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Pignone D.

in

Heywood V.H. (ed.), Skoula M. (ed.).
Identification of wild food and non-food plants of the Mediterranean region

Chania : CIHEAM
Cahiers Options Méditerranéennes; n. 23

1997
pages 79-85

STATE OF THE PLANT GENETIC RESOURCES PROGRAMMES IN ITALY

D. Pignone
Germplasm Institute,
National Research Council, Bari, ITALY

ABSTRACT

An overview is presented on the situation of plant genetic resources conservation activities in Italy. A more detailed description is provided for the Instituto del Germoplasma of the National Research Council which is presently the only active Italian gene bank.

RÉSUMÉ

La situation de l'activité sur les ressources phytogénétiques en Italie est présentée. On décrit particulièrement l'activité de l'Istituto del Germoplasma du Conseil National des Recherches, le seul gene-bank Italien.

KEY-WORDS

ITALY, GENETIC RESOURCES, GERMPLASM CONSERVATION, COLLECTION

MOTS-CLES

ITALIE, RESSOURCE GENETIQUE, CONSERVATION DU MATERIEL GENETIQUE

INTRODUCTION

Indigenous plant genetic resources (PGR) in Italy are, generically speaking, very important. The Italian territory is highy differentiated from an ecological, pedoclimatic, and orographic point of view. As a result the Italian flora is rich in endemic and rare plants (Pignatti 1982), many crops were domesticated or differentiated in Italy, and for many cultivated species there are Italian genotypes or land-races representing a genetic 'uniqueness' in the germplasm of that species (Hammer *et al.* 1993). Moreover the Italian flora has numerous wild relatives of cultivated species (Zeven & Zhukowsky 1975). Nevertheless, the continuous interaction that is taking place between the territory and changing socio-economic conditions are putting at risk even the more widespread wild species (Pignone 1990).

A strong cultural differentiation (also due to historical reasons) is also typical of Italy and as a consequence in different geographic areas different plants may be utilized or distinct uses may have been developed for any one species. Moreover, many plants are still directly collected from the wild for both culinary (food and non-food) reasons or as medicinal or aromatic plants (Bianco 1990). The interest in the Italian flora has not only attracted botanists and other scientits, but also many amateurs.

It is not surprising, therefore, that widespread for plant conservation activities are being carried out in Italy; this activity was largely boosted after the Rio summit (UNCED) and is also pursued by non-governmental organizations (NGOs). Unfortunately, this activity is not coordinated. Italy, in fact, lacks a organic scheme and programming of plant genetic resources (PGR).

The only public institution specifically and institutionally devoted to the collection, conservation, documentation and evaluation of plant genetic resources is the Istituto del Germoplasma (IdG) of the National Research Council (CNR) which is located in Bari. The IdG was established in 1970 and deals essentially with crop germplasm; it is the only Italian gene-bank which stores nearly 80 000 different accessions representing more than 40 genera and almost 600 species, including the world's sixth largest collection of wheat and the world's third largest collection of *Vicia faba* (Leipzig Conference 1996). The activity of the IdG, starting in the late 1980's, has been concentrating more interest on the wild relatives of the cultivated species (Perrino 1995). Details on the activities of the IdG are given below.

Other minor collections are to be found at several public research institutions: most of them are working collections used by plant breeders to develop new varieties. Nevertheless some specific collections still maintain old germplasm. For instance, the Istituto Nazionale per la Cerealicoltura (MiRAAF) conserves collections of wheat, barley, maize and other cereals, mainly made up of varieties that had commercial value in the past in Italy, plus some other certified varieties; the Istituto Sperimentale per le Colture Industriali (Bologna) stores some 250 accessions of potato, including old varieties, local landraces and farmers' stocks. Cryopreservation of potato germplasm is also practised.

In recent years there has been an increased interest in local germplasm conservation and new initiatives have been started. For instance, the University of Palermo (Sicily) is carrying out a new project on the assessment and conservation of wild *Brassica* germplasm present in Sicily; the University of Basilicata is promoting a project on the conservation of aromatic and condiment plants of the Basilicata region.

In 1993, in cooperation with many institutions, the International Plant Genetic Resources Institute (IPGRI) started a project on the Underutilized Mediterranean Species (UMS) coordinated by Dr. Stefano Padulosi. Almost 650 questionnaires were was sent out to several researchers belonging to some 25 countries in which it was asked to indicate priorities on studies concerning underutilized species or species offering a potential economic impact. The questionnaires were also aimed to gathering information on the availability of genetic material and information, level of genetic diversity, acceptance in the Mediterranean region, evaluation of potential impact, etc. Some 200 answers come mainly from Italy, France and Spain indicating a wide range of species used as food, fodder, condiment medicinal or industrial crops. As a consequence four networks were established dealing with pistachio nuts, hulled wheats, oregano and rocket.

