Phytosociological Approach for the Assessment of Pastoral Value of Pastures of the Nebrodi Mountains (Sicily)

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Introduction

Within the framework of an agreement between the Azienda Silvo-pastorale of Troina and the Department of Agraria di Reggio Calabria, a research was carried out to provide guidelines for the sustainable planning of agro-forestry-pastoral resources, with reference to the pastures of the Nebrodi Mountains area. The property of the Azienda Silvo-pastorale of Troina, which covers about 4200 ha, is mostly covered by woods and to a lesser extent by pastures. The Nebrodi pastures, from a phytosociological point of view, refer to the Molinio-Arrhenatheretea, a phytosociological unit that includes the pastures of the broadleaf deciduous tree zone. The research presents the possibility of integration and use of data collected both for botanical purposes and for pastoral planning.

Materials and Methods

Vegetation was assessed at altitudes between about 800 and 1500 m, performing 62 phytosociological surveys according to the Braun-Blanquet methodology (Braun-Blanquet, 1951). For each uniform area, sample areas not less than 60 m^2 were randomly chosen (Chytry ´e Otypkova, 2003; Cristaudo et al., 2015). Ground cover of each species was recorded according to Pignatti (1953). The identification of plant species was carried out following Flora of Italy (Pignatti et al., 2017-2019).

To obtain the pastoral value, the specific contribution of presence (CSP) was adopted, an index that represents the percentage of coverage of the land attributable to each identified species. The CSP was calculated by relating to 100 the central values of each class, comparing them to the sum of all the central values related to the single survey:

$$CSP = \text{central value} / \sum \text{central values} * 100$$

Subsequently, a specific quality index (IS) was assigned to each species based on their main quantitative and qualitative characteristics, ranging from 0 (species rejected) to 5 (excellent forage species). To this aim, the values proposed by Cavallero et al. (2002) and by Roggero et al. (2002) were adopted. Finally, the pastoral value (PV) was obtained through the following formula:

$$PV = \sum(CSPi \times ISi)/5$$

PV is a synthetic index, ranging theoretically between 0 and 100, which describes the forage potential of the pastoral area under examination and it is considered proportional to the potential stocking rate applying the following formula:

$$\text{Potential stocking rate} = VP \cdot Ct$$

where Ct is a value variable between 0.01 and 0.02 in relation to the environmental conditions of the grassland cover and allows us to obtain the maintainable stocking rate of the studied area expressed in LU ha^{-1} $year^{-1}$. In the case in question, an average value of 0.015 was used.

Results

Overall, 123 species have been identified, 18 of which belong to the Fabaceae, 20 to the Poaceae and the remaining 85 to other botanical families (Asteraceae, Apiaceae, Plantaginaceae, Polygonaceae, etc.). The best pastures, characterized by highest forage potentiality, are those with a high abundance-dominance (70-80%) of grasses such as *Lolium perenne*, *Cynosurus cristatus*, *Dactylis glomerata* and *Festuca morisiana* subsp. *sicula*, which are associated with various rosulate hemicryptophytes (mostly composite

such as *Hypochaeris radicata*, *H. laevigata*) and some species of the genus *Trifolium*. In the presence of greater edaphic humidity (edges of ponds, watersheds) there are groupings that differ for the presence of wet habitat species, such as *Mentha pulegium*, *Juncus* sp. pl., *Carex flacca* subsp. *serrulata*, *Oenanthe pimpinelloides*, etc. These groupings can be interpreted as hygrophilous variants of the pasture. In drier environments and with high levels of grazing there is a marked selection, to the detriment of the most palatable species. In these situations, *Eryngium campestre*, *Centaurea solstizialis*, *Plantago cupani*, *Cichorium intybus* prevail. Under conditions of excessive grazing and high fertility return, there is a considerable reduction in the vegetation cover and nitrophilous pecies such as *Cirsium vallis-demoni*, *C. italicum*, *Galactites tomentosus*, *Carduus pycnocephalus* are predominant. Where excessive intake is accompanied by high erosion, so as to reduce the thickness of the soil, and pronounced xericity, aspects of reduced pabular value and floristic heterogeneity have been detected. They are characterized by the prevalence of species with a short vegetative cycle such as *Bromus hordeaceus*, *Trifolium stellatum*, *Triticum vagans*. These species are associated with some perennial species linked to the degradation of the pasture, such as *Asphodelus ramosus* which, thanks to underground vegetative organs, can tolerate conditions of greater xericity.

On the basis of what is reported in the literature (Argenti et al., 2006), the 62 surveys were classified into the following three categories in relation to the pastoral values obtained:

Poor quality pastures	(VPs <= 15)	N. 2 samples
Medium quality pastures	(15 > VPs >= 25)	N. 16 samples
High quality pastures	(VPs > 25)	N. 44 samples

The average pastoral value of the 62 surveys was equal to 31 with a consequent maintainable stocking rate of 0.47 UBA ha^{-1} $year^{-1}$, equal to about twice the seasonal stocking rate for a grazing period of 6 months. This value places the pastures of the study area among those of medium-high quality, even if there is a certain variability depending on the different local situations that can act as limiting factors, and which can be attributed both to limitations of location and to mismanagement, in terms of animal pressure and grazing management.

Conclusions

The survey permitted us to investigate the area under study using an approach that would allow us to integrate botanical investigations obtaining useful data also for pastoral planning purposes. Further refinements are needed to combine the sizing of the potential stocking rate, considered of a good average level, with a more rational management technique, as significant imbalances of utilization between different pastoral areas are evident, which reflect on the vegetation composition.

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