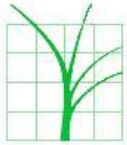


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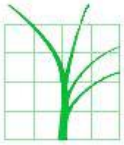


## Rain protection in apple orchards

**Five years experiences**

F. Zavagli – F. Verpont - M. Giraud – J. Favareille (*Ctifl Centre de Lanxade – France*)

Ctifl



# Principe : create a mechanical barrier against rain



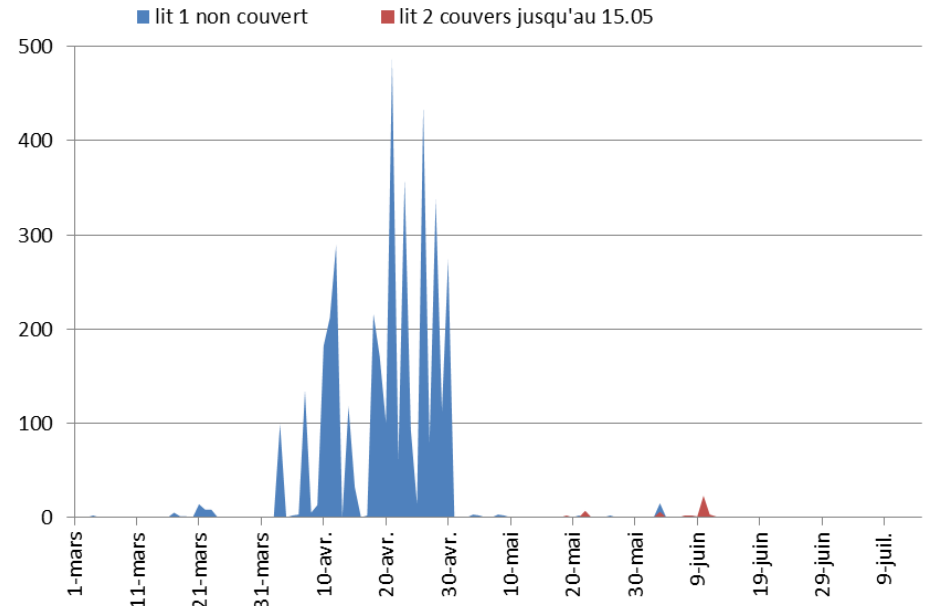
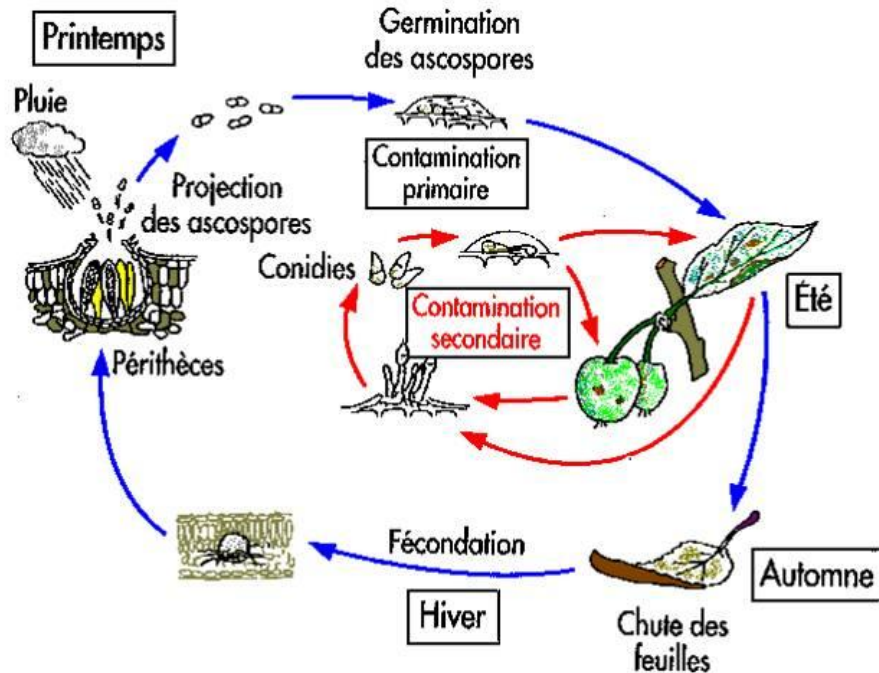
**Aim** : limit or stop the development of pathogens



Uncovered

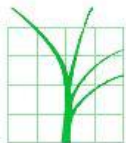


Covered until 15<sup>th</sup> may

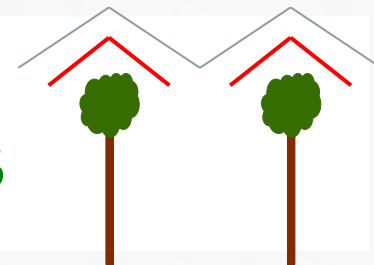


Number of ascospores aspired by the Marchi trap from two leaves « beds », one covered et one not





# Two different ways to tight plastic covers under hail nets



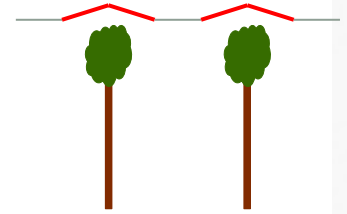
**1** 1.40 or 1.60 m large covers maintained by long elastics (tensioner) through the row making the mechanical work more difficult.

**2**

Short elastics (tensioner) between the two plastic covers.



