Fig Genetic Resources and Research at the US National Clonal Germplasm Repository in Davis, California

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Abstract

The National Clonal Germplasm Repository (NCGR) in Davis, California houses most of the Mediterranean-adapted fruit and nut crop collections in the US, including the fig. The NCGR is part of the United States Department of Agriculture (USDA) National Plant Germplasm System (NPGS). Our missions are to acquire, preserve, characterize and distribute germplasm resources of our designated crops. The NCGR fig collection currently includes 190 different accessions: 78 named fruiting cultivars, 44 regional selections from diverse locations, 40 advanced selections from plant breeders, 28 caprifigs, and a small number of species and hybrids. It is NPGS policy to distribute plant material, free of charge, to research interests around the world (see our website http://www.ars-grin.gov/dav/). We have initiated DNA microsatellite fingerprinting of NCGR fig accessions, and anticipate complete testing of our collection over the next year. Proper identification is a key concern of the NCGR since individual fig cultivars have been widely distributed with many synonyms, and often the same name used for different cultivars. To finalize identification, it will also be necessary to compare fingerprints to "type" material from other collections. The microsatellite information and AFLP data will also make it possible to assess relatedness among fig genotypes, and will facilitate understanding of evolution within the genus *Ficus*. We are committed to acquiring additional material and are very interested in learning of opportunities, with a special interest in protecting collections which may otherwise be lost.

INTRODUCTION TO THE DAVIS NATIONAL CLONAL GERMPLASM REPOSITORY

The US National Plant Germplasm System is a component of the Agricultural Research Service of the United States Department of Agriculture (USDA). The National Clonal Germplasm Repository (NCGR) in Davis, California is one of 20+ sites in the US National Germplasm System, and is one of ten repositories which emphasize clonal materials. The NCGR houses most of the Mediterranean-adapted fruit and nut crop collections in the US, including the fig. Our missions are to acquire, preserve, characterize and distribute germplasm resources of our designated crops.

THE *FICUS CARICA* COLLECTION OF THE NCGR

The NCGR fig collection currently includes 190 different accessions: 78 named fruiting cultivars, 44 regional selections from diverse locations, 40 advanced selections from plant breeders, 28 caprifigs, and a small number of species and hybrids (Table 1). A five-year acquisition plan will be developed to further improve this collection.

Named Cultivars and Regional Selections

The named cultivars in the NCGR collection represent a fair cross-section of Western European figs, and represent the largest collection in North America. Because, there is new interest in developing commercial fresh fig production, we are conducting detailed evaluations of 25 cultivars identified as being promising. These data will be collected over the next two years and will include phenological data and detailed

assessment of fruit quality.

A small number of regional selections have been acquired from Turkmenistan, Pakistan, Armenia, Italy, as well as the U.S. In the interest of maintaining broad diversity, we hope to collect additional material from the center of diversity for figs in the Middle-East as well as from under-represented regions at the fringes of fig production.

Breeders' Selections

We are fortunate to have many advanced selections from the University of California fig breeding program of Ira Condit and William Storey. The number of generations of crosses represented in some of these selections is really quite remarkable for a woody perennial (Table 2). Included in this group are a number of selections which have been introduced into the nursery trade without ever being officially released. Among these are selections which have acquired the names of 'Nardine', 'Tena', and 'Yvonne' (Storey, 1975). Among the most valuable material in the NCGR collection are three persistent caprifigs (UCR 228-20, 271-1, and 347) which were developed over many years by Condit and Storey. These caprifigs derive their persistent (highly "parthenocarpic") trait from the old French selection 'Croisic' (Storey, 1975), but have been backcrossed for 3 to 5 generations using high fruit quality female parents (Table 2). These caprifigs should prove extraordinarily valuable to future breeders attempting to develop high-quality figs which do not require caprification to set heavy crops. This was the focus of the Condit and Storey efforts which led to 'Conadria', the first fig cultivar developed through a planned breeding program, and several other cultivars which are grown commercially in California (Storey, 1975).

