Effect of Gibberllic Acid on Earliness of Cauliflower Curd Initiation under Assuit Conditions

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Abstract
This work was carried out to study the effect of using gibberllic acid on earliness of curd in two cauliflower genotypes. Seeds were sown on August 6 in a nursery in 2007/2008 and 2008/2009 seasons respectively. The obtained transplants were planted on September 17 in both seasons. Plants were sprayed twice, first at 2 months after transplanting with gibberllic acid (GA₃) at 0, 50, 100, 200, 400, 800 ppm concentrations, and the second time was after one month from the first spray. The results revealed that, gibberellic acid stimulate plant growth as it increase the height, number of leaves per plant and the fresh weight of whole plant. The results showed that GA₃ at 800ppm concentration was the most appropriate one for floral induction and this concentration also gave the highest total yield in both cultivars.

Key Words: Growth regulators, GA₃, Yield, Brassica oleracea var., botrytis, Brassicaceae.

Introduction
Gibberllic acids are a group of plant growth regulators that have been identified in different plants (MacMillian et al., 1961). Gibberllic acid (GA₃) is used extensively in Egypt to increase the growth of some vegetables such as tomatoes, cabbage and cauliflower (Weaver et al., 1961). Application of gibberellins induced early flowering and affected flower morphology (Richards et al., 2001). It is a stimulant for physiological processes, including flowering, stem growth and seed production. It also is involved in sex expression, development of seedless fruits and retention of foliage.

Gibberellic acid is used by plants to induce growth and, in some cases, flowering and seed germination. As days lengthen, gibberellic acid acts to induce flowering, as in the case of plants in the mustard family like radish, cauliflower and broccoli.

Materials and Methods
The present work was carried out at the Experimental farm of the Faculty of Agriculture, Assiut University, Assiut during 2007/2008 and 2008/2009 seasons respectively. The soil of the farm was clay. Cauliflower cultivar, Amsherey and cauliflower ecotype from El-sharkia governorate were used in this work .Seeds were sown on August 6 in a nursery in 2007/2008 and 2008/2009.
The obtained transplants were done on September 17 in both seasons. Transplants were planted on rows of 3 m long and at 50 cm space between plants. Three rows were included in each plot. Plants were sprayed twice, two months after transplanted and the second time was after one month from the first spray with gibberlic acid (GA₃) at concentrations of 0, 50, 100, 200, 400, 800 ppm in both seasons. The concentrations of gibberlic acid (GA₃) were arranged in Randomized Complete Block Design with three replicates.

Data records:

1. Vegetative characters:-
   1.a- Plant height (cm):
   Data presented in (Table 1), showed that, application of GA₃ resulted in elongation in plant in both genotypes. Plant that sprayed by 800 ppm of GA₃ showed the highest plant height and there is no difference between GA₃ using 200 ppm or 800 ppm on plant height. It could be, generally noted that, the highest concentration of GA₃ were used, the highest plant height will be obtain. There is an exception on 400ppm treatment so there no significant different between using 50 ppm and 400ppm on plant height. Gibberlic acid (GA₃) is used extensively to increase the growth of some vegetables such as tomatoes, cabbage and cauliflower (Weaver et al., 1961). This could be due to the role of GA₃ in stimulating both cell elongation and cell division.

1.b- Fresh weight of whole plant (gm):
   Data on fresh weight of whole plant as affected by concentration of GA₃ treatments are shown in (Table 1). It could be generally, noted that, application of GA₃ improve the value of fresh weight of whole plant in both genotypes. There was an increase in fresh weight of whole plant by increasing the concentration of GA₃ except in 400 ppm treatment so there was

1.c- Number of leaves/plant: All visible leaves were counted (dry leaves were excluded).

2. Yield and its components:-
   2.a- Earliness of curd formation: Days number from transplanting to the day of first harvest were recorded.
   2.b- Average weight of marketable curd (kg):The average weight of 5 curds were recorded.
   2.c- Curd diameter (cm): The average of the two dimensions of 5 curds were measured.
   2.d- Total yield (kg/plot): All marketable curds in each plot were weight and yield/ fed. was calculated.

Statistical analysis:
Data were subjected to statistical analysis according to Snedecor and Cochran (1980) and means of treatments were compared using L.S.D.

Results and Discussion

1- Vegetative characters:
   1.a- Plant height (cm):
   Data presented in (Table 1), showed that, application of GA₃ resulted in elongation in plant in both genotypes. Plant that sprayed by 800ppm of GA₃ showed the highest plant height and there is no difference between GA₃ using 200 ppm or 800 ppm on plant height. It could be, generally noted that, the highest concentration of GA₃ were used, the highest plant height will be obtain. There is an exception on 400ppm treatment so there no significant different between using 50 ppm and 400ppm on plant height. Gibberlic acid (GA₃) is used extensively to increase the growth of some vegetables such as tomatoes, cabbage and cauliflower (Weaver et al., 1961). This could be due to the role of GA₃ in stimulating both cell elongation and cell division.

1.b- Fresh weight of whole plant (kg):
   Data on fresh weight of whole plant as affected by concentration of GA₃ treatments are shown in (Table 1). It could be generally, noted that, application of GA₃ improve the value of fresh weight of whole plant in both genotypes. There was an increase in fresh weight of whole plant by increasing the concentration of GA₃ except in 400 ppm treatment so there was
no difference between this treatment and 50 ppm treatment. Sachs (1965) and Sauter and Kende (1992) reported that gibberellins increased both cell elongation and division.

