Proceedings of the Latin American Conference on Bioimpedance – CLABIO
Nov 26 - 29, 2024 / Santa Catarina State University, Joinville, Brazil

Bioelectric signals in rice seeds (Oryza sativa L.) priming in ultra-dilute water

Jasper J. Zanco

Plant Science Laboratory, Santa Catarina South University, UNISUL, Brazil

Correspondence: Jasper J. Zanco, e-mail:
jasper.zanco@animaeducacao.com.br

Proceedings of the Latin American Conference on Bioimpedance – CLABIO
Nov 26 - 29, 2024 / Santa Catarina State University, Joinville, Brazil

Introduction

- Plants are affected by substances diluted below certain limits.
- In seeds subjected to ultra-high dilutions (UHD), according to phytohomeopathic methods, it is possible to reduce the concentrations to infinitesimal levels and the effects persist (Mirzajani et al. 2024).
- Biological tissues, such as those of seedlings, have capacitive properties due to their cellular composition and the water content in the cells (Besharati et al., 2021)

Objective

- This research aimed to test different potencies of UHD to modify the vigor of Oryza sativa L. seedlings.
- Conjectures were made to evaluate whether capacitance and electrical conductivity can anticipate information about the effect of dynamized ultradilutions on seed germination.

UDESC
UNIVERSIDADE
DO ESTADO DE
SANTA CATARINA

5TH CLABIO
LATIN AMERICAN BIOIMPEDANCE
FLORIANOPOLIS - BRAZIL - 2024

UNIVERSITY
OF OSLO

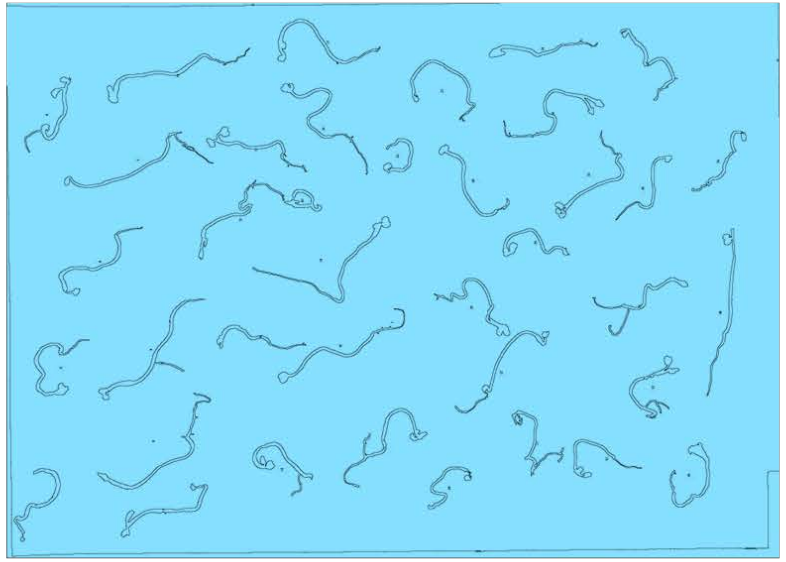
Proceedings of the Latin American Conference on Bioimpedance – CLABIO
Nov 26 - 29, 2024 / Santa Catarina State University, Joinville, Brazil

Materials and Methods

- Eight UHD treatments were tested, six drops for every 30 mL of distilled water, except control 1 (Distilled water - 05 µS/cm - DW): Control 2 (70% alcohol - A70); Sulphur (S9), Acidum fluoridricum (A30), Calcarea carbonica (C200), Graphies naturalis (G200), Kali carbonicum (K100) Belladonna (B12), diluted and succussed in Hahnemannian centesimal standards.
- Frequencies between 5-22.5 KHz were generated by Hund Wetzlar T100® and capacitance measurements by Oscilloscope FNIRSI 2C23T®.

Conductivity (EC, µS/cm) was measured with Digital Meter BLE-C600 – Bluetooth. The Capacitance(C, nF) and Duty Cycle (D, µs) measurements were made in the seed water soakin, using a FNIRSI 2C23T® multimeter and oscilloscope. Images and measurements of rice seedlings were taken using Imagej 1.54f software.

Fig. 1. Phytohomeopathic germination morphology (ImageJ) and soaking water measuring equipment.



