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Variation of the bloom and fruiting within fourteen Algerian populations of Sulla

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Abstract. In the framework of the evaluation and valuation of plant genetic resources of fodder and pastoral interest in Algeria, fourteen Algerian populations of *Sulla coronaria* (L.) Medik. (Syn. *Hedysarum coronarium* L., Fabaceae), have been the subject of a behaviour trial. The populations are originating from different natural habitats. Eight variables concerning the bloom and fruiting have been studied. The analysis of variance enabled us to quantify the variation between populations in order to facilitate its utilization during a selection program. The variation seems to be linked to the ecological factors (altitude, rainfall) of the environment of origin of the populations. Because of its economic and environmental interest (forage legume, nectar plant, ornamental plant, fight against the erosion of sloping soils on which it is frequently encountered), this allogamous species deserves particular attention.

Keywords. Ecological factors – Forage legume – *Hedysarum coronarium* L. – Pods.

Variation de la floraison et de la fructification chez quatorze populations algériennes de Sulla

Résumé. *Dans le cadre de l'évaluation et de la valorisation des ressources phytogénétiques d'intérêt fourrager et pastoral en Algérie, quatorze (14) populations de l'espèce* Sulla coronaria *(L.) Medik. (Syn.* Hedysarum coronarium *L., Fabaceae), ont fait l'objet d'un essai de comportement. Les populations proviennent de différents milieux d'origine. Huit (8) variables relatives à la floraison et à la fructification ont été étudiées. L'analyse de variance a permis de quantifier la variation observée entre les populations afin de faciliter son exploitation lors d'un programme de sélection. La variation semble être liée aux facteurs écologiques (altitude, pluviométrie) du milieu d'origine des populations. De par son intérêt à la fois économique et environnemental (légumineuse fourragère, plante mellifère, ornementale, lutte contre l'érosion des sols en pente sur lesquels elle est fréquemment rencontrée), cette espèce allogame mérite une attention particulière.*

Mots-clés. *Facteurs écologiques – Gousses –* Hedysarum coronarium *L. – Légumineuse fourragère.*

I – Introduction

In Algeria, the genus *Hedysarum* L. consists nine species including three endemic ones (Quezel and Santa, 1962). *Hedysarum coronarium* L. (Fabaceae), commonly called Sulla and recently reclassified by Choi and Ohashi (2003) as *Sulla coronaria* (L.) Medik., is one of the most important natural forage legumes in Mediterranean areas (Flores *et al*., 1997). A cytogenetic study revealed the existence of two chromosome numbers in the Algerian populations of the species *Hedysarum coronarium* L. The first number (2n = 16, n = 8) is usually observed in this species while the second number (n = 9, 2n = 18,) was recently observed (Issolah *et al*., 2006). This work concerns the evaluation and valorization of plant genetic resources of fodder and pastoral interest in Algeria and follows the studies of wild forage legumes (Issolah *et al*., 2001, 2006; Issolah and Khalfallah, 2007; Issolah and Yahiaoui, 2008).

II – Material and methods

Following prospect missions carried out by INRAA in 1998 across the North East of Algeria

(Issolah *et al*., 2001), fourteen Algerian populations of different origins (Table 1) have been tested, in terms of behaviour, at the experimental station of Mehdi Boualem of INRAA during the 1999-2000 season. The pH of soil is 8.12. The soil texture is silty clay. The populations were sown in autumn 1999 at 35 individuals per population. The experimental design is randomized complete blocks with two repetitions. Eight characteristics were considered: FB (appearance of flower bud), FI (appearance of the first inflorescence), FB1 (Full bloom), EB (end of the bloom), DB (duration of the bloom), NFP (number of inflorescences per plant), FH1 (appearance of the first fruiting head), FH (full formation of fruiting heads). The notations concerning the bloom and the fruiting heads are expressed in the number of days after sowing. The ecological factors (altitude, rainfall) of the natural habitat of the populations (ANRH, 1993) have also been considered in the statistics treatments (variance analysis, matrix of correlations).

Table 1. Ecological characteristics of fourteen Algerian populations of Sulla (Issolah *et al*., 2006 completed; Issolah and Khalfallah, 2007)

N° of populations	Origin	Altitude (m)	Rainfall (mm)
2/98	Béjaia1	1	964
4/98	Béjaia2	3	800
6/98	Béjaia3	250	800
8/98	Setif1	740	564
10/98	Setif2	830	564
12/98	Setif3	960	665
13/98	Setif4	1030	600
16/98	Guelma1	120	700
18/98	Guelma2	250	800
20/98	Guelma3	400	558
22/98	Guelma4	500	600
24/98	Skikda1	270	600
26/98	Souk Ahras1	840	700
28/98	Tarf1	5	700

