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Taxonomical and chorological diversity of native woody flora of Italy at regional scale

Abstract

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This study aims at describing the taxonomical (at species and genus ranks) and chorological diversity of native woody flora of Italy, comparing with phytoclimatic and biogeographic complexity. After providing the most recent data about the native woody flora of Italy, the analysis has been performed at the level of political region. Cluster analisys shows that woody genera are the most effective variables to outline phytogeographical subdivisions, while chorological spectra provide more information in climatic terms.

Introduction

One of the most relevant questions in biodiversity assessment is whether it is possible to infer the overall biodiversity by using suitable data subsets (Noss 1990; Caro & O'Doherty 1999; Bacaro & al. 2008). Complete biological inventories are in fact expensive, and require a lot of time and qualified people to collect and elaborate complex taxonomical information. Shortcuts for biodiversity have therefore become necessary, especially when attempting to meet global or local biodiversity targets and fast assessment actions are required. Vascular plants are often used as a surrogate for total biodiversity in evaluations of conservation, since they are both an umbrella group and the main primary biomass producers (Pharo & al. 2000). The higher taxa approach has been largely used, especially in terms of families and genera representing total floristic richness (Ricotta & al. 2002; Prinzing & al. 2003; Villaseñor & al. 2005). An effective and rapid analysis can be based upon a well known plant group, such as the woody plants (Macía 2008).

As regards Italy, it is known to have a high richness in terms of flora and fauna (Abbate & al. 2007). Italy, extending over about 300,000 km², has an exceptionally variable territory, since it has two major mountain chains with different lithological features (Alps and Apennines), volcanic reliefs, some of which still active, which is a "unique" in Europe, and alluvional plains. A clear W-E geographical gradient can be recognized from Tyrrhenian to Adriatic coasts in terms of topography, lithology, soil genesis and climate. This is mainly referable to the latitudinal extension of Italy in the Mediterranean Sea, to the presence of

both latitudinal and longitudinal orographic systems, and to the influence of the two large continental masses of Eurasia and Africa (Abbate & al. 2007; Blasi & al. 2007).

In order to use easily available biological datasets, after providing a report about the up-to-date statistics of the native woody flora of Italy, the aim of the present work is to analyse, at the level of political region , the taxonomical diversity at the ranks of genus and unit (species and subspecies) and the chorological spectra of Italy comparing with its phytoclimatic and biogeographic complexity.

Materials and methods

The data set, derived from the Checklist of the Italian Vascular Flora and revisions (Conti & al. 2005, 2007; VV.AA. 2005-2008), includes all the native woody units certainly occurring in Italy at present.

We performed a selection, on the entire database, of the units assigned to the plant life subforms *sensu* Raunkiaer (1934): P scap, P caesp, P lian, and NP; forms and subforms as in Pignatti (1982) [P stands for Phanerophyte (scapose, caespitose and lianose) and NP for Nanophanerophyte]; only for few genera or units, we critically changed the life subforms. Some units living in the wild as NP or chamaephytes have been assigned to NP (e.g., *Andrachne telephioides* L., *Santolina ligustica* Arrigoni).

The software employed for the cluster analysis is NCSS 2007; the analyses were performed on 3 matrices, units × regions, genera × regions, chorotypes (16 categories) × regions.

Results and discussion

The native woody flora of Italy consists of 508 units (6.68% of total units), 467 species and 41 subspecies, 135 genera and 60 families. 116 units are trees, 374 are shrubs and 18 are lianas. The regions with the highest number of woody units (exceeding 200) are (Fig. 1): Toscana (245), Liguria and Lazio (227), Friuli-Venezia Giulia (225), Sicilia (223), Abruzzo (215), Campania (209), Lombardia (208).

The richest families are: *Rosaceae* (140 units), *Fabaceae* (62), *Salicaceae* (43), *Pinaceae* and *Fagaceae* (18), *Caprifoliaceae* (14), *Rhamnaceae* (16), *Cistaceae* (12). The richest genera are: *Rubus* (54 units), *Rosa* and *Salix* (39), *Genista* (27).

The chorological spectrum of woody plants of Italy shows the prevalence of Stenomediterranean (21.0%), European (18.4%) and Endemic (14.8%) taxa (Fig. 2). Namely, woody endemic plants (including subendemics *s.l.*) are 74, 50 of which (67.57%) are stenoendemic units (occurring in one region) and 24 (32.43%) euriendemic (occurring in more than one region). The endemites are divided into 17 families and 26 genera. The families and genera richest in endemites are: Fabaceae (27 units), Salicaceae (16), Rosaceae (9), *Genista* (20), *Salix* (16), *Adenocarpus* and *Santolina* (4); namely the tribe Genisteae in Italy (genera *Adenocarpus*, *Cytisus*, *Genista*, *Retama*) has as many endemites (27 units) as are found in the whole Mediterranean area (Cristofolini 1997).

