

**SCAR**  
Standing Committee  
on Agricultural Research

**SCAR SWG AKIS 5 – 1st Meeting**  
**ACIREALE, 17-18<sup>th</sup> June 2019**



**SCAR**  
**AKIS**  
Agricultural Knowledge  
and Innovation Systems

A good example of local EIP group:  
FICODINDINNOVA (Rural Development Programme, Sicily, 2007-2013)

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AgriUniTech s.r.l., Catania University spin-off



UNIVERSITÀ  
degli STUDI  
di CATANIA

**Agriuni**  **tech** s.r.l.

Spin-off dell'Università degli Studi di Catania

# Project main information



## Misura 124 “Cooperazione per lo sviluppo di nuovi prodotti, processi e tecnologie nei settori agricolo e alimentare e in quello forestale”



Leader partner: Consorzio Euroagrumi O.P.

Project title: Co-innovations related to agronomic factors and to product management aspects for prickly pear chain (FICODINDINNOVA)

Scientific responsible: Prof. Alessandra Gentile

Funds: 591.000,00 €



FONDO EUROPEO AGRICOLO  
PER LO SVILUPPO RURALE:  
L'EUROPA INVESTE NELLE ZONE RURALI

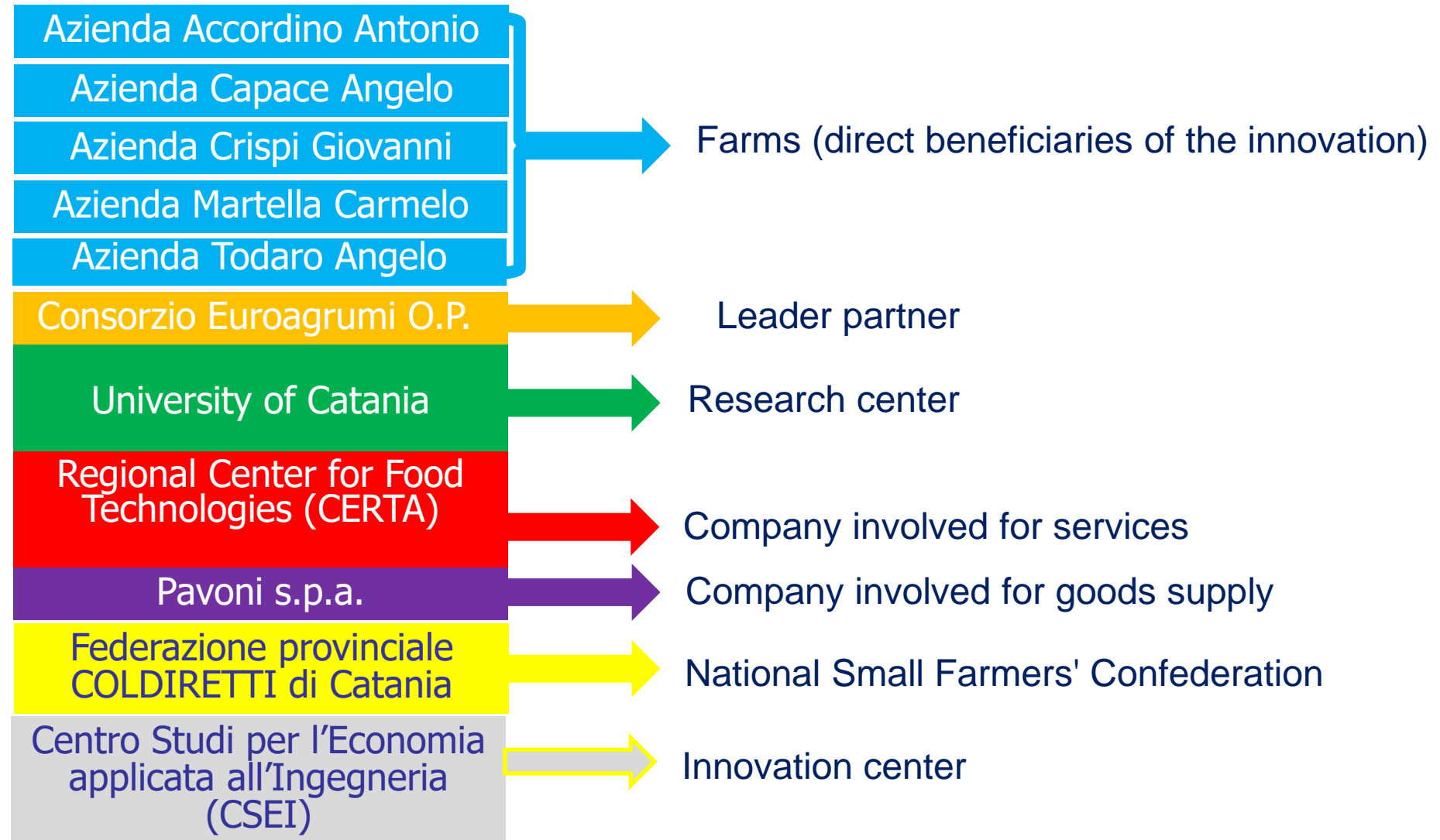


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AGRICOLE E ALIMENTARI

