Introduction of a new pre treatment for *Beta vulgaris* seeds

Lesly González Galaz

ANASAC Chile Seed testing laboratory

OBJECTIVE

To demonstrate that an alternative pretreatment for *Beta vulgaris* seeds like soaking could be as effective as the use of running water for hours, to leach the inhibitory substances present on the surface of the seeds.

INTRODUCTION

- *Beta vulgaris* is a widely cultivated species around the world due to its importance as an agricultural and forage crop for animal feed.

- ISTA Rules indicates
  Substrates: TP; BP; S
  Temperatures: 20<=>30°C; 15<=>25°C; and 20°C.

INTRODUCTION

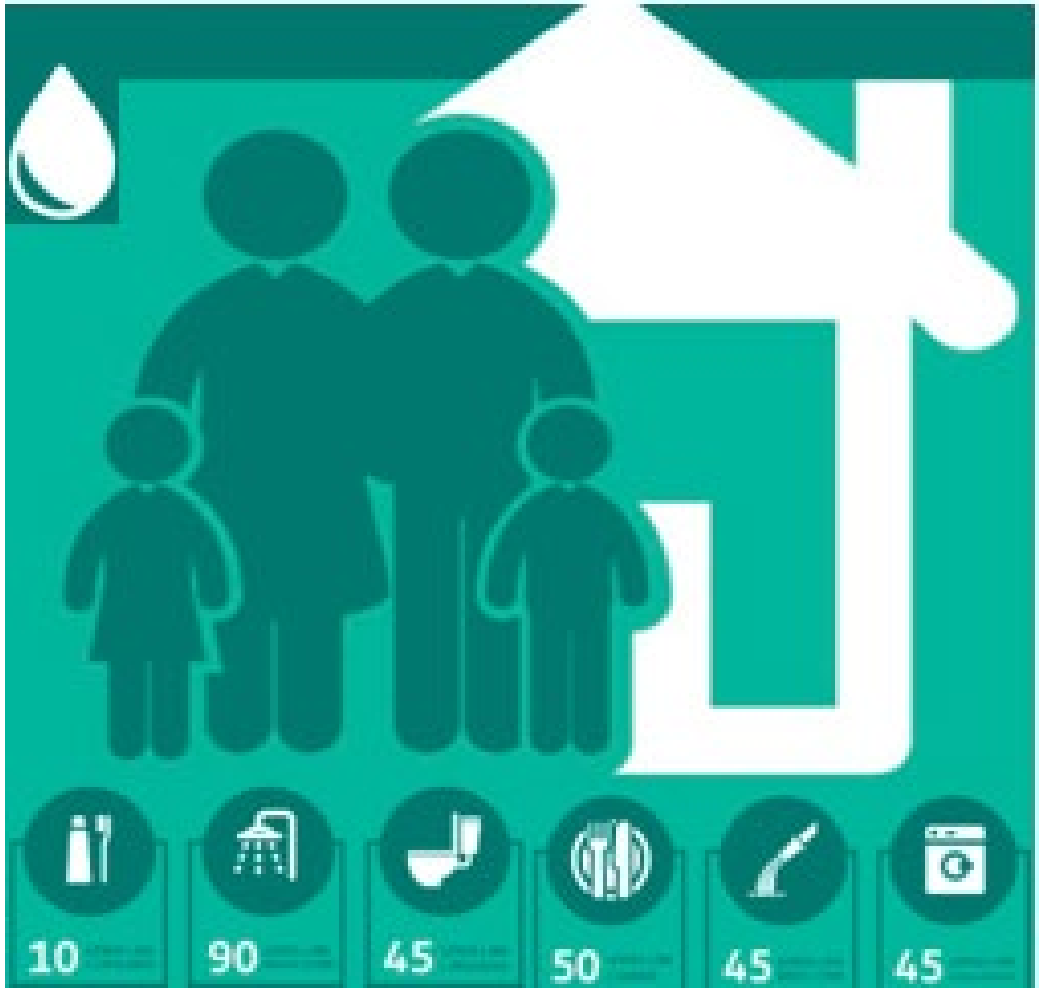
- Table 5A describes prewash (multigerm: 2 h; genetic monogerm: 4 h) and dry at max. 25 °C, as a recommendation for breaking dormancy.

- **<u>This procedure is carried out in running water.</u>**

INTRODUCTION

1 sample prewashed
(1440-2880L running water)

=



Daily water consumed family 4 people

INTRODUCTION

1000 sample prewashed/year
(1.440.000-2.880.000L)