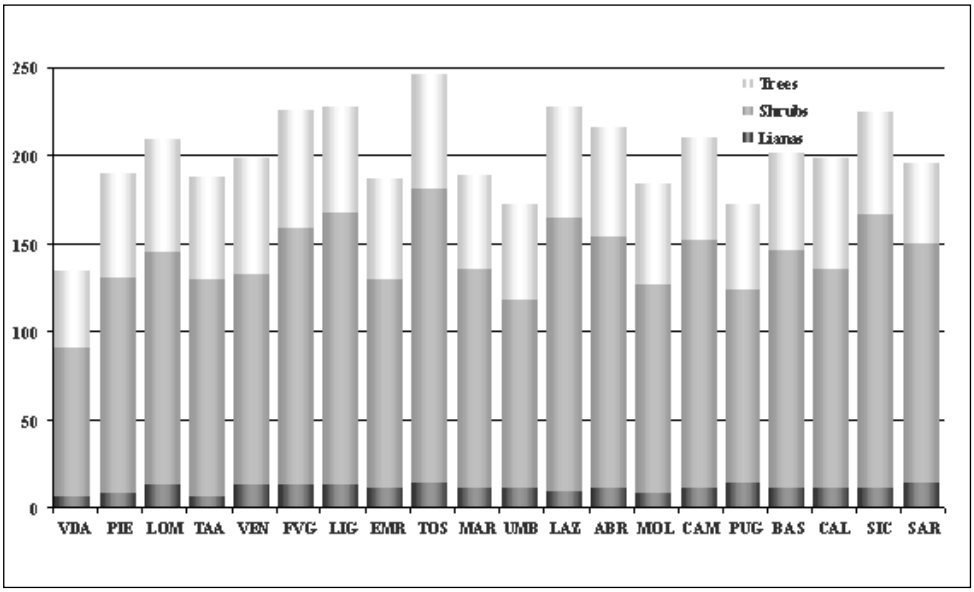

Fig. 1. Richness of native trees, shrubs and lianas (units) in the 20 administrative Italian regions.

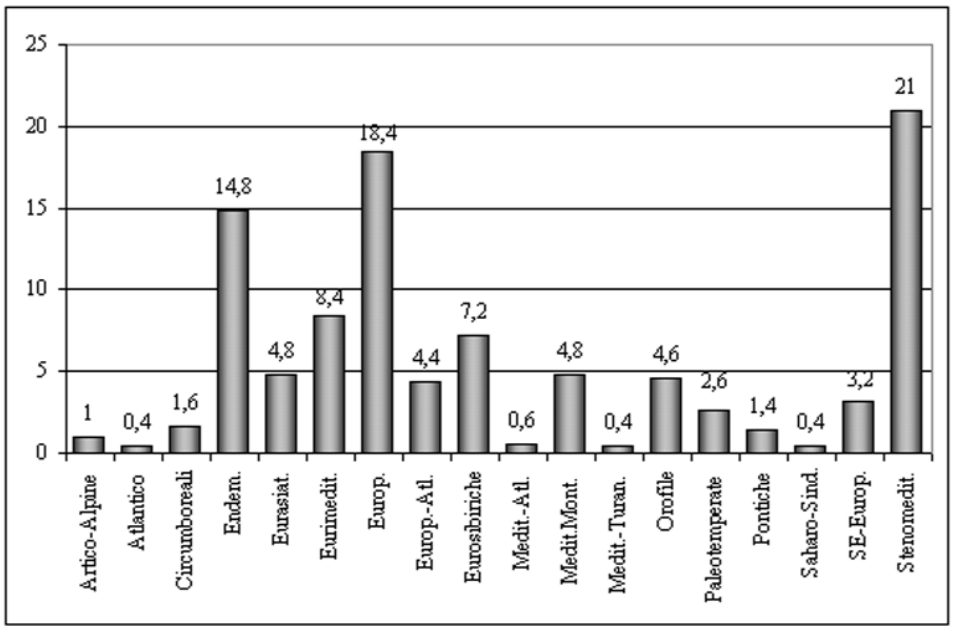

Fig. 2. Chorological spectrum of native woody flora of Italy.

Worth mentioning are the trans-Adriatic units, showing distributions with punctiform disjunctions, such as: *Quercus trojana* subsp. *trojana* (Puglia), *Q. ithaburensis* subsp. *macrolepis* (Puglia), *Styrax officinalis* (Lazio, Campania).

