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Variability within 31 spontaneous populations of *Trifolium scabrum* L.; Nature of relations with factors of the site of origin

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SUMMARY - As part of the valorization of local phytogenetic resources of pastoral interest, 31 spontaneous populations of T. scabrum form the subject of a study which focuses on the behaviour and biometrical characters. Our results show the existence of a variability within the species. Relations seem to exist between some characters and conditions of the origin environment (rainfall, altitude, longitude, latitude). According to the present study, this species can play a prominent part in the improvement of rangeland and dry areas throughout Algeria.

Key words: Clovers, plants, fruiting heads, pods, seeds, Algeria.

RESUME *- "Variabilité chez 31 populations spontanées de* Trifolium scabrum *L. : nature des relations avec les facteurs du milieu d'origine". Dans le cadre de la valorisation des ressources phytogénétiques locales d'intérêt pastoral, 31 populations spontanées de Trifolium scabrum ont fait l'objet d'une étude de comportement et de biométrie. Nos résultats ont montré l'existence d'une variabilité à l'intérieur de l'espèce. Des relations semblent exister entre quelques uns de ces caractères et les conditions du milieu d'origine (pluviométrie, altitude, longitude, latitude). La présente étude a montré l'intérêt de cette espèce quant à l'amélioration des terres de parcours et des régions sèches à travers l'Algérie.*

Mots-clés : *Trèfles, plantes, infrutescences, gousses, graines, Algérie.*

Introduction

It is among the 37 species existing in Algeria (Quezel and Santa, 1962) that we meet T. *scabrum,* a species native of dry places on shallow and sandy soils (Clapham *et al.*, 1962). *T. scabrum* reveals itself more frequently in the areas of high altitude, on sloping soils and seems to prefer very calcareous soils (Zatout *et al.*, 1989). This present study was carried out to assess the variability present in spontaneous populations of this species and its relationship with different ecological factors.

Material and methods

A study of behaviour was conducted on 31 spontaneous populations belonging to *T. scabrum* (Issolah, 1991). The attempt was conducted on the experimental station of Guelma at the altitude of 227 m, subhumid zone, average annual rainfall 678.6 mm, temperature was Min: 11°C and Max: 23.8°C, texture of soil clayey, pH: 7; the populations were sown (07/11/90) on lines 1 m long. The characters studied were:

W1 (24/03/91) and W2 (05/05/91): maximum width of vegetation at the line; S1: speed of the winter daily growth (from 11/02 to 24/03/91); S2: speed of the spring daily growth (from 24/03 to 05/05/91); 1F: appearance of the first inflorescence; BF: beginning of the bloom (one inflorescence/plant); DF: duration of the bloom (days). 1F, BF, are expressed in number of days from the emergence of the seedlings. This work was carried out by a biometrical study which concerns the fruiting heads, pods and seeds. For each population, 30 fruiting heads were chosen at random and the following characters were studied: size of fruiting head: length (LF) and width (WDF); number of pods per fruiting head (PF); number of seeds per pod (SP); number of seeds per fruiting head (SF); size of seeds: length (LS) and width (WS);

weight of 30 fruiting head (WF); weight of 1000 seeds (WTS); ratio weight of seeds/weight of fruiting head (RW).

A correlation analysis was conducted to establish the relationship between these characters and certain factors of the origin environment of populations especially the altitude (ALT), the rainfall (R) according to Gaussen and Bagnouls (1947), the longitude (LGT), the latitude (LAT).

Results and discussion

Variability existing (Table 1)

Table 1. Variability of the fruiting heads, pods and seeds in *T. scabrum*

Characters	Min[1]	Max[2]	Mean[3]	S.D.[4]	V.C.%[5]
LF (cm)	1.01	1.52	1.24	0.11	8.6
WDF (cm)	0.91	1.23	1.09	0.08	7.6
PF	10.57	19.70	14.36	1.99	13.8
SP	-	-	1	-	-
SF	9.30	17.73	12.88	1.84	14.3
LS (mm)	1.44	1.69	1.57	0.07	4.6
WS (mm)	0.78	0.93	0.85	0.04	4.7
WF (g)	0.71	1.74	1.21	0.25	20.4
WTS (g)	0.69	1.20	0.85	0.10	12.2
RW	0.23	0.32	0.27	0.03	9.5

[1] Min : mean of a population
[2] Max: mean of a population
[3] Mean: mean of the species
[4] S.D: standard deviation
[5] V.C: variation coefficient

The results of the variance analysis allowed to show a certain variability within the species on the one hand, and within each population on the other hand. Thus, the characters «number of pods per fruiting head» and «number of seeds per fruiting head» presented the middle variability's coefficient with 13.8% and 14.3%, respectively. In comparison with the whole studied characters, they are the most variable ones. For this purpose, we notice that our results confirm those of Ghoubay and Abdelguerfi (1991) by the fact that *T. scabrum* contains less than 13 seeds per fruiting head and one seed per pod. For the size of fruiting heads, we notice that a weak variability characterized the length and the width of the fruiting heads.

