



# Book of Abstracts

University of Bologna  
9-10 February 2017

# Plant Traits 2.0

State of the art and future perspectives for research  
on plant functional traits in Italy



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA  
DIPARTIMENTO DI SCIENZE BIOLOGICHE,  
GEOLOGICHE E AMBIENTALI



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Barni E., Marignani M., Acosta A.T.R., Bragazza L., Campetella G., Cannone N., Cerabolini B.E.L., Chiarucci A., Pierce S., Ricotta C. (Eds.), (2017). *Plant Traits 2.0: state of the art and perspectives for research on plant functional traits in Italy*. Book of Abstracts, Bologna, 9-10 febbraio 2017. Società Botanica Italiana, Firenze, Italy.

**ISBN: 978-88-85915-19-0**

## Thorns, spines and prickles in the Italian flora

S. Bagella<sup>1\*</sup>, R. Filigheddu<sup>1</sup>, R. Benesperi<sup>2</sup>, P. Giordani<sup>3</sup>, L. Minuto<sup>4</sup>, D. Viciani<sup>2</sup>, G. Casazza<sup>4</sup>

<sup>1</sup>Department of Science for Nature and Environmental Resources, University of Sassari, 07100 Sassari, Italy

\*e-mail: sbagella@uniss.it

<sup>2</sup>Department of Biology, University of Florence, 50121 Firenze, Italy

<sup>3</sup>DIFAR, University of Genova, 16148 Genova, Italy

<sup>4</sup>DISTAV, University of Genova, 16132 Genova, Italy

Thorns, prickles and spines are sharp appendices of different origins whose presence in the Mediterranean floras has an ecological, evolutionary and biological meaning. Nevertheless, little information is available on the number and on the characteristics of the spinescent plants at local and regional scale. The aims of our research were: i) to create a check-list of spiny, thorny and prickly plants belonging to the wild flora of Italy and ii) to characterize this group basing on different morphological traits and ecological features.

The check-list, based on the analysis of the flora of Italy (1, 2), includes 404 taxa belonging to 31 families, Asteraceae (44%), Rosaceae (19%) and Fabaceae (12%) being the most represented ones. Each taxon was associated to one or more of the following types of spinescence: thorns, prickles, spines (leaves fully converted to spines, spinose or pungent apical process, laminar spines, stipular spines, petiolar spines, leaflet spines, laminar spines). Moreover, the following attributes were: biological form, thermoclimate (termotypes *sensu* Rivas-Martinez) and habitat type (Corine Biotopes Level 1). Some 50% of the plants present just one type of spinescence. The more common types were some of those derived from leaves (i.e., spinose leaf margins 26%, leaflet spines 19%, apical processes 19%) followed by prickles (17%) and thorns. Hemicriptophytes (42%) and Phanerophytes (33%) were the dominant biological forms. The distribution between Mediterranean and Temperate thermoclimatic belt was balanced (52% vs 48%) with some 70% of the species occurring at least in two or three different thermoclimatic belts. The richest habitat in spinescent species were grasslands (28%), ruderal areas (21%) and woods (17%).

We conducted a Principal Component Analysis (PCA) on type of spinescences to evaluate the correlations between them. Furthermore, in order to elucidate whether the habitat and thermoclimate may influence the spinescence composition a Redundancy Analysis (RDA) was used. The “envfit” function in “vegan” was used to determine the possible relationships between the spines composition vs. habitat and thermoclimate. To test the probability that type of spinescences would co-occur we used the approach implemented by Veech (3).

PCA showed spinose apical process, leaflet spines, spinose leaf margin, thorns and prickles as the most effective traits in discriminating between species. In particular, the presence of spinose apical processes and leaflet spines characterized herbaceous species, whereas the presences of thorns and prickles were strictly associated with tree and shrub species. RDA detected significant correlations ( $p < 0.05$ ) with the spinescences composition vs. three habitats and vs. four out of seven termotypes. Mediterranean thermoclimate was associated with thorny species, whereas temperate thermoclimate was correlated with species with prickles or spinose leaf margin. Species bearing prickles and spinose leaf margin species with spinose apical processes preferentially occurred in anthropic habitats and a weak correlation between bracts and forest habitats was also observed. Notably, the presence of thorns excluded the presence of the majority of other type of spines.

The relationship between spinescences and both ecological feature and taxonomy supports the hypothesis of interactive processes of both selective pressures and phylogenetic constraints in the evolution of spinescences in the Italian flora.

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