Comparison of the susceptibility to pests and diseases of new cultivars.

First results from an evaluation network created in France in 2012

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Introduction

- **Societal expectations** in terms of **reduction of inputs** in agriculture (particularly plant protection products), the **ban** of certain **commercial pesticides** (that leads, in some cases, to a technical dead end) and the development of more and more **restrictive specifications from wholesalers** make the **management of pests and diseases particularly complex**.
- A possible **solution** is to identify **more resilient cultivars**.

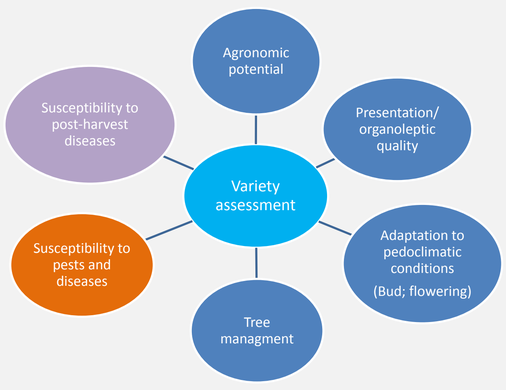
Objective

The **objective** of the trial is to **classify the new cultivars as regards their susceptibility** to powdery mildew (*Sphaerotheca pannosa*), to peach leaf curl (*Taphrina deformans*) and thrips (*Frankliniella occidentalis* / *Thrips meridionali*)

The main pests and diseases on peach.

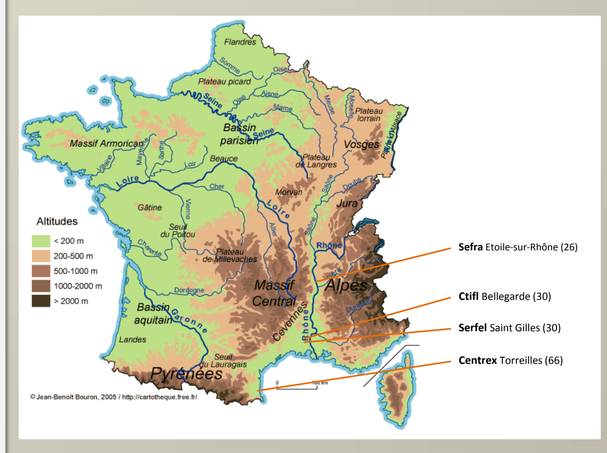
		Frequency / Nuisibility	Impacted organs	Remarks / observations	Varietal susceptibility assessment
Diseases	Bacteria (*Pseudomonas syringae*)	High	Leaves + fruit	Damage on leaves and fruits that could render fruit non-marketable	X
	Leaf curl (*Taphrina deformans*)	High	Leaves	Reduction of tree vigour and fruit size	X
	Brown rot (*Monilia laxa, M. fructigena*)	High	Fruit	Drop in yield (in orchards and during post-harvest phases)	X
	Brown rot (*M. fructicola*)	Medium	Twigs		
	Powdery mildew (*Podosphaera pannosa*)	Medium	Leaves	Reduction of tree vigour / blotch on fruits responsible of fruit declassification	X
	Sharka (virosis) vector = aphid	Medium	Leaves + fruit		
	Black spot / scab (*Venturia carpophila*)	Low	Fruit	Non-marketable fruit	
	Canker (*Fusicoccum amygdali*)	Low	Twigs		
Pests	Oriental peach moth (*Grapholita molesta*)	High	young twigs + fruit	Reduction of tree growth / larvae bore holes in fruit	
	Green peach aphid (*Myzus persicae*)	High	Leaves		
	Peach "cigarier" aphid (*Myzus varians*)	Medium	Leaves		
	Black peach aphid (*Brachycaudus persicae*)	Medium	Leaves		
	Peach twig borer (*Anarsia lineatella*)	Medium	young twigs + fruit		
	Peach thrips (*Thrips meridionalis*)	Medium	Fruit	Visual damage on fruit	X
	Western flower thrips (*Frankliniella occidentalis*)	Medium	Fruit	Visual damage on fruit	X
	Leaf weevil (*Polydrusus sp.*)	Low	Leaves		

Methodology



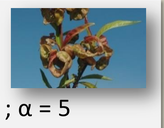
The study of varietal susceptibility : complementary information to the cultivar assessment.

