

## Drones Add a New Kick to Protecting the Sichuan Pepper

China's rich culinary history is a source of pride, with every dish representing a region, a people, and a culture. But of all the country's signature flavors, none is more renowned for its kick and spice than the Sichuan pepper. One of the essential ingredients in Chinese five-spice, Sichuan peppers are famous for their signature bite that leaves the mouth tingling and numb. If you've ever eaten classic Sichuan hot pot, you'll know what this means. Sichuan peppers have even proved useful outside the kitchen in traditional Chinese Medicine, using the plant to stimulate blood circulation, warm the body, and relieve pain. The Sichuan pepper's numbing quality has even been put to use as a form of anesthesia.



*These Sichuan peppers will be plucked for culinary and medicinal use*

For its range of applications and essential status in national cuisines, Sichuan pepper trees are planted throughout China with the ability to grow in diverse conditions. These trees thrive in the blustery winters of the northeast, the forests of southeastern Tibet, and even at altitudes of 2500 m on the slopes of Qianhai.

Sichuan pepper trees themselves are considered small and deciduous, often standing at the height of 2-7 m. Drought-resistant and adaptive to various amounts of sunlight, they fare well in terraced fields, near orchards, and uncultivated land. As a commercial crop, the Sichuan pepper tree consistently turns a profit, increasing a farmer's income while improving the overall quality of the soil from which it grows.

### **Red Spider Mites: Small Pest, Huge Threat**

Despite its ability to grow and bear peppercorns in almost any weather, elevation, or sunlight, the Sichuan pepper tree can easily fall victim to a tiny, almost unnoticeable culprit: the red spider mite. An arachnid parasite, red spider mites can be found under the leaves of the tree, feeding on its juices, flower buds, young fruits, and tender shoots. When enough occupy a tree, flowers and fruits will drop prematurely. With an output of up to nine generations per year, red mite spiders can lay siege to entire acres of Sichuan pepper trees.



*Red spider mites hiding underneath leaves*

For the farmers of Sichuan, the first step in combatting the scourge of red spider mites is anticipating an attack. These mites thrive during the Sichuan pepper tree's blossoming period, peaking in April and May. One theory suggests that the mite population is more likely to multiply in high temperatures, as well as during the evening. In addition, the mites prepare for the winter with adult females fertilized for the cold months.

### **Airborne Efficiency**

Taking all this information into account, tree farmers in Sichuan province's city of Chongqing set out for the arduous task of pest control and prevention. Conventionally, this involved walking through orchards with knapsack sprayers at a rate of 0.4-0.6 acres per day.

To boost the efficiency of pesticide application and relieve their workload, farmers turned to Jiangnong, a local plant protection service provider who had just reached into the emergence of agricultural drone technology. At the end of the project, the spraying drones achieved remarkable results, covering about 3.3-4.7 acres of land each day. The Sichuan pepper trees of Chongqing were treated to prevent the spread of red spider mite infestation, promising a fruitful harvest that would benefit kitchens all over China.



Water-sensitive paper is applied to the tree to show spray effectiveness



The paper indicated the MG-1S performed very well

Pesticide Name	Man-Ba-Biao	Active Ingredient Concentration	Spirodiclofen 24%
Dosage Type	Suspending	Dosage	150 ml/acre

### Dosage

Considering the mite infestation, Jiangnong employed a solution of spirodiclofen at 24% concentration. This ingredient, produced by Langfang Pesticide Factory of Chinese Academy of Agricultural Science, is quite effective in preventing the proliferation of red spider mites.



DJI's Agras MG-1S spraying pesticides on the Sichuan pepper trees

Sichuan pepper trees flower in April, making it a crucial period to eliminate red spider mites. Considering Chongqing's mountainous with undulating terrain, the DJI Agras MG-1S was flown manually so that the pilot could gain full control of the drone. The canopy was so dense that trees were sprayed one by one to ensure an even application. With all these factors in mind, water

volume increased to 4 L, reducing pesticide concentration, while providing better coverage.

Flight Altitude	1 m	Flying Speed	2 m/s
Flight Mode	P		
Spray Speed	1.3 L/min	Sprayer	Normal
Operation Distance	2 m	Operation Mode	Manual

Operation Parameters

Flight route plans had to be based on the conditions of where the MG-1S would fly. Over gentle slopes, the operator has a complete aerial view, avoiding risks and obstacles. During horizontal spraying, operators may encounter blind spots, prompting them to pay particular attention to aircraft altitude.



Sichuan pepper trees in Caijia Town, Jiangjin District, Chongqing Municipality