

Supplementary information

Table S1. Descriptors of soybeans development stages [99,100].

Physiological stage	Description
V _(n)	Vegetative phases of growth, with (n) denoting the number of nodes on the main stem
R ₁	Early flowering
R _{3.5}	Late flowering
R ₃	Early pod-fill; very small pods
R ₄₋₅	Mid-pod-fill; larger pods with beans starting to develop
R ₆	Late pod-fill; pods containing full-sized green beans
R ₇	Physiological maturity; pods yellowing and about 50% leaves yellow
R ₈	Harvest maturity; pods brown

Table S2. Physiochemical characteristics of a representative composite soil sample used.

Properties	Value
Sand (%)	36.9±0.6
Silt (%)	25.9±0.4
Clay (%)	37.7±0.9
Texture grade	Clay loam
Humus (%)	0.63±0.003
pH	6.3±0.05
EC (dsm ⁻¹)	0.41±0.002
Available nitrogen (mg kg ⁻¹)	730±0.5
Available phosphorus (mg kg ⁻¹)	2.43±0.005
Potassium (mg kg ⁻¹)	500±2.23

Table S3. Differences in nodule number per plant and nodule dry weight per plant of soybean at V₅ and R_{3.5} physiological stages under different treatments.

Treatments	NNP		NDWP (mg plant ⁻¹)	
	V ₅	R _{3.5}	V ₅	R _{3.5}
T1	13.25 ^d ±1.49	14.50 ^d ±1.0	210.50 ^d ±22.92	201.00 ^d ±52.39
T2	26.50 ^b ±0.87	33.00 ^b ±1.55	430.50 ^b ±14.05	536.25 ^b ±19.20
T3	21.25 ^c ±1.03	28.50 ^c ±1.55	344.50 ^c ±16.54	496.50 ^c ±13.32
T4	19.50 ^c ±1.04	27.75 ^c ±1.85	336.25 ^c ±16.85	468.50 ^c ±13.91
T5	36.75 ^a ±1.11	78.55 ^a ±2.55	591.25 ^a ±18.10	1277.25 ^a ±94.90
T6	33.75 ^a ±0.75	74.30 ^a ±4.5	580.73 ^a ±12.14	1259.25 ^a ±98.37
Bacteria	***	****	****	****
Yeast	**	***	***	****
Bacteria × yeast	****	****	****	****

Data (means ± SE, n = 5). P-values of two-way ANOVAs followed by different superscripts denotes significant differences between treatments at $p < 0.05$ according to Tukey's HSD. P-values of two-way ANOVAs of bacterial, yeast, and their interaction (bacteria × yeast) are indicated $p < 0.05$, *; $p < 0.01$, **; $p < 0.001$, ***; $p < 0.0001$, ****; ns, not significant. Treatments: non-inoculated soybeans (T1), soybean inoculated with *B. japonicum* (T2), *S. cerevisiae* (T3), *S. exiguus* (T4), *B. japonicum* × *S. cerevisiae* (T5) or *B. japonicum* × *S. exiguus* (T6).

Table S4. Differences in the rhizosphere soil N and P concentrations under different treatments. stages under different treatments.

Treatments	Rhizosphere soil available N concentration (mg g ⁻¹)	Rhizosphere soil available P concentration (mg g ⁻¹)
T1	5.52±0.03 ^d	1.86±0.01 ^c
T2	6.21±0.05 ^a	1.73±0.03 ^c
T3	5.33±0.04 ^c	2.96±0.03 ^b
T4	5.31±0.03 ^c	2.94±0.03 ^b
T5	5.73±0.04 ^b	3.21±0.02 ^a
T6	5.73±0.04 ^b	3.2±0.02 ^a
Bacteria	***	*
Yeast	**	****
Bacteria × yeast	*	****

Data (means ± SE, n = 5). P-values of two-way ANOVAs followed by different superscripts denotes significant differences between treatments at $p < 0.05$ according to Tukey's HSD. P-values of two-way ANOVAs of bacterial, yeast, and their interaction (bacteria × yeast) are indicated $p < 0.05$, *; $p < 0.01$, **; $p < 0.001$, ***; $p < 0.0001$, ****; ns, not significant. Treatments: non-inoculated soybeans (T1), soybean inoculated with *B. japonicum* (T2), *S. cerevisiae* (T3), *S. exiguus* (T4), *B. japonicum* × *S. cerevisiae* (T5) or *B. japonicum* × *S. exiguus* (T6).

