RESEARCH ARTICLE

PLANT GROWTH REGULATORS AFFECTING SEX EXPRESSION OF BOTTLE GOURD [*LAGENARIA SICERARIA* (MOL.)] CV. PUSA SUMMER PROLIFIC LONG

Reena Kumari[1]*, S.P. Singh[2], B.L. Meena [3], Sunita Kumari and Ravi Prakash

[1,2] Department of Horticulture, S.K.N. COA, Jobner-303329 (Rajasthan)
[3] ICAR RC for NEH Region, Tripura Centre, Lembucherra - 799210
Email: meenareena2007@gmail.com

Received-03.03.2017, Revised-16.03.2017

Abstract: The investigation was carried out in the experimental farm of Department of Horticulture, S.K.N Agriculture University, Jobner,Jaipur (Rajasthan) to see the effect of various plant growth regulators and thiourea on vegetative growth, sex expression, quality and yield attributes of bottle gourd cv. cv. Pusa Summer Prolific Long, during the season 2012. The experimental was laid out with 13 treatments in randomized block design and replicated thrice. The treatment comprised of plant growth regulators and thiourea, viz. T_0 (control), T_1 (100 ppm NAA), T_2 (200 ppm NAA), T_3 (300 ppm NAA), T_4 (150 ppm Ethrel), T_5 (300 ppm ethrel), T_6 (450 ppm ethrel), T_7 (100 ppm CCC), T_8 (200 ppm CCC), T_9 (300 ppm CCC), T_{10} (250 ppm thiourea), T_{11} (500 ppm thiourea), T_{12} (750 ppm thiourea). The results revealed that the application of NAA 300 ppm (T_3) recorded maximum vine length (6.80 m), nodes per vine(22.01) and leaf area (274.00 cm^2). The CCC 300 ppm (T_9) treatment produced maximum primary branches (22.97) and secondary branches (9.30) per vine and leaf area (203.26 m^2) were observed in this treatment. The results showed that NAA 300 ppm registered maximum vegetative growth, ethrel 750 ppm significantly decreased male flower (65.60). Most of the quality parameters are maximum at ethrel 450 ppm as crude protein contents (0.226), ascorbic acid (12.90), TSS (5.31%). It may be concluded that ethrel 400 ppm (T_6) was found most effective as it remained statistically at par in all the growth, flowering attributes and yield.

Keywords: Bottle guard, PGRs, Thiourea, Vegetative growth, Flowering, Yield, Quality

INTRODUCTION

Bottle gourd [*Lagenariasiceratia*(mol.) standl.] cv. Pusa summer prolific long is a commonly grown and used vegetable in India. It belongs to family cucurbitaceaes. Besides an important vegetable crop it has also got good medicinal as well as nutritional value. Due to these qualities and people now days becoming more health conscious. The intake of its demand has been increasing day by day. The fruits are also used as vegetable or for making sweets/halwa, kheer, petha, barfi and pickles. It is economically found growing in Ethiopia, Africa and Central America. In India, bottle gourd is grown in the area of 532.7 thousand hectares with annual production of 6346.4 thousand metric tones and having 11.9 metric tonnes/hectares productionvity (NHB Database, 2014). It occupies 5,120 hectares area in Rajasthan producing 17857 matric tones with a productivity of 3.4876 tonnes ha^{-1} (Anonymous, 2011). In Jaipur district is occupies 1164 hectares area producing 1419 matric tones with a productivity of cucurbits, the growth regulators are more important due to their direct effect on males and female flowers ratio, fruit set, fruit drop and ultimately on yield. The use of plant growth regulators at proper stage plays an important role in sex expression and yield of bottle gourd (Sircael, 1971). In bottle gourd, the production of staminate flowers is much more than pistillate flower. These situations lead to the use of plant growth regulators like NAA, Ethrel and CCC in bottle gourd which play an important role in sex expression and sex ratio and thiourea plays a vital role in the physiology of plants both as a sulphydryl compound and to some extent as an amino compound like urea. The stimulating action of thiourea in various physiological activities of plants is well known. Keeping these facts in view, the present investigation was under taken with objectives to know the effect of plants growth regulators and thiourea on growth yield and quality of bottle gourd.

