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in

Bellini E. (ed.), Giordani E. (ed.).
First Mediterranean symposium on persimmon

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 51

2002
pages 71-73

Genetic diversity of persimmon accessions introduced and surveyed in Spain

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SUMMARY – The oriental persimmon (Japanese persimmon or kaki), *Diospyros kaki* L.f., is believed to have originated in China and was introduced from Japan into Europe, Brazil and the United States in the nineteenth century. Persimmon culture has become an alternative for fruit growers in Italy, Israel and Spain. However, there is some confusion concerning cultivar identification in non-Asian countries where the species has been introduced. Authenticating the identity of germplasm resources of persimmon would be of great value for breeding. RAPD markers were chosen for this study of persimmon germplasm resources in Spain. Nineteen markers were obtained from eight primers. Results suggest that RAPD technology is adequate for fingerprinting persimmon and the data is consistent with persimmon's hypothetical origins and adaptation history. By means of RAPD markers, a better identification of the European germplasm is available.

Key words: *Diospyros kaki* L.f., isozymes, pomology, RAPD markers.

RESUME – *"Diversité génétique des accessions de plaqueminier introduites et étudiées en Espagne". Le plaqueminier oriental (plaqueminier du japon ou kaki),* Diospyros kaki *L.f., est présumé originaire de Chine et a été introduit depuis le Japon en Europe, au Brésil et aux Etats-Unis au dix-neuvième siècle. La culture du plaqueminier est devenue une solution alternative pour les cultivateurs en Italie, Israël et Espagne. Cependant, il y a une certaine confusion concernant l'identification des cultivars dans les pays non asiatiques où cette espèce a été introduite. L'authentification de l'identité des ressources en germoplasme de plaqueminier serait de grande valeur pour l'amélioration génétique. Des marqueurs RAPD ont été choisis pour cette étude des ressources en germoplasme de plaqueminier en Espagne. Dix-neuf marqueurs ont été obtenus à partir de huit amorces. Les résultats suggèrent que la technologie RAPD est adéquate pour le "fingerprinting" du plaqueminier et les données concordent avec les origines hypothétiques du plaqueminier et l'histoire de son adaptation. Les marqueurs RAPD permettront une meilleure identification du germoplasme européen.*

Mots-clés : Diospyros kaki *L.f., isozymes, pomologie, marqueurs RAPD.*

Introduction

World-wide persimmon production in 2000 totalled 2,300,000 t, with 71% from China, 12.3% from Japan and 11.7% from Korea (FAO, 2001). Persimmon has limited popularity elsewhere. However, Italy, Israel and Brazil are now producing substantial amounts, and were responsible for 5% of total global production in 2000. Recently, Spain, Australia and New Zealand have started to produce persimmon mainly for export, and the United States is also producing persimmon on a small scale.

The oriental persimmon (Japanese persimmon or kaki), *Diospyros kaki* L.f., is believed to have originated in China and it has been described in China, Korea and Japan from ancient times. Persimmon culture was introduced into Europe, Brazil and the United States in the nineteenth century (Yonemori *et al.*, 2000).

In non-Asian countries, most cultivars have came from introductions from Japan. However, new cultivars have arisen as bud-sports, developing local cultivars in all countries where the crop has been established. Persimmon growing has become an alternative for fruit growers in Italy, Israel and Spain. There is some confusion, however, concerning identification of cultivars from non-Asian countries where the species has been introduced. Authenticating the identity of germplasm resources of persimmon would be of great value for breeding. Molecular markers are an efficient tool for fingerprinting and the choice of the marker system to use for a particular application depends on the type of genomic information required and the system's ability to detect polymorphism in a given

population. We have chosen RAPDs as the molecular marker system, which is the most convenient analysis for this type of plant material.

The aim of this study was to determine the identity of both types of cultivars, those introduced from Japan and those selected from local surveys, as a tool for better germplasm management and future cultivar breeding.

Material and methods

The material used in this study, and its origin, is shown in Table 1. All cultivars used were selected from the persimmon germplasm bank located at IRTA, Reus, Spain. Genomic DNA was isolated from leaf samples following the CTAB (hexadecyltrimethylammonium bromide) method of Doyle and Doyle (1987). RAPD analysis was performed as described in Badenes *et al.* (1998).

