

Agronomic Test in Spain

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GLOBAL NATURE

Interreg 
Mediterranean
EUROPEAN UNION

Project co-financed by the European
Regional Development Fund

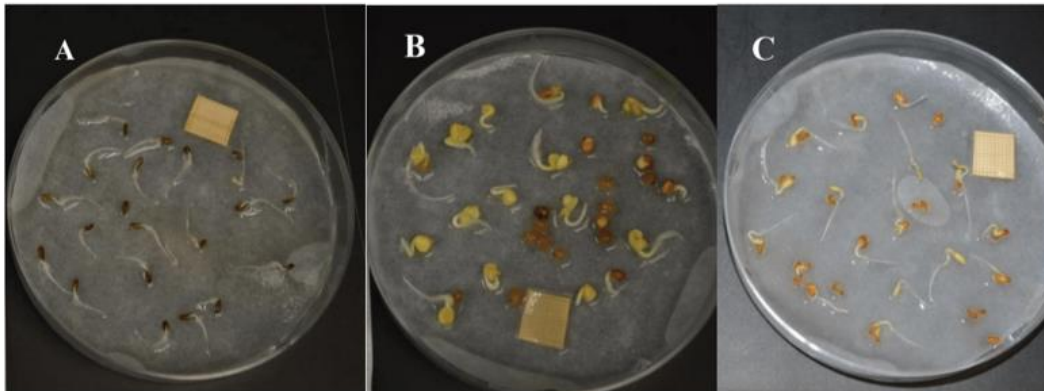
 RE-LIVE WASTE

Results obtained: significant agronomic value

The agronomic protocol determines that the struvite produced has an agronomic interest. More specifically, the addition of struvite to plants under controlled conditions:

- Results in a faster plant growth
- Higher primary production
- Higher levels of chlorophyll
- Higher shelf life of harvested plants
- Higher concentration of phenols and flavonoids
- Higher quality of substrate: higher porosity, better C/N ratio

Researchers stress the potential role of the material obtained for improving the water retention capacity, which could be very interesting under Mediterranean climate projectio



Results obtained: significant agronomic value

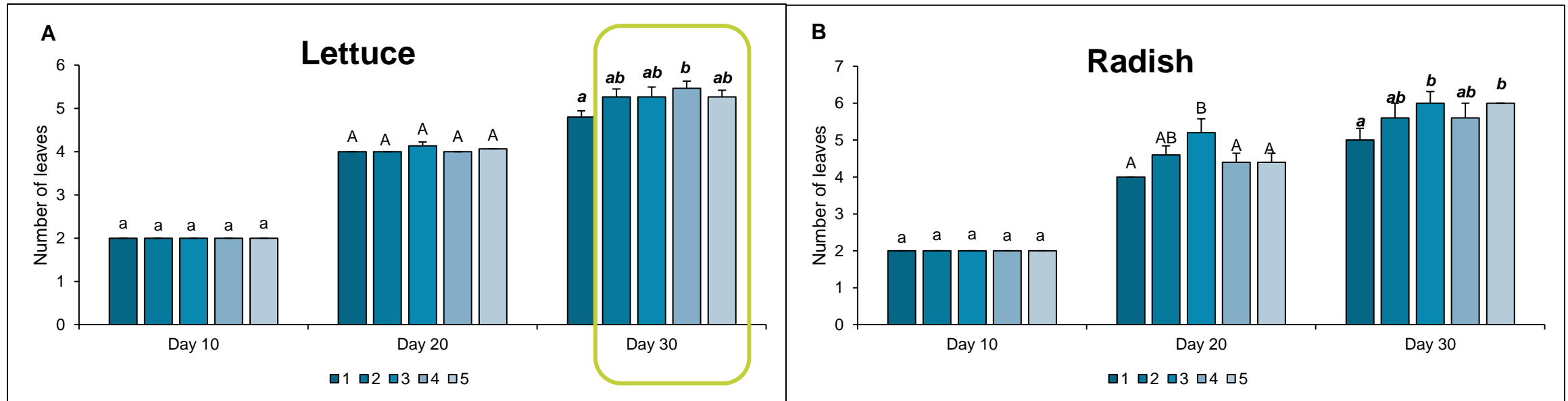


Figure: Number of leaves in lettuce (A) and radish (B) at the end of the treatments. Mean values with SE are shown. Mean values with SE are shown (n=15 lettuce and n=5 radish)

