

The Effect Hormone Cytokynin and Giberelin On Maize Growth (Zea mays L.)

Pengaruh Aplikasi Hormon Giberelin dan Sitokinin pada Jagung (Zea mays L.)

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ABSTRACT

Maize is important food commodity in Indonesia beside rice. In its development, maize does not only function as food for human, but also as a staple in animal feed industry and other needs, to meet market demand for increased maize production, it is necessary to improve cultivation methods with the application of growth regulators, namely by using gibberellin and cytokinins. Gibberellin is a hormone that affects plant growth in the germination and flowering phases while cytokinins play a role in cell elongation. The aim of this study was to evaluate the effect of gibberellin and cytokinins on stem height, leaf length, panicle length. This study used a completely randomized design with two factors, the concentration of gibberellin and cytokinin 0, 10, 20, 50 ppm. Based on the data analysis below, the combination had a significant effect on the stem height (P₂C₁). Cytokinin at a concentration of 25 and gibberellin 10 ppm increase the stem height. The combination of cytokinin 50 ppm and gibberellin 50 ppm (P₃C₃) affect leaf length and length of panicle maize.

Keywords : Gibberella, Cytokinin, Zea mays

ABSTRAK

Jagung (*Zea mays* L) merupakan komoditi pangan yang penting di Indonesia selain padi. Dalam perkembangannya jagung tidak hanya berfungsi sebagai bahan pangan bagi manusia, namun juga sebagai bahan pokok dalam industri pakan ternak dan kebutuhan lainnya, untuk memenuhi permintaan pasar terhadap peningkatan produksi jagung maka perlu peningkatan cara budidaya dengan aplikasi zat pengatur tumbuh yaitu dengan menggunakan giberelin dan sitokinin. Giberelin merupakan hormon yang mempengaruhi pertumbuhan tanaman pada fase perkecambahan dan pembungaan sedangkan sitokinin berperan dalam pemanjangan sel, pembentukan, akar, tunas dan pembentukan organ pada tanaman lainnya. Tujuan penelitian ini untuk mengevaluasi pengaruh giberelin dan sitokinin terhadap tinggi batang dan panjang daun tanaman jagung. Penelitian ini menggunakan Rancangan Acak lengkap dengan dua faktor yaitu konsentrasi giberelin 0, 10, 25, 50 ppm dan sitokinin 0, 10, 25, 50 ppm. Berdasarkan analisis data di bawah ini bahwa kombinasi P₂C₁ memberikan pengaruh nyata terhadap tinggi tanaman yaitu konsentrasi . Panjang daun dan panjang malai pada jagung yang paling berpengaruh kombinasi P₃C₃ yaitu kombinasi sitokinin 50 ppm dan giberelin 50 ppm.

Keywords : Gibberelin, Sitokinin, Zea mays

INTRODUCTION

Maize (*Zea mays* L) is an important food commodity in Indonesia besides rice. In a development, maize not only use for humans, but also as a basic food industry for poultry. In the last five years, the need of maize as a food industry increases 10-15% per year and it will 2 million ton of per year. There are some

efforts that can be done to increase maize production is to expand planting area and cultivation technique. The increase of production by expand the planting area is more difficult, because the land production decrease and cultivation techniques. Increasing production by expanding the planting area is more difficult, because the land conversion and degradation (Badan Litbang Pertanian, 2012).

There fore, an increase of national maize production is often used cultivation improvement system the growth regulators is administered of gibberelin hormone in a process of growth and development. The addition of the hormone gibberellins to the maize can be able to stimulate cambium cell division, stimulate flowering prematurely (Agus et al., 2009).

Cytokinins is a substitute for adenine to increase cell division and growth regulatory functions. How it works the same as kinetin (6- furfurylaminopurine). The first natural cytokines isolated is zeatin in young seed maize. Zeatin is a cytokinin that is often found in almost high plants, moss, pathogenic and non-pathogenic fungi, bacteria, and tRNA in microorganism cells and animal cells. Cytokinins are a class of hormones that are important in growth because it is essential in cell division (Roitch, 2000). Beside its function cell division, cytokines is also involve delaying the shedding of leaves, flowers, fruit and the growth of shoots, roots and increasing resistance to pathogens. Because of cytokinin has an important role to the plant growth, so the writer interested to evaluate the optimal toward concentration of gibberellin and cytokinins hormone toward of maize on the growth of maize plants, especially on the stem height leaf length, and the length panicle of the plant.