# Adaptation to optimize time and costs



3

Prototype : very tight rain cover (70 cm) combined with hail nets (flat crossed)



4

Larger rain cover (1,40 m) combined with hail nets (not crossed in the middle)





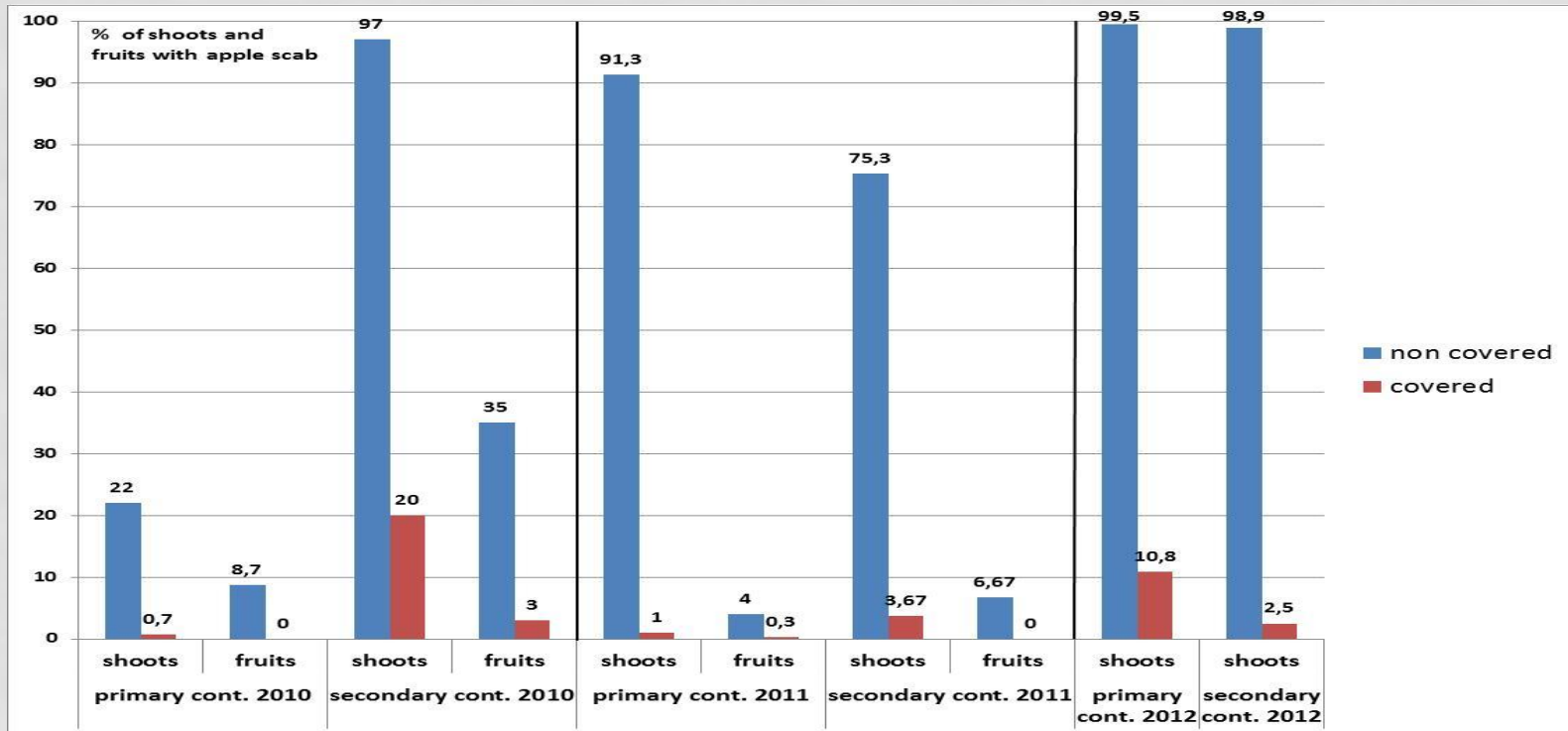
# More resistance to wind



5

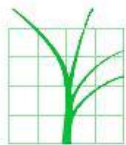
Five plastic band stitched on the hail nets and moving following the wind

# Braeburn : Three seasons trials (2010, 2011, 2012)

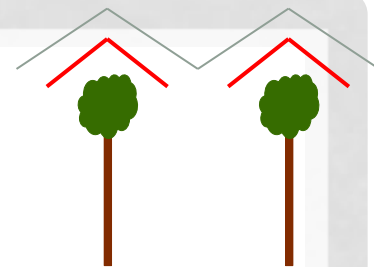


- 2010 : Late installation (6<sup>th</sup> April). Inadequate joints of the covers on the top of the trees.
- 2011 : Covered on the 9<sup>th</sup> March. Improved joints.
- 2012 : Not enough fruits to be evaluated (frost 18<sup>th</sup> April)

