



A collage of various agricultural products is arranged in a grid-like fashion. The items include: a cluster of bright red strawberries; a bunch of green asparagus spears; a cluster of ripe blueberries; a halved peach showing its orange flesh and pit; several fresh raspberries; and several heads of white garlic. The collage is set against a dark brown background with various colored rectangular blocks in shades of green, blue, orange, and purple.

Strawberry
Blueberry
Raspberry
Asparagus
Garlic
Stone fruit

Research & Development in New Plant Varieties

www.planasa.com

PLANasa
INNOVATION IN PLANT VARIETIES

Is a result of merging varietals activities from Planasa and Darbonne



PLANasa
PLANTAS DE NAVARRA. S. A.

Darbonne

PLANasa
INNOVATION IN PLANT VARIETIES

Breeding program, aims to offer continuous innovation in strawberry cultivars suited to any kind of climate.



Company Divisions

➔ **R+D Division:**

- Strawberry
- Raspberry
- Stone Fruit
- Asparagus
- Garlic

➔ **Nursery Division:**

- Strawberry Plants
- Raspberry Plants
- Blueberry Plants
- Stone Fruit Trees
- Asparagus Plants and Seeds
- Garlic seeds

➔ **Fresh Produce Division:**

- Endive: Fresh production



Considerations about breeding

Breeding is all about :

1. Anticipating customers wishes
 - Be aware, 10 years ahead
2. Setting the right breeding objectives
 - Be smart and realistic
3. Implementing the right technologies
 - Rising costs
4. Transform technology into art
 - The heart of breeding

In order to deliver **the best variety** at **the right time**

Research Lines

At the moment, 3 different lines are being developed both in Spain & France through classical recurrent selection :

➔ Short day line :

- Early cultivars
- Season cultivars



➔ Day neutral line:

- Fall production cultivars



All of them, fulfilling the basic objectives, they should present good nutritional quality and resistance to diseases

➔ Resistance to diseases line :

Inverse program: Starting from resistance to disease seedlings, they should present good basic and fruit quality characteristics





Breeding Program for central-north Europe climate type

- Started: 1.975
- Location: Le Barp (Bordeaux)
- Volume and distribution of research per year:
 - Short day:
 - 60 crosses → 6.000 seeds = 75%
 - 40% earliness.
 - 50% mid-season.
 - 10% late
 - Day Neutral
 - 20 crosses → 2.000 seeds = 25%

 **Darbonne**





Breeding Program for Mediterranean climate type

- Started: 1.984
- Location: Cartaya (Huelva)
- Volume and distribution of research per year:

- **Short day:**

- 50 crosses → 12.500 seedlings
 - 40% Generals objectives
 - 50% Exclusive fruit characteristics
 - 10% Resistance Diseases

- **Day Neutral :**

- 10 crosses → 2.000 seedlings





Mission Statement

The plant breeding activities of the Darbonne – Planasa group

Committed to

The Farmer's Needs

And

The Consumer's Tastes

KEY OBJECTIVES

Tudla (1989)
Chiflon (2001)
Tudnew (1992)
Macarena (2004)

Cartuno (1995)

Sabrosa (2002)

Carmela (2004)

Sabrina (2009)

Cristal

- ➔ Productivity & Earliness
- ➔ Long Shelf Life
 - ➔ Fruit firmness
- ➔ Fruit homogeneity:
 - ➔ Size & Shape
- ➔ Production linearity
- ➔ Organoleptic Quality:
 - ➔ Linked to consumers senses
 - ➔ High Brix° level, Taste & Aroma
- ➔ Health Quality :
 - ➔ Linked to environment impact.
 - ➔ Resistance diseases cultivars.
- ➔ Nutritional Quality:
 - ➔ Linked to nutritional Properties
 - ➔ C.A.T., Antirust, Vitamin C,

Darline (1992)
Daroyal (2.003)

Darselect (1.996)

Darlisette (2.003)

Diana (2.005)

Donna (2.005)

Amandine

DA49

DA48

Crosses & Seedlings

Crosses



Germination



Germination



**Seedlings
Nursery**



Selection

1st Phase



2d Phase



**Day Neutral
Cultivars**



**Diseases
Resistance**

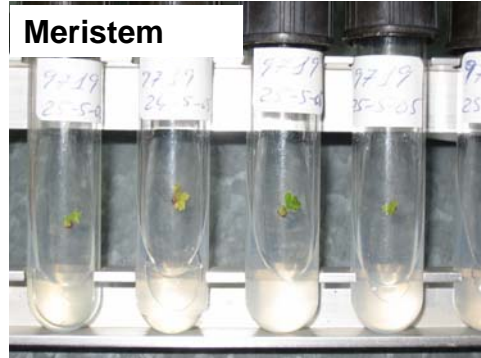


Material cleaning

Thermoterapy



Meristem



Aclimatation



Transplant





Foundation Material



Insect Proof 1st Phase



Insect Proof 2^d Phase

Foundation Nursery





Resistance to Pathogens

PLANASA started its resistance to disease breeding line in 1997



Simple idea: resistant cultivars will become strategic in a 10 years time

Today's Concerns :

