



## CAB ABSTRACTS HOT TOPIC:

# Unmanned aerial vehicles for precision agriculture

Technology in agriculture is constantly evolving as the industry addresses the dual challenges of food security and climate change. Collecting reliable and accurate data on the health of crops is essential to maximise yield and reduce losses. Unmanned Aerial Vehicles (UAVs) present a quick and increasingly cost-effective way of collecting this data and offer a higher resolution, unobstructed view down to the individual leaves of a crop, when compared with traditional satellite imagery. While UAVs have been around since the 1980s, practical application of this technology has been expanding rapidly in recent years, particularly within the agricultural sector.

**CAB Abstracts** covers the global literature on all aspects of precision agriculture, including remote sensing (image processing, mapping, robotics and computer software) for use in agriculture as well as forest management. The use of UAVs in agriculture is still a relatively new concept; however, changes in the law are making it easier for farmers to adopt this technology.

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CAB Abstracts sources the world literature to provide the complete picture on advances in the use of Unmanned Aerial Vehicles in agriculture, including information on:

- **Crop health assessment:** UAVs can produce multispectral images that track changes in plants and indicate their health. Responding as soon as a disease is detected could save an entire crop.  
*UAV-assisted dynamic clustering of wireless sensor networks for crop health monitoring.*  
*Sensors, 2018*  
*Low-cost multispectral imaging for remote sensing of lettuce health.*  
*Journal of Applied Remote Sensing, 2017*
- **Soil analysis:** UAVs can produce detailed maps for early soil analysis, which can be used to help detect contamination or plan sowing patterns.  
*Estimation of the vertical distribution of radiocesium in soil on the basis of the characteristics of gamma-ray spectra obtained via aerial radiation monitoring using an unmanned helicopter.*  
*International Journal of Environmental Research and Public Health, 2017*
- **Crop spraying:** UAVs can scan the ground and spray the correct amount of liquid which increases efficiency and reduces the amount of chemicals penetrating into the groundwater.  
*Chemical control of Ceratovacuna lanigera Zehntner with multi-rotor unmanned aerial vehicle.*  
*Plant Diseases and Pests, 2017*  
*Design and test of a six-rotor unmanned aerial vehicle (UAV) electrostatic spraying system for crop protection.*  
*International Journal of Agricultural and Biological Engineering, 2017*
- **Irrigation:** drones with hyperspectral, multispectral or thermal sensors can identify which parts of a field are dry. Also, once the crop is growing, UAVs enable the calculation of the vegetation index, which describes the relative density and health of the crop, and can show the amount of energy or heat the crop emits.  
*Addressing groundwater declines with precision agriculture: an economic comparison of monitoring methods for variable-rate irrigation.*  
*Water, 2017*

