



# Vigour Committee Report

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Cairo  
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- Detail of all activity in Activity Report
- Focus on two topics
  
- Radicle emergence test
  - Soybean
  - Cucurbit rootstock seed
  - Other species
- ISTA special project

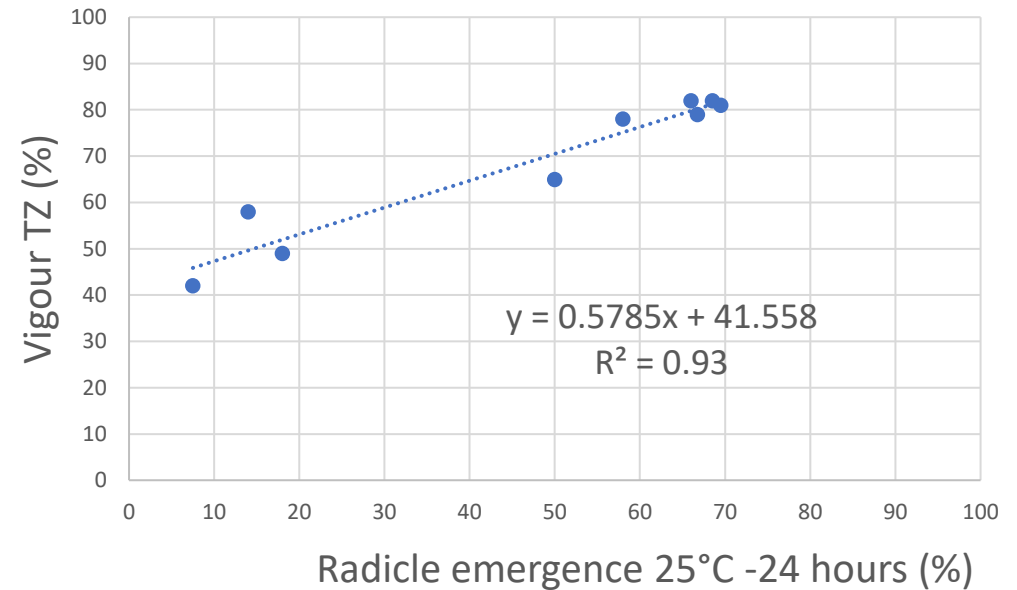
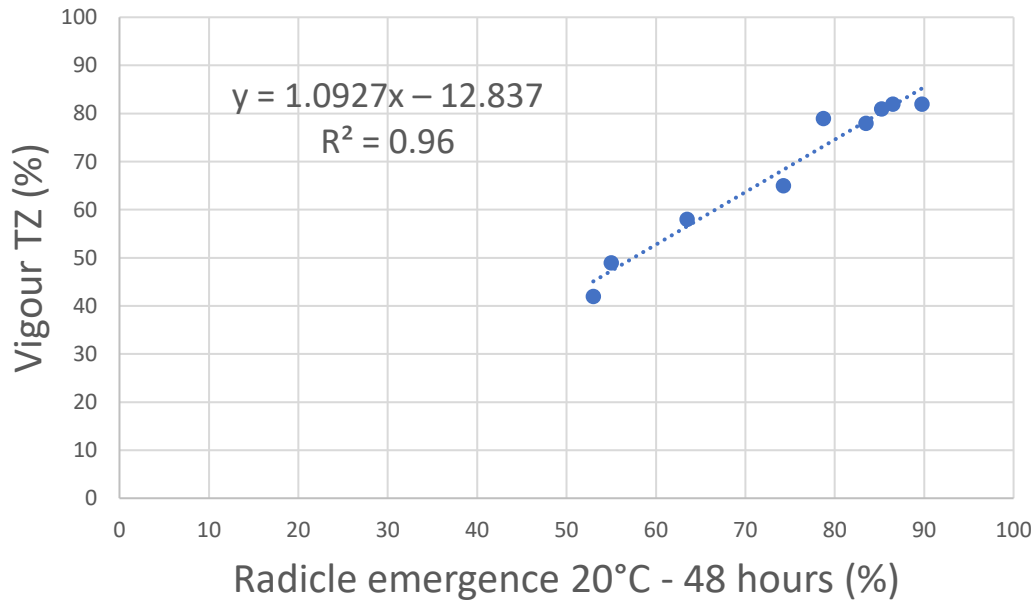