=

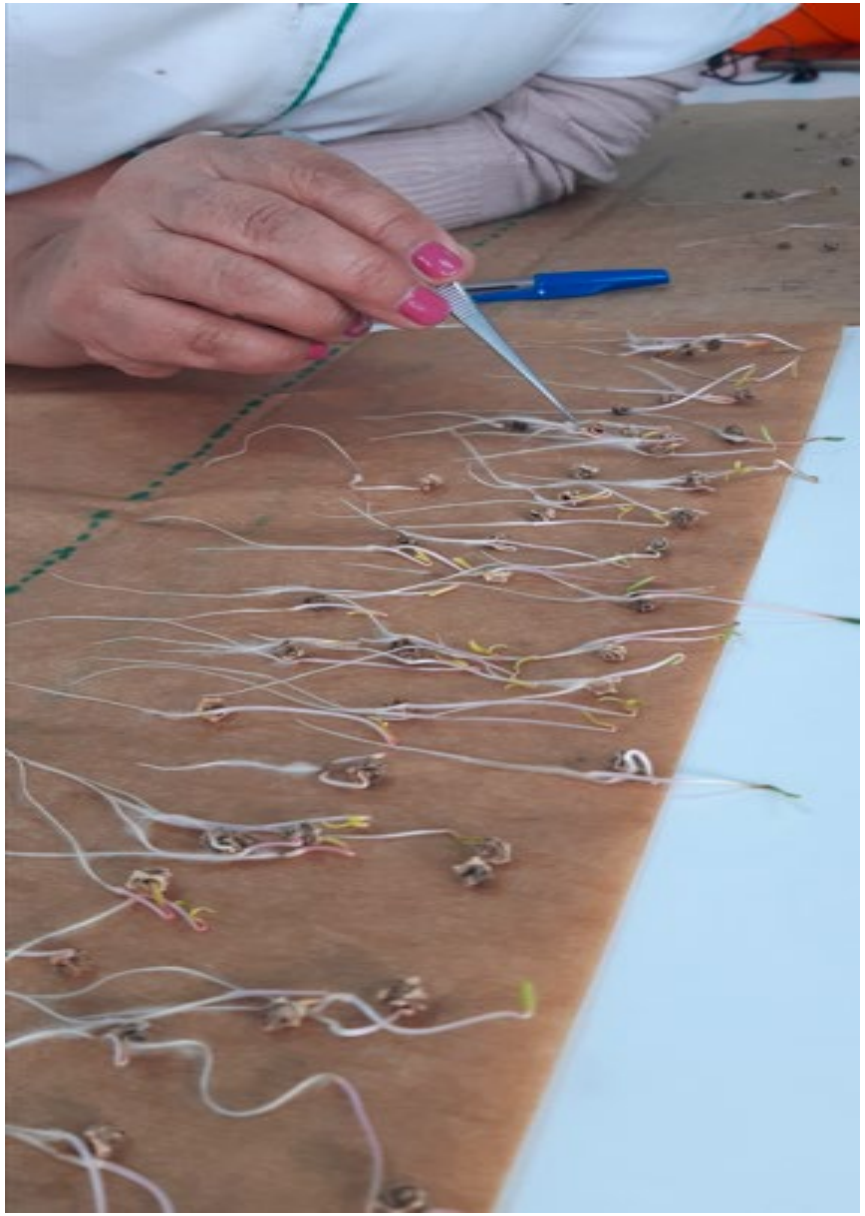
Olympic pool
(2.500.000 L)

MATERIAL AND METHODS

- -4 seed lots of *Beta vulgaris*,
  -Mono and multigerm species.
  -400 seeds per test.
  -PSD 46

- First count/Final count:
  4-14 days.
  Seedling Group A-2-1-1-1

- In order to avoid any risk of contamination, a fungicide treatment was applied before the sowing.