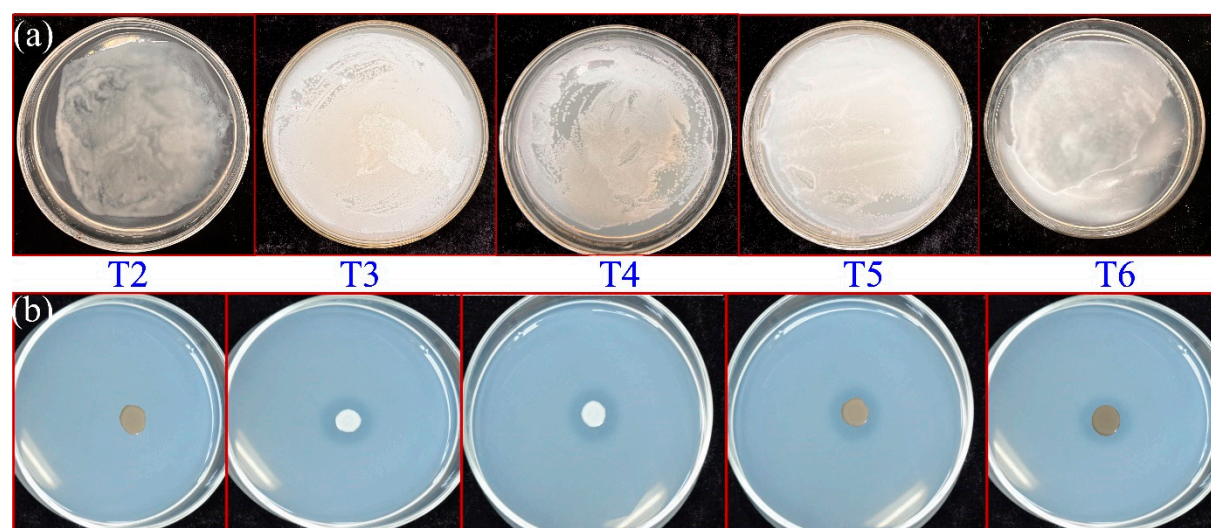


Figure S1. In vitro determination of (a) antagonism between bacteria and different yeast isolates, and (b) P solubilization after culturing microbes for 7 days on Pikovskaya's agar medium showing the clear zone of phosphate dissolution. Treatments: non-inoculated soybeans (T1), soybean inoculated with *B. japonicum* (T2), *S. cerevisiae* (T3), *S. exiguus* (T4), *B. japonicum* × *S. cerevisiae* (T5) or *B. japonicum* × *S. exiguus* (T6).

