

A note on *Vicia ervilia* cultivation utilisation and toxicity in Morocco

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RESUME

Titre: Note sur la culture, l'utilisation et la toxicité de *Vicia ervilia* au Maroc

Afin de mieux cibler la recherche et le développement de *V. ervilia* comme une culture pour la zone méditerranéenne, une enquête a été réalisée sur la culture et l'utilisation de cette espèce dans la région du Rif. Dans la région du Rif, *Vicia ervilia* est cultivée sur des sols de fertilité moyenne à faible, et les engrais sont rarement apportés. Elle est semée de décembre à février. Les pucerons noirs et l'orobanche sont les ennemis majeurs de la culture. Le rendement en grain varie de 300 à 800 kg/ha. *Vicia ervilia* est cultivée dans la région du Rif uniquement pour la production de grain qui est utilisé pour nourrir les bovins (vaches, veaux et animaux de trait).. La consommation humaine du grain n'est plus pratiquée. Parmi les besoins en amélioration de la culture, la résistance à l'orobanche et aux pucerons noirs sont considérées comme les plus importants.

Mots-clés: *V. ervilia*, cultivation, utilisation, région du Rif

SUMMARY

In order to focus research and further development of *V. ervilia* as a crop for Mediterranean agriculture, a survey was conducted about cultivation and utilisation of this species in the Rif region. In the Rif region, *Vicia ervilia* is cultivated on soils of medium to low fertility, and fertilisers are rarely used. It is sown from December to February. Black aphids and *Orobanche* are the major pests of *V.ervilia* in this area. Grain yields range between 300-800 kg/ha. The crop is cultivated in the Rif region solely for grain production. The grain is used for cows, calves and bovine draught animals. Human consumption of the grain

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is not practised in the area anymore. Resistance to *Orobanche crenata* and to black aphids were considered to be the most important traits needy of improvement.

Key words: *V. ervilia* , cultivation, utilisation, Rif region

ملخص

العنوان: زراعة، استغلال وسمية كرسانة في المغرب

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من أجل تحديد أولويات البحث والتنمية الخاصة بزراعة كرسانة كمحصول لمنطقة حوض البحر الأبيض المتوسط، أقيم استقصاء حول زراعة وإستغلال هذا النبات في منطقة الريف.

في منطقة الريف، تزرع كرسانة في الأراضي ذات الخصوبة المتوسطة أو الضعيفة، ولا تضاف الأسمدة إلا نادرا. فترة الزرع تمتد من دجنبر إلى فبراير. وتمثل الأرقعة السوداء إلى جانب الهالوك أهم الآفات لهذا المحصول. تتراوح المردودية من 300 إلى 800 كلغ في الهكتار.

تزرع كرسانة في منطقة الريف من أجل إنتاج الحبوب التي تستعمل لتغذية الأبقار(البقرات، العجول، أبقار الجر). وقد توقف إستهلاك حبوب كرسانة من طرف الإنسان .

وقد أعتبرت مقاومة الأرقعة السوداء والهالوك من الأولويات لتحسين زراعة كرسانة بمنطقة الريف .

الكلمات المفتاحية : كرسانة، زراعة، استغلال، منطقة الريف

INTRODUCTION

The legume species *Vicia ervilia* Willd. is an ancient crop (Zohary and Hopf 1988) and is still cultivated in Turkey (Durutan *et al.* 1990), Spain, Greece (incl. Crete), Cyprus (Barulina 1930; Fischer 1937; Mateo-Box 1961). In Morocco it is cultivated in the Arbaoua, Ouezzane, Pre-Rif, Rif, Fès and Taza regions (Foury 1954) from where germplasm was collected recently by joint INRA/CLIMA/ICARDA missions (Francis *et al.* 1994).

In order to focus research and further development of the species as a crop for Mediterranean agriculture, the Rif region was visited to seek interviews with farmers about its cultivation and utilisation.

MATERIALS AND METHODS

A questionnaire was prepared on the basis of information from the literature and hypotheses derived from experience with other grain and forage crops, incorporating recent findings on the toxicity of *Vicia* species (Enneking 1995).

After consultation with extension officers of the Agriculture Services in Chefchaouen and Asjen, a group of 10 farmers with experience in *V. ervilia* cultivation was located near Asjen and interviewed with the help of the questionnaire. The information thus collected was confirmed near Chefchaouen through an additional interview (1 individual) and discussions with agriculture extension officers.

RESULTS AND DISCUSSION

Cultivation

In the Rif region *Vicia ervilia* is cultivated on soils of medium to low fertility. Depending on seasonal rainfall it is sown either in December (dry years) or February (wet years). Early sowing in a wet year results in excessive vegetative growth and can lead to lodging of the crop with consequent heavy crop losses due to bacterial disease (rot).

Fertilisers are rarely used for *V. ervilia* but are applied to preceding cereal crops (soft wheat, barley). When mature the crop is harvested by uprooting during the early morning hours in order to avoid shattering of the pods.

Fields with a minimum of *Orobanche crenata* infestation are chosen for *V. ervilia* cultivation. The species is regarded by the farmers to be more tolerant to this parasitic plant and serious pest than *Vicia faba* vars. *major* (Fève) and *minor* (Féverole) and *Cicer arietinum* (pois chiche).

The seed is broadcast at 30-50 kg/ha, depending on soil fertility. The soil is then cultivated lightly (type of implement: araire). Crops are hand-weeded and thinned if required to avoid excessive crowding. Black aphids and *Orobanche* are the major pests of *V. ervilia* in this area.

Grain yields range between 300-800 kg/ha. Complete crop failures have occurred during the current drought.