MATERIAL AND METHODS

- **Test conditions: PP, BP; 20°C**

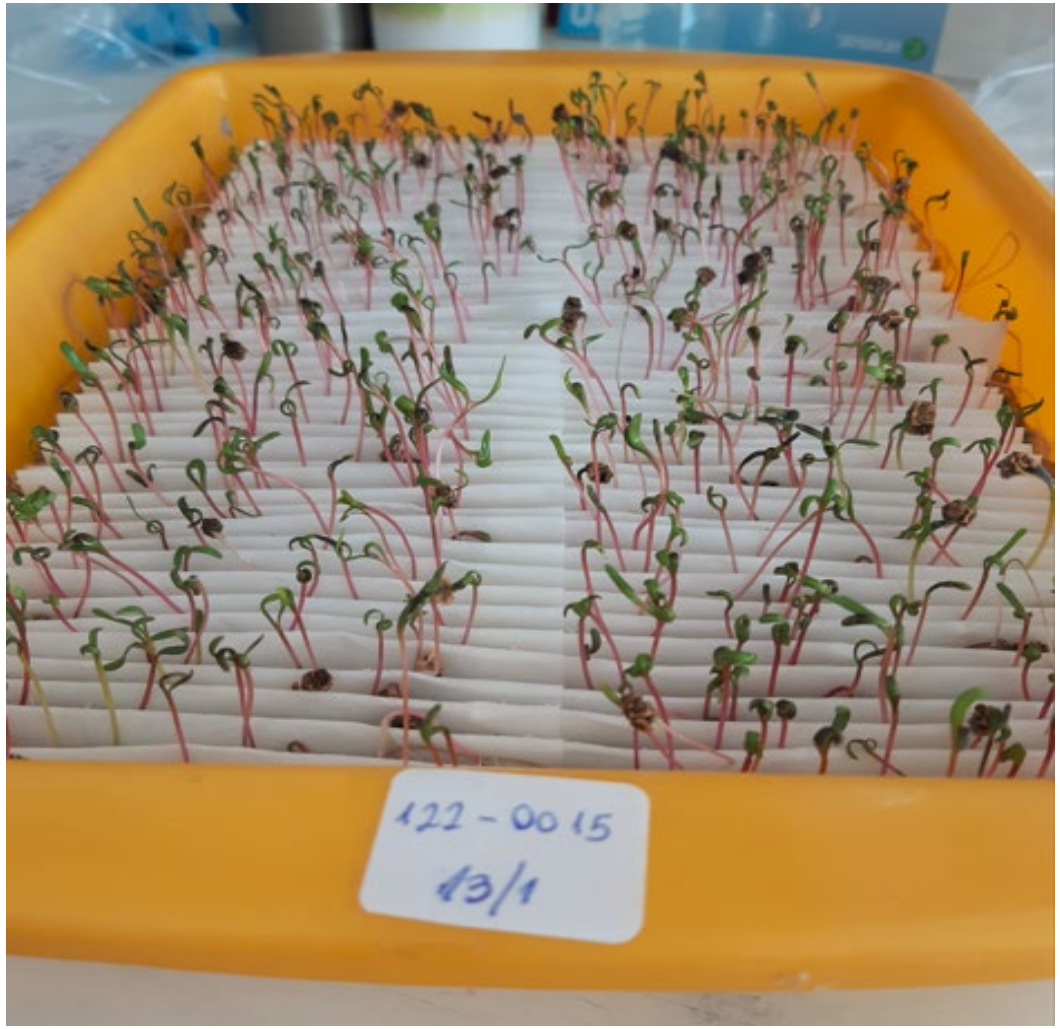


Table 1. Germination testing methods for *Beta vulgaris*

Test Number	Breaking dormancy pretreatment
1	Prewash (multigerm: 2 h; genetic monogerm: 4 h). Dry at max. 25°C. As it is currently described on point 5.6.3.3 and Table 5 A of the ISTA Rules.
2	Presoak the seeds in water for two hours, using 250ml of water per 100 seeds. Then clean in running water and the surface blotted dry. Temperature of soaking and washing water should be at 20-25°C.
3	Sow directly with no pretreatment (only using fungicide).

Statistical analysis of the results

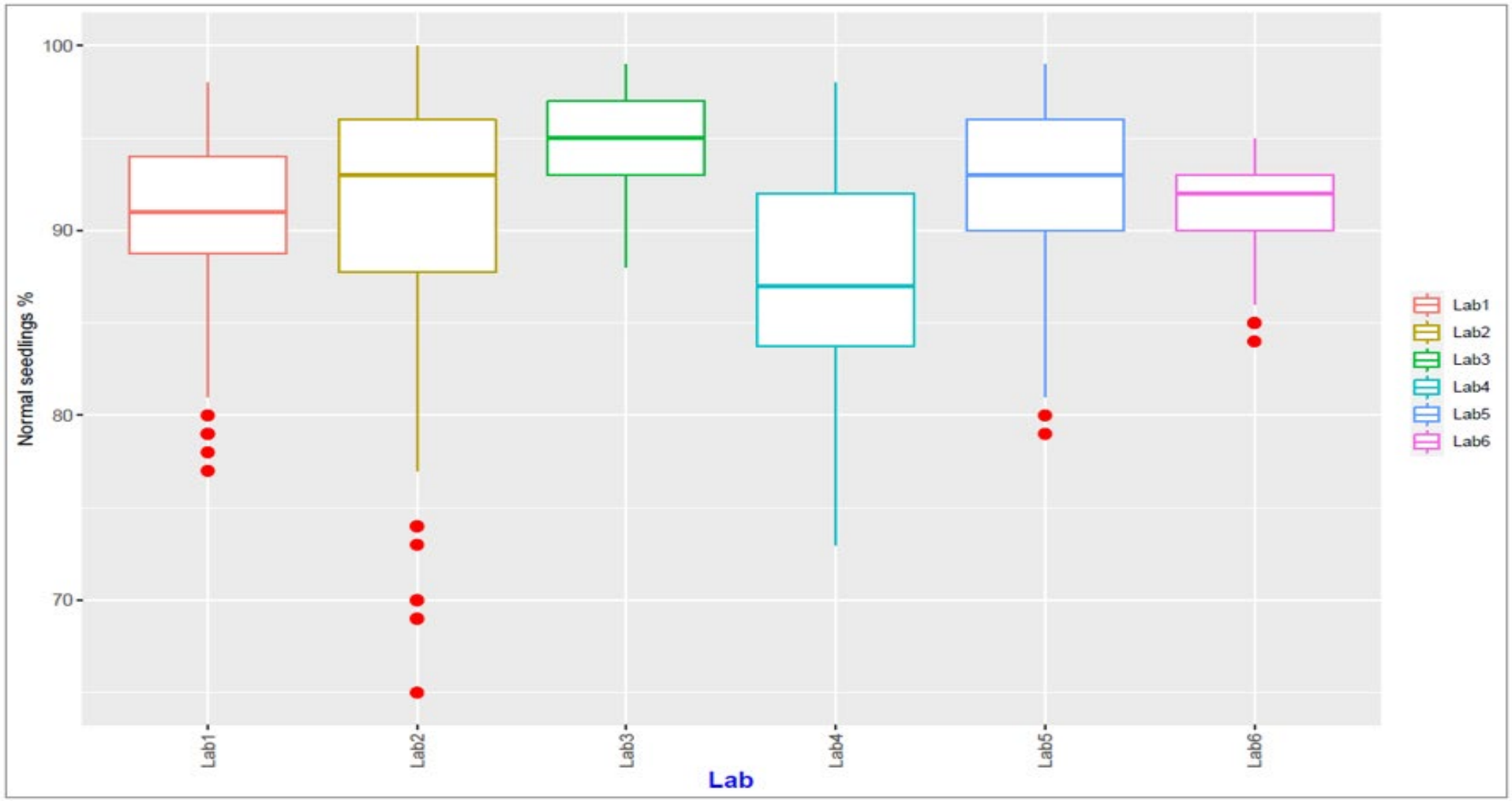


Figure 1. Percentage of normal seedlings for all the samples and all the methods, per laboratory.