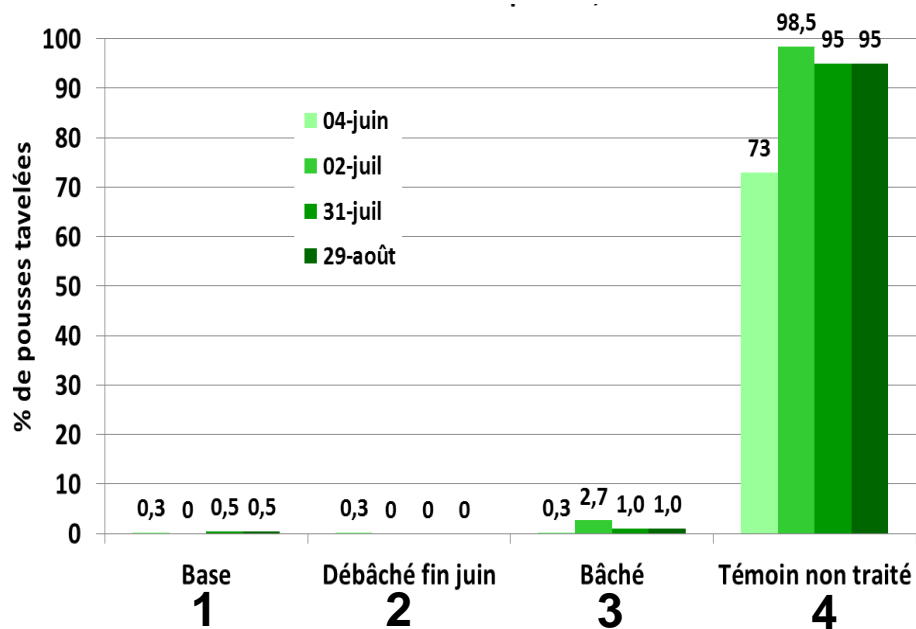




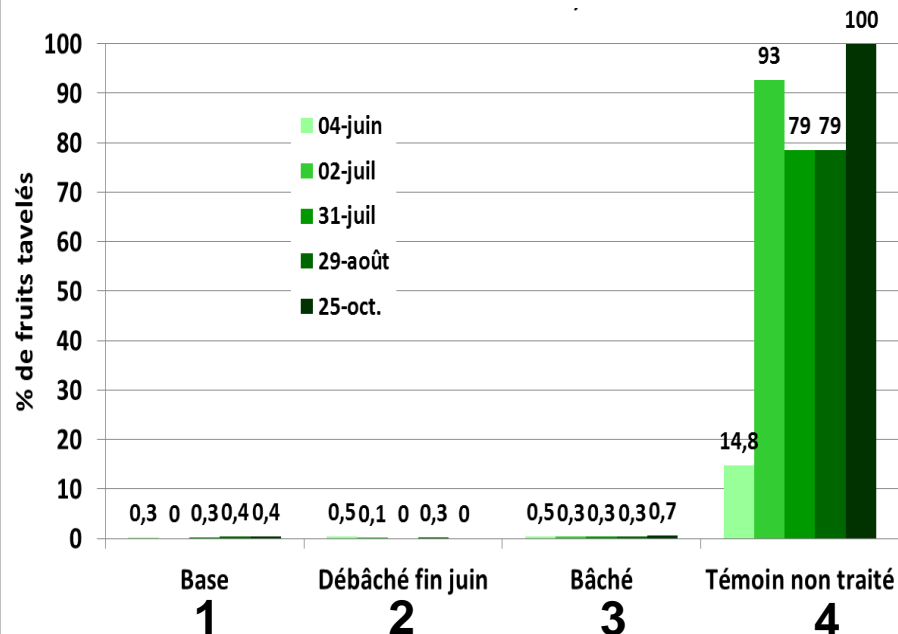
# Results 2013 : Braeburn



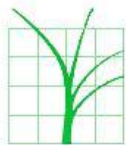
## Apple scab on leave shoots



## Apple scab on fruits



- 1 - « Base » : chemical reference
- 2 - « Uncovered from the end of June » (rain protection put on the 04/03/13)
- 3 - « covered until harvest » (rain protection put on the 04/03/13)
- **4 - « untreated » : indicator for the scab pressure of the year**

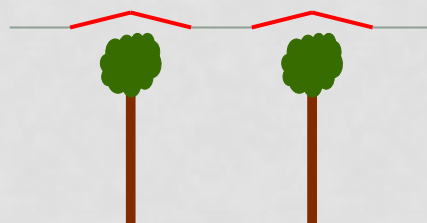
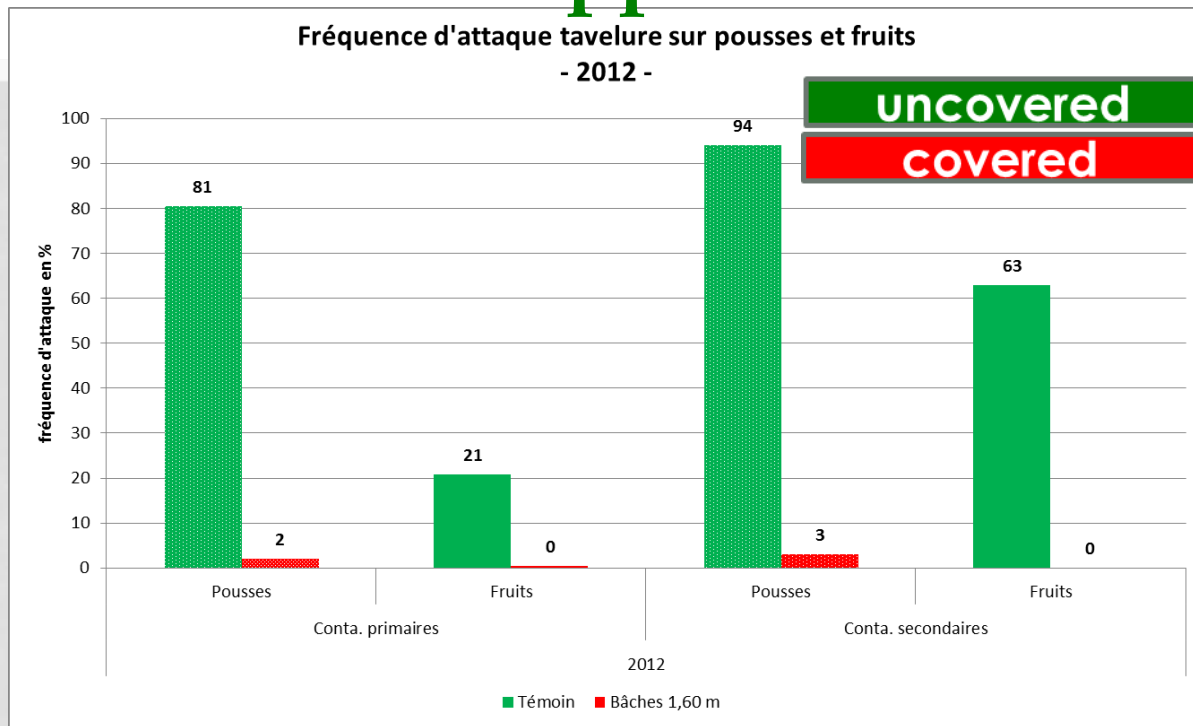


