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# Addressing the impact of *Septoria tritici* blotch pressure on wheat cultivar resistance in France

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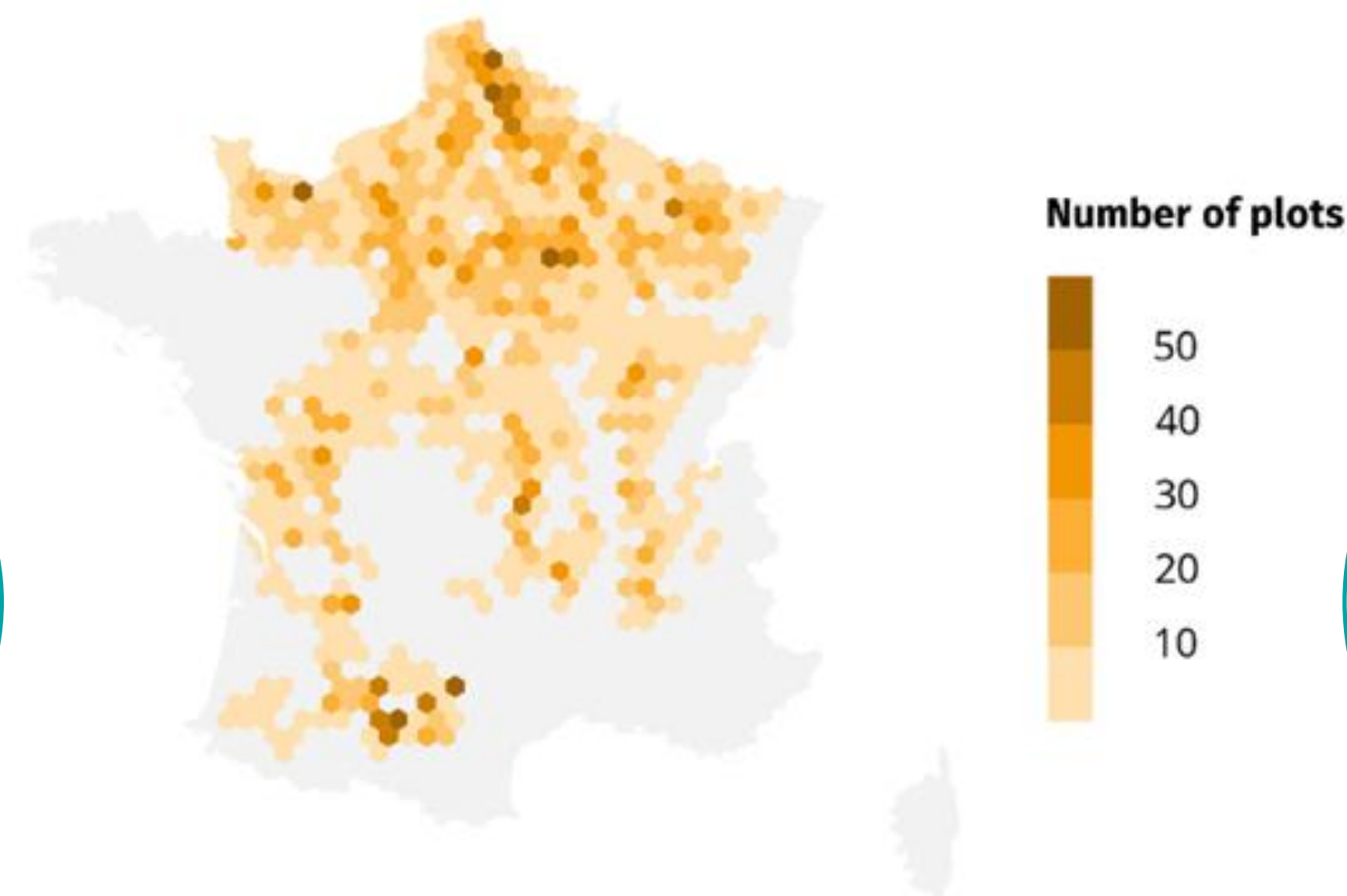
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**Introduction:** *Septoria tritici* blotch (STB) caused by the fungal pathogen *Zymoseptoria tritici* is one of the main devastating wheat pathogens in France. This fast evolving pathogen constantly challenges the resistant wheat cultivars released by breeders, which ultimately lead to resistance breakdown. While few cases of breakdown have been referenced, their dynamic and their frequency remain unknown. To get a better insight of these events, historical datasets gathering thousands of STB severities or incidences on hundred of wheat cultivars have been analysed.