Statistical analysis of the results

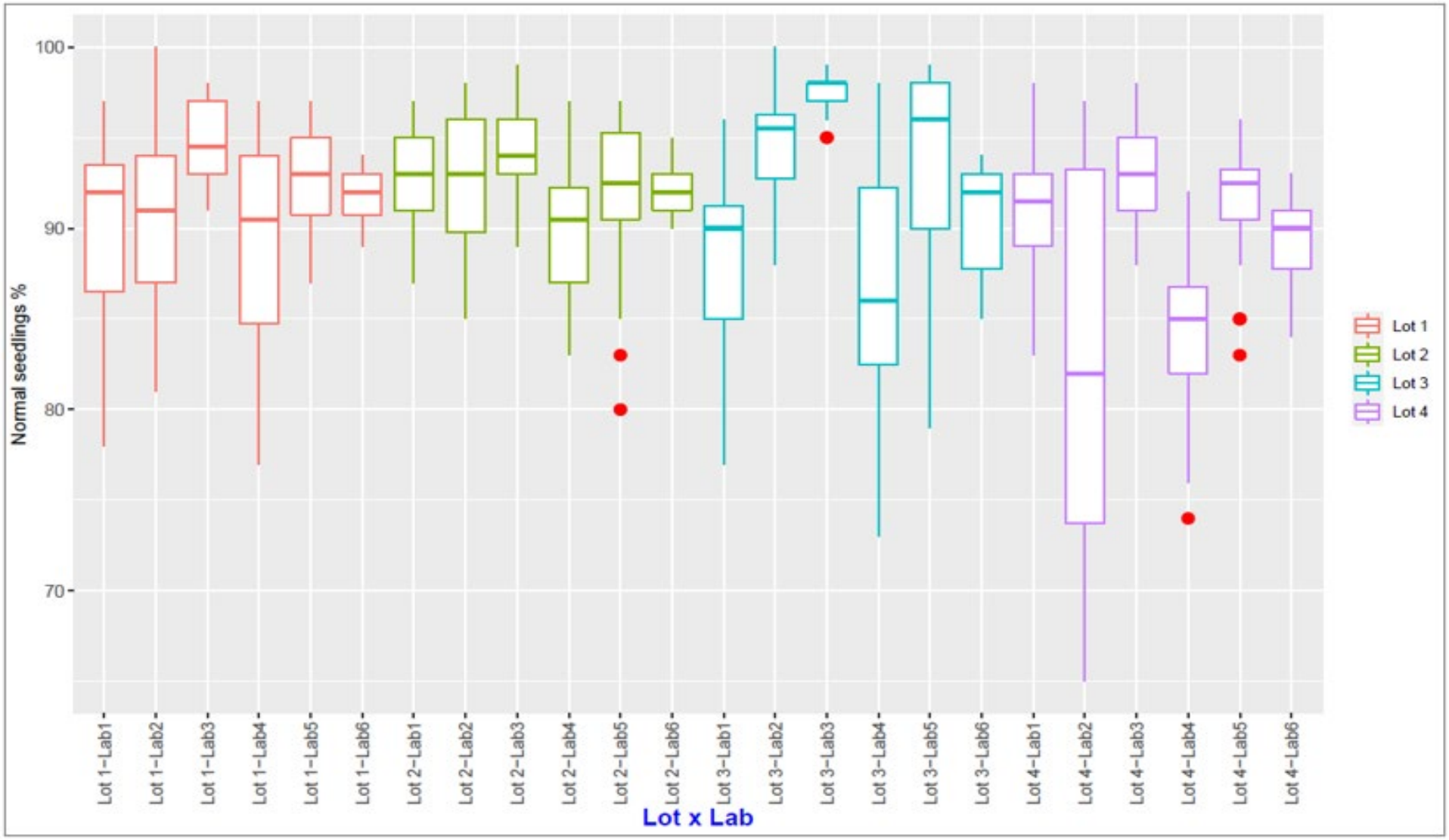


Figure 2. Percentage of normal seedlings per laboratory, per lot.

