Electronic Supporting Information

A smart roof transforming raindrops into agricultural spraying

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This PDF file includes:

Figs. S1 to S3

Legend for Movie S1

Other supplementary materials for this manuscript include the following:

Movie S1

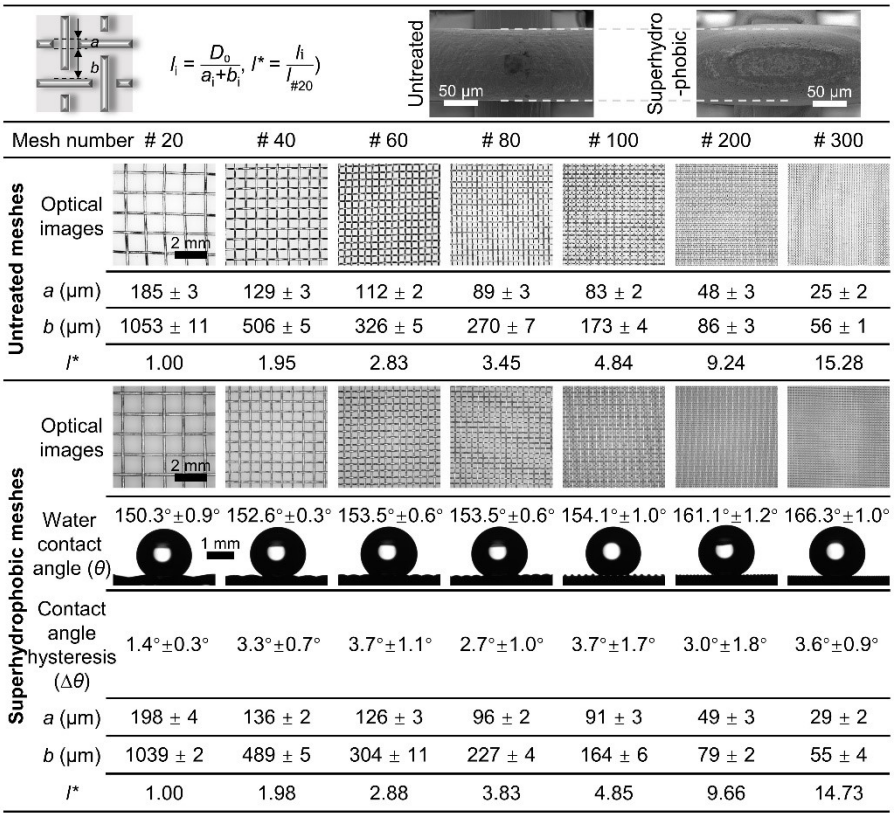

Fig. S1 Measurement and calculation of superhydrophobic mesh parameters. SEM images of untreated and superhydrophobic #100 mesh. Optical microscopic images showing the mesh of different pore sizes. The width of the single wire (a) and the free area (b) of different meshes are measured. The water contact angles (θ) are characterized by a contact angle device (DSA 25S, KRUSS, Germany) with liquid droplets of 2 μL. Contact angle hysteresis ($\Delta\theta$) were measured using the DSA 25S with liquid droplets from 3 μL to 10 μL. $I_i = D_0/(a_i+b_i)$, where D_0 is the initial diameter of droplet, a_i and b_i is the width of single wire and free area, respectively, and subscript i refers to different mesh number. I^* is defined as the scaling factor representing the mesh density ($I^* = I_i / I_{\#20}$). Data are shown as mean ± SD (N = 5, independent experiments), and the error bar represents SD. The mesh density scaling factor (I^*) is proposed to normalize the mesh size, and calculated by measured results.

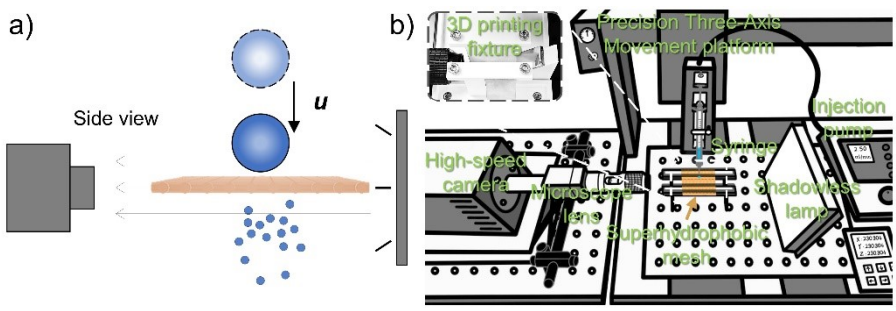

Fig. S2 Experimental setup for photographing droplets impact-fragmentation. a) Schematic diagram of high-speed photographing in side view. b) Sketch of a set of 3D printed apparatus for firmly fixing superhydrophobic meshes and precisely regulating impact velocity of droplets.

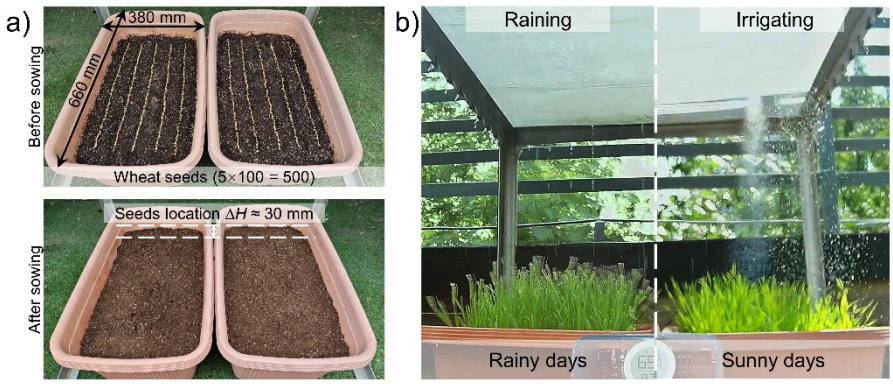

Fig. S3 Outdoor wheat seedling growth experiments. a) Wheat seeds pattern before covered by a soil layer with thickness ΔH of 30 mm. The inner size of the planting box is 660 × 380 × 230 mm, length × width × depth. The seeds are evenly spread in 5 rows of 100 seeds spaced with 60mm. b) Chronophotography of microdroplets fragmented by raindrops in rainy days and irrigated waterdrops in sunny days impacting superhydrophobic mesh, respectively.

Mov. S1 (separate file) Outdoor wheat seedling growth under the microdroplet spraying achieved by water impacting the superhydrophobic mesh. Microdroplets spraying can be achieved by the fragmentation of raindrops in rainy days (left) or irrigated waterdrops in sunny days (right) after impacting superhydrophobic mesh.