

Supporting Information

Agricultural beneficial microbes accelerate soil degradation of poly(butylene adipate-co-terephthalate) (PBAT) films

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Tab.S1 Absolute dosing of beneficial microbes in the soil degradation experiment

sample	native non-heated soil	sterilized soil	heat-treated + re-inoculated controls(Tri15)
CFU (g⁻¹ dry soil)	$(7.10 \pm 0.01) \times 10^8$	$(2.70 \pm 0.01) \times 10^3$	$(4.50 \pm 0.03) \times 10^7$

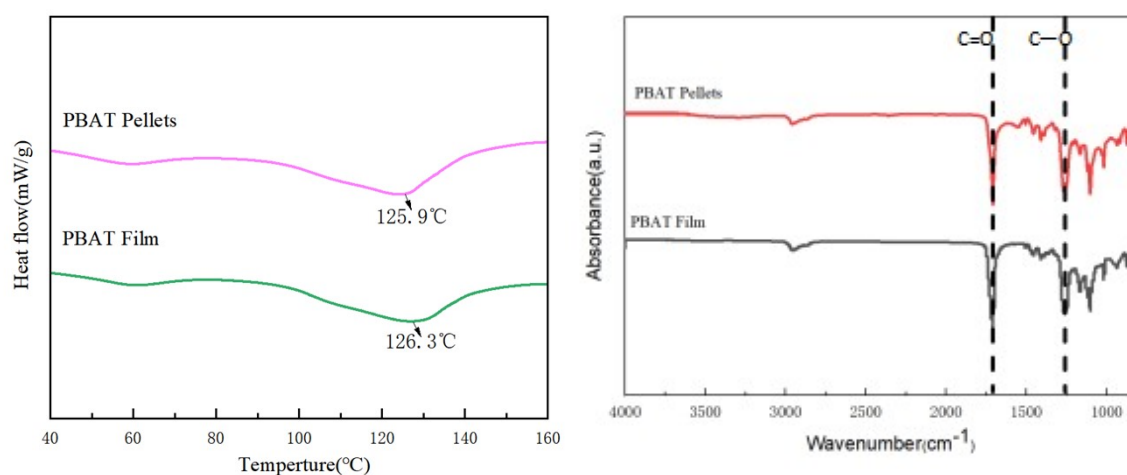


Fig. S1. Comparative DSC and FTIR spectra Analysis of Virgin and Processed PBAT

Tab.S2 Viable cell counts (CFU g⁻¹dry soil) of the introduced microbial strains
in soil at 0, 7, and 21 days.

sample	CFU(g ⁻¹ dry soil)		
	0day	7day	21day
Bac 1%	$(8 \pm 0.05) \times 10^6$	$(2.10 \pm 0.04) \times 10^{10}$	$(1.40 \pm 0.03) \times 10^{10}$
Bac 5%	$(4 \pm 0.05) \times 10^7$	$(1.39 \pm 0.03) \times 10^{11}$	$(7.00 \pm 0.03) \times 10^{10}$
Bac 15%	$(1.2 \pm 0.05) \times 10^8$	$(4.10 \pm 0.06) \times 10^{11}$	$(2.80 \pm 0.04) \times 10^{11}$
Bac 30%	$(2.4 \pm 0.05) \times 10^8$	$(6.20 \pm 0.05) \times 10^{11}$	$(5.40 \pm 0.05) \times 10^{11}$
Flu 1%	$(5 \pm 0.05) \times 10^6$	$(1.90 \pm 0.02) \times 10^{10}$	$(6.10 \pm 0.02) \times 10^9$
Flu 5%	$(2.5 \pm 0.05) \times 10^7$	$(8.50 \pm 0.04) \times 10^{10}$	$(1.50 \pm 0.04) \times 10^{10}$
Flu 15%	$(7.5 \pm 0.05) \times 10^7$	$(1.20 \pm 0.03) \times 10^{11}$	$(2.75 \pm 0.03) \times 10^{11}$
Flu 30%	$(1.5 \pm 0.05) \times 10^8$	$(2.30 \pm 0.04) \times 10^{11}$	$(4.10 \pm 0.05) \times 10^{11}$
Tri 1%	$(3 \pm 0.03) \times 10^6$	$(1.58 \pm 0.02) \times 10^9$	$(2.20 \pm 0.03) \times 10^9$
Tri 5%	$(1.5 \pm 0.03) \times 10^7$	$(1.36 \pm 0.04) \times 10^{10}$	$(1.65 \pm 0.04) \times 10^{10}$
Tri 15%	$(4.5 \pm 0.03) \times 10^7$	$(1.81 \pm 0.05) \times 10^{11}$	$(1.98 \pm 0.03) \times 10^{11}$
Tri 30%	$(9 \pm 0.03) \times 10^7$	$(2.73 \pm 0.04) \times 10^{10}$	$(3.20 \pm 0.03) \times 10^{11}$

