



## Supplementary Materials

# Nanopesticide Formulation from Pyraclostrobin and Graphene Oxide as a Nanocarrier and Application in Controlling Plant Fungal Pathogens

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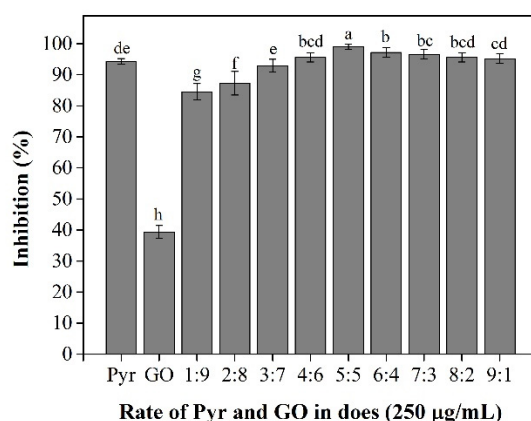
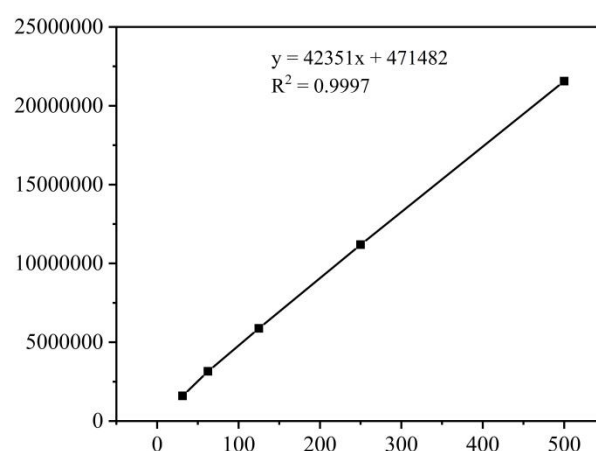
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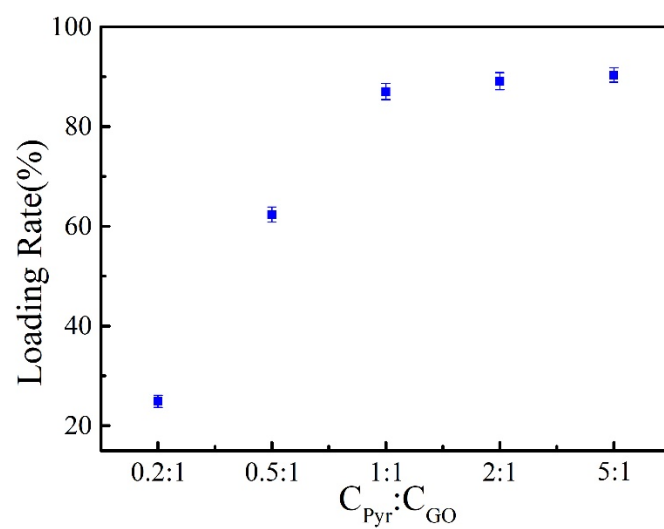
**Table S1.** Release kinetics of Pyr and GO-Pyr nanocomposite at 25 °C, 30 °C and 35 °C . Data are mean of cumulative release rates  $\pm$  stand error (SE). Error bars represent the SE ( $N = 3$ ).

Temperature (°C)		the cumulative release rate at t (h)										
		3	6	10	24	36	48	72	96	120	144	168
25°C	pyr	25.91 $\pm$ 0.23	49.65 $\pm$ 1.11	66.60 $\pm$ 2.10	83.51 $\pm$ 2.98	91.99 $\pm$ 1.80	96.58 $\pm$ 0.22	—	—	—	—	—
	GO-pyr	13.63 $\pm$ 2.09	18.69 $\pm$ 1.19	23.87 $\pm$ 2.21	40.64 $\pm$ 0.35	47.55 $\pm$ 1.24	54.47 $\pm$ 2.79	59.33 $\pm$ 1.02	64.13 $\pm$ 2.34	67.37 $\pm$ 1.43	69.71 $\pm$ 2.57	70.38 $\pm$ 1.73
30°C	pyr	26.69 $\pm$ 2.30	50.50 $\pm$ 1.34	66.91 $\pm$ 1.20	83.59 $\pm$ 0.75	92.10 $\pm$ 2.27	97.01 $\pm$ 1.58	—	—	—	—	—
	GO-pyr	13.68 $\pm$ 1.89	18.86 $\pm$ 1.86	23.96 $\pm$ 1.78	40.00 $\pm$ 2.17	48.45 $\pm$ 0.38	54.99 $\pm$ 2.31	60.17 $\pm$ 0.86	65.54 $\pm$ 1.22	68.18 $\pm$ 0.45	70.44 $\pm$ 2.23	72.09 $\pm$ 1.45
35°C	pyr	26.95 $\pm$ 1.78	51.17 $\pm$ 2.16	68.03 $\pm$ 1.78	83.82 $\pm$ 2.24	92.19 $\pm$ 1.10	97.26 $\pm$ 1.96	—	—	—	—	—
	GO-pyr	14.52 $\pm$ 0.84	19.14 $\pm$ 0.91	24.43 $\pm$ 1.04	40.27 $\pm$ 0.98	48.86 $\pm$ 1.26	55.81 $\pm$ 2.30	60.31 $\pm$ 1.21	65.81 $\pm$ 0.65	68.53 $\pm$ 2.10	70.99 $\pm$ 1.78	72.35 $\pm$ 1.45

