Il packaging attivo nel mercato dell'ortofrutta: il caso SAES Coated Films

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Advanced coatings
for sustainable solutions

About our Group: SAES Group

- Italian Public Company
- 250 Mio € Net Sales
- 11 Manufacturing facilities worldwide
- 1100 Employees
- Functional materials and gas management in high tech markets and flexible packaging

Since April 12, 2018

Our contribution to Sustainable Packaging

ECO-FRIENDLY

- CO_2 REDUCTION down gauging
- CO_2 REDUCTION No Al foil
- 100% RECYCLABLE Mono-materials

COMPOSTABLE

- PLASTIC-FREE

ACTIVE

- LESS FOOD WASTE

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ETHYLENE - FREE

Environmental and Food sustainability

The resources used to produce food that is eventually lost or wasted account for approximately 4.4 gigatonnes of greenhouse gas emissions (CO_2 equivalent) annually, making food loss and waste the world's third largest emitter, after only China and the United States.

http://www.fao.org/save-food

Fruit and vegetable waste in developed economies

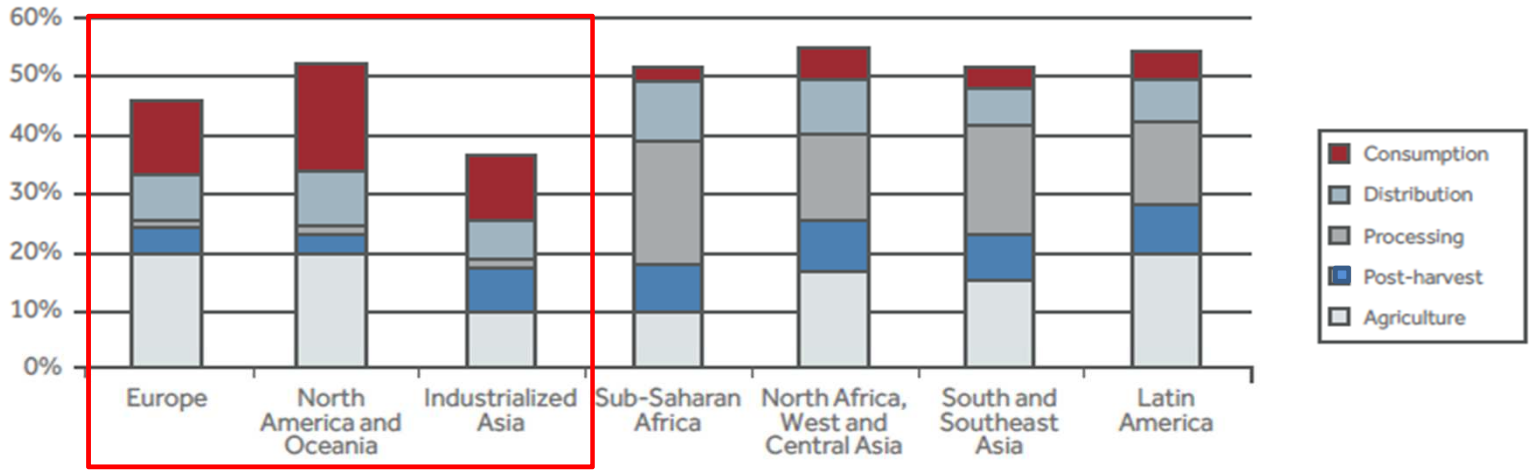

Figure 1. Percentage of the initial production lost or wasted at different stages of the FSC for fruits and vegetables in different regions. "Agriculture" indicates losses occurring during harvest operation and subsequent sorting and grading. "Post-harvest" indicates losses occurring during handling, transportation and storage immediately after harvest and before processing.

Waste in all Fruit & Veg. supply chain is also substantial in the first three regions, with 15-30% of purchases by mass discarded by consumers.