The native woody flora of Italy shows a known asymmetry typically affecting the distribution of species in the higher taxonomic groups.

The classification of woody units cluster the Italian regions as follows: 1) Northern and peninsular Italy + Sicilia, 2) Sardegna; 1.1) Northern and peninsular Italy, 1.2) Sicily; 1.1.1) Northern Italy, 1.1.2) Central-Southern Italy (Fig. 3a, b). At regional scale, the classification of units highlights affinities principally related to climatic factors and secondly to paleogeographic ones; the Po Valley-Alpine regions indeed are clearly separated from the rest of the peninsula, while Sardegna reveals its early floristic autonomy, as stated by Arrigoni (1980), due to the Ligurian sphenocasm (Miocene, ca. 23 Ma).

The analysis of woody genera cluster the Italian regions as follows : 1) Northern + Adriatic Italy, 2) Thyrrenian Italy + Southern + major islands; 1.1) Northern Italy, 1.2) Adriatic Italy, 2.1) Southern Italy, 2.2) Thyrrenian Italy, 2.3) major islands (Fig. 4a, b). Such analysis highlights the paleogeographic features of the regions, mainly referring to the following groups: Northern Italy and Adriatic regions, Thyrrenian regions. This agrees with the phytogeographical subdivisions made by Arrigoni (1980), who has argued that the Eurosiberian Region lengthens along the Adriatic left out the Gargano, and that in Italy the Mediterranean Region includes an Italic-Provençal Dominion (which comprises the Thyrrenian coasts of Italy), a Sardinian-Corsican one and an Apulian-Sicilian one.

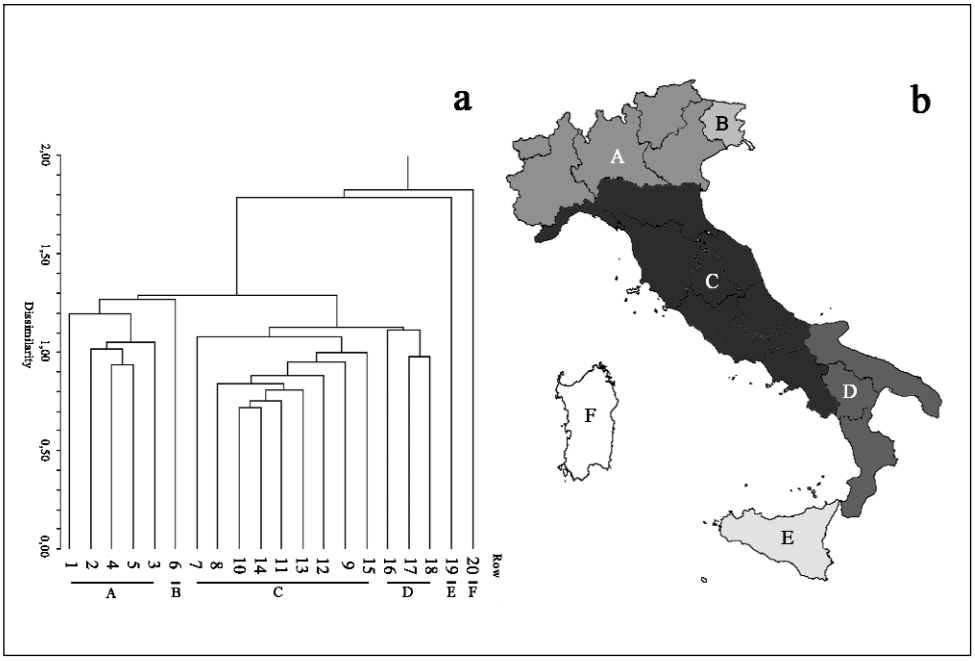

Fig. 3. Cluster analysis of the woody units of Italy (a) and respective geographic display (b).