Tab.S3 Statistical Analysis of PBAT Degradation at 1% Mass Concentration

Time	sample	Mean degradation rates (D)%	SD (%)	p-value (Strain)	Tukey's HSD grouping
90 day	Blank	1.23	0.23	<0.05	a
	Tri1	5.42	0.86	<0.05	b
	Bac1	5.23	1.45	<0.05	b
	Flu1	5.54	0.76	<0.05	b
180 day	Blank	6.45	0.67	<0.05	a
	Tri1	13.56	2.23	<0.05	c
	Bac1	8.53	1.14	<0.05	ab
	Flu1	9.23	1.32	<0.05	b
270 day	Blank	13.47	1.23	<0.05	b
	Tri1	18.76	3.56	<0.05	c
	Bac1	11.76	2.52	<0.05	a
	Flu1	13.23	1.86	<0.05	b
360 day	Blank	17.13	2.13	<0.05	b
	Tri1	25.52	4.12	<0.05	c
	Bac1	15.95	2.82	<0.05	a
	Flu1	18.45	2.32	<0.05	b

Tab.S4 Statistical Analysis of PBAT Degradation at 5% Mass Concentration

Time	sample	Mean degradation rates (D)%	SD (%)	p-value (Strain)	Tukey's HSD grouping
90 day	Blank	1.23	0.23	<0.05	a
	Tri5	6.43	0.86	<0.05	b
	Bac5	8.76	1.45	<0.05	c
	Flu5	14.43	3.23	<0.05	d
180 day	Blank	6.45	0.67	<0.05	a
	Tri5	11.54	1.23	<0.05	b
	Bac5	14.53	2.11	<0.05	c
	Flu5	20.14	4.14	<0.05	d
270 day	Blank	13.47	1.23	<0.05	a
	Tri5	24.75	2.47	<0.05	c
	Bac5	17.76	3.51	<0.05	b
	Flu5	26.14	5.23	<0.05	c
360 day	Blank	17.13	2.13	<0.05	a
	Tri5	34.54	4.01	<0.05	c
	Bac5	24.32	4.23	<0.05	b
	Flu5	37.45	5.56	<0.05	c

Tab.S5 Statistical Analysis of PBAT Degradation at 15% Mass Concentration

Time	sample	Mean degradation rates (D)%	SD (%)	p-value (Strain)	Tukey's HSD grouping
90 day	Blank	1.23	0.23	<0.05	a
	Tri15	16.42	1.85	<0.05	c
	Bac15	5.67	1.37	<0.05	b
	Flu15	6.34	1.76	<0.05	b
180 day	Blank	6.45	0.67	<0.05	a
	Tri15	35.16	2.23	<0.05	c
	Bac15	18.53	4.14	<0.05	b
	Flu15	9.12	2.12	<0.05	a
270 day	Blank	13.47	1.23	<0.05	a
	Tri15	45.76	3.56	<0.05	b
	Bac15	48.16	5.89	<0.05	b
	Flu15	31.35	3.18	<0.05	c
360 day	Blank	17.13	2.13	<0.05	a
	Tri15	70.02	5.12	<0.05	c
	Bac15	64.53	5.43	<0.05	b
	Flu15	48.23	3.32	<0.05	b