FNIRSI 2C23T®

Fonte: ZANCO (2024);

UDESC UNIVERSIDADE DO ESTADO DE SANTA CATARINA

5TH CLABIO LATIN AMERICAN BIOIMPEDANCE FLORIANOPOLIS – BRAZIL - 2024

UNIVERSITY OF OSLO

Proceedings of the Latin American Conference on Bioimpedance – CLABIO
Nov 26 - 29, 2024 / Santa Catarina State University, Joinville, Brazil

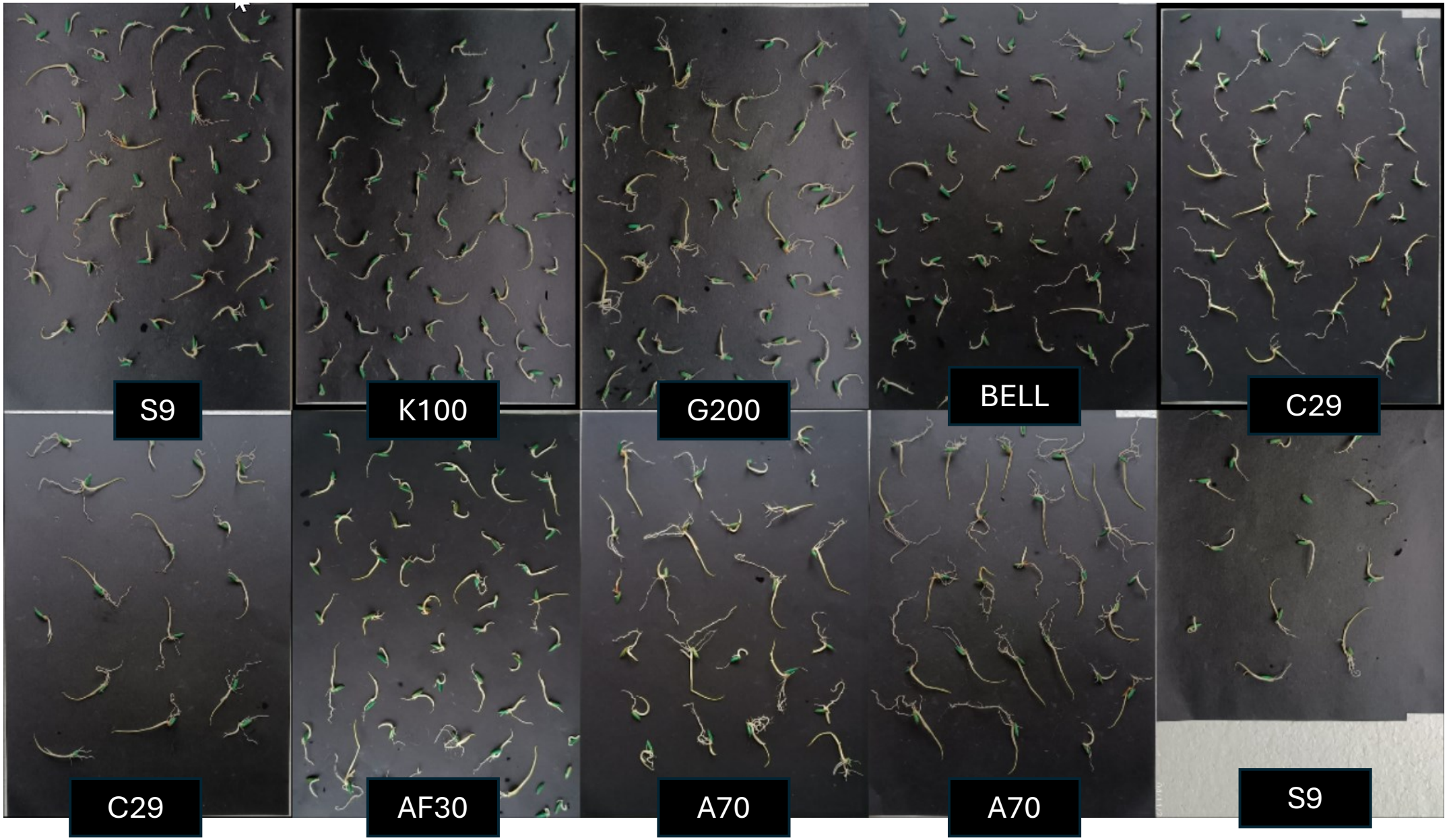
Experimental Desing

- The seeds germinated on germitest paper (neutral pH) for 10 days. The statistical design consisted of 400 seeds. Four replicates per treatment were completely randomized, ANOVA analysis, and Tukey's test.
- The study was conducted at the Plant Science Laboratory, UNISUL (Brazil).
-

