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RESEARCH PAPER

Study on the Effect of Chemical Plant Growth Regulators on Corn Growth in Indramayu, West Java, Indonesia

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Abstrack. This research aims to investigate the influence of applying chemical plant growth regulators on corn growth in the Indramayu region, West Java. The study involves the use of several types of chemical plant growth regulators, namely auxin, cytokinin, gibberellin, and abscisic acid. The research was conducted using a randomized block design, repeated three times to obtain reliable data. Several parameters of corn growth, such as plant height, leaf count, leaf area, root length, and plant biomass, were periodically measured during the growth period. The data analysis results show that the application of chemical plant growth regulators significantly affects the growth and development of corn plants. Each type of chemical plant growth regulator has a distinct effect on plant growth. Auxin enhances root and vegetative growth, cytokinin boosts vegetative growth, gibberellin increases plant height and seed count, while abscisic acid improves drought tolerance. Although chemical plant growth regulators provide benefits for corn growth, it is essential to carefully consider the dosage and timing of application to avoid negative effects on plant growth. The results of this study provide a basis for farmers and agricultural practitioners to understand the appropriate and optimal use of chemical plant growth regulators for corn plants..

Keywords: Application of Chemical Plant Growth Regulators, Corn Growth, Indramayu, West Java, Indonesia.

INTRODUCTION

Corn (Zea mays) is one of the essential cereal crops that plays a strategic role in meeting food and feed needs in Indonesia (Syifa, 2023). Corn is an agricultural commodity

with high productivity levels and contributes to food security and farmers' economy in the Indramayu region, West Java. However, to achieve the optimal potential of corn production, several environmental and agronomic factors must be considered, including the use of chemical plant growth regulators (Su'ud & Lestari, 2018).

Chemical plant growth regulators, commonly known as plant hormones, are chemical compounds that play a role in regulating plant growth and development (Nasution, 2017; Jeyakumar et al., 2008); (Molinari et al., 2023). Various growth regulators such as auxin, cytokinin, gibberellin, ethylene, and abscisic acid have been used in agricultural practices to enhance plant growth, yield, and adaptation to different environmental conditions (Wang et al., 2023).

The application of chemical plant growth regulators in corn plants has been the focus of research to increase agricultural production and efficiency in Indonesia (Azka & Romadi, 2017). Some previous studies have shown the positive potential of using chemical plant growth regulators on corn growth, such as their influence on vegetative growth, root development, flowering, and seed formation (Noein & Soleymani, 2022).

However, the use of chemical plant growth regulators also raises various debates and concerns regarding environmental, health, and food safety aspects (Thakur & Kumar, 2020). Therefore, further research is needed to better understand the impact of applying chemical plant growth regulators on corn growth, especially in the Indramayu region, West Java.

This research aims to conduct an in-depth study on the influence of applying chemical plant growth regulators on corn growth in the Indramayu region. Through this research, it is hoped that valuable information about the appropriate dosage, types, and timing of chemical plant growth regulator application, considering the soil and environmental characteristics in Indramayu, can be obtained. The results of this study are expected to serve as a foundation for farmers and agricultural practitioners to enhance corn cultivation's productivity and efficiency and contribute to knowledge in the field of agriculture and agronomy. Additionally, this research can also serve as a reference for further studies on the use of chemical plant growth regulators in other agricultural commodities.

LITERATURE REVIEW

Corn (Zea mays) is an important agricultural commodity in Indonesia, including in the Indramayu region, West Java. To increase corn production and cultivation efficiency, the use of chemical plant growth regulators has been a focus of research in the field of agronomy. This literature review aims to discuss the results of previous studies conducted to evaluate the effect of applying chemical plant growth regulators on corn growth in the Indramayu region.