Species Material

The relative cold-sensitivity of most *Ficus* species has led to the housing of most material which is not *F. carica* at our sister repository in Miami, Florida (http://www.ars-grin.gov/ars/SoAtlantic/Miami/Pages/PlantSciences/Plant_Sciences.htm). The Miami repository holds more than 44 *Ficus* species, most of which are considered ornamentals, but represent a significant secondary and tertiary gene pool for the edible fig. The Miami collection includes several members of the *Ficus* subgenus *Eusyce*. Only one accession each of *F. pseudo-carica* and *F. pumila* are maintained at the Davis, California NCGR.

MICROSATELLITE FINGERPRINTING OF THE NCGR FIG COLLECTION

Proper identification is a key concern of the NCGR since individual fig cultivars have been widely distributed, with many synonyms, and often the same name used for different cultivars. Molecular markers offer a stable and reliable method for genetic identification and characterization of germplasm collections. Recently, microsatellite markers, randomly amplified polymorphic DNA (RAPD), inter-simple sequence repeat (ISSR), restriction length polymorphism (RFLP), and mitochondrial DNA RFLP markers have been used in fingerprinting, assessing genetic diversity, structure and differentiation in fig collections (Khadari et al., 2001; Papadopoulou et al., 2002; Amel et al., 2004; Khadari et al., 2005; Gao and Quiros, unpublished).

We have initiated DNA microsatellite fingerprinting of NCGR fig accessions (74 accessions of *F. carica* and 1 of *F. pumila*). In the initial test, six microsatellite markers (MFC1 through 5 and MFC8; Khadari et al., 2001) were used. Amplified products were resolved using capillary electrophoresis on an ABI Prism 3100 genetic analyzer with the data collection software, version 1.2 (PE/Applied Biosystems). The data was further analyzed using Genescan, Version 3.1 and Genotyper, Version 2.5. The binary data were used to compute the Dice coefficient of association (Dice, 1945) and Nei and Li distance (Nei and Li, 1979) based on the proportion of alleles shared between two accessions for all possible pair-wise combinations. The resultant matrices were subjected to cluster analyses with the neighbor-joining (NJ; Saitou and Nei, 1987) and UPGMA (Unweighted Pair Group Method using Arithmetic means) methods.

Sixty-eight out of 74 genotypes examined possessed unique fingerprints. The fig

collection showed considerable polymorphism with the observed number of alleles per locus ranging from three for MFC4 and 5 to six for MFC1 with an average of 4.3 alleles per locus (data not shown). The cluster analysis (CA) using the neighbor-joining method revealed seven groups with somewhat distinct affinities (data not shown). In this preliminary study, all of the San Pedro type figs fell into a single group. It will be interesting to see if this relationship is sustained when the entire collection is assessed using more markers. Six more markers are being developed and we anticipate complete testing of our collection over the next year.

To finalize identification, we will need to compare fingerprints with "type" material from other collections through international cooperation. The microsatellite information and AFLP data will also make it possible to assess relatedness among fig genotypes, and will permit exploration of evolution within the genus *Ficus*.

NEW ACQUISITIONS AND DISTRIBUTION FROM THE NCGR FIG COLLECTION

We are committed to acquiring additional material and are very interested in learning of opportunities, with a special interest in protecting collections which may otherwise be lost. It is NPGS policy to distribute plant material, free of charge, to research interests around the world (see our website http://www.ars-grin.gov/dav/).

ACKNOWLEDGEMENTS

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Tables

Table 1. Identity of *Ficus* accessions in the National Clonal Germplasm Repository, Davis, California.