# Results on Gala 2012 : % of leave shoots and fruits with apple scab

Plastic cover (1,60 m)  
under hail nets

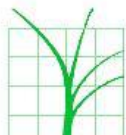


Prototype of combined plastic cover (0,70 m) and hail nets



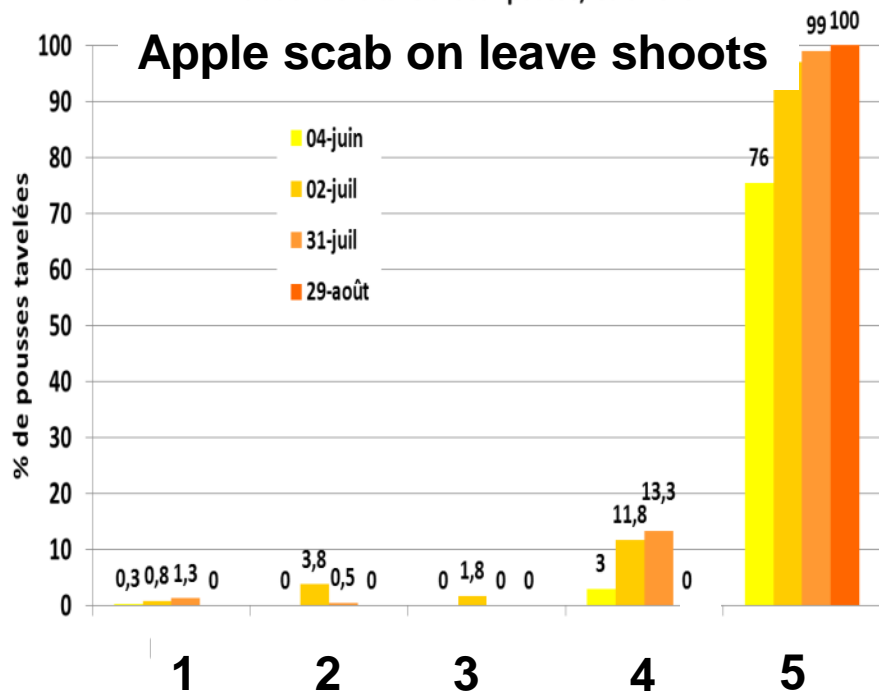
40% of the shoots were with apple scab in mai → chemical treatments for the rest of the season.



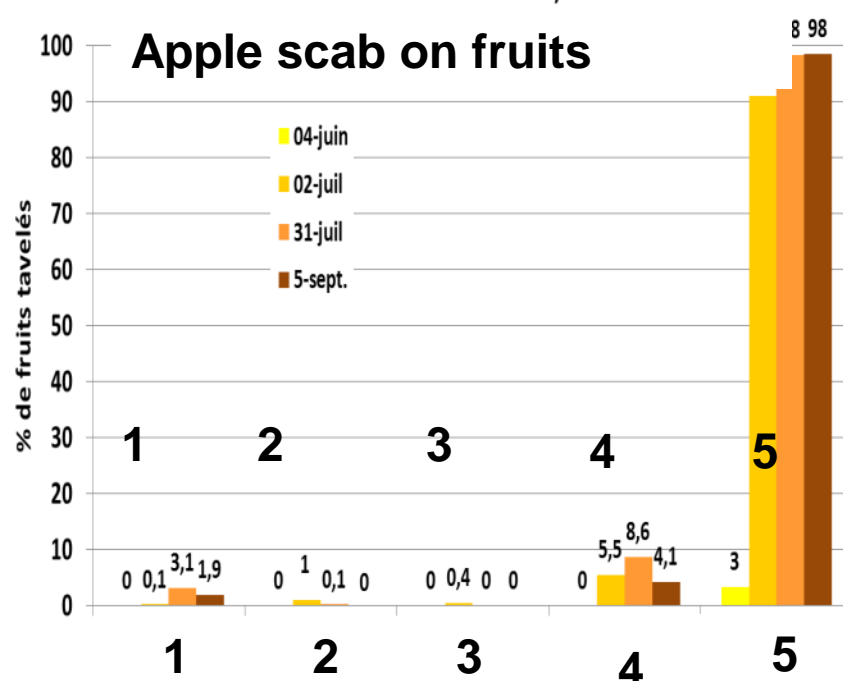


# Results 2013 : Gala

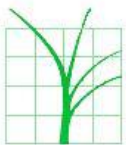
Evolution de la tavelure sur pousse, Gala 2013



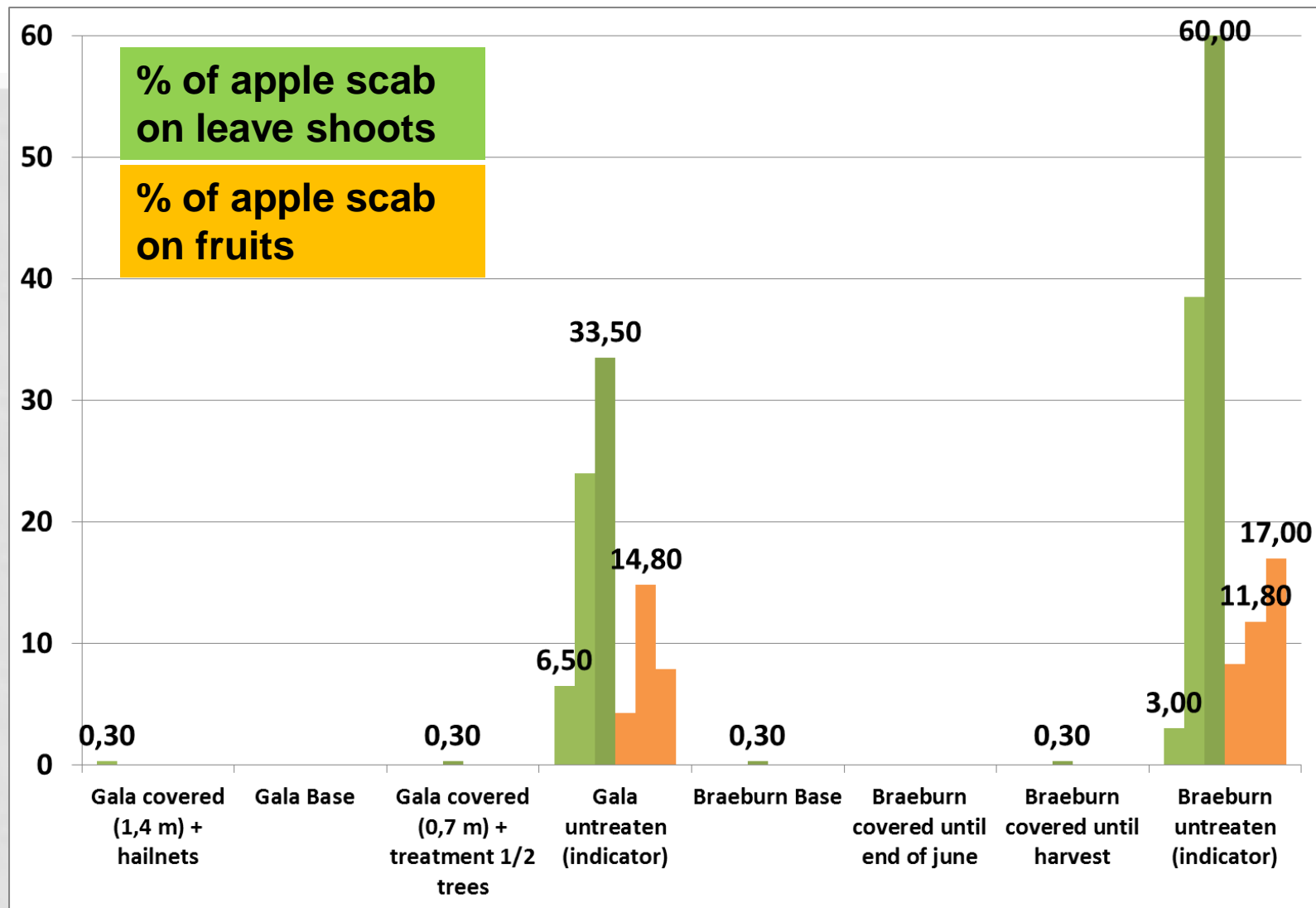
Evolution de la tavelure sur fruits, Gala 2013