- Prohibition of Methyl Bromide soil fumigation
- Continuous reduction of efficient pesticides availability
- Continuous reduction of allowed pesticide residues limits
- Society trend toward more sustainable agriculture
- Rising concerns about **environment protection**

Today's Answer : a resistant cultivar is one of the solution to answer above concerns and in particular:

- Farmers needs for a reliable crop with pesticide use reduction
- Consumers wish for a healthier and safer food (less residues)
- **Environment protection**



COLLABORATION IRTA: Goals

- Program started in 1997 focused in two ways:
 - Constructing genomic tools for *Fragaria*.
 - Applying them to the breeding program

- Mix research unit located in Cabrils (Barcelona)
 - DNA characterization equipment (secuenciador)

- The goals:
 - To get Molecular Markers for:
 - Varietal identification.
 - Germplasm characterization (Genetic distance)
 - Marker Assisted Selection

↘ Continental climate

- ↘ **Darlisette:** (Exceptional taste)
- ↘ **Daroyal:** (great early ripening)
- ↘ **Darselect:** (Great flavour)
- ↘ **Donna:** (Quality early season)
- ↘ **Diana:** (Quality early season)
- ↘ **Amandine:** (Pay Neutro)

↘ Temperate climate

- ↘ **Milsei-Tudla:** (Saline Soil)
- ↘ **Carmela:** (Resist. Diseases)
- ↘ **Macarena:** (High productivity)
- ↘ **Cristal:** (Strong D.N.)
- ↘ **Candonga-Sabrosa:** (High quality)
- ↘ **Sabrina:** (High productivity)

Key Characteristics

- **High productivity**
- **Very earliness.**
- Vigorous plant
- Red cardinal colour.
- Low deformation.



Key Characteristics

- **High flavor & aroma**
- **Firmness fruit**
- Middle season
- Vigorous plant



- **Great demand in Central and western European countries due to its great flavour aroma and self-life**

Key Characteristics

- **High productivity & very earliness**
- Very good self-life
- Low deformation
- Dark red shiny color



Key Characteristics

- **High productivity & Earliness**
- Very good self-life
- Good tolerant to powdery mildew
- Low deformation
- Red shiny color

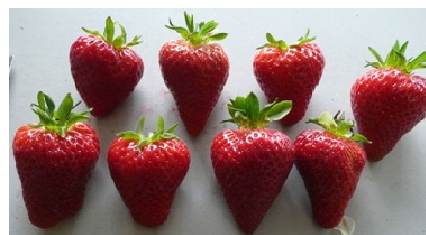


New Continental Varieties

- ➔ DA 46 :
 - Short Day Variety
 - Red Orange Colour
 - Mid Season
 - Good Firmness



- ➔ AMANDINE:
 - Neutral Day Variety
 - Red Bright Colour
 - Great Taste
 - Good Production



- ➔ DA 49:
 - Short Day Variety
 - Red Bright Colour
 - Very Early
 - Good Production



Improvements Sabrosa-Candongga

Basic Objectives:

- Reduced level of malformed fruit
- Reduced harvesting cost (erected plant)
- Reduced packing cost
- Production linearity
- Shelf-life

Quality increase:

- Higher organoleptic fruit quality (taste, colour, flavour)
- Higher health fruit quality (Less diseases and treatments)
- Higher nutritional fruit quality. (Big amount on CAT)





Trends and challenges in strawberry breeding program conclusions:

- ➔ The aim of the programs is to breed varieties which:
 - ➔ Report the highest satisfaction to the consumer.
 - ➔ Can get the biggest commercial yield to the farmer.
 - ➔ Can help to cause the minimum environment impact possible.

- ➔ Actually, our main objectives lines are to work in order to enhance the three quality lines:
 - ➔ **Organoleptic quality:** linked to consumer senses
 - ➔ **Health quality:** linked to environment impact. (And therefore to enhance varietal resistance to diseases and lack of pesticide residues).
 - ➔ **Nutritional quality:** linked to nutritional properties.

- ➔ In this way the development of marker-assisted selection, is a fundamental tool to a quicker advance in the achievement of our goals.