- The **breeding programs** in France are **very intense**, considering the number of varieties proposed each year to the assessment network. The **assessments** are usually based on the observation of **tree management** (shape, vigour…), the **agronomic performance** (yield, fruit size), the **visual quality** of the fruit (color) and its **organoleptic** quality.
- Within the framework of the 'cultivar and rootstock assessment national chart', **specific orchards have been planted** to evaluate their susceptibility to various pests and diseases.
- This study is conducted within the **network** by the **Ctifl** (which is responsible for the network coordination and result synthesis) and three Regional Experimentation centers : **Sefra**, **Sud Expé Serfel** and **Centrex**. The 4 sites are localized in the main French peach production areas.
- The experimental orchards were planted during the **winter 2011-2012** on four sites. The same **cultivars** are assessed on each site but each site works on a specific pest or disease. The trials are conducted using the following method : randomized block with 6 repetitions. 28 cultivars were planted during winter 2011-12, 11 during winter 2014-15. Cultivar references are also included in the trials.



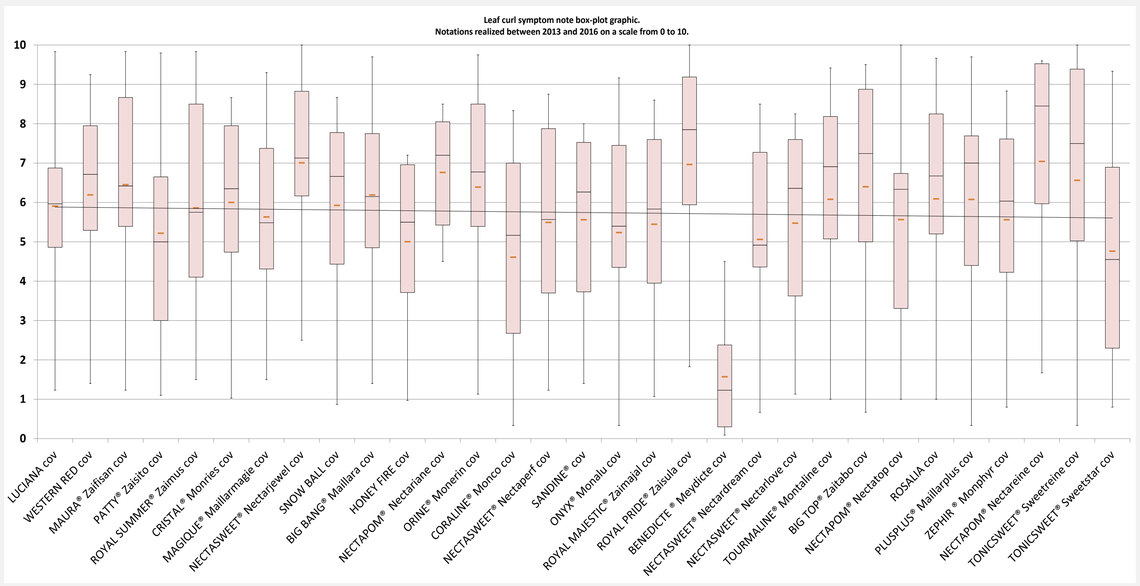
Results

Leaf curl *(Taphrina deformans)*



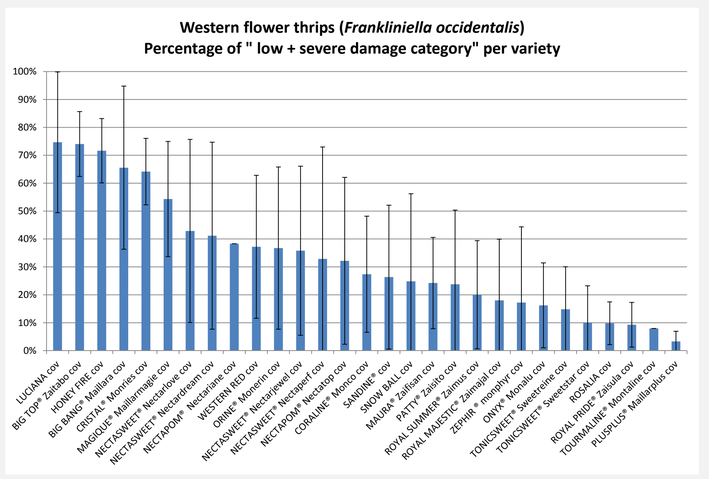
No significant difference between the cultivars was observed using the statistic analysis (Anova ; α = 5 %). However, some trends were observed :

