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Study of the variability in 28 spontaneous populations of *Trifolium tomentosum* L.: relations with factors of the environment of origin

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SUMMARY - As part of the valorization of local fodder resources, several spontaneous clovers (genus *Trifolium*) may be used to reduce erosion and improve grazing on marginal areas. This study focuses on the behaviour and biometrical characters of 28 spontaneous populations of *T.tomentosum*. The populations manifested a certain variability that could be linked to ecological factors of their environment of origin (rainfall, altitude, longitude, latitude). The longitude followed by the rainfall were the environmental factors most correlated with the different morphological and growth characters.

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

Résumé - Dans le cadre de la valorisation des ressources fourragères locales, plusieurs trèfles spontanés (genre *Trifolium*) pourraient être utilisés afin de réduire l'érosion et améliorer les pâturages dans les régions marginales. A cet effet, 28 populations spontanées de *T. tomentosum* ont fait l'objet d'une étude biométrique et de comportement. Ces populations ont manifesté une certaine variabilité qui pourrait être liée aux conditions du milieu d'origine (pluviométrie, altitude, longitude, latitude). La longitude, suivie de la pluviométrie ont été les facteurs écologiques les plus corrélés aux caractères morphologiques et de croissance.

Mots clés: trèfles, plantes, infrutescences, gousses, graines

Introduction

Trifolium tomentosum is a species of grazing and humid meadows (Quezel and Santa, 1962). According to Zatout *et al.* (1989), it is frequently found under low rainfall, high altitude and on soils with strong slopes. The 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

Following previous works (Issolah, 1991; Issolah *et al.*, 1993; Issolah and Abdelguerfi, 1995), a study on 28 spontaneous populations of *T.tomentosum* was conducted on the experimental station of Guelma at the altitude of 227m, in a subhumid zone, with an average annual rainfall of 678.8 mm and with a temperature ranging from 11° C min to 28.8°C max; the soil is clayey with pH of 7.

The populations were sown (07/11/90) on 1 m long lines. The characters studied were: maximum height and width of these lines (H1), (W1) (24/03/91) and (H2), (W2) (05/05/91); speed of the winter daily growth (from 11/02 to 24/03/91) (S1); speed of the spring daily

growth (from 24/03 to 05/05/91) (S2); appearance of the first inflorescence (first flowers at the base of the inflorescence) (1F); beginning of bloom (one inflorescence per plant) (BF); duration of bloom (days) (DF); 1F and BF are expressed in number of days from emergence of the seedlings.

For each population, 30 fruiting heads (thereafter called heads) were randomly picked and the following characters were measured: length (LF) and width (WDF) of the heads; number of pods per head (PF); number of seeds per pod (SP); number of seeds per head (SF); length (LS) and width (WS) of seeds; weight of 30 heads (WF); weight of 1000 seeds (WTS); and ratio weight of seed to weight of heads (RW).

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

Results and discussion

The results of this study revealed the presence of variability within and among the different spontaneous populations of *T.tomentosum* (Table 1).

Table1 Variability of fruiting heads, pods and seeds within *T.tomentosum*.

Characters	Min ¹	Max ²	Mean ³	S.D. ⁴	CV ⁵ %
LF (cm)	1.04	1.40	1.18	0.09	7.4
WDF (cm)	0.98	1.35	1.16	0.09	7.4
PF	17.90	23.10	20.51	1.01	4.9
SP	1	2	1-2	-	-
SF	21.50	34.03	26.51	3.68	13.90
LS (mm)	1.20	1.48	1.32	0.07	5.3
WS (mm)	0.45	0.57	0.50	0.03	5.5
WF (g)	0.76	1.59	1.10	0.20	18.4
WTS (g)	0.50	0.92	0.68	0.10	14.7
RW	0.34	1.55	0.47	0.05	11.4

¹ Min: minimal population mean

² Max: maximal population mean

³ Mean: mean of the species

⁴ S.D.: standard deviation

⁵ CV: coefficient of variation

The variation differed in magnitude according to the character under consideration. Our results for the character number of seeds per pod, with one to two seeds per pod, are similar to those presented by Ghoubay and Abdelguerfi (1991). However, these authors obtained an average of 22.8 seeds per head as compared with 26.51 in our study. This difference could have arisen from the fact that we evaluated 28 populations instead of only 6 in their study. We obtained an identical value for the weight of the heads (1.1g) but slightly higher value (0.68g against 0.65g) for the weight per thousand seeds. The ratio weight of seeds to weight of heads obtained in our study was superior (0.47) to the one reported (0.39) by the authors previously cited.

