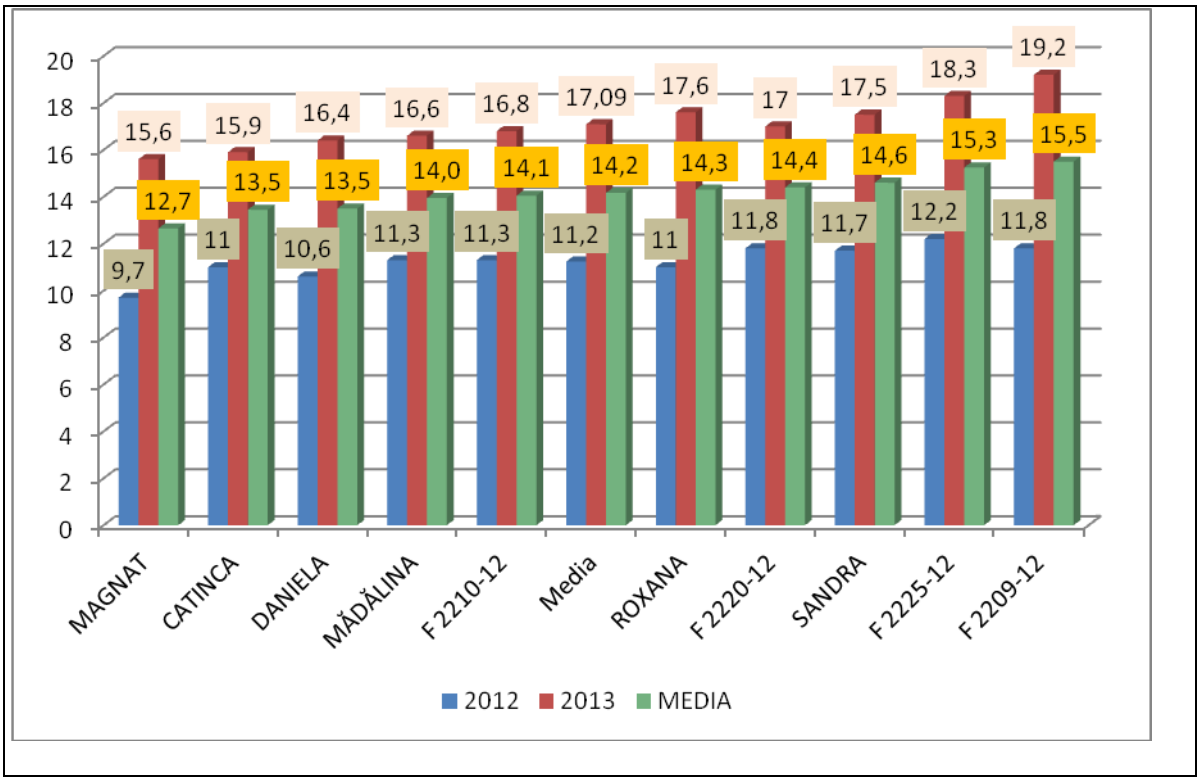

Figure 4. Yield of dry matter obtained by the new alfalfa varieties, A.R.D.S. Caracal 2012-2013

Table 4

Yield of dry matter and pure protein obtained by alfalfa varieties Average of two years (2012-2013)

Variety	Dry matter		Pure protein		
	t/ha	%	% from d.m.	kg/ha	% Control
F 2209-12	15.5	122	22.7	3.518	136.7
F 2225-12	15.3	120.5	21.17	3.228	125.4
Sandra	14.6	114.9	21.97	3.208	124.6
F 2220-12	14.4	113.4	21.13	3.043	118.2
Roxana	14.3	112.6	20.9	2.989	116.1
F 2210-12	14.1	111.0	20.85	2.929	113.8
Catinca	13.5	106.3	21.71	2.920	113.4
Madalina	14.1	110.2	20.84	2.907	112.9
Daniela	13.5	106.3	21.07	2.845	110.5
Magnat	12.7	100.0	20.35	2.574	100.0
AVERAGE	14.2	111.72	21.27	3016.1	117.16

In qualitative terms, from data presented in Table 4, we can see the superiority of the new varieties. The percentage of crude protein is 10.5 -36.7%, higher than the control variety. It highlights the varieties F 2209-12, F 2225-12 and Sandra that exceed the control variety with 24.6-36.7%. Crude protein yield is comprised between 3208-3518 kg / ha. Compared to the average, the control variety is lower with 17.16%

CONCLUSIONS

- ✓ The 10 varieties of alfalfa presented in this paper are created at N.A.R.D.I. Fundulea and are completed results of selection for improved forage quality, high yield of forage and seed and good adaptability to biotic and abiotic environmental conditions;
- ✓ Respond very well to the specific conditions of the Olt Plain and make a better use of irrigation water;
- ✓ On average of two years of testing (2012-2013), the behavior of the best varieties have a new F 2209-12 and F 2225-12, which achieved over 15 t / ha dry matter and 3200-3500 kg / ha crude protein, 20-36% exceeding the control variety;
- ✓ Proving good adaptability to biotic and abiotic environmental conditions, new varieties of alfalfa are suitable for cultivation both in the intensive technology and clasic technology.

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