

# Effect Influence of **different** plant growth regulators on **growth traits** growth and flowering behaviors of bottle gourds (*Lagenariasiceraria* L.). cv. Narendra Jyoti

## Abstract:

The present investigation **experiment** was carried out with the title Effect Influence of **different** plant growth regulators on **growth traits** growth and flowering behavior of bottle gourds (*Lagenariasiceraria* L.). cv. Narendra Jyoti at the agriculture research farm of Sanjeev Agrawal Global Educational University, Bhopal, during the Zaid season of 2024. The experiment was laid out with RBD (randomized block design) with three replications and thirteen treatments. The experiment was conducted with four levels of each of three plant growth regulators namely (NAA, GA<sub>3</sub> and Ethylene) respectively were sprayed on bottle gourd to find out their response on growth and flowering behaviour. NAA at 50 ppm, 75 ppm, 100 ppm, and 150 ppm, GA<sub>3</sub> at 20 ppm, 40 ppm, 60 ppm, and 80 ppm, ethylene at 50 ppm, 100 ppm, 150 ppm, and 200 ppm were sprayed to Narendra Jyoti at ..... (Which leaf stages). Different growth and flowering behaviours such as number of primary branches, number of nodes to the first male flower anthesis, number of nodes to the first female flower anthesis, days to the first male flower opening, days to the first female flower opening, days to the first harvest, and vine length at the time of final harvesting were observed during this experiment. **Finally, the results indicated that in all growth traits, NAA reported that T<sub>5</sub> NAA at 150 ppm, GA<sub>3</sub> found that T<sub>9</sub> and GA<sub>3</sub> at 80 ppm, and ethrel observed that T<sub>13</sub> ethrel at 200 ppm performed better.**

The result indicated that the growth and flowering behaviour of bottle gourds showed significant better result at NAA @ 150 ppm over NAA @ 100, NAA @ 50 ppm and NAA @ 25 ppm, while in case of Gibberellic acid GA<sub>3</sub> @ 80 ppm recorded better results over GA<sub>3</sub> @ 60, GA<sub>3</sub> @ 40, and GA<sub>3</sub> @ 20 ppm, whereas in ethylene, Ethrel @ 200 ppm performed better results for all growth and flowering traits over Ethrel @ 150, Ethrel @ 100, and Ethrel @ 50 ppm

**Keys words: PGRs, Growth traits, RBD, Narendra Joyti**

## **Introduction**

Bottle gourd (*Lagenariasiceraria* L.), also known as calabash or white-flowered gourd, is a member of the Cucurbitaceae family. It is widely cultivated in tropical and subtropical regions around the world. Known for its diverse uses, the bottle gourd is an essential vegetable crop with significant nutritional, medicinal, and economic value. The exact origin of the bottle gourd is debated, but it is believed to have been domesticated independently in Africa and Asia. Bottle gourd is a vigorous, climbing, or trailing annual vine. The leaves are large, heart-shaped, and hairy, providing ample surface area for photosynthesis. Bottle gourd is low in calories but rich in vitamins and minerals. bottle gourd is a versatile and valuable crop with significant nutritional, medicinal, and economic benefits. Understanding its growth traits and improving its genetic potential through hybridization can lead to better **yield** and resilience, benefiting both farmers and consumers. It is an excellent source of vitamins such as vitamin C and B-complex and minerals such as calcium, magnesium, potassium, and iron, as well as dietary fiber that aids in digestion and helps in maintaining a healthy weight of the body. Bottle gourd has traditional **medicinal value like it has been** used for its therapeutic properties and is good for aiding in digestion and alleviating constipation. Its high water content makes it a natural coolant, helping to keep the body hydrated. They had detoxification, which acts as a detoxifying agent, flushing out toxins from the body. It has **anti-inflammatory property**, used to reduce inflammation and treat urinary infections.

