Effect of sodium para nitrophenolate on flowering and yield of cucumber (*Cucumis sativus* L.)

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**Abstract**

An experiment was conducted at College of Agriculture, Vijayapura, University of Agricultural Sciences, Dharwad during the year 2019 to know the influence of Sodium para nitrophenolate on flowering and yield of cucumber variety of Dharwad local. Temperature influences the genes responsible the synthesis of hormones leading to flower formation. Exogenous application of growth regulators at appropriate stage alters the sex ratio. Among the treatments of sodium para nitrophenolate at 0.3% SL @ 2ml/L of water recorded low sex ratio as well as high yield.

**Keywords:** Sodium para nitrophenolate, cucumber, sex ratio

**Introduction**

Cucumber (*Cucumis sativus* L.) is a widely cultivated plant belonging to the family Cucurbitaceae. It exhibits a fascinating flowering pattern with staminate, pistillate and hermaphroditic. It is an annual, dioecious creeping vine that grows up trellises or other supports, wrapping around them with thin, spiral tendrils. The plant has large leaves that form a canopy over the fruit. The fruit of the cucumber is roughly cylindrical, elongated with tapered ends.

Cucumber is used as salad, pickle and also as cooked vegetable because of its low calorie content. Tender leaves are also used as vegetables. Fruits help in the cure of constipation, jaundice and indigestion. Seeds have a number of ayurvedic uses. The fruits and seeds possess cooling properties, hence used as astringent and antipyretic. Cucumber has originated from India, but is now grown in most continents. Many different varieties are traded on the global market.

The fruits are highly nutritive and have very high water content and very low calories. The fruit is used as a vegetable or salad. It is rich in minerals, thiamine, niacin and vitamin C. (0.38 g, 0.3 mg, 0.2 mg and 78 mg, respectively per 100 g of edible fruit). Fruits consist about 80 percent of edible portion which contains 95% water, 0.7% protein, 0.1% fat, 3.4% carbohydrates, 0.4% fiber and 0.4% ash (Aykroyd, 1963) [1].

The sex expression of cucumber is determined by genetics as well as environmental factors such as photoperiod and temperature. Along with the environment endogenous levels of phytohormones like auxin and gibberellins at time and set of ontogeny determine the sex ratio and sequence of flowering (Dey et al., 2005) [2]. Among the plant growth regulators GA3 and NAA have a great importance on sex modification in various cucurbitaceous crops (Hilli, 2010) [3]. Exogenous application of plant growth regulators can alter the sex ratio and sequence, if applied at two and four leaf stages which are critical stages to promote or suppress either of the sex (Hossain 2006) [4].

**Material and Methods:** The experiment was conducted at the College of Agriculture, Vijayapura, UAS, Dharwad. The experiment was laid out in randomized block design with three replications and eight treatments were imposed on cucumber variety of Dharwad local. The plot size was 4m X 6m with spacing of 1.5 m. between row to row and 0.75m between plants. Along with farm yard manure (20 t/ha) was applied before the preparation of bed. Nitrogen, phosphorous and potash were applied at rate of 60:50:80 kg/ha and also sowing was done in the month of August with two seeds per hill at 2-3 cm depth. Later, gap filling and thinning were carried out and maintained one plant per hill.
The treatments consist of six different levels of sodium para nitrophenolate (C₆H₄NNaO₃) @ 0.3% SL, ethrel @ 250 ppm and control (water spray) and also treatments of three foliar sprays were imposed at 20, 35 and 50 days after sowing. The observations were recorded such as number of primary branches per plant, days to first male flowering, days to first female flowering, days to 50% flowering, total number of male flowers per plant, total number of female flowers per plant, fruit length, fruit diameter, number of fruits per plant, weight of fruits, average fruit weight per plant and fruit yield per hectare from the five tagged plants from each of the treatment.

**Treatment Details**

| Sl. No | Treatments                     | Dosage   |
|--------|--------------------------------|----------|
| T1     | Sodium para nitrophenolate 0.3% SL | 1ml/l    |
| T2     | Sodium para nitrophenolate 0.3% SL | 2ml/l    |
| T3     | Sodium para nitrophenolate 0.3% SL | 3ml/l    |
| T4     | Sodium para nitrophenolate 0.3% SL | 4ml/l    |
| T5     | Sodium para nitrophenolate 0.3% SL | 5ml/l    |
| 6      | Sodium para nitrophenolate 0.3% SL | 6ml/l    |
| 7      | Ethrel                         | 250 ppm  |
| 8      | Untreated control –Water spray  | Water    |

**Results and Discussion**

**Effect of sodium paranitrophenolate on phenology of cucumber**

Cucumbers are known for their plasticity in sex expression. The photoperiod significantly influences the flower development processes, while temperature strongly stimulate phytohormone-pathway-related genes (Lai, et.al, 2018)[6]. In the present study number primary branches differed significantly among the treatments. Highest number of primary branches per plant (4.8) was observed in 3 ml/l C₆H₄NNaO₃ followed by ethrel 250 ppm (4.7). There was no significant difference in days to first flowering as well as days to 50% flowering. Days to first flowering and 50% flowering were lowest in the 3 ml/l C₆H₄NNaO₃ treatment (32.7 and 39.7 days respectively). (Table 1)

Days to first female flower appearance differed significantly among the treatments. Days to first female flower to form was lowest in Ethrel 250 ppm (39.0) followed by 3 ml/l C₆H₄NNaO₃ (40.7). Whereas, untreated control (water) had recorded highest number of days (46.0).

