Electronic Supplementary Material

Development of Functionalized Abamectin Poly(Lactic Acid) Nanoparticles with Regulatable Adhesion to Enhance Foliar Retention

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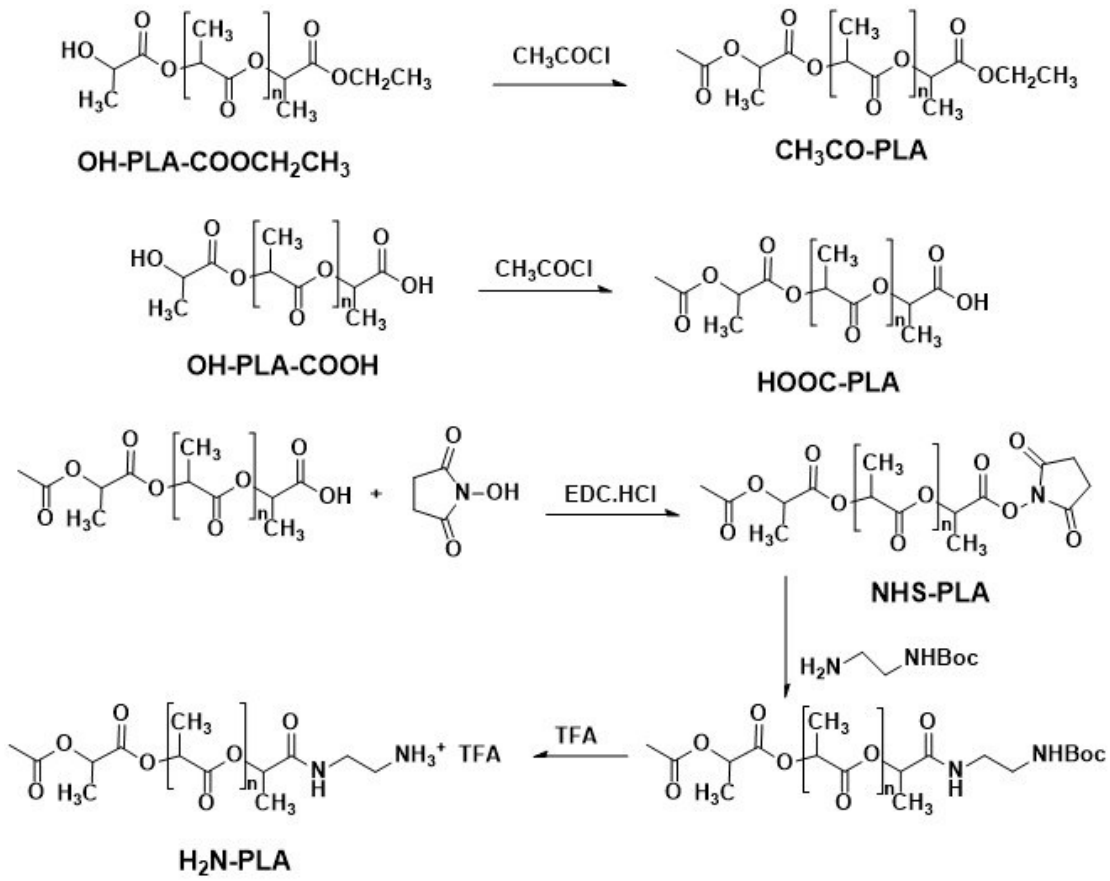

Scheme S1. The synthetic route to the functionalized polymer CH_3CO-PLA, HOOC-PLA and H_2N-PLA.

2, Supplementary tables

Table S1. The density of carboxylic and amino groups on the surface of Abam-PLA nanoparticles.

Samples	carboxylic groups (nm^{-2})	amine groups (nm^{-2})
CH_3CO-PLA-NS	0.8	-
HOOC-PLA-NS	4.6	-
H_2N-PLA-NS	0.5	2.8

Table S2. The fitting equation of sustained release profiles of abamectin provided by Abam-PLA nanoparticles.