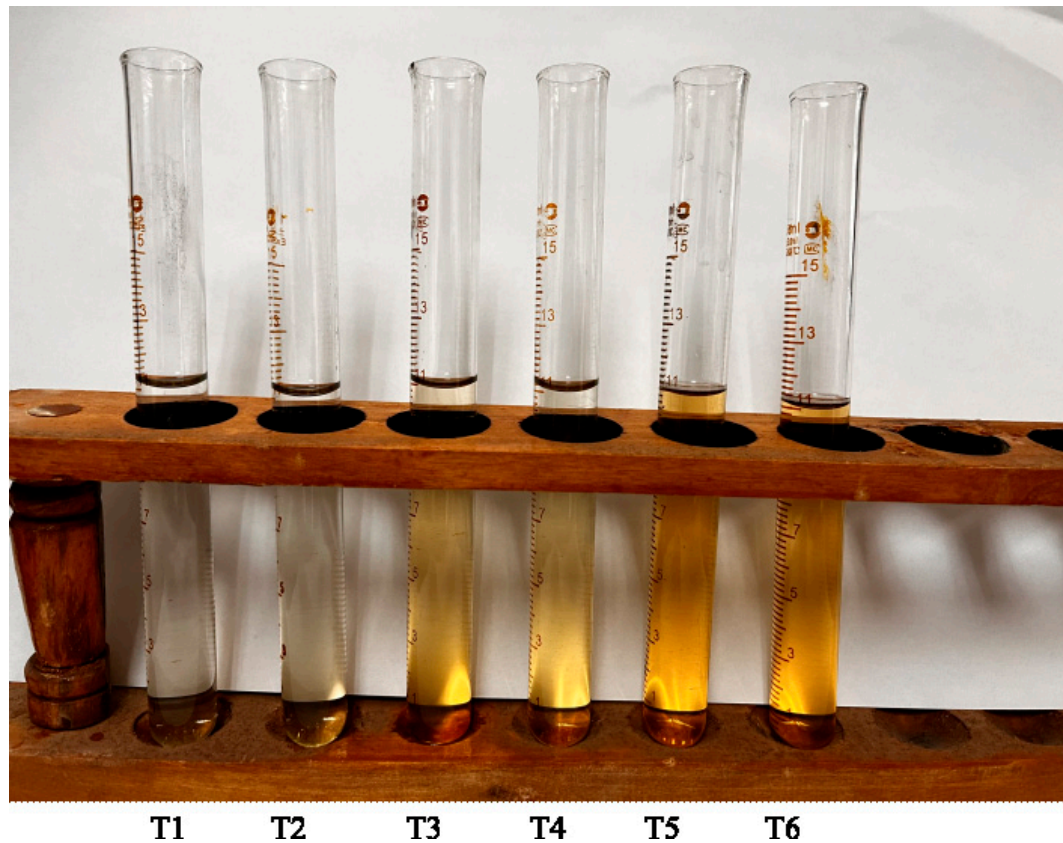


Figure S2. In vitro determination of IAA production in liquid media by different microbes. Treatments: non-inoculated soybeans (T1), soybean inoculated with *B. japonicum* (T2), *S. cerevisiae* (T3), *S. exiguus* (T4), *B. japonicum* × *S. cerevisiae* (T5) or *B. japonicum* × *S. exiguus* (T6).

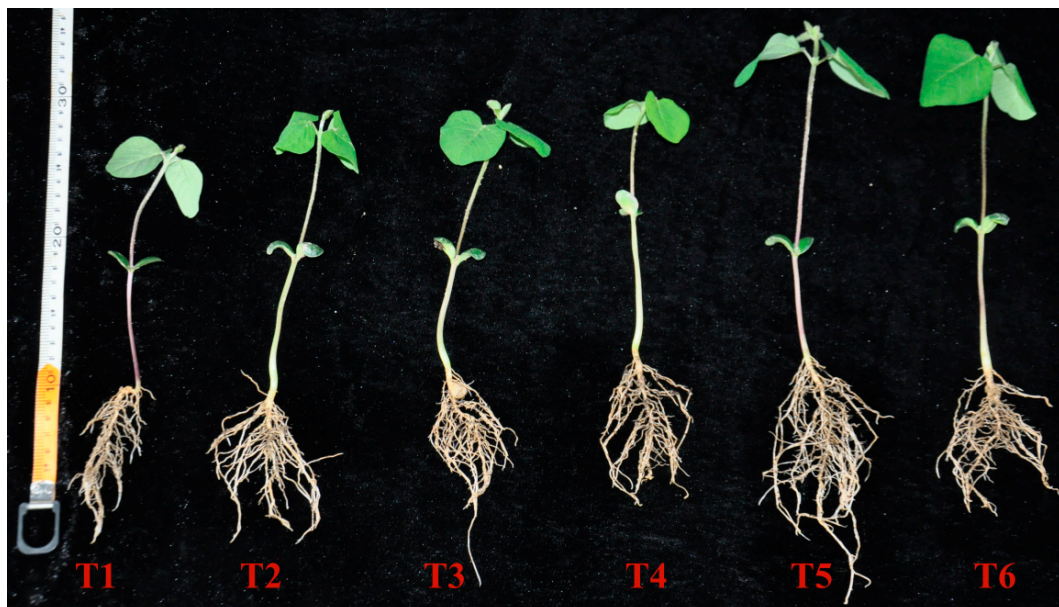


Figure S3. Five-day old soybean seedlings germinated under different microbial inoculation treatments. Treatments: non-inoculated soybeans (T1), soybean inoculated with *B. japonicum* (T2), *S. cerevisiae* (T3), *S. exiguus* (T4), *B. japonicum* × *S. cerevisiae* (T5) or *B. japonicum* × *S. exiguus* (T6).