Problems and Countermeasures of Tropical Orchard Plant Protection Machinery (Equipment) Application

YONGSEN YE

ABSTRACT

Focusing on unmanned aerial vehicle (UAV) spraying pesticides, the methods of theoretical analysis and literature research are adopted in this paper to analyze the actuality of application of tropical orchard plant protection machinery, with the purpose to put forward the strategy of popularizing and perfecting the application of mechanical devices based on the analysis. The current problems in this aspect include low levels of technology, low utilization of pesticides and weak security in pesticide delivery. As for these problems, there is a need to improve the technical level and pesticide utilization to ensure the security of plant protection machinery in tropical orchards. As the application of tropical orchard plant protection machinery has become the general trend of agricultural development in the future, only by profoundly analyzing and solving problems can we make the best use of it in the modernization of agriculture.

KEYWORDS

Tropical orchard plant protection machinery UAV technology application; spraying pesticides; actuality; problems; countermeasures.

INTRODUCTION

With the development of social economy and rapid development of urban-rural integration in China, the modernization of agriculture has become an inevitable trend. The direct indicator measuring the level of agricultural development is the status of modern agricultural equipment application. Tropical orchard plant protection machinery is the modernized machinery used in tropical orchard cultivation. The advantage of this is that it can be used for planting orchards with higher efficiency and the core task is to use UAVs to spray pesticides on tropical orchards. At present, the technology has started to be applied in tropical orchards in China. However, combining with many research results and the actual situation, there are still some general problems in the actual application, which not only restricts the actual role of tropical orchard plant protection machinery, but also, to certain extent, limits the level of agricultural modernization. Therefore, it is of vital practical significance for further promoting the modernization of agriculture to actively find out the problems existing in the process of using tropical orchard plant protection machinery and put forward the tactics to solve these problems from the holistic perspective.
ACTUALITY OF TROPICAL ORCHARD PLANT PROTECTION MACHINERY APPLICATION

Overview of tropical orchard plant protection machinery

Plant protection machinery refers to various types of plant protection machinery widely used in agricultural production. Tropical orchard plant protection machinery can mainly be divided into small power plant protection machinery, self-propelled plant protection machinery and aircraft plant protection machinery. According to the usage, tropical orchard plant protection machinery contains spraying machinery, dusting machinery and fruit processing and some other types. The tropical orchard plant protection machinery studied in this paper mainly refers to the plant protection machinery that utilizes the biological control method and takes UAVs as the carrier to spray the medicine. That tropical orchard applies plant protection machinery for pest control of fruit trees can greatly enhance the efficiency of drug spraying and reduce labor costs. The use of UAVs for tropical orchard chemical pesticide spraying can effectively improve pesticide adhesion, greatly reducing the loss of pesticides. The use of UAV spraying pesticides in tropical orchards has now been widely disseminated and applied at home and abroad, and the technology is also maturing.

The working principle of multi-rotor spraying UAVs employed in tropical Orchard is as follows: The UAV sprays pesticides above the tropical orchard, and then the huge airflow produced by the rotating wings directly sprays liquid pesticides to all levels of fruit trees; after adhering to the surface of branches and leaves of fruit trees, pesticides flow deep into the roots of fruit trees with the respiratory action of plant and airflow and ultimately prevent pests and diseases; UAV spraying pesticides needs tight control of the ground monitoring center.

Fig.1. Picture of UAV spraying pesticides in orchard.
Actuality of application of tropical orchard plant protection machinery

At present, the production and export of tropical fruits in China are constantly expanding. The overall planting quality and fruit quality of tropical fruits also continue to increase, which relies on the continuous improvement of R&D and application of tropical orchard plant protection machinery in China. At the present stage, the overall coverage rate of tropical orchard plant protection machinery application has been more than 70%, which not only greatly promotes the efficiency of pesticide use, but also enhances the application effect. By this way, the content of pesticide residues in tropical fruits are reduced while insect disease prevention is achieved, achieving the effect of high efficiency of pesticide application and reduction of environmental pollution.

