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***Tetragonolobus purpureus* Moench: a legume species to be exploited as a forage and other uses**

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Abstract. In a multi-year project aiming to valorize the flora of Sardinian pastures, some native species were collected and evaluated. Among these, an ecotype of *Tetragonolobus purpureus* Moench proved to be particularly interesting. This species is a Mediterranean legume growing in hilly pastures up to 1200 m a.s.l., but it is not properly exploited. In this preliminary study, the species has performed interestingly in every growth stage: in winter for grazing, in early spring for hay and in late spring for grain. Moreover it is appreciable for its gastronomic value, especially because of its immature pods which can be either cooked whole or shelled. Other uses of potential interest are related to soil fertility improvement and landscape enhancement due to its velvety purple flowers. The seeds, compared to those of classic self-reseeding legume species, have the considerable advantage of being able to be harvested with the cereals threshers. All these features, together with the good organoleptic characteristics and its versatility of use, make this species very interesting for the Mediterranean areas. This paper aims to set up a study group in order to ensure its successful widespread in the Mediterranean environment.

Keywords. *Tetragonolobus purpureus* Moench – Biodiversity – Multiuse.

***Tetragonolobus purpureus* Moench: une légumineuse à exploiter comme fourrage et à usages multiples**

Résumé. Dans un projet pluriannuel visant la valorisation de la flore des pâturages sardes, plusieurs espèces indigènes ont été recueillies et évaluées. Parmi ces espèces, un écotype de *Tetragonolobus purpureus* Moench semble être particulièrement intéressant. Il s'agit d'une légumineuse méditerranéenne qui pousse dans les pâturages vallonnés à une altitude allant jusqu'à 1200 m mais elle n'est pas encore adéquatement exploitée. Dans cette étude préliminaire, des résultats intéressants ont été obtenus à tous les stades de croissance: en hiver comme pâturage, au début du printemps pour le foin et à la fin du printemps pour le grain. Par ailleurs, cette espèce est appréciable d'un point de vue gastronomique, surtout pour ses gousses immatures qui peuvent être cuites entières ou décortiquées. D'autres utilisations comme l'amélioration de la fertilité des sols et l'amélioration du paysage en raison de ses fleurs violettes veloutées sont d'un intérêt potentiel. Les graines, par rapport à celles des légumineuses classiques à auto-régénération, ont l'avantage considérable d'être récoltées avec les moissonneuses-batteuses pour céréales. Toutes ces caractéristiques en plus de ses bonnes qualités organoleptiques et de son usage multiple, font d'elle une espèce très intéressante pour les régions méditerranéennes. Ce travail vise à mettre en place un ensemble d'études dans le but d'assurer la réussite de sa large répartition dans les environnements méditerranéens.

Mots-clés. *Tetragonolobus purpureus* Moench – Biodiversité – Multi-usage.

I – Introduction

In Sardinia within a multi-year study aiming to enhance the floristic knowledge of pastures, some native pastoral species have been collected and evaluated. The first evaluation, carried out in different environmental conditions, focused on the traditional self-reseeding legumes (subterranean clovers and annual medics) because of their productive aspects, both quantitative and qualitative, as well as their constancy of production.

The main obstacle for the commercial deployment of these species lies on the difficulty of seed

harvest that is performed by suction because the ripe pods fall down to the ground. The seeds of these Mediterranean genotypes are exclusively produced in Australia where large-scale economies can be easily achieved.

To overcome the difficulties of seed production, the interest was focused on species that can be easily harvested with cereals threshers. Our attention was addressed to an ecotype of *Tetragonolobus purpureus* Moench. Its solitary or paired flowers are very showy in spring due to their velvety and intense red-purple colour related to its botanical name. Likewise, the genus name refers to the characteristic pods.

This strictly Mediterranean species grows in hilly pastures up to 1200 m a.s.l. (Pignatti, 1982) and up to date it is not properly evaluated and valorized for forage purpose (Martyniak *et al.*, 1998). Moreover it can be used for environmental purposes, both to improve soil fertility and to increase the amenity of landscape thanks to its outstanding red-purple flowers. It is also interesting for its gastronomic characteristics, especially with regards to the unripe pods that can be cooked whole or shelled (Świąder, 2011). Therefore, this species shows a high versatile use for food as it has a good value for livestock and humans and for its remarkable environmental benefits.

This paper reports the preliminary results on the biological cycle in our environment and the potential productivity and quality of herbage and seed of an ecotype of *Tetragonolobus purpureus* Moench, and aims to set up a study group in order to ensure its successful widespread in the Mediterranean basin.

