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Distribution of ecotypes of the genus *Trifolium* and annual *Medicago* in grazing areas in southwest Spain

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SUMMARY – The need for genetic material to improve the grazing lands of the dehesa has led the Research and Technology Development Service of the Regional Government in Extremadura to establish a germplasm bank for annual leguminous forage plants. This bank contains 3361 accessions of the genus *Trifolium*, mainly *Trifolium subterraneum*, and 684 of the genus *Medicago*, with the majority *Medicago polymorpha*. In order to define a model which can be adapted to every area, it was necessary to carry out an analysis of the distribution of these species, evaluating them and relating them to the soil and climatic conditions of the area under examination (pH, texture, height above sea level, rainfall, etc.). The results show that, in relation to the flowering cycle, 95% of the ecotypes of the genus *Trifolium* fall between 118 and 170 days, while 90% of the ecotypes of the genus *Medicago* are concentrated in a shorter cycle between 118 and 140 days.

Key words: Annual leguminous forage plants, days to flowering, flowering period, hardseededness.

RESUME – “Répartition des écotypes des *Trifolium* et des *Medicago* annuels dans les zones de pâturage du sud-ouest de la Péninsule Ibérique”. À l’objet de satisfaire les besoins en matériel génétique pour l’amélioration des pâturages de la “dehesa”, le Service de Recherche et Développement Technologique Agricole de la Junta de Extremadura (Espagne), a créé une banque de germoplasme de légumineuses d’herbage annuelles. On dispose actuellement de 3361 accessions du genre *Trifolium*, dont la majorité appartient au *T. subterraneum*, et 684 du genre *Medicago*, la plupart *M. polymorpha*. On fait une étude de distribution des espèces, ainsi que d’évaluation par rapport aux conditions édaphoclimatiques de la zone, telles que pH, texture, altitude, pluviométrie, etc. Les résultats montrent que les cycles de floraison de 95% des écotypes de *Trifolium* sont compris entre 118 et 170 jours, tandis que 90% des *Medicago* sont concentrés au cycle de floraison entre 118 et 140 jours de longueur.

Mots-clés : Légumineuses d’herbage annuelles, cycle de floraison, durée de la floraison, dureté séminale.

Introduction

The Research and Technology Development Service has collected forage legumes since 1967, with the purpose of holding plant material for selection of varieties adapted to different edaphic and climatic conditions, to obtain higher productivity and to increase the dehesa pasture quality.

The first collections were made mainly of *T. subterraneum* L., but after some failures of persistence of this specie in some areas (Olea and Paredes, 1984), we realized that sowing a mixture of species and varieties better adapted to the area, the chance to attain a productive and equilibrated pasture and to withstand the adverse climatic conditions are higher (Crespo, 1997).

With the aim to collect the genetic variability of the leguminous species, several collections trips, to different climatic areas with acid soils and under grazing, were carried out. The seeds collected are identified with the FAO/IPGRI descriptors for the forages, multiplied and evaluated and then conserved in the germplasm bank at the Service.

The objective of the present report is to present the relations found among the climatic conditions and some agronomic characters and their distribution for the genera *Trifolium* and *Medicago* on the SW of the Iberian Peninsula.

Materials and methods

The number of the accessions studied, held in the germplasm bank, was: *T. subterraneum* L. (2556), *T. glomeratum* L. (440), *T. cherleri* L. (132), *T. striatum* L. (76) and *T. stellatum* L. (42). The genus *Medicago* includes accessions of *M. polymorpha* L. (305), *M. orbicularis* (L.) Bart. (63), *M. truncatula* Gaertn. (60), *M. arabica* (L.) Huds (39) and *M. doliata* Carving. (38).

All this material has been grown at the Finca La Orden nursery, in lines of 3 m long, during at least three years and the agronomic characters most related with the persistency have been evaluated (Ramos and Gomez, 1977): days to flowering (days from sowing to first flower), flowering period (days from first flower to the last flower) and hardseededness (% of hard seed remaining after 90 days in stove subjected to alternating temperatures of 30/60°C).

To compare the agronomic characters with the climatic and edaphic factors of the origin locations for the different species, the distributions and correlations were analysed with the statistical program SPSS.

Results and discussion

Both genera have been found mainly at loam and clay-loam soil textures, except *T. subterraneum* which appears mainly in sandy soils. In the genera *Trifolium* the most frequent interval of soil pH varies among 5.5 to 7.5, except in *T. stellatum* which appears also at pH > 7.5. The genera *Medicago* are located mainly at pH > 6.5, although *M. polymorpha* and *M. doliata* also are present at pH < 5.5.

The elevation of the collection sites ranges from 0 to 1200 m, being mostly distributed between 300 and 600 m of altitude. *M. arabica* has been found at 1200 m of altitude, but it has not been found lower than 200 m.

The distribution of the *Trifolium* in relation with the average total rainfall of the locations, shows that *T. subterraneum* appears more frequently in dry areas (<500 mm), *T. glomeratum* and *T. cherleri* up to 700 mm, being *T. striatum* and *T. stellatum* the ones which appear at higher rainfall, up to 800 mm.