**Growth regulators have tremendous effects on sex expression and flowering in various cucurbits leading to either suppression of male flowers or increasing in the number of female flowers (Mosum and Masri, 1999) [7] without affecting environment and human health.**

Sodium para nitrophenolate significantly affected the formation of number of male and female flowers. Highest number male flowers per plant were observed in the treatment 2ml/l C₆H₄NNaO₃ (70.7) followed by 5 ml/l C₆H₄NNaO₃ (62.1) compared to control (water) which recorded the least (47.8). Number of female flowers per plant were highest (18.7) in 2 ml/l C₆H₄NNaO₃ followed by Ethrel 250 ppm (17.7) compared to control (water spray) which recorded the least number of female flowers per plant (10.0). The ratio of male to female flowers was lowest (4.52) in 3ml/l followed by 2ml/l C₆H₄NNaO₃ (4.52) compared to control (6.03).

**Effect of sodium paranitrophenolate on yield components of cucumber**

Foliar spray of sodium paranitrophenolate increased the fruit length, size as well as yield (Hussein et al 2019) [8]. The cucumber fruit length differed significantly among the treatments. Ethrel 250 ppm had recorded highest fruit length (31.0 cm) followed by 1 ml/L C₆H₄NNaO₃ (28.0cm).Whereas, fruit length was least (18.0cm) in control. The fruit diameter differed significantly. It was highest (7.7 cm) in 1ml/L C₆H₄NNaO₃ followed by 3 ml/L C₆H₄NNaO₃ and ethrel 250 ppm. The average fruit weight was highest in 3 ml/l C₆H₄NNaO₃ followed by 6 ml/L C₆H₄NNaO₃ treatment (Table 2).

Number of fruits per plant and yield were influenced by sodium para nitrophenolate spray (Hussein et al 2019) [8]. Highest number of fruits per plant (15.0) was observed in 2ml/L C₆H₄NNaO₃ treatment followed by 3 ml/L C₆H₄NNaO₃ (12.7) compared to control which recorded the least (6.0). The fruit yield differed significantly among the treatments. Highest fruit yield per plant was recorded in 3 ml/L C₆H₄NNaO₃ (2.55kg) followed by 2 ml/L C₆H₄NNaO₃ (2.35 kg) compared to control (0.86 kg). Fruit yield per hectare also differed significantly. Highest fruit yield of 300 q/ha was recorded in 2 ml/L C₆H₄NNaO₃ followed by 3ml/L C₆H₄NNaO₃ (266 q/ha) when compared to control (90 q/ha).

**Table 1: Effect of Sodium para nitrophenolate on phenology of cucumber**

| Treatments | Particulars | Primary branches per plant | Days to first flowering | Days to 50% flowering | Days to First female flowering | No. of male flower per plant | No. of female flower Per plant | Male to Female ratio |
|------------|-------------|-----------------------------|------------------------|-----------------------|-------------------------------|-------------------------------|------------------------------|----------------------|
| T1         | Sodium para nitrophenolate at 0.3% SL @ 1ml/L | 3.3                        | 33.7                   | 39.7                  | 43.3                          | 59.2                          | 13.7                         | 5.49                 |
| T2         | Sodium para nitrophenolate at 0.3% SL @ 2ml/L | 3.8                        | 34.7                   | 40.3                  | 43.0                          | 70.7                          | 18.7                         | 4.73                 |
| T3         | Sodium para nitrophenolate at 0.3% SL @ 3ml/L | 4.8                        | 32.7                   | 39.7                  | 40.7                          | 55.9                          | 15.7                         | 4.52                 |
| T4         | Sodium para nitrophenolate at 0.3% SL @ 4ml/L | 4.3                        | 32.0                   | 42.0                  | 44.7                          | 58.6                          | 14.3                         | 5.18                 |
| T5         | Sodium para nitrophenolate at 0.3% SL @ 5ml/L | 4.4                        | 33.3                   | 39.7                  | 43.3                          | 62.1                          | 14.3                         | 5.46                 |
| T6         | Sodium para nitrophenolate at 0.3% SL @ 6ml/L | 3.7                        | 33.7                   | 41.7                  | 46.0                          | 57.3                          | 14.0                         | 5.17                 |
| T7         | Ethrel @ 250 ppm                              | 4.7                        | 33.0                   | 40.0                  | 39.0                          | 60.4                          | 17.7                         | 4.88                 |
| T8         | water spray                                   | 3.4                        | 32.7                   | 41.3                  | 46.0                          | 47.8                          | 10.0                         | 6.03                 |
|            | S.Em ±                                         | 0.2                        | 1.3                    | 1.0                   | 0.9                           | 2.2                           | 1.0                          |                      |
|            | CV                                             | 8.9                        | 6.6                    | 4.1                   | 3.7                           | 5.3                           | 11.8                         |                      |
|            | CD @ 5%                                        | 0.6                        | 3.8                    | 2.9                   | 2.8                           | 6.8                           | 3.0                          |                      |
Table 2: Effect of Sodium para nitrophenolate on fruit and fruit yield of cucumber