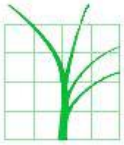
- 1 - « Base » : chemical reference
- 2 - « Uncovered from the end of June » (rain protection put on the 04/03/13)
- 3 - « covered until harvest » (rain protection put on the 04/03/13)
- 4 - « combined plastic cover and hail nets » (rain protection put on the 04/03/13) + treatment in July and August (4 fungicides)
- **5 - « untreated » : indicator for the scab pressure of the year**



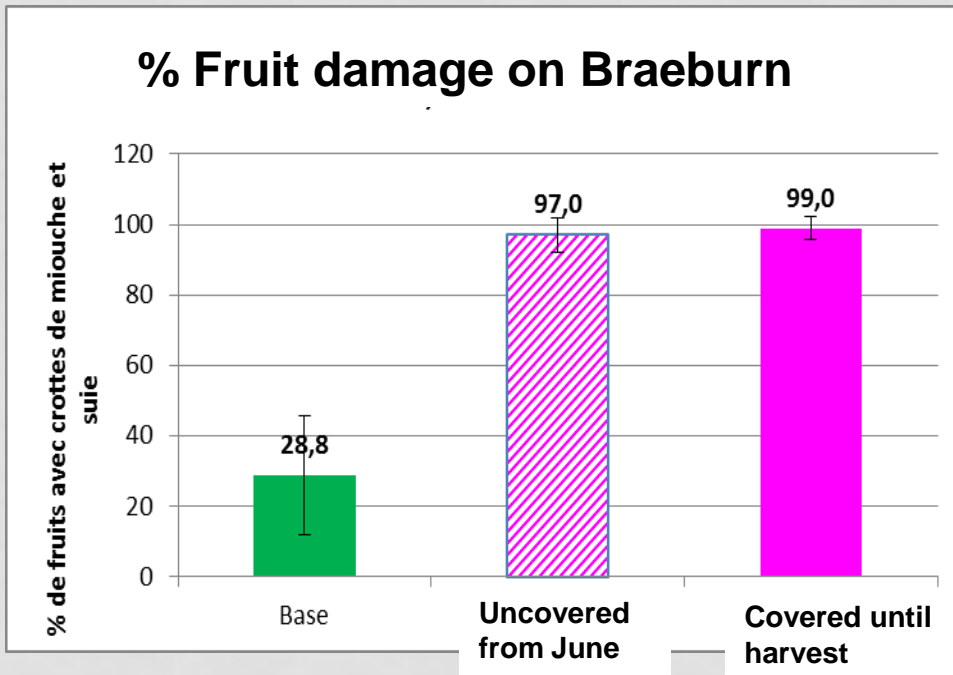
# Apple scab 2014 : Gala & Braeburn



Observation done in May, June, July and August

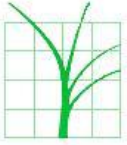


# Specificity of the season 2013 : flyspeck & sooty blotch

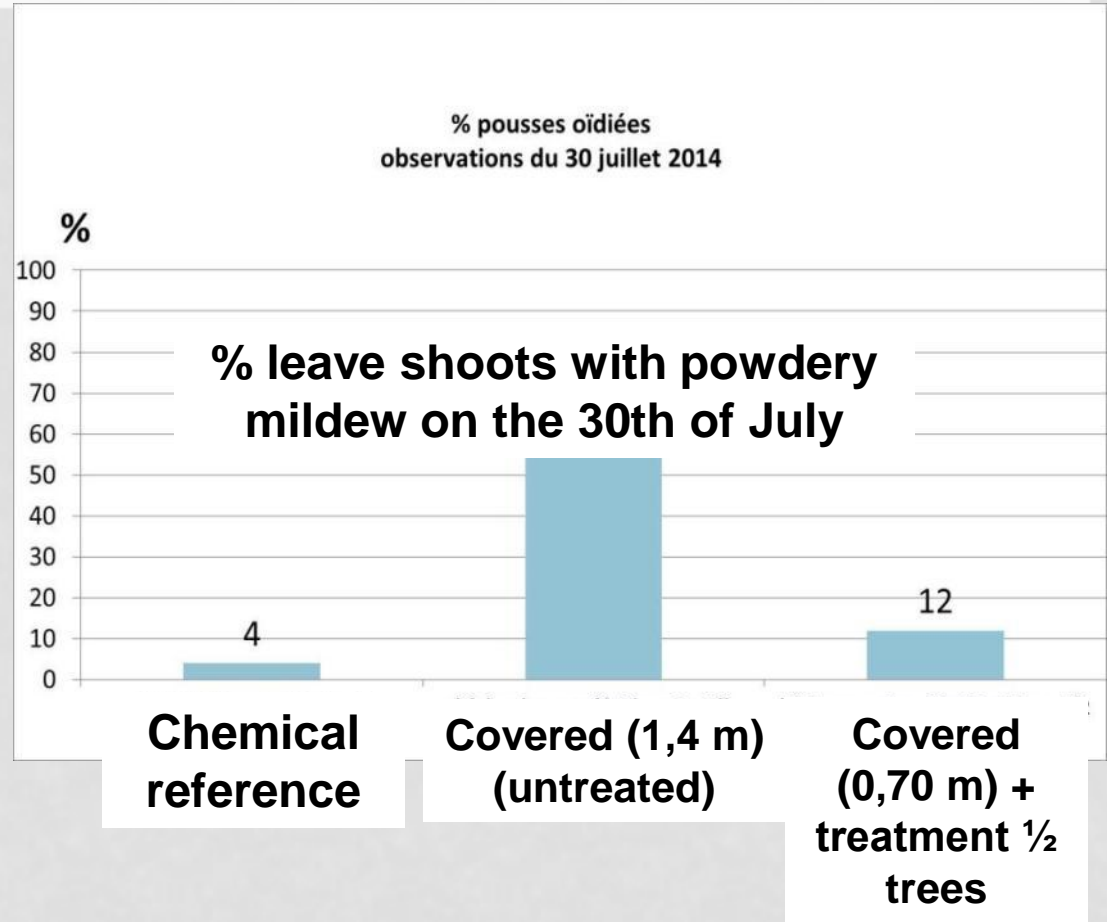


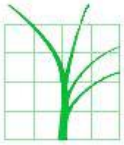
- « Base » : fungicides treatments only on primary contaminations
- Observation at harvest (21/10/13)



