Recovery and conservation of the Salento agricultural genetic resources (Apulia-Italy).

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Abstract

Agricultural genetic resources represent a good percentage of total terrestrial biodiversity. The Botanic Garden of Salento University has undertaken programmes of investigation and collection of horticultural varieties selected over the last centuries at the local level with the aim of creating a germplasm bank. The agrarian biodiversity analysis has confirmed a strong reduction of Salento cultivars; many once common, are now preserved only in the historical memory of our grandparents. Investigations were made to identify reproductive material (seeds) of varieties considered by farmers as ancient tasty varieties - varieties with undisputed nutritional quality. Those varieties have been multiplied and cultivated in catalogue fields in order to reintroduce them amongst farmers but also for use in local agrotourism. Many these cultivars have not been characterized by taxonomy or molecular analysis, therefore part of the material is being used for more in-depth investigations.

Key words: biodiversity, botanic garden, molecular investigation, niche variety, propagation, seed bank

Introduction

Salento University Botanic Garden is a centre for studying Mediterranean plant species protection and conservation, providing information to the public and the scientific world with the aim above all of conserving *ex situ* threatened species (Marchiori *&* Dedej, 2000). Its strategic objective is *ex situ* plant diversity conservation, according to the Convention on Biological Diversity article 9 (CBD) (Secretariat of the CBD, 2005).

Particular attention is given to maintenance of Red List species (National and Regional), and understanding their reproductive ability (Accogli & Marchiori, 2006a). For every species, seed and vegetative propagation success is verified. In the botanic garden, artificial environments are reproduced for plant conservation and seed plant cultivation and collection (medicinal, nutritional and endemic plants). Seed conservation is very important for *index seminum* realization. Priority is given by the Botanic Garden to the reintroduction of rare species and plant protection activities.

Education activities are focused on landscape protection, natural, historic, cultural and social interactions, with natural heritage and humanistic sciences (Blasi, 2007).

Ex situ conservation also focuses on conserving local cultivars used as food. Agricultural genetic resources constitute a good percentage of total terrestrial biodiversity, including both old and new cultivars, as well as intra-and inter-specific hybrids, local populations and mutants (Porfiri *et al*., 2001).

Salento Botanic Garden has undertaken investigation and recovery programs for horticultural varieties selected in the last centuries at the local level with the purpose of creating a germplasm bank. The agrarian biodiversity analysis has confirmed a strong reduction of Salento cultivars. Many once common, are now preserved only in the historical memory of our grandparents. Crop genetic erosion in Salento has been widespread in the past 25 years; changing socio-economic factors and modernization of agro-techniques has resulted in a new generation of farmers and modern cultivars have caused a rapid decline of landraces which are unable to compete in the market place (Accogli *&* Marchiori, 2006b).

Methods, research and results

Seeds are collected of varieties considered as ancient tasty varieties with good nutritional qualities. These varieties have been multiplied and cultivated in catalogue fields for reintroduction amongst farmers and also for use in local agrotourism.

Vegetable cultivars still occupy an important place in Salento agricultural production, but they have an exclusively local market. Genetic erosion processes have also affected interesting local Salento varieties. For fruit-bearing species, vegetative material is collected from local custodians that preserve the species in their fields (often small pieces of land) or in closed gardens. Fig trees, blackthorns, vines, almond tree, apple trees, pomegranates, citrus fruit and others were collected - 215 varieties in total (Minonne *et al*., 2004).

Seed companies and agro-consortia were investigated for accessing varieties available at national or local level, and comparing with those which had been preserved by farmers for more than 20-30 years. These local varieties often do not have a common name and, morphologically they don't show particular distinctive characters different to the more commercialized varieties. Therefore characterization and phenological information was collected and recorded in a database.

Around 670 horticultural crop accessions are made, belonging to 10 families (Figure. 1), 43 genera and 58 species. This genetic material is preserved in the Botanic Garden's seed bank and is in part under cultivation. The collection represents around 362 varieties, of which 74 are stabilized varieties (Accogli *et al*., 2008).

A very important accession is *Daucus carota* L. cv *pestanaca Santo Ippazio*. This is a local variety of carrot, grown in Tricase, Tiggiano and in Leuca; it's not produced in trade, but is only maintained through folk traditions; it's a yellow carrot, with burgundy nuances. On St Ippazio day (18th January) in Tiggiano the population organizes the "Sagra della pestanaca" (pestanaca festival): the farmers sell tasty vegetables on their stalls in the church square. This cultivar produces a specific cyanidine quantity (5,2 mg/100 g WF) (Figure.2) and β-carotene (8,13 mg/100 g WF), with very marked antioxidant and anti-inflammatory compounds (Accogli *et al*., 2006). These two aspects give it interesting nutritional characteristics and it is much appreciated in the local market.