Samples	one-order kinetics model	R^2
CH_3CO-PLA-NS	$y = -98.947e^{-0.00809x} + 100.438$	0.99493
HOOC-PLA-NS	$y = -95.862e^{-0.00875x} + 99.273$	0.99683
H_2N-PLA-NS	$y = -92.442e^{-0.00743x} + 94.534$	0.99206

Table S3. The contact angles (CA) on surface of cucumber foliage.

Samples	CA-left (°)	CA-right (°)
H_2O	76.7±7.4	74.8±7.5
CH_3CO-PLA-NS	65.8±6.1	69.5±10.6
HOOC-PLA-NS	70.1±1.4	74.1±11.2
H_2N-PLA-NS	70.7±6.2	69.0±1.7

3, Supplementary figures

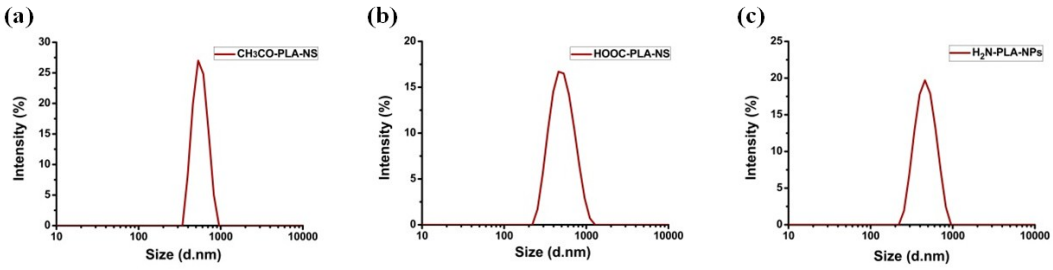

Fig. S1. The hydrodynamic size distribution of Abam-PLA nanoparticles (1.0 mg/mL). CH_3CO-PLA-NS (a), HOOC-PLA-NS (b) and H_2N-PLA-NS (c).

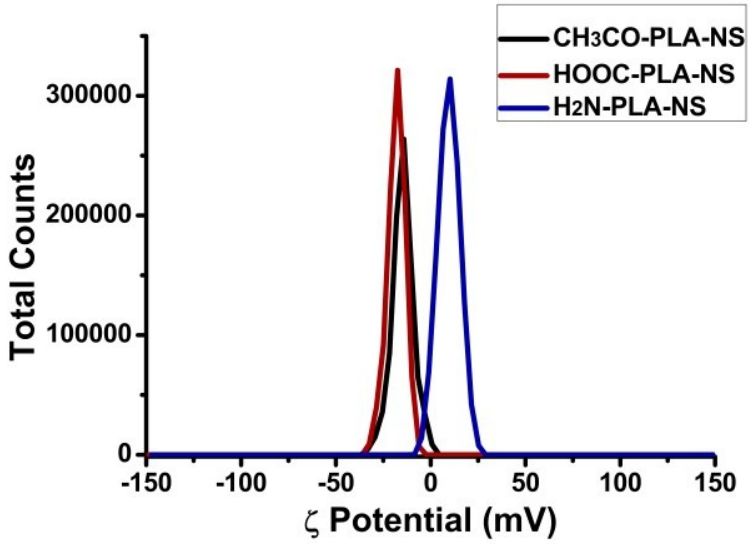

Fig. S2. ζ potentials of Abam-PLA nanoparticles (1.0 mg/mL) obtained by DLS.

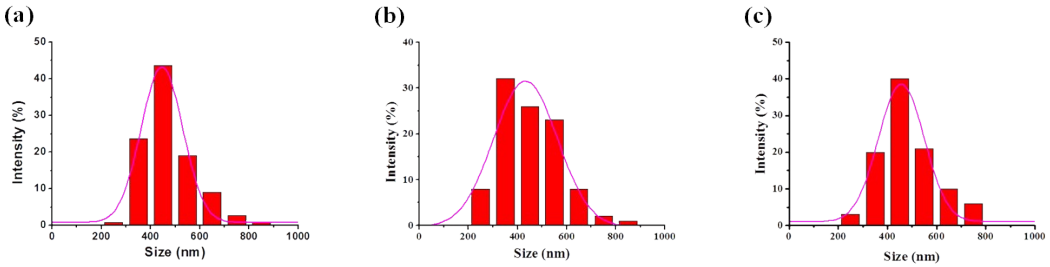

Fig. S3. The statistical size distribution histogram of Abam-PLA nanoparticles: (a) CH_3CO-PLA-NS, (b) HOOC-PLA-NS and (c) H_2N-PLA-NS. The number of statistical particles is about 200 in random area of SEM images.