# Addition of a species to Radicle Emergence test: Soybean

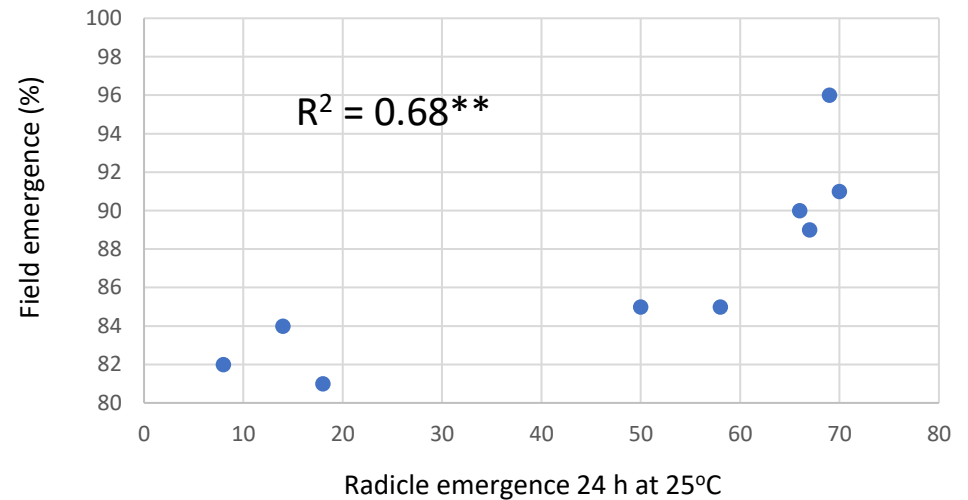
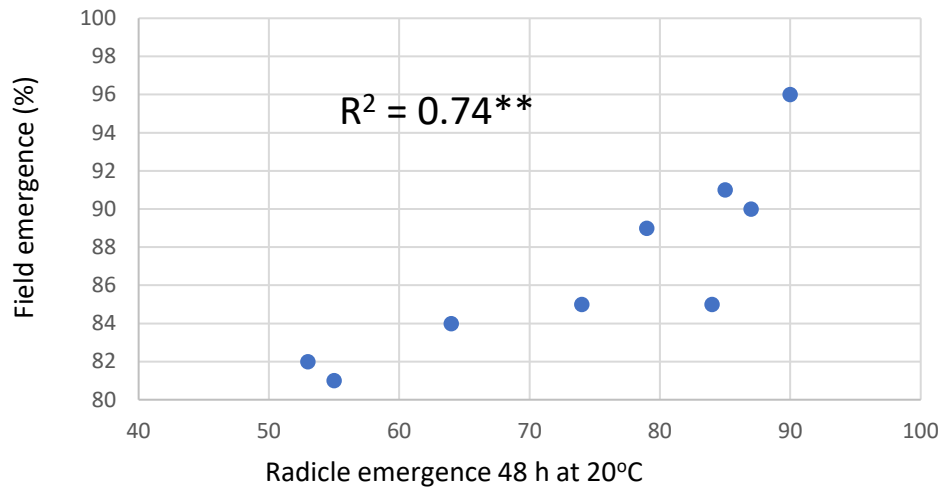
- Carina Gallo (Argentina)
- Nine soybean seed lots
  - Germination (normal seedlings %) above 80%
- Counts of RE at 10 times during germination (23 – 101 hours)
- Two temperatures: 20°C, 25°C
- TZ vigour test
- Field emergence



# RE and TZ identify same differences between seed lots



# RE at both temperatures predicts vigour differences



- Both RE and TZ test provide a quick assessment of soybean vigour
- TZ requires more training, plus experience
- RE more easily applied



# Radicle Emergence test: Cucurbit rootstock seed

Ibrahim Demir's laboratory (Turkey)  
8 cucurbit hybrid rootstock seed lots  
Stored at 75% RH, 35°C, 100 days  
Survival curves produced:

$K_i$  Initial estimated viability

$p_{50}$  Time to loss of 50% viability

Time of RE count (h)	Germination percentage (% normals)	$K_i$	$p_{50}$
30	0.91***	0.84**	0.88**
32	0.95***	0.86**	0.92**
34	0.99***	0.86**	0.93***
36	0.99***	0.83*	0.92**
38	0.97***	0.77*	0.87**
40	0.94***	0.72*	0.83*



# Radicle emergence test

## Recent evidence for other species:

### *Astragalus sinicus*:

Single count of radicle emergence and mean germination time estimate seed vigour of Chinese milk vetch (*Astragalus sinicus*). Tao, Sun, Zhang, Sun, Li, Zhong and Sun (2022). *Seed Science and Technology*, 50, 47-59

### *Festuca sinensis*

Detection of seed vigour differences in *Festuca sinensis* seed lots  
Munyaneza, Chen and Hu (2022). *Seed Science and Technology*, 50, 61-75.