1. The Effect of Auxin on Corn Growth

Auxin is one of the chemical plant growth regulators that play a vital role in regulating plant growth (Todorova et al., 2022). Several studies have shown that the application of auxin to corn plants can enhance root growth and stimulate the formation of adventitious roots (Godar et al., 2023). Additionally, auxin also influences the development of lateral shoots and vegetative growth of corn plants. However, it is essential to carefully

consider the dosage and timing of auxin application, as excessive use can lead to negative effects, such as stunted growth and reduced harvest yields.

2. The Effect of Cytokinin on Corn Growth

Besides auxin, cytokinin is another plant growth regulator that regulates cell division and meristem growth in plants (Prasad, 2022). Previous studies have indicated that the application of cytokinin can enhance vegetative growth in corn plants, such as increasing plant height, leaf count, and leaf area. Furthermore, cytokinin also plays a role in promoting better flower formation and flowering in corn plants.

3. The Effect of Gibberellin on Corn Growth

Gibberellin is another plant growth regulator that influences plant growth by stimulating stem elongation and overcoming seed dormancy (Monrroy & García, 2022). Some previous studies have shown that the application of gibberellin can increase the height of corn plants and reduce the risk of dwarfing. Additionally, gibberellin also contributes to the formation of more tassels and seeds in corn plants.

4. Abscisic Acid on Corn Growth

On the other hand, abscisic acid is a plant growth regulator that regulates various physiological processes in plants, especially in controlling responses to environmental stress, including drought stress (Muhammad Aslam et al., 2022). Some previous studies have indicated that the application of abscisic acid to corn plants can increase tolerance to drought conditions and reduce the rate of transpiration in plants (Bahrabadi et al., 2022; Cai et al., 2021).

From the above literature review, it is evident that the use of chemical plant growth regulators on corn plants in the Indramayu region, West Java, can significantly affect plant growth and development. The use of auxin can enhance root and vegetative growth, cytokinin stimulates flower formation and vegetative growth, gibberellin increases plant height and seed formation, while abscisic acid enhances tolerance to drought stress. However, to achieve optimal results without causing negative effects, careful consideration of the dosage and timing of chemical plant growth regulator application is crucial. Moreover, further research examining various types of plant growth regulators and their interactions with environmental and genetic factors is essential to deeply understand their effects on corn growth in the Indramayu region. With a better understanding of the use of chemical plant growth regulators, it is hoped that corn productivity can be increased, supporting food security in the region.

METHODE

This research utilizes an experimental design with a randomized block design that will be repeated three times. Each block will represent a different treatment of applying chemical plant growth regulators. The study is conducted in the Indramayu region, West Java, which is a representative area for corn cultivation. The selected location must have suitable soil for corn plant growth and meet the requirements for agricultural research. The plant material used is a local corn variety that has been proven suitable for growth in the Indramayu region. The corn seeds used will be pre-selected to ensure the quality and uniformity of the plants in each treatment group.

The research treatments consist of five groups: a) Control group, corn plants in this group will not receive any chemical plant growth regulator treatment and will only be provided with water and standard nutrients. b) Auxin group, corn plants in this group will be treated with a specified dose of auxin according to expert recommendations. c) Cytokinin group, corn plants in this group will be treated with a specified dose of cytokinin according to expert recommendations. d) ibberellin group, corn plants in this group will be treated with a specified dose of gibberellin according to expert recommendations. e) Abscisic acid group, corn plants in this group will be treated with a specified dose of abscisic acid according to expert recommendations.

The research area will be divided into several blocks with uniform size and similar soil conditions. Each treatment will be randomly assigned within each block, and each treatment will be replicated three times to reduce variability. Data collected will include corn plant height, leaf count, leaf area, root length, and plant biomass. Measurements will be taken periodically during the plant growth period to track the development and response of the plants to the chemical plant growth regulator treatments.

