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Behaviour of some alfalfa populations from algerian oasis

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Abstract. Surveys carried out between April and December 2006 at several Saharan farms showed that farmers continue to use local alfalfa seed they buy from other neighbouring farmers even with higher prices than those of introduced varieties. Thus, we have implemented a behaviour test (March 2008) at Hassi Ben Abdallah (800 km Southeast of Algiers) with a Lattice device with 4 blocks (repetitions) for 20 Saharan populations and 13 biometrical parameters (fresh and dry yields, dry matter content, height and diameter of the main stem, number of mowing, …) considered for about three years. The first observation is that nineteen alfalfa populations continue growing in the winter and just one (Guemar) which stop its growing when it's cold. After an ANOVA test, all parameters have shown a significant or high significant difference except the number of mowing which revealed a non significant difference. Using an ascending hierarchical classification, we obtain three groups of alfalfa populations from algerian oasis according to our biometric parameters.

Keywords. Alfalfa – Oasis – Algerian oasis – Behaviour.

Comportement de populations de luzerne provenant des oasis algériens

Résumé. Des prospections menées entre avril et décembre 2006 au niveau de plusieurs exploitations sahariennes ont montré que les agriculteurs persistent à utiliser des semences de luzerne locale qu'ils se procurent chez d'autres agriculteurs voisins même avec des prix plus élevés que ceux des variétés introduites. Ainsi, nous avons mis en place essai de comportement (Mars 2008) à Hassi Ben Abdallah (800 km au Sud-Est d'Alger)) avec un dispositif en Lattice comprenant 4 blocs (répétitions) portant sur 20 populations sahariennes et 13 paramètres biométriques (rendements frais et sec, taux de matière sèche, hauteur et diamètre de la tige dominante, nombre de coupes, …) ont été pris en considération pendant près de trois années. Le premier constat est que 19 populations de luzerne continuent leur développement en hiver et une seule (Guemar) qui arrête sa croissance quand il fait froid. Suite à une ANOVA, tous les paramètres ont montré une différence significative à l'exception du nombre de coupes. En utilisant une classification ascendante hiérarchique, nous avons obtenus trois groupes de populations de luzerne des oasis algériennes d'après nos paramètres biométriques.

Mots-clés. Luzerne – Oasis – Oasis algérienne – Comportement.

I – Introduction

In Algeria, the area devoted to perennial alfalfa (*Medicago sativa* L.) is between 0.37 and 0.71% of the area devoted to fodder crops. In the Sahara, alfalfa is the main forage species grown. Farmers in the region have shaped populations which come to equal and sometimes exceed widely the varieties introduced for some characters (Chaabena and Abdelguerfi, 2001). Surveys carried out between April and December 2006 at several Saharan farms showed that farmers continue to use local alfalfa seed they buy from other neighboring farmers even with higher prices than those of introduced varieties. The morphological and botanical composition of alfalfa has a great influence on the parameters of nutritional value (Marble, 1993). However, the influence of

climatic conditions, soil, water, and more genetic variability was very clear on the morphology and anatomy of different populations and varieties of alfalfa.

This work follows those of Chaabena (2001) and Chaabena et *al.* (2004). Thus, the objective of this work is to assess some agronomic characters and behavior of this saharan collection alfalfa.

II – Materials and methods

During our surveys, we collected seeds of alfalfa from seed producer and have appointed the population, as do farmers, with the name of the locality of the place of harvest. We sowed 20 populations: Aoulef 1, Aoulef 3, Blidet Amor, Chott, Ghardaïa, Hassi Ben Abdallah, Hassi Laabid, In Salah, Janet, Lioua, Meggarine 1, Meggarine 2, Nezla, Ouargla, Taghit, Tamantit, Temacine 1, Temacine 2, and Touijine; at March 2008 and monitor their development until April 2011, by some biometrical parameters: Green yield (q/ha), Dry yield (q/ha), Dry matter rate (%), Stem height at mowing (cm), Number of ramifications by plant, Dominant stem diameter (mm), Leaf length (mm), Leaf width (mm), Fresh ratio Leaf/Leaf+Stem, Dry ratio Leaf/Leaf+Stem, Total green production (q/ha), Total dry production (q/ha), and Number of mowing. We have implemented performance test (March 2008) in Hassi Ben Abdallah (25 km northeast of Ouargla) with a Lattice plan with 4 blocks (replicates). All data were analysed by ANOVA. Analyis of variance than an Ascending hierarchical classification analysis were undertaken using the XLSTAT statistic package (XLSTAT, 2009).