Utilisation

The crop is cultivated in the Rif region solely for grain production. No green grazing nor hay production is practised. Other crops (*Trifolium alexandrinum*, *Medicago sativa*, *Avena sativa* etc.) are used for such purpose because of their superior biomass production.

The grain is fed to cattle at 1/3 to 2/3 of concentrate rations, the other part being made up with either sugar beet pulp, barley or bran flour.

The grain is crushed before feeding. It is used for cows to encourage and sustain milk production (2-4 kg/head/day), for calves (0.25- 0.5 kg/head/day; 3-4 months of age). This ration increases to 2kg/head/day for yearlings prior to sale.

The grain is also used to feed bovine draught animals (1-2 kg kg/head/day).

V. ervilia grain is considered to aid the recovery of ruminant animals which are in poor condition. For fattening, cereals, chickpeas or faba beans are used in preference to *V. ervilia*.

Large seeds (for sowing) carry a premium price (up to 5 Dirhams/kg; 8.37 Dirhams = 1 US Dollar e.g. (597 US Dollars/ton). Prices for the grain vary depending on seed size between 3-5 Dirhams/kg (ca. 350-600 US Dollars/ton). Larger seeds are preferred for the purpose of animal feeding and achieve the highest price.

Straw is very valuable as a feed in the area, especially during the present drought. *V. ervilia* is no exception.

Human consumption of the grain is not practised in the area anymore. Only one farmer from Asjen could provide details of such use from a period of food shortage (ca. 1945-1950). The grain was soaked in water for up to 36 hours and then decorticated through hand rubbing. It was then dried in an oven or in the sun until the cotyledons turned white and was then ground into a flour. Leavened bread was prepared with this flour. Consumption of the bread led to fatigue and drowsiness. Such discomfort prompted the cessation of its continuous consumption after ca. two weeks. Indeed, *V. ervilia* is the least preferred grain for human consumption and was used only as a last resort. In view of the known presence of the toxic amino acid canavanine in the seed (Bell and Tirimanna 1965; Tschiersch and Hanelt 1967) at levels ranging from 0.01 to 0.26 %

(Garcia and Ferrando 1989) and the effect of this toxin on feed intake (Enneking *et al.* 1993), the lack of popularity of *V. ervilia* as a food is perfectly understandable. The reduced palatability caused by the presence of canavanine may have prevented serious intoxications. The range of canavanine levels (0.5-2.5 %) found during a preliminary screening of 200 accessions of *V. ervilia* germplasm from ICARDA (Enneking and Greirson, unpublished) and the data provided by Garcia and Ferrando (1989) suggest that selection of non-toxic varieties is a possibility for the future development of this species as a feed for monogastric animals. Improved techniques for processing could also be developed to remove all traces of canavanine through leaching and degradation under alkaline conditions (Enneking *et al.* 1993) thus providing a safe option for the human consumption of this crop during famines.

The local name for *V. ervilia* in the Rif region is Kersannah (Koursannah), commonly used in Arabic. No indication of Spanish or Berber names could be found. However, more intensive searching including other regions where the crop is cultivated may extend the linguistic picture in Morocco and provide a better indication of its antiquity in the area.

The species appears to be an integral part of the local economy in the Rif region and presumably also in the other regions of Morocco where it is still cultivated today. The grain is esteemed as a high quality feed for ruminants and is used strategically for this purpose. Further information about its nutritional value *in vivo* for cattle and sheep (incl: data on feed intake, N-retention, digestibility, protein quality and animal production) in comparison with other grains would be desirable in order to assess whether this species has superior nutritive properties. Aletor *et al.* (1994) found that the *in vitro* organic and dry matter digestibilities of *V. ervilia* seeds were higher than those found in other *Vicia* species tested in their experiments, however, while recognising seed toxicity as a problem for the genus, they did not consider the presence of canavanine in the seeds of *V. ervilia*. The present seed levels of this compound may be related to its nutritional properties through an effect on ruminant feed intake and consequent improved utilisation. If this is the case then such an effect should be reflected by increased N-retention and digestibility. The amount of seed protein which bypasses the rumen is also of interest in relation to an assessment of nutritive quality.

Resistance to *Orobanche crenata* and to black aphids were considered to be the most important traits needy of improvement. Shattering is not a problem since it is not excessive and can be managed through harvesting during the early morning hours. Large seed size is useful for animal feeding and should be a consideration during selection of improved cultivars. The species is grown under low fertility conditions and may therefore need to be selected under such conditions in order to guarantee its optimum performance in minimum input farming systems.

It remains to be seen whether selection for increased aphid resistance in *V. ervilia* also leads to increased levels of canavanine in the seeds, or conversely, whether

selection for low or even zero seed canavanine makes the crop more susceptible to such pests.

The current method of harvesting by uprooting depletes soil fertility (Columella, ca. 200 AD); therefore in these circumstances it is unlikely that the cultivation of *V. ervilia* provides the maximum benefit of a legume to succeeding crops.

The collected information complements that already provided by Foury (1954) and Velu (1937). The sole use of the crop for grain production may not only be due to its low biomass production but also to the fact that it becomes toxic at flowering time to both monogastric and ruminant animals (Chapuis *et al.* 1937). This finding is in agreement with cases of cattle and horse poisonings reported recently for *V. villosa* and *V. benghalensis* forage crops (for a review see Enneking 1995). These two vetch species are also known to produce canavanine during seed formation, the seed levels of which are 20-30 times those found in *V. ervilia*. A causal connection between the toxicity of the forage and canavanine intoxication has been postulated, but further evidence is required to test this hypothesis.

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