Results obtained: significant agronomic value

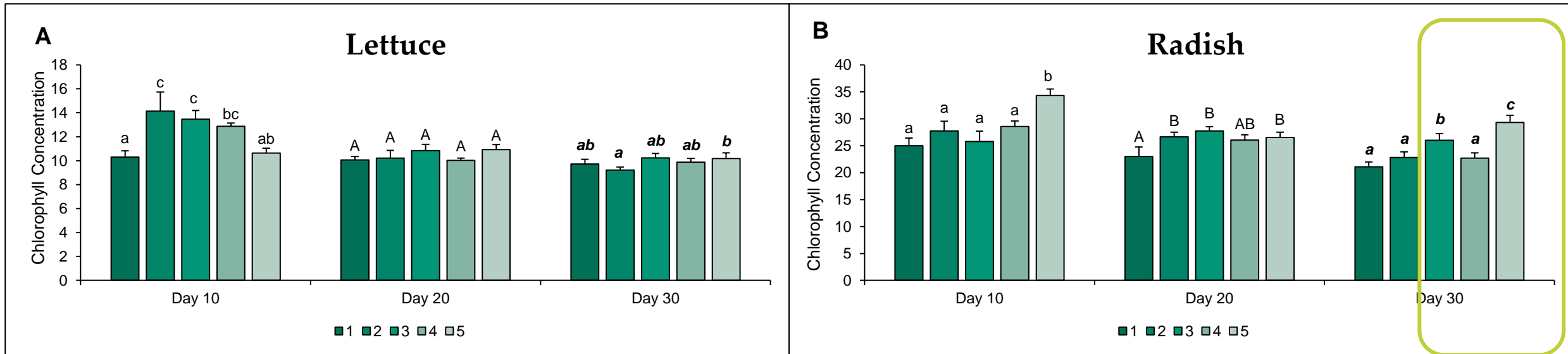




Figure: Chlorophyll concentration in lettuce (A) and radish (B) at the end of the treatments.

Results obtained: significant agronomic value



Lettuce	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1	39.400	39.020	38.718	38.593	38.437	38.080	37.890
2	44.640	44.614	44.451	44.447	44.437	44.339	44.285
3	49.2900	49.558	49.426	49.302	49.218	48.590	48.978
4	52.840	53.109	52.897	52.847	52.798	52.627	52.582
5	53.700	53.935	53.859	53.809	53.753	53.682	53.646

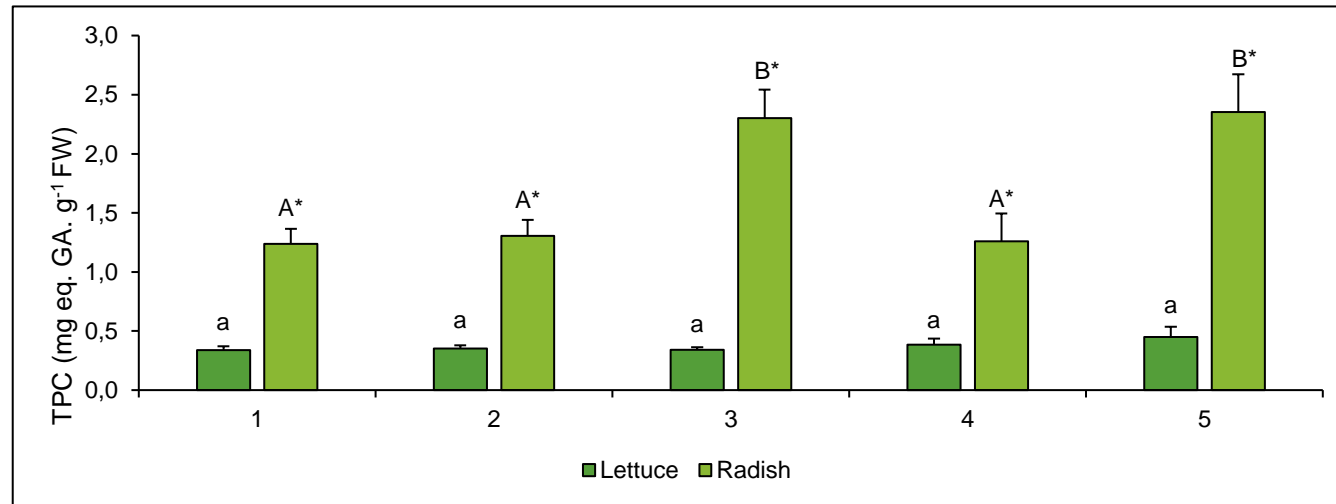
Radish Shoots	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1	4.380	4.319	4.272	4.183	4.145	4.118	4.107
2	9.930	9.817	9.732	9.675	9.622	9.587	9.569
3	14.100	14.016	13.775	13.742	13.709	13.665	13.628
4	6.470	6.410	6.294	6.212	6.141	6.06	6.001
5	11.970	11.804	11.776	11.639	11.54	11.533	11.524



