

A demand for vigour testing on sunflower seeds

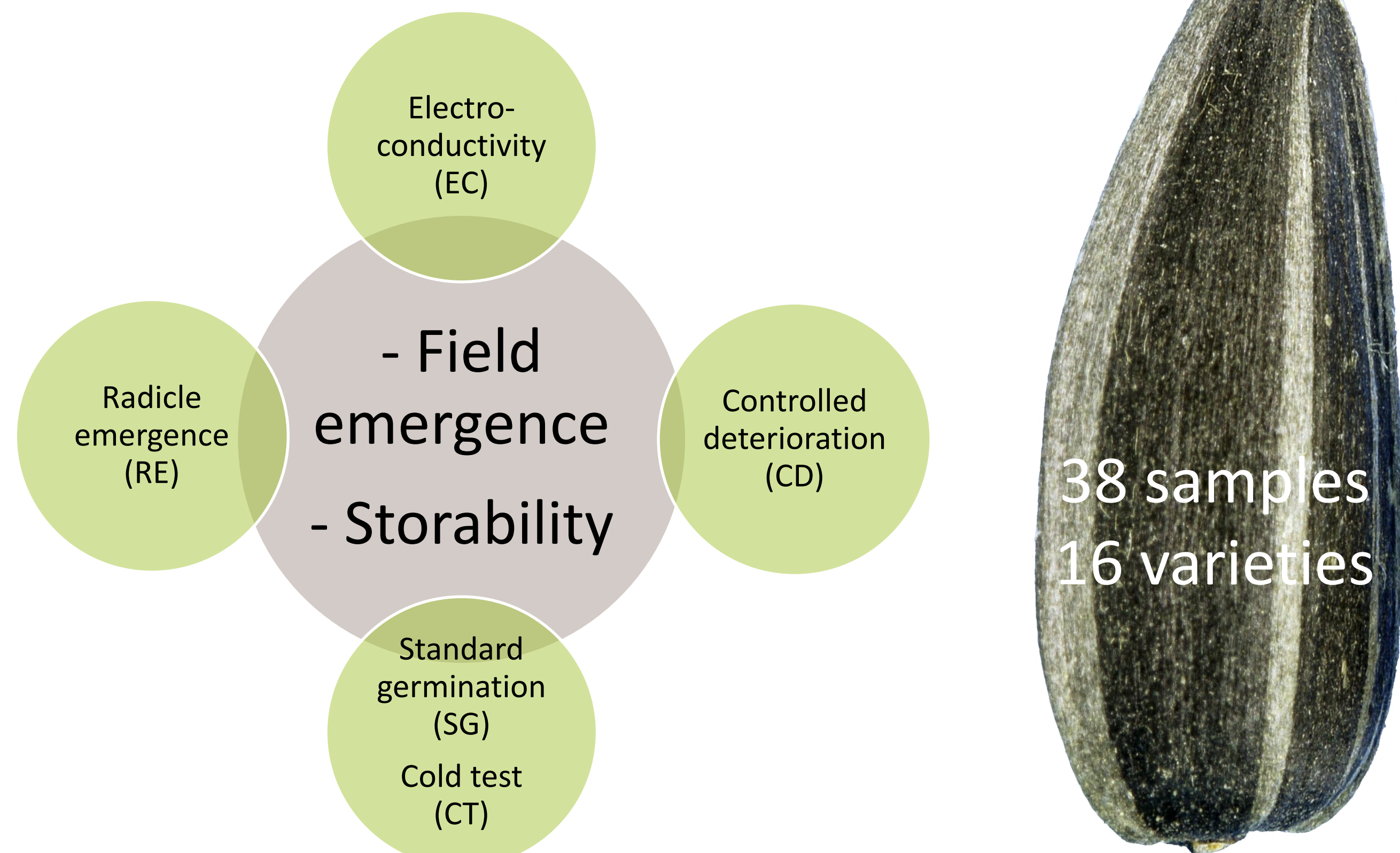
Early sowing has become common practice in spring crops to avoid water stress during flowering stage. There are two problems for sunflower cultivation: residual seed dormancy when seed lots are produced off-season, and seed vigour when acceptable germination is achieved. Dormancy can be overcome by standard germination (SG) with a pre-treatment for breaking dormancy but no vigour test is available to predict poor field emergence when

seed lots have a good germination potential.