Plant growth regulators are currently used to regulate a wide range of physiological functions, including **growth, flowering and fruiting**. Although growth regulators can be used to alter expression, which is a genetic control method (Ying *et al.*, 1994). The exogenous application of growth regulators sprayed between the 2-4 true leaf stage can increase the expression of female flowers (Hossain, 2004). **Most cucurbitaceous crop plants exhibit female flowering due to the action of common hormones such as auxin, gibberellin, cytokinin, ethylene, and abscisic acid** (Hidayatullah *et al.*, 2012). The sex expression of most of the cucurbitaceous crops commonly depend upon the upregulation or down regulation of one or more growth regulators like auxin, gibberellins, cytokinin, ethylene and abscisic acid (Hidayatullah *et al.*, 2012). A multipurpose chemical hormone that releases ethylene, etrel can stimulate female flowers and boost cucurbitaceous plants' fruit production.

## Materials and methods

The experiment was conducted on agriculture research from Sanjeev Agrawal Global Educational University, Bhopal. The experimental site is located at an altitude of 1506 meters above mean sea level, lying between 32.06° North latitude and 76.61° East longitude. The research work was conducted during *Zaid*, 2024. The mean minimum temperature is 22°C and the mean maximum temperature is 45°C recorded in the months of Feb. to June (respectively). In this experiment, three plant growth regulators, NAA, GA<sub>3</sub>, and Ethylene, were used with different doses, such as NAA at 50 ppm, 75 ppm, 100 ppm, and 150 ppm, while GA<sub>3</sub> at 20 ppm, 40 ppm, 60 ppm, and 80 ppm, ethylene at 50 ppm, 100 ppm, 150 ppm, and 200 ppm on Narendra Jyoti. The treatment details were T<sub>1</sub> (control), T<sub>2</sub>( NAA @ 50 ppm), T<sub>3</sub>( NAA @ 75 ppm), T<sub>4</sub>( NAA @ 100 ppm), T<sub>5</sub>( NAA @ 150 ppm), T<sub>6</sub>(GA<sub>3</sub> @ 20 ppm), T<sub>7</sub>(GA<sub>3</sub> @ 40 ppm), T<sub>8</sub>(GA<sub>3</sub> @ 60 ppm), T<sub>9</sub>(GA<sub>3</sub> @ 80 ppm), T<sub>10</sub> (Ethrel @ 50 ppm), T<sub>11</sub>(Ethrel @ 100 ppm), T<sub>12</sub>(Ethrel @ 150 ppm), and T<sub>13</sub>(Ethrel @ 200 ppm). The data observed on growth and flowering traits are number of primary branches, number of nodes to the first male flower anthesis, number of nodes to the first female flower anthesis, days to the first male flower opening, days to the first female flower opening, days to the first harvest, and vine length at the time of final harvesting. The statistical analysis for RBD was done with the help of Pans and Sukhatme (1985).

## Results and discussion

### Growth and flowering traits of bottle gourds (

#### *Lagenariasiceraria* L.). cv. Narendra Jyoti

#### Number of primary branches:

Table 1 and Figure 1 showed that results in NAA showed that T<sub>5</sub> @ 150 ppm had the maximum number of primary branches over T<sub>4</sub>, T<sub>3</sub>, and T<sub>2</sub>, while in GA<sub>3</sub> it was found that T<sub>9</sub> at 40 ppm had the maximum primary branches, followed by T<sub>8</sub>, T<sub>7</sub>, and T<sub>6</sub>, whereas in Ethylene it was recorded that T<sub>13</sub> at 200 ppm had the highest primary branches, followed by T<sub>12</sub>, T<sub>11</sub>, and T<sub>10</sub>. However, the lowest primary branches were reported in T<sub>1</sub> (control), similar finding reported by Kumari *et al.* (2019) and Barot *et al.* (2022).

Note- Kindly suggest any one of the above treatment including NAA, GA<sub>3</sub> and Ethylene, which one found to be best at which concentration for Number of primary branches along with proper interpretation which is missing in this result and discussion section.

### **Number of nodes to first male flower anthesis:**

Nodes to the first male flower anthesis recorded that the T<sub>1</sub> (control) had taken maximum nodes for anthesis. In NAA, T<sub>5</sub> at 150 ppm had taken minimum nodes for male flower anthesis, followed by T<sub>4</sub>, T<sub>3</sub>, and T<sub>2</sub>, while in GA<sub>3</sub>, it was found that T<sub>9</sub> at 40 ppm had taken minimum nodes over T<sub>8</sub>, T<sub>7</sub>, and T<sub>6</sub>, whereas in ethylene, it was reported that T<sub>13</sub> at 200 ppm had taken minimum nodes for male flower anthesis, followed by T<sub>12</sub>, T<sub>11</sub>, and T<sub>10</sub>. The data presented in table 1 and figure 1, closed results reported by Kumar *et al.* (2020) and Sabu *et al.* (2022).