Advanced microelectronics technology used in UAV devices improve the overall level of control operations on the ground, enhancing the reliability and security of UAV spraying pesticides. In addition, in response to the national concept of green development, most pesticide spraying and powder spraying by tropical orchard plant protection machinery has realized low spray volume and high precision spraying, which effectively improves the efficiency of farm chemicals while reducing pollution to the nature. At present, the application of tropical orchard plant protection machinery in China is moving towards the intellectualization and optoelectronic integration, and the application level of plant protection machinery in tropical orchards will also be further promoted in the future.

PROBLEMS IN THE APPLICATION OF TROPICAL ORCHARD PLANT PROTECTION MACHINERY

Although tropical orchard plant protection machinery has started to be implemented in some areas in China, there are still some obvious universal problems in general, which limits the maximum effect of tropical orchard plant protection machinery. The specific problems are as follows:

Low level of technology

According to relevant statistics, the overall technology level of the existing tropical orchard plant protection machinery in China is not high, especially when compared with the related technologies in developed countries. Specifically, the technical level of a number of equipment, including unmanned pesticide spraying equipment, currently only reaches the standards of the developed countries in the last century. Furthermore, the relevant technologies widely used in developed countries have not yet been applied in China, such as fully enclosed automatic compounding technology, microcomputer hydraulic control technology and low-capacity wide-angle spraying. It is necessary to arouse more attention in this field at present.

Low utilization of pesticides

Pesticide spraying is the core technology of tropical orchard plant protection machinery. Although the spraying of pesticides has already realized the application of UAV devices at present, the utilization rate of pesticides, from the perspective of the
technical level today, is still low in the process of spraying pesticides. Effective utilization is no more than 50%. It can be seen that there is a huge of pesticide loss in the spraying process, generating serious economic loss and long-lasting influence caused by pesticide residues. This is particularly unfavorable for the construction and development of green orchards and may even threaten the ecological stability.

Weak security in drug delivery

The preparations for UAV spraying pesticides, namely the preparation of pesticides, are still not automated and require the manual allocation of farmers, that is, farmers have to directly contact with pesticides in this process. Farmers can be far away from pesticides during UAV spraying, breaking the limitations of traditional manual sprayers, but there is often a certain number of residues left on the UAV surface and operators may be easily poisoned by direct contact; In addition, UAV applications are also more prone to failure, so that pesticide contact in the troubleshooting operation also weakens the security of the application process.

COUNTERMEASURES TO SOLVE THE PROBLEMS IN THE APPLICATION OF TROPICAL ORCHARD PLANT PROTECTION MACHINERY

The problems mentioned above have restricted the actual effect of tropical orchard plant protection machinery application, and also limited the improvement of agricultural modernization to a certain extent. As tropical orchard plant protection machinery applications continue to expand, factors like growing labor costs lead to the shortage of agricultural workers and reduction of operating efficiency. Moreover, due to geographical constraints also receive too high seedling destruction rate and poor spraying effect. Therefore, the use of farm-oriented UAVs is precisely to solve these problems. UAV pesticide spraying technology has initially been popularized, and its advantages have become more and more obvious. Through continuous improvement of the technology, it is possible to improve the application efficiency of tropical orchard plant protection machinery in an all-round way. Accordingly, the following aspects should be actively rectified in view of the problems existing in the application of tropical orchard plant protection machinery.