Accession no.	Species	Cultivar	Likely prime name	Type	Pedigree if known	Source
DFIC0140	carica	Capri A		Capri[3]		local CA
DFIC0141	carica	Capri B		Capri[3]		local CA
DFIC0142	carica	Capri C		Capri[3]		local CA
DFIC0143	carica	Capri D		Capri[3]		local CA
DFIC0117	carica	Capri N		Capri[3]		local CA
DFIC0123	carica	Capri O		Capri[3]		local CA
DFIC0124	carica	Capri P		Capri[3]		local CA
DFIC0126	carica	Capri Q		Capri[3]		local CA
DFIC0125	carica	Capri R		Capri[3]		local CA
DFIC0127	carica	Capri S		Capri[3]		local CA
DFIC0128	carica	Capri T		Capri[3]		local CA
DFIC0118	carica	Capri V		Capri[3]		local CA
DFIC0122	carica	Capri W		Capri[3]		local CA
DFIC0119	carica	Capri X		Capri[3]		local CA
DFIC0120	carica	Capri Y		Capri[3]		local CA
DFIC0121	carica	Capri Z		Capri[3]		local CA
DFIC0131	carica	Maslin Edible Variant	Maslin	Capri[3]		local CA
DFIC0129	carica	Milco		Capri[3]		local CA
DFIC0093	carica	Roeding 2		Capri[2]		USA
DFIC0133	carica	Roeding 3		Capri[2]		USA
DFIC0132	carica	Roeding 4		Capri[2]		USA
DFIC0134	carica	Stanford		Capri[3]		local CA
DFIC0032	carica	Adriatic	Verdone	Common[2]		USA, UCR
DFIC0031	carica[1]	Alma		Common?	TAMU, Vernino × Hamma[4]	USA, UCR
DFIC0115	carica	Angelique		Common[2]		England
DFIC0007	carica	Archipel		Common[2]		USA, UCR
DFIC0195	carica	Barbillone		Common[2]		USA
DFIC0069	carica	Barnissotte		Common[2]		USA, UCD
	carica	Becane				
DFIC0027	carica	Beall		Common[2]		USA, UCR
DFIC0070	carica	Blanquette	Blanche	Common[2]		USA, UCD
DFIC0212	carica	Bourjassotte Blanche	Barnissotte Blanche	Common[2]		USA
DFIC0190	carica	Bourjassotte Grise		Common[2]		USA
DFIC0017	carica	Brown Turkey		Common[2]		USA, UCR
DFIC0034	carica	Brunswick		Common[2]		USA, UCR

Table 1. Continued.

Accession no.	Species	Cultivar	Likely prime name	Type	Pedigree if known	Source
DFIC0155	carica	California Brown Turkey		Common?		USA
DFIC0077	carica	Calvert		Common[2]		USA, UCD
DFIC0080	carica	Celeste	Malta	Common[2]		USA, UCD
DFIC0074	carica	Col de Dame		Common[2]		USA, UCD
DFIC0005	carica	Conadria		Common		USA, UCR
DFIC0050	carica	Conadria		Common	UCR, Adriatic × 72-80[5]	USA, UCD
DFIC0024	carica	Deanna		Common?	UCR[5]	USA, UCR
DFIC0015	carica	DiRedo		Common?	UCR, Adriatic × 72-80[5]	USA, UCR
DFIC0222	carica	Dokkar	Dokkar d'Algerie?	Common?		France via USA
DFIC0213	carica	Doree		Common[2]		USA
DFIC0145	carica	Early Violet		Common[2]		
DFIC0020	carica	Excel		Common?	UCR, Kadota × ?[5]	USA, UCR
DFIC0009	carica	Flanders		Common?	UCR Adriatic × ?[5]	USA, UCR
DFIC0209	carica	Gazir		Common[2]		USA
DFIC0030	carica	Genoa		Common[2]		USA, UCR
DFIC0081	carica	Genoa White	Genoa	Common[2]		USA, UCD
DFIC0161	carica	Golden Celeste		Common?		USA
DFIC0090	carica	Ischia Black		Common[2]		USA, UCD
DFIC0052	carica	Ischia Green	Verte	Common[2]		USA, UCD
DFIC0073	carica	Ischia White	Ischia	Common[2]		USA, UCD
DFIC0066	carica	Kadota 1	Dottato	Common[2]		USA, UCD
DFIC0225	carica	Lattarula	Blanche?	Common?		France via USA
DFIC0206	carica	L.S.U. Everbearing		Common?	LSU	USA
DFIC0204	carica	L.S.U. Gold		Common?	LSU	USA
DFIC0205	carica	L.S.U. Hollier		Common?	LSU	USA
DFIC0207	carica	L.S.U. Improved Celeste		Common?	LSU	USA
DFIC0203	carica	L.S.U. Purple		Common?	LSU, Hunt × C-1[4]	USA
DFIC0219	carica	Lemon	Blanche	Common[2]		TX
DFIC0197	carica	Longue d' Aout		Common[2]		USA
DFIC0223		Maho	Mahounnaise?	Common?		France via USA
DFIC0022	carica	Mary Lane		Common?		USA, UCR
DFIC0012	carica	Mission	Franciscana	Common[2]		USA, UCR
DFIC0086	carica	Native De Argentile	Hative d' Argenteuil	Common[2]		USA, UCD