Table 1. Plant material studied, origin and horticultural classification by astringency and pollination behaviour according to types defined by Yonemori *et al.* (2000). All cultivars were obtained from the germplasm collection at IRTA, Reus (Spain)

Cultivar	Type†	Origin††	Cultivar	Type†	Origin††
1 Cal Fuyu	PCNA	Japan	21 Cristalino A	PCA	Valencia
2 Hana Fuyu	PCNA	Unknown	22 Tamamoto	PCA	Unknown
3 Ichikikey Jiro	PVNA	Japan	23 Betera-1	PVA	Valencia
4 Jiro C-24276	PVNA	California	24 Betera-2	PVA	Valencia
5 O'Gosho	PCNA	Japan	25 Bétera-3	PVA	Valencia
6 Suruga	PCNA	Japan	26 Burriana	PVA	Valencia
7 Tenjin Gosho	PCNA	Unknown	27 Cristalino A	PCA	Valencia
8 Fuyu	PCNA	Japan	28 Enguera 1	PCA	Valencia
9 Aizumishirasu a	PVA	Unknown	29 Enguera 2	PVA	Valencia
10 Aizumishirasu b	PVA	Japan	30 Enguera 3	PCA	Valencia
11 Constantí	PVA	Tarragona	31 Picudo	PCA	Valencia
12 Hiratanenashi	PVA	Unknown	32 Rojo Brillante	PVA	Valencia
13 Pakistan Seedless	PVA	Japan	33 Tomatero	PCA	Valencia
14 Tone Wase	PVA	Japan	34 Xato Bonrepos	PVA	Valencia
15 Ferran 12	PVA	Tarragona	35 Vaniglia	PVNA	Italy
16 Hachiya	PCA	Japan	36 Mercatelli	PVNA	Italy
17 Garidells	PCA	Tarragona	37 Kaki tipo	PVA	Italy
18 La Selva 14	PVA	Tarragona	38 Aneka	PCA	Valencia
19 Reus 6	PCA	Tarragona	39 Amankaki	PVNA	Japan
20 Reus 15	PVA	Tarragona	40 Fuji	PCA	Japan

†PCNA: pollination constant non astringent; PVNA: pollination variant non astringent; PVA: pollination variant astringent; PCA: pollination constant astringent.
††Valencia and Tarragona are two areas of Spain where a survey was made in 1995.

Results and discussion

Eight primers out of 28 polymorphic ones were selected for screening of the 40 cultivars. Nineteen markers were obtained from eight primers, with an average of 2.4 markers/primer, which is higher than that obtained in other woody fruit species. Variability found indicated that RAPD technology is a good system for studies of persimmon species.

Some cultivars collected from a local survey in two areas of Spain shared the same combinations of RAPD markers, and some of these shared the same pomological characteristics suggesting they could be the same cultivar named differently, depending on the area where it was selected. Table 2 shows cultivar groups that could not be resolved. In conclusion, the recent introduction of the species

from Japan has not allowed development of much new diversity in those areas where the crop was introduced.

Table 2. Identification of cultivars

Groups of cultivars that shared the same RAPDs markers	Identity
Burriana, Enguera 2 Xato	They should be renamed as the same cultivar
Garidells Enguera 1	They might be the same cultivar
Enguera 3 Picudo	They might be the same cultivar
Vaniglia Mercatelli	They may be the same cultivar, might be a misslabelling
Cal Fuyu Fuyu	They may be the same cultivar, named in two locations
Cristalino A Rojo Brillante	Corresponded to the same cultivar
Cristalino B	Closely related to Cristalino A
Hiratanenashi Pakistan Seedless Tone Wase	Mutations from Hiratanenashi that need a more efficient marker system to allow identification
Tomatero Reus 6 Ferran 12	They differ for a unique trait
Aneka	Closely related, but distinguished from Tomatero

References

Badenes, M.L., Martínez-Calvo, J. and Llácer, G. (1998). Analysis of peach germplasm from Spain. *Acta Horticulturae*, 465: 243-250.

Doyle, J.J. and Doyle, J.L. (1987). A rapid isolation procedure for small quantities of fresh leaf tissue. *Phytochem. Bul*., 19: 11-15.

FAO (2001). FAOSTAT, FAO Statistical Databases. Web site at http://apps.fao.org

Yonemori, K., Sugiura, A. and Yamada, M. (2000). Persimmon genetics and breeding. *Plant Breeding Reviews*, 19: 191-225.