## Two national networks

### Vigiculture

~630 plots monitored/year  
107 cultivars  
10 years (2010/2019)  
Scattered across France (Figure 1)  
3 leaf layers (Leaf 1, 2, 3) / plot along several dates



### Arvalis

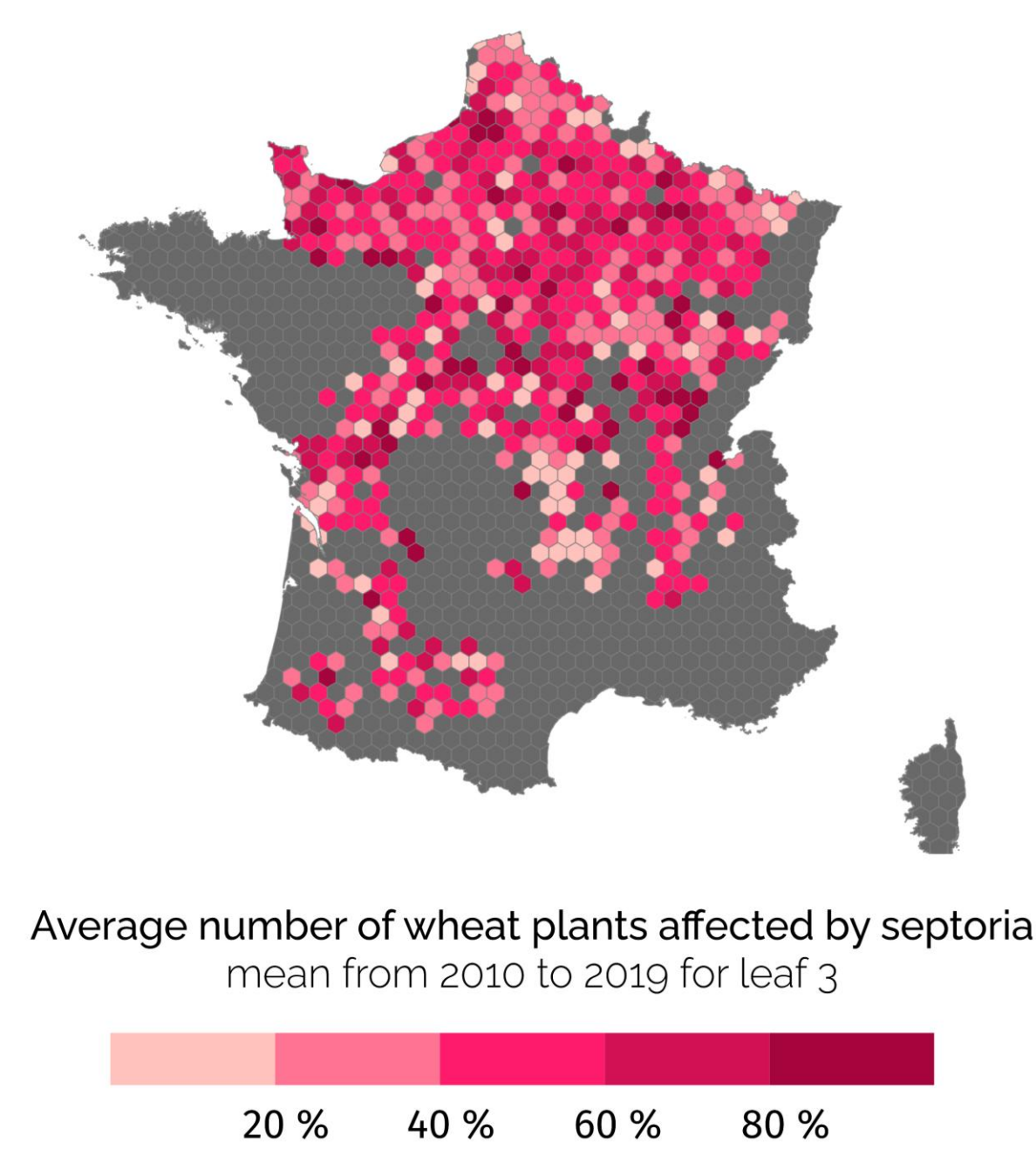
30 locations in France  
10 years (2012/2019)  
STB severity / plot

Figure 1: Distribution of wheat plots monitored in the Vigiculture network over ten years in France.

