Response of Two Varieties Eggplant (*Solanum melongena* L.) Growth and Production to Many Kinds of Gibberellins

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Abstract: The aim of this study was to know the influence of plant growth regulator gibberellins on plant growth and production of Kopek and Gelatik purple eggplant. This study has been done in Educational and Research Garden in Stiper Agriculture University at Maguwoharjo, Depok, Sleman, Yogyakarta in September 2016 to February 2017. The experimental design used was CRD (Completely Randomized Design) with two factors. The first factor was different kinds of gibberellins consisting of G0 (no gibberellin/control), G1 (young bamboo gibberellin) and G2 (corn gibberellin) and G3 (inorganic gibberellin). The second factor was the kind of 2 varieties consisting of purple eggplants. V1 variety was Kopek purple eggplant and V2 variety was Gelatik purple eggplant. The study used six replications. Data were analyzed by Anova followed by DMRT (Duncan’s Multiple Range Test) at 5% significant level. The result showed significantly interaction between kinds of gibberellins with eggplant variety on plant height. The Kopek purple with inorganic gibberellin significantly was the best. Kopek purple eggplant was much more in growth and production than Gelatik purple eggplant.

Key words: Eggplant, gibberellin, plant growth regulator.

1. Introduction

Eggplant is important vegetable that has nutrition materials in 100 g of vegetable consisting of 92.7 g water; 0.6 g mineral; 0.6 mg Fe; 5.7 g carbohydrate; 0.2 g lipid; 0.8 g fibre; 24.0 calories; 27.0 mg P; 223.0 mg K; 30.0 mg Ca; 1.1 g protein; 4.0 mg Na; 0.6 mg Vitamin B3; 0.05 mg Vitamin B2; 10.0 mg Vitamin B1; 130.0 SI Vitamin A and 5.0 mg Vitamin C [1].

This study used some kinds of plant growth regulator gibberellins to increase productivity and growth of eggplant. Gibberellins are used to promote cell division, cell elongation and regulation [2-4]. Using of organic gibberellin was not only useful and easy to make and to apply but also the material was easy to find out. In this study two varieties of eggplants, Kopek and Gelatik, were used because these varieties were demanded more than others in markets.

2. Material and Methods

This experiment was conducted in Educational and Experimental Garden of STIPER Agricultural University in Maguwoharjo, Depok, Sleman, Yogyakarta, Indonesia. Altitude was 118 m high sea level. The study was done in September 2016 until February 2017.

Material used in this study was seed varieties of eggplant, regusol soil, inorganic gibberellin, young bamboo, corns, sugar, Effective Microorganisms 4, water. Organic gibberellins were made young bamboo or corns were blended then added 1 kg of the materials with 1 L water. The mixture added with EM4 and let it 15 days and the extract was ready for use. The experimental design used was CRD (Completely Randomized Design) with two factors. The first factor was two varieties of purple eggplants. V1 = Kopek variety and V2 = Gelatik variety. The second factor was gibberellic acid application. G0 (no gibberellins/control); G1 = young bamboo gibberellins;
G2 = corn gibberellins and G3 = inorganic gibberellins. There were 8 combinations, and 6 replications for a total of 48 experimental units (plants). ANOVA was used to test treatment effect. DMRT (Duncan’s Multiple Range Test) of means separation was done at 0.05 level of probability to determine significance among the variables tested.

3. Results and Discussion

3.1 Plant Height

To know the plant growth, plant height was measured every week. Fig. 1 shows in the first week until 7 weeks, the plant height was apparently same. However, in 8 weeks until 12 weeks inorganic gibberellins on Kopek were the highest. But Gelatik with control was the lowest among others. There was significantly interaction between purple eggplant variety and kinds of gibberellins (Table 1). Inorganic gibberellins applied on Kopek variety were the highest. However control on Gelatik variety was the lowest.

3.2 Fruit Weight

The varieties of eggplants affected the fruit weight but kinds of gibberellins did not affect the fruit weight (Table 2). The fruit weight of Kopek was greater than Gelatik variety.

3.3 Crown Fresh Weight

Kinds of gibberellins did not affect the crown fresh weight, but varieties affected the crown weight (Table 3). The crown fresh weight of Kopek variety was greater than Gelatik.
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Table 2  The effect of kinds of gibberellins and two varieties of eggplant on fruit weight (g).

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Control</th>
<th>Young bamboo</th>
<th>Corn</th>
<th>Anorganic gibberellin</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kopek</td>
<td>82.20</td>
<td>82.51</td>
<td>82.50</td>
<td>82.93</td>
<td>82.53³</td>
</tr>
<tr>
<td>Average</td>
<td>51.97ⁿ</td>
<td>52.13³</td>
<td>52.19¹</td>
<td>52.41ᵃ</td>
<td>52.41ᵃ</td>
</tr>
</tbody>
</table>

Means with the same letter in the same column are not significantly different by DMRT at 0.05.