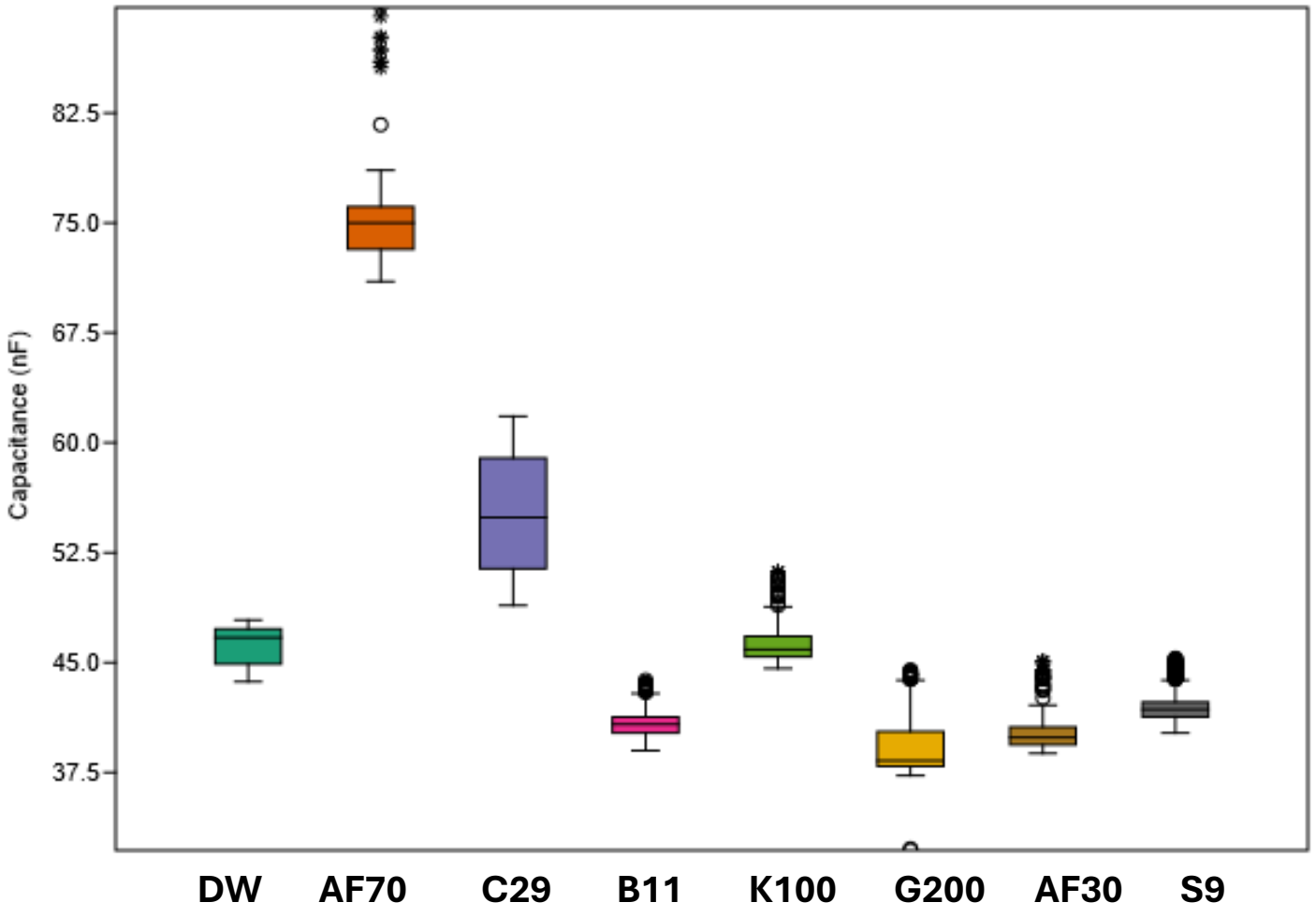
Results and Discussion

- The results showed significant differences between controls (DW, A70) and other treatments. Conductivity (CE, µS/cm), Capacitance(C, nF) and Duty Cycle (D, µs) measurements were made in the seed water soaking.
- After 14 hours of soaking, the highest medium conductivity and capacitance occurred in the control 1 treatment (DW: 90.1 µS/cm) and the lowest in S9 (40.7 µS/cm) and C29 (43.2 µS/cm).
- After germination, DW and A70 were significantly different from C29 (1%) and S9 (5%). The S9 (93.1%) and C29 (90,4%) obtained the best germination.