Another niche variety is *Brassica oleracea* L. var. *botrytis* and var. *italica* Plenck; it's a cabbage cultivar similar to Italian "broccolo rapa" (*Brassica rapa* L. ssp. *oleifera* (DC) Metzg.); the crop is well known in different parts of Salento but almost unknown in some Apulia regions and other parts of Italy: it represents probably, an ancestor of more well known varieties of cabbage (Laghetti *et al*., 2005). It's still produced and so appreciated by local people. "Mugnuli" cultivation is carried out only for family consumption and in a few cases for local markets (Accogli *et* Marchiori, 2007). In "mugnulu" cooked inflorescences, indole Glucosinolates (GLS) are predominant GLS (2.96 µMol/g) followed by aliphatic GLS (2.12 µMol/g) and aromatic GLS (0.59 µMol/g). Cooked inflorescences differ from raw ones in total content (Argentieri *et al*., accepted).

Winter tomato (a long natural shelf-life) is still a largely cultivated vegetable by farmers; 9 varieties, cultivated in Salento were analysed for their antioxidant compounds content, and antioxidant activity (AA). Results showed variability in carotenoid compounds (β-carotene, lycopen and lutein) (Figure. 3). The β-Carotene amount was greater than that reported in the literature for traditional varieties; lutein was determined in these tomatoes for the first time. Hydrophilic and lypophilic fractions antioxidant activity was high (test DPPH, referred as TEAC), comparable with cherry tomatoes activity (Negro *et al*., 2010).

Legumes are recognized for their broad use as a human food and as livestock feed. They are associated with ancient agricultural practices and popular traditions. Genetic resource recovery and maintenance guarantees the conservation of ecotypes that have been selected by farmers over centuries, for taste as well as for the ability to produce under dry conditions.

In the framework of the CoAlTa project (Tobacco Alternative Crops), several old chickpea ecotypes and peas were collected during a survey carried out in Salento.

Twelve local chickpea ecotypes, (Alessano, Corigliano, Leverano, Monteroni, Muro Leccese, Sannicola, Soleto, Tricase 08, Tricase 19, Uggiano la Chiesa, Vitigliano and Zollino), were compared to four commercial varieties (Kairo, Pascià, Sultano, Visir) in field trials during a two year experiment, using low input traditional agricultural techniques. Various characters were measured. Two commercial varieties Sultano and Visir showed the lowest yield value (1.58 t/ha), the Uggiano la Chiesa and Vitigliano ecotype instead, were the most promising (yield 2.31 and 2.23 t/ha respectively) (Raimo *et al*., 2010a).

Similarly, eight pea ecotypes (Alessano, Corigliano, riccio di Sannicola, San Donato, Sannicola, Soleto, Tranesi and Zollino) were tested in field trials during a two year experiment, using traditional, low input agricultural techniques. Yields spanned from 0.67 t/ha for the Soleto ecotype to 1.43 t/ha for the Alessano ecotype; the observed values were consistently lower compared to commercial varieties actually cultivated (Raimo *et al*., 2010b)

Conclusions

Cultivation of local crop and vegetable varieties can guarantee on the Salento table, local food with good flavour and high nutritional value. Cultivation of such varieties can also help reduce soil erosion and restore agricultural land.

The advantages of local, typical products can be passed on through local knowledge and thorough the determination of their intrinsic values; their qualities contribute to the environmental and cultural image of a territory, giving it its own identity through germplasm recovery connected to ancient cultural varieties and older knowledge.

