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Fresh water from fog collection: Smart improvement inspired by plants from the Atacama Desert of Chile

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Due to global climate changes and population growth, fresh water shortages is a prominent issue faced by an increasing number of communities around the world. In many countries such as Chile, the collection of water from coastal fog offers an inexpensive local alternative to more costly water acquisition strategies such as desalinization.

Current fog collectors are mostly made of the cheap and widely available Raschel mesh but have not been optimized for efficiency. The greatest issue with these collectors is that the droplets caught on the mesh have to grow to a critical size (mainly by coalescence) before they can be moved by the action of gravity. The formation of large drops is problematic because it leads to re-entrainment and mesh clogging, two processes contributing to important losses in water collection efficiency.

Our solution emerges from an interaction between biological observations and physical analysis. Indeed, a study of the fog-adapted plant Tillandsia landbeckii from the Atacama Desert of Chile has revealed that collection efficiency can be enhanced by the formation of stable water films instead of droplets on the collecting surfaces. In the case of the Tillandsia leaf, microscopic hydrophilic scales force fog droplets to spread and form a stable film. Laboratory experiments have been carried out using a wind tunnel and testing various structured threads made of standard mesh material and without chemical treatment. Our results show that re-entrainment of water droplets can be greatly limited by braided threads that maintain a thin water film onto which incident droplets can coalesce and flow stably downward.

The improved fog collection technology that emerged from this work offers an elegant solution to the problem of drop re-entrainment and would help maximize the benefits of fog collection in arid regions worldwide.