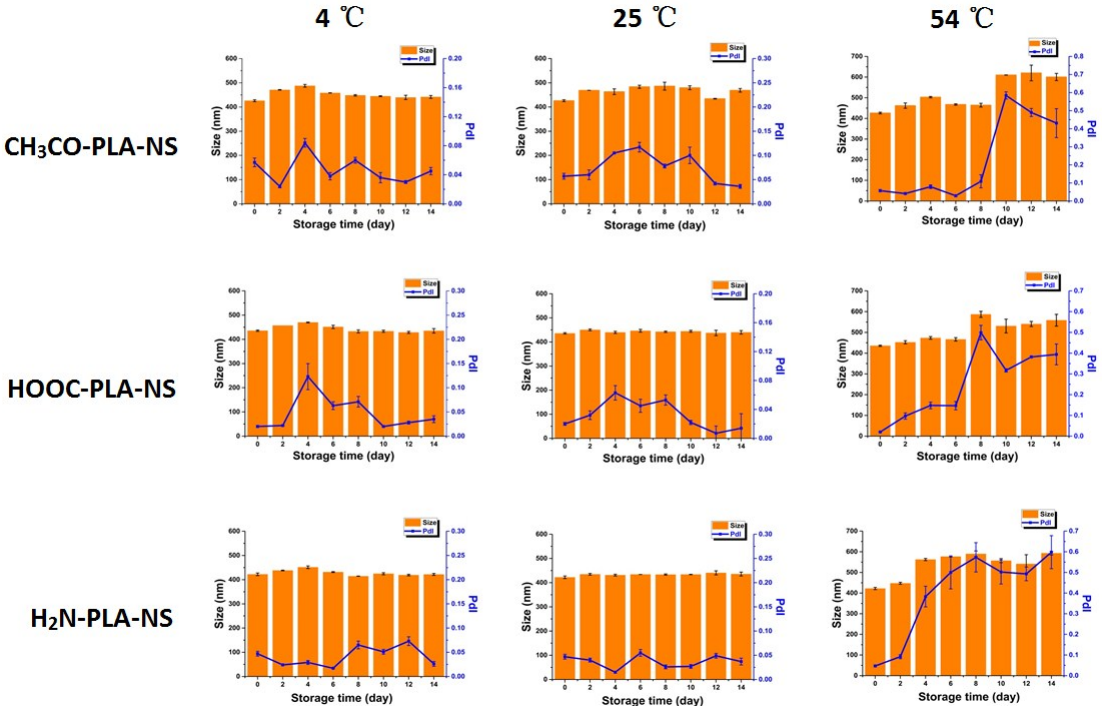

Fig. S4. The time dependent variation of DLS mean size and PdI of Abam-PLA nanoparticles.

