

Effects of Hot Spring-Derived Photosynthetic Bacteria on Growth and Quality of Chinese Kale (*Brassica oleracea* var. *alboglabra*) Seedlings

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Introduction

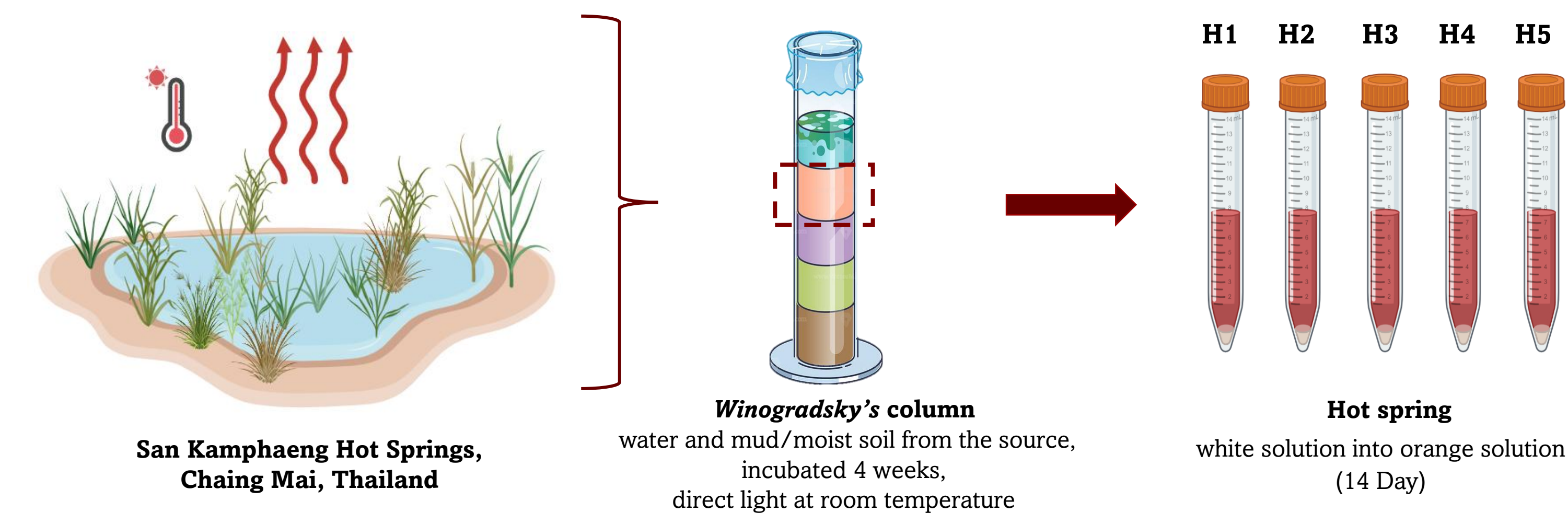
- **Hot springs** are extreme environments that select for microorganisms with strong stress-adaptive traits.
- **Microorganisms** from hot springs may possess thermotolerance and unique metabolic capabilities that could support plant performance under environmental stress.
- **Photosynthetic bacteria (PSB)** are promising microbial bio-stimulants that can enhance plant growth, nutrient uptake, physiological performance and improved tolerance to environmental stress.

Objective

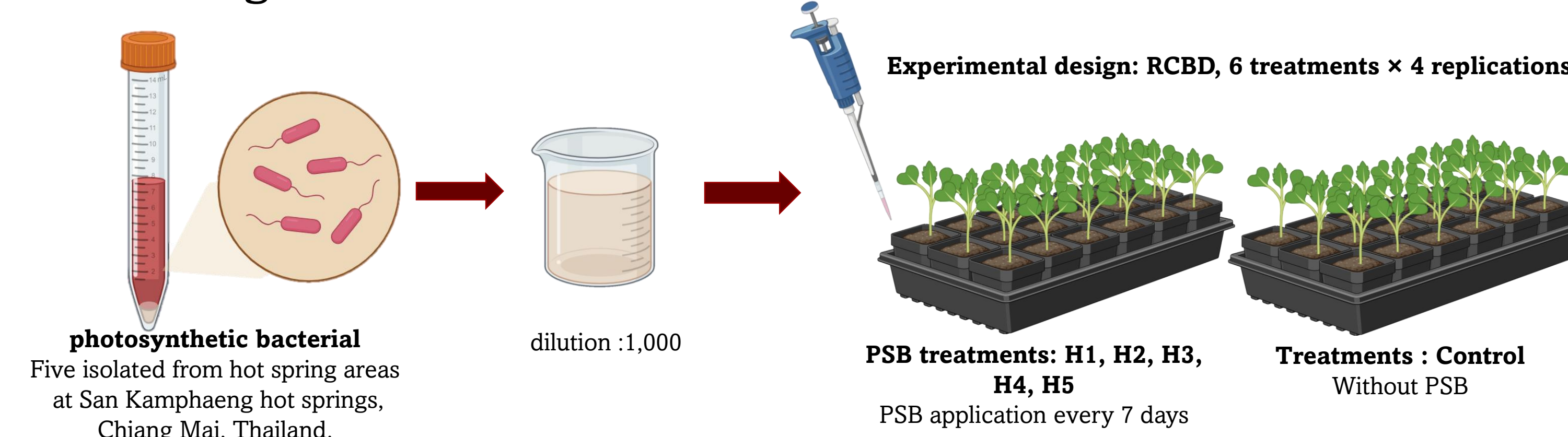
- To **evaluate the potential of photosynthetic bacteria** from San Kamphaeng hot springs to **promote Chinese kale seedling growth**, nutrient uptake, and photosynthetic pigment accumulation.

