Dehesa habitats and dehesa landscapes. Disentangling components of vascular plant species diversity.

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Dehesa habitat
Dehesa landscape

Dense dehesa

Pastures

Olive grove

Shrub land

Forest

Rural path


Aims

• Evaluate the biological diversity of vascular plants at different scales, from dehesa habitat to dehesa landscape.

• Determine how each land use contribute to diversity at municipality scale.

• Compare the diversity of four municipalities in relation with climatic type and agro-pastoral uses.
Study sites

- Four municipalities in western Spain where dehesas are the main land use.
- Covering the entire climatic range where dehesas are actually located.
Methods

• Vegetation quantitative sampling
• Calculation of Hill’s numbers (H: 0,\(\rightarrow\)1, 2) for estimation of \(\alpha, \gamma\) and \(\beta\) diversity (municipalities and land uses).
• Performing diversity profiles (municipalities and land uses).
• Comparison of diversity at dehesa habitat and dehesa landscape scales.
Sampling procedure

- Plots were randomly selected after a previous stratification by main land uses of each municipality performed on the basis of the Spanish Forest Map (MFE50).
- Quantitative sampling of herbaceous, shrub and tree species in each plot of 20 x 50 m².
- All the plots in each municipality were sampled only once in the spring, at the time of peak flowering.
- The determination of species was conducted following Iberian Flora updates and Anthos (www.Anthos.es).
Whittaker multi-scale plot modified

20x 50 m²
Area 1000 m²

5 x 20 m²
Area 100 m²

2 x 5 m²
Area 10 m²

0.5 x 2 m²
Area 1 m²

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Diversity indices and diversity profiles

Calculated diversity indices were Hill numbers or effective number of species ($qD$) for ($q= 0, \rightarrow 1$ y 2), following the formula:

$$qD = \left(\sum_{i=1}^{S} p_i^q\right)^{1/(1-q)}$$

- $^0H$ species richness, list of species
- $^1H$ exponential Shannon index, common species.
- $^2H$ inverse of Simpson concentration, abundant species.
Results municipalities

Barcarrota
Oropesa
Zorita
Aldehuela

ALPHA

GAMMA

BETA

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Results municipalities

• The four municipalities harbor 564 species, 136 of which are common species and 51 abundant species.

• Gamma accumulated reflected a gradient with Oropesa at the top and Zorita at the bottom for species richness (287 versus 248), common species (90.37 versus 58.16) and abundant species (46.12 versus 26.76).

• Climatic gradient is not apparently significant for diversity because Oropesa and Zorita, the most distant in gamma values, belong to the same climatic type II.
Results main land uses

**ALPHA**

**GAMMA**

**BETA**

Rarefaction 8 samples

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Results main land uses

Rarefaction at 12 samples

More than 90% of species found
Results unique species by land uses

- Dehesa habitat includes 58% of species found in landscapes with 8% of unique species. Similarly forest habitat includes 55% of landscape species with 6% of unique species.
- Linear elements like water courses and rural paths harbors 70% of species with a unique species proportion of 18%.
- Rest of land uses like scrublands and pastures harbors similar proportion of species (55%) than dehesa habitat and forest with the same rate of unique species (6%).
Conclusions

- Dehesa landscapes are agro-silvo-pastoral systems with four main vegetation habitats; dehesas, forests, different types of linear features and other lands uses (pastures, meadows and scrublands mainly).
- Local species richness (α) elsewhere is high (77.1 ± 4.2) with only less local values in marginal areas of other land uses (56.4 ± 3.7).
- Diversity of dehesa habitat decrease from local to regional scale showing the lowest β values of all land uses or, in other words, dehesas are very similar in composition along its distribution area regardless of the climate or the substrate.
- Low levels of human intervention and the heterogeneity of land uses enhance the existence of a network of edge areas and linear features where are located seven out of ten of the species of vascular plants that we can find in these sylvo-pastoral landscapes, being at least 25% of them so common to be able to recolonize other adjacent land uses.
- Proyecto SC00-042. Evaluación Territorial de la Sostenibilidad Agroambiental en la Planificación Rural: Estudios Piloto de Sistemas Agrosilvopastorales Españoles.
- AGL2005-06648-C02-02. La planificación del paisaje en los Planes de Ordenación de Recursos Forestales (PORFs) con el mantenimiento o mejora de la biodiversidad como objetivo. BIOFORLAN
- SUM2006-00034-C02. El sistema agroforestal dehesa como sumidero de carbono: hacia un modelo conjunto de la vegetación y el suelo.
Some publications

Thank you

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