Statistical analysis of the results

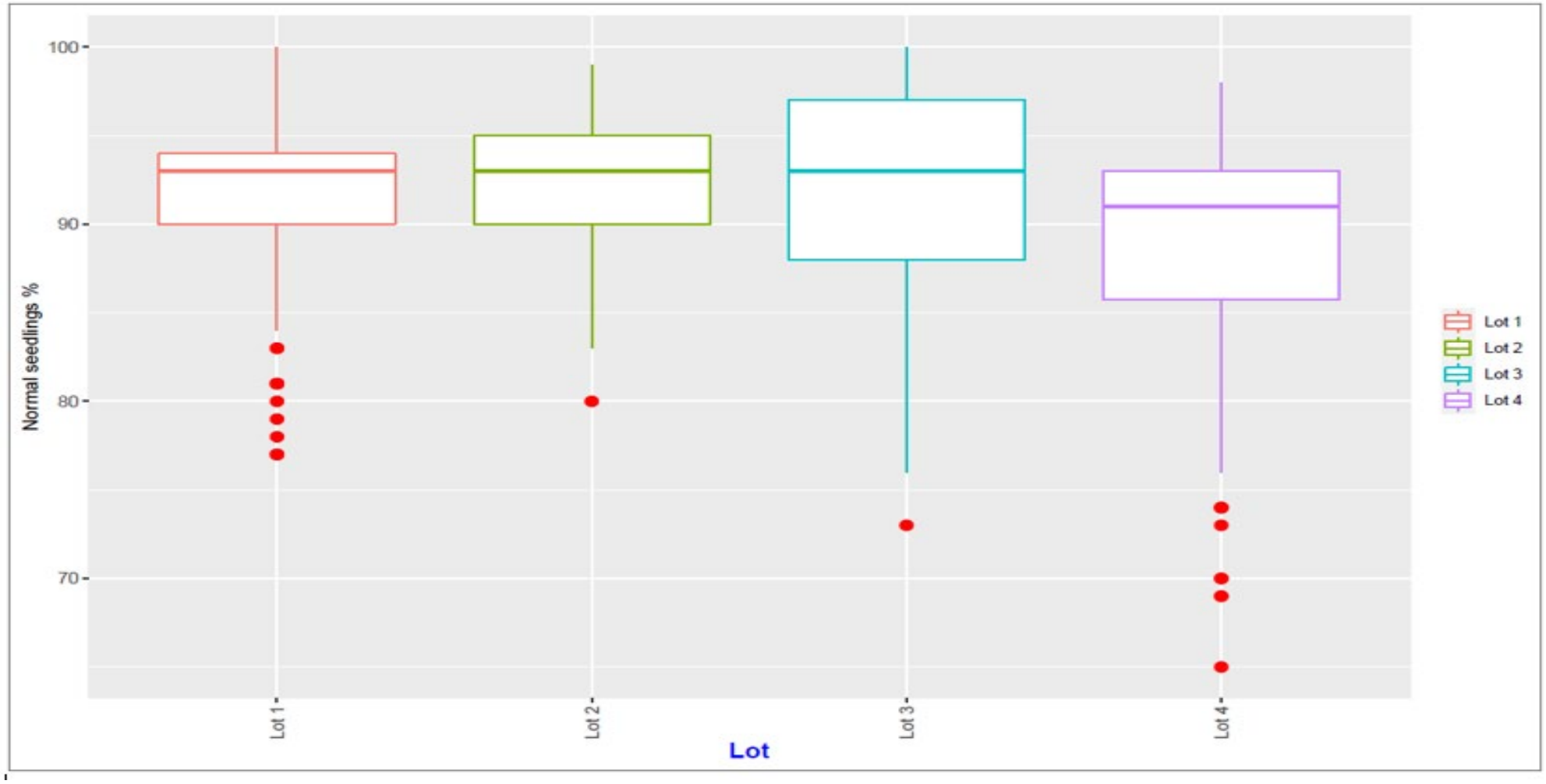


Figure 3. Percentage of normal seedlings for all the laboratories and all the methods, per Lot.