III – Results and discussion

The number of mowing does not show significant differences between the populations and ranges from 20 cuts for Nezla, Aoulef 1, Meggarine 2, Ghardaïa, and Aoulef 3 to 16.5 cuts for Guemar. All the 12 other parameters differed significantly between populations (Table 1 and Fig. 1). For the stem height at mowing, all populations except one (Guemar with 29.6 cm) are grouped together. This population show the shows lowest values for most variables: Green yield (51.337 q/ha), Dry yield (11.607 q/ha), Stem height at mowing (29.6 cm), Dominant stem diameter (2.07 mm), Leaf width (30.173 mm), Total green production (866.141 q/ha), and Total dry production (194.089 q/ha); and the best for one parameter: Dry ratio leaf/leaf+stem (0.694). Best values are presented by Meggarine 2 for Green yield (147.044/ha) and Total green production (2940.882 q/ha); Blidet Amor for Dry yield (51.296 q/ha), Dry matter rate (39.585%), and Total dry production (992.811 q/ha); Ghardaïa for Stem height at mowing (53.302 cm), Dominant stem diameter (4.963 mm), and Leaf width (55.917 mm); Chott for Number of ramifications (6.75); Aoulef 1 for Leaf length (56.094 mm); and Ouargla for Fresh ratio leaf/leaf+stem (0.724).

Some of these results are slightly higher, lower or similar than those obtained by Chaabena (2001). Slightly higher for stem height at mowing we obtain values 53.302 - 29.600 cm against 45.82 - 26.75 cm; for Dominant Stem Diameter, 4.963 -2.070 mm against 3.15 - 2.03 mm; for Leaf length, 56.094 – 35.094 mm against 26.5 - 17.8 mm; for leaf width, 55.917 – 30.173 mm against 17.1 - 8.0 mm; for dry matter rate, 39.585 – 14.961 % against 32.11 - 21.60%. Lower for number of ramifications, 6.75 – 3.75 against 8.60 - 2.92. And similar for fresh ratio leaf/leaf+stem, 0.724 – 0.500 against 0.701 – 0.552; and dry ratio leaf/leaf+stem, 0.694 – 0.467 against 0.697 - 0.531.

To synthesise all data an ascending hierarchical classification analysis was undertaken on all 13 factors (Fig. 2).

This classification highlighted three groups (classes) populations:

– Class 1: Guemar, In Salah, Aoulef 3, and Lioua

– Class 2: Temacine 2, Tamantit 2, Hassi Ben Abdallah, Meggarine1, and Blidet Amor

Table 1. Average values and average groups of 12 variables for the 20 populations of alfalfa studied in Ouargla

Parameters / Population	Average Green Yield (qx/ha)	Average Dry Yield (qx/ha)	Average Dry Matter Rate (%)	Average Stem Height at Mowing (cm)	Average Number of Ramifications by plant	Average Dominant Stem Diameter (mm)	Average Leaf Length (mm)	Average Leaf Width (mm)	Average Fresh Ratio Leaf/Leaf+Stem	Average Dry Ratio Leaf/Leaf+Stem	Average Total Green Production (qx/ha)	Average Total Dry Production (qx/ha)
Aoulef 1	143.047	34.559	24.205	47.639	5.75	3.963	56.094	46.917	0.6	0.563	2860.942	691.184
	a	bcde	ef	a	ab	bcdef	a	a	gh	g	a	bcd
Aoulef 3	98.65	31.079	32.618	44.659	3.75	3.163	35.094	39.917	0.7	0.616	1973	621.586
	ab	bcde	bc	a	b	ef	g	bc	b	b	ab	bcd
Blidet Amor	130.252	51.296	39.585	48.436	4	2.963	49.094	38.917	0.655	0.56	2521.928	992.811
	a	a	a	a	ab	f	bc	cd	d	g	a	a
Chott	109.816	17.857	17.19	49.479	6.75	4.463	40.094	45.917	0.5	0.467	2175.565	353.804
	ab	ef	h	a	a	abcd	f	a	j	n	ab	de
Ghardaïa	110.947	25.579	23.414	53.302	5.75	4.963	52.094	55.917	0.589	0.534	2218.943	511.587
	ab	cdef	ef	a	ab	a	ab	a	h	j	ab	bcde
Guemar	51.337	11.607	24.025	29.6	5.5	2.07	36.651	30.173	0.62	0.694	866.141	194.089
	b	f	ef	b	ab	g	g	f	f	a	b	e
Hassi Ben Abdallah	133.54	40.392	31.145	43.335	5.75	3.463	41.094	45.917	0.603	0.6	2649.424	801.157
	a	abc	cd	a	ab	def	f	a	gh	d	a	abc
Hassi Laabid	118.788	29.994	25.995	44.117	4.75	3.963	56.094	35.917	0.576	0.598	2326.528	587.394
	ab	bcde	e	a	ab	abcdef	a	e	i	d	ab	bcd
In Salah	114.291	28.31	25.61	43.043	3.75	3.163	51.094	49.917	0.639	0.612	2219.431	549.069
	ab	bcde	ef	a	b	ef	ab	a	e	c	ab	bcd
Janet	116.078	25.521	22.954	47.281	6.75	3.563	47.983	52.733	0.602	0.534	2276.393	499.558
	ab	cdef	f	a	a	cdef	cde	a	gh	j	ab	bcde
Lioua	104.095	23.099	23.615	50.557	3.75	3.063	46.094	41.917	0.683	0.55	2041.659	453.167
	ab	def	ef	a	b	f	de	b	c	hi	ab	cde