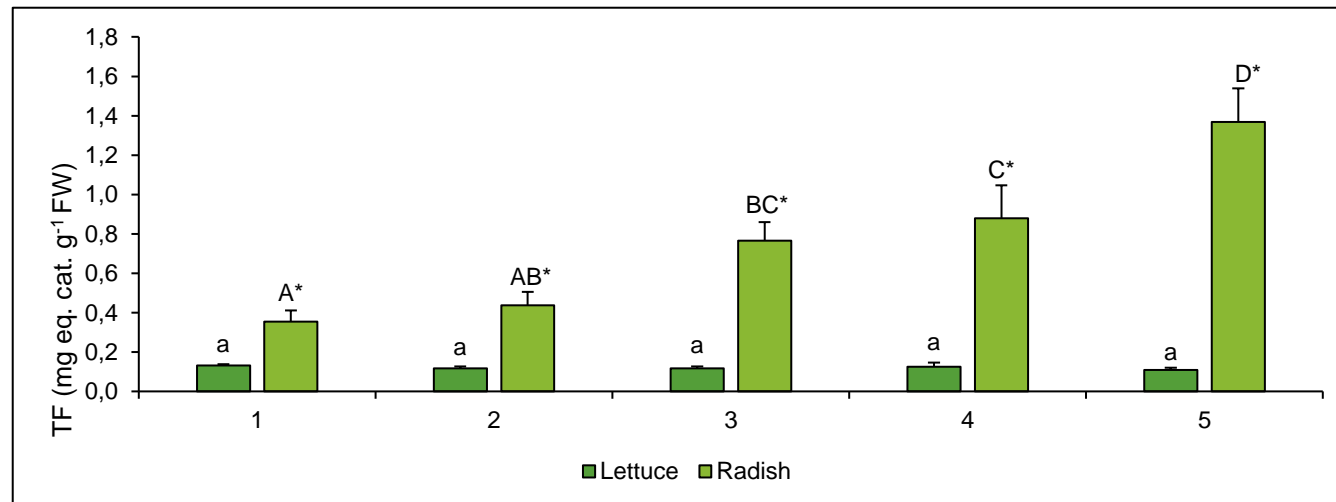
Radish Root	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1	0.230	0.214	0.205	0.195	0.187	0.181	0.176
2	0.650	0.590	0.577	0.564	0.554	0.545	0.539
3	0.810	0.764	0.729	0.736	0.703	0.691	0.679
4	0.880	0.589	0.563	0.552	0.542	0.527	0.515
5	1.103	0.933	0.896	0.877	0.859	0.637	0.820

The **shelf life** assessed for shoots in lettuce and shoots and roots in radish indicated only a small reduction of 4 % in control in lettuce but practically no reduction in plants from the media with struvite. There is also practically no variation in the fresh weight of radish shoots but a stronger reduction of radish roots in all treatments.

Results obtained: significant agronomic value



Figures: Total flavonoids (TF) and Total poliphenols (TPC) quantified in leaves of lettuce and radish at the end of the experiment.