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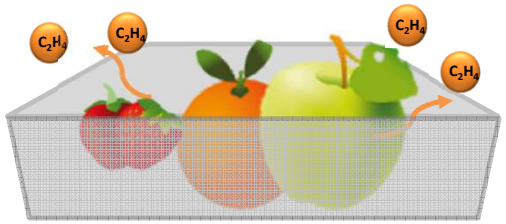
How to take care of the produces?

Ethylene is one the key factors influencing fruit & vegetable degradation

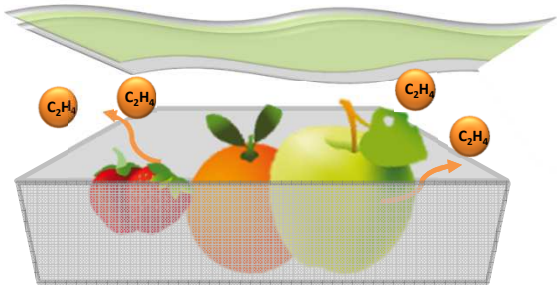


*Ethylene production from different fresh produce types			
Low (<1,0 µl kg^{-1} h^{-1})	Moderate (1-10 µl kg^{-1} h^{-1})	High (1-100 µl kg^{-1} h^{-1})	Very high (>100 µl kg^{-1} h^{-1})
Orange, Blueberry, Plum	Banana, Mango, Tomato	Apricot, Pear, Kiwi	Apple, Avocado

*Platinum Metals Rev. 2009, 53, (3)

Multivariable mechanism: Ethylene sensitive products

SAES Ethylene-free film absorbs Ethylene through its engineered zeolites controlling the atmosphere into typical package



PRODUCT CULTIVARS

STORAGE TEMPERATURE

ETHYLENE EMISSION QUANTITY

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SAES in partnership with its clients can address the best cases

Case study: Blueberry

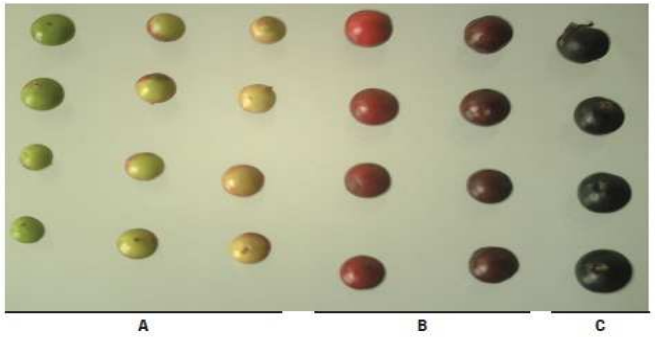


FIGURE 1. Colombian blueberry fruits at different stages of maturity. A, immature (state 1, green fruits); B, mature (stage 2, purple fruit); C, very mature (state 3, dark purple or black fruit).

- Commercial species
- Highbush blueberry - 3 varieties (early= end may-end July; medium=end June-end July; late= end July-end sept.) – 24 cultivar
- Lowbush blueberry
- Rabbiteye blueberry – 3 varieties – 4 cultivar

- Ethylene production rate and sensitivity
- Reference **at 20°C**: 0.1-1 µl kg^{-1} h^{-1} (non climacteric)
- Ethylene peak arises in synchrony with green-pink stage: 0.1 µl kg^{-1} h^{-1} C_2H_4 vs. 15-50 mg kg^{-1} h^{-1} CO_2 (Lipe, 1978, - Windus *et al.,* 1976) (not at last stage of ripening, i.e. at the beginning of senescense)
- Forney (2003), states that blocking ethylene action with 1-MCP, had no effect on the post-harvest quality or storage life of blueberries.
- Rabbiteye blueberry cultivars differ considerably in terms of their respiration rate, ethylene production and moisture loss. “Premier” shows non detectable level of ethylene (at 20°C ?), “Climax” produced 4-6.5 µl kg^{-1} h^{-1} , while “Brightwell” were in the range of 0.012-0.047 µl kg^{-1} h^{-1}

Case study: Blueberry

- Respiration rate
- Reference at 5°C = 10-20 ml kg^{-1} h^{-1} CO_2 (moderate respiration rate)
- Once berries are picked, they maintain their living status and consume reserve of organic materials, with a rapid decline in quality
- Blueberries have a Q10 of 3 (respiration increases 3 time each 10°C)

Table 1. Harvest and sampling dates of 'Tifblue' and 'Bluegem' blueberry fruits.