Tab.S6 Statistical Analysis of PBAT Degradation at 30% Mass Concentration

Time	sample	Mean degradation rates (D)%	SD (%)	p-value (Strain)	Tukey's HSD grouping
90 day	Blank	1.23	0.23	<0.05	a
	Tri30	6.35	1.12	<0.05	b
	Bac30	8.86	1.37	<0.05	c
	Flu30	10.37	1.76	<0.05	c
180 day	Blank	6.45	0.67	<0.05	a
	Tri30	16.16	2.13	<0.05	b
	Bac30	32.23	2.14	<0.05	c
	Flu30	29.12	2.22	<0.05	c
270 day	Blank	13.47	1.23	<0.05	a
	Tri30	30.76	3.45	<0.05	b
	Bac30	45.56	5.89	<0.05	c
	Flu30	41.35	5.18	<0.05	c
360 day	Blank	17.13	2.13	<0.05	a
	Tri30	40.02	3.23	<0.05	b
	Bac30	56.32	4.43	<0.05	c
	Flu30	65.17	6.89	<0.05	d

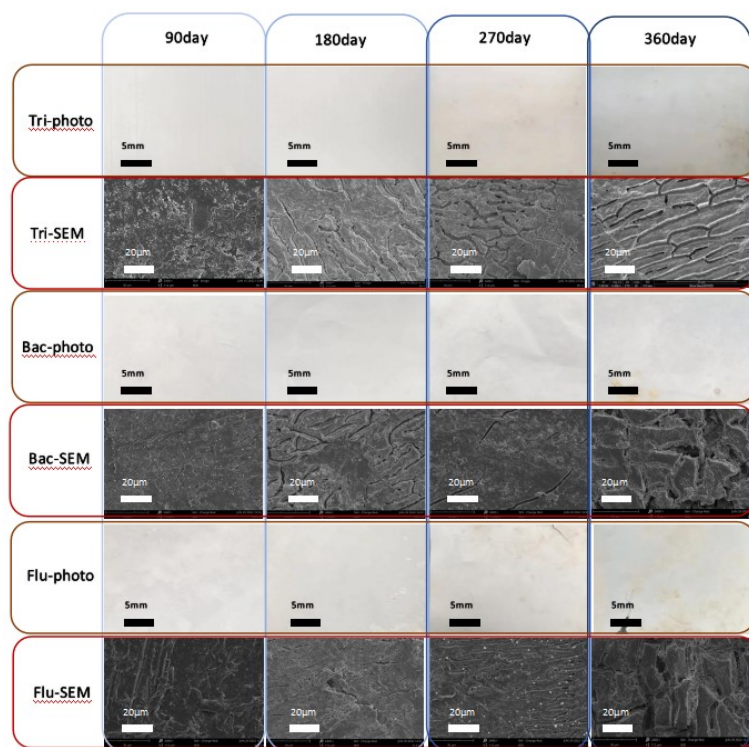


Fig. S2. Macroscopic morphology photos (-photo) and scanning electron microscopy images (-SEM) of PBAT films after the degradation test at different time points, under the influence of three different bacteria with a concentration of 1% by mass, respectively.