abcdefg: averages with different letters on the same column are significantly different at 5%.

Table 1 (cont.). Average values and average groups of 12 variables for the 20 populations of alfalfa studied in Ouargla

Parameters / Population	Average Green Yield (qx/ha)	Average Dry Yield (qx/ha)	Average Dry Matter Rate (%)	Average Stem Height at Mowing (cm)	Average Number of Ramifications by plant	Average Dominant Stem Diameter (mm)	Average Leaf Length (mm)	Average Leaf Width (mm)	Average Fresh Ratio Leaf/Leaf+Stem	Average Dry Ratio Leaf/Leaf+Stem	Average Total Green Production (qx/ha)	Average Total Dry Production (qx/ha)
Meggarine 1	125.516	42.176	33.799	49	3.75	3.763	54.094	45.917	0.607	0.487	2483.021	834.24
	ab	ab	b	a	b	bcdef	a	a	g	k	a	ab
Meggarine 2	147.044	21.199	14.961	46.597	4	4.563	45.094	41.917	0.708	0.547	2940.882	423.976
	a	def	i	a	ab	abc	e	bc	b	i	a	de
Nezla	137.537	21.407	16.377	49.434	4.75	3.963	51.135	50.917	0.655	0.576	2750.747	428.14
	a	def	hi	a	ab	bcdef	ab	a	d	f	a	de
Ouargla	102.301	23.435	23.57	50.278	5.75	4.763	53.114	46.917	0.724	0.551	2029.382	464.736
	ab	def	ef	a	ab	ab	a	a	a	h	ab	cde
Taghit	122.331	24.495	20.933	48.312	4	3.763	49.094	45.917	0.65	0.599	2387.488	477.334
	ab	cdef	g	a	ab	bcdef	bcd	a	d	d	ab	bcde
Tamantit 2	122.304	35.758	30.322	51.605	4.75	3.463	37.094	44.917	0.608	0.471	2416.448	706.247
	ab	bcd	d	a	ab	def	g	a	g	m	ab	bcd
Temacine 1	139.697	31.82	23.063	50.73	5	4.163	46.094	46.917	0.63	0.588	2751.815	626.186
	a	bcde	f	a	ab	abcde	de	a	f	e	a	bcd
Temacine 2	107.725	31.936	30.166	46.062	6.75	2.963	41.094	36.917	0.597	0.478	2136.291	633.271
	ab	bcde	d	a	a	f	f	de	gh	l	ab	bcd
Touijine	115.287	21.046	19.658	51.061	5.5	3.85	41.094	38.917	0.655	0.589	2261.446	412.068
	ab	def	g	a	ab	bcdef	f	cd	d	e	ab	de

abcdefg: averages with different letters on the same column are significantly different at 5%.