Note- Kindly suggest any one of the above treatment including NAA, GA<sub>3</sub> and Ethylene, which one found to be best at which concentration for **Number of nodes to first male flower anthesis** along with proper interpretation which is missing in this result and discussion section.

### **Number of nodes to first female flower anthesis:**

Data presented in table 1 and figure 1 revealed that NAA T<sub>5</sub>@ 150 ppm at 150 ppm was taken as minimum nodes for female flower anthesis, followed by T<sub>4</sub>, T<sub>3</sub>, and T<sub>2</sub>, while GA<sub>3</sub> found that T<sub>9</sub> at 40 ppm was taken as minimum nodes over T<sub>8</sub>, T<sub>7</sub>, and T<sub>6</sub>, whereas ethylene reported that T<sub>13</sub> at 200 ppm was taken as minimum nodes for male flower anthesis, followed by T<sub>12</sub>, T<sub>11</sub>, and T<sub>10</sub>. However, maximum nodes were taken in T<sub>1</sub> (control), this result was conformed with Kumar *et al.* (2020) and Moniruzzama *et al.* (2019).

Note- Kindly suggest any one of the above treatment including NAA, GA<sub>3</sub> and Ethylene, which one found to be best at which concentration for **Number of nodes to first female flower anthesis** along with proper interpretation which is missing in this result and discussion section.

### **Days to first male flower opening:**

Table 2 and Figure 2 showed that in NAA@ 150 ppm (T<sub>5</sub>) had taken a minimum number of days to first male flower opening, followed by T<sub>4</sub>, T<sub>3</sub>, and T<sub>2</sub>, while in GA<sub>3</sub>, it was recorded that T<sub>9</sub> had taken a minimum number of days over T<sub>8</sub>, T<sub>7</sub>, and T<sub>6</sub>, whereas in ethylene, it was recoded that T<sub>13</sub> had some minimum days for first male flower opening over T<sub>12</sub>, T<sub>11</sub>, and T<sub>10</sub>. However,

in T<sub>1</sub> (control), the maximum days for the first male flower to open were taken, result conformed with Duhan et al. (2022) and Barot et al. (2022).

Note- Kindly suggest any one of the above treatment including NAA, GA<sub>3</sub> and Ethylene, which one found to be best at which concentration for **Days to first male flower opening** along with proper interpretation which is missing in this result and discussion section.

### **Days to first female flower opening:**

In the case of days to first female flower opening presented in Table 2 and Figure 2, it was recorded that NAA@150 ppm(T<sub>5</sub>) was taken as the as the minimum number of days to first female flower opening, followed by T<sub>4</sub>, T<sub>3</sub>, and T<sub>2</sub>, while in the case of GA<sub>3</sub>, it was recorded that T<sub>9</sub> was taken as the as the minimum number of days, followed by T<sub>8</sub>, T<sub>7</sub>, and T<sub>6</sub>, whereas in ethylene, it was recoded that T<sub>13</sub> had the minimum days for first female flower opening over T<sub>12</sub>, T<sub>11</sub>, and T<sub>10</sub>. However, in T<sub>1</sub> (control), the maximum days for the first female flower to open were taken, the findings align with those reported by Sabu et al. (2022) and Kumari et al. (2019).

Note- Kindly suggest any one of the above treatment including NAA, GA<sub>3</sub> and Ethylene, which one found to be best at which concentration for **Days to first female flower opening** along with proper interpretation which is missing in this result and discussion section.

### **Days to first harvest**

Data presented in table 2 and figure 2 showed that NAA@ 150 ppm T<sub>5</sub> had a minimum number of days for first harvesting over T<sub>4</sub>, T<sub>3</sub>, and T<sub>2</sub>, while in the case of GA<sub>3</sub>, it was reported that T<sub>9</sub> had a minimum number of days over T<sub>8</sub>, T<sub>7</sub>, and T<sub>6</sub>, whereas in ethylene, it was recoded that T<sub>13</sub> had some minimum days for harvesting over T<sub>12</sub>, T<sub>11</sub>, and T<sub>10</sub>. However, in T<sub>1</sub> (control) taken maximum days to first harvesting, results closely match those of Barot et al. (2022) and Kumar et al. (2020), Barot *et al.* (2022) and Kumari (2019).