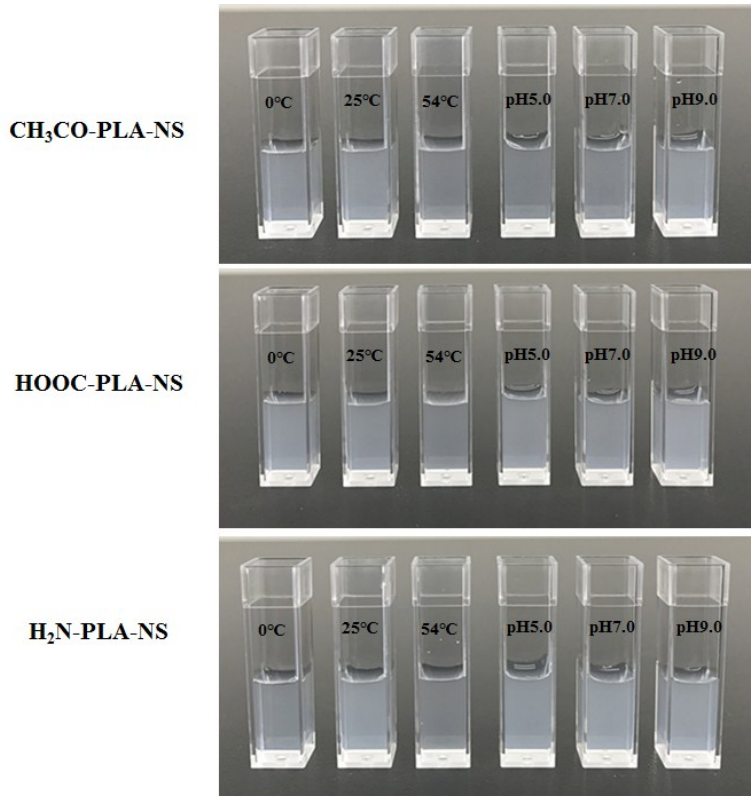

Fig. S5. The photograph feature of Abam-PLA nanoparticles at different temperature after 14 day storage, and at different pH values.

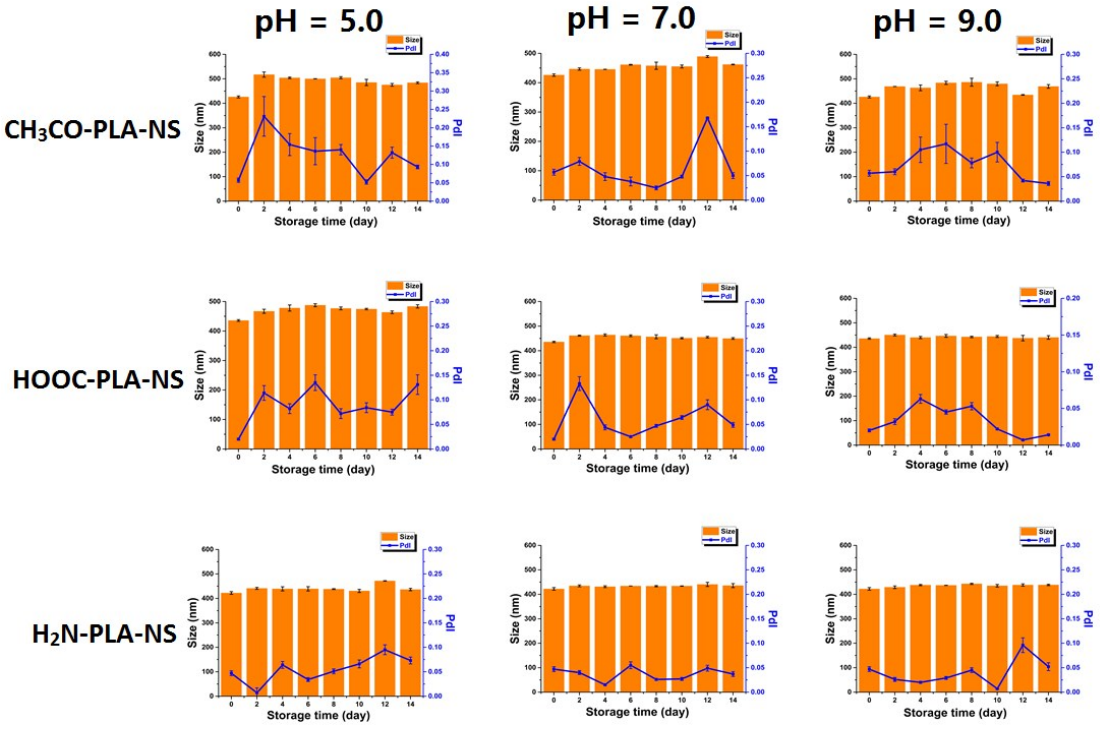

Fig. S6. The variation of DLS mean size and PdI of Abam-PLA nanoparticles at

different pH values.