A range of vigour tests already standardised for others crops in ISTA Rules or described in literature (see references below) have been developed for sunflower. Sunflower is the second-largest oilseed crop in France, representing 20% of sunflower production in Europe.

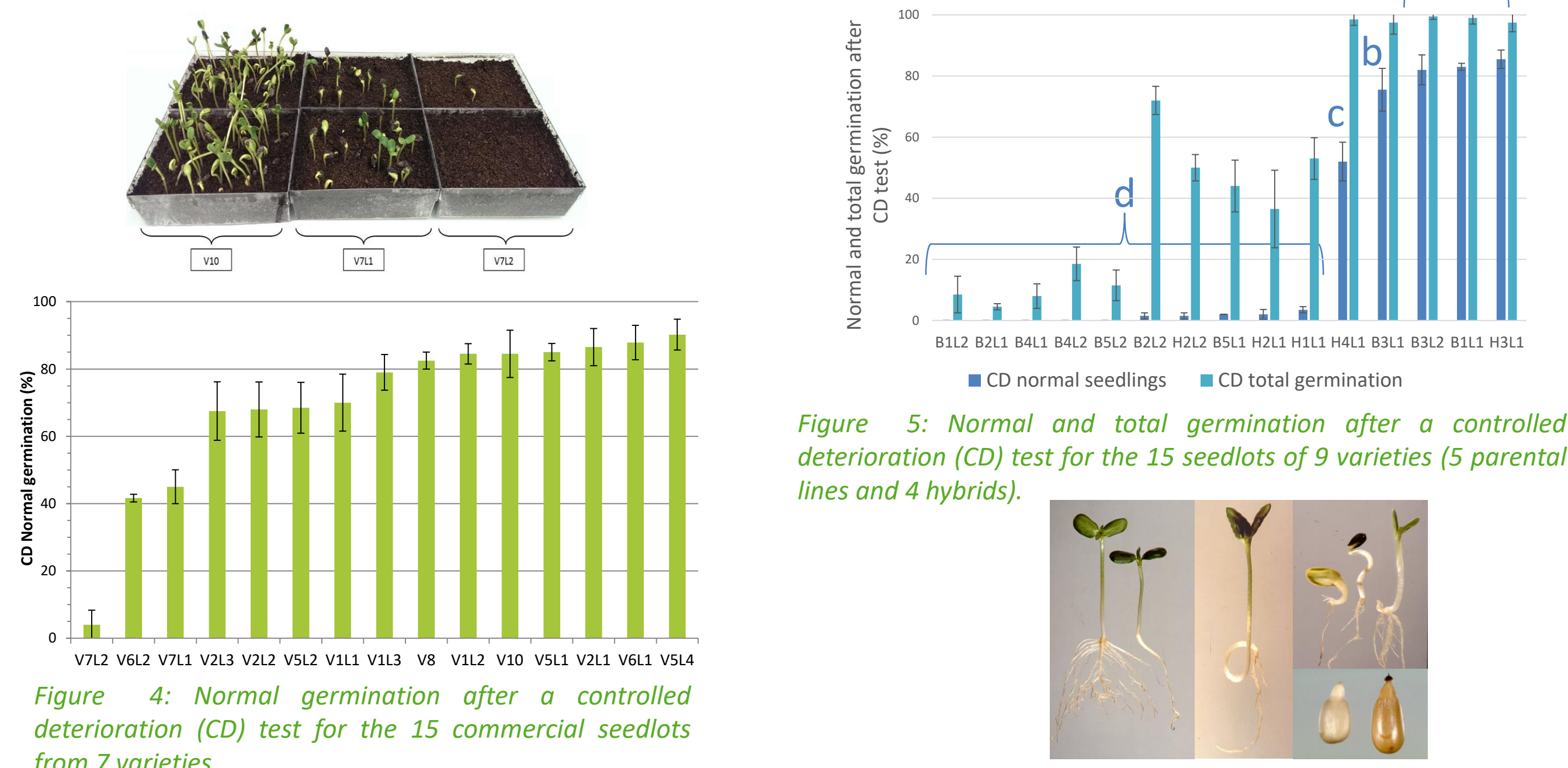
A two-step study before field trials in 2017