The rocket network deals with species of *Eruca* and *Diplotaxis* growing both wild and cultivated in the Mediterranean basin; in Italy there is a non-scientific selection of *Diplotaxis* species which are being domesticated especially in the Apulia region. Rocket is a good example of plant with wide uses: it is widely used as a condiment and salad constituent; local non-pungent genotypes are used as salad in Egypt; it is a oil seed plan (Jamba oil); it is considered a medicinal plant as well as an aphrodisiac plant; and, finally, it can be used to donate useful traits to other cultivated *Brassicaeae* (Padulosi 1995).

Particular attention is to be given to forage plants. No *in situ* conservation programme has been establishes for these species and, at the same time, most genetic resources are constituted by local ecotypes which may be easily lost. Besides a minor collection at the IdG, the University of Perugia recently arranged a long term conservation facility whereby some 3,000 samples of populations and land races indigenous to central Italy have been gathered. Presently the concerned Italian institutions are putting emphasis

As regards woody plants, some 15 years ago the CNR promoted an action intended to coordinate and stimulate activity on collection and characterization of fruit tree species; at present this action is coordinated by CNR and Ministry of Agriculture (MiRAAF). Conservation and evaluation of woody species germplasm is a difficult task, since it requires extensive areas for growing the living

collections of the various clones. Low temperature conservation of meristems (cryopreservation) is not widespread. A limited number of accessions of fruit species, mainly recent cultivars, is stored *in vitro* at some public research institutions, and are intended essentially as material useful to breeders for the constitution of new varieties (therefore they almost totally exclude old landraces); commercially valuable clones are maintained *in vitro* also at private propagation laboratories. Some NGOs have small scale *in situ* conservation projects dealing essentially with old fruit varieties or local clones.

Recently the Italian Botanical Society has undertaken an initiative with Italian botanical gardens to monitor and catalogue the existing biodiversity of wild plants with special attention to some ecologically interesting areas and with a focus on the existing natural parks.

Natural parks under the protection of both MiRAAF and the Ministry for the Environment are increasing in number. Only twenty years ago the 'Parco Nazionale dello Stelvio' was the sole national park of Italy. Other protected areas were present mostly in the Alps. In the last decade many national parks have been established, but they are aimed to the conservation of local wild biodiversity, discouraging agricultural practice, and therefore endangering local crop germplasm (Pignone *et al.* 1996).

On the other hand, the 18 Italian national parks account for more than 10% of the total surface covered by forest trees. The management of all these areas is quite complicated due to strong differences in environmental conditions (Italy extends for more than 10° in latitude) and topography in which each park is situated. This great variability present has been recognized and a permanent inventory of forests has been established and is regularly updated.

There is also an *ex situ* conservation activity carried out by forest research institutes, Forestry Faculties and the National Forest Service, as well as by some initiatives in botanic gardens and arboreta. The National Forest Service collects seeds for reforestation. Moreover it also collects seeds on request for universities and research institutions for research on forest genetics and for monitoring genetic erosion.

The Istituto del Germoplasma

In 1970 the National Research Council recognized the urgent need to start a laboratory devoted to the collection, conservation, evaluation and promotion of plant genetic resources that would be of use for Italian, Mediterranean, and European agriculture. In 1979 the former Laboratorio del Germoplasma adopted its present name. The IdG is one of about 300 research organs of the CNR and belongs to the National Committee for Agricultural Science together with other 45 CNR research institutes. The staff at IdG is 38 persons with one Research director, three principal investigators and eight researchers. The activity of the IdG is supervised by a Scientific Council formed by the Director of the Institute, five external experts nominated by the CNR, and five staff members. At the IdG, together with the proper genebank activity, research is carried on the collection of PGRs, evaluation and description of the collected material, studies of differentiation and microevolution using cytogenetical, biochemical and molecular methods, studies on physiological process of seed germination, and studies on the response of seeds to stress.

In the period 1971-1995 the IdG has collected over 13 000 accessions of germplasm in about 100 collecting missions all over the Mediterranean basin, Ethiopia, Somalia, and South-Africa. Evaluation studies have concentrated on wheat, pea, vetches and broad bean, and has been conducted under different environmental conditions in four experimental fields, each one with its own particular pedoclimatic conditions.