The results of the days to flowering are presented in Fig. 1, showing two patterns: a short cycle (up to 150 days) for the 99.5% of medics, for the 95% of the accessions of *T. stellatum*, for the 84% of the *T. cherleri* and 74% of *T. subterraneum* accessions, and a long cycle >150 days for *T. striatum* (95%) and *T. glomeratum* (86%). The correlation between the days to flowering and the average rainfall is positive in the genus *Trifolium*, but negative in the genus *Medicago* and *T. glomeratum*, which although it was collected at low rainfall sites, its cycle is the longest.

The flowering period (Fig. 1) is short, around 40 days for *T. cherleri*, *T. striatum* and *T. glomeratum*, of medium duration, up to 60 days for *T. stellatum* and long for the medics and *T. subterraneum*. The character days to flowering and duration are always negatively correlated.

The percentage of hardseednes (Fig. 1) is low (average less than 30%) in *T. subterraneun* and *M. doliata*, higher than 90% in *T. glomeratum* and *M. orbicularis* and medium (between 30-70%) for the rest of the species. The average rainfall of the sites of collection and the hardseedednes are negatively correlated in all the Tricolour species and in *M. polymorpha*, that pattern on the rest of medics not being clear.

Conclusions

The results of this study show the variability on the behaviour of the collected species and ecotypes, in relation to the agronomic characters which have special relevance in their persistence as: days to flowering, flowering length and hardseededness.

This variability will allow us to carry out a second evaluation on seed production and dry matter in order to obtain new varieties adapted to our edaphic conditions.

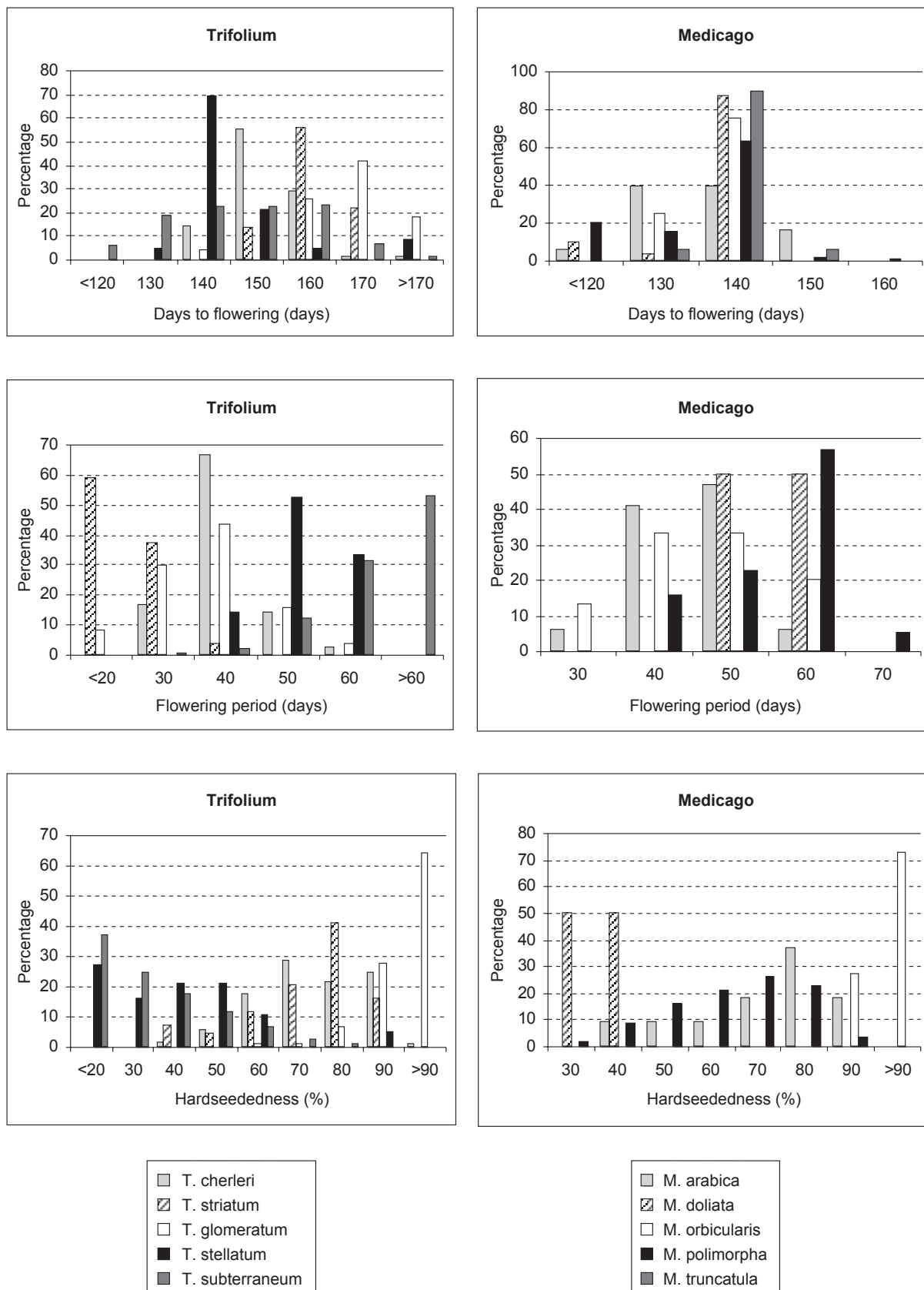


Fig. 1. Frequency of the distribution of the accession in relation with day to flowering, flowering period and hardseededness in the genera *Trifolium* and *Medicago*.

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