Our study revealed that the fruiting heads of different sizes (big and small) also characterize the well distinguished populations. This would constitute probably a new criterion of classification of different morphological types within this species. We also notice that the mean number of pods per fruiting head was 14.36. This corresponds exactly to the number of flowers per inflorescence which has been found by Aguenarous (1987) within the same species. Concerning the mean weight of fruiting heads and the weight of 1000 seeds, we obtained respective values of 1.21 g and 0.85 g. These are weaker than those (1.3 g and 0.91 g) noticed by Ghoubay and Abdelguerfi (1991). For the ratio weight of seeds/weight of fruiting heads, our result is identical (0.27) with that of authors mentioned above.

Would the existing variability be connected to factors of the origin environment?

Relations revealed (Tables 2 and 3)

Table 2. Behaviour and biometry: relations between the characters in *T. scabrum*

Characters	W1	W2	BF	WDF
W2	0.559**	-	-0.444*	0.432*
S1	0.944***	0.537**	-0.653***	0.203
S2	-0.048	0.801***	-0.105	0.396*
1F	-0.597***	-0.498**	0.812***	-0.138
BF	-0.596***	-0.444*	-	-0.341
DF	0.459**	0.423*	-0.428*	-0.027
LF	0.199	0.374*	-0.340	0.575***
WDF	0.173	0.432*	-0.341	-
PF	0.099	0.201	-0.306	0.469**
SF	0.009	0.164	-0.321	0.486**
LS	0.272	0.389*	-0.254	0.445*
WF	0.208	0.347	-0.473**	0.757***
WTS	0.018	0.073	-0.082	0.544**
RW	-0.323	-0.368*	0.423*	-0.405*

Significance: * 5%; ** 1%; *** 0.1%

The matrix of correlations has made evident a certain number of relations between some of characters and the factors of the origin environment. First, we note that the populations which are characterized by a good covering of soil (W2) showed a good speed of winter and spring growth. They are precocious for the appearance of the first inflorescence and the beginning of the bloom, present a long duration of the bloom, big sized fruiting heads, long seeds and a weak ratio weight of seeds/weight of fruiting heads. Moreover, the precocious populations for the beginning of the bloom are characterized by a long duration of the bloom, heavy fruiting heads, a weak ratio weight of seeds/weight of fruiting heads.

Such populations mentioned above come from the least watered areas, low longitude and latitude. They come from inland and the western part of the country. The populations presenting wide fruiting heads are characterized by heavy fruiting heads, high number of pods and seeds per fruiting heads, heavy and long seeds, a weak ratio weight of seeds/weight of fruiting heads. These populations originate from the least watered and low altitude areas. The populations with big fruiting heads (high length) come from areas of low altitude too.

By another way we notice that the populations with a high weight of 1000 seeds come from the areas of a low latitude (inland). An observation based on the frequency of intervention of different factors of origin environment on the precocity at the flowering stage and the biometrical characters linked to the fruiting heads and seeds, allowed to establish that the altitude is the factor which is the most frequently met (6 times), followed by the rainfall (5 times).

Thus we notice that the altitude plays a leading part on nearly all the biometrical characters. The rainfall seems to have a big influence on the precocity at the flowering stage. The latitude constitutes the only factor which would have an influence on the size and the weight of the seeds. In a previous study conducted on a certain number of populations within the same species (Issolah and Abdelguerfi, 1991), the weight of 1000 seeds appeared positively correlated to the altitude but varied independently of the rainfall.

Table 3. Behaviour and biometry: relations with factors of the origin environment

Factors	Characters										
	IF	BF	LF	WDF	PF	SF	WS	LS	WF	WTS	RW
ALT	0.173	0.354	-0.396*	-0.370*	-0.505**	-0.511**	0.322	0.005	-0.499**	0.075	0.508**
R	0.416*	0.537**	-0.085	-0.499**	-0.064	-0.169	-0.211	-0.251	-0.447*	0.230	0.502**
LGT	0.393*	0.470**	0.086	-0.062	0.165	0.190	-0.394*	-0.225	-0.149	-0.230	0.211
LAT	0.283	0.401*	0.036	-0.289	0.087	0.076	-0.549**	-0.381*	-0.332	-0.418*	0.301

Signification: * 5%; ** 1%; C^1 : Characters; F^2: Factors

Conclusion

T. scabrum is characterized by a specific variability within the species, more or less accurate according to the considered character. For certain populations, a striking difference regarding the size of the fruiting heads was noticed. The results of the correlations bring out enough interesting relations. Native of the dry areas and characterized by its prominent development in the width, its long bloom duration and its late withering (Issolah, 1991), *T. scabrum* constitutes for this fact, a very interesting species because of its capacity of subsistence, specially in the unfavourable and the least watered areas throughout Algeria.

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