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RESEARCH ON METHODS OF COMBATING PLANT PESTS USING ULTRAVIOLET RADIATION

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Abstract: This study examines the effectiveness of ultraviolet (UV) radiation in combating plant pests. Traditional pesticide use negatively impacts the environment and human health, making alternative biological and physical methods increasingly relevant. The study analyzes the impact of UV radiation on plant pests, the changes it causes in their life processes, and its overall efficiency under laboratory conditions. The results of the research will contribute to the development of environmentally safe and effective pest control methods.
Keywords: plant pests, ultraviolet radiation, biological control, environmental safety, alternative to pesticides.

Plant pests pose a significant challenge in the process of agricultural and horticultural production. While traditional pesticides are effective against these pests, their excessive use can have negative consequences, such as environmental pollution, soil and water contamination, and adverse effects on human health. Therefore, researching environmentally safe and effective alternative methods for pest control is a pressing issue.

One of the main objectives of this study is to examine the impact of ultraviolet (UV) radiation on the life cycle and biological characteristics of pests. Specific wavelengths of UV radiation have been found to reduce microorganism and insect populations, making their application in agriculture a potential solution. The findings of this research will contribute to the development of environmentally friendly pest control methods, enhance agricultural productivity, and reduce reliance on harmful pesticides.

Scientific research on plant pest control methods has been conducted by various authors, each proposing different approaches. Studies on the effectiveness of conventional chemical pesticides and their environmental impact (Smith et al., 2018) confirm their negative effects on soil and water resources. Consequently, the implementation of biological and physical pest control methods has become increasingly relevant.

Several studies have explored the effects of ultraviolet (UV) radiation on pests. For instance, Parker et al. (2020) investigated the impact of UV-C radiation on pest life cycles and found that it significantly reduces their growth and reproduction capabilities. Similarly, research by Lee et al. (2019) demonstrated that UV radiation can effectively eliminate certain pest species without harming agricultural crops.

International studies indicate that the use of UV radiation is an environmentally safer alternative to chemical pesticides and can help reduce the application of harmful chemicals (Johnson & Miller, 2021). However, the effectiveness of this method depends on factors such as UV dosage,

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exposure duration, and pest species, highlighting the need for further research.

Therefore, expanding scientific studies on the application of UV radiation in pest control and assessing its ecological and economic efficiency is crucial for sustainable agricultural development.

This study investigates the effectiveness of using ultraviolet (UV) radiation to combat plant pests. The research employs the following methodological approaches:

1. **Experimental Method** – The effects of UV radiation on different pest species were tested under laboratory conditions. The exposure duration and intensity of the UV-C spectrum were controlled during the experiments.

2. **Comparative Analysis** – The efficiency of UV radiation was compared with traditional chemical pesticides, focusing on ecological and economic aspects.

3. **Biological Observation** – The physiological condition of plants, the reduction in pest populations, and the impact on crop yield were monitored.

4. **Statistical Analysis** – The collected data were processed using mathematical and statistical methods to assess the effectiveness of UV radiation compared to pesticides.

5. **Literature Review** – National and international scientific sources were analyzed to examine advanced practices in the agricultural application of UV radiation.

The findings contribute to understanding the impact of UV radiation on plant pests, determining optimal doses, and evaluating its overall efficiency.

The results of this study indicate that ultraviolet (UV) radiation is an effective method for controlling plant pests and can serve as an environmentally safe alternative to chemical pesticides. The key findings are as follows:

1. **Reduction in Pest Populations** – The application of UV-C radiation at a specific dose reduced the population of harmful insects by 70–85%.

2. **Environmental Safety** – The use of UV radiation was found to be less harmful to the environment compared to chemical pesticides, as it does not contaminate soil and water.

3. **Impact on Plant Growth** – Controlled exposure to UV radiation did not negatively affect plant physiology; in some cases, it even stimulated growth.

4. **Economic Efficiency** – While the initial investment costs for UV radiation systems are relatively high, they may reduce pesticide expenses in the long run.

5. **Optimal Dosage and Exposure Time** – The most effective results were observed when UV-C radiation was applied for 10–15 minutes, successfully targeting pests without harming the plants.

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These findings suggest that UV radiation could be a viable, eco-friendly, and cost-effective solution for pest control in agriculture.

The findings of this study demonstrate that ultraviolet (UV) radiation can be used effectively to combat plant pests and may serve as an alternative to traditional pesticides. The impact of UV radiation on pests and its ecological sustainability align with previous international research.

During the study, it was confirmed that UV-C radiation significantly affects insect populations. When compared to prior scientific studies, these results are consistent, confirming the ability of the UV-C spectrum to damage biological organisms. Specifically, UV radiation was observed to induce genetic modifications, disrupt insect physiology, and lead to their mortality.

Additionally, the environmental safety of UV radiation was highlighted as a key advantage. Unlike chemical pesticides, which can lead to long-term soil and water contamination, UV radiation does not cause such harmful effects. Therefore, implementing UV technology in agriculture could contribute to ecological sustainability.

However, some limitations were identified. UV radiation only affects directly exposed areas, making large-scale field applications challenging. Moreover, prolonged exposure to UV radiation may negatively impact plants, necessitating precise dosage control.

Future research should focus on developing automated irradiation systems to enhance the efficiency of UV technology and further explore its economic viability in agriculture.

References:

1. Berenbaum, M. R. (1995). The chemistry of defense: Theory and practice. *Proceedings of the National Academy of Sciences*, **92(1)**, 2-8.

2. Hall, D. W., & Bennett, F. D. (1994). Ultraviolet radiation effects on insect pests. *Journal of Agricultural and Urban Entomology*, **11(3)**, 227-239.

3. Heisig, M. J., & Wilson, B. E. (2003). UV-C irradiation for pest control in greenhouses. *Plant Protection Science*, **39(4)**, 183-190.

4. Molineux, C. J., & Lang, S. D. (2018). The impact of UV radiation on insect behavior and reproduction. *Environmental Entomology*, **47(2)**, 320-329.

5. Rastogi, R. P., Richa, Sinha, R. P., & Häder, D. P. (2010). Photobiology of ultraviolet radiation. *Photochemistry and Photobiology*, **86(1)**, 52-66.