

## Summary

After strawberries are picked in the field, they need to be cooled down rapidly for a long shelf life. In many cases the strawberries are already packed before the cooling process starts. The rate of cooling is influenced by the type of packaging. Three types of packaging are evaluated in this trail;

- ✓ Open punnets
- ✓ Closed punnets with macro holes (semi-open)
- ✓ Closed punnets with one small perforation

## Conclusions

- ✓ 2 – 3 times faster cooling in open punnets
- ✓ 0.51% and 0.30% weight loss per hour of cooling for the open and semi-open punnets
- ✓ No weight loss in the closed punnets
- ✓ Condensation in the closed punnets, increased risk of mould growth
- ✓ In open punnets most efficient cooling (in time) is achieved
- ✓ Cooling before packaging is recommended

## Want to know more?

If you are interested into more details feel free to contact us at [amap@top-bv.nl](mailto:amap@top-bv.nl)

# Strawberry cooling

## Influence of packaging

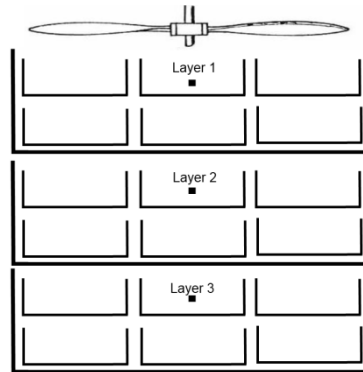
Results of cooling trails



## Experimental data

### Experimental set up

Variety: Virtue,  
Spain April 2013  
Conditions:  $V_{air} = 4-5 \text{ m/s}$   
 $T_{air} = 4-5^\circ\text{C}$



## Experimental result

### Cooling rates of strawberries in open punnets<sup>1</sup>

layer	Location	$T_{start}$ [°C]	$T_{end}$ [°C]	$\Delta T$ [°C]	Cooling rate [°C/min]
1	core	19.0	5.9	13.1	0.28
2	core	19.7	12.5	7.2	0.16
3	core	21.4	12.1	9.3	0.20

### Cooling rates of strawberries in semi-open punnets<sup>1</sup>

layer	Location	$T_{start}$ [°C]	$T_{end}$ [°C]	$\Delta T$ [°C]	Cooling rate [°C/min]
1	core	13.7	7.1	6.6	0.11
2	core	15.0	10.5	4.5	0.08
3	core	14.7	9.9	4.8	0.08

### Cooling rates of strawberries in closed punnets<sup>1</sup>

layer	Location	$T_{start}$ [°C]	$T_{end}$ [°C]	$\Delta T$ [°C]	Cooling rate [°C/min]
1	core	20.6	15.2	5.4	0.09
2	core	21.1	16.9	4.2	0.07
3	core	21.1	17.4	3.7	0.06

<sup>1</sup> Single measurements, size differences influence the cooling rate

## Effect of cooling on weight loss of strawberries

Packaging	Weight loss [%/hour]
Open	0.51
Semi-open	0.30
Closed	0.03

## Required cooling time

Packaging	Cooling time <sup>2</sup>
Open	1.5 hours
Semi-open	3 hours
Closed	4 hours

<sup>2</sup>Cooling from 20°C to under 7°C core temperature at given air conditions at third layer from top. Increased air speeds lower the required cooling time.

### Reference product before cooling

Open

Semi-open

Closed



### Product after cooling

Open

Semi-open

Closed<sup>3</sup>



<sup>3</sup> Condensation in closed packaging, increased risk of mould growth