Agronomic Test in Bosnia and Herzegovina

Agronomic testing,
FAFS, B&H

Interreg
Mediterranean



RE-LIVE WASTE

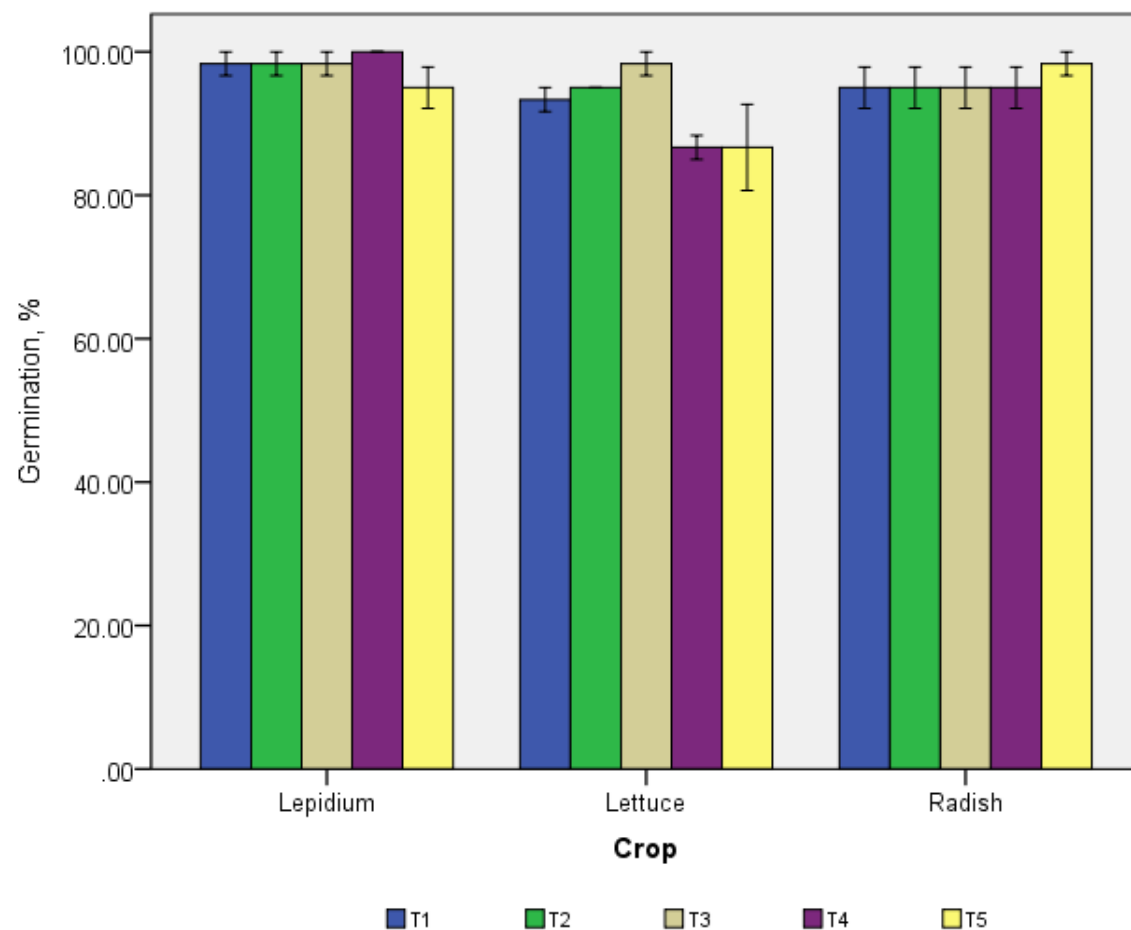
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Results obtained: significant agronomic value