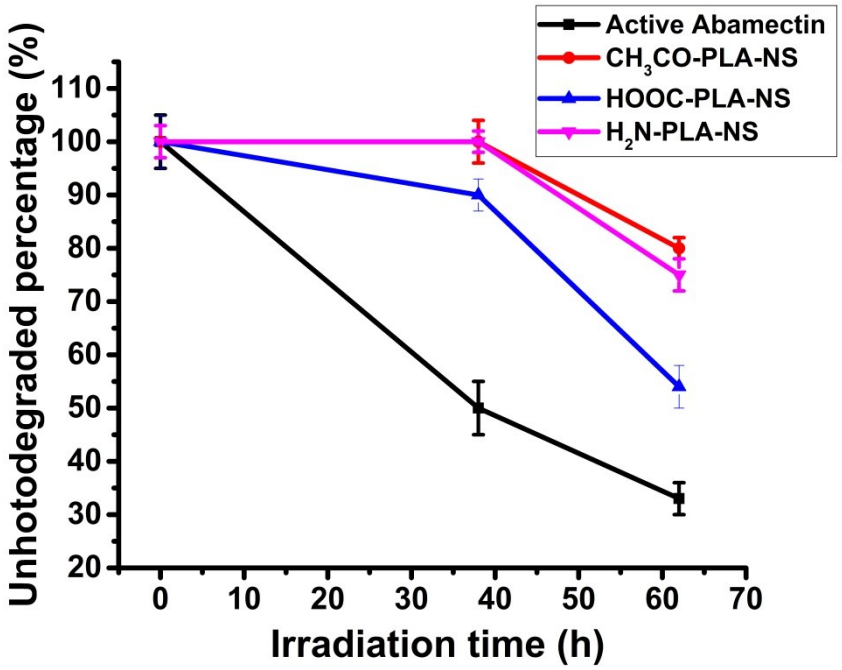

Fig. S7. The responsive curves of active Abamectin and Abamectin loaded in Abam-PLA nanoparticles versus irradiated time at 25 °C.

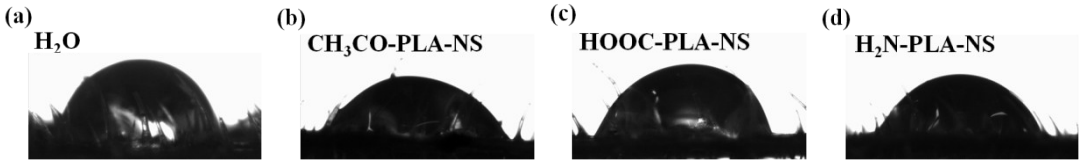

Fig. S8. The images of contact angles on the surface of cucumber leaves. Deionized water (a), CH_3CO-PLA-NS (b), HOOC-PLA-NS (c), and H_2N-PLA-NS (d). 5.0 μL samples with Abam-PLA nanoparticle (1.0 mg/L) were dropped on the foliage.