## Co-innovations related to agronomic factors and to product management aspects for prickly pear chain (FICODINDINNOVA)



# Leader partner and its role



Leader partner is a producer organisation established in 1986, whose main activities concern blood oranges, but with an increasing interest for other vegetable and fruit crops and among these cactus pear

Propensity for innovation

Acknowledgment of University role and competencies

The project was focused on cactus pear chain and moved from some «research needs» of the species



# Cactus pear use



biomass  
> 1,000,000 ha



Human feeding  
100,000 ha



Food and Agriculture Organization  
of the United Nations

# Cactus: a miracle crop to combat climate change



Friday, 24 November 2017

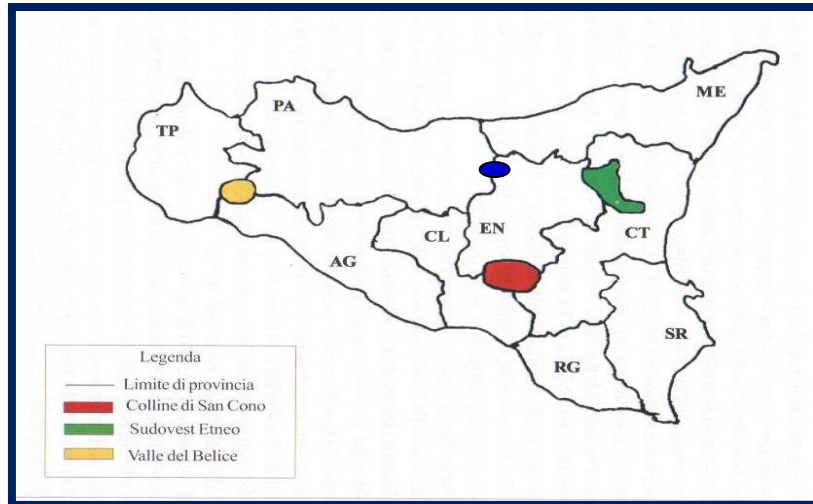
10:00-12:30

Iran room (B116)

All staff are welcome

# Economic importance in Italy

- Italy accounts second (about 100.000 tons of fresh fruit)

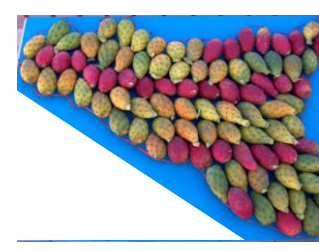


- San Cono
- South-west Etna
- Valle del Belice
- Roccapalumba





# Cactus pear in Sicily



## Cultivar

- Bianca
- Gialla
- Rossa

Only few clones  
for each cultivar

- ✓ Recent introduction in the mediterranean area
- ✓ Clonal propagation
- ✓ Strict autogamy



Low level of genetic diversity

# Project concept

1. Match producer needs with University know-how (on cactus pear and on other species)
2. Search for partners (especially farmers and stakeholders and companies)
3. Design specific actions
4. Project building