To improve the technological level of tropical orchard plant protection machinery

In recent years, the technical requirements of tropical orchards for plant protection machinery continue to rise, and it has become an inevitable trend for mechanical and electrical equipment like UAVs to carry out further technology innovations. This trend of development is not only technically innovative, but also has been constantly optimized and improved in the actual application process. Today, the demand of tropical orchard growers for this kind of equipment is increasing, and at the same time, the economic level and spending power of farmers have also significantly improved. Driven by national environmental protection policies, to improve the technical level of tropical orchard plant protection machinery has become an urgent realistic demand. Therefore, the technical level of tropical orchard plant protection machinery needs to
be further strengthened to be in line with the development of the times. Meanwhile, it is needed to strengthen the innovation in this field to ensure that tropical orchard plant protection machinery can better meet the actual needs of agricultural production and ensure the tropical orchards can obtain sufficient hardware equipment in the planting process, which will provide support for the overall development of agricultural economy and the improvement of orchard production capacity.

To improve the drug utilization of UAV spraying pesticides

In traditional tropical orchards, pesticide utilization rate is too low in the pesticide spraying by UAVs and other plant protection machinery and equipment, which not only causes great economic losses to farmers, but also goes against the construction of environmental agriculture. To solve this problem, it is necessary for the production and research departments of the tropical orchard plant protection machinery to intensify the effective innovation of the mechanical technology in conformity with the concept of sustainable agriculture, trying their best to solve the waste of farm chemicals in UAV spraying pesticides more effectively through effective solutions. For example, some technologies such as electrostatic spray can effectively reduce the amount of pesticide spray per unit area of the orchard, which can not only effectively ensure that pesticides can play its due role, but also can help farmers save planting costs and improve the planting benefits of tropical orchards.

To enhance the safety performance of tropical orchard plant protection machinery

To solve application problems of tropical orchard plant protection machinery should rely on actively enhancing its safety performance. At present, most plant protection machinery now widely used in tropical orchards of China have problems of poor sealing property and leakage, which may lead to the operator being infected in contact with the liquid pesticides. Therefore, it is necessary to continue improving the automatic drug mixing technology and pesticide injection system to minimize operators' contact with the drug, so as to avoid infection and enhance the safety of drug applicators. The application of optoelectronic technology and microelectronic chip technology can also enhance the overall safety and ease of operation convenience of plant protection machinery, promote the overall efficiency of the use of tropical orchard plant protection machinery and thereby optimize the supervision of the scientific management system of the orchard. Not only that, it also has very important guiding significance and practical significance for the overall innovation and development of the machinery in this field.

CONCLUSION

As the application of plant protection machinery in tropical orchard has become the general trend of agricultural development in the future, only by profoundly analyzing and solving problems can we make the best use of it to promote the modernization of agriculture and ensure the increase of agricultural income. The specific direction is as follows:
To actively learn from the advanced experience of developed countries

The development and design of plant protection machinery in foreign countries is more in line with the concept of green development. At the same time, it is more automated and more precise in the operation of UAV spraying pesticides. At present, the electrostatic spraying technology has also been widely applied. The research and innovation of tropical orchard plant protection machinery in China should also actively learn from foreign advanced technologies and experience to speed up the pace of its own innovation and development, promote production efficiency and quality of tropical orchards in China and then achieve a comprehensive upgrade of orchard production capacity.

To innovatively develop large-sized tropical orchard plant protection machinery

The overall reliability of UAV atomizing operation is low in tropical fruit orchards of China, and the spraying range and accuracy also needs to be improved. In addition to the limited production technology and design level of plant protection machinery in China, this can also be attributed to that the quality of mechanical equipment components does not meet standards. Therefore, China should actively enhance the overall design and manufacturing level of plant protection machinery, and increase R&D and innovation in parts of spraying UAVs, such as liquid pumps, shower nozzles, jet nozzles, and so on. At present, there are many small and medium-sized orchards in China, and therefore, it is needed to develop more small-sized and low-polluted manual plant protection machinery. Medium-sized and large-sized plant protection machinery should be also designed for large-scale tropical orchards. By enhancing the development and innovation of plant protection machinery and strengthening research on application of pesticides, it is certainty in the near future that the plant protection machinery design and crop application technology in China will surely meet international standards.

REFERENCES