Harvest date	Cultivar	Fruits with 75% or more blue (%)	Harvest no.	Sampling date	Decay (%)
June 15th (Harvest I)	'Tifblue'	25- 35	I	July 1st	1- 3
			II	July 15th	6- 7
			III	Aug. 1st	25
	'Bluegem'	30- 40	I	July 1st	5- 7
			II	July 15th	11-14
			III	Aug. 1st	35
July 1st (Harvest II)	'Tifblue'	80- 90	I	July 15th	11-15
			II	Aug. 1st	35-40
			III	Aug. 15th	40-50
	'Bluegem'	95-100	I	July 15th	10-15
			II	Aug. 1st	15-25
			III	Aug. 15th	50-90
July 15th (Harvest III)	'Tifblue'	100-Overripe	I	Aug. 1st	50-90
			II	Aug. 15th	100
			III	Sept. 1st	—
	'Bluegem'	Overripe	I	Aug. 1st	—
			II	Aug. 15th	—
			III	Sept. 1st.	—

- Decay
- Diseases is the main cause of blueberries decay, associated with Botrytis cinerea infection. It has been documented that the attack of the fruit by microorganism causes significant increases in ethylene evolution (Burg, 1962). Ethylene stimulate production of H2O2 which produces fast necrosis of tissue attached by grey mould, avoiding further proliferation
- Decay incidence is higher if harvest occurs during cool, rainy weather
- Blueberries show a moisture loss of 1%w/w per week, while in closed plastic container it reduces down to 0.3% w/w per week. Moisture loss is associated with increased ethylene and CO_2 production
- Decay is concentrated in fruit with low acidity and high TSS.
- Market tolerance for decay is set at 2% at the end of the shelf life period, therefore decay must be reduced almost to zero

Case study: Blueberry

- Storage conditions
- The optimum conditions are 90-95% R.H. and 2°C
- There are two main supermarket scenario: 22-24°C or 2°C in refrigerated displays (which run closer to 6-7°C).
- Storage < 2-3 weeks (extremely variable).

- MAP
- T 1-2°C, R.H. 95%, 10-15% CO_2 and O_2 levels no lower than 3-4% (Ehlenfeldt,2002).
- Possible disadvantages associated are: 1) development of off flavours and fermented taste due to shifting to fermentative metabolism (CO_2 > 15%) ; 2) after removal of fruits (or opening the package) from MAP, the deteriorates faster than freshly marked berries (Ehlenfeldt,2002).
- For imported blueberries = possible synergy with ethylene scavenger (value chain import/export)