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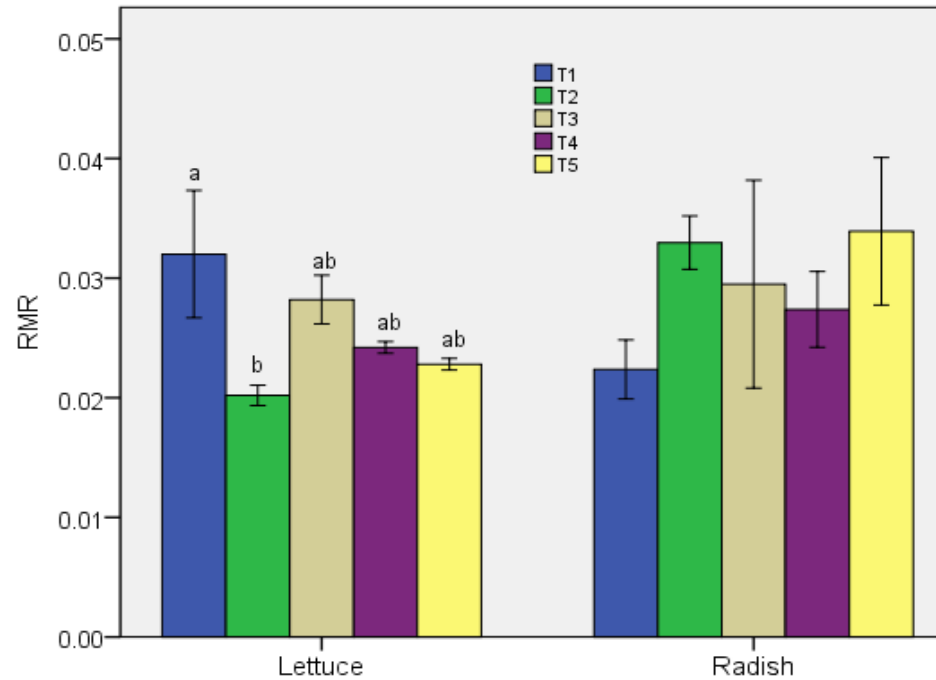
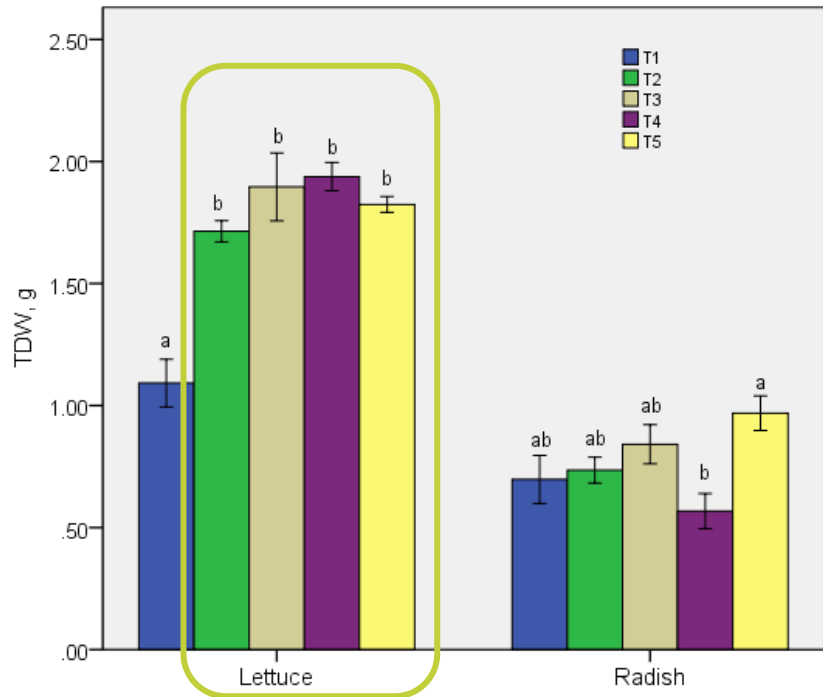
- Results in same germination of seeds
- Final emergency rate of lettuce was similar although treatments with struvite have tendency to reach plateau much earlier than other treatments
- Similar physical/morphological characteristics as commercial fertilizers
- Improved phosphorus content in lettuce shoot
- Better shelf life of crops

Germination, % of lepidium, lettuce and radish seeds



Seed germination (%) grown on different growing media. The error bars represent standard error of mean. Differences between treatments in each crop are not significant ($p > 0,05$)

Physical/morphological characteristics



a,b,c Values in same colon with different letter in subscript differ at significant level of $p < 0.05$ (Tukey test)

Total dry weight (TDW), g and root mass ratio (RMR) of lettuce (A) and radish (B) grown on different growing media. The error bars represent standard error of mean.

Chemical characteristics

Mineral content in fresh biomass of lettuce (mg/100g) grown in different growing media. Values are expressed as mean of n=3 with standard error of mean.

Treatment	Cu	Zn	Mn	Fe	K	Ca	Mg	P
T1	0.094±0.002	0.280±0.006	0.890±0.029	0.328±0.017	108.11±6.75 ^a	99.55±7.73 ^b	15.55±1.46	16.70±0.29 ^b
T2	0.102±0.008	0.319±0.024	0.965±0.074	0.361±0.012	147.73±5.96 ^c	118.12±2.43 ^{ab}	17.42±0.60	19.46±0.08 ^a
T3	0.085±0.007	0.319±0.034	0.885±0.077	0.345±0.032	125.62±3.80 ^b	129.85±2.69 ^a	17.30±1.15	19.83±0.32 ^{ac}
T4	0.082±0.002	0.354±0.023	1.022±0.046	0.365±0.002	138.61±5.96 ^{bc}	120.37±6.96 ^{ab}	17.84±0.85	21.87±0.99 ^{ac}
T5	0.079±0.004	0.331±0.020	0.884±0.106	0.302±0.009	139.29±3.71 ^{bc}	119.61±7.52 ^{ab}	17.86±0.34	21.89±0.21 ^c
p	0.104	0.344	0.600	0.067	0.001	0.030	0.109	0.000

^{a,b,c} Values in same column with different letter in subscript differ at significant level of p<0.05 (Tukey test)