World Breeding

- In Europe over 325 new cultivars have been registered since 1995
- More than 450 new cultivars have been registered in the world in the past 20 years
- Over 30 countries have breeding programs
- Over 80 public agencies or private companies have breeding programs
- Only a few varieties are really commercialized
- In the past years more private companies have appear and less public agencies
- UPOV: 68 countries have entered but still many important countries are still out and don't have any breeder's legal protection

EUROPE BREEDERS

France, Belgium



INSTITUTE / PRIVATE CO.	VARIETIES (...)
ANGIER SAS INTERNATIONAL	Angelina, Anabelle, Anaïs
CIREF	Ciflorette, Cigaline, Charlotte, Cirafine, Betty, Cifrance, Cilady, Cijosee, Cilôe, Cireine, Candiss
DARBONNE SAS	Darselect, Daroyal, Daisy, Donna, Diana, Diadème, Darlisette
MARIONNET SARL	Mara des Bois, Matis, Manille, Mamie, Maraline, Marascot, Dèsse des vallés
INRA BORDEAUX	Gariguette, Favete
Gaec GUILLLOTEAU	Gustine
Agrana Fruit S.A.	Prelude, Siabelle
Cultura Jean Moors Bvba	Isaura

EUROPE BREEDERS

Germany, Switzerland



INSTITUTE / PRIVATE CO.	VARIETIES (...)
Julius Kühn Institut	Julia
Hansabred	
Dr.Barbara Dathe	Mieze Nova
Putfarken Jochen	Rubia
M.Stoppel	Malwina
Prisma Stauden & Jungpflanzen	Pink Diamond
Fruttica GMBH	Frugodi
Häberli Obst – und Beerenzentrum	Avalon Classic, Thuriga, Hobdoel, Hobottrece, Turana

EUROPE BREEDERS ITALY



INSTITUTE / PRIVATE CO.	VARIETIES (...)
CReSO Centro Sperimentale Orticolo	Roxana, Arosa, Sugarlia, Elsinore
Istituto Sperimentale di Frutticoltura-Provincia di Verona	Dora,Patty, Eva
Apo Scaligera S.C.A.R.L	
ASIA / Azienda Agricola Sprimentale Dimostrativa "Pantanello"	
Unità di Ricerca per la Frutticoltura (Caserta) CRA-FRC	Pircinque
Università di Palermo Dipartimento A.C.E.P. Azienda Didattico Sprimentale	Demetra
CRA-FRF Unità di Ricerca per la Frutticoltura di Forlì	Adria, Dora, Sveva, Nora, Kilo, Palatina, Argentera, Tecla, Vale, Unica, Zeta
CRPV.Soc.Coop. Centro Ricerche Produzioni Vegetali - Cesena	Patience, Paros, Onda, Lia, Eva, Irma, Queen Elisa, Dora, Patty
New Fruits S.A.S , Cesena	Asia, Alba, Roxana, Siria, Maya, Gema, MF245, MF311
UNIVPM, Dipartimento di Scienze Ambientali e delle Produzioni Vegetali - SACROV Università Politecnica delle Marche	
Dante Magnani	Anitabis
Sant'Orsola Società Cooperativa Agricola	Sarica
C.I.V. Consorzio Italiano Vivaisti	Arosa, Civka, Civl35, Civmad, Clery, Civri30, Onebor

EUROPE BREEDERS

Lithuania, Finland, Sweden



INSTITUTE / PRIVATE CO.	VARIETIES (...)
MTT Agrifood Research Finland Plant Production Research, Horticulture	
Swedish University of Agricultural Sciences	
Lithuanian Institute of Horticulture	

Poland, Hungary

INSTITUTE / PRIVATE CO.	VARIETIES (...)
Agricultural University of Lublin, Department of Genetics and Horticultural Plant Breeding	
Proplant Gyümölcszaporítóanyag Előállító KFT.	Nerina

EUROPE BREEDERS



The Netherlands

INSTITUTE / PRIVATE CO.	VARIETIES (...)
Plant Research International Wageningen	Elsanta, Pavana, Lambada
(ABZ) Aardbeien uit Zaad B.V.	Durban, Elan F1, Milan, Loran F1, Merlan F1, Tristan F1, Delicia
Konings Plant BV	Kimberly, Melani, Nancy, Susi, Valery
Vissers BV	Elianny
Fresh Forward Holding BV	Figaro, Salsa, Sonata

Spain

INSTITUTE / PRIVATE CO.	VARIETIES (...)
IVIA, Instituto Valenciano de Investigaciones Agrarias	Vilanova, Durval, Calderona, Marina Medina
IFAPA CIFA Junta Andalucía	Aguedilla, Amiga, Fuente Pina
Fresas Nuevos Materiales S.A	Cisco, Coral, Pedrone, Primoris
PLANASA	Macarena, Sabrosa/Candongga, Tudla, Carmela, Chiflón, Plarionfre