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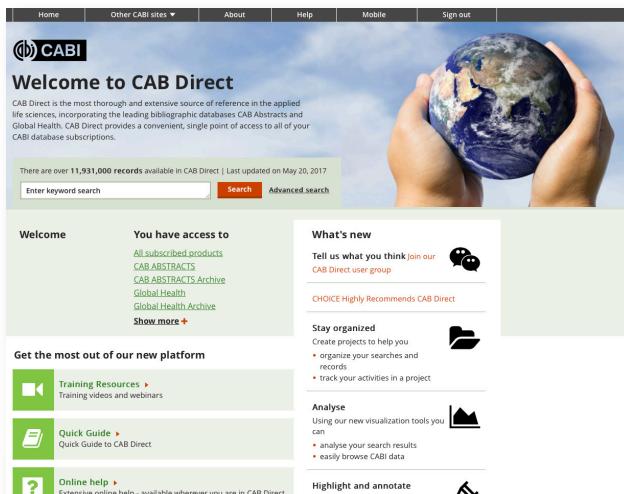
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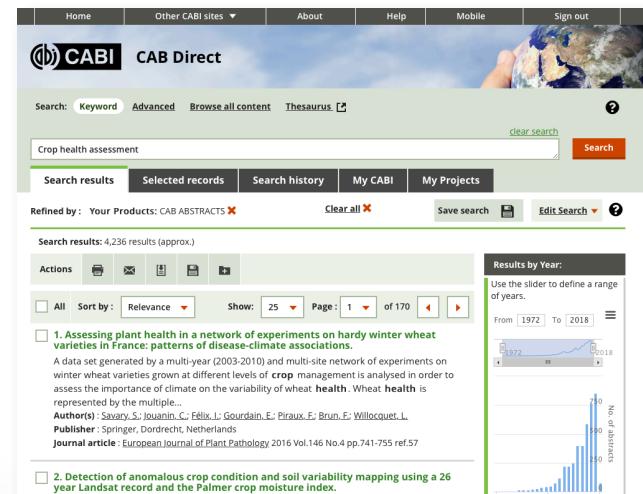
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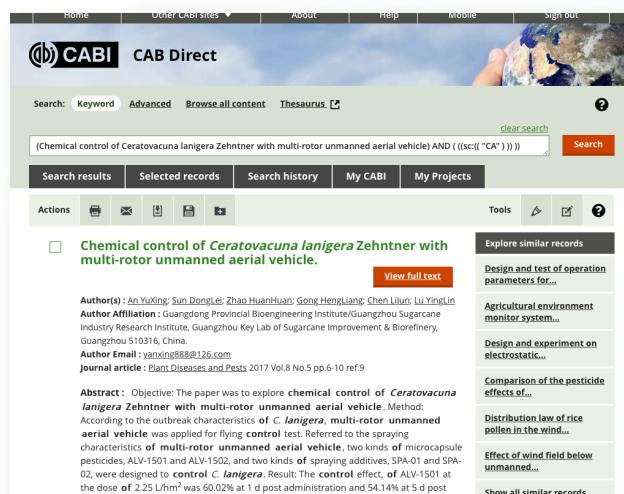
Author(s): Savary, S.; Jouany, C.; Félix, J.; Gourdin, E.; Piau, F.; Brun, F.; Willocquet, L.; Publisher: Springer, Dordrecht, Netherlands

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Chemical control of Ceratovacuna lanigera Zehntner with multi-rotor unmanned aerial vehicle.

Author(s): AnYuxing; SunDonglei; ZhaoHuanHuan; GongHengLiang; ChenLijun; LuYinglin

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Author Email: yanxing888@126.com

Journal article : Plant Diseases and Pests 2017 Vol.8 No.5 pp.6-10 ref.9

**Abstract:** Objective: The paper was to explore chemical control of *Ceratovacuna lanigera* Zehntner with multi-rotor unmanned aerial vehicle. Method: According to the outbreak characteristics of *C. lanigera*, multi-rotor unmanned aerial vehicle was applied for flying control tests. Referring to the spraying characteristics of multi-rotor unmanned aerial vehicle, two kinds of microcapsule pesticides, ALV-1501 and ALV-1502, and two kinds of spraying additives, SPA-01 and SPA-02, were designed to control *C. lanigera*. Result: The control effect of ALV-1501 at the dose of 2.25 L/hm<sup>2</sup> was 60.02% at 1 d post administration and 54.14% at 5 d post administration, respectively. The control effect of SPA-01 at the dose of 2.25 L/hm<sup>2</sup> was 49.42% at 1 d post administration and 54.14% at 5 d post administration, respectively. The control effect of SPA-02 was improved 1.42±1.47 times and 1.16±1.18 times by adding 0.6 L/hm<sup>2</sup> SPA-01 and 0.6 L/hm<sup>2</sup> SPA-02, respectively. Conclusion: The results showed that the chemical control of *C. lanigera* with multi-rotor unmanned aerial vehicle was effective and cost-effective.