Strategic role of the consortium



# 1. Sustainable fertilization and irrigation for prickly pear orchards

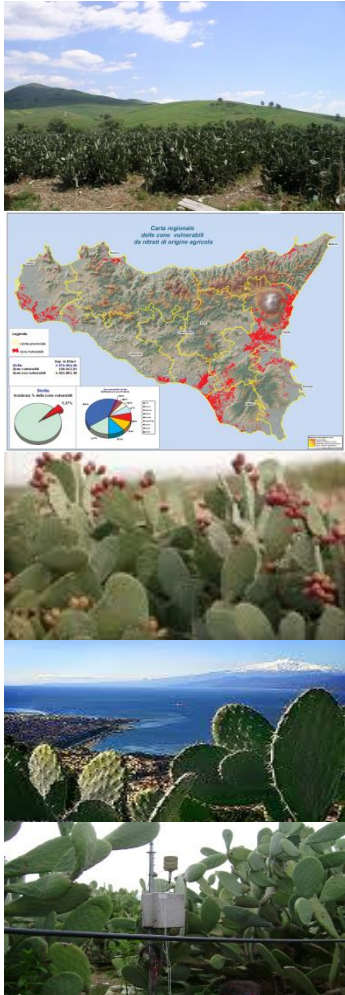


## Specific problems

- Very high biomass production (fruits and cladodes)
- High level of nutrient uptake from the soil
- Need to prevent nitrogen dispersal (accomplishing nitrates directive)
- Need to increase water use efficiency



- Set up of fertirrigation protocols
- Determination of crop factor ( $K_c$ ) for cactus pear
- Application of micrometeorological parameters for irrigation scheduling
- Evaluation of effects on productive and qualitative parameters



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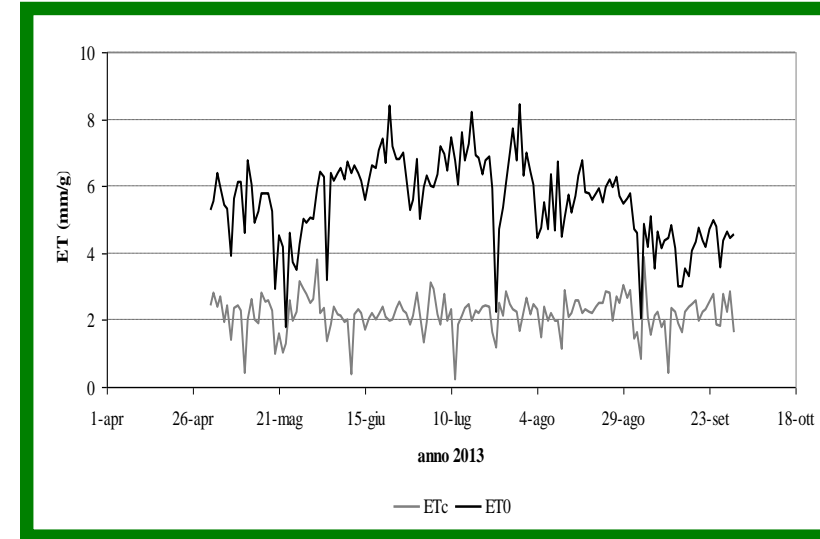
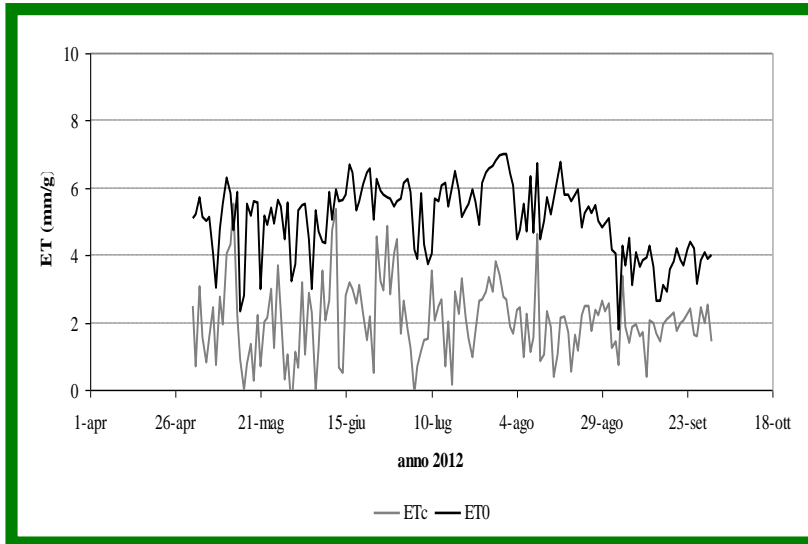


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### Azione 3: Trasferimento di metodologie innovative per la gestione dell'irrigazione del ficodindia



	ET <sub>c</sub> (mm d <sup>-1</sup> )	ET <sub>0</sub> (mm d <sup>-1</sup> )	K <sub>c</sub>
Media	2,1	5,5	0,4
Max	4,2	8,1	1,1
Min	0,1	1,8	0.01

