

## Effect of gibberellic acid (GA<sub>3</sub>) on the growth and head development of *Lactuca Sativa* L. var. *capitata*

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### ABSTRACT

*Lactuca sativa* L. var *capitata* plants treated with high concentrations of GA<sub>3</sub> (50 and 100 ppm), resulted in bolting. However enormous increase in the head is observed when the plants were treated with 5, 15, 25 ppm GA<sub>3</sub>. Maximun increase in leaf area as well as head weight was observed when the plants were treated with 15 ppm GA<sub>3</sub>.

### INTRODUCTION

Plant hormones play a vital role in the control of growth not only within the plants as a whole but apparently within the individual organs also. Gibberellic acid (GA<sub>3</sub>) plays an important role in seed germination (1), stem elongation (2), leaf number and size (3). It also affects flower bud formation (4).

Lettuce (*Lactuca sativa* L.) is a major component of every day meal of the common Libyan family throughout the year. Its cultivation, is, therefore, of economic importance. Practically no work has been done on the effect of GA<sub>3</sub> on the growth and development of head in *L. sativa*. Hence the present work was undertaken to study such a valuable plant response.

### MATERIALS AND METHODS

One month old *L. sativa* plants, cultivated in the field, were used in the experiment. These were sprayed, by hand sprayer, with different concentration of GA<sub>3</sub> (5, 15, 25, 50 and 100 ppm), while control plants were sprayed with water alone. Each treatment was replicated six times with one plant per replicate. Treatments were completely randomized. The experiment was repeated for three years (January 1979, 1980, 1981). Observations were taken on fresh weight, dry weight and leaf area. The dry weights were taken after drying in an oven at 103°C for 48 hours. The results were statistically analysed using the (t-test) of significance assuming a normal population.

### RESULTS AND DISCUSSION

In a preliminary experiment, lettuce plants were treated with zero (control), 50 and 100 ppm GA<sub>3</sub>. Three weeks after spraying, an enormous increase in the leaf size was observed as well as mottled chloroses as compared with the control. Treated plants sho-



Fig. 1 — Bolting in *Lactuca sativa* L. var. capitata treated by  $GA_3$  (a) Control plants (b) and (c) Bolted plants treated with 50 and 100 ppm  $GA_3$  respectively.



Fig. 2 — Head formation of *Lactuca sativa* L. var. capitata treated by 15 ppm  $GA_3$  (a) Control plant (b) Treated plant.

wed bolting also (Fig 1). Probably the lower concentrations were more favourable for the head development.

In the following experiment plants were treated with zero (control), 5, 15 and 25 ppm  $GA_3$ , three times at weekly interval.  $GA_3$  at 15 ppm gave the best head formation (Fig. 2).

Enormous increase in the fresh weight and the leaf area was observed in  $GA_3$  treated plants as compared with the control (Table 1).

In the second and 3rd year plants were only treated with zero (control) and 15 ppm  $GA_3$  to follow the development of the head weekly. No difference in fresh weight of shoot was observed in all treatments (Table 2).

However, enormous increases in the fresh and dry weight of shoot were observed in the treated plants after the 2nd and 3rd week (Table 3 and 4). It is clear that spraying the plants with 15 ppm  $GA_3$ , enhanced the growth and development of this variety. Further tests at different seasons and under different soil conditions should be undertaken before the use of  $GA_3$  could be recommended to the farmers.

**Table 1** — Fresh weight and leaf area of *Lactuca sativa* L. var. *capitata* treated with different GA<sub>3</sub> concentration (ppm)

| Treatments  | Fresh weight (g) | Leaf area (cm <sup>2</sup> ) |
|-------------|------------------|------------------------------|
| Control (0) | 271.0            | 2303.5                       |
| 5           | 396.6            | 4256.5                       |
| 15          | 452.5            | 5435.0                       |
| 25          | 375.8            | 4328.2                       |

**Table 2** — Fresh weight (shoot, root and head) of *Lactuca sativa* L. var. *capitata* plant one week after treatment with 15 ppm GA<sub>3</sub>

| Treatment       | Fresh weight (g) |      |      |
|-----------------|------------------|------|------|
|                 | Shoot            | Root | Head |
| Control         | 11.06            | 0.66 | 0.70 |
| GA <sub>3</sub> | 12.71            | 0.67 | 1.93 |

**Table 3** — Fresh weight (shoot and root) of *Lactuca sativa* L. var. *capitata* plant two weeks after treatment with ppm GA<sub>3</sub>

| Treatment       | Fresh weight (g) |         |
|-----------------|------------------|---------|
|                 | shoot            | root    |
| Control         | 152.60           | 6.45    |
| GA <sub>3</sub> | 246.45           | 10.00   |
| Pooled S.D.     | 17.048           | 0.450   |
| Calculated T.   | 5.505*           | 7.889** |

\*\* Means are statistically significant at 1% level

**Table 4** — Fresh weight (shoot, root and head) dry weight and leaf area of *Lactuca sativa* L. var. *capitata* plant three weeks after treatment with 15 ppm GA<sub>3</sub>

| Treatment          | Fresh weight (g) |        |          | Total plant dry weight (g) | Total leaf area (cm <sup>2</sup> ) |
|--------------------|------------------|--------|----------|----------------------------|------------------------------------|
|                    | Shoot            | Root   | Head     |                            |                                    |
| Control            | 271.70           | 17.65  | 79.35    | 21.30                      | 2303.50                            |
| GA <sub>3</sub>    | 452.50           | 19.66  | 197.70   | 25.33                      | 5435.00                            |
| Control Pooled S.D | 47.611           | 37.780 | 12.085   | 4.329                      | 235.128                            |
| Calculated T.      | 4.971**          | 0.638  | 11.753** | 1.118                      | 15.378**                           |

\*\* Means are statistically significant at 1% level

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## تأثير حمض الجيريلليك على النمو وزيادة حجم الرأس في نبات الخس

د. حازم الألوسي

### المستخلص

اظهر نبات الخس (*Lactuca sativa* L. var. *capitata*) استجابة ملموسة في الساق بعد معاملة بهرمون الجبرلين GA<sub>3</sub> (بتركيز 50 و 100 جزء في المليون). كما لوحظت زيادة كبيرة في حجم الرأس بعد معاملة النبات بنفس الهرمون بتركيزات 5 و 15 و 25 جزء في المليون على التوالي. هذا وقد اعطى 15 جزء في المليون من الجبرلين اكبر زيادة في مساحة الورقة، وكذلك في وزن النبات.