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Induction of parthenocarpy through growth regulators in watermelon (*Citrullus lanatus* Thunb.)

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Abstract

A field experiment was carried out during *Rabi* 2016 at College of Horticulture, Dr. Y.S.R. Horticultural University, Venkataramannagudem (A.P) to study the effect of plant growth regulators on induction of parthenocarpic fruit development in watermelon. The results revealed that application of CPPU @ 200 ppm and NAA @ 150 ppm were significantly induced parthenocarpy in watermelon. The highest number of empty seeds (91.83) with lowest seed weight (1.44 gm) was registered with the application of CPPU @ 200 ppm. Minimum number of empty seeds or papery seeds were recorded with the application of 2, 4-D @ 25 ppm. The characters like number of fruits per plant (3.27), yield per plant (5.91 kg) were highest with the application of CPPU @ 200 ppm.

Keywords: CPPU, NAA, growth regulators, parthenocarpy

Introduction

Watermelon (*Citrullus lanatus* Thunb.) is a member of cucurbitaceae family, which contains more than 800 different species. It is originated from Southern Africa. Watermelon is a major cucurbit in India covering an area of 0.91 million hectares, with an annual production of 21, 82, 000 MT (NHB, 2017). The application of plant growth regulators has positive effect on watermelon. The application of growth regulators is reported to increased fruit size, yield and parthenocarpic fruit development. Growth regulators are also reported to improve yield of many horticultural crops those in which involved in production of parthenocarpic development. Therefore, the present study was under taken to study the induction of parthenocarpy through growth regulators in watermelon and to determine optimum concentration of plant growth regulators for induction of parthenocarpy.

Material and Methods

The experiment was laid out in Randomized Block Design with three replications. The experiment consisted of different plant growth regulators (T₁- 2,4-D @ 25 ppm, T₂- 2,4-D @ 50 ppm, T₃- NAA @ 100 ppm, T₄- NAA @ 150 ppm, T₅- CPPU @ 50 ppm, T₆- CPPU @ 100 ppm, T₇- CPPU @ 200 ppm and T₈- Control). The seed variety Arka Muthu collected from Indian Institute of Horticultural Research (IIHR), Bangalore. The healthy and disease free seeds were sown in black poly bags of 10 × 8 cm size filled with well mixed farm yard manure. The seedlings obtained from nursery planted in the plots at a spacing of 2.0 m × 0.6 m at a depth of 2-3 cm. The prepared plant growth regulators solutions were applied carefully with the help of brush to stigma of female flower at the time of anthesis *i.e.*, flower opening, where as the plants in the control plots were sprayed with distilled water as per the schedule. The data on fruit characters, parthenocarpy and yield characters were recorded and analysed statistically by using OPSTAT software.

Results and Discussion

Yield attributes

Number of fruits per plant

The maximum number of fruits per plant (3.27) recorded with the application of CPPU @ 200 ppm and it was on par with control (3.05). However, the lowest number of fruits per plant (1.54) was recorded with application of 2, 4-D @ 25 ppm. CPPU showed effectiveness in increasing the number of fruits per plant might be due to reduction in flower and fruit drop

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which resulted in retention of fruits per plant. These results were in conformity with the findings of Susila *et al.* (2013)^[9] and Known and Jaskani (2006)^[4] in watermelon.

Average fruit weight

The effect of different growth regulators showed that

significantly highest fruit weight was observed with the application of NAA @ 150 ppm (1.88 kg) and it was on par with CPPU @ 200 ppm (1.76 kg). The minimum fruit weight (1.12 kg) was recorded with the application of 2, 4- D @ 25 ppm. Increase in fruit weight might be due to increase in cell division and cell expansion of individual cells.

Table 1: Effect of different plant growth regulators on fruit attributing characters and parthenocarp in watermelon.