- 1) Vigour tests were developed to enlarge physiological range of samples with acceptable germination, selected from commercial seedlots
- 2) Validation of repeatable tests with field or storage trials on new samples



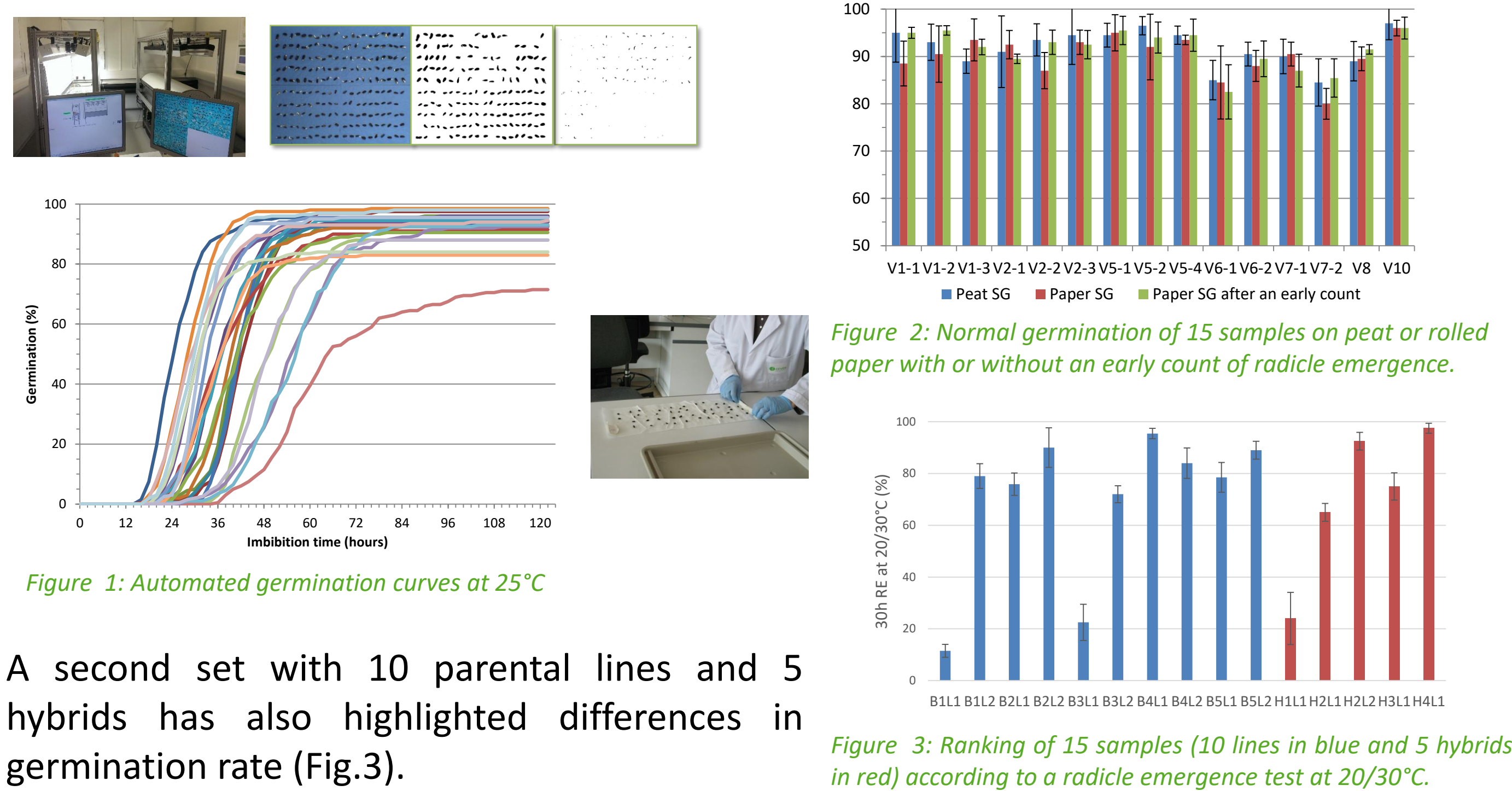
Controlled deterioration test: an interesting range of vigour