MATERIALS AND METHODS

This research is done in Batang Angkola sub-district from July until October 2020. The material of Materials in the research of maize seeds, soil, cytokinin gibberellin and other supporting materials. The tools used are polybags, sprayers, hoes, rulers, scales, plantlets, plastic strap. This study used a factorial completely randomized design. The first factor was cytokinin P0(0), P1(10), P2(25) and P3(50) and the second was gibberelin with a Concentration of C0(0), C1(10), C2(25), C3(50) ppm. Statistic analysis two way Anava (Gomez,1976).

Observation parameters

The parameters measured are:

1. The height of the maize plant is measured from the point of growth to the end of each week.
2. The length of the third leaf is measured every week until reaching the maize plant post harvest,
3. The panicle length of maize plants was measured at the time the panicle exits The measurement was carried out once a week.

RESULTS AND DISCUSSIONS

Table 1. Stem height of maize (cm)

Giberelin	Cytokinin (ppm)				
	0	10	25	50	
Stem height (cm)					
Week - 5	0	60	72	69	71
	10	67	70	73	71
	25	82	67	62	67
	50	80	73	69	63
Week - 9	0	67	81	83	83
	10	72	83	93	90
	25	93	90	89	89
	50	90	82	85	92
Week - 13	0	106	11	12	11
	10	108	7	0	1
	25	134	10	10	11
	50	110	9	7	6
			11	11	
			3	97	7
			11	10	12
			9	6	0

Based on Table 1, the height of the stalks in maize at the fifth week was most visible at the P2C2 concentration and the most significant at week 13. It was concluded that gibberellins and cytokinins had a significant effect on maize plant height. Gibberellin is proven to increase plant height (Pavlista et al.,2013).

Cytokinins functions to increase stem height by increasing cell elongation (Wicaksono, et al. 2016). The concentrations of gibberellin depend on each other at the stage of cytokinin concentrations as seen in Table 1, so it is suspected that

cytokinin concentrations can decrease the performance of gibberellins and vice versa.

Table 2. Length leaves of maize (cm)

Treatment	C ₀	C ₁	C ₂	C ₃	Average
P ₀	22.1	24.2	23.7	23.5	23.4 ^x
P ₁	24.2	26.8	25.6	26.6	25.8 ^x
P ₂	23.8	29.2	27.6	24.7	26.3 ^{xy}
P ₃	26.2	27.3	26.1	27.8	27 ^y
Average	24. ^x	27. ^y	25. ^x	25. ^y	25 ^x

Based on Table 2 above, the optimal leaf length of the P3C3 combination compared to other concentrations. This proves that gibberellin has a significant effect on cell enlargement so that leaf length increases (Taiz&Zeiger,2002) while cytokinins function in cell division, there by affecting leaf length of maize.

Table 3. Length Panicle of maize cm

Treatment	C ₀	C ₁	C ₂	C ₃	Average
P ₀	24.7	27	24	23.5	26.3 ^x
P ₁	24.2	26.8	26	28	26.3.8 ^x
P ₂	25	27	27.8	27	26. ^y
P ₃	26.2	27.8	28	29	27,8 ^{xy}
Average	25. ^x	27. ^y	26.5. ^x	26,8 ^x	26.8 ^x

Based on the result above, cytokinin and gibberellin give some effect toward the plants growth and production. Cytokinin has function in cell division so that the length of panicle is added. Cytokinin can affect growth such as long panicle formation. Cytokinin treatment that give in 2 weeks after it has flower twice, will increase the panicle growth. Cytokinin can increase length. Which is a of hole size and the activities of leaf the consequence will stimulate the panicles growth. and twice the frequency would increase panicle

growth (Pavlista *et al*,2013)

Cytokinin has function in cell division so that the length of panicle is added. Cytokinin can affect growth such as along panicle formation. Cytokinin treatment that give in 2 weeks often it has flower will increase the panicle growth (Davis,2005). Cytokinin can increase hole strength which is a combination of hole size and the activities of leaf and the activities of the consequence will stimulate applied to plant can affect the balance of endogenous hormone in plants especially gibberellin, auxin and cytokines which have a role in cell elongation (Damagaska,2011). The combination cytokinin and gibberellin P3C3 affect the length of panicle maize. The plant growth and development not only affects external factor but also internal factor, but the environment factor can also affect the plant growth. It doesn't give maximum result, in this case the plant still give a quick response against nutrient absorption that comes from outside plants, because the age of plant really affects nutrient absorption of the plant (Wang, 2011)

CONCLUSION

Based on the statements above, the application of gibberellin and cytokinins can increase height of stem and leaf length in maize plants in combination P2C1. The combination P3C3 leaf length and panicle length in maize plant.

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