The correlation analysis (Table 2) indicated that the longitude is the environmental factor the most often significantly correlated with the different morphological and growth characters (10times). It influences the vegetative development in width, the speed of winter and spring growth, the characters associated with the bloom, and also the size and weight of seeds. Rainfall is the second most significantly correlated factor (8times). It affects the vegetative development particularly plant height (H1 and H2) and plant width (W2), speed of winter and spring growth, beginning of bloom and seed size. At the third position (7times), we have the latitude which seems to intervene on the final recovery of soil, the winter and spring speed growth, the number of seeds per head, the size of seeds and the weight of heads. The altitude seems to intervene less than the other factor (twice). It intervenes only on the vegetative development (H1) and the beginning of the bloom. This last character is clearly under the interaction of the following three (03) factors (altitude, rainfall and longitude).

In addition, all the other characters are under the interaction of at least of two environmental factors with the exception of the final height (H2/rainfall), the width (W1) at the end of winter (longitude), the appearance of the first inflorescence (longitude), the duration of the bloom (longitude), the number of seeds per head (latitude) and the weight of one thousand seeds (longitude) which are influenced only by one factor.

Table 2 Behaviour and biometry: relations with factors of the environmental origin in *T.tomentosum*.

Factors	Altitude	Rainfall	Longitude	Latitude
Characters				
H1	-0.419*	-0.402*	-0.317	-0.198
H2	-0.224	-0.488**	-0.302	-0.374
W1	-0.149	-0.352	-0.402*	-0.295
W2	-0.264	-0.559**	-0.582**	-0.532**
S1	-0.186	-0.474*	-0.462*	-0.405*
S2	-0.264	-0.540**	-0.539**	-0.537**
1F	0.215	0.301	0.527**	0.329
BF	0.552**	0.445*	0.428*	0.303
DF	-0.219	-0.331	-0.407*	-0.329
SF	0.113	-0.121	-0.160	-0.488**
WS	0.004	-0.508**	-0.488**	-0.493**
LS	-0.188	-0.450*	-0.580**	-0.511**
WF	-0.077	-0.109	-0.293	-0.389*
WTS	-0.137	-0.261	-0.383*	-0.212

*, **, *** Significant at the 5%, 1% and 0.1% levels of probability, respectively.

Conclusion

The existence of variability is clearly demonstrated throughout this study. The matrix of correlations showed the preponderant part of the longitude on a large number of characters linked to the behaviour and biometry. Rainfall was the second most important factor followed by the latitude, whereas the altitude seems to intervene rarely with regards to the studied ecological factors. Thus, we assume that *Trifolium tomentosum* would be a very useful crop in the rangelands throughout Algeria.

References

- Ghoubay, A., Abdelguerfi, A. (1991). Les espèces spontanées du genre *Trifolium* L. en Algérie. Comparaison des graines et des inflorescences chez treize trèfles. *Actes du quatrième congrès international des terres de parcours*. Montpellier. France, Vol. 1, 375-376.
- Issolah, R. (1991). Etude du comportement de populations spontanées de treize (13) espèces du genre *Trifolium* L. *Thèse ing. INA*. El-Harrach, 1-235.
- Issolah, R., Abdelguerfi A., Bouazza L. (1993). Behaviour of 144 populations of 13 spontaneous species of the genus *Trifolium*: comparative study. In *Management of Mediterranean shrublands and related forage resources-7th Meeting of FAO*. Reur Technical Series 28 - MAIC, 38-39.
- Issolah, R., Abdelguerfi, A. (1995). Etude comparative des graines, gousses et infrutescences de populations de différentes espèces de trèfles spontanés en Algérie. *Cahiers options méditerranéennes*. ISSN: 1022 - 1379. Vol 12, 13-16.
- Quezel, P., Santa, L. (1962). *Nouvelle flore de l'Algérie et des régions désertiques méridionales*. Ed; C.N.R.S, 505 - 514.
- Zatout, M., Berrekia R., Abdelguerfi, A. (1989). Contribution à l'étude des espèces spontanées du genre *Trifolium* L. en Algérie. Répartition en fonction de quelques facteurs du milieu. *Proc. XVI Int. Grass. Cong.*, Nice, France, 281-282.