Table 1. Continued.

Accession no.	Species	Cultivar	Likely prime name	Type	Pedigree if known	Source
DFIC0035	carica	Orphan		Common?		USA, UCR
DFIC0075	carica	Osborn Prolific		Common[2]		USA, UCD
DFIC0002	carica	Panachee		Common[2]		USA, UCR
DFIC0047	carica	Pastiliere		Common[2]		USA, UCR via UCD
DFIC0189	carica	Pissalutto		Common[2]		USA
DFIC0079	carica	San Pietro		Common[2]		USA, UCD
DFIC0224	carica	Sierra		Common[2]	KAC, Calimyrna × D13-39	
DFIC0053	carica	St. Jean		Common[2]		USA, UCD
DFIC0021	carica	Tena		Common?	UCR, Calimyrna × 271-1[5,6]	USA, UCR
DFIC0046	carica	Trojano	Troiano	Common[2]		USA, UCD
DFIC0056	carica	Verdal Longue	Verdal	Common[2]		USA, UCD
DFIC0001	carica	Vernino		Common[2]		USA, UCR
DFIC0026	carica	Verte		Common[2]		USA, UCR
DFIC0210	carica	Violet Sepor		Common[2]		USA
DFIC0063	carica	Violette De Bordeaux	Bordeaux	Common[2]		USA, UCD
DFIC0162	carica	White Texas Everbearing		Common?		USA
DFIC0220	carica	Yede Vern	Yediver?	Smyrna?		France via USA
DFIC0033	carica	Yellow Neches		Common[2]		USA, UCR
DFIC0153	carica	Castle Kennedy		San Pedro[2]		
DFIC0084	carica	Dauphine		San Pedro[2]		USA, UCD
DFIC0085	carica	King		San Pedro[2]		USA, UCD
DFIC0194	carica	Lampeira		San Pedro[2]		USA
DFIC0088	carica	Pied De Boeuf		San Pedro[2]		USA, UCD
DFIC0215	carica	White San Pedro	San Pedro	San Pedro[2]		USA
DFIC0186	carica	KAC 11-4W	K11-4	Common or San Pedro?[3]	Table 2	USA, KAC
DFIC0191	carica	Afghan A	Afghan?	Smyrna?		USA
DFIC0057	carica	Calimyrna	Sari Lop	Smyrna[2]		USA, UCD
DFIC0156	carica	Kalamata		Smyrna[2]		
DFIC0078	carica	Karayaprak		Smyrna[2]		USA, UCD
DFIC0051	carica	Marabout		Smyrna[2]		USA, UCD
DFIC0003	carica	Marabout C. Smyrnay		Smyrna[3]		USA, UCR
DFIC0087	carica	Snowden		Smyrna[2]		USA, UCD
DFIC0036	carica	Zidi		Smyrna[2]		USA, UCR
DFIC0198	carica	Abruzzi				USA
DFIC0058	carica	Aked				USA, UCD

Table 1. Continued.