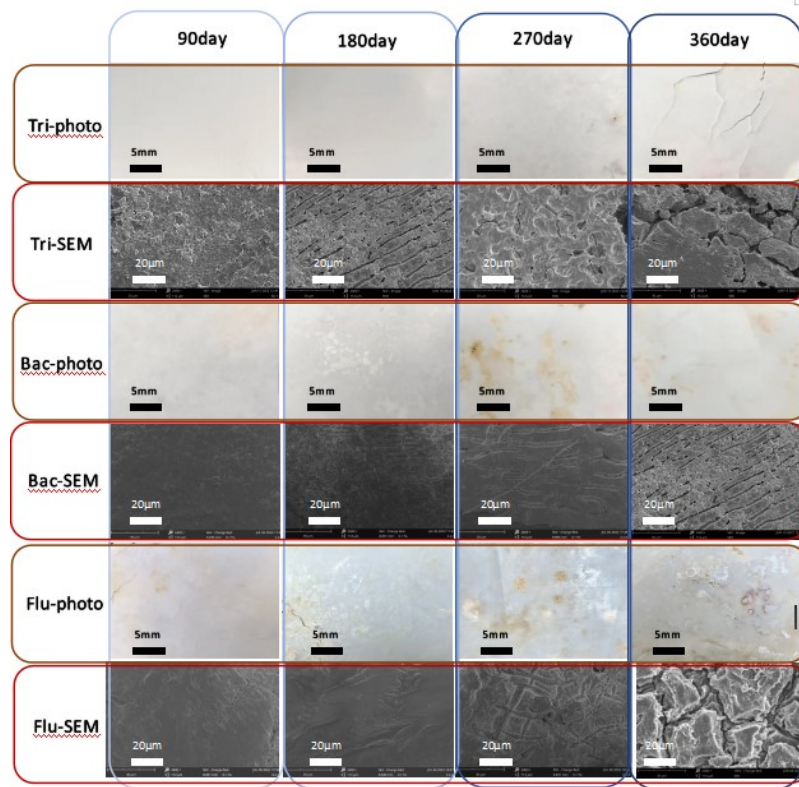


Fig. S3. Macroscopic morphology photos (-photo) and scanning electron microscopy images (-SEM) of PBAT films after the degradation test at different time points, under the influence of three different bacteria with a concentration of 5% by mass, respectively.

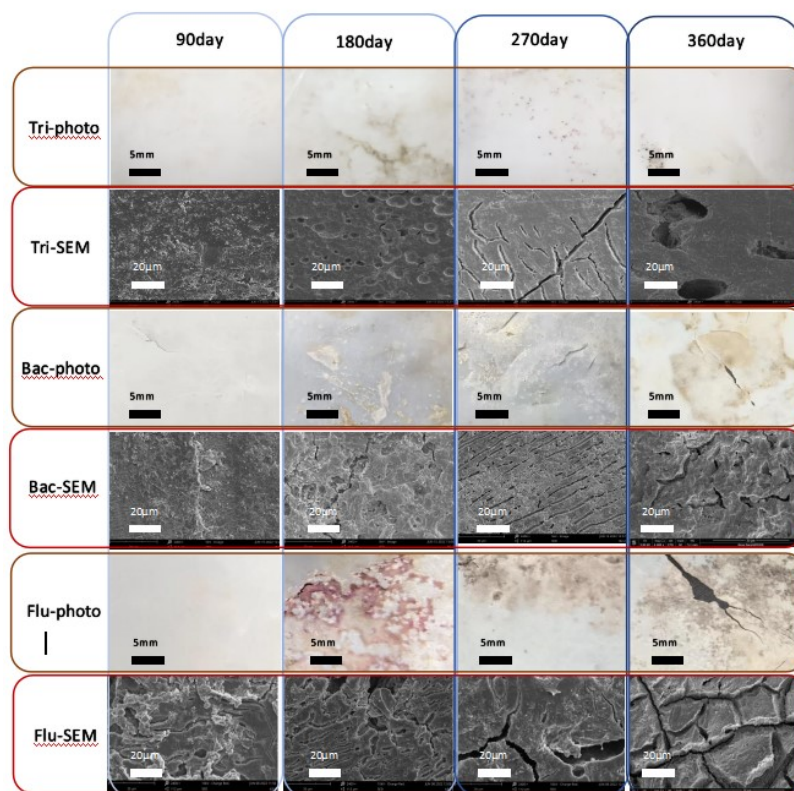


Fig. S4. Macroscopic morphology photos (-photo) and scanning electron microscopy images (-SEM) of PBAT films after the degradation test at different time points, under the influence of three different bacteria with a concentration of 30% by mass, respectively.

