



# Testing varieties at GEVES for resistance to Fusarium head blight on cereals: A way to improve genetic progress in the French Catalogue and to reduce the use of pesticides

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## Introduction

- Testing candidate varieties resistance to pests and diseases for registration in the French catalogue is very important for varietal innovation, as it provides a description of resistant varieties to the farmers and could also encourage breeders to improve the level of disease resistance ; GEVES is responsible for carrying out these studies.
- From 2005 to 2007, a FSOV programm research, entitled « Comportment of common wheat cultivars to Fusarium head blight and mycotoxin accumulation in kernels », enabled GEVES to define an official protocol for the assesment of resistance to Fusarium Head Blight , for the registration to the french catalogue.

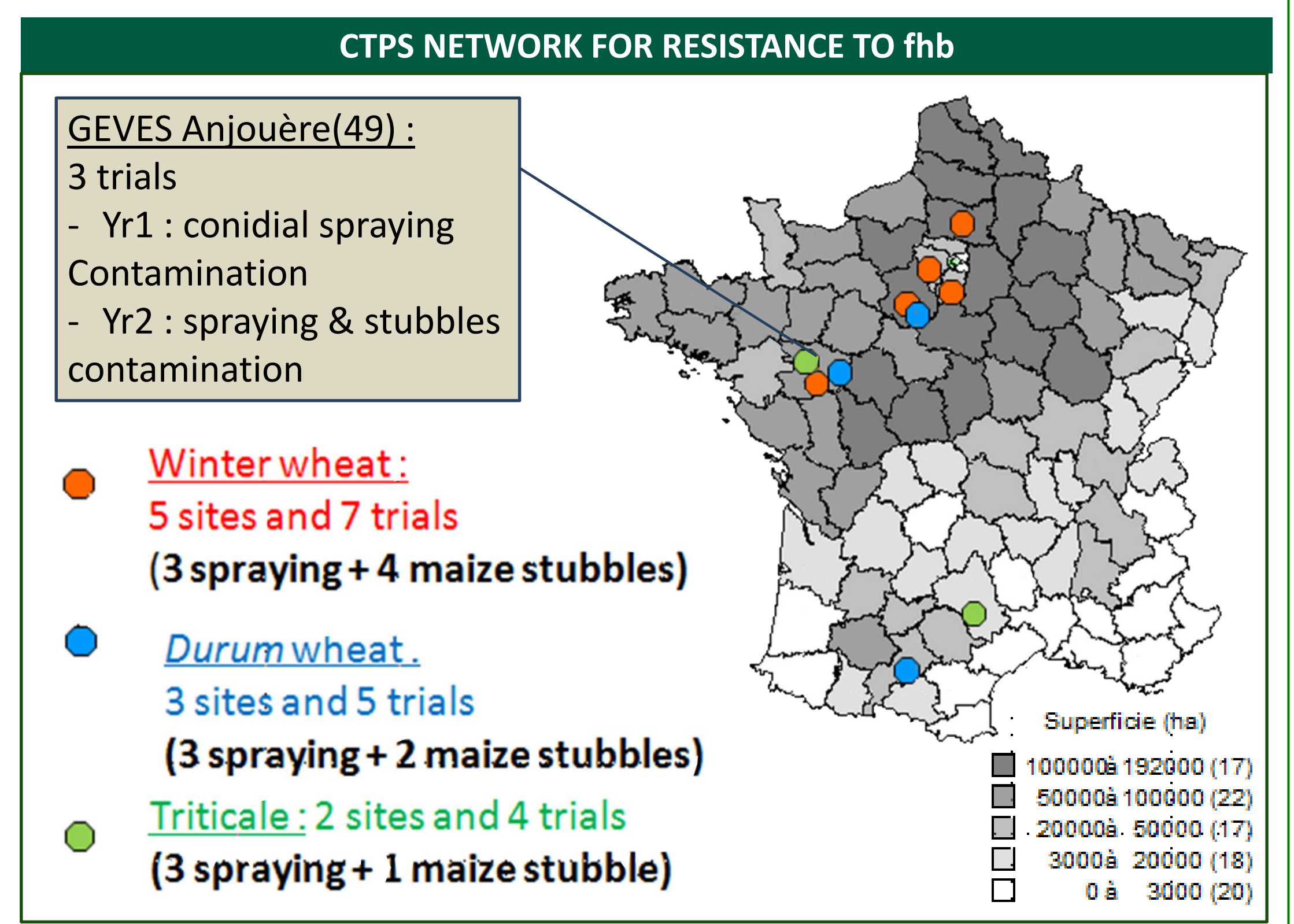
- When considering the Value for Cultivation, Use and Sustainability, the CTPS regulation awards bonus points to resistant cultivars (if cotation  $\geq 6$ ) and a penalty (if cotation  $\leq 3$ ) to susceptible ones: this facilitates the registration of resistant cultivars and improve their healthy quality. The resistance cotation goes from 1: susceptible to 9: resistant.
- From 2008 to 2012, the genetic progress of FHB resistance on winter wheat of all the registered cultivars was studied, to verify the action of the regulations on breeding.