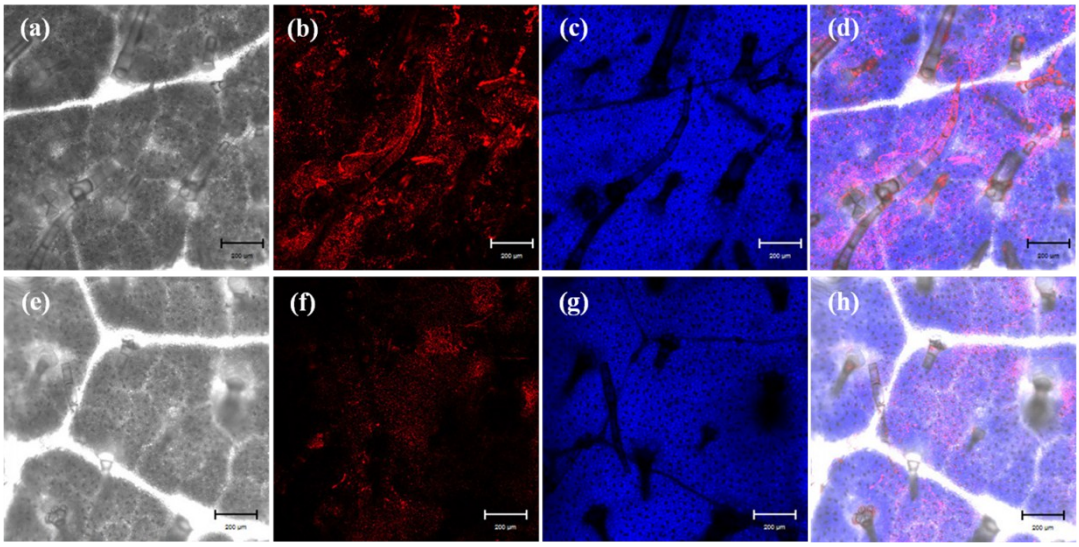

Fig. S9. Confocal fluorescence images of CH_3CO-PLA-NS on the surface of cucumber foliage. (a-d) Images before washing, and (e-h) images after washing. (a, e) Bright-field images, (b, f) CH_3CO-PLA-NS fluorescence imaging (excited at 555 nm, detected at 580 nm), (c, g) chlorophyll fluorescence imaging (excited at 630 nm, detected at 670 nm), and (d, h) overlays of images. The scale bar is 200.0 μm in all images.

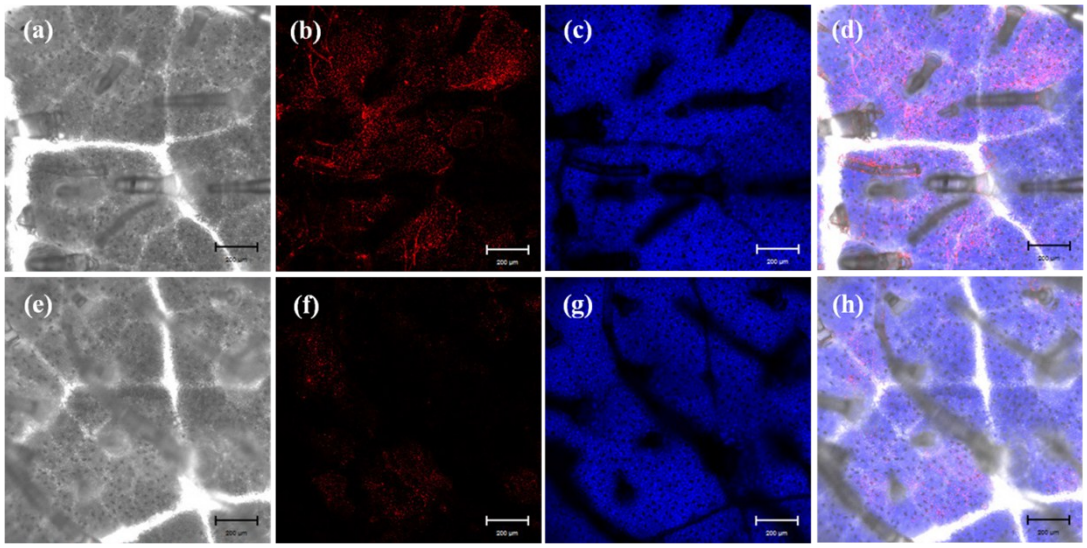

Fig. S10. Confocal fluorescence images of HOOC-PLA-NS on the surface of cucumber foliage. (a-d) Images before washing, and (e-h) images after washing. (a, e) Bright-field images, (b, f) HOOC-PLA-NS fluorescence imaging (excited at 555 nm, detected at 580 nm), (c, g) chlorophyll fluorescence imaging (excited at 630 nm, detected at 670 nm), and (d, h) overlays of images. The scale bar is 200.0 μm in all images.