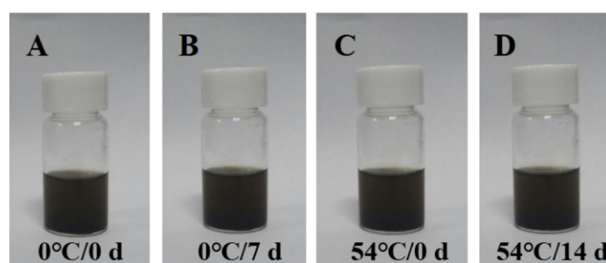
**Table S2.** Release kinetics of Pyr and GO-Pyr nanocomposite at pH 5, pH 7 and pH 9 . Data are mean of cumulative release rates  $\pm$  stand error (SE). Error bars represent the SE ( $N = 3$ ).

pH		the cumulative release rate at t (h)										
		3	6	10	24	36	48	72	96	120	144	168
5	pyr	29.30 $\pm$ 0.40	59.24 $\pm$ 2.18	70.59 $\pm$ 0.85	85.24 $\pm$ 1.27	92.82 $\pm$ 0.54	98.42 $\pm$ 2.12	—	—	—	—	—
	GO-pyr	14.70 $\pm$ 1.35	20.92 $\pm$ 2.33	25.20 $\pm$ 1.18	40.76 $\pm$ 0.69	49.09 $\pm$ 2.12	56.33 $\pm$ 1.77	61.08 $\pm$ 1.50	66.45 $\pm$ 2.15	69.25 $\pm$ 2.97	71.59 $\pm$ 1.74	72.24 $\pm$ 0.43
7	pyr	29.06 $\pm$ 1.73	59.03 $\pm$ 3.65	70.32 $\pm$ 0.36	84.29 $\pm$ 2.30	92.38 $\pm$ 0.87	98.17 $\pm$ 1.20	—	—	—	—	—
	GO-pyr	14.67 $\pm$ 0.33	20.75 $\pm$ 1.36	25.48 $\pm$ 2.68	39.51 $\pm$ 1.00	48.71 $\pm$ 2.36	55.94 $\pm$ 1.28	60.12 $\pm$ 2.64	65.25 $\pm$ 1.75	68.40 $\pm$ 2.10	70.77 $\pm$ 1.87	71.95 $\pm$ 2.12
9	pyr	29.10 $\pm$ 1.23	58.88 $\pm$ 2.48	70.14 $\pm$ 0.30	83.93 $\pm$ 1.32	92.30 $\pm$ 2.62	98.03 $\pm$ 1.09	—	—	—	—	—
	GO-pyr	14.50 $\pm$ 1.02	20.37 $\pm$ 1.07	23.97 $\pm$ 1.04	39.45 $\pm$ 1.32	48.43 $\pm$ 2.33	55.59 $\pm$ 1.15	59.65 $\pm$ 2.07	64.82 $\pm$ 2.95	67.86 $\pm$ 1.73	69.81 $\pm$ 2.11	70.22 $\pm$ 1.22

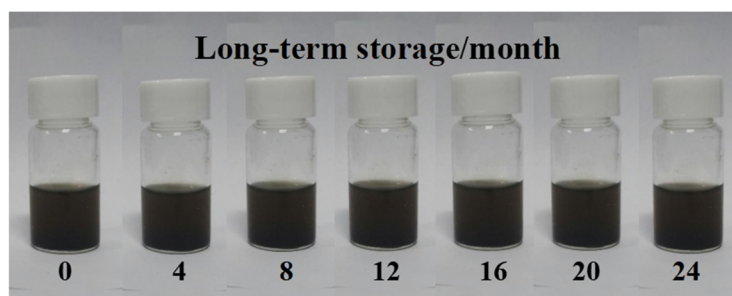
**Figure S1.** Inhibitory activities of single fungicides or in combination with GO at different mass ratios against mycelial growth of *F. graminearum*. Data are mean  $\pm$  stand error (SE). Error bars represent the SE ( $N = 3$ ). Different lower case letters indicate significant differences between treatments ( $P < 0.05$ ).**Figure S2.** HPLC standard curves of Pyr.



**Figure S3.** Loading capacity of Pyr on GO at different concentration ratio.



**Figure S4.** Images of GO-Pyr under storage of 0 °C and 54 °C.



**Figure S5.** Images of GO-Pyr in 2 years of storage.