Assessment of pasture renovation systems in an area of northern Apennines

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Assessment of pasture renovation systems in an area of northern Apennines

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Abstract. Vegetation evolution in pastures produces often negative effects on botanical composition and on pastoral value, and this is emphasized in relation to reduced stocking rates. In order to assess the development of pastoral resources along time and to analyze the effect of management activities on botanical composition and on grazing value, a survey was conducted in summer 2015 on a pastoral area of about 65 ha grazed by Limousine cows and placed inside the Dynamo Camp of Limestre (a WWF Oasis), in the Northern Apennine (Tuscany Region). The area is located at an altitude ranging from 900 to 1,100 a.s.l. with pastures that are periodically sown with appropriate seed mixtures or mechanically treated to remove shrubs and undesirable species. Linear transects were assessed in order to compare the effect of sowing and of shrubs cutting on botanical composition and on pastoral value. The comparison between different techniques of pasture renovation, showed a better performance of sowing in terms of overall botanical composition (a presence of more than 70% of grasses and legumes in sown pastures, less than 50% in brush-cutted ones) and of pastoral value (55 *vs*. 40); on the contrary the latter kind of restoration presented higher floristic richness in terms of species occurring along transects. Regression analysis between years since sowing and botanical composition or pastoral value gave evidence of the close relationship of these two variables with age of pastures, providing useful technical suggestions for the future renovation programs in the area.

Keywords. Botanical composition – Grazing value – Vegetal evolution – Seed mixtures.

Évaluation des systèmes de rénovation de pâturage dans une zone du nord des Apennins

Résumé. *La réduction du chargement animal conduit très souvent à des effets négatifs sur la composition botanique et sur la qualité des ressources pastoraux. Afin d'évaluer ces effets, une étude a été conduite dans une zone pastorale (environ 65 ha) exploitée par des vaches de race Limousine et localisée à l'intérieur du Dynamo Camp de Limestre (une Oasis WWF), dans les Apennins du Nord (Toscane, Italie). Le site est situé à une altitude comprise entre 900 et 1100 mètres et il est composé de pâturages qui sont périodiquement semées avec des mélanges d'espèces fourragères ou soumis à un traitement mécanique pour réduire les arbustes et les espèces indésirables. L'évaluation des techniques d'amélioration a été effectuée au moyen de relevés linéaires afin de comparer l'effet de semis et du débroussaillement sur la composition botanique et sur la valeur pastorale. En plus, la connaissance de la constitution des mélanges utilisées et de l'année de l'intervention dans chaque secteur pastorale a également permis d'analyser les changements de la végétation dans le temps. Pour ce qui concerne la comparaison entre les techniques de rénovation des pâturages, les interventions de semis ont produit les meilleures performances en termes de composition floristique (plus de 70% de la présence de graminées et de légumineuses dans les pâturages, moins de 50% dans les surfaces débroussaillées) et de la valeur pastorale (55* vs. *40). Par contre, le débroussaillement a montré une plus grande richesse floristique dans le transect linéaire. En réalisant des régressions entre l'année de l'intervention et la composition botanique on a obtenu des suggestions techniques utiles pour les futurs programmes d'amélioration des surfaces fourragères de l'Oasis.*

Mots-clés. *Composition botanique – Valeur pastorale – Dynamique de la végétation – Mélanges fourragères.*

I – Introduction

Botanical composition and grazing value of pastures are deeply affected by management, such as stocking rate and grazing system (Cavallero *et al*., 2002), or by agronomical interventions, such as ploughing, sowing, shrub control, etc. (Prach *et al*., 2014). In this way semi-natural pastures can be regulated and developed. This is especially true in many pastoral lands that are subjected to a reduced animal utilization (Peeters, 2008) and characterized by undergrazing which can lead to many undesirable consequences both from a productive but also ecological point of view (Mc Allister *et al*., 2014). To provide useful data for management purposes, an assessment on a pastoral area located in the north Apennines was performed, in order to evaluate the effect of different renovation techniques on botanical and pastoral characteristics.

II – Materials and methods

The experimental site is located inside the Dynamo Camp area (a WWF Natural Oasis), in Limestre (Pistoia, north Tuscany). The analyzed pastures cover an area of about 70 ha, mainly on sandstone, and are located at an altitude from 900 to 1,100 m a.s.l. The available pasture for grazing was divided by a fence into the inner area (38.6 ha) and the outside area (23.7 ha). The inner area was managed by periodical ploughing and reseeding of seed mixtures adapted to the local conditions, whereas in the outside area shrubs and other undesirable species were periodically eliminated (mainly *Pteridium aquilinum*).