The CD test was conducted over 24h at 45°C after seed moisture content adjustment at 20%. This ageing test allowed to enlarge the quality range of both sets of samples. In the first set (Fig.4), the two seed lots of variety 7 had very poor germination after CD test. Whereas the two seed lots of variety 6 were different in vigour, showing that seed production had an higher effect on seed vigour than genetic background. In 2017, normal germination was very low for most samples, only two parental lines and one hybrid were tolerant to CD test. And again, a variety (parental line B1) had two seed lots with different vigour: B1L1 with high vigour, B1L2 with low vigour (Fig.5).



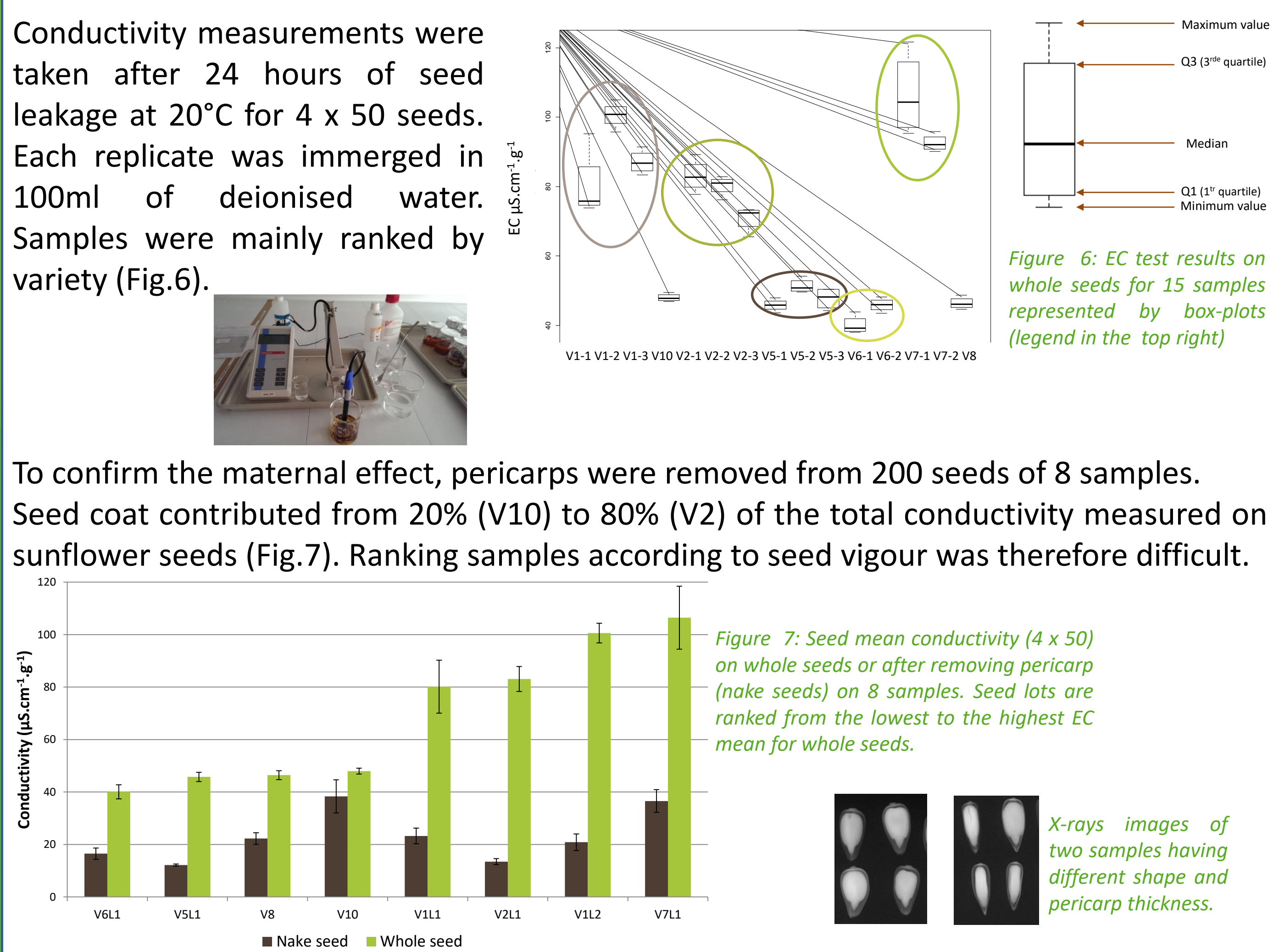
Radicle emergence test development based on mean germination rate