Materials and methods

A: Screening of photosynthetic bacteria from hot spring



B: Efficiency of photosynthetic bacteria in promoting the growth of Chinese kale seedlings



Results

Table 1. Effects of PSB on nutrient uptake and photosynthetic pigments of Chinese kale seedlings

Treatments	Nutrient uptake (mg/plant)			Pigment content (mg/L)			
	Nitrogen	Phosphorus	Potassium	Chlorophyll a	Chlorophyll b	Total Chlorophyll	Carotenoid
DW	11.41	1.12	1.06	3.59	3.64	3.24	1.66
H1	14.00	1.37	1.34	2.91	3.13	2.79	1.51
H2	13.59	1.33	1.29	4.22	4.21	3.75	2.00
H3	15.63	1.53	1.45	2.66	2.88	2.57	1.40
H4	12.94	1.27	1.26	3.70	3.85	3.43	1.77
NH	9.99	0.98	0.95	3.47	3.65	3.25	1.66
LSD	*	*	*	*	*	*	*
CV (%)	10.96	10.92	10.27	7.10	6.78	6.77	6.94

Note: * significant difference at p<0.05

Acknowledgement

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Graphical abstract

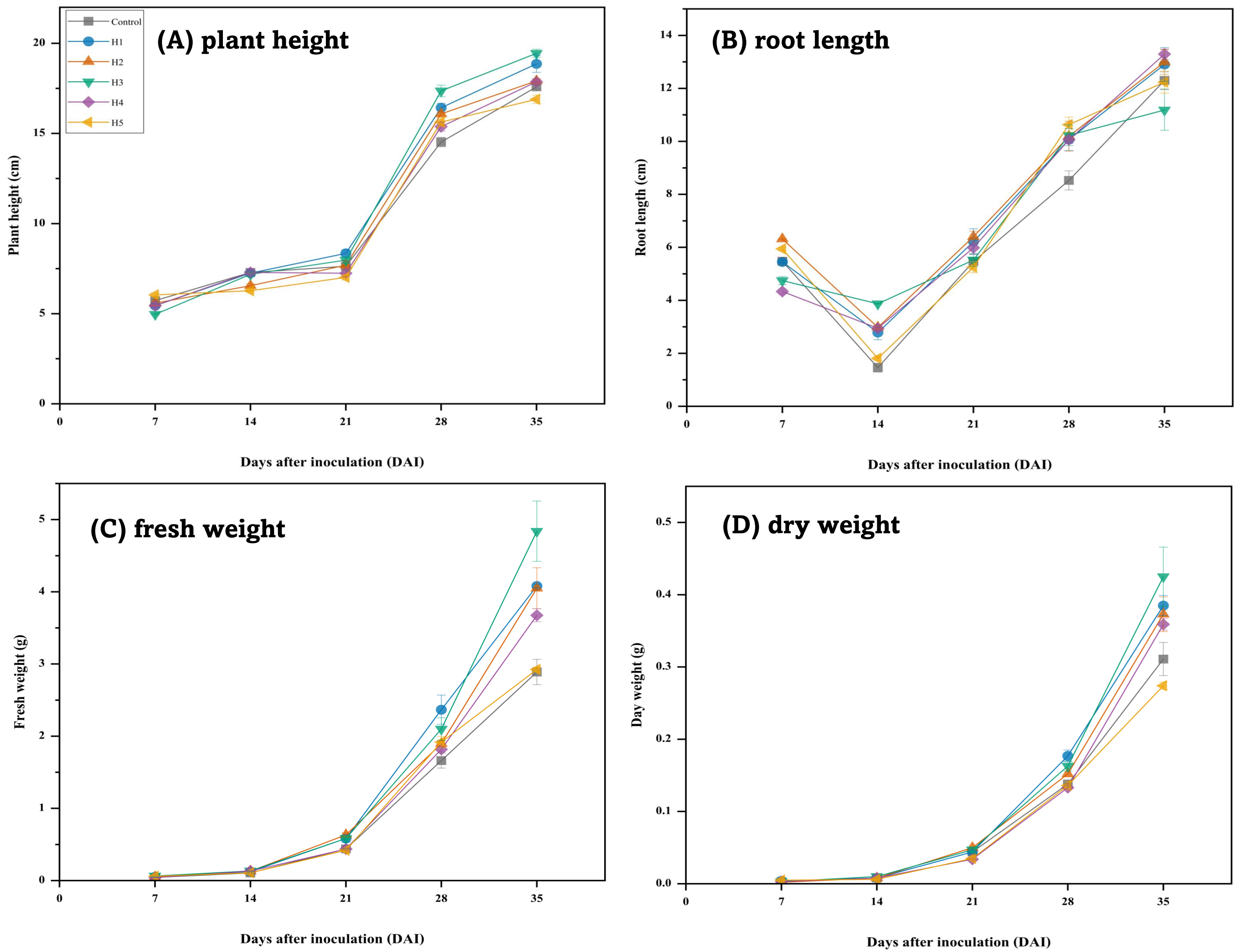
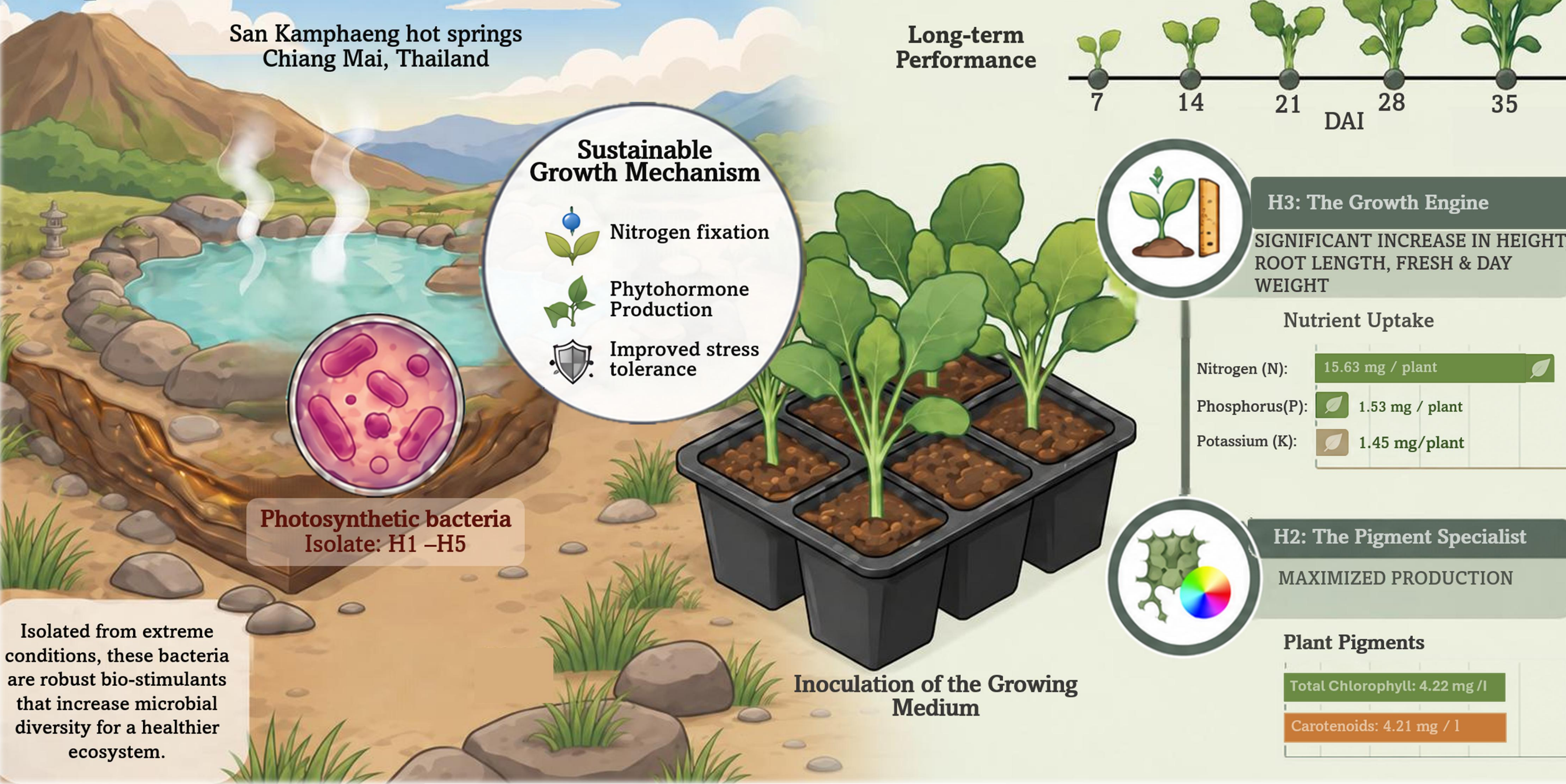