## CTPS resistance protocole to Fusarium Head Blight in France

- **Number of applicant cultivars** : about 130 for winter wheat, 25 for durum wheat and triticale.
- **strains** : *F. graminearum* & *F. culmorum* strains chosen in accordance with their toxinogenicity to deoxynivalenol (DON) and aggressiveness.
- **Methods of inoculation:**
  - 1° by spraying a conidiospore suspension  
Anthesis of each genotype , with a mixing of *F. graminearum* & *F. culmorum*,  $c = 2.10^5$  spores/ml
  - 2° by maize stubbles  
contaminated with ascospores of *F. graminearum*
- Irrigation by sprinklers** : 20 days before flowering and during flowering
- **Scoring** : on 3 replicates of 25 spikes.
  - 1<sup>st</sup> scoring: at 350°C day after anthesis
  - 2<sup>nd</sup> scoring: 450°C day
- % scabbed spikelets** : by visual scores



- FHB resistance was assessed over a two year period in a specific CTPS network, composed of 7 winter wheat trials, with 20 controls shared in 4 groups of earliness. Each group contained resistant, intermediary and susceptible cultivars.

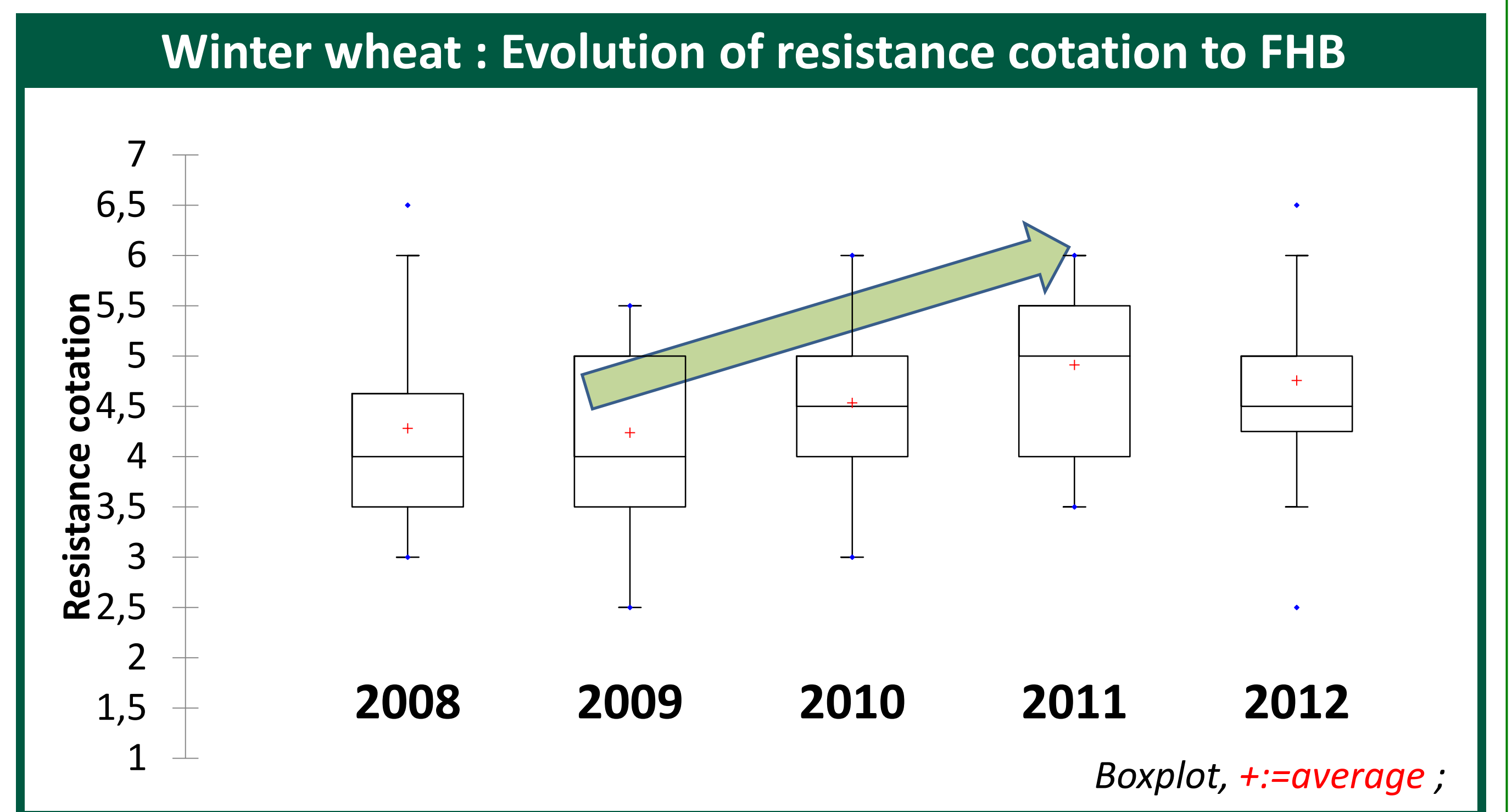
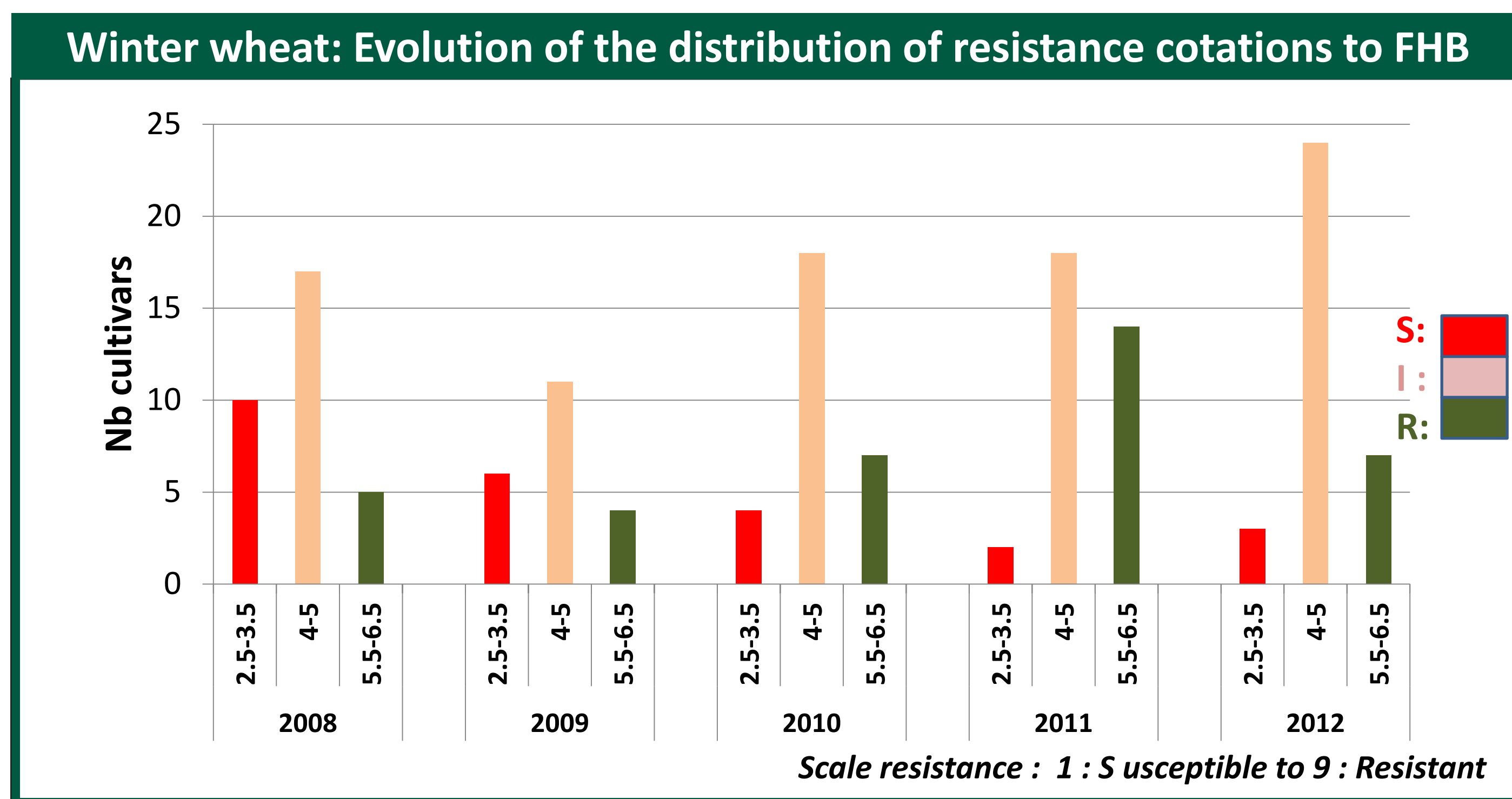


