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Statistical analysis of some reproductive features of Apuan flora

Abstract

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The flora of Apuan Alps is rather known, as it has been studied since 1700s and it is composed of 1922 species, 3.27% of which are endemics to the region and 1.50% endemics to Italy. Our research represents the first contribution to the knowledge of the reproductive biology of the species of this region. As regards sex expression, hermaphrodite are about 90 %, monoecious 7% and dioecious 3%. H life form is the most represented (above 36%), followed by T and G. June and July are the months with a highest percentage of blooming species. Entomophilous species are the most represented and bloom during late springtime and summer, whilst more anemophilous species bloom in winter, autumn and early springtime. Passive dispersal of seeds is predominant (above 54%), followed by the anemochorous one. There are more dry fruits than the fleshy ones (only 10%). The most frequent type of dry fruits is the achene in dicots and the capsule in the monocots ; the most frequent fleshy fruit is the drupe. Fleshy fruits mostly ripe in late summer-early autumn, whilst dry fruit from springtime up to the winter.

Introduction

The Apuan Alps (Tuscany, Italy) are mountains located in front of the Tyrrhenian Sea, and delimited by the Tuscan-Emilian Apennine, by the Magra, Aulella, and Serchio rivers; they are about 55 Km long and 25 Km wide, with a maximum altitude of about 2000 m.

Due to their complex morphology and exposure, the climate is highly variable, but the rainfall/year is around 800 mm at Massa - 65 m a. s. l. and near the sea -, 1600 at Pontremoli (237 m a. s. l.) and around 4000 at Orto di Donna (1100 m a. s. l.) (Marchetti & al. 1979, Ferrarini & Bassani 1997).

Since XVII century (Boccone 1697) the Apuan Alps have been studied from the floristic point of view (Simi 1851, Bertoloni 1819, 1832, Rossetti 1892, Pellègrini 1942, Ferrarini 1963, 1964, 1968, Ansaldi & al. 1994, Ferrarini & Marchetti 1994, Ferrarini & al. 1997), and since 1970's (Garbari 1971) from the caryological and in general the biosystematic point of view (Viegi & Cela Renzoni 1981, Garbari & Bechi 1992, Bechi & al., 1992, 1996).

In the present research we statistically analyse the following features: blooming period, life forms, sex expression, type of pollination, type of seed dispersal and types of fruits.

Observations and discussion

The list of the considered species, based on the Floras by Pellegrini (1942), Del Carratore (1990-1991), Ferrarini & Marchetti (1994), Ferrarini & al. (1997) and unpublished data from Pellegrini Herbarium in PI Herbarium (Garbari & Del Carratore, 1993), is composed by 1922 taxa. They represent 33.05% of 5815 of Italian Flora and 68.01 % of Tuscan Flora (2826 species) (Pignatti & Pignatti 1990).

The species are characterised from the point of view of type distribution and of classes and family distribution. The endemics represent 3.23% of the Apuan Flora; 36% of these are schizoendemics and 28% are apoendemics: this reveals the presence of a continuous process of speciation. The number of Pteridophyta is relatively high (3.38%) and represents 0.54 % of that reported in the World (12.000, according to Pichi Sermolli 1970). The Gymnosperms are 10 (i.e. 0.52%). The Angiosperms are 1847, of which 1491 are dicots and 356 are monocots. 39.86% of the families consists of more than 5 species.

May, June and July are the months with the highest percentage of blooming species. This is strictly correlated with the peculiar climate of the area.

Perennials are more represented (67.37%), followed by annuals (30.15%), whilst biennials are very few (4.77%).

As concerns life forms, the Hemicryptophytes are the most represented (36.68%), followed by Therophytes (26.44%) and Geophytes (13.44%); the others are in low percentages (7%-0.1%). The biological spectrum of Apuan Alps flora reflects that of Tuscan and Italian Flora according to Pignatti & Pignatti (1990-91).

As regards sex expression, hermaphrodite are the most numerous (90.31%), monoeious are 7.82% and dioecious 1.88 %.

Entomophilous species are more (73.40%) than anemophilous (20%). Some species are simultaneously anemophilous and entomophilous (*Ligustrum*) and some are first anemophilous and then entomophilous (*Erica*). 10.07 % bear nectar as reward for pollinators (27 *Boraginaceae*, 5 *Cistaceae*, 76 *Cruciferae*, 1 *Labiatae*, 1 *Primulaceae*, 81 *Umbelliferae*), 0.11% pollen. Most anemophilous species bloom in winter, autumn and early springtime whilst entomophilous, bloom during late springtime and summer.

Passive dispersal of seeds is predominant (54.68%), followed by anemochorous (16.35%) and zoochorous (10.34); 2.55% are polychorous, 1.46 % are hydrochorous.

There are more dry fruits (90%) than fleshy ones (10%). The most frequent type of dry fruits is the achene in dicots and the capsule in monocots; the most frequent fleshy fruit is the drupe. Fleshy fruits mostly ripe in late summer-early autumn, whilst the dry ones ripe from springtime up to the winter.

In conclusion, following the data obtained, let us say that the reproductive features of the species of Apuan Alps are quite similar to those found in species of other Italian regions or the whole Italy (Franchi & Pacini, 1996). This agrees with the fact that the reproductive adaptations of the Apuan plants to this environment are not so significant from a statistical point of view. Bassani & Pacini (1992), in their analysis of the breeding systems of some selected Apuan Alps species, have reached the same conclusions.

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