To compare effects of these two treatments a survey was performed in summer 2015 by means of 10 transects according to Daget and Poissonet (1969) to survey botanical composition of investigated swards in terms of species abundance and species proportion. The pastoral value within different pasture sectors was estimated according Argenti and Lombardi, 2012. Sown species and species from natural recolonization of the sward were evaluated as well as the development of botanical composition along time.

Data were statistically analyzed by means of t-tests to compare effects of intervention methods on botanical data and by linear regression to evaluate floristic development along time.

III – Results and discussion

Remarkable differences were found in pastures treated with different kinds of intervention (Table 1). Pastures sown after ploughing showed a botanical composition dominated by grasses with higher values than those recovered by cutting the shrubs. Presence of legumes showed no significant differences between the two techniques but in general ploughed and sown pastures presented higher proportion of species with better forage quality (*i.e.* grasses and legumes) than those subjected to a periodical mechanical treatment (71.6 *vs.* 49.9 in total), which were dominated by forbs. Introduction of forage species by sowing caused a remarkable change in the botanical composition and this effect is prolonged for many years. Results are consistent with previous studies conducted in a nearby area under similar environment conditions (Argenti *et al*., 2012) and emphasize the importance of periodical intervention of ungrazed areas to reduce shrubs encroachment and presence of undesirable species. Anyway, a high pastoral value was observed also in areas recovered by shrubs clearing. Even though this value is significantly lower compared with ploughed and sown area (40 *vs.* 55) it demonstrates the positive effect of mechanical intervention in habitat restoration, as already observed in similar environments Cervasio *et al*. (2016).

Table 1. Results of pasture assessment in the two sectors of pastures

Parameter		Ploughing/sowing	Shrub removal	Sign.
Specific proportion	Grasses	49.9	31.6	*
	Legumes	21.7	18.3	ns
	Forbs	28.4	50.1	**
N. of species	Grasses	7.2	7.8	ns
	Legumes	3.5	4.3	ns
	Forbs	9.0	14.5	*
	Total	19.7	26.5	*
Pastoral value		55	40	

*Sign.: ** P<0.01; * P<0.05; ns: not significant (P > 0,05).

Concerning floristic diversity (represented by number of species occurring along a transect) pastures renewed by shrubs removal showed higher values of forbs, with a remarkable effect on total diversity, as the average number of grasses and legumes is not significantly different.

Specific contribution (SC) of sown species and pastoral value tend to decrease along time (Fig. 1) and this development is independent on the kind of restoration system applied. This aspect allows identifying a proper time span for every intervention in order to maintain a desired proportion of sown species or quality of pastures. In our case, an appropriate interval of 6-8 years between each treatment of pasture recovery was hypothesized. The same development in similar environments was reported by Ponzetta *et al*. (2010).

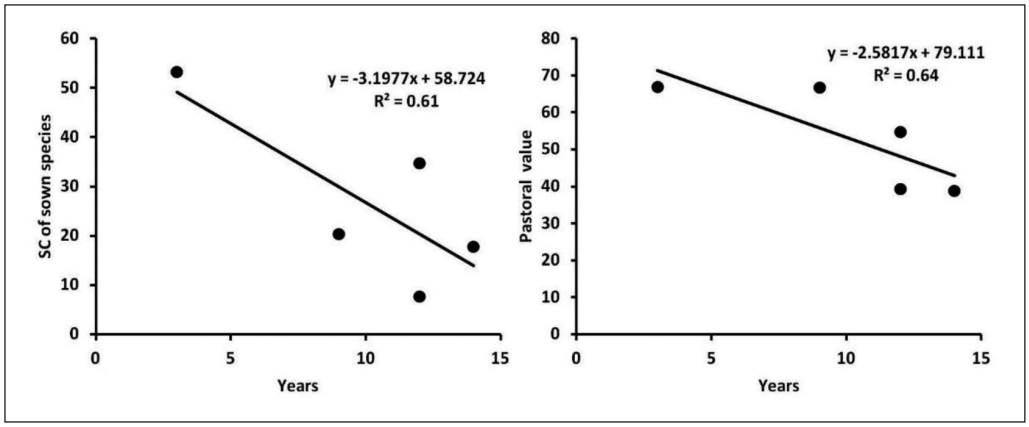

Fig. 1. Relationships between specific contribution (SC) of sown species (left) and pastoral value (right) with years since pasture recovery.

IV – Conclusions

The analysis of the pastoral resources in the area indicates that the actual stocking rate is under the potentiality evaluated by the pastoral value. Moreover, mechanical interventions caused remarkable improvement of the pastures, although for some features re-sowing performed better. Finally, analysis of some botanical and qualitative characteristics of the pastures along time development provide useful data and information for future renovation programs in the area.

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