## Winter wheat: Increase of resistance level of french cultivars to FHB from 2008 to 2012

- From 2008 to 2012, the evolution of the resistance level to Fusarium of 150 registered cultivars was studied, with about 30 registered cultivars per year out of 80 applicants.
- A genetic progress of the resistance level was observed, with a significant reduction of the susceptible class (from 31% cultivars to 9%), a significant increase of the intermediate class (from 53% to 71%) and a slight increase of the resistant class (from 16 % to 21%). From 2008 to 2012, 16 resistant cultivars/150 were registered with a bonus and only 9 cultivars with a malus, representing respectively 10.6 % of resistant cultivars and 6% of susceptible registered cultivars. In 2012, 6/35 resistant cultivars (17%) were registered with a bonus (Jaceo, Calisol, Hyxtrem, Hylux, Hyspeed, Hyfi) against only 1 susceptible cultivar with a malus (3%).  
[http://cat.geves.info/Page/RECAPDOC/51\\_Plaqu](http://cat.geves.info/Page/RECAPDOC/51_Plaqu)

Table 1: Box-plot statistics about the resistance cotation per year of winter wheat to FHB

	2008	2009	2010	2011	2012
Nb. Cultivars	32	21	29	34	35
Minimum	3.00	2.50	3.00	3.50	2.50
Maximum	6.50	5.50	6.00	6.00	6.50
1st Quartile	3.50	3.50	4.00	4.00	4.25
Médiane	4.00	4.00	4.50	5.00	4.50
3 rd Quartile	4.63	5.00	5.00	5.50	5.00
Moyenne	4.28	4.24	4.53	4.91	4.76
Variance (n-1)	0.82	0.87	0.61	0.64	0.73



**Conclusion and prospects** We have highlighted an increase of resistance level to FHB for winter wheat cultivars registered in France for these last five years, related to the CTPS policy, with the use of bonus, penalty. Cereal Section of CTPS is currently being considered the possibility to introduce the trait of resistance to mycotoxin accumulation (DON) in the regulation ; studies are on going to analyse the relationship between the DON content and the percentage of scabbed spikelets ( $R^2$ : 0.6 to 0.8) . New methods based on multispectral approach for phenotyping FHB resistance are also being set up.