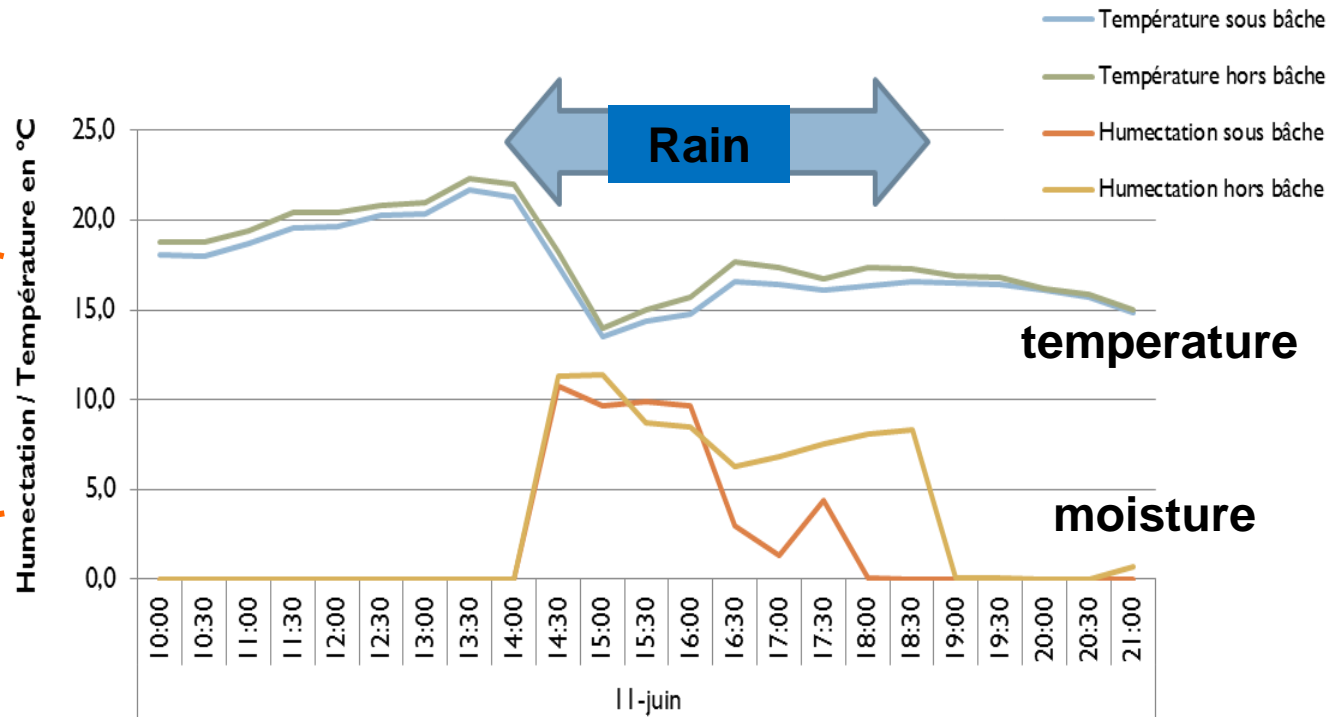


# Important pressure of powdery mildew in 2014 (Gala)

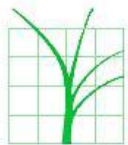




# Incidence of the plastic cover on the climate



- No difference between the temperatures.
- Moisture longer high outside the rain protection than under the plastic cover.