Treatments	Number of fruits per plant	Average fruit weight (kg)	Yield per plant (kg)	Number of normal seeds per fruit	Number of empty seeds per fruit	Total seed weight/ fruit (gm)
T ₁ : 2,4-D @ 25 ppm	1.54	1.12	3.44	50.83	48.63	10.30
T ₂ : 2,4-D @ 50 ppm	1.60	1.19	3.66	72.85	82.56	7.74
T ₃ : NAA @ 100 ppm	1.91	1.42	4.65	104.66	69.20	5.39
T ₄ : NAA @ 150 ppm	2.83	1.88	5.13	0.00	60.30	1.56
T ₅ : CPPU @ 50 ppm	2.30	1.71	4.83	58.63	85.73	2.94
T ₆ : CPPU @ 100 ppm	2.57	1.75	5.41	49.93	80.36	2.17
T ₇ : CPPU @ 200 ppm	3.27	1.76	5.91	0.00	91.83	1.44
T ₈ : Control	3.05	1.71	5.72	270.76	80.50	17.75
SE(m)±	0.09	0.04	0.07	1.77	2.20	1.18
CD at 5%	0.27	0.12	0.23	5.44	6.76	3.64
CV	6.57	4.46	2.69	4.05	5.10	33.3

Yield per plant

The significant yield was recorded with application of CPPU @ 200 ppm (5.91 kg) and it was on par with the control (5.72) followed by CPPU @ 100 ppm (5.41 kg). The lowest yield was recorded with the spraying of 2, 4 -D @ 25 ppm (3.44 kg). Application of CPPU improved the internal physiology of developing fruits in the term of better supply of water, nutrients and other compounds vital for their growth and development, which resulted in highest fruit set, fruit weight and ultimately greater yield compared to control. Similar responses of CPPU were reported by Camacho Ferre *et al.* (2003)^[1], Known and Jaskani (2006)^[4], Maroto *et al.* (2005)^[5] in watermelon.

Number of normal seeds per fruit

With respect to different level of plant growth regulators, normal seeds were not observed in CPPU @ 200 ppm and NAA @ 150 ppm. The maximum number of normal seeds (270.76) was observed in control. These results are similar in accordance with the findings of Hayata and Nimmi (1995)^[2], Camacho Ferre *et al.* (2003)^[1], Susila *et al.* (2013)^[9] in watermelon, Jing Quan U (1999)^[3] in bottle gourd, Mohammad *et al.* (2008)^[6] in teasel gourd and Niu *et al.*

(2015)^[7] in pear. Parthencarpic fruits were observed mainly due to exogenously applied cytokinins, which increased the level of endogenous auxin in some plant tissues. (Noorsah and Hemberg, 1980)^[8].

Number of empty seeds or papery seeds per fruit

The lowest number of empty seeds per fruit (48.63) was observed with the application of 2, 4 -D @ 25 ppm. The maximum number of the empty seeds per fruit (91.83) were observed with the application of CPPU @ 200 ppm and it was found to be on par with CPPU @ 50 ppm. Highest number of empty seeds in CPPU @ 200 ppm attributed to higher levels of auxin content as explained by Susila *et al.* (2013)^[9].

Total seed weight per fruit

The seed weight was significantly influenced with plant growth regulators at different concentrations. The lowest seed weight was observed with the application of CPPU @ 200 ppm (1.44 gm). The maximum seed weight (1.75 gm) was observed with control followed by the application of 2, 4-D @ 25 ppm (10.30 gm). These results were similar to the findings of Susila *et al.* (2013)^[9] in watermelon.