Table 3  The effect of kinds of gibberellins and two varieties of eggplant on crown fresh weight (g).

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Control</th>
<th>Young bamboo</th>
<th>Corn</th>
<th>Anorganic gibberellin</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kopek</td>
<td>421.9</td>
<td>421.6</td>
<td>418.2</td>
<td>437.4</td>
<td>424.7⁷</td>
</tr>
<tr>
<td>Gelatik</td>
<td>231.2</td>
<td>242.6</td>
<td>237.9</td>
<td>241.4</td>
<td>238.2⁷²</td>
</tr>
<tr>
<td>Average</td>
<td>326.55ⁿ</td>
<td>323.1³</td>
<td>328.05⁴</td>
<td>339.4⁴</td>
<td>339.4⁴</td>
</tr>
</tbody>
</table>

Means with the same letter in the same column are not significantly different by DMRT at 0.05.

3.4 Crown Dry Weight

Kinds varieties of eggplants affected the crown dry weight but kinds of gibberellins did not affect the crown dry weight (Table 4). The crown dry weight of Kopek was greater than Gelatik variety.

3.5 The Sum of Fruits Every Plant

Gelatik variety significantly was more amount than Kopek. The kind of gibberellins did not affect the sum of fruit every plant (Table 5). There was no interaction effect between varieties of eggplant and the kind of gibberellins.

3.6 The Length of Fruits

Kopek had the length of fruits longer than Gelatik. Different kinds of gibberellins affected the same the length of fruits (Table 6).

The kind of gibberellins and two varieties of eggplant interacted on plant height (Table 1). Kopek with inorganic gibberellins was the highest. However, Gelatik without gibberellins was the lowest. This finding estimated that the content of gibberellic acid in inorganic gibberellins was higher than in organic gibberellins in young bamboo and corns. Whereas, Gelatik without gibberellins was the lowest, this case was assumed there was no addition organic and inorganic gibberellins that promoted cell division and elongation. This finding appropriated with gibberellins function that the usage of gibberellins in plant will support formation of proteolitic enzyme that will free tryptophan as an equipment auxin. In addition, other mechanism explained that gibberellins will stimulate cell elongation, because carbohydrate hydrolysis resulted by gibberellins promoted the amylase enzyme. Therefore, sugar concentration increased osmotic pressure in the inside of cell, so cell tend to develop [5]. Many plants are affected by gibberellins application hence an increase plant height [6]. Physiological and genetic studies show that active Gibberellic Acid promotes seed germination and vegetative growth [7, 8]. Gibberellic Acid Insensitive/Repressor Gibberellic Acid and orthologs play major roles in gibberellin signaling in diverse plant species and the gibberellin probably stimulates growth by depression of GAI/RGA [9, 10].

With the usage of many kinds of gibberellins and without gibberellins application (control), the production of eggplant was apparently same on fruit weight, crown fresh and dry weight, the sum of fruits of every plant and the length of fruits (Tables 2-6). This was assumed that the frequency and volume of gibberellins application was too high. One time every two weeks and the volume 50 ml every plant and no water was added on organic gibberrellin application therefore viscosity gibberellic too high, so make this
plant growth regulator could not be absorbed well by plant cell. Therefore, the function of gibberellins did not work optimally. In addition, the expression of genes encoding enzymes involved in the later steps of GA biosynthesis pathway is often subject to regulation by GA itself, and by environmental signals such as light [11]. The location of this study was tropical climate with the light being enormous. Therefore various GA applied did not significantly affect the production of 2 varieties of eggplants.

The kinds of gibberellins did not affect all parameters except the plant height. This indicated that control was the most efficient. One of the most important structural features determining biological activity is 3-hydroxylation. For example, in Arabidopsis, the 3-hydroxylated GA$_4$ is biologically active, whereas its immediate non 3-hydroxylated precursor GA$_9$ is not [12].

Kopek was better than Gelatik on fruit weight, crown fresh and dry weight, and the length of fruit (Tables 2-4 and 6). Genetically Kopek was better than Gelatik. In addition, Gelatik was lighter and smaller than Kopek (Tables 5 and 6). According to Sahid and Murti dan Trisnowati [13], Gelatik genetically is smaller so this variety has fresh weight and is smaller than Kopek. Otherwise, the sum of fruits (Table 5) for Gelatik was more amount than Kopek because for Kopek mostly one until two becoming fruits were signed by swollen flower base. But Kopek had fruits 2-3 on the fruit set.

### 4. Conclusions

Application of the kind of gibberellins was interacted with two purple varieties on the plant height. Inorganic gibberellins on Kopek variety was the highest. Control on Gelatik was the lowest. Application of the kind of gibberellins in two purple varieties of eggplant did not affect the growth and production. Kopek variety was better than Gelatik on growth and production.
References