Figure 1. Effects of PSB isolates on the growth performance of Chinese kale seedlings at 7, 14, 21, 28, and 35 days after inoculation (DAI).

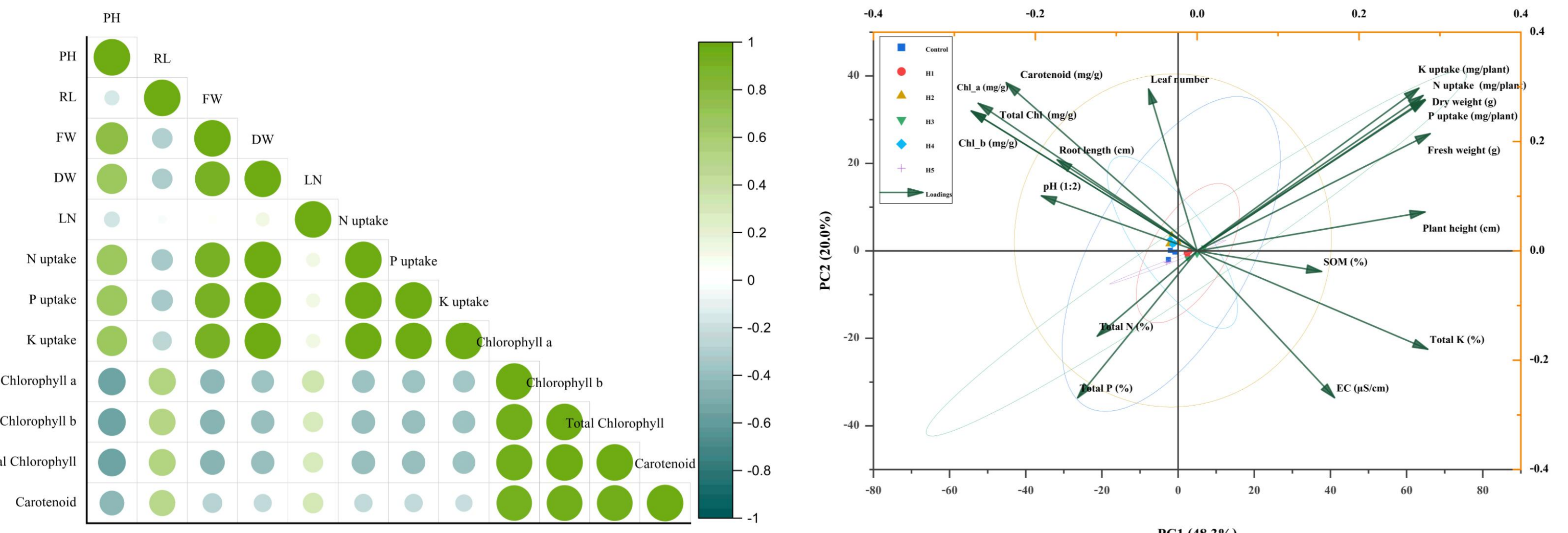


Figure 2. Pearson correlation matrix of growth, nutrient uptake, and photosynthetic pigments in Chinese kale seedlings.

Conclusions

- **H3** enhanced Chinese kale **growth and nutrient uptake**.
- **H2** increased **photosynthetic pigment accumulation**.
- **Both isolates** show **potential as microbial bio-stimulants for sustainable and climate-resilient crop production**.
- Further field validation is needed

References

Winogradsky S.N. 1952. Microbiologie du sol, Problèmes et méthodes; cinquante ans de recherches (Soil Microbiology: Problems and Methods, Fifty Years of Investigations). House of the Academy of Science of USSR, Moscow. 861 p.