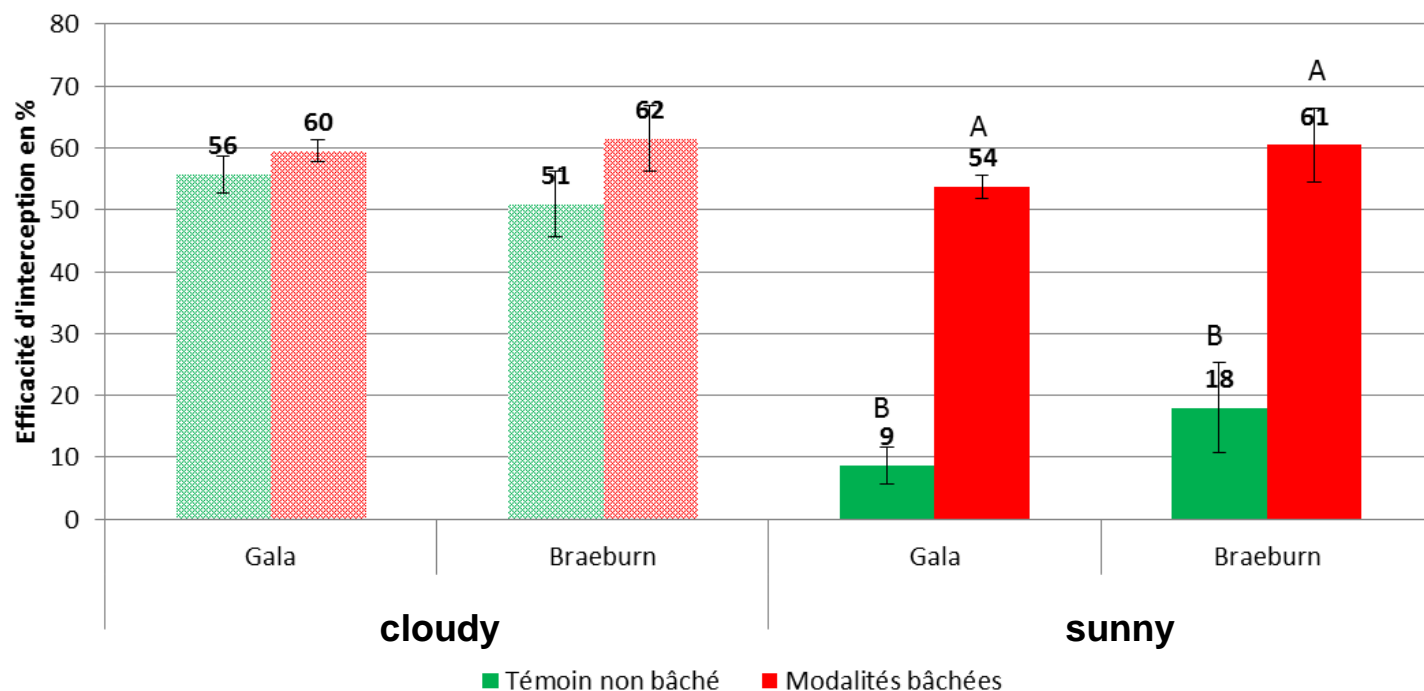


# Incidence of the rain cover on luminosity (cloudy and sunny)

uncovered

covered

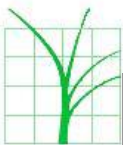
Efficacité d'interception moyenne au Picqhélios sur Gala et Braeburn  
- 2012 -



A et B : groupes de Newman et Keuls significativement différents au seuil de 5%

Whit out clouds, the rain cover intercepts in average 54 to 61% of the radiation (visible spectrum) → Incidence on fruit quality ?

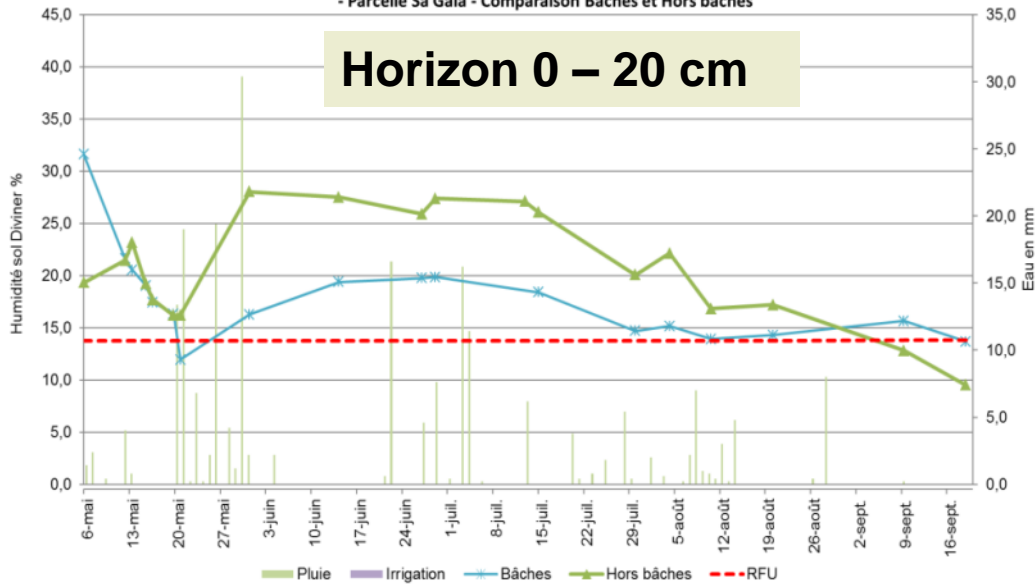




# Survey of the water potential in the soil

Suivi humidité du sol - Moyenne sur les horizons superficiels 0 -20 cm  
- Parcelle Sa Gala - Comparaison Bâches et Hors bâches

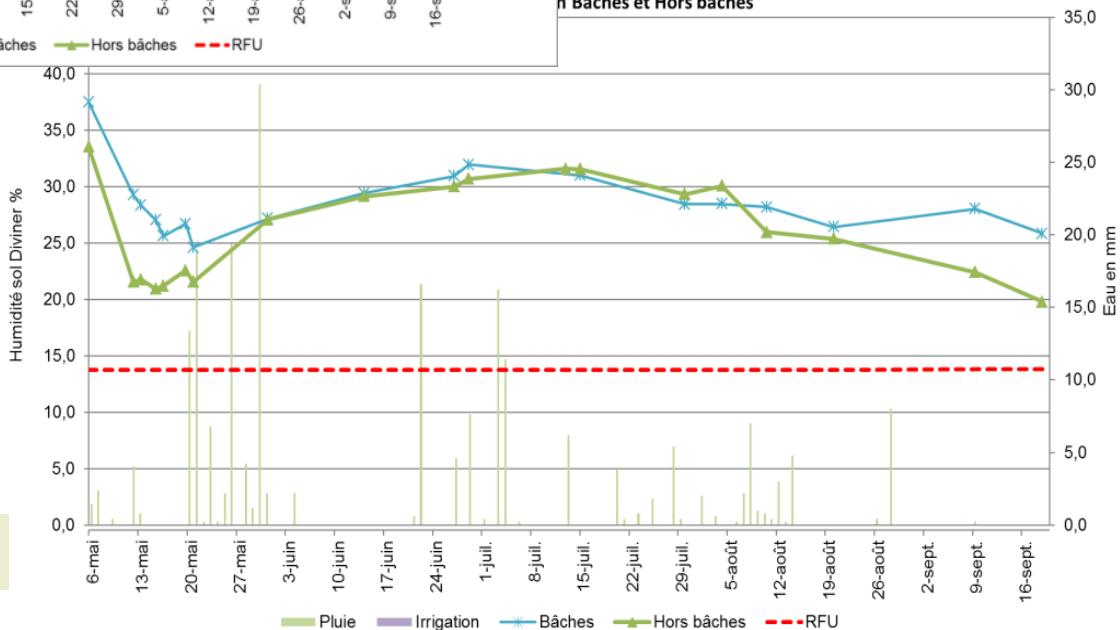
## Horizon 0 – 20 cm



uncovered  
covered

Suivi humidité du sol - Moyenne sur l'horizon 30-40 cm  
- Parcelle Sa Gala - Comparaison Bâches et Hors bâches