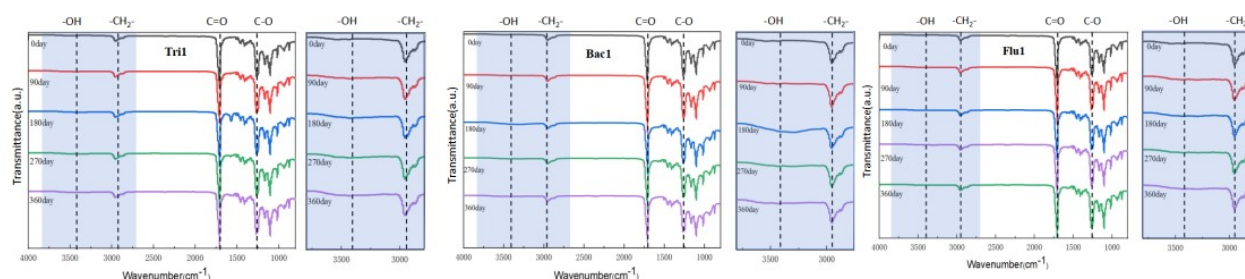


Fig. S5. FTIR spectra of PBAT films after degradation for different time under the action of different bacteria (Bac1%: with bacteria Bac of 1% mass concentration; Tri 1%: with bacteria Tri of 1% mass concentration; Flu 1%: with bacteria Flu of 1% mass concentration)

Fig. S6. FTIR spectra of PBAT films after degradation for different time under the action of different bacteria (Bac5%: with bacteria Bac of 5% mass concentration; Tri 5%: with bacteria Tri of 5% mass concentration; Flu 5%: with bacteria Flu of 5% mass concentration)

Fig. S7. FTIR spectra of PBAT films after degradation for different time under the action of different bacteria (Bac30%: with bacteria Bac of 30% mass concentration; Tri 30%: with bacteria Tri of 30% mass concentration; Flu 30%: with bacteria Flu of 30% mass concentration)