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Figures

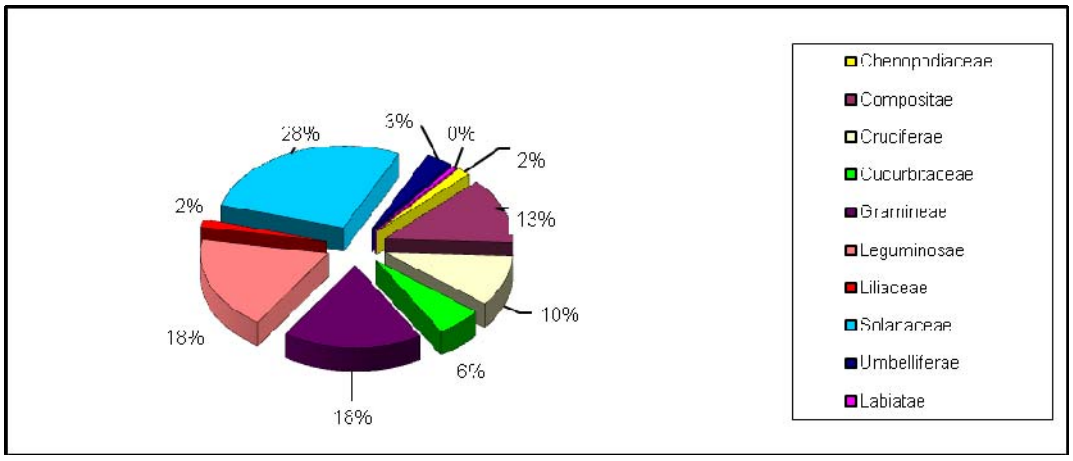

Figure 1 – Families of crops in Salento

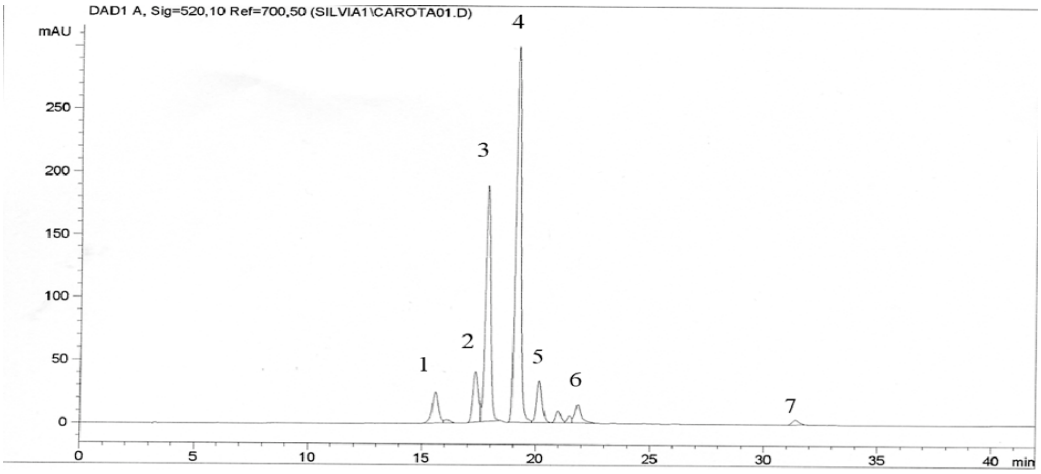

Figure.2- cromatogramm HPLC DAD in order to cyanidin (cyn3) t in Salento *Daucus carota* L.: (1) cyn 3(2"xil-gal); (2) cyn 3(2"xil-6"sin-gluc-gal); (3) cyn 3[2"xil-6"-(4cum)-glu-gal]; (4) Glu; (5) cyn 3(2"xil-6"glucgal); (6) cyn 3(2"xil-6"fer-gluc-gal); (7) cyn 3[2"xil-6"-(idrben)gluc-gal].

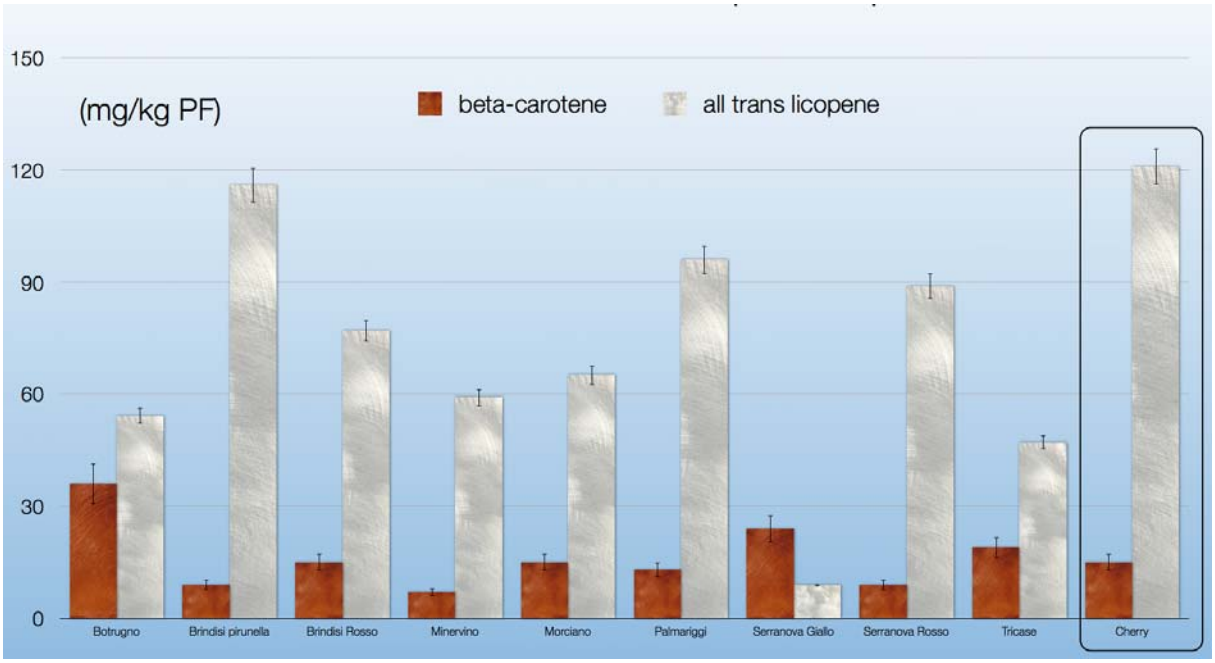

Figure. 3: β-caroten and *all*-trans licopen content in winter tomatoes