- The variety **BENEDICTE ® Meydicte cov** seems to be the least susceptible of the tested varieties.
- Varieties with an early bud burst are globally more impacted than cultivars with late bud burst.
- There is **high disparity** of **behavior** for a same cultivar between years and sites.
- The cultivars that appear to be the most susceptible are NECTASWEET® Nectarjewel cov, ROYAL PRIDE® Zaisula cov, NECTAPOM® Nectareine cov and TONICSWEET ® Sweetreine cov.



The Box-plot graphic presents the leaf curl symptoms notation (on a scale from 0 to 10), observed on the sites of Ctifl, Centre of balandran, Sefra and Centrex, between 2013 and 2016, that represents 10 repetitions. The cultivars are sorted by their bud burst date (the cultivars with the earlier bud burst time are on the left side).

Western flower thrips *(Frankliniella occidentalis)*



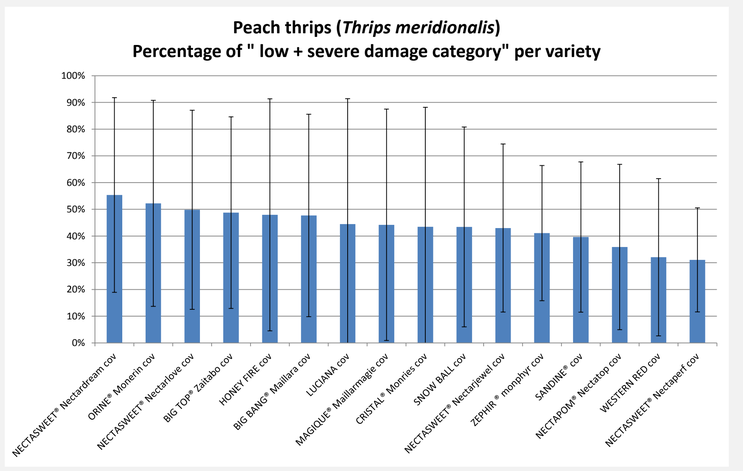
Varieties with the **higher damage level** are LUCIANA cov, BIG TOP ® Zaitabo cov, HONEY FIRE cov.

Observations : Ctifl (2014), Serfel (2014 ; 2015 ; 2016) . Varieties are classified per decreasing damage percentage

Peach thrips *(Thrips meridionalis)*

Nectarines suffer more damage than peach (pubescence acts as a physical barrier)

The cultivars that are impacted the most are NECTASWEET® Nectardream, cov, ORINE ® Monerin cov, NECTASWEET® Nectarlove cov and BIG TOP cov.



Observations : Serfel (2014 ; 2015 ; 2016). Varieties are classified by decreasing damage percentage.

Conclusions

Mean and Standard deviation for the different pests and diseases. Varieties sorted by subspecies and alphabetic order.