## Results 1

- STB incidence in France is highly variable across regions and years (Figure 2).
- 80% of the plots monitored presented at least one leaf with symptoms of STB.
- Hotspots of STB have been identified in regions Centre and Normandie.
- STB incidence between leaves from different layers are well correlated across years, with a decrease in symptom from leaf 3 to leaf 1.

### a. Spatial variability of STB incidence



### b. Temporal variability of STB incidence on different leaf layers

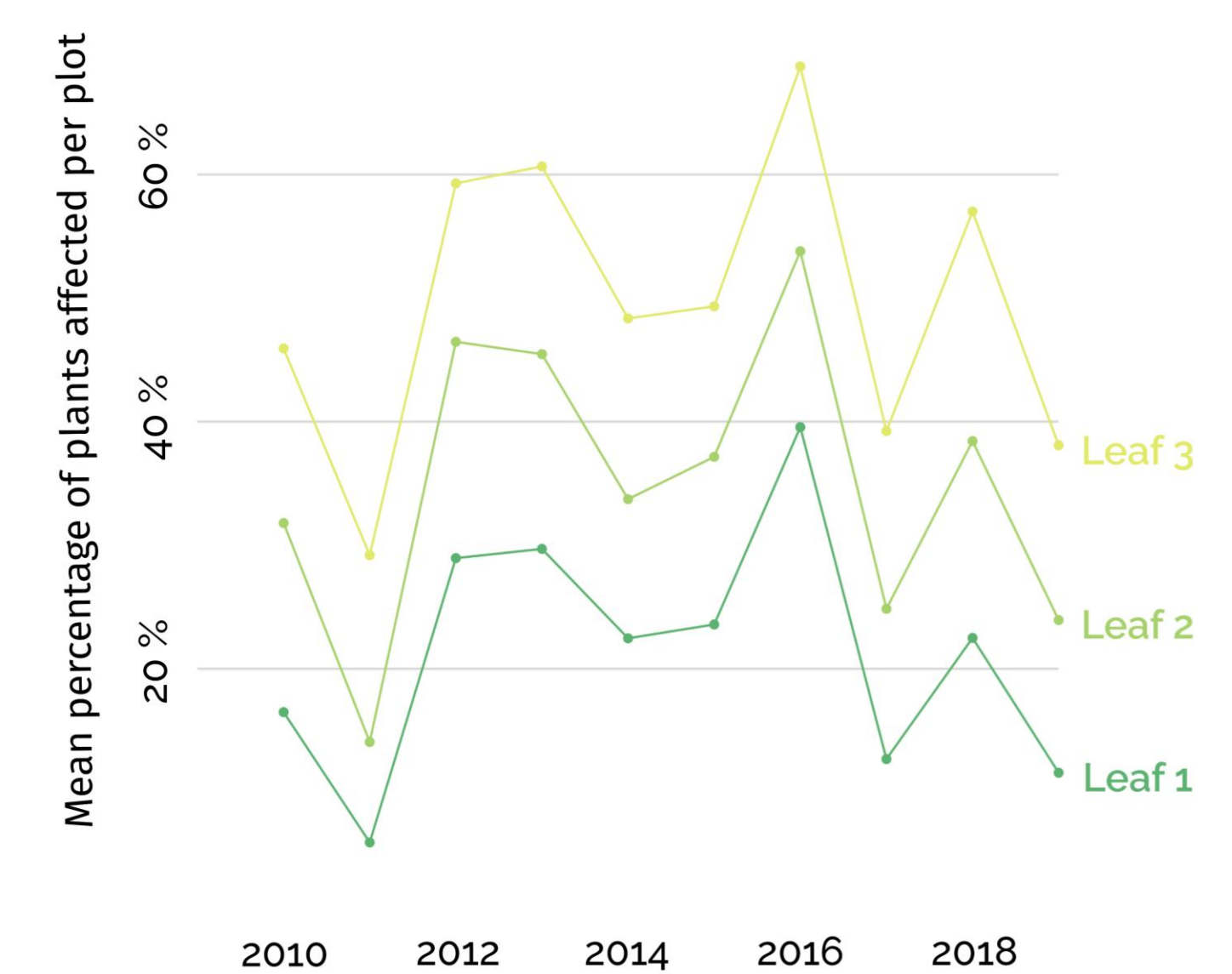
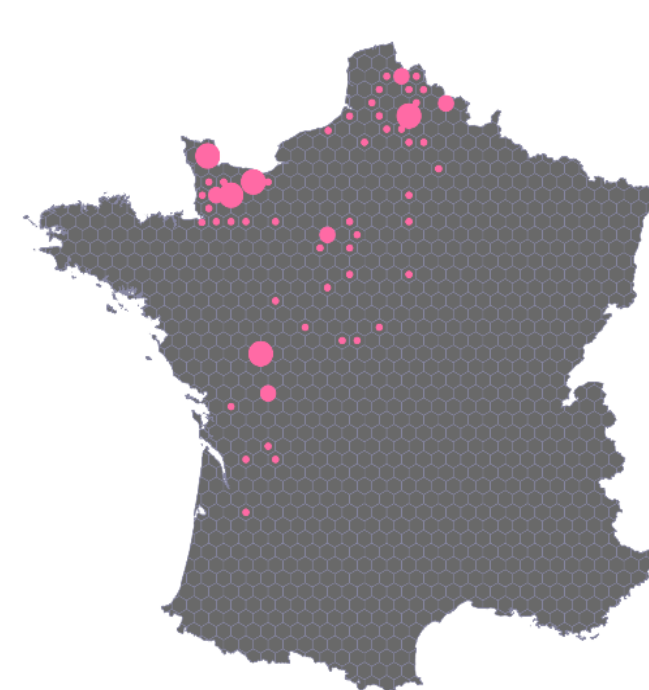