1.c- Number of leaves/ plant:

As shown in Table (1), leaves number per plant was responded to varying GA$_3$ treatments. Using GA$_3$ has an important role in increment the number of leaves. There is no significant difference between using 50 ppm or 100 ppm on number of leaves in both the cultivar and the ecotype. Also there is no difference between using 200 ppm or 800 ppm on number of leaves per plant.

<table>
<thead>
<tr>
<th>Cultivar/ Ecotype</th>
<th>GA₃ Concentration (ppm)</th>
<th>2007/2008 season</th>
<th>2008/2009 season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plant height (cm)</td>
<td>F.W. of whole plant (kg)</td>
<td>Number of leaves/plant</td>
</tr>
<tr>
<td>El-Sharkia</td>
<td>0</td>
<td>81.38</td>
<td>4.839</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>89.33</td>
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<td></td>
<td>400</td>
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<td>800</td>
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<td>3.985</td>
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<tr>
<td></td>
<td>800</td>
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<td>4.214</td>
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Yield and its components:-

2.a- Earliness of curd development (day):

Data presented in Table (2) showed that, number of days from transplanting to the first harvest were affected by using gibberellic acid. Using 200ppm or 800ppm gave the least number of days from transplanting to the first harvest. Application of gibberellins induced early flowering and affected flower morphology (Richards et al., 2001). It is a
stimulant for physiological processes, including flowering.

2.b-Average weight of marketable curd (kg):

As shown in Table (2), application of gibberellic acid increasing average weight of marketable curd as comparing with control treatment. Using 800 ppm gave the highest value for average weight of marketable curd with El- sharkia ecotype. On other hand, using 200 ppm with Amshery cultivar gave the highest value for this character. Caser (2009), showed that improving curd fresh weight might be referred to the actions of gibberellins on protein and nucleic acid synthesis.

2.c- Curd diameter (cm):

Data on curd diameter as affected by GA$_3$ concentration treatments are shown in Table (2), the results showed that, using both 200 ppm and 800 ppm gave the highest value for curd diameter. However, non-significant difference were detected neither between 50 ppm, 100 ppm nor 400 ppm

2.d- Total yield (kg/plot):

Data presented in Table (2), showed that CA$_3$ application substantially increased the yield of cauliflower particularly 800 ppm, which gave the highest yield. However, plant growth regulators play an important role in high value horticultural crop, it could be increase yield, enhance crop quality and management as reported by Caser (2009), showed that, application of GA$_3$ resulted in an increase in yield of cauliflower.

<table>
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<td>Cultivar/Ecotype</td>
<td>GA$_3$ Concentration (ppm)</td>
<td>Earliness of curd development (day):</td>
<td>Average weight of marketable curd (kg):</td>
<td>Curd diameter (cm):</td>
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</table>

**Conclusion**

Both of cauliflower genotypes used in this study (cv. Amshery and ecotype El-sharkia) have a determinate growth habit. Gibberellic acid application to cauliflower plants has many effects on a plant, but primarily stimulates elongation growth. Spraying a plant with gibberellins will usually cause the plant to grow to a larger than normal. Increasing plant height by using the GA$_3$ was attributed to the role of gibberellins in increasing cell
elongation and division. Taiz and Zeiger (2002) and Sachs (1965) reported that gibberellins increased both cell elongation and division, as evidenced by increase in cell length. Cauliflower plants applied with GA₃ had significantly higher leaf number/plant.

In general, the increase in yield and its components in GA₃-treated plants was attributed to the increasing in vegetative growth.

References


تأثیر استخدام معاملات الجبريلين على تبکیر تكوین القرص في
محصول القنبيث تحت ظروف أسيوط

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أجري هذا البحث بمزرعة كليّة الزراعة باسيوط خلال المواسم الشتوية 2007/2008, 2009/2010 لتثليث تأثیر معاملات الجبريلين بتركيزات مختلفة (صفر، 0.5، 1، 2، 4 غمل في المليون) على تبکیر تكوين القرص في بعض الأصناف المتأخرة الظهور في الأسواق.

وتتلوث أهم نتائج الدراسة فيما يلي:

- أعطى التركيز 0.2 غمل في المليون أعلى القيم لكل من طول النبات وعدد الأوراق للنباتات، أقل عدد للايام من الشتل وحتى أول حصاد (التبکیر في تكوين القرص) أكبر قطر للقرص، أعلى محصول كلي.
- أدى استخدام الجبريلين إلى زيادة الوزن الطازج للنباتات الكلى ولكن لم يكن هناك فرق معنوي عند استخدام المعاملتين 0.5، 0.4 غمل في المليون.
- لم يكن هناك فرق معنوي عند استخدام المعاملتين 0.5، 0.4 غمل في المليون بالنسبة لعدد الأوراق للنباتات.
- أعطى التركيز 0.2 غمل في المليون أعلى وزن للقرص الصالح للتسويق عند استخدامه مع الصنف الأشيري.
- أعطى التركيز 0.8 غمل في المليون أعلى وزن للقرص الصالح للتسويق عند استخدامه مع سلالة الشرقية.