Seed Germination (One repetition sample)



Seed Priming Capacitance



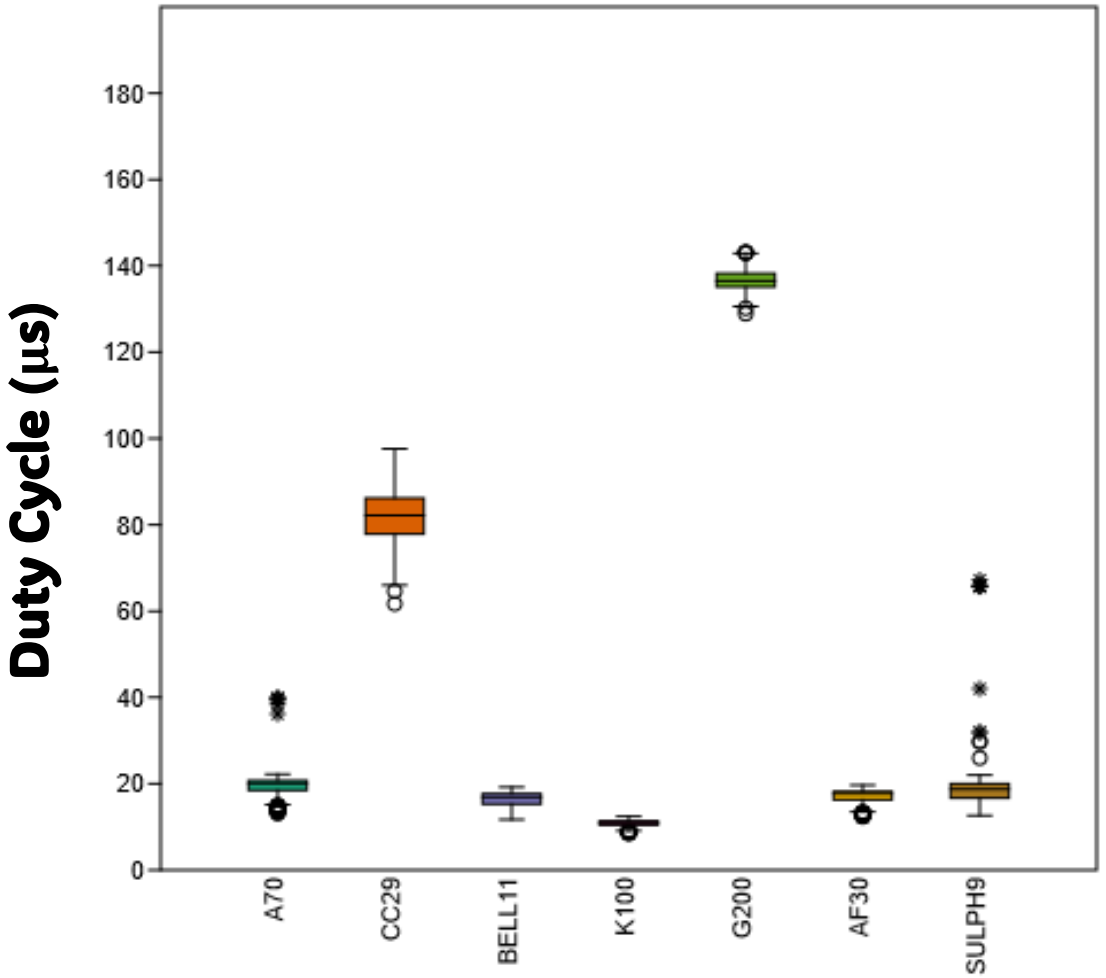
Clustering Information Using Tukey's Method and 95% Confidence

Treatment	N	Average	Clustering						
AF70	245	75.193	A						
C29	245	55.073		B					
K100	245	46.3192			C				
DW	245	46.1735			C				
S9	245	42.2163				D			
B11	245	40.9486					E		
AF30	245	40.2416						F	
G200	245	39.511							G

Averages that do not share a letter are significantly different

Duty Cycle (D, µs)

Does ultra-dilution cause bioelectric pulses that have effects on germination?
(Guedes et al., 2018)