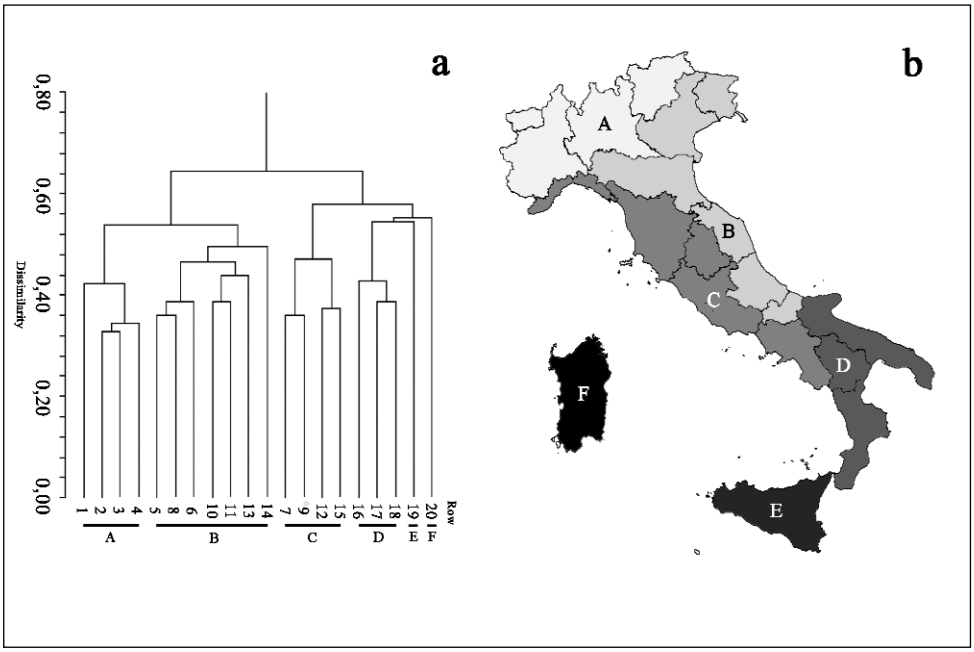

Fig. 4. Cluster analysis of the woody genera of Italy (a) and respective geographic display (b).

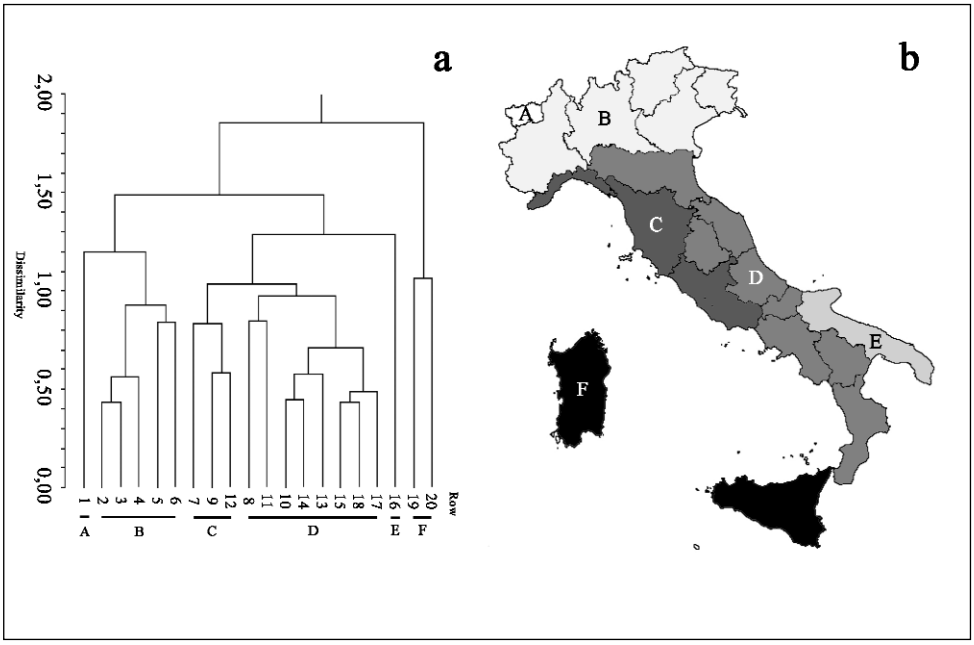

Fig. 5. Cluster analysis of the woody chorotypes of Italy (a) and respective geographic display (b).

The cluster analysis of chorotypes groups the Italian regions as follows : 1) Northern and peninsular Italy, 2) major islands; 1.1) Northern Italy; 1.2) Central-Southern Italy; 1.1.1) Valle d'Aosta, 1.1.2) Northern Italy, 1.2.1) Puglia 1.2.2) Peninsular Italy excluding Puglia (Fig. 5a, b). This analysis agrees in first instance with the phytoclimatic features of Italy (Blasi & Michetti 2007); from a paleogeographic point of view it is interesting that Puglia, which is rich in trans-Adriatic elements, splits at high ranks of dissimilarity.

Conclusions

The performed analyses are consistent with the paleogeographic and climatic features of Italy. Namely woody genera reveal the most effective variables to outline phytogeographical subdivision; the chorotypes provide more information in climatic terms. Further analyses on the whole Italian vascular flora will eventually prove the effectiveness of the woody flora as a good predictor of floristic diversity and phytoclimatic and biogeographic complexity at a medium scale.

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