Evidence for RE predicting vigour: 20 species; 4 ISTA validated



# ISTA Special Project

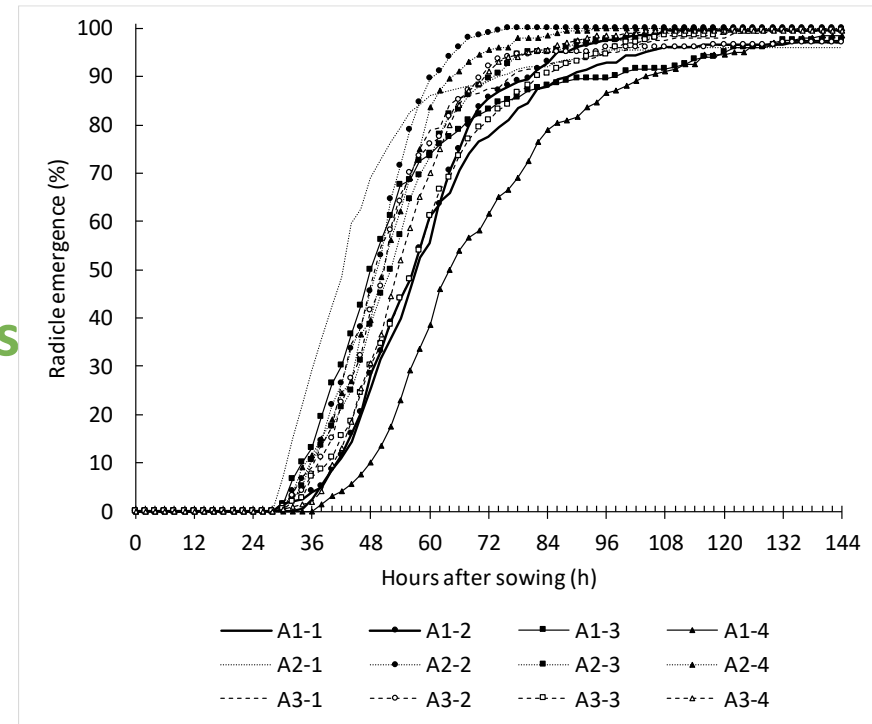
## Development of rapid tests to predict germination and vigour and their potential for automation using image analysis

- Germination and Vigour Committees
- Five vegetable brassica species:
  - cauliflower, cabbage, radish, mustard, Chinese cabbage
- RGB imaging
- Multispectral imaging
- Details for cauliflower
- Summary for other species