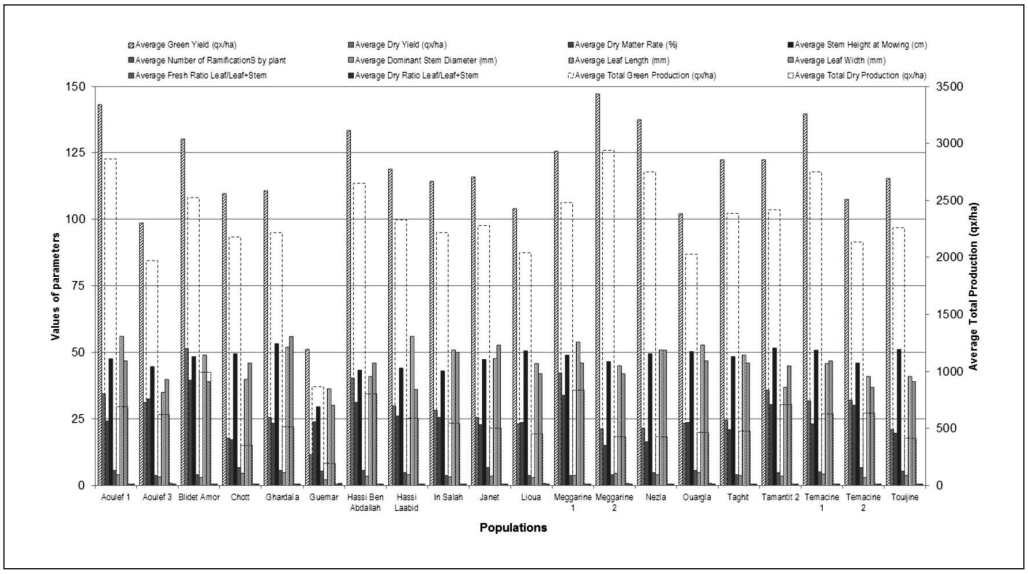

Fig. 1. Average values of 12 parameters for 20 populations of oasis populations of alfalfa.

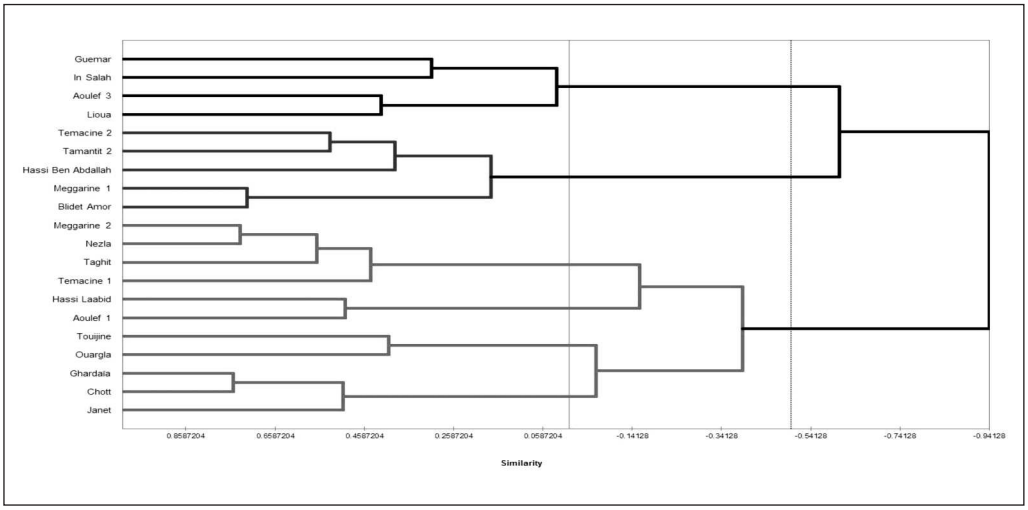

Fig. 2. Ascending hierarchical classification analysis of some alfalfa populations from algerian oasis.

– Class 3: Meggarine 2, Nezla, Taghit, Temacine 1, Hassi Laabid, Aoulef 1, Touijine, Ouargla, Ghardaïa, Chott, and Janet

The first class includes populations of alfalfa with the worst results (globally), and the third class takes in the best ones. The second class go-between the two.

IV – Conclusion

The four year assessment of some agronomic characteristics of alfalfa oasis collection confronted us to a wide range of variation in all observed traits. Population and local climate influenced the biometric values of this fodder. Principal component analysis helped to integrate all data and eventually to select several varieties of interest, both commercial accessions and landraces, on agronomic criteria.

References

Chaabena, A. et Abdelguerfi, A., 2001. Situation de la luzerne pérenne dans le Sahara et comportement de quelques populations locales et variétés introduites dans le sud-est du Sahara algérien, *XIVe Réunion Eucarpia du Groupe Medicago spp.)* Zaragoza et Lleida, Espagne, 12 au 12.09.2001: 57-60.

Chaabena A., 2001. Situation des cultures fourragères dans le Sud-Est septentrional du Sahara algérien et caractérisation de quelques variétés introduites et populations sahariennes de luzerne cultivée, El-Harrach: Mem. Magister, INA; 142 p.

Chaabena A., Abdelguerfi A. and Baameur M., 2004. Comportement et caractérisation de quelques variétés de luzerne (*Medicago sativa* L.) dans la région de Ouargla, Cahiers Agricultures Ed. J.L.E.; 13:271-6.

Marble Vern L., 1993. Des Fourrages pour le Proche-Orient: La luzerne, Université de Californie, Davis, Etats-Unis 237 p.