Volume irriguo richiesto,  
in media per stagione  
(maggio-settembre), ~  
3.000 m<sup>3</sup> ha<sup>-1</sup>

Volume irriguo  
somministrato, in media  
per stagione (maggio-  
settembre), ~ 1.300 m<sup>3</sup> ha<sup>-1</sup>



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## 2. Longer fruit marketing season

Two productions:

- 1) agostani or «primofiore» (first flush, summer production)
- 2) bastardoni or «scozzolati» (reflush, autumn production, more valuable, bigger in size)



**Aim:** Delay production till December



# Green pruning of “Primofiore or Agostano”



## 2. Longer fruit marketing season



In each farm different green pruning periods were imposed (in may and june) and reflowering index was calculated

		Azienda Crispi			Azienda Capace/Accordino		
		n. frutti scozzolati	n. frutti riemessi	I.R.	n. frutti scozzolati	n. frutti riemessi	I.R.
Scozzolatura controllo	27/05/2012	10,12	3,11	0,31			
Scozzolatura Tesi 1	03/06/2012	8,84	2,90	0,33			
Scozzolatura Tesi 2	09/06/2012	7,56	1,80	0,24			
Scozzolatura controllo	07/06/2012				8,20	0,40	0,05
Scozzolatura Tesi 3	10/06/2012				7,96	1,22	0,15
Scozzolatura Tesi 4	13/06/2012				8,91	0,93	0,12
Scozzolatura Tesi 5	16/06/2012				9,92	1,86	0,19
Scozzolatura Tesi 6	19/06/2012				8,42	0,47	0,06
Scozzolatura Tesi 7	22/06/2012				8,26	0,58	0,07
Scozzolatura Tesi 8	25/06/2012				7,80	0,52	0,07
Scozzolatura Tesi 9	28/06/2012				8,94	2,20	0,25

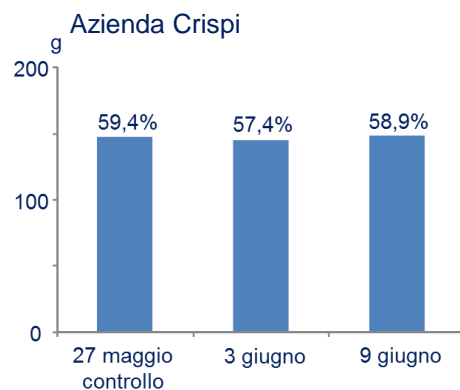
1. Plants pruned in late periods exhibited reflowering indexes (I.R.) similar to those pruned at the conventional period

2. The most important: the delayed green pruning allowed to obtain fruits to be harvested in december without any negative effect on fruit size and quality

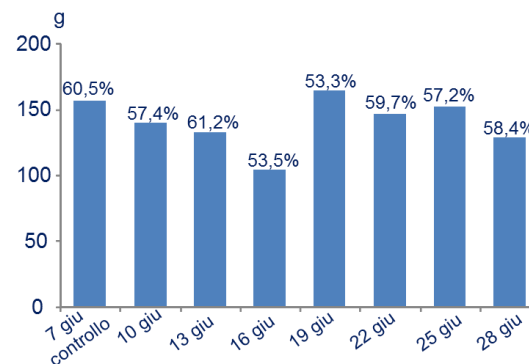




## 2. Longer fruit marketing season



Azienda Capace/Accordino



		S.S.T.	pH	Acidità titolabile g/100mL
<b>Scozzolatura controllo</b>	27/05/2012	16,1	4,8	0,2
<b>Scozzolatura Tesi 1</b>	03/06/2012	16,3	5	0,2
<b>Scozzolatura Tesi 2</b>	09/06/2012	16,8	5,2	0,2
<b>Scozzolatura controllo</b>	07/06/2012	15,6	5,1	0,4
<b>Scozzolatura Tesi 3</b>	10/06/2012	15,5	5,2	0,2
<b>Scozzolatura Tesi 4</b>	13/06/2012	15,5	4,4	0,3
<b>Scozzolatura Tesi 5</b>	16/06/2012	15,1	4,6	0,4
<b>Scozzolatura Tesi 6</b>	19/06/2012	14,4	4,5	0,4
<b>Scozzolatura Tesi 7</b>	22/06/2012	15,5	5,7	0,3
<b>Scozzolatura Tesi 8</b>	25/06/2012	14,4	5,1	0,2
<b>Scozzolatura Tesi 9</b>	28/06/2012	15,5	4,6	0,2



### 3. Increasing fruit shelf-life and evaluation of new products

#### **Specific postharvest problems of cactus pear**

- Structure of the fruit
- High deperibility at room temperature
- Susceptibility to low temperatures (below 12°C)
- Glochids (and spines)
- Fungi and bacteria



For this specific action is important to underline the role played by consultants (together with researchers and stakeholders) who proposed and adapted solutions (already known for other fruits) to cactus pear



### 3.1. Increasing fruit shelf-life

*Commun Agric Appl Biol Sci.* 2012;77(3):207-17.