Accession no.	Species	Cultivar	Likely prime name	Type	Pedigree if known	Source
DFIC0171	carica	Ak-inzhyr Koinekashirskii				Turkmenistan
DFIC0172	carica	Ak-inzhyr Kuruzhdeiskii				Turkmenistan
DFIC0157	carica	Armenian				
DFIC0147	carica	Black Fig I				Pakistan
DFIC0144	carica	Black Madeira				local CA
DFIC0055	carica	Bournabat				USA, UCD
DFIC0113	carica	Capitola Long				local CA
DFIC0192	carica	Caucasus #1				Russia? via USA
DFIC0193	carica	Caucasus #3				Russia? via USA
DFIC0196	carica	Caucasus #6				Russia? via USA
DFIC0180	carica	Chikishlyarskii				Turkmenistan
DFIC0217	carica	Fico Bianco				local selection Perugia, Italy
DFIC0218	carica	Fico Nero				local selection Perugia, Italy
DFIC0208	carica	Fico Verde				local selection Italy via NJ
DFIC0216	carica	Ficotto				local selection Perugia, Italy
DFIC0114	carica	Giant Amber				local CA
DFIC0168	carica	Igo				USA
DFIC0176	carica	Inzhyr from Sopyev				Turkmenistan
DFIC0177	carica	Kugitangskii Chernyi				Turkmenistan
DFIC0178	carica	Kukurchinskii				Turkmenistan
DFIC0169	carica	Kury Gol				Turkmenistan
DFIC0214	carica	Moissoniere				USA
DFIC0163	carica	Nazarti				Israel
DFIC0211	carica	Noire de Caromb				USA
DFIC0179	carica	Nuhurskii				Turkmenistan
DFIC0112	carica	Rattlesnake Island				local CA
DFIC0016	carica	Santa Cruz Dark				USA, UCR
DFIC0139	carica	Santa Cruz Light or White				local CA
DFIC0111	carica	Santa Cruz White				local CA
DFIC0181	carica	Shevlan 1				Turkmenistan

Table 1. Continued.

Accession no.	Species	Cultivar	Likely prime name	Type	Pedigree if known	Source
DFIC0182	carica	Shevlan 2				Turkmenistan
DFIC0183	carica	Shevlan 3				Turkmenistan
DFIC0170	carica	Shih Berdy 3				Turkmenistan
DFIC0146	carica	Skardu Black				Pakistan
DFIC0092	carica	Stanford				USA
DFIC0166	carica	Sucrette				USA
DFIC0175	carica	Zheltoplodnyi Okruglyi				Turkmenistan
DFIC0173	carica	Zheltyi from Seidov				Turkmenistan
DFIC0199	carica					Armenia
DFIC0200	carica					Armenia
DFIC0201	carica					Armenia
DFIC0202	carica					Armenia
DFIC0185	carica	KAC 11-7W	K11-7W	Persistent Capri[3]	Table 2	USA, KAC
DFIC0188	carica	KAC 11-30E	T 30E	Persistent Capri[3]	Table 2	USA, KAC
DFIC0187	carica	KAC 16-32W	K16-32W	Persistent Capri[3]	Table 2	USA, KAC
DFIC0008	carica	UCR 228-20		Persistent Capri[3]	Table 2	USA, UCR
DFIC0010	carica	UCR 271-1		Persistent Capri[3]	Table 2	USA, UCR
DFIC0006	carica	UCR 347-1	UCR 347	Persistent Capri[3]	Table 2	USA, UCR
DFIC0076	carica	UCR 135-15s			Table 2	USA, UCR via UCD
DFIC0059	carica	UCR 135-4s			Table 2	USA, UCR via UCD
DFIC0065	carica	UCR 143-28			Table 2	USA, UCR via UCD
DFIC0048	carica	UCR 143-36			Table 2	USA, UCR via UCD
DFIC0062	carica	UCR 143-38			Table 2	USA, UCR via UCD
DFIC0049	carica	UCR 143-5			Table 2	USA, UCR via UCD
DFIC0060	carica	UCR 152-4s			Table 2	USA, UCR via UCD
DFIC0083	carica	UCR 153-17			Table 2	USA, UCR via UCD
DFIC0054	carica	UCR 153-7			Table 2	USA, UCR via UCD
DFIC0064	carica	UCR 160-50			Table 2	USA, UCR via UCD
DFIC0071	carica	UCR 171-59			Table 2	USA, UCR via UCD
DFIC0082	carica	UCR 184-15			Table 2	USA, UCR via UCD