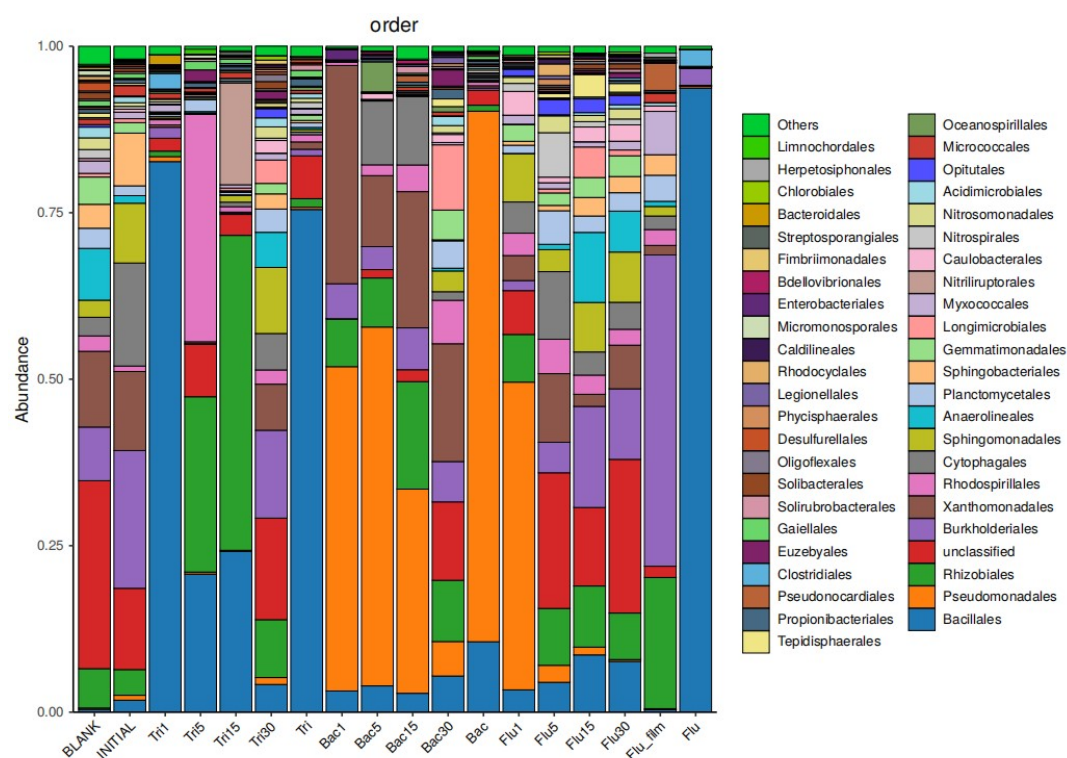


Fig.S8.Soil bacteria community composition and relative abundance at order level after PBAT films degradation under the action of different microbes by R16s. (Initial: the PBAT film before degradation; Blank: without bacteria; Bac, Tri, and Flu are the Experimental bacteria; Bac1-Bac30: with bacteria Bac of 1 -30% mass concentration; Tri 1-Tri30: with bacteria Tri of 1 -30% mass concentration; Flu 1-30: with bacteria Flu of 1-30% mass concentration.)

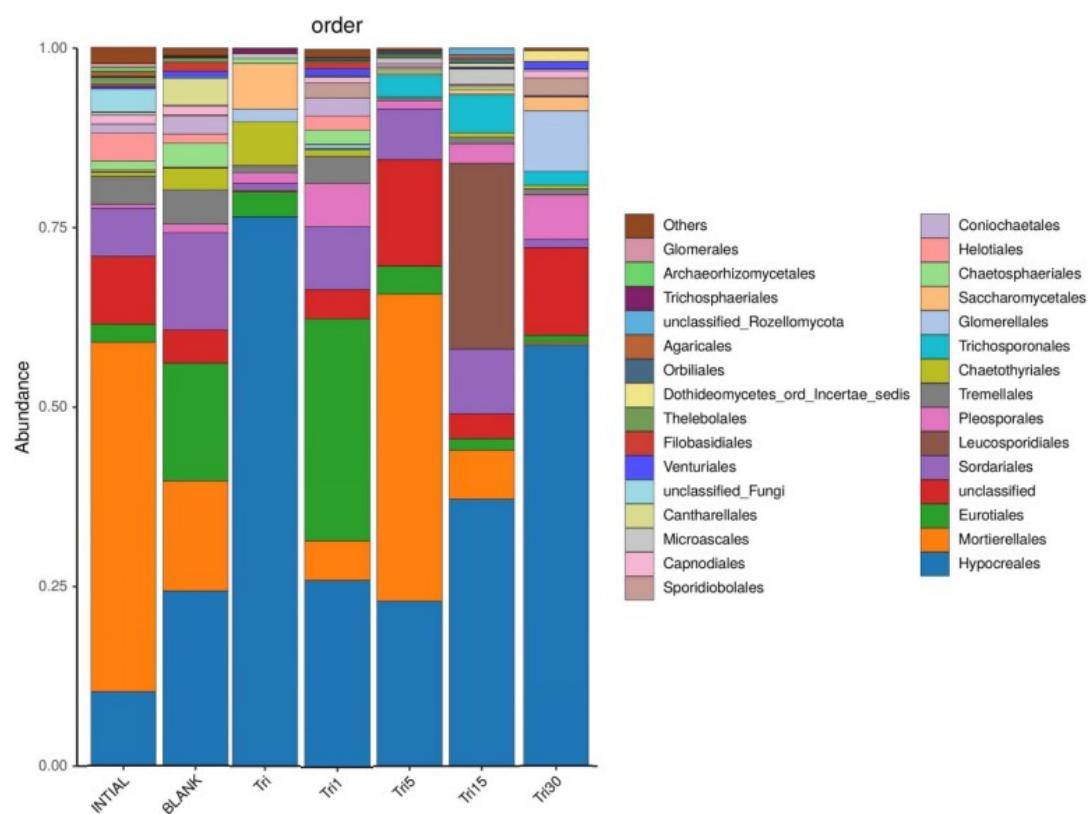


Fig. S9. Soil microbes community composition and relative abundance at class level after PBAT films degradation by ITS. (Initial: the PBAT film before degradation; Blank: without microbes; Tri 1-Tri30: with microbes Tri of 1 -30% mass concentration)