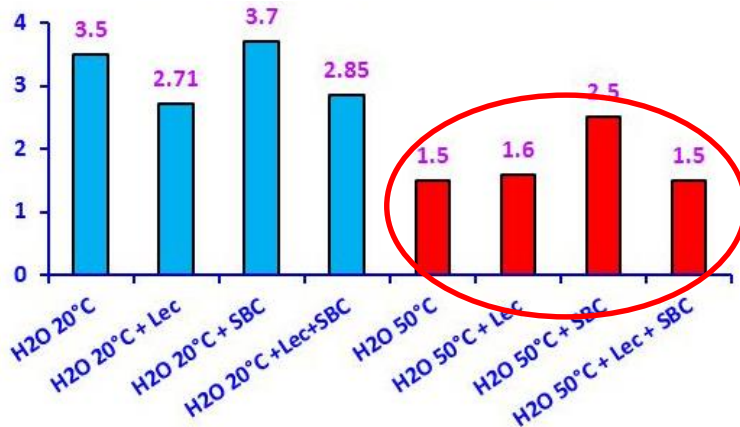
**Individual and combined effects of postharvest dip treatments with water at 50 degrees C, soy lecithin and sodium carbonate on cold stored cactus pear fruits.**

D'Aquino S<sup>1</sup>, Barberis A, Continella A, La Malfa S, Gentile A, Schirra M.



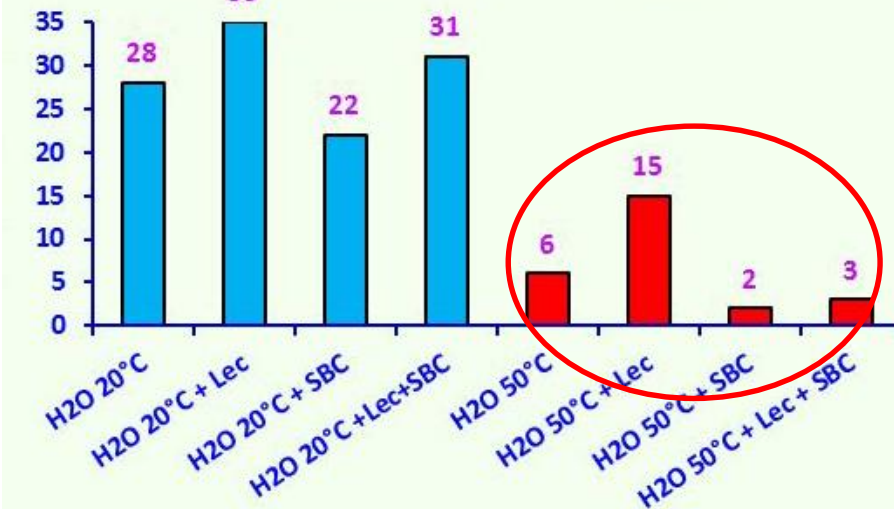
#### Incidence of peel physiological alterations

21 days at 2 °C + 1 week at 20 °C



#### Incidence of rots (% of fruits)

21 days at 2 °C + 1 week at 20 °C



## 3.2. Evaluation of new products



Controllo (no FW: no MA)