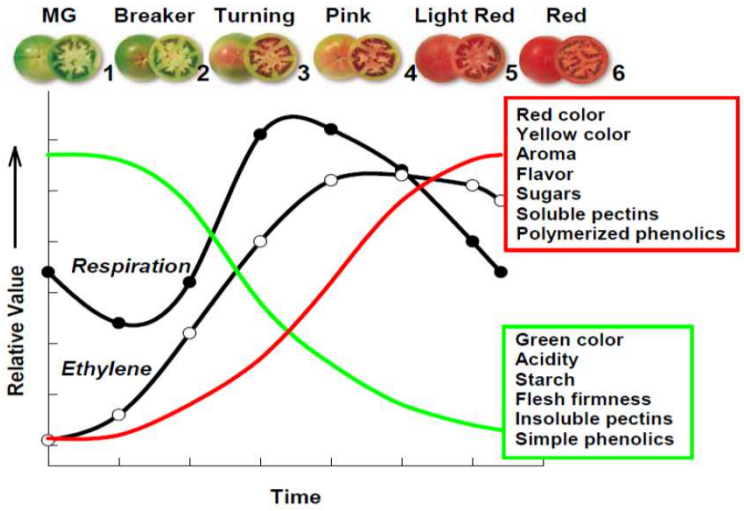
Case study: Cherry Tomato

- Cultivars
- Main commercial cultivars: 9 (Ciliegia, Ciliegia F1, Suncherry, Pepe, Chipano, Small fry, Lilliput, Golden nugget, Tondino)
- Ethylene production rate and sensitivity
- Ethylene triggers the ripening process of tomato affecting the storage durability and shelf life (loss of quality) and inducing fruit decay.
- 5°C = 0.5 µl kg^{-1} h^{-1}
- 7.5°C = 0.7 µl kg^{-1} h^{-1}
- **10°C = 1.3 µl kg^{-1} h^{-1} (Optimal storage condition)**
- 12°C = 2 µl kg^{-1} h^{-1}
- After transfer at 20°C (post cold storage) = max 6 µl kg^{-1} h^{-1} after 21 days

The addition of **GAC-Pd** led to the lower ethylene accumulation inside packages, while the higher was obtained in controls. The parameters related to ripening showed that treated tomatoes exhibited a reduction in color evolution, softening, and weight loss, especially for GAC-Pd treatment. Moreover, these treatments were also effective in delaying tomato decay. After sensorial panel, tomatoes treated with GAC-Pd received the higher scores in terms of sweetness, firmness, juiciness, color, odor, and flavor (Bailen et al., 2006).

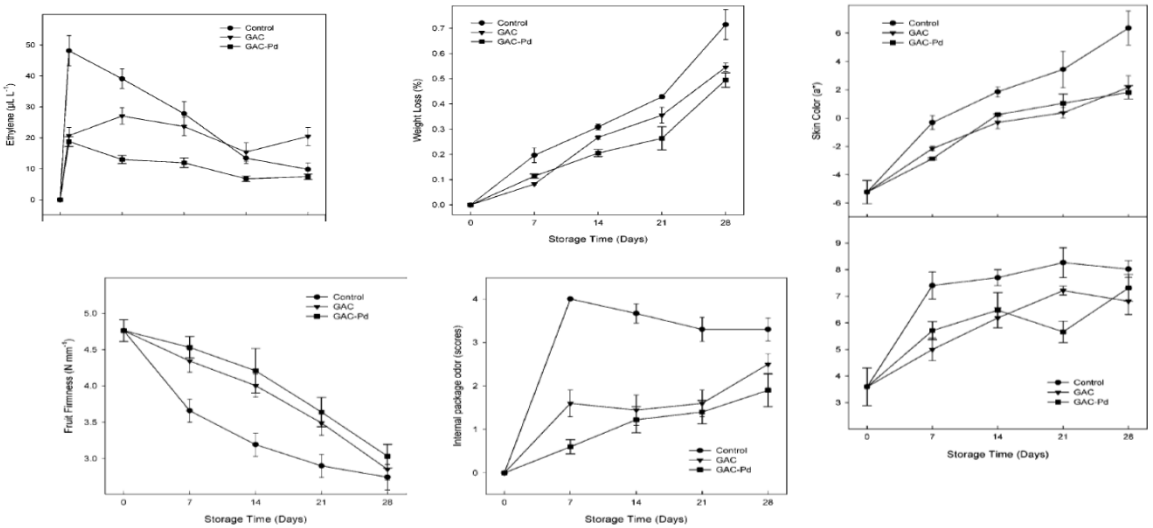
Case study: Cherry Tomato

- Respiration Rate (CO_2 emitted)
- 5°C = 2.5 ml kg^{-1} h^{-1}
- 7.5°C = 4 ml kg^{-1} h^{-1}
- **10°C = 6 ml kg^{-1} h^{-1} (Optimal storage condition)**
- 12°C = 8 ml kg^{-1} h^{-1}
- After transfer at 20°C (post cold storage) = max 23 ml kg^{-1} h^{-1}