Table 1. Continued.

Accession no.	Species	Cultivar	Likely prime name	Type	Pedigree if known	Source
DFIC0089	carica	UCR 184-15s			Table 2	USA, UCR via UCD
DFIC0068	carica	UCR 187-25			Table 2	USA, UCR via UCD
DFIC0061	carica	UCR 200-43			Table 2	USA, UCR via UCD
DFIC0107	carica	UCR 233-10	Yvonne [5, 6]		Table 2	USA, UCR via KAC
DFIC0019	carica	UCR 276-14			Table 2	USA, UCR
DFIC0014	carica	UCR 276-49			Table 2	USA, UCR
DFIC0025	carica	UCR 278-128			Table 2	USA, UCR
DFIC0102	carica	UCR 284-11	Gulbun or Nardine [5, 6]		Table 2	USA, UCR via KAC
DFIC0004	carica	UCR 291			Table 2	USA, UCR
DFIC0037	carica	UCR 291-4			Table 2	USA, UCR
DFIC0028	carica	UCR 309 B-1			Table 2	USA, UCR
DFIC0100	carica	UCR 315-1			Table 2	USA, UCR via KAC
DFIC0106	carica	UCR 319-1			Table 2	USA, UCR via KAC
DFIC0095	carica	UCR 324-2			Table 2	USA, UCR via KAC
DFIC0101	carica	UCR 326-1			Table 2	USA, UCR via KAC
DFIC0098	carica	UCR 327-1			Table 2	USA, UCR via KAC
DFIC0097	carica	UCR 333-1			Table 2	USA, UCR via KAC
DFIC0103	carica	UCR 337-2			Table 2	USA, UCR via KAC
DFIC0096	carica	UCR 337-3			Table 2	USA, UCR via KAC
DFIC0108	carica	UCR 341-1			Table 2	USA, UCR via KAC
DFIC0109	carica	UCR K-6-5			Table 2	USA, UCR via KAC
DFIC0105	carica	UCR K-7-11			Table 2	USA, UCR via KAC
DFIC0158	pseudocarica					
DFIC0159	pumila					Pakistan
DFIC0023	carica × palmata					USA, UCR
DFIC0029	pumila × carica					USA, UCR
DFIC0110	pumila × carica					USA, UCR via KAC

[1]Some *F. palmata* from 'Hama' parent according to [4] below; [2]Condit, 1955; [3]Data provided on donation of material to NCGR; [4]Givan, 1998; [5]Storey, 1975; [6]There is some confusion between the published pedigree for these selections and the notes in Storey's notebooks; [7]LSU= Louisiana State University, KAC= Kearney Agricultural Center of the Univ. of California, TAMU= Texas A&M University, UCD= University of California at Davis, UCR= University of California at Riverside.

Table 2. Pedigree of numbered breeder selections of *Ficus* accessions in the National Clonal Germplasm Repository, Davis, California. Data are derived from notebooks of Ira Condit and William Storey.