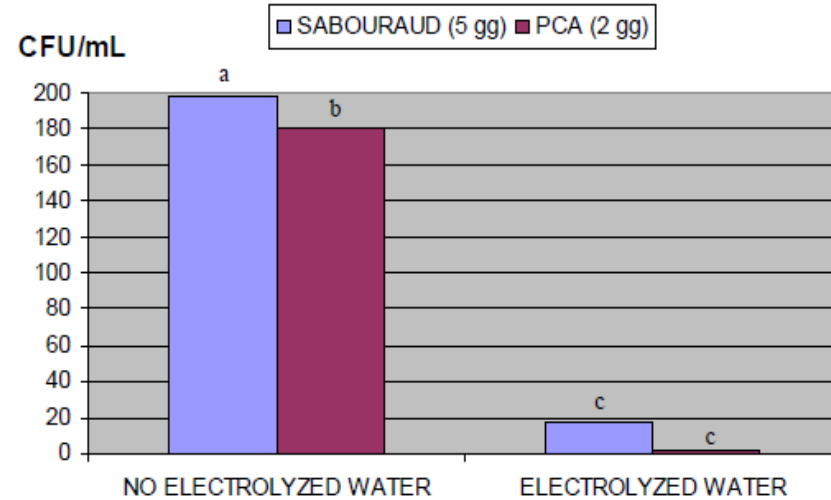
T2 (No EW: MA)



T1 (EW: no MA)



T1 + T2 (EW: MA)



	Storage time (days)															
	0				5				10				15			
	pH	%CO <sub>2</sub>	TSS	TA	pH	%CO <sub>2</sub>	TSS	TA	pH	%CO <sub>2</sub>	TSS	TA	pH	%CO <sub>2</sub>	TSS	TA
<b>CONTROL</b>	4.30	6.9	12.5	0.03	4.62	15.2	11.7	0.02	4.41	26.9	12.2	0.02	4.37	39.0	11.8	0.02
<b>MA</b>	4.10	21.3	12.9	0.02	5.12	24.9	12.7	0.02	4.91	42.4	12.5	0.02	4.37	52.7	13.6	0.02
<b>EW</b>	4.75	6.7	11.1	0.02	4.57	16.6	11.9	0.02	4.82	27.5	11.1	0.02	4.38	40.6	11.6	0.02
<b>EW+MA</b>	4.03	21.8	12.8	0.03	4.52	34.1	12.5	0.02	4.53	39.0	12.2	0.02	4.16	56.8	13.1	0.02

Surface sterilization of the fruit surface prior to peeling is generally achieved by dip treatments in sodium hypochlorite; however, new alternatives that are safer for workers and consumers as well as environmentally friendly and cheap, such as electrolyzed water. This, coupled with conservation under modified atmosphere packaging (MAP), makes it possible a shelf-life extension of ready to eat product till 12-14 days.

# Dissemination actions



- ✓ **Several meetings in farms and packing houses**
- ✓ **Publication of factsheets**
- ✓ **Seminars**
- ✓ **Congresses**
- ✓ **Website**
- ✓ **Scientific papers and publications**



## Impact of the project

- The project has been focused on a single minor fruit crop but of strategic importance for Italy and for arid and semiarid regions
- The actions of the project derived from needs expressed by the growers
- The results had a direct impact on the sustainability of the production process (inputs saving and waste reduction)
- Growers took benefits from innovations deriving from other species and applied for the first time on cactus pear
- The actions have been carried out in a single productive area but, thanks to the dissemination events, have been spread to a large auditory
- New consumers can be reached thanks to the co-innovation in post-harvest (longer presence in the market and ready-to-eat fruit)



The partnership established for the project is still active and the cooperation among some of the partners, especially the LP, allowed the set-up of new actions dealing with the agro-industrial products and by-products valorization of cactus pear

**Food products, by-products and additives obtained from cactus pear fruit and cladodes**

Products	Products	By-products
<i>Fruit</i>	<i>Cladodes</i>	<i>Fruit and cladodes</i>
Juices and nectars	Juices	Oil from seeds
Jams, gels and jellies	Pickled and brine-cured products	Mucilage from cladodes
Dehydrated fruits and fruit leathers	Jams and jellies	Pigments from peel and fruit
Sweeteners	Flours	Dietary fibre from cladodes
Alcohols, wines and vinegars	Alcohol	Pulp for animal feed from peel and seeds
Canned fruit	Confectionery	
Frozen fruit and pulp	Sauces	
	Young stems ( <i>nopalitos</i> )	

Source: Sáenz (2000); Corrales and Flores (2003).

Some of these actions allowed to attract funds from private companies, and some others are part of new project proposals (Ministry of Economic Development and Rural Development Programme, 2014-2020).

The most reliable activities are dealing with the set up of efficient propagation methods and with the evaluation of different parts of the plant.



TOZZIgreen









dryGrow

The logo features a stylized green plant with three leaves above the text "dryGrow". The word "dry" is in yellow, "G" is in red, and "row" is in green.