Statistical analysis of the results

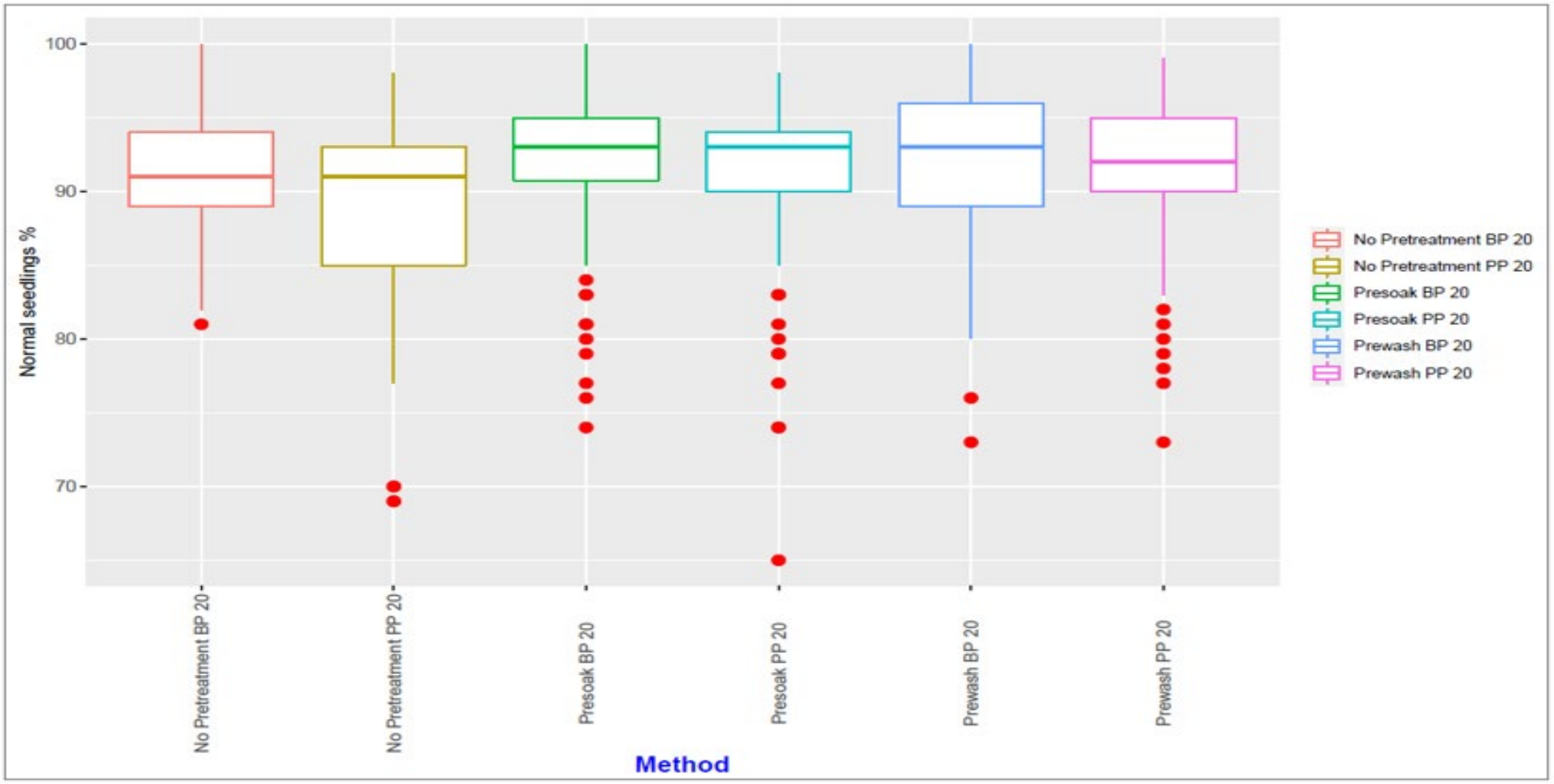


Figure 4. Effect of the testing method on germination (percentage of normal seedlings results).

Statistical analysis of the results

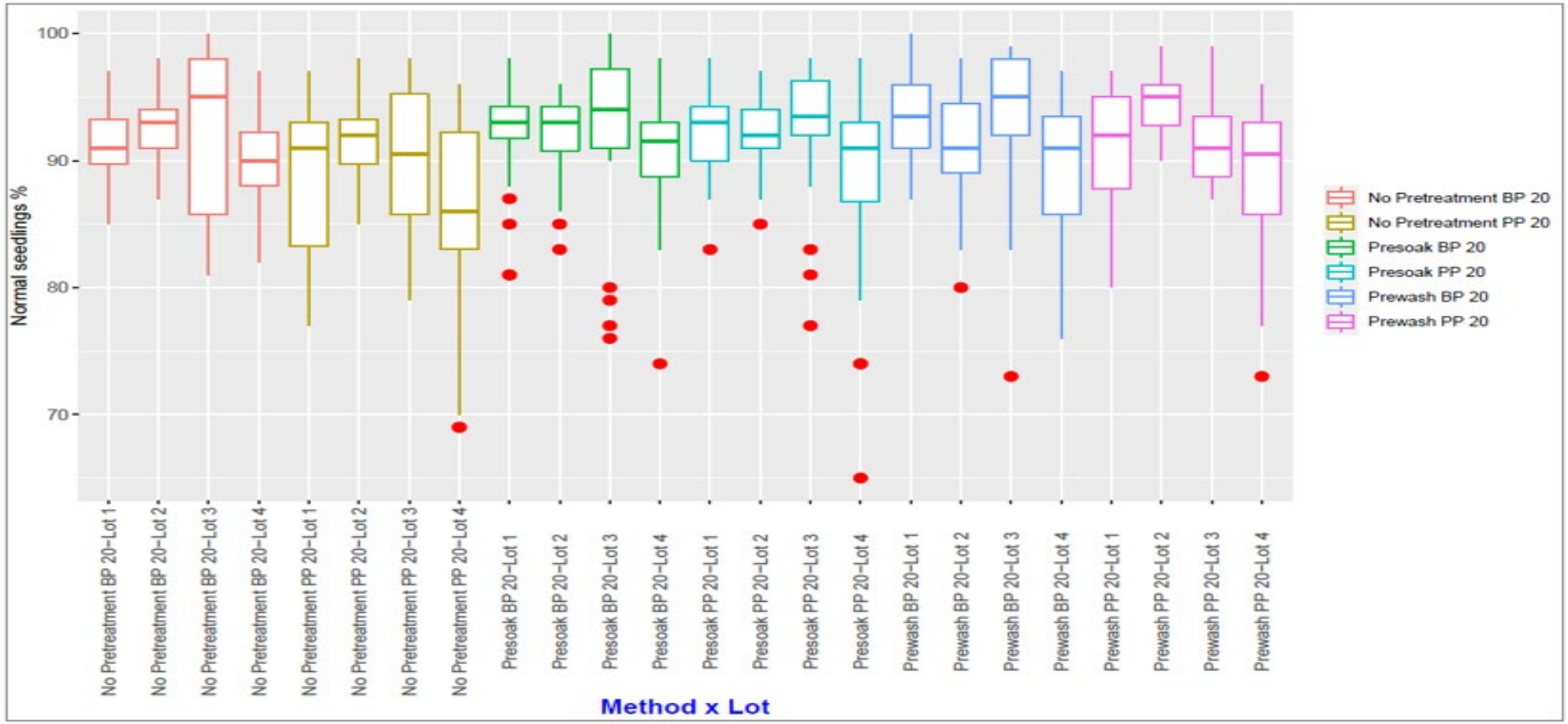


Figure 5. Percentage of normal seedlings depending on the seed testing method, per lot.

Statistical analysis of the results

Table 2. Tests of fixed effects for “lot”, “method” and “lot*method”.