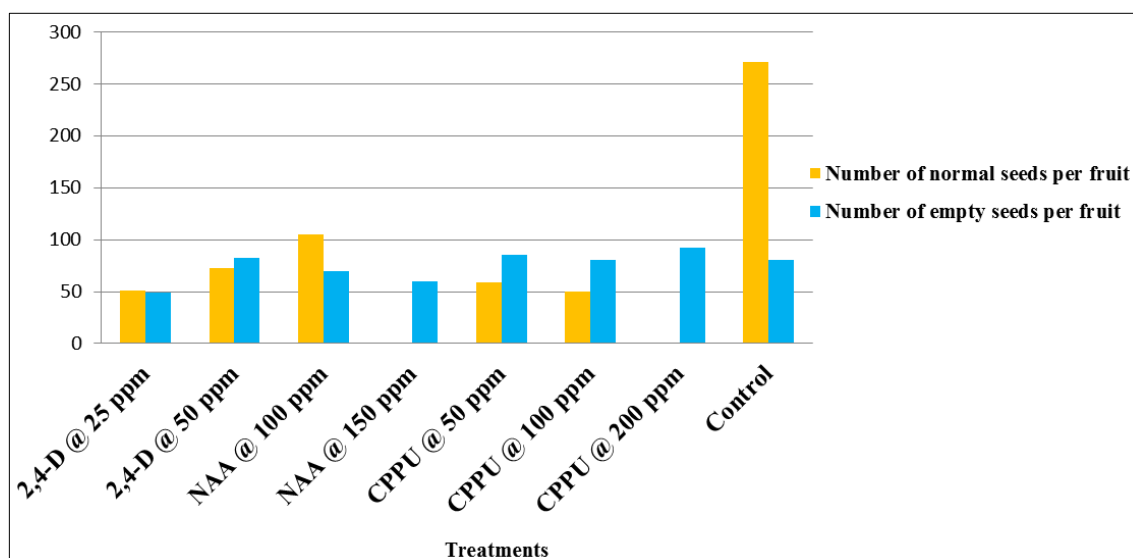


Fig 1: Effect of different concentrations of growth regulators on number of normal seeds and empty seeds per fruit

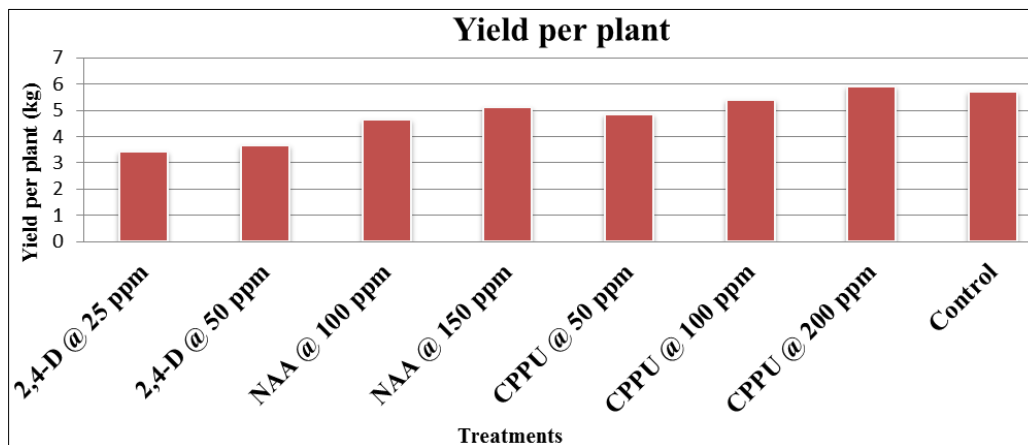


Fig 2: Effect of different concentrations of growth regulators on yield per plant

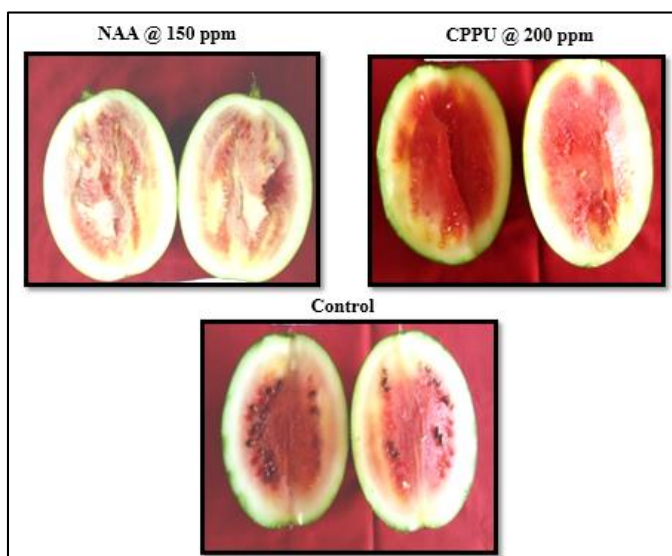


Plate 1: Effect of different levels of NAA and CPPU on inducing parthenocarpy in watermelon.

Based on the results obtained, it can be concluded that, parthenocarpy was completely achieved with CPPU @ 200 ppm and NAA @ 150 ppm. The application of CPPU @ 200 ppm resulted, more number of fruits per plant, maximum fruit diameter, highest yield per plant, lowest seed weight in watermelon.

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