Biochemical characteristics

Chlorophyll content in **lettuce** leaves at different stage of growing, mg/100 g of FW

Treatment	10 th day		20 th day		30 th day	
	Chlo A	Chlo B	Chlo A	Chlo B	Chlo A	Chlo B
T1	18.30±0.42	10.44±1.01	23.17±2.39	13.05±3.69	26.70±4.01	7.83±1.34
T2	17.05±0.23	12.17±0.15	25.16±2.17	16.94±2.05	23.46±0.85	6.66±0.52
T3	17.57±1.60	10.65±0.41	30.22±1.84	20.59±3.68	22.43±1.81	7.08±0.22
T4	20.60±0.41	9.84±0.88	30.44±4.18	14.46±1.66	24.38±2.26	7.01±0.52
T5	20.22±0.68	9.59±0.48	25.68±2.54	10.19±2.02	28.87±1.31	8.40±0.34
p	0.053	0.128	0.305	0.165	0.347	0.453

Total carotenoids (TC), total phenolic (TPC), total flavonoids (TF) and malondialdehyde (MDA) content in leaves of lettuce after 30 days

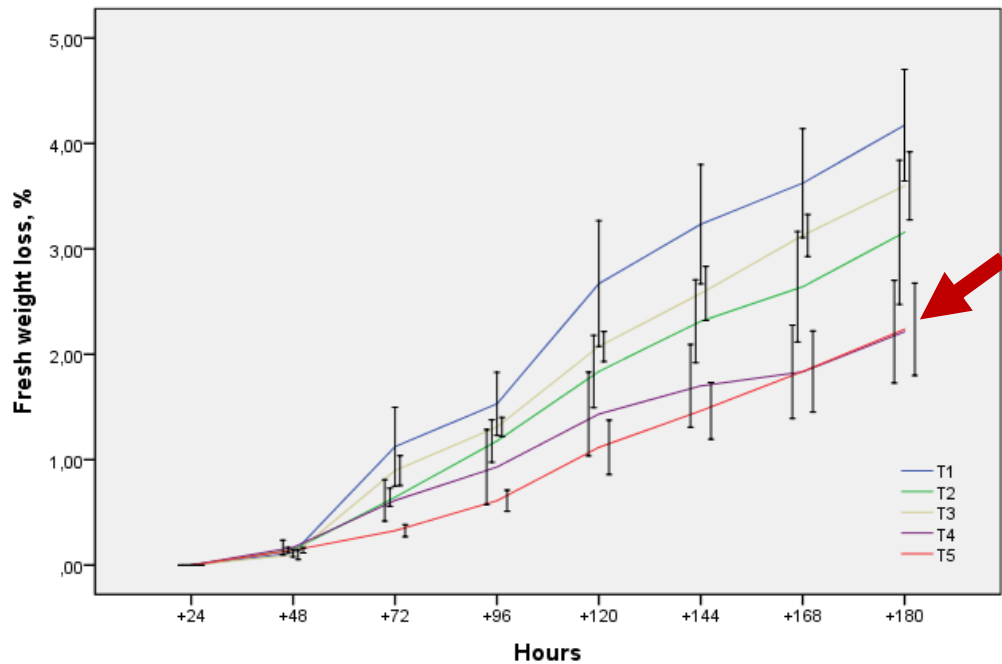
Treatment	TC, mg 100 g ⁻¹	TPC, mg g ⁻¹	TF, mg eq. GA g ⁻¹	MDA, nmol g ⁻¹
T1	7.49±0.72 ^a	0.46±0.01	0.18±0.03 ^b	20.50±1.75 ^b
T2	5.67±0.25 ^{ab}	0.47±0.06	0.15±0.01 ^b	14.67±1.52 ^{bc}
T3	5.26±0.49 ^b	0.52±0.02	0.30±0.03 ^{ab}	15.58±0.65 ^{bc}
T4	5.59±0.47 ^{ab}	0.59±0.04	0.38±0.71 ^a	13.5±1.81 ^{ac}
T5	7.26±0.41 ^{ab}	0.55±0.08	0.19±0.03 ^b	7.92±1.17 ^a
p	0.025	0.340	0.009	0.002

^{a,b,c} Values in same colon with different letter in subscript differ at significant level of $p < 0.05$ (Tukey test)

Shelf life

Accumulated fresh weight loss of lettuce (left) and radish (right) shoots. Error bars represent one standard error of mean (SE)

Lettuce



Radish

