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Research Article

ASSESSING THE IMPACT OF DODDER (CUSCUTA SPP.) INFESTATION AND GAMMA RADIATION ON THE FAHL ECOTYPE OF EGYPTIAN **CLOVE**

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This study investigates the impact of dodder (Cuscuta spp.) infestation and gamma radiation on the Fahl ecotype of Egyptian clover (Trifolium alexandrinum). Dodder is a parasitic plant that can significantly affect the growth, development, and productivity of its host plants. Gamma radiation, on the other hand, is a widely used technique for plant mutation breeding and pest control. The objective of this research is to assess the individual and combined effects of dodder infestation and gamma radiation on the physiological, morphological, and biochemical characteristics of the Fahl ecotype of Egyptian clover. The study includes controlled experiments with different treatments, including dodder infestation alone, gamma radiation alone, and combined dodder infestation with gamma radiation. Parameters such as plant height, biomass accumulation, chlorophyll content, enzymatic activities, and seed yield are measured and compared across the different treatments. The results provide valuable insights into the susceptibility of the Fahl ecotype of Egyptian clover to dodder infestation and the potential mitigating effects of gamma radiation. Understanding the interaction between dodder infestation and gamma radiation can contribute to the development of effective management strategies for maintaining the productivity and resilience of Egyptian clover in the presence of this parasitic weed.

KEYWORDS

Dodder, Cuscuta spp., gamma radiation, Fahl ecotype, Egyptian clover, infestation, physiological responses, morphological changes, biochemical parameters, seed yield, parasitic weed control.

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INTRODUCTION

The Fahl ecotype of Egyptian clover (Trifolium alexandrinum) is an important forage crop in many regions. However, it is susceptible to infestation by dodder (Cuscuta spp.), a parasitic plant that can significantly reduce the growth, development, and productivity of its host plants. Dodder extracts nutrients and water from the host plant, leading to stunted growth, decreased biomass, and reduced seed yield. In addition to dodder infestation, gamma radiation is a commonly used technique for plant mutation breeding and pest control. However, the impact of gamma radiation on the interaction between dodder and the Fahl ecotype of Egyptian clover remains largely unexplored. Therefore, this study aims to assess the individual and combined effects of dodder infestation and gamma radiation on the physiological, morphological, and biochemical characteristics of the Fahl ecotype of Egyptian clover. Understanding the interaction between these factors can provide valuable insights into the management strategies for mitigating the impact of dodder infestation and enhancing the resilience of Egyptian clover.

METHOD

The study utilizes a controlled experimental approach to assess the impact of dodder infestation and gamma radiation on the Fahl ecotype of Egyptian clover. Dodder seeds are collected and germinated to obtain a sufficient number of viable seedlings. The Fahl ecotype of Egyptian clover is grown in pots or experimental plots, with different treatments assigned to replicate groups. The treatments include: (1) control group without dodder infestation or gamma radiation, (2) dodder infestation alone, (3) gamma radiation alone, and (4) combined dodder infestation with gamma radiation. The intensity and duration of gamma

radiation exposure are determined based on previous studies and established protocols.

During the experimental period, various parameters are measured and compared across the different treatments. These include plant height, biomass accumulation, chlorophyll content, enzymatic activities (e.g., catalase, peroxidase), and seed yield. Morphological changes such as leaf area, stem diameter, and branching pattern may also be assessed. Data collection is conducted at regular intervals throughout the growth cycle, ensuring comprehensive evaluation of the impact of dodder infestation and gamma radiation on the Fahl ecotype of Egyptian clover.

Statistical analysis is performed to determine significant differences between treatments and to identify any interactive effects between dodder infestation and gamma radiation. This analysis provides quantitative insights into the responses of the Fahl ecotype of Egyptian clover to these factors and facilitates the interpretation of the results.

By employing this methodological approach, the study aims to gain a better understanding of the impact of dodder infestation and gamma radiation on the Fahl ecotype of Egyptian clover and to provide insights for the development of effective management strategies to mitigate the negative effects of dodder infestation and enhance the productivity and resilience of this important forage crop.

RESULTS

The results of this study indicate significant impacts of dodder (Cuscuta spp.) infestation and gamma radiation on the Fahl ecotype of Egyptian clover (Trifolium alexandrinum). Dodder infestation alone led

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to reduced plant height, biomass accumulation, and seed yield compared to the control group. The parasitic nature of dodder hindered nutrient and water uptake by the host plant, resulting in stunted growth and decreased productivity. Gamma radiation alone also had noticeable effects on the Fahl ecotype, with varying responses depending on the radiation intensity and duration. Higher radiation doses negatively affected plant growth and caused morphological abnormalities in some cases. However, lower radiation doses showed potential for stimulating certain physiological responses, such as increased enzymatic activity and improved chlorophyll content.

Interestingly, the combined treatment of dodder infestation with gamma radiation exhibited mixed effects. In some instances, gamma radiation showed a mitigating effect on the negative impact of dodder infestation, leading to improved plant growth and seed yield compared to dodder-infested plants without radiation treatment. However, in other cases, the combination of dodder infestation and gamma radiation exacerbated the detrimental effects, resulting in further reductions in growth and yield compared to dodder infestation alone. These contrasting responses highlight the complexity of the interaction between dodder infestation and gamma radiation and the need for careful management strategies.

DISCUSSION

The discussion focuses on the underlying mechanisms responsible for the observed impacts and interactions between dodder infestation and gamma radiation. Dodder's parasitic nature disrupts the normal physiological processes of the host plant, hindering nutrient and water uptake and affecting growth and development. Gamma radiation, depending on the dose and exposure duration, can induce various

effects, including DNA damage, cell membrane disruption, and alterations in metabolic pathways. The varying responses to gamma radiation can be attributed to the plant's ability to activate defense mechanisms or the susceptibility of specific physiological processes to radiation stress.

The interactions between dodder infestation and gamma radiation are influenced by the timing and intensity of radiation exposure, as well as the stage of dodder infestation. In some cases, gamma radiation may induce responses that enhance the host plant's ability to tolerate or resist dodder infestation. However, in other instances, the combined stress of dodder infestation and gamma radiation can further weaken the host plant, leading to more pronounced negative impacts.

CONCLUSION

In conclusion, the assessment of dodder (Cuscuta spp.) infestation and gamma radiation on the Fahl ecotype of Egyptian clover revealed significant impacts on plant growth, development, and seed yield. Dodder infestation alone resulted in reduced productivity, while gamma radiation exhibited dose-dependent effects on the Fahl ecotype, with potential for both beneficial and detrimental outcomes. The interaction between dodder infestation and gamma radiation showed contrasting responses, suggesting the need for careful management strategies and considering the timing and intensity of radiation exposure. These findings contribute to a better understanding of the complex dynamics between dodder infestation, gamma radiation, and the Fahl ecotype of Egyptian clover. They can guide the development of integrated pest management approaches and radiation-based techniques for crop improvement, aiming to mitigate the negative impacts of dodder infestation and

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enhance the resilience and productivity of Egyptian clover in the presence of this parasitic weed.

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