Accession no.	Selection no.	Other name?	Interpretation	Parents
DFIC0186	KAC 11-4W	K11-4	(D3-9 no longer exists but was 25% Calimyrna; caprifig 347-1 is male parent of D3-9)	Calimyrna × D3-9
DFIC0094	UCR 66-31		Ischia Black × (Mission × Kearney)	Ischia Black × 8-87
DFIC0076	UCR 135-15s		No detailed notes found	(Victory) 1-26 × Excelsior
DFIC0059	UCR 135-4s		No detailed notes found	(Victory) 1-26 × Excelsior
DFIC0065	UCR 143-28		Adriatic × [Verdal Longue × (Calimyrna × Kearney)]	Adriatic × 72-80
DFIC0048	UCR 143-36		Adriatic × [Verdal Longue × (Calimyrna × Kearney)]	Adriatic × 72-80
DFIC0062	UCR 143-38	DiRedo	Adriatic × [Verdal Longue × (Calimyrna × Kearney)]	Adriatic × 72-80
DFIC0049	UCR 143-5		Adriatic × [Verdal Longue × (Calimyrna × Kearney)]	Adriatic × 72-80
DFIC0060	UCR 152-4s		(Victory) 1-26 × [Partridge Eye × (Calimyrna × Kearney)]	1-26 × 71-71
DFIC0083	UCR 153-17		Monstreuse × [Monstreuse × (Calimyrna × Kearney)]	Monstreuse × 75-29
DFIC0054	UCR 153-7		Monstreuse × [Monstreuse × (Calimyrna × Kearney)]	Monstreuse × 75-29
DFIC0064	UCR 160-50		Blanquette × Roeding #3	Blanquette × Roeding 3
DFIC0187	UCR 16-32W		Kadota × Brawley	Kadota × Brawley
DFIC0071	UCR 171-59		Snowden × [Partridge Eye × (Calimyrna × Kearney)]	Snowden × 71-70
DFIC0082	UCR 184-15		[Partridge Eye × (Calimyrna × Kearney)] × [Partridge Eye × (Calimyrna × Kearney)]	71-4 × 71-90
DFIC0089	UCR 184-15s		[Partridge Eye × (Calimyrna × Kearney)] × [Partridge Eye × (Calimyrna × Kearney)]	71-4 × 71-90
DFIC0068	UCR 187-25		[Partridge Eye × (Calimyrna × Kearney)] × {Kadota × [(Kadota × Roeding 3) × (Kadota × Roeding 3)]}	71-4 × 91-10
DFIC0061	UCR 200-43		{Kadota × [(Kadota × Roeding 3) × (Kadota × Roeding 3)]} × [Partridge Eye × (Calimyrna × Kearney)]	91-12 × 71-8
DFIC0008	UCR 228-20		{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × [Monstreuse × (Calimyrna × Kearney)]	143-5 × 75-97
DFIC0107	UCR 233-10	Yvonne[1]	{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {Kadota × [(Kadota × Roeding 3) × (Kadota × Roeding 3)]} × [Kadota × (Calimyrna × Kearney)]	143-5 × 201-29
DFIC0010	UCR 271-1		Beall × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × [Monstreuse × (Calimyrna × Kearney)] |	Beall × 228-20
DFIC0019	UCR 276-14		Calimyrna × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]} |	Calimyrna × 228-20

Table 2. Continued.