Note- Kindly suggest any one of the above treatment including NAA, GA<sub>3</sub> and Ethylene, which one found to be best at which concentration for **Days to first harvest** along with proper interpretation which is missing in this result and discussion section.

### Vine length at the time of final harvesting:

Vine length at the time of final harvesting was recorded as **NAA @ 150 ppm (T<sub>5</sub>)** having the maximum vine length over T<sub>4</sub>, T<sub>3</sub>, and T<sub>2</sub>, while in the case of GA<sub>3</sub>, it was reported that T<sub>9</sub> had the maximum vine length over T<sub>8</sub>, T<sub>7</sub>, and T<sub>6</sub>, whereas in the case of the case of ethylene, it was recoded that T<sub>13</sub> had the maximum vine length, followed by T<sub>12</sub>, T<sub>11</sub>, and T<sub>10</sub>. However, T<sub>1</sub> (the control) had the minimum vine length over all three plant growth regulators, result was conformed with Kumar et al. (2020) and Kumari et al (2019).

Note- Kindly suggest any one of the above treatment including NAA, GA<sub>3</sub> and Ethylene, which one found to be best at which concentration for **Vine length at the time of final harvesting** along with proper interpretation which is missing in this result and discussion section.

Note- In result section, instead of writing treatment name T<sub>1</sub>, or T<sub>2</sub>, write the treatment details and you can make T<sub>1</sub> or T<sub>2</sub> in bracket.

Table-1. Effect of plant growth regulators on number of primary branches, number of nodes to first male and female flower anthesis.

		Number of primary branches	Number of nodes to first male flower anthesis	Number of nodes to first female flower anthesis
<b>T1</b>	<b>Control</b>	4.53	9.55	11.44
<b>T2</b>	<b>NAA@50ppm</b>	5.94	9.27	11.20
<b>T3</b>	<b>NAA@75ppm</b>	4.97	8.18	9.20
<b>T4</b>	<b>NAA@100ppm</b>	6.11	7.70	8.94
<b>T5</b>	<b>NAA@150ppm</b>	6.35	7.38	8.36
<b>T6</b>	<b>GA3@20ppm</b>	5.04	8.06	10.94
<b>T7</b>	<b>GA3@40ppm</b>	5.71	7.84	9.94
<b>T8</b>	<b>GA3@60ppm</b>	5.77	7.78	8.87
<b>T9</b>	<b>GA3@80ppm</b>	6.17	7.07	8.54
<b>T10</b>	<b>Ethetal@50</b>	5.06	8.87	10.10
<b>T11</b>	<b>Ethetal@100</b>	5.97	7.65	9.47
<b>T12</b>	<b>Ethetal@150</b>	6.71	7.24	8.42
<b>T13</b>	<b>Ethetal@200</b>	6.37	7.20	7.70
	<b>C.D.</b>	<b>0.49</b>	<b>0.72</b>	<b>0.86</b>
	<b>SE(m)</b>	<b>0.17</b>	<b>0.25</b>	<b>0.29</b>
	<b>SE(d)</b>	<b>0.24</b>	<b>0.35</b>	<b>0.41</b>
	<b>C.V.</b>	<b>5.05</b>	<b>5.31</b>	<b>5.33</b>

Figure-1. Effect of plant growth regulators on number of primary branches, number of nodes to first male and female flower anthesis.