Data gathered have been stored in different databases. Current thinking about databases is changing considerably due to the availability of cheap computer memory resources. Therefore at the IdG databases are being processed in order to form a less complicated structure that is able to be easily accessed by the Internet. An experimental prototype has been produced regarding collection

data of *Phaseolus* and *Vigna*. The IdG also takes part in the activities of the European Cooperative Programme of Genetic Resources (ECP/GR), participating in some networks such as those on *Brassica* and forage species.

An important aspect related to the conservation activity is the distribution of seed samples to other research institutions and genebanks. To give an idea of the size of this activity it may be noted that in the period 1972-1993 the IdG distributed over 75 000 samples to institutions all over the world. The IdG is one of the four genebanks in the world that stores a duplicate of the world wheat collection. Wheat always had highest priority, especially *durum* wheat, that in Italy has a major interest due to its importance in the pasta making industry. The IdG stores more than 6000 samples of this crop and roughly 20% of this collection has been directly gathered by teams of the Institute.

Starting in the 1980's the IdG has given growing importance to the wild relatives of cultivated species and to wild plants used directly by Italian people. Teams of the Institute have participated in several collecting missions aimed at wild *Brassica* of the *oleracea* group (1982-1986), collecting some 100 samples all over the Mediterranean Region (Gustafsson *et al.* 1986); particular attention has been given to wild *Gramineae* potentially useful in breeding wheat, barley or rye. As a result some hundreds of samples were collected, especially in southern Italy, in the few last years.

In most recent years particular attention has been paid to two different aspects of PGRs: assessment of the level of genetic diversity in collections and promotion of local ecotypes through the assessment of their peculiarity. In both cases advanced techniques are used, in particular molecular and biochemical tools. The results are quite promising in both directions and are already yielding cooperation with the extension services of some southern regions interested in the recognition of the peculiarity of typical products for market reasons (IdG 1995).

Finally, within the frame of the National Institute for Agricultural Production (INPA), promoted by the CNR, the IdG is participating to a project aimed at the establishment of a coordinated network for agricultural genetic resources, comprising also microbial and animal ones. This main objective of this project is to establish an information system and a database of all genetic resources; the proposed plan of action anticipates that a first draft of this information system should be available by mid 1997.

SOME MAJOR COLLECTIONS CONSERVED AT THE IDG

Genus, species or group	Approx. no. of samples
Dactylis glomerata	180
Festuca	120
Hordeum	2000
Lens culinaris	260
Medicago	630
Pisum sativum	4100
Trifolium	300
Triticum	33 000
Vicia faba	3700
Zea mays	600
Gramineae	6000
Leguminosae	16 000
Vegetable crops	2000

SOME INSTITUTIONS HOLDING MAJOR SEED COLLECTIONS OF NON-WOODY GERMPLASM

Institute denomination	Institution	Type	Location
Istituto del Germoplasma	CNR	Seeds non-wood	Bari
Istituto Sperimentale Colture Foraggiere	MiRAAF	Seeds non-wood	Lodi
Istituto Sperimentale di Cerealicoltura	MiRAAF	Seeds non-wood	Forenzola d'Arda, Bergamo, Badia
Dipartimento Agrobiotecnologia	ENEA	Seeds non-wood	Casaccia (Roma)
Istituto Agronomia Generale	University	Seeds non-wood	Firenze
Istituto Orticoltura Industriale	CNR	Seeds non-wood	Bari
DI.VA.PR.A.	University	Seeds non-wood	Torino
Istituto Allevamento Vegetale	University	Seeds non-wood	Perugia
CS Miglioramento Genetico Ortaggi	CNR	Seeds non-wood	Portici
Istituto Sperimentale per la Frutticoltura	MiRAAF	Living wood	Roma, Trento, Forlì, Caserta
Dipartimento Colture Arboree	University	Living wood	Torino
Istituto Coltivazioni Arboree	University	Living wood	Padova
Dipartimento Colture Arboree	University	Living wood	Bologna
Istituto Colture Arboree	University	Living wood	Palermo
Dipartimento Coltivazione Difesa Specie Legnose	University	Living wood	Firenze
Istituto Propagazione Specie Legnose	CNR	Living wood	Firenze
Istituto Sperimentale Viticoltura	MiRAAF	Living wood	Conegliano Veneto
Istituto Ricerche sull'Olivicoltura	CNR	Living wood	Perugia

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