23 seed lots from 10 varieties were analysed for their germination rate at 25°C using automated tools (Fig.1). 15 samples with SG>85% were selected to develop a RE test in rolled towel. The highest correlated counts to mean germination time were tested on standard germination test and a 30h RE test at 20/30°C was validated as being compatible to the SG without any damage of the early count on the same trial (Fig.2).



Electro-conductivity test: variability due to pericarp

Conductivity measurements were taken after 24 hours of seed leakage at 20°C for 4 x 50 seeds. Each replicate was immersed in 100ml of deionised water. Samples were mainly ranked by variety (Fig.6).



Field emergence better than predicted by lab testing

CD test predictive of storage potential

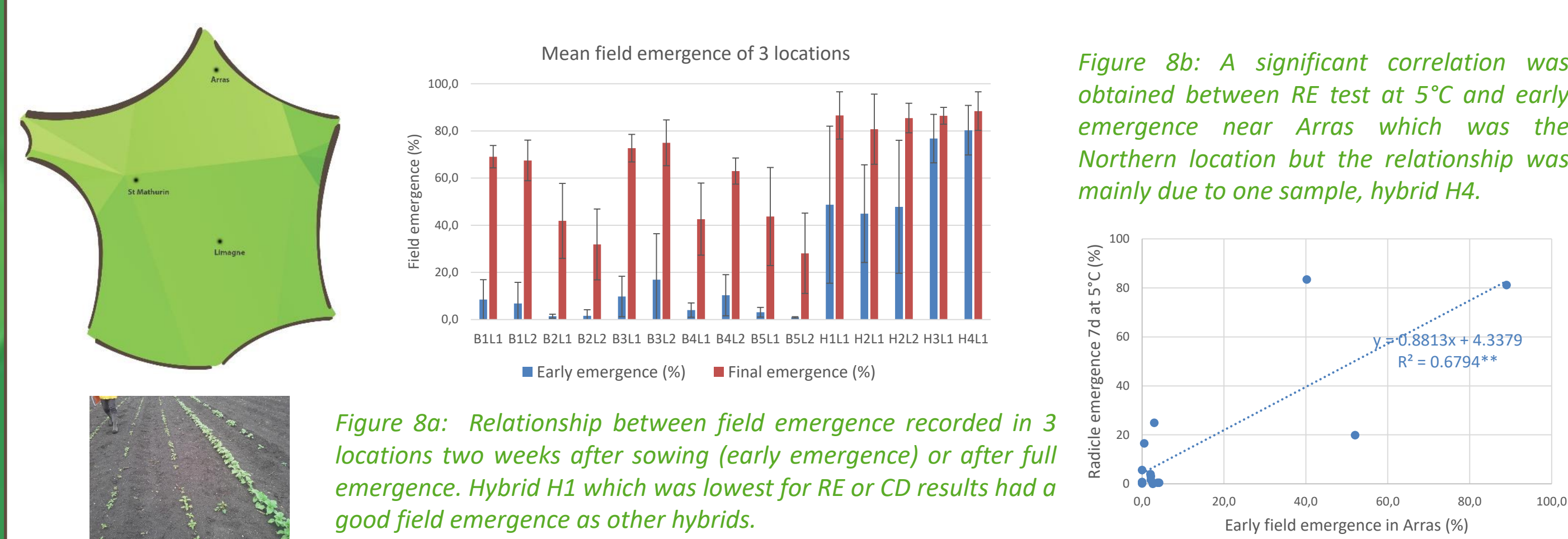
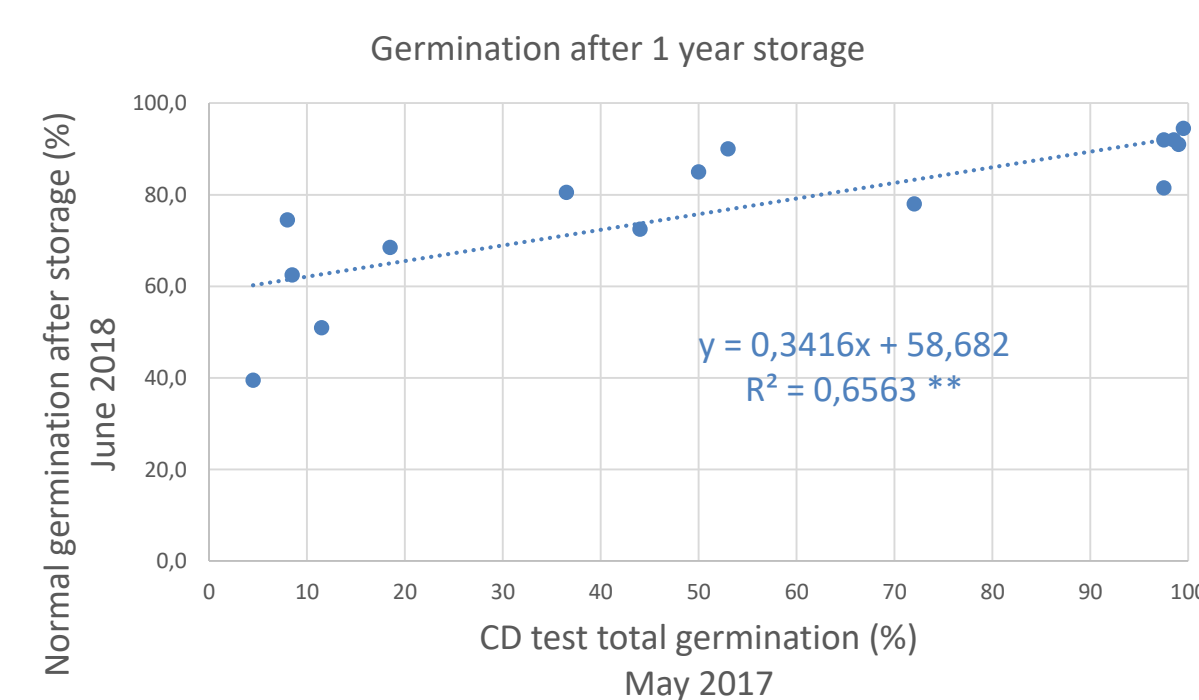


Figure 9: Relationship between normal germination after one year storage in a warehouse and total germination after controlled deterioration test carried out before storage.



This two-year comparison between several vigour tests developed on sunflower seed leads to conclude that seed lots can be ranked consistently within a variety. But the comparison between samples from different genetic background becomes difficult, especially lines and hybrids which have contrasted behaviour. The controlled deterioration test gave the most interesting results to predict storage potential rather than field emergence, at least in 2017.

Acknowledgments

Laurence Charrier, Luc Dormoy, Christelle Esquerdo, Rosie Gilonis, Lydie Ledroit, Pierre Lerebours.

References

Corbinau *et al.*, *Physiol. Plant.*, 2002
ISTA, *International Seed Testing Rules*, 2019.
Kibinza *et al.*, *Physiologia Plantarum* 2006
Rodrigues Sá Braz Madelon *et al.*, *Ciencia Rural*, 2008

Contact: marie-helene.wagner@geves.fr