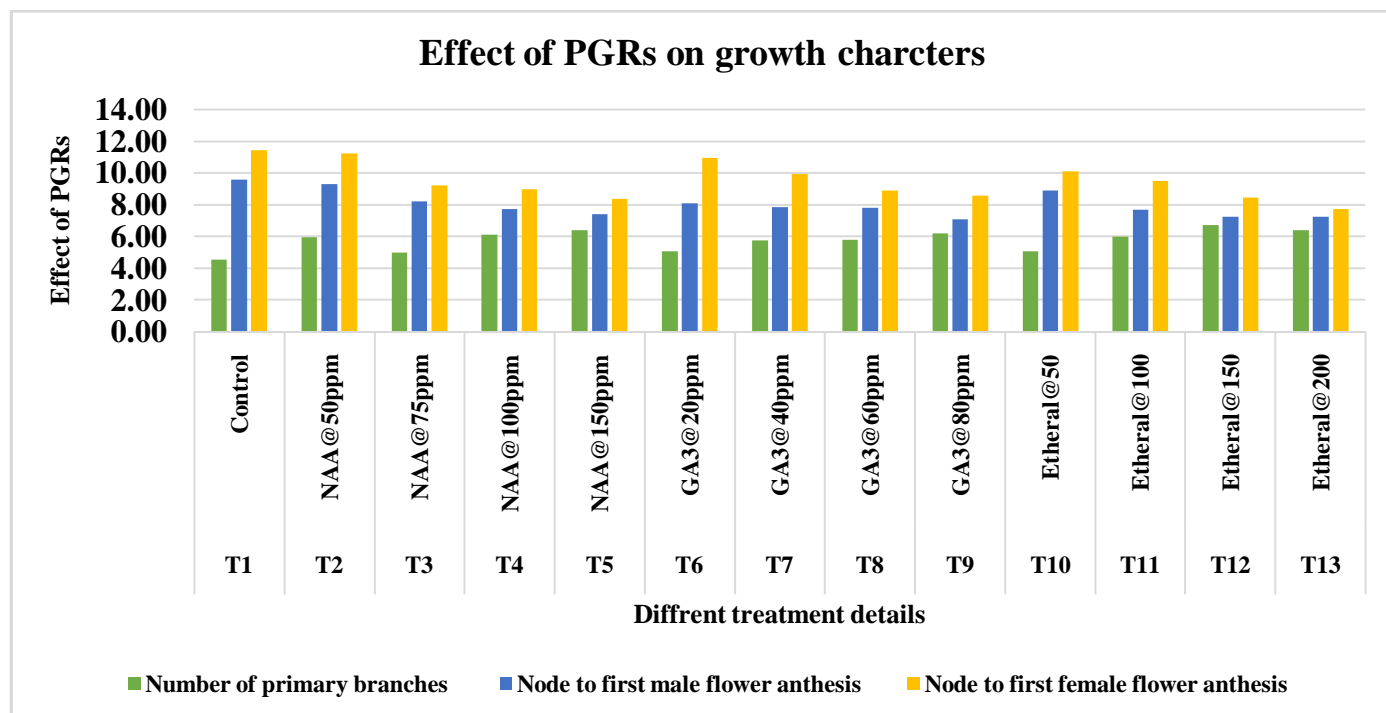
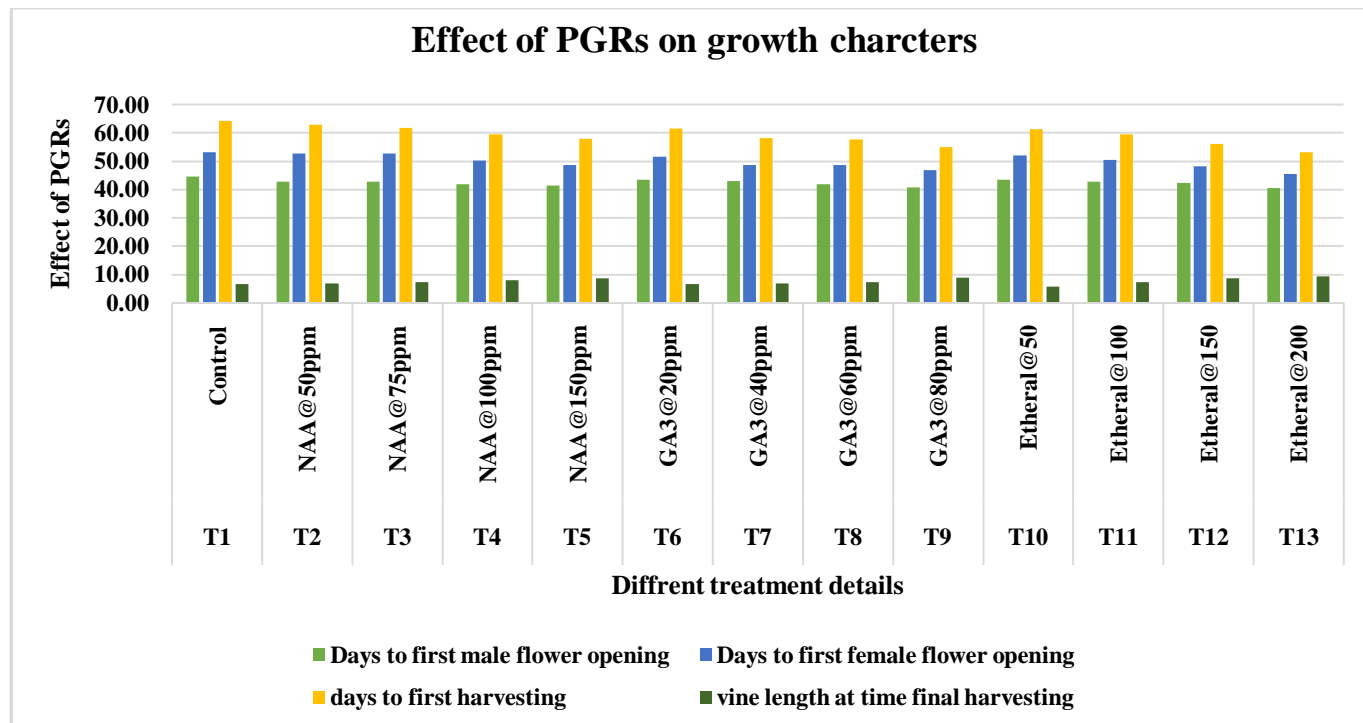