EUROPE BREEDERS

United Kingdom



INSTITUTE / PRIVATE CO.	VARIETIES (...)
EMR East Malling Research	Amelia, Lucy, Sallybright, Judibell, Mae, Malling Opal, Flamenco
Edward Vinson Limited	Everest, Evie1, Evie2, Evie3, Evita
Redeva Redbrigde Holdings Ltd.	
SCRI Scottish Crob Resarch Institute	Symphony
Angust Soft Fruits Ltd. East Seaton Farm	Ava, Ava Maria
Medway Fruits Ltd.	
KG Growers Ltd.	Hermoine, Cordelia, Juliet
Horticultural Research international	Sopfie, Rosie, Calipso, Florence

WORLD BREEDERS

USA



INSTITUTE / PRIVATE CO.	VARIETIES (...)
The Regents of the University of California	Albion, Aromas, Camarosa, Camino Real, Diamante, Ventana, Pacific, Honeoye, Pájaro, Monterrey, Portolas, San Andreas, Gaviota, Selva, Osogrande
Driscoll Strawberry Associates	San Miguel, Ventura, Camarillo, Driscoll Malibu-Bonaire-Ojai, Atlantics, Osteola, El Dorado, Sausalito
Berry Genetics Inc. (Plant Sciences Inc.)	Splendor, Virtue, Paciente, Honor
Florida Foundation Seed Producers Inc. (Greenwood, FL)	Sweet Charlie, Florida Festival, Fortuna
J&P Research Inc.	Treasure Harvest
Beach Street Farms LLC (VPP Corporation)	Whitney
Cornell Research Foundation inc.	Seneca
California Giant	Galante, Galexia, Gloria, Catalina, Gala, Gianna
University of Minnesota Department of Horticultural Science	Itasca
Cornell University College of Agriculture and Life Sciences New York State Agricultural Experiment Station	L'Amour, Jewel

WORLD BREEDERS

USA



INSTITUTE / PRIVATE CO.	VARIETIES (...)
Washington State University Tree Fruit Research & Extension Center	
Ohio Agricultural Research and Development Center (OARDC)	
Genetic Improvement of Fruits and Vegetables Laboratory (GIFVL) U.S.Dept. of Agriculture (USDA) Agricultural Research Service (ARS) Plant Sciences Institute (PSI)	
Michigan State University	
North Carolina State University	

WORLD BREEDERS

Canada



INSTITUTE / PRIVATE CO.	VARIETIES (...)
Agriculture and Agri-Food Canada	Yamaska, Saint Pierre, Wendy
Agriculture Canada Research Station	L'Authentique Orléans St. Pierre
University of Guelph Horticultural Research Institute of Ontario	Sapphire, Sevenity

Israel

INSTITUTE / PRIVATE CO.	VARIETIES (...)
Gyo International Ltd.	Suzana
ARO Agricultural Research Organization	Tufts, Nurit, Rachel, Dorit, Ofra
Fertiseeds Ltd.	Doron, Yuval, Ronit, Orly
Efraim Yosef	Rotemi, Shaked
Ministry of Agriculture and Rural Development	Tamar, Yael, Malah, Hadas, Hedut

WORLD BREEDERS



China

INSTITUTE / PRIVATE CO.	VARIETIES (...)
Institute of Forestry and Pomology Science Academy of Agriculture & Forestry Science	
Institute of Horticulture Jiangsu / Academy of Agricultural University	
Shenyang Agricultural University / College of Horticulture	
Shenyang Agricultural University	
Shijiazhuang Pomology Institute / Hebei Academy of Agricultural and Forestry Sciences	
Shi Jia Zhuang Pomology Institute	

Japan

INSTITUTE / PRIVATE CO.	VARIETIES (...)
Mie Prefecture Agricultural Research Institute	
Nii Bio Kaki Kenkyusho Corp.	Awaitumo
Kagawa University Faculty of Agriculture	

WORLD BREEDERS

South Africa



INSTITUTE / PRIVATE CO.	VARIETIES (...)
ARC Infruitec-Nietvoorbij (Institute for Deciduous Fruit, Vines and Wine)	

Australia, New Zealand

INSTITUTE / PRIVATE CO.	VARIETIES (...)
State of Queensland Department of Primary Industries and Fisheries (Brisbane AU)	Rubygem, Kabarla, Sugarbaby
HortResearch	

WORLD BREEDERS

Brazil, Mexico, Uruguay



INSTITUTE / PRIVATE CO.	VARIETIES (...)
Instituto Agronômico de Campinas	
INIFAP Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias	Buena Vista, Cometa
INIA Instituto Nacional de Investigación Agropecuaria	