		Leaf curl (*Taphrina deformans*) / damage note (from 0 to 10)		Western flower thrips (*Frankliniella occidentalis*) / percentage damaged fruits		Peach thrips (*Thrips meridionalis*) / percentage damaged fruits		Brown rot (*Monilia laxa, M. fructigena*)		Xanthomonas (*Pseudomonas syringae*)
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	2000-14 / Gard
WN	CRISTAL® Monries cov	6.0	2.4	69%	20%	25.7%	14%	0.124	0.040	
WN	MAGIQUE® Maillarmagie cov	5.6	2.6	68%	31%	29.2%	19%	0.093	0.028	
WN	NECTASWEET® Nectaperf cov	5.5	2.7	21%	19%	32.7%	21%	0.112	0.032	
WN	NECTASWEET® Nectardream cov	5.1	2.6	41%	36%	47.9%	27%	0.096	0.026	
WN	NECTASWEET® Nectarjewel cov	7.0	2.4	38%	33%	31.3%	12%	0.112	0.067	
WN	NECTASWEET® Nectarlove cov	5.5	2.6	40%	42%	41.7%	26%	0.093	0.017	
WN	SANDINE® cov	5.6	2.3	30%	31%	28.5%	11%	0.113	0.042	
WN	SNOW BALL cov	5.9	2.6	38%	34%	34.5%	23%	0.086	0.027	
WN	TOURMALINE® Montaline cov (ctifl, centrex, sefra)	6.1	2.9	9%				0.094	0.037	
WN	ZEPHYR ® Monphir cov (sefra, centrex, serfel)	5.6	2.7	26%	35%	31.3%	15%	0.110	0.059	
YN	BIG BANG® Maillara cov	6.2	2.5	59%	41%	37.5%	22%	0.119	0.058	
YN	BIG TOP® Zaitabo cov	6.4	3.1	64%	24%	36.3%	14%	0.140	0.035	
YN	HONEY FIRE cov	5.0	2.2	69%	36%	27.1%	8%	0.112	0.040	
YN	LUCIANA cov	5.9	2.7	64%	40%	36.1%	33%	0.137	0.026	
YN	NECTAPOM® Nectareine cov (sefra)	7.0	3.7					0.118	0.043	
YN	NECTAPOM® Nectariane cov (ctifl et centrex)	6.8	1.7	9%				0.114	0.027	
YN	NECTAPOM® Nectatop cov	5.6	3.1	28%	28%	31.3%	25%	0.094	0.030	
YN	ORINE® Monerin cov	6.4	2.7	38%	40%	40.4%	19%	0.102	0.038	
YN	WESTERN RED cov	6.2	2.4	30%	31%	25.7%	19%	0.122	0.055	
WP	BENEDICTE ® Meydicte cov	1.6	1.6					0.123	0.037	
WP	MAURA® Zaifisan cov	6.5	2.8	54%	26%	0.0%		0.107	0.021	
WP	ONYX® Monalu cov	5.2	2.9	50%	28%	0.0%		0.122	0.028	
WP	PATTY® Zaisito cov	5.2	2.9	50%	29%	0.0%		0.124	0.030	
WP	ROSALIA cov	6.1	2.9	28%	25%	0.0%		0.140	0.048	
WP	TONICSWEET® Sweetreine cov	6.6	3.5	35%	33%	2.1%		0.109	0.026	
WP	TONICSWEET® Sweetstar cov	4.8	3.2	31%	26%	2.1%		0.144	0.077	
YP	CORALINE® Monco cov	4.6	2.9	43%	30%	0.0%		0.140	0.034	
YP	PLUSPLUS® Maillarplus cov	6.1	3.2	10%	14%	0.0%		0.132	0.053	
YP	ROYAL MAJESTIC® Zaimajal cov	5.4	2.6	45%	28%	0.0%		0.159	0.057	
YP	ROYAL PRIDE® Zaisula cov	7.0	3.0	25%	22%	2.1%		0.111	0.026	
YP	ROYAL SUMMER® Zaimus cov	5.9	2.9	42%	34%	2.1%		0.123	0.036	

Legend:

High susceptibility — Low susceptibility

Absence of data

Classification of the tested varieties by susceptibility mean rank

	Variety rank from the less impacted (rank : 1) to the more impacted (rank : 21).	Leaf curl	Western flower thrips	Peach thrips	Brown rot	Rank mean
WN	TOURMALINE® Montaline cov (ctifl, centrex, sefra)	12	1		3	5.3
YN	NECTAPOM® Nectatop cov	9	6	7	3	6.3
WN	ZEPHYR ® Monphir cov (sefra, centrex, serfel)	9	5	7	8	7.3
WN	NECTASWEET® Nectaperf cov	8	3	8	10	7.3
WN	SNOW BALL cov	10	10	9	1	7.5
WN	SANDINE® cov	9	7	5	11	8.0
YP	ROYAL PRIDE® Zaisula cov	18	4	2	9	8.3
YP	PLUSPLUS® Maillarplus cov	12	2	1	18	8.3
WP	BENEDICTE ® Meydicte cov	1			16	8.5
WP	TONICSWEET® Sweetstar cov	3	8	2	21	8.5
WP	TONICSWEET® Sweetreine cov	16	9	2	7	8.5
WN	NECTASWEET® Nectarlove cov	8	11	14	2	8.8
WN	NECTASWEET® Nectardream cov	5	12	15	4	9.0
YP	CORALINE® Monco cov	2	14	1	20	9.3
WN	MAGIQUE® Maillarmagie cov	9	20	6	2	9.3
WP	ONYX® Monalu cov	6	16	1	15	9.5
YN	WESTERN RED cov	13	7	3	15	9.5
WP	ROSALIA cov	12	6	1	20	9.8
WP	MAURA® Zaifisan cov	15	17	1	6	9.8
YN	HONEY FIRE cov	4	21	4	10	9.8
WP	PATTY® Zaisito cov	6	16	1	17	10.0
YN	NECTAPOM® Nectariane cov (ctifl et centrex)	17	1		12	10.0
YP	ROYAL SUMMER® Zaimus cov	10	13	2	16	10.3
YN	ORINE® Monerin cov	14	10	13	5	10.5
YP	ROYAL MAJESTIC® Zaimajal cov	7	15	1	22	11.3
WN	NECTASWEET® Nectarjewel cov	18	10	7	10	11.3
WN	CRISTAL® Monries cov	11	21	3	17	13.0
YN	BIG BANG® Maillara cov	13	18	12	14	14.3
YN	LUCIANA cov	10	19	10	19	14.5
YN	NECTAPOM® Nectareine cov (sefra)	18			13	15.5
YN	BIG TOP® Zaitabo cov	14	19	11	20	16.0

Xanthomonas : the study was carried out by A.Garcin (Ctifl) between 2000 and 2014 . The evaluation orchard was planted on an infested grower plot (Garcin et al., 2009).
Brown-rot : Post-harvest sensitivity to brow-rot evaluation. Datas issued from the network study initiated in 2009 (Ruesch et al., 2010,2012)

- **No varieties are tolerant** to **all tested pests and diseases**. Most of the time, varieties can present a lower susceptibility to one or two pests/diseases but rarely to all of them.
- The **susceptibility levels** are **complex to evaluate** and to highlight, due to the **high number of factors** that are involved in the expression of symptoms (bud burst date, climatic conditions, inoculum pressure..)
- The **genetic factor**, that we want to highlight in this study, requires a high number of repetitions. This **high number of repetitions** should **erase** year-to-year and site-to-site **variability** and to more acurately define the tolerance level of each variety.
- This study provides **complementary information on peach varieties**. However, it is imperative to **apply adapted orchard management** depending on the level of susceptibility of the variety and to the annual climatic conditions.

Literature:

Ruesch J., Hilaire C., Montrognon Y., Courthieu N., Blanc P., 2016. Sensibilité des nouvelles variétés de pêche-nectarine aux bio-agresseurs : bilan d'évaluation de trois années d'étude. Infos-Ctifl n°327 p. 39-51.
Giraud M., Verpont F., Codarin S., Hilaire C., Boubennec A.,Ruesch J., 2014. Pomme et pêche face aux maladies et ravageurs : dispositifs d'évaluation de la sensibilité des nouvelles variétés. Infos-Ctifl n°300.
Ruesch J., Ctifl, 2010. Maladies de conservation pêcher : la sensibilité des nouvelles variétés. Infos-Ctifl n° 267 décembre, p. 29-31.
Ruesch J., Hilaire C., Ctifl ; Malecot J., Ctifl-Ensat ; Montrognon Y., Sefra ; Courthieu N., Centrex; Blanc P., Serfel. 2012. Face aux maladies de conservation : la sensibilité des nouvelles variétés de pêche-nectarine. Infos-Ctifl n° 287, p. 44-50
Blanc P., Gallia V., Dhaussy T., Serfel, 2015. Évaluation des principales variétés de pêches et nectarines à trois bioagresseurs. Compte rendu d'essai. www.serfel.fr.
Garcin A, Ctifl ; Bresson J, Ctifl-UPPA. 2009. Sensibilité des arbres à noyau au Xanthomonas : bilan de 8 ans d'expérimentation. Infos-Ctifl n° 254 septembre, p. 30-35.
Mandrin J.-F. (Ctifl) cloque du pêcher et sensibilité – un essai comparatif sur 31 variétés – synthèse des 5 années d'observation. Infos-Ctifl n° 232 juin 2007, p. 45-49.

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