Case study: Cherry Tomato

- Decay
- Mold/bacterial growth
- Color
- Firmness
- Weight loss
- Sensorial (associated to fermentation in MAP)



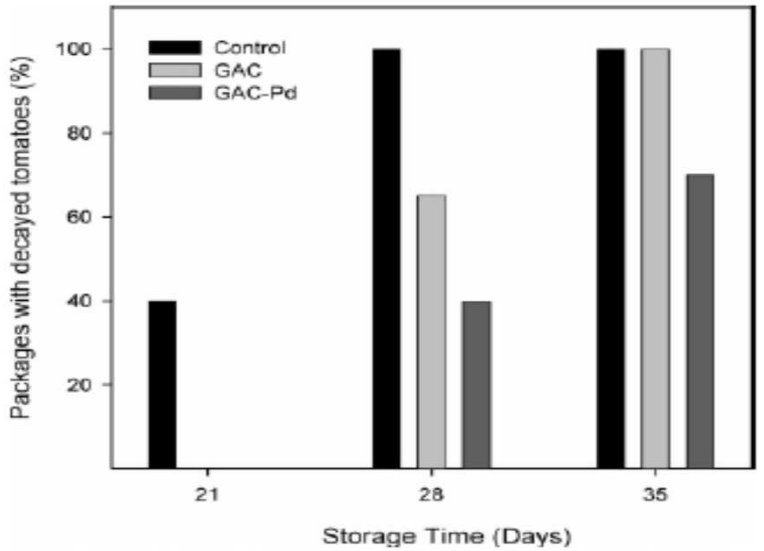


Figure 5. Percentage of bags that showed some decayed fruit throughout storage time in MAP-packaged tomatoes.

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Packaging features

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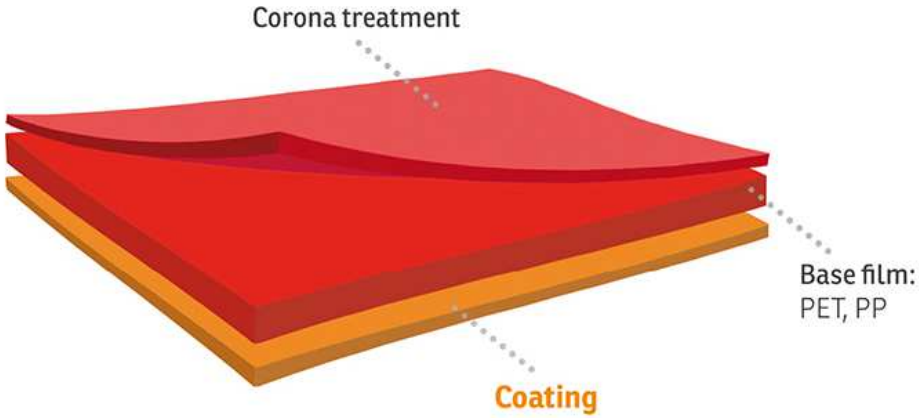
- Water based coating
- Fully integrated
- Mono material
- Mono layer
- Fully transparent
- High gas selectivity



The main benefits for the fruit & veg.

- Better organoleptic taste
- Longer shelf life
- Better hygienic conditions
- Better nutritional stability all over shelf life
- Maintain the texture and freshness
- Maintain the fresh appearance

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The beginning of a virtuous circle

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Benefits along value chain: from farm to fork

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ETHYLENE - FREE

Farmer & Packer → Point of Sale → Home

Food waste is up to packaging, packaging is up to us… let's implement it together

Thank you for your attention

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