| Treatments | Particulars                                      | Fruit length (cm) | Fruit Diameter (cm) | Avg. fruit weight (g/fruit) | No. of fruits/plant | Fruit weight (kg/plant) | Fruit yield (q/ha) |
|------------|-------------------------------------------------|-------------------|---------------------|-----------------------------|---------------------|-------------------------|-------------------|
| T₁         | Sodium para nitrophenolate at 0.3% SL @ 1ml/L  | 28.0              | 7.7                 | 136                         | 10.7                | 1.44                    | 150               |
| T₂         | Sodium para nitrophenolate at 0.3% SL @ 2ml/L  | 19.0              | 6.5                 | 168                         | 15.0                | 2.35                    | 300               |
| T₃         | Sodium para nitrophenolate at 0.3% SL @ 3ml/L  | 27.0              | 7.2                 | 202                         | 12.7                | 2.55                    | 266               |
| T₄         | Sodium para nitrophenolate at 0.3% SL @ 4ml/L  | 23.0              | 6.3                 | 158                         | 11.0                | 1.75                    | 183               |
| T₅         | Sodium para nitrophenolate at 0.3% SL @ 5ml/L  | 20.0              | 5.0                 | 186                         | 11.3                | 2.11                    | 220               |
| T₆         | Sodium para nitrophenolate at 0.3% SL @ 6ml/L  | 19.0              | 5.5                 | 168                         | 10.3                | 1.74                    | 182               |
| T₇         | Ethrel @ 250 ppm                                 | 31.0              | 7.2                 | 151                         | 12.0                | 1.80                    | 212               |
| T₈         | water spray                                      | 18.0              | 5.5                 | 144                         | 6.0                 | 0.86                    | 90                |
| S. Em ± CV |                                                 | 1.7               | 0.7                 | 12.3                        | 0.9                 | 0.20                    | 18                |
| CV         |                                                 | 12.5              | 18.6                | 13.0                        | 14.3                | 14.38                   | 16                |
| CD @ 5%    |                                                 | 5.1               | 2.1                 | 37.2                        | 2.8                 | 0.46                    | 56                |

**Conclusion:** The overall results of present investigation concluded that among the different doses of Sodium para nitrophenolate @ 2 ml/L of water found to be superior in terms of days to first female flower formation, low sex ratio and yield as compare to control.

**References**

1. Aykroyd WR. The nutritive value of Indian foods and planning of satisfactory diet. Indian Council of Medical Research, Special Report, series, 1963, 42.
2. Dey SS, Batters TK, Pal A, Munshi AD. Correlation and path coefficient analysis in bitter gourd (*Momordica charantia* L) Veg. Sci. 2005; 32:173-176.
3. Hilli JS, Vyakarnal BS, Biradar DP, Ravi H. Effect of growth regulators and stage of spray on growth, fruit set and seed yield of ridge gourd (*Luffa acutangula* L. Roxb). Karnataka Journal of Agricultural Sciences. 2010; 23(2):239-242.
4. Hossain D, Karin MA, Pramani MHR, Rehman AAS. Effect of foliar application of IAA and GA3 on sex expression and yield attributes and yield of bitter gourd (*Momordical charanti* L.). The Chittagong University. Journal of Biological Sciences. 2006; 5:55-62.
5. Hussein Heba A, Mhaibes Majida MH, Atallah Hakeem SH. Study the foliar times numbers and atinik stimulator on the growth and yield of cucumber (*Saif cultivar*) cultivated in the unheated plastic houses, Plant Archives 19, Supplement. 2019; 1:1254-1259.
6. Lai Yun-Song, Shen Di, Zhang Wei, Zhang Xiaohui, Qiu Yang, Wang Haiping, Dou Xinxin et al. BMC Plant Biology. 2018; 18:268.
7. Mousam-Al AA, Masri AA. Effect of ethephon on flowering and yield of monoecious cucumber. Egyptian Journal of Horticulture. 1999; 26:229-236.