II – Materials and methods

In 1995, a *Tetragonolobus purpureus* Moench ecotype was collected nearby Collinas, a small village in central Sardinia. In the following years it was evaluated and multiplied.

This study was carried out in an experimental farm located in southern Sardinia (39°10' N, 3°20' E, 150 m a.s.l.). The site is characterized by typical Mediterranean climatic conditions. Long term rainfall of 460 mm is distributed from October to May with a large annual and seasonal variation. Winter temperatures seldom reach 0°C, while maximum temperature average is 32°C in July.

The observations regarded: biological cycle, disease susceptibility, forage potential productivity, herbage and seed quality. Herbage production was sampled with cutting and chemically analysed for protein and fibre content.

In the year 1995-1996, the assessment started on three benches containing soil of different origins: basalt, schist and granite. In the year 1996-1997, the ecotype was planted only in the most adapted bench of schistose soil. In the year 2005-2006, the evaluation on bench restarted. Herbage was sampled at the end of February and analysed for macro and microelements. In the year 2006-2007, the seed previously collected from bench was sown in 10 m² plot to evaluate the ecotype under field conditions. From 2006-2007 up to date, the ecotype was sown in order to produce more seeds for the evaluation in open field in different seasonal and annual weather conditions.

III – Results and discussion

Biological cycle. In the first year after sowing (1995-96), the ecotype showed a remarkable speed of emergence and establishment, allowing a late winter pasture. The growing rate was affected by soil types: in granitic soil, forage production was about 20 days later than in the other soils (cutting date: March 22 vs February 27). On schistose soil, before the flowering stage (April 24), the herbage was sampled at both previous dates. Oppositely flowering date (April 24) was not affected by soil types.

In 1996-97, the previous results were confirmed, reaching the suitable height for grazing (15-20 cm) in February. Its potential production was confirmed in 2012 with a record DM yield of 3 t/ha.

Flowering date was constant over years; it occurred at the end of March until early April if not grazed and 20 days later if grazed. Moreover the ecotype showed a long flowering period.

The first pods appeared in the second part of April. Seed development started at the beginning of May in the advanced flowering stage. So, it is possible to observe at the same time, flowers, immature pods and ripe pods.

Seed yield and harvest. The annual seed yield ranged from 0.25 to 1.87 t/ha with an average of 1 t/ha. The 1000 seed weight was 23.6 g on average and ranged from 16.7 to 31.2 g.

For all years, seeds were collected using a cereal harvester with an adequate setting for thresher, fan and sieves. Each year, a serious attack to the grain by a *coleopteran* was observed.

Quality. Forage production contains 25% of protein and 14% of crude fibre on average. Tables 1 and 2 show some analytical results with regards to forage quality.

Table 1. Chemical analyses (% DM) of herbage in 1996

Protein (%)	NDF (%)	ADF (%)	ADL (%)
24.2	24.9	12.6	5.2

Table 2. Content of macro (%) and micro (ppm) elements in forage in 2006

Ca (%)	Mg (%)	Na (%)	K (%)	P (%)	S (%)	B (ppm)	Zn (ppm)	Cu (ppm)	Mn (ppm)	Fe (ppm)
1.12	0.41	0.39	2.54	0.48	0.38	51.8	41.6	3.3	66	104

Table 3 shows the most important parameters on seed quality to be used for concentrate.

Table 3. Chemical composition (% DM) of seeds collected in 2011

Ashes	6.53	Raw lipid	3.24
Organic matter	93.47	Raw protein	23.38
NDF	38.47	<i>In vitro</i> digestibility	77.64
ADF	24.88	WSC	5.78
ADL	2.90	Amides	12.49

IV – Conclusions

Compared to the traditional self-reseeding legumes, the considerable advantage of this species is its easy harvest with the cereal thresher. The following crop models could be identified:

1. As a forage, the crop can be grazed at the end of winter, and provide a later cut for hay production at the flowering period.
2. After the initial grazing, the crop can be used for seed production. Moreover, the seeds could serve as protein feeding, while the straw residues could be usefully baled or grazed.

This species could be very interesting for the Mediterranean environment for its rapid emergence, its early grazing, its organoleptic characteristics and the versatility of its use. It

could be used for both human food and animal feeding, as well as for environmental purposes in order to increase soil fertility, landscape enhancement, gardening, etc.

Based on all these features, we suggest constituting a working group on *Tetragonolobus purpureus* Moench in order to ensure the success of its cultivation through the Mediterranean countries.

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