Source of variation	Sum of Squares	Mean Square	Num DF	Den DF	F value	Pr(>F)
Method	38.31	7.66	5	25	1.00	0.436434
Lot	64.69	21.56	3	15	2.82	0.074399
Method x Lot	80.92	5.39	15	75	0.71	0.770675

Statistical analysis of the results

Table 3. Repeatability dispersion factor of the methods tested for breaking dormancy of B. vulgaris

Method	$\bar{p}$	$\hat{\sigma}$ Lab	$\hat{\sigma}$ Lot x Lab	Sr	fr	SR
No pretreatment BP 20	91	2.19	2.83	2.62	0.94	3.62
No pretreatment PP20	89	2.78	5.45	2.87	0.91	6.15
Presoak BP 20	92	4.29	2.34	2.65	0.96	4.92
Presoak PP 20	91	2.85	3.99	2.91	1.03	4.94
Prewash BP 20	92	3.22	3.13	2.85	1.04	4.53
Prewash PP 20	91	2.11	3.43	2.67	0.95	4.07

Statistical analysis of the results

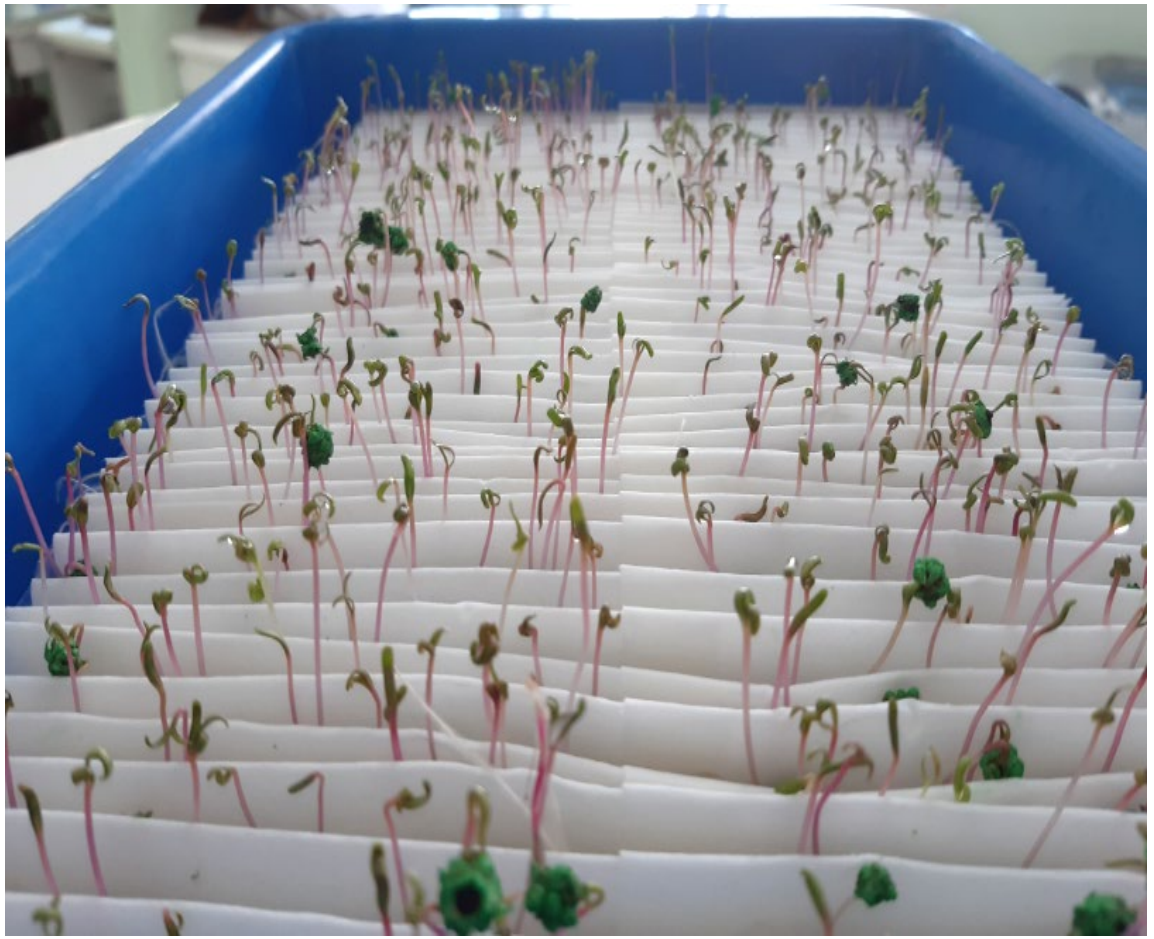
Table 4. Reproducibility dispersion factor of the methods tested for breaking dormancy of B. vulgaris

Method	$\bar{p}_{...}$	Excluded samples %	f_R	f_{Miles}
No Pretreatment BP 20	91	20.8	1.40	1.62
No Pretreatment PP 20	89	29.2	2.32	1.64
Presoak BP 20	93	12.5	1.77	1.60
Presoak PP 20	93	8.3	2.20	1.61
Prewash BP 20	93	20.8	2.26	1.61
Prewash PP 20	92	8.3	2.16	1.61