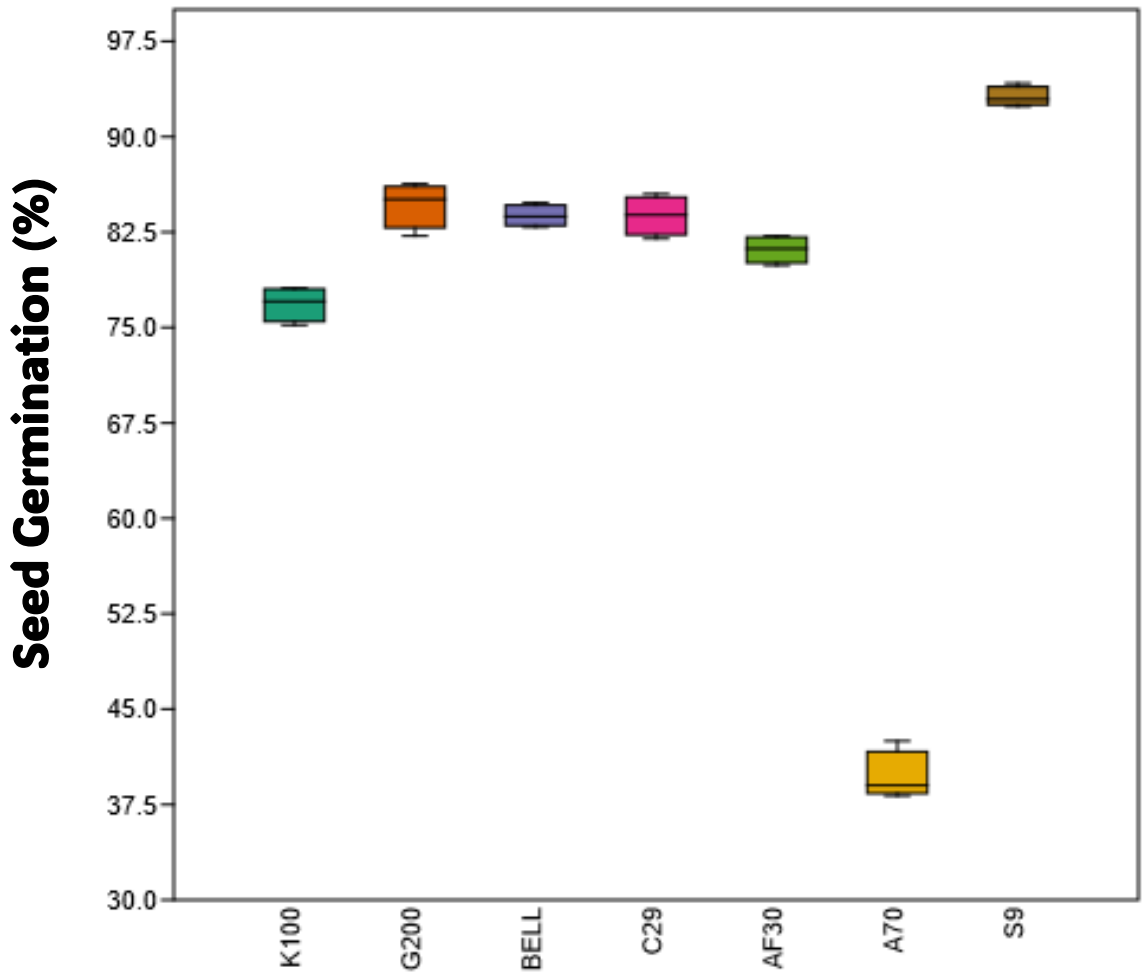
Clustering Information Using Tukey's Method and 95% Confidence

Treatment	N	Average	Clusterig					
G200_3	485	136.735	A					
CC29	485	81.933		B				
A70_3	485	19.527			C			
SULPH9	485	18.744				D		
AF30_3	485	17.1282					E	
BELL11	485	16.3305						F
K100_3	485	10.8453						G

Averages that do not share a letter are significantly different

Optimized duty cycle can improve germination by providing stimuli at the appropriate time and intensity, reducing seed stress and maximizing resource utilization. Controlled studies will be needed to determine the optimal duty cycle for each type of treatment used for rice seed germination.