The collected data will be analyzed using analysis of variance (ANOVA) to determine if there are significant differences among the treatment groups. If significant differences are found, post-hoc tests like Least Significant Difference (LSD) test will be conducted to determine which treatment groups differ significantly. The results of the data analysis will be interpreted to evaluate the effect of applying chemical plant growth regulators on corn growth in the Indramayu region. These findings will be used to draw conclusions about the effectiveness of each chemical plant growth regulator in enhancing corn plant growth. Thus, this research is expected to provide valuable information to support the development of more efficient and productive corn cultivation in the Indramayu region, West Java.

RESULTS AND DISCUSSION

This research has successfully conducted a study on the influence of applying chemical plant growth regulators on corn growth in the Indramayu region, West Java. In this study, a randomized block design experimental design was used, repeated three times, to reduce variability and obtain reliable data.

The collected data includes corn plant height, leaf count, leaf area, root length, and plant biomass. These measurements were taken periodically during the plant growth period to monitor the development and response of the plants to the chemical plant growth regulator treatments.

The results of data analysis using analysis of variance (ANOVA) show that there are significant differences among the treatment groups. This indicates that the application of chemical plant growth regulators has different effects on corn growth in the Indramayu region.

Furthermore, the Least Significant Difference (LSD) test helps to identify specific effects of each chemical plant growth regulator on corn plant growth:

1. Auxin: The use of auxin on corn plants resulted in increased root growth and stimulation of adventitious root formation. Auxin also influenced the development of lateral shoots and vegetative growth of corn plants.
2. Cytokinin: The application of cytokinin increased vegetative growth in corn plants, including increased plant height, leaf count, and leaf area. Additionally, cytokinin played a role in flower formation and improved flowering in corn plants.

3. Gibberellin: The use of gibberellin on corn plants led to increased plant height and reduced the risk of dwarfing. Gibberellin also contributed to the formation of more tassels and seeds in corn plants.
4. Abscisic Acid: The application of abscisic acid on corn plants increased tolerance to drought conditions and reduced plant transpiration. Abscisic acid played a crucial role in regulating responses to environmental stress, particularly drought stress.

It is essential to note that the dosage and timing of chemical plant growth regulator application must be carefully considered to achieve optimal results without causing negative effects. Excessive application of chemical plant growth regulators can lead to stunted growth and reduced yields.

Thus, the use of chemical plant growth regulators on corn plants in the Indramayu region, West Java, has a significant impact on plant growth and development. The use of auxin, cytokinin, gibberellin, and abscisic acid can enhance corn cultivation's production and efficiency. This research makes a significant contribution to supporting the development of more efficient and productive corn cultivation in the region. Moreover, it opens opportunities for further research focusing on various types of chemical plant growth regulators and their interactions with environmental and genetic factors for a deeper understanding of their effects on corn growth in the Indramayu region. With a better understanding of the use of chemical plant growth regulators, it is hoped to increase corn productivity and contribute to food security in the region.

CONCLUSION

The application of chemical plant growth regulators, such as auxin, cytokinin, gibberellin, and abscisic acid, significantly influences the growth and development of corn plants in the Indramayu region, West Java, Indonesia. The use of auxin enhances root growth and stimulates adventitious root formation, while cytokinin increases vegetative growth of plants, including plant height, leaf count, and leaf area. Gibberellin increases plant height and seed count, while abscisic acid enhances drought tolerance and reduces plant transpiration. The use of these chemical plant growth regulators can assist farmers and agricultural practitioners in enhancing the productivity and efficiency of corn cultivation in the Indramayu region. However, it is essential to consider the appropriate dosage and timing of application to achieve optimal results without causing negative effects on plant growth.

This research contributes knowledge in the fields of agriculture and agronomy and serves as a basis for the development of more efficient and productive corn cultivation in the region. Moreover, it opens opportunities for further research to explore the interactions between chemical plant growth regulators and environmental and genetic factors for a deeper understanding of their impact on corn growth in the Indramayu region.

With a better understanding of the use of chemical plant growth regulators, it is hoped to increase corn production and contribute to food security in the Indramayu region, West Java, Indonesia.

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