Figure 2: Spatiotemporal dynamic of STB incidence in France from 2010 to 2019 (all cultivars included).

## Results 2

- Comparison of STB incidence over years revealed resistance breakdown for seven cultivars.
- Breakdown of cultivars Cellule carrying the *Stb16q* resistance gene and Rubisko followed a similar spatial pattern (Figures 3) and temporal dynamic (Figure 4) compared to the susceptible cultivar Apache.
- The evolution of differences in STB severities between Cellule and Apache was heterogeneous across the territory (Figure 4), suggesting that the frequency of virulence to *Stb16q* in *Z. tritici* populations varied between regions, likely due to differences in disease pressure and in the deployment of *Stb16q*.
- 2016, one of the wettest spring years, appears to be a pivotal year for the breakdown of these resistances.

### a. Decreased resistance to septoria



### b. Stable resistance to septoria

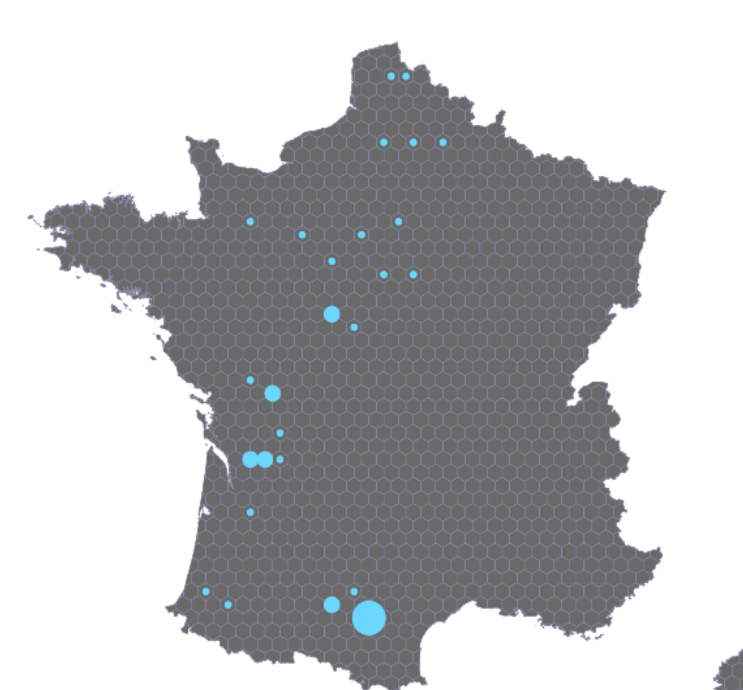


Figure 3: Location of plots of cultivar Cellule (*Stb16q*) showing breakdown (a) or stable resistance (b) in France between 2012 et 2019.