Table-2. Effect of plant growth regulators on days to first male, female flower opening and harvesting and vine length at the time of final harvesting.

		Days to first male flower opening	Days to first female flower opening	days to first harvesting	vine length at time final harvesting (Please mention the unit)
<b>T1</b>	<b>Control</b>	44.45	53.05	64.11	6.46
<b>T2</b>	<b>NAA@50ppm</b>	42.75	52.72	62.82	6.88
<b>T3</b>	<b>NAA@75ppm</b>	42.65	52.52	61.55	7.28
<b>T4</b>	<b>NAA@100ppm</b>	41.78	50.12	59.49	7.81
<b>T5</b>	<b>NAA@150ppm</b>	41.41	48.65	57.76	8.48
<b>T6</b>	<b>GA3@20ppm</b>	43.44	51.45	61.38	6.46
<b>T7</b>	<b>GA3@40ppm</b>	42.85	48.52	58.09	6.74
<b>T8</b>	<b>GA3@60ppm</b>	41.70	48.45	57.60	7.19
<b>T9</b>	<b>GA3@80ppm</b>	40.59	46.85	54.82	8.73
<b>T10</b>	<b>Etherval@50</b>	43.36	51.99	61.26	5.59
<b>T11</b>	<b>Etherval@100</b>	42.66	50.39	59.33	7.17
<b>T12</b>	<b>Etherval@150</b>	42.15	48.20	55.91	8.57
<b>T13</b>	<b>Etherval@200</b>	40.36	45.32	52.95	9.36
	<b>C.D.</b>	<b>2.26</b>	<b>4.72</b>	<b>4.33</b>	<b>0.79</b>
	<b>SE(m)</b>	<b>0.77</b>	<b>1.61</b>	<b>1.48</b>	<b>0.27</b>
	<b>SE(d)</b>	<b>1.09</b>	<b>2.27</b>	<b>4.36</b>	<b>0.38</b>

	C.V.	3.16	5.58	5.33	6.29
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Figure 2. Effect of plant growth regulators on days to first male, female flower opening and harvesting and vine length at the time of final harvesting.



## Conclusion

On the basis of the results, it was concluded that different plant growth regulators reported that in NAA @ 150 ppm performed better results over 100, 50 ppm and 25ppm, while GA<sub>3</sub>@ 80 ppm recorded better results over 60, 40, and 20 ppm, whereas in ethylene @ 200 ppm performed better results for all growth and flowering traits over 150, 100, and 50 ppm.

Note- Kindly suggest any one of the above treatment including NAA, GA<sub>3</sub> and Ethylene, which one found to be best at which concentration for **growth and flowering traits of bottle gourd (*Lagenariasiceraria*L.) cv. Narendra Jyoti** which can be used as recommended consideration for further research and study.

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