**Keywords:** Unmanned aerial vehicle; Sugarcane; *Ceratovacuna lanigera*; Zehntner; Chemical control

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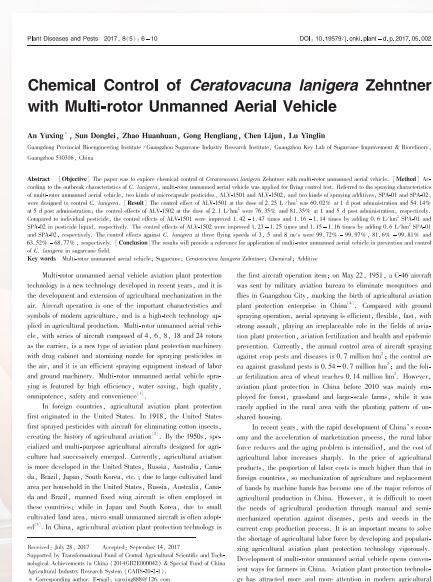
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**Chemical Control of *Ceratovacuna lanigera* Zehntner with Multi-rotor Unmanned Aerial Vehicle**

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**Abstract (Objective)**: The paper was to explore chemical control of *Ceratovacuna lanigera* Zehntner with multi-rotor unmanned aerial vehicle. **Method**: Referring to the outbreak characteristics of *C. lanigera*, multi-rotor unmanned aerial vehicle was applied for flying control test. Referring to the spraying characteristics of multi-rotor unmanned aerial vehicle, two kinds of microcapsule pesticides, ALV-1501 and ALV-1502, and two kinds of spraying additives, SPA-01 and SPA-02, were designed to control *C. lanigera*. **Result**: The control effect of ALV-1501 at the dose of 2.25 L/hm<sup>2</sup> was 60.02% at 1 d post administration and 54.14% at 5 d post administration, respectively. The control effect of SPA-01 at the dose of 2.25 L/hm<sup>2</sup> was 49.42% at 1 d post administration and 54.14% at 5 d post administration, respectively. The control effect of SPA-02 was improved 1.42±1.47 times and 1.16±1.18 times by adding 0.6 L/hm<sup>2</sup> SPA-01 and 0.6 L/hm<sup>2</sup> SPA-02, respectively. **Conclusion**: The results showed that the chemical control of *C. lanigera* with multi-rotor unmanned aerial vehicle was effective and cost-effective.

**Keywords**: Unmanned aerial vehicle; Sugarcane; *Ceratovacuna lanigera*; Zehntner; Chemical control

The first aircraft operation item on May 22, 1951, a C-46 aircraft was used to spray aviation kerosene to eliminate mosquitoes, and it is the earliest application of aerial spraying. In 1958, the United States began to use aircraft to spray herbicides to eliminate plant protection pests in the United States. Compared with ground spraying operation, aerial spraying is efficient, flexible, fast, with strong sound, playing an irreplaceable role in the control of arable land pests and diseases, and has been widely used in pest and disease prevention. Currently, the annual control area of aerial spraying against crop pests and diseases is 0.7 million hm<sup>2</sup>, the control area against grain pests is 0.54~0.7 million hm<sup>2</sup>, and the total area of aerial spraying is about 1.2 million hm<sup>2</sup>. In China, however, aerial plant protection in China before 2010 was mainly employed for forest, grassland and large-scale farms, while it was gradually applied in the rural areas with the planting pattern of scattered household plots.

In recent years, with the rapid development of China's economy and the acceleration of marketization process, the rural labor force has been transferred to non-agricultural sectors, and the demand for labor force in agriculture has decreased, so the proportion of agricultural labor increases sharply. In the price of agricultural products, the proportion of labor costs is much higher than that in industrial products. Therefore, the replacement of agricultural labor by machine leads to the decline of the unit cost of agricultural production in China. However, it is difficult to meet the needs of agricultural production through manual and semi-mechanized methods, which has become a bottleneck in the current crop production process. It is an important means to solve the shortage of agricultural labor force by developing and popularizing agricultural plant protection technology vigorously.

Development of multi-rotor unmanned aerial vehicle is an important way for farmers in China. Aviation plant protection technology has attracted more and more attention in modern agricultural