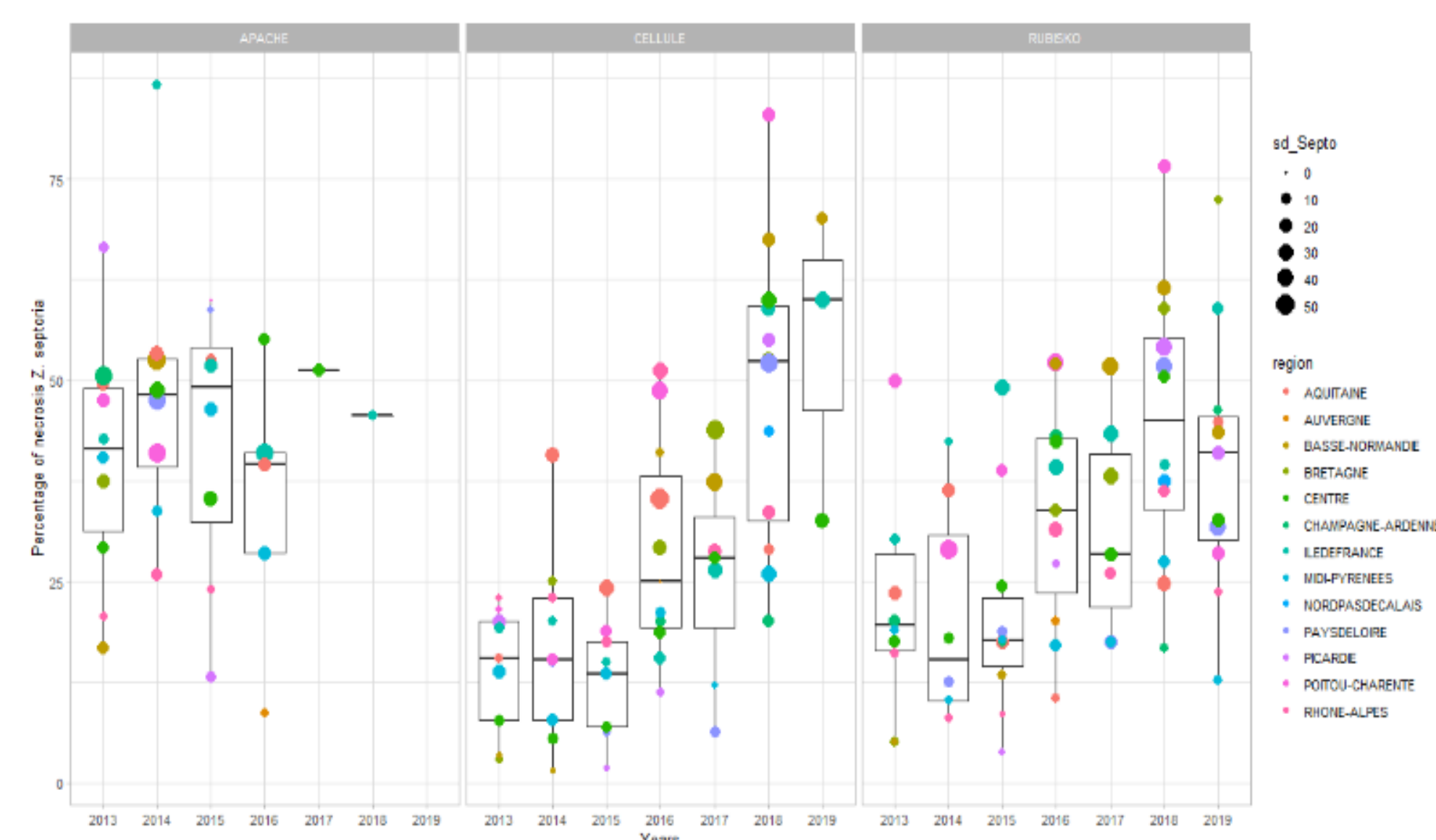


Figure 4: Spatiotemporal dynamic of STB severities (from Arvalis network) on cultivars Apache, Cellule and Rubisko among different French regions from 2012 to 2019.

**Conclusion:** These findings offer a comprehensive overview of STB dynamic at large spatiotemporal scale, the identification of hotspots of STB and the dynamics of resistance breakdown. Future analyses will also allow the identification of durable resistance along with their optimal deployment condition across the territory to maximize their efficacy and their durability in the future.