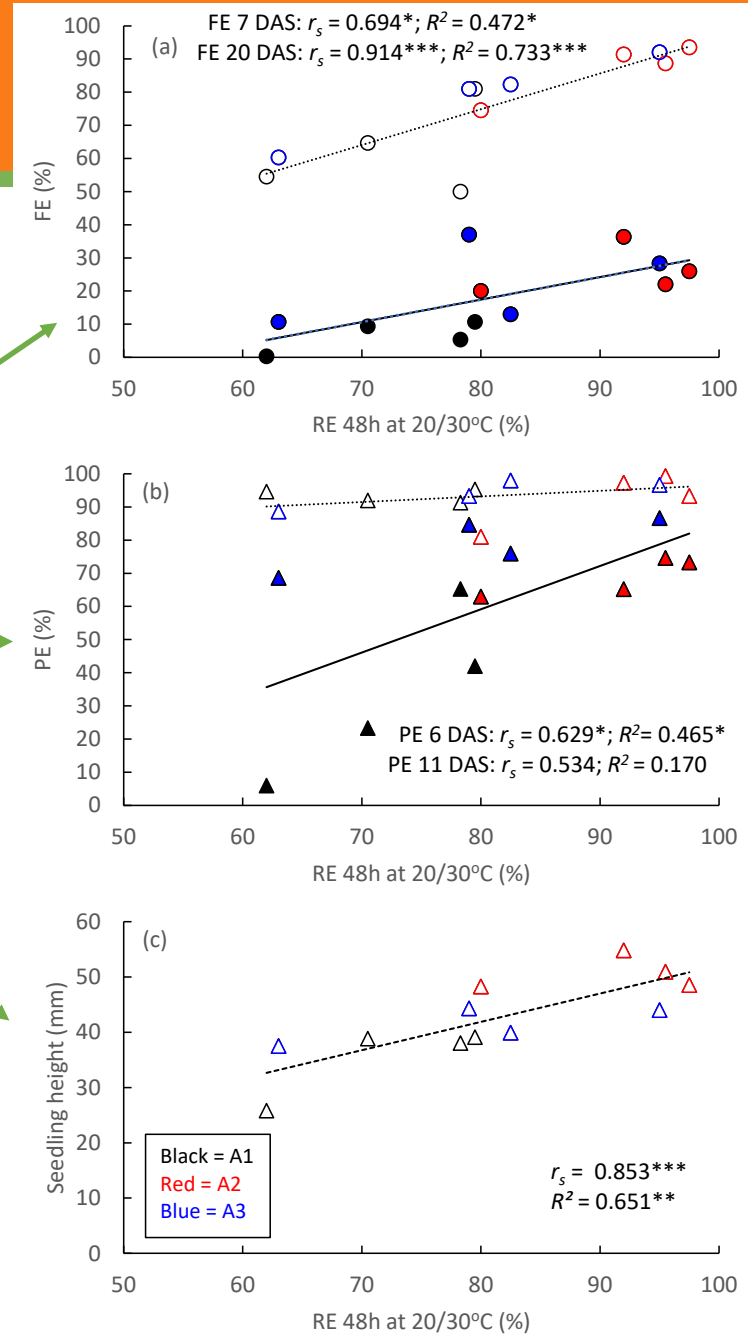


- 5 Brassica species
- 12 lots (3 varieties x 4 lots)
- Manual RE count: 48 h 20-30°C
- RGB imaging at 20°C: germination progress curves
- Vigour:
  - field emergence; plug emergence (glasshouse)



Cauliflower: manual count  
48 h RE at 20/30°C predicts:

- Field emergence (FE)
- Plug emergence (PE)
- Seedling size in plug emergence

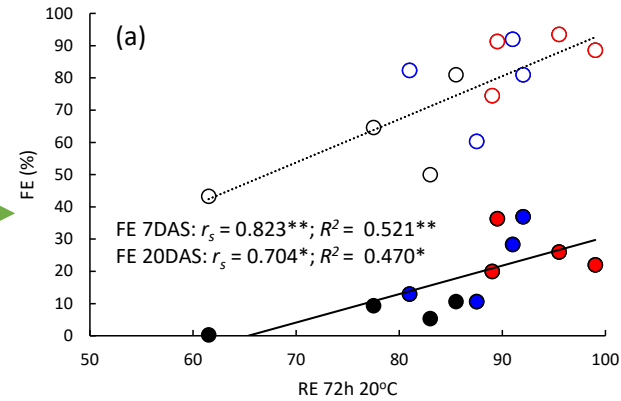


## Cauliflower: RGB imaging count at 20°C RE at both 72 h and 96h predicts

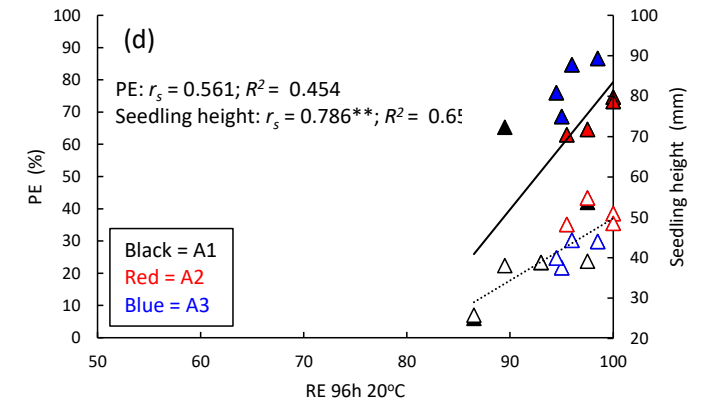
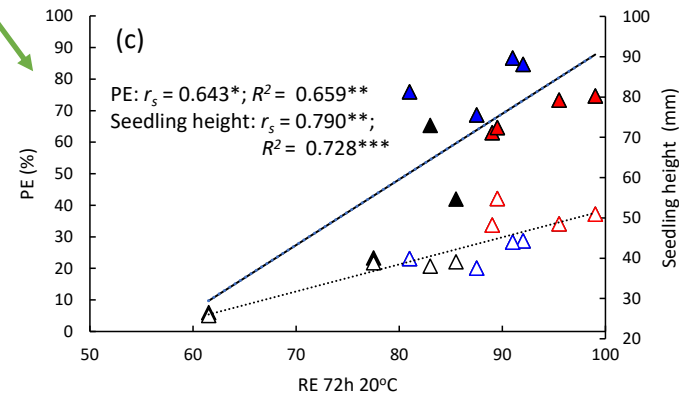
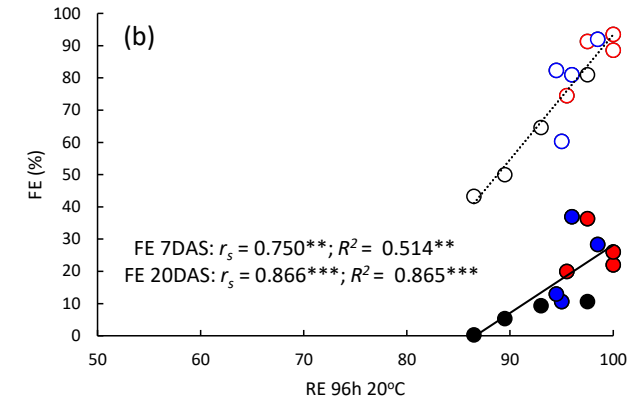
- Field emergence (FE)
- Early plug emergence (PE)
- Seedling height at maximum PE

Greater range of RE at 72 h

72h RE



96h RE



# Summary: Manual and RGB imaging Prediction of vigour in five Brassica species

	RE 20/30°C: 48 hour count	RE 20°C: Timing of RE count differs for each species
	Manual count	RGB imaging
Cauliflower	Field emergence (final count): $P \leq 0.001$ Plug emergence (early count): $P \leq 0.05$ Seedling height: $P \leq 0.001$	Field emergence (final count): $P \leq 0.001$ Plug emergence (early count): $P \leq 0.05$ Plug emergence (final count): $P \leq 0.05$ Seedling height: $P \leq 0.001$
Cabbage	Field emergence (early count): $P \leq 0.001$ Field emergence (final count): $P \leq 0.05$	Field emergence (early count): $P \leq 0.001$ Plug emergence (early count): $P \leq 0.001$ Plug emergence (final count): $P \leq 0.05$
Mustard	Plug emergence (final count): $P \leq 0.01$	Field emergence (early count): $P \leq 0.001$ Field emergence (final count): $P \leq 0.001$ Plug emergence (early count): $P \leq 0.05$ Seedling height: $P \leq 0.05$
Radish	Field emergence (early count): $P \leq 0.05$ Field emergence (final count): $P \leq 0.01$	Field emergence (final count): $P \leq 0.05$
Chinese cabbage	Plug emergence (early count): $P \leq 0.01$	Plug emergence (early count): $P \leq 0.001$ Plug emergence (final count): $P \leq 0.001$ Seedling height: $P \leq 0.05$



## Multispectral imaging (MSI)

- Alina Fetcu (masters student)
- Cauliflower, cabbage
- 48 h assessment of RE:
  - Manual and MSI (Videometer)
- Compared to:
  - Field emergence
  - Plug emergence

MSI RE vs	Cauliflower: $P \leq$	Cabbage: $P \leq$
Manual RE	0.001	0.001
Early FE	0.01	0.05
Final FE	0.001	NS
Early PE	0.01	0.001
Final PE	0.001	0.001



## Comparative tests

- Germination: RE 48 hours, 20/30°C
    - 6 labs
  - Vigour: RE 48h and 72h, 20°C
    - 8 labs
- } Manual counts
- Multispectral imaging (Videometer)
    - 3 labs
  - Analysis now completed; validation reports in preparation



## Next steps

- **Comparative test**
  - Towards validation of RE test for soybean
- **RE test for germination**
  - Validation provides potential for use in companies and/or seed labs.
  - No Rules proposal.
- **RE vigour test for vegetable Brassica spp.**
  - Rules proposal



# Thank you

All the Vigour Committee

All involved with the ISTA Special Project:

- **Germination Committee:** Sylvie Ducournau, Gillian Musgrove
- **Vigour Committee:** Marie-Helene Wagner, Takashi Shinohara, Stan Matthews
- **GEVES:** Audrey Dupont, Alina Fetcu, Germination laboratory







Thank you!

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