Precision spraying techniques using an automatic infrared system to detect the target in a Chinese orchard

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Abstract

There is an urgent need for new chemical application techniques and sprayers in Chinese orchard spraying, because of the requirements of environment, safety for food and operator during chemical application in Chinese orchards. A new tractor-mounted, automatic target-detecting system was designed and developed which incorporates electrostatics and infrared sensor is fitted to an air-assisted orchard sprayer. The spraying system was developed to meet the demand of chemical pest control in orchards. This sprayer is lightweight, highly efficient, reduces pesticide use and is environmentally-friendly.

The techniques of automatic target detection, electrostatics, and air-assisted spraying were combined within this system. The infrared ray sensor was used for this system to detect the target, the sprayer can automatically open and stop the nozzle for spraying chemical liquids, when the infrared sensor find target of tree, the nozzle will be opened, when the infrared sensor find the interstitial space between the trees, the sprayer will automatic stop to spray.

The electrostatically charged droplets are projected towards the target by the assistance of an air stream that increases droplet penetration into the canopy. Experimental results show that the new automatic target-detecting orchard sprayer with an infrared sensor can save more than 50 to 75% of pesticides, improve the utilization rate (above 55%), control efficiency, and significantly reduce environmental pollution caused by the spray application. At the same time the key technological problems related to air-assisted low volume and electrostatic spraying are solved.

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Key words. Precision spraying, Orchard sprayer, automatic plant detection, air assisted spray, electrostatic spray

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