Conclusions

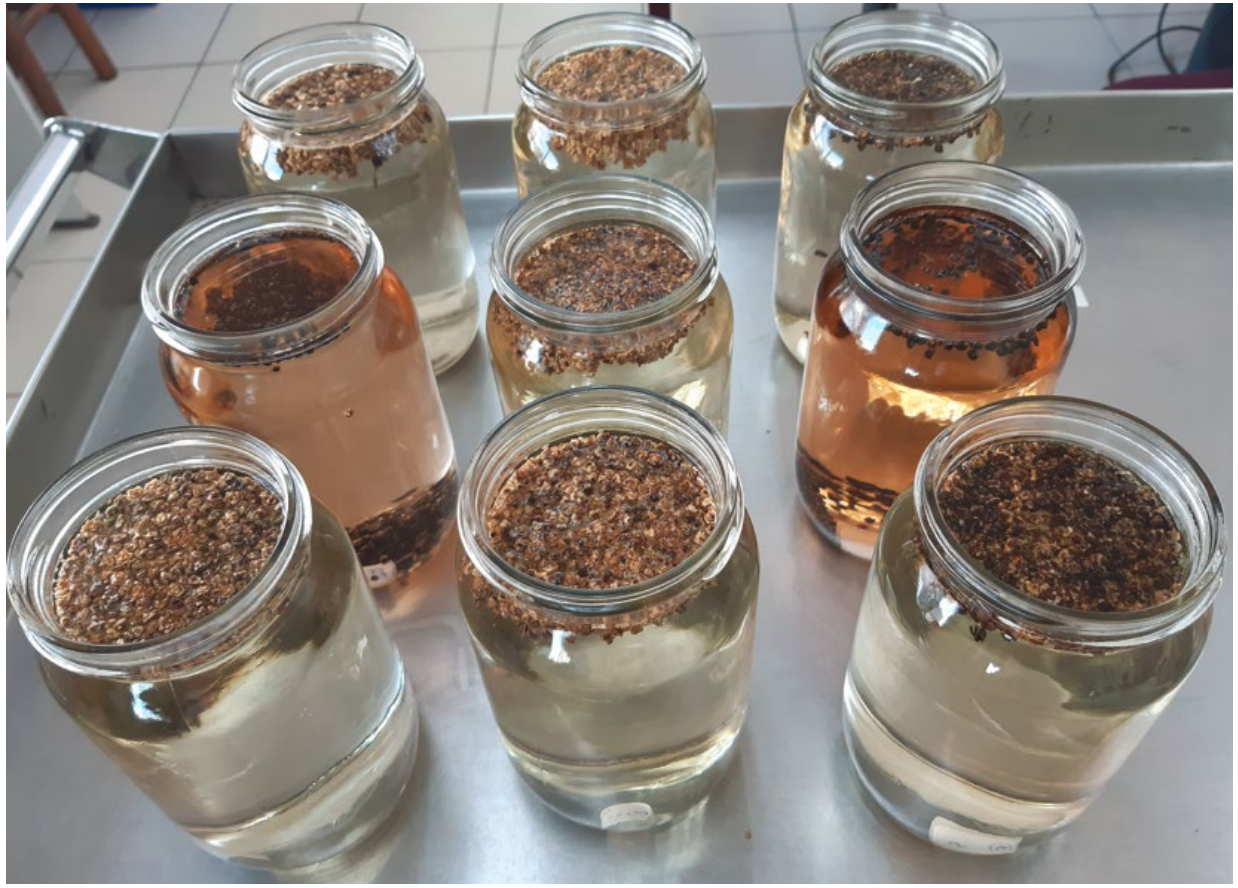
- It was observed that regardless of the seed lot, with Presoak was possible to obtain higher germination results and practically the same as those obtained with Prewash.

- Both methods are also slightly superior in terms of the percentage of normal seedlings in comparison with the results obtained when no method was used to eliminate the inhibitors present on the surface of the seeds.



Conclusions

- Although not all temperatures and substrates were included in this study, they did not reveal any interactions with Presoak. For this reason, pre-soaking method could be extrapolated with the rest of the test conditions prescribed for this species.



Conclusions

- The use of this pretreatment is as effective as prewashing to leach the inhibitory substances present on the surface of the seeds and has the advantage of improving the efficiency in the use of water resources, by avoiding the waste of hours of running water.

Method proposed:

Presoak the seeds in water for two hours, using 250ml of water per 100 seeds. Then clean in running water and the surface blotted dry. Temperature of soaking and washing water should be at 20-25°C.

References

- To Devlin, H.R.; Harris, I.J. Mechanism of the oxidation of aqueous phenol with dissolved oxygen. Ind. Eng. Chem. Fundam 1984.

- ISTAgermMV in R package following statistical tools ‘inter-laboratory tests, developed by the ISTA Statistics Committee.

- Miles S.R., 1963. In the “Handbook of tolerances and measures of precision for seed testing” Proceedings of the International Seed Testing Association, 28, 525-686.

- Servicio nacional del consumidor. (2024,June 13).Consumo de agua- Portal SERNAC. https://www.sernac.cl/portal/607/w3-article-1576.html.

Acknowledgment

GEVES-SNES Station Nationale d'Essais de Semences (France)
SGS Mid-West Seed Services (USA)
Naktuinbouw Seed Analysis (The Netherlands)
LUFA Nord-West Institut für Düngemittel und Saatgut (Germany)
OSTS, SASA, (Scotland)
ANASAC Seed Testing Laboratory (Chile).

KWS (Germany) and SESVANDERHAVE (Belgium)

GERCOM Colleagues
Jean Louis Laffont
Sonia Barra
Mery Galvez
Family and friends

ISTA ANNUAL MEETING 2024
01-04 JULY
CAMBRIDGE, UNITED KINGDOM

Thanks for your attention