III – Results and discussion

The analysis of variance (Table 2) indicates that the population no. 4/98 is the latest one for the characteristics linked to the bloom and the formation of fruiting heads. The population no. 10/98 is relatively the earliest one. Concerning the number of inflorescences per plant, the population no. 4/98 presents the highest number (67). Regarding this last parameter, the values we have obtained vary between 16 and 67 with an average of 37 inflorescences. Abdelguerfi-Berrekia (1985) indicates higher values, ranging from 87 to 441 inflorescences per plant in the Algerian population of *H. coronarium*, whereas Yakoubi and Chriki (2000) reported 15 to 30 inflorescences per plant in the Tunisian populations. The results indicated the influence of altitude and rainfall on flowering and the influence of altitude on fruiting (Table 3). A previous study highlighted the existence of great morpho-physiological variation between the populations from the same area, particularly from Setif in *Hedysarum coronarium* L. (Issolah and Khalfallah, 2007).

IV – Conclusions

Sulla coronaria (L.) Medik. (Syn. *Hedysarum coronarium* L., *Fabaceae*) is an allogamous, forage and ornamental plant, in addition to its role in the fight against the erosion of sloping land

on which it is frequently encountered. The species presents both economic and environmental interest. The study highlighted the existence of variability of flowering and fruiting between the different populations within this species. The variation seems to be linked to the ecological factors (altitude, rainfall) of the natural habitat of the populations. The present work should be continued on a higher number of populations to quantify the variation to facilitate the choice of populations in a selection program.

Table 2. Variation of the bloom and fruiting within Algerian populations of Sulla

No. of population	FB		FI		FB1		EB		DB		NFP		FH1		FH	
	M (days)	CV (%)	M (days)	CV (%)	M (days)	CV (%)	M (days)	CV (%)	M (days)	CV (%)	M (days)	CV (%)	M (days)	CV (%)	M (days)	CV (%)
/98	160.71	5.05	173.14	1.06	174.25	1.25	202.31	0.51	30.50	14.98	49.03	32.31	183.53	0.37	195.83	0.31
4/98	169.33	3.98	178.00	3.41	183.63	4.60	206.45	1.39	27.98	11.12	67.28	65.43	190.01	3.61	204.88	1.83
6/98	152.82	1.66	166.48	1.47	173.63	1.96	192.33	0.27	26.28	5.94	57.94	74.68	181.64	0.88	194.42	0.01
8/98	146.40	2.54	166.46	1.48	171.52	0.55	188.02	1.73	21.97	8.83	26.65	3.79	176.51	0.52	187.70	90.57
10/98	146.41	5.30	162.35	0.78	173.48	6.5	187.67	3.25	28.98	16.11	46.00	28.74	175.60	2.95	187.42	2.02
12/98	157.81	1.19	170.58	1.83	177.00	2.07	193.65	0.42	24.18	13.90	23.94	57.02	179.72	1.12	192.00	0.42
13/98	155.57	1.19	168.18	1.03	176.09	1.36	191.42	0.38	23.97	2.50	23.04	32.42	178.78	1.49	190.36	0.69
16/98	155.84	1.00	171.40	0.50	177.44	2.36	195.40	1.99	25.24	3.09	24.92	0.40	182.91	1.87	193.06	2.24
18/98	160.70	0.70	169.09	0.08	178.76	1.38	193.49	1.62	26.14	0.73	20.90	22.68	180.70	0.63	193.99	0.25
20/98	162.31	2.19	172.65	2.49	180.72	0.29	196.67	2.13	22.42	2.59	43.65	51.64	186.08	0.96	196.25	1.41
22/98	150.97	0.95	165.70	1.16	174.47	0.71	195.31	1.04	28.39	6.32	50.53	7.26	180.22	0.47	193.83	0.92
24/98	158.87	0.12	177.88	4.55	180.81	4.18	198.96	3.46	24.49	16.50	29.75	35.29	185.40	4.51	198.75	2.97
26/98	158.98	0.10	173.17	1.07	177.25	2.35	197.43	0.67	26.90	4.28	40.21	38.00	183.74	1.49	197.24	1.42
28/98	157.15	11.38	173.76	6.42	178.36	4.15	193.77	4.66	21.41	8.17	16.63	103.01	184.07	4.08	191.96	4.26

FB (appearance of flower bud), FI (appearance of the first inflorescence), FB1 (Full bloom), EB (end of the bloom), DB (duration of the bloom), NFP (number of inflorescences per plant), FH1 (appearance of the first fruiting head), FH (full formation of fruiting heads).
M: Mean of the population. CV: Coefficient of variation.

Table 3. Relations between the bloom, the fruiting and the ecological factors of the natural habitat of Sulla

	EB	FH1	FH
Altitude	-0.59*	-0.66*	-0.54*
Rainfall	0.55*	0.39	0.43

EB (end of the bloom), FH1 (appearance of the first fruiting head), FH (full formation of fruiting heads).
*,**,***Significant at the 5, 1 and 0.1% levels of probability.

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