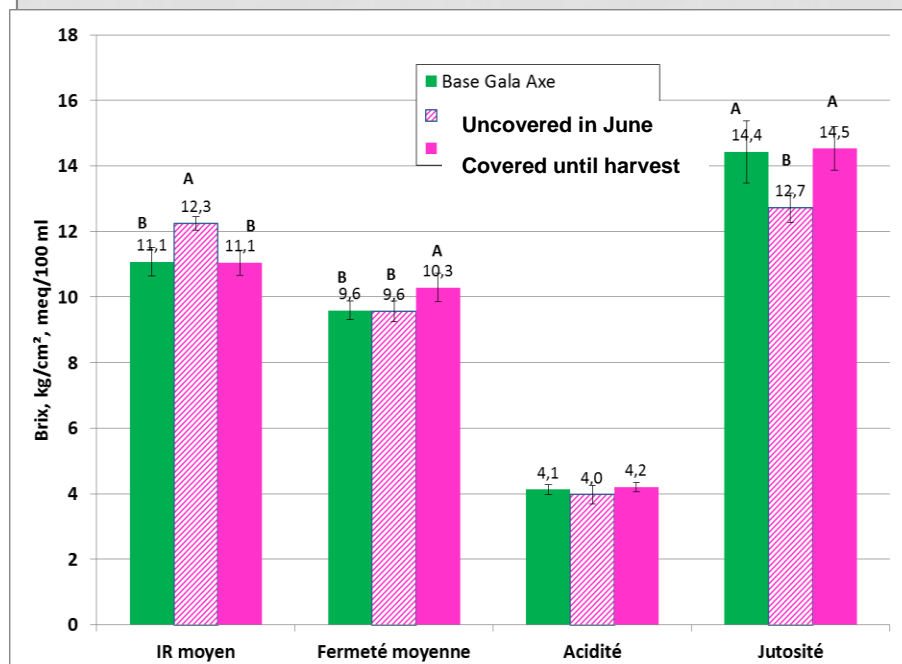
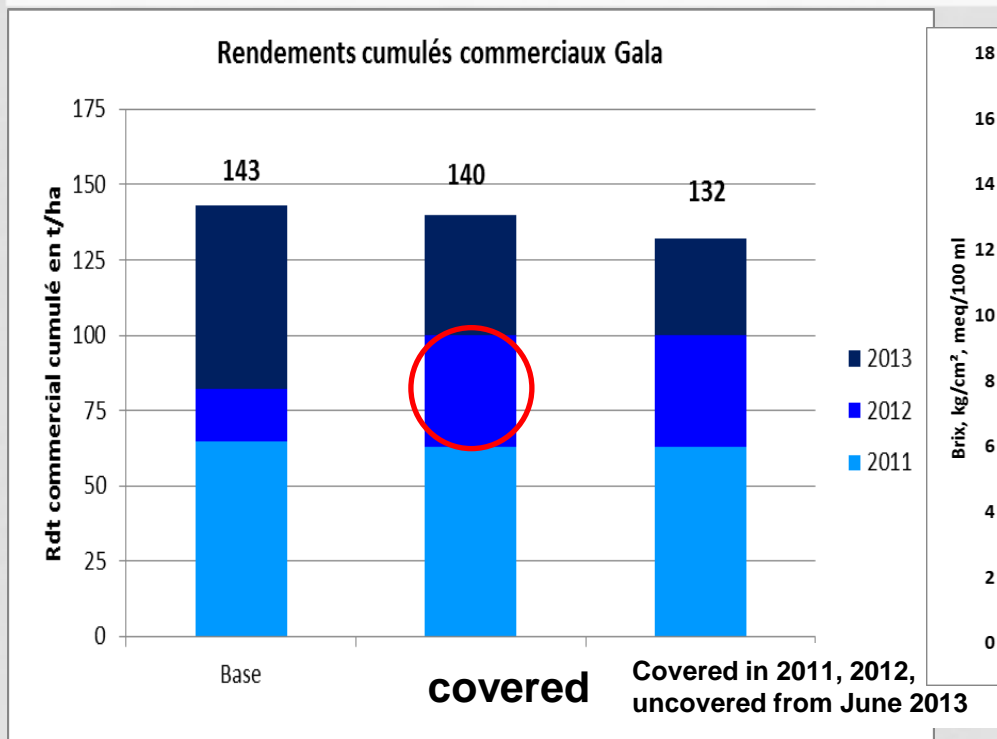
## Horizon 30 – 40 cm



Method : DIVINER 2000.



# Yields & quality between 2010 and 2013 (without optimization of the irrigation under rain cover)



- **In 2012 : significant « frost protection effect » under rain cover.**
- No significant colour difference between covered and non covered on these specific varieties (clone Mariri Red et Brookfield)



# Costs approach / hail nets

## Material (without poles)

- Hail nets : 0,25 – 0,40 €/m<sup>2</sup>. Complete material : 1 €/m<sup>2</sup>.
- Rain cover combined with hail nets : 1,30 - 1,40 €/m<sup>2</sup>.  
Complete material : 1,70 €/m<sup>2</sup>
- Rain cover alone : 1 €/m<sup>2</sup>

**Amortization of the plastic cover** : less longer (6 years ?)

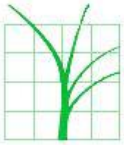
## Time to install

- Hail nets : 80 hours/ha
- Rain cover : 100 -150 hours/ha

**Time to open or close them** ≈ hailnets



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# Perspectives of plastic covers on appels



- **Get better knowledge on :**
  - Protection against *Gloeosporium*
  - Global incidence fruit production (irrigation, fertilisation), yield and fruit quality.
- **Develop experiences within a national working group :**
  - 40 system – 12 producers - 5 experimental stations
  - 9 regions
  - From 200 to 10,000 m<sup>2</sup> (1 to 16 rows)
  - Different varieties (Belchard, Braeburn, Fuji, Gala, Golden, Granny, Jazz, Joyat, Rosy Glow, Red, Smoothie, Tentation) and ages (plantation from 1985 to 2014)
  - 6 suppliers

## Thanks for your attention

Action pilotée par le ministère chargé de l'agriculture, avec l'appui financier de l'Office national de l'eau et des milieux aquatiques, par les crédits issus de la redevance pour pollutions diffuses attribués au financement du plan Ecophyto 2018