Seed Germination (%)

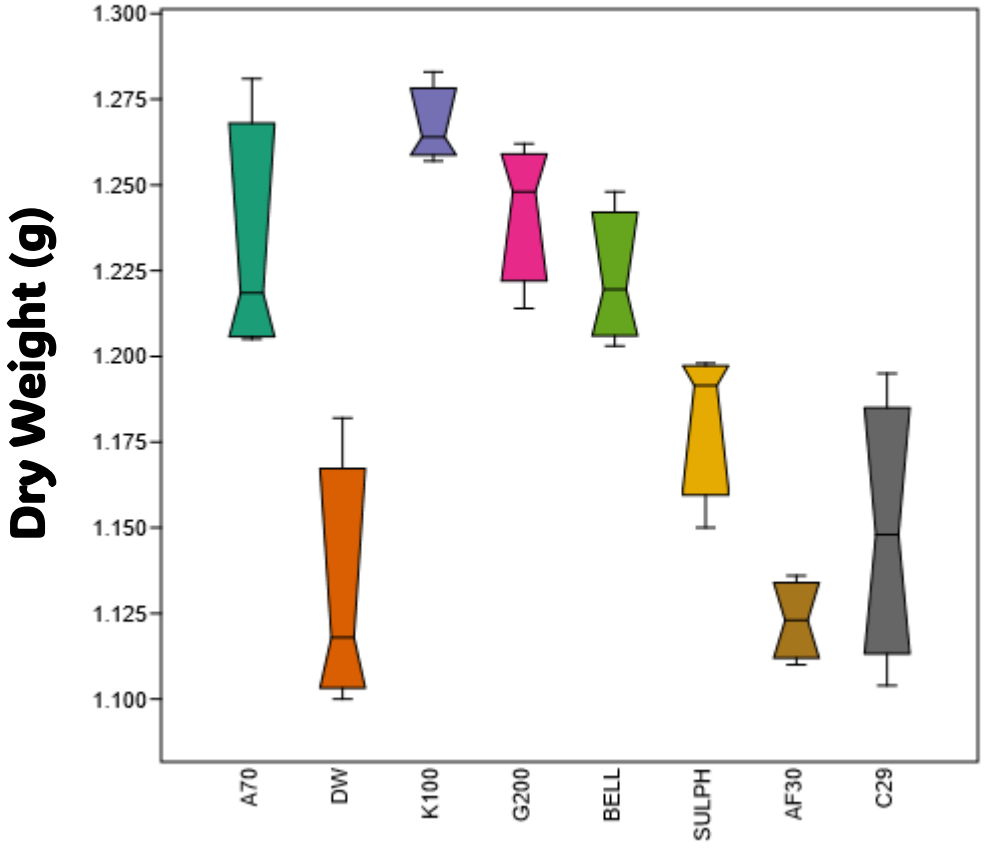


Clustering Information Using Tukey's Method and 95% Confidence

Treatment	N	Average	Clusterig			
S9	4	93.125	A			
G200_2	4	84.665		B		
C29_2	4	83.795		B	C	
BELL_2	4	83.792		B	C	
AF30_2	4	81.123			C	
K100_2	4	76.852				D
A70_2	4	39.677				E

Averages that do not share a letter are significantly different

Seed Germination - Dry Weight



Clustering Information Using Fisher-LSD's Method and 95% Confidence

Treatment	N	Average	Clusterig			
K100_1	4	1.26700	A			
G200_1	4	1.2430	A	B		
A70_1	4	1.2308	A	B		
BELL_1	4	1.22250		B		
SULPH_1	4	1.1828			C	
C29_1	4	1.1488			C	D
DW_1	4	1.1295				D
AF30_1	4	1.12300				D

Averages that do not share a letter are significantly different

Conclusion

- The S9 (93.1%) and C29 (83,79%) obtained the best germination.
- The difference between S9 and C29 for the other treatments was the number of germinated seeds and the vigor of the seedlings.
- Capacitance was not shown to be efficient in anticipating the effect of the treatments used, although it indicated a tendency for treatment C29 (Calcarea carbonica)
- The ultra-dilution for preparing the treatments was significantly different from the controls and suggests that the dynamization method modifies the properties of the water in which the phytohomeopathies were applied.
- It is necessary to continue experiments to answer whether phytohomeopathic treatments work by generating bioelectric pulses in the seeds.

References

- Besharati, B., Lak, A., Ghaffari, H., Karimi, H., & Fattahzadeh, M. (2021). Development of a model to estimate moisture contents based on physical properties and capacitance of seeds. *Sensors and Actuators A: Physical*, *318*, 112513.
- Guedes, J. R. P., Bonamin, L. V., & Capelozzi, V. L. (2018). Water-related mechanisms proposed for storing and transmitting homeopathic information: putative links with biological responses. Homeopathy, 107(03), 172-180.
- Mirzajani, F., Rezadoost, H., Zerang, R., & Sonboli, A. (2024). Impact of ultra-high dilutions from Iranian endemic and commercial calendula on the germination and growth quality of Oryza sativa L. Heliyon, 10(15).