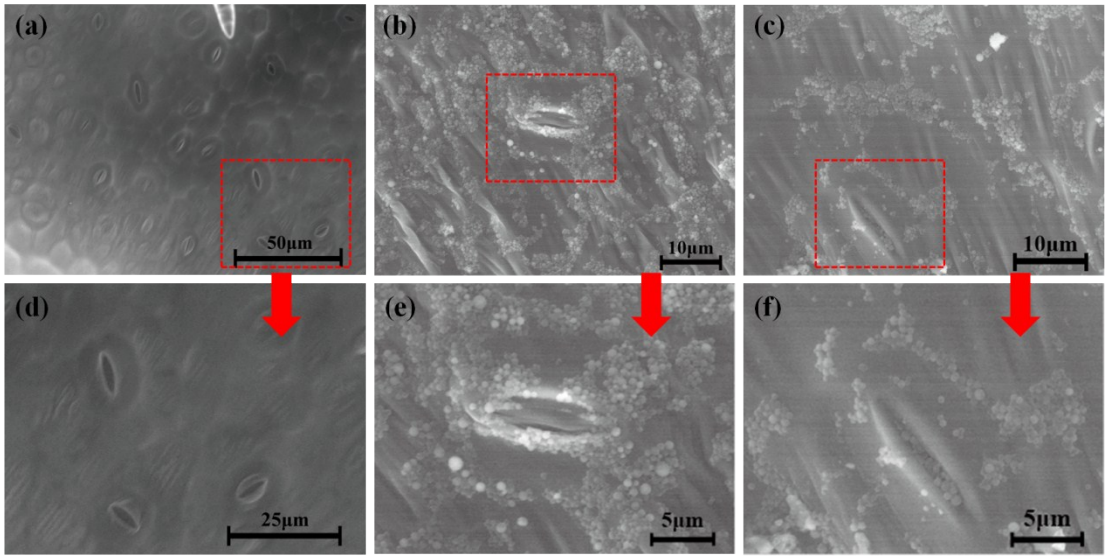

Fig. S11. ESEM images of CH_3CO-PLA-NS on the surface of cucumber leaves. (a) Foliage image using nanoparticles as a control, (b) image with CH_3CO-PLA-NS, (c) image after washing, and (d, e, f) magnified images in indicated specific regions in a, b and c, respectively.

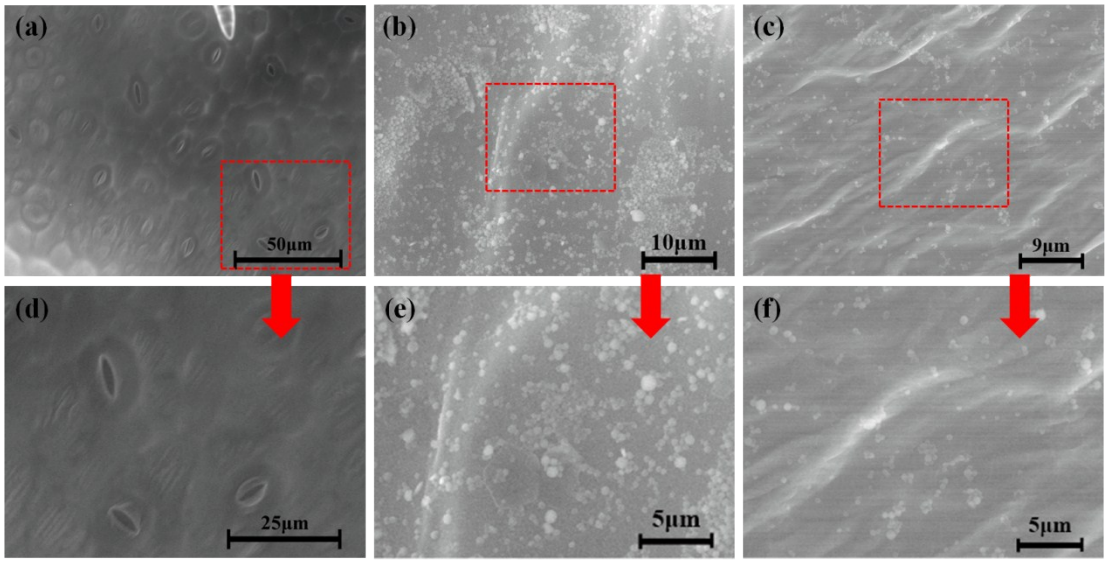

Fig. S12. ESEM images of HOOC-PLA-NS on the surface of cucumber leaves. (a) Foliage image using nanoparticles as a control, (b) image with HOOC-PLA-NS, (c) image after washing, and (d, e, f) magnified images in indicated specific regions in a, b and c, respectively.