Accession no.	Selection no.	Other name?	Interpretation	Parents
DFIC0109	UCR 276-30	K6-5	Calimyrna × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]} |	(Calimyrna × 228-20)
DFIC0014	UCR 276-49		Calimyrna × | {Adriatic × [Verdal Longue × (Calimyrna x Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]} |	Calimyrna × 228-20
DFIC0021	UCR 276-83		Calimyrna × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]} |	Calimyrna × 228-20
DFIC0025	UCR 278-128		Calimyrna × ‖ Beall × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × [Monstreuse × (Calimyrna × Kearney)] | ‖	Calimyrna × 271-1
DFIC0102	UCR 284-11	Gulbun or maybe Nardine[1]	| Calimyrna × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]} | × | Calimyrna × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]} |	276-14 × 276-31
DFIC0004	UCR 291	Either is or sib of Deanna, Gulbun, or Evrem[1]	‖ Adriatic × [Verdal Longue × (Calimyrna × Kearney)] × | {Kadota × [(Kadota × Roeding 3) × (Kadota x Roeding 3)]} × [Kadota × (Calimyrna × Kearney)] | ‖ × ‖ Beall × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × [Monstreuse × (Calimyrna × Kearney)] | ‖	233-10 × 271-1
DFIC0037	UCR 291-4	Sib of Deanna, Gulbun, Evrem[1]	‖ Adriatic × [Verdal Longue × (Calimyrna × Kearney)] × | {Kadota × [(Kadota × Roeding 3) × (Kadota × Roeding 3)]} × [Kadota × (Calimyrna × Kearney)] | ‖ × ‖ Beall × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × [Monstreuse × (Calimyrna × Kearney)] | ‖	233-10 × 271-1
DFIC0028	UCR 309 B-1		Gulbun × ‖ Beall × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × [Monstreuse × (Calimyrna × Kearney)] | ‖	(Gulbun × 271-3)
DFIC0105	UCR 309B	K7-11	Gulbun × ‖ Beall × {[Adriatic × Verdal Longue × (Calimyrna × Kearney)] × [Monstreuse × (Calimyrna × Kearney)]} ‖	(Gulbun × 271-3)
DFIC0100	UCR 315-1	Selection 315-1	‖ | Calimyrna × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]} | × | Calimyrna × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]} | ‖ × ▌Zidi × ‖ Calimyrna × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]} | ‖ ▌	284-11 × 305
DFIC0106	UCR 319-1	Selection 319-1	Calimyrna × | {Beall × {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]}} × [Monstreuse × (Calimyrna × Kearney)] |	Calimyrna × 271-3
DFIC0095	UCR 324-2	Selection 324-2	Tena × ‖ Beall × | {Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × [Monstreuse × (Calimyrna × Kearney)] | ‖	Tena × 271-3

Table 2. Continued.

Accession no.	Selection no.	Other name?	Interpretation	Parents
DFIC0101	UCR 326-1	Selection 326-1	Calimyrna × ▌{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × ‖Beall × ‖{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × [Monstreuse × (Calimyrna × Kearney)]‖ ‖▌	Calimyrna × 281-1
DFIC0098	UCR 327-1	Selection 327-1	Calimyrna × ▌Zidi × ‖Calimyrna × ‖{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]‖ ‖▌	Calimyrna × 305-1
DFIC0097	UCR 333-1	Selection 333-1	‖Calimyrna × ‖{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]‖ ‖× 305-1	276-14 × 305-1
DFIC0103	UCR 337-2	Selection 337-2	‖Calimyrna × ‖{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]‖ ‖ × ‖Beall × ‖{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × [Monstreuse × (Calimyrna × Kearney)]‖ ‖	276-49 (K9-18) × 271-1
DFIC0096	UCR 337-3	Selection 337-3	‖{Calimyrna × ‖{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]‖ ‖ × ‖Beall × ‖{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × [Monstreuse × (Calimyrna × Kearney)]‖ ‖	276-49 (K9-18) × 271-1
DFIC0108	UCR 341-1	Selection 341-1	Tena × ‖{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]‖	Tena × 228-20
DFIC0006	UCR 347-1	UCR 347	Calimyrna × ‖{Adriatic × [Verdal Longue × (Calimyrna × Kearney)]} × {[Monstreuse × (Calimyrna × Kearney)]‖	Calimyrna × 228-20
DFIC0185	KAC11-7W	K11-7W	(D3-9 no longer exists but is 25% Calimyrna; UCR 347-1 is male parent of D3-9)	Calimyrna × D3-9
DFIC0188	KAC11- 30E	T 30E	(D3-9 no longer exists but is 25% Calimyrna; UCR 347-1 is male parent of D3-9)	Calimyrna × D3-9
DFIC0187	KAC16-32W	K16-32W	(D3-11 no longer exists but was 50% Calimyrna)	Calimyrna × D3-11

[1]There is some confusion between the published pedigree (Storey, 1975) for these selections and the notes in Storey's notebooks.