MATERIAL AND METHOD

Field experiment was conducted on Bottle gourd cv. Pusa summer prolific long the experimental farm of the department of horticulture, S.K.N. College of Agriculture, Jobner, Jaipur (Rajasthan). The soil of experimental farm was sandy loam texture, having organic carbon 0.13%, pH 8.2 and EC0.85 (dSm^{-1}). The treatment comprised of plant growth regulators and thiourea viz. T_0 (control), T_1 (100 ppm NAA), T_2 (200 ppm NAA), T_3 (300 ppm NAA), T_4 (150 ppm Ethrel), T_5 (300 ppm ethrel), T_6 (450 ppm ethrel), T_7 (100 ppm CCC), T_8 (200 ppm CCC), T_9 (300 ppm CCC), T_{10} (250 ppm thiourea), T_{11} (500 ppm thiourea), T_{12} (750 ppm thiourea) were designed in randomized block design with replicated thrice. The gross plot size was 6m x 3m with spacing of 2.5 m x 0.75 m (row x plant). The bottle gourd three to flower seeds per pit was sown on 12th July 2012 by dibbling method. Bottle gourd crop was fertilized with recommended dose i.e. 250 FYM, 60, 40, 60 NPK kg ha^{-1}. Nitrogen, phosphorus and potash fertilizer were

*Corresponding Author

applied in the form of urea, single super phosphate and muriate of potash respectively. Half dose of nitrogen and whole quantity of phosphorus and potash were applied. The remaining half dose of nitrogen (60 kg/ha) was top dressed after one month of sowing. The observation on growth and yield parameters were recorded during investigation.

RESULT AND DISCUSSION

The data pertaining to the effect of plant growth regulators and thiourea on vine length are presented in Table 1. The data revealed that plant growth regulators and thiourea significantly increased as well as decreased the vine length and number of nodes per vine. The maximum vine length and number of nodes per vine was recorded under foliar spray of NAA 300 ppm (T_3) and minimum with CCC 300 ppm (T_9) but treatment NAA 200 ppm (T2) was found at par with NAA 300 ppm (T_3). Chhonkar and Singh (1959) assigned that the increase in vine length under application of NAA was on account of its stimulatory effect on obserption of available nutrient present in the soil or by the modification in plant root system through the associated microflora of the soil similar results were also reported by Das and Das (1996) in pumpkin due to application of NAA (150 ppm).

The increased nodes on vine axis under exogenous application of NAA 250 ppm might be due to stimulatory effect of NAA on vine growth, cell division, cell elongation, cell enlargement (Chhonkar and Singh, 1959). These findings are also in conformity with Randhawa and Singh (1976) in bottle gourd and Chovatia *et al.* (2010) in bitter gourd cv. Priya.

The maximum leaf area was found under exogenous application of NAA 300 ppm (T_3) and minimum in CCC 300 ppm (T_9) are presented in Table 1. The effect of NAA on leaf area might be due to physiological process of plant that leads to accumulation of carbohydrates and minerals, which showed that gibberellins and auxins have some role in leaves other than cell elongation. These finding are in close conformity with the results reported by Sharma et al. (1988) in bottle gourd, Kabir *et al.* (1989) in bitter gourd, Das and Maurya (1992) and Das and Das (1996) in pumpkin, respectively.

The results of the present investigation revealed that the maximum number of primary branches and secondary branches were found under CCC 300 ppm (T_9) and minimum in control respectively (Table-1). These results are also in accordance with Randhawa and Singh (1976) in bottle gourd.

Among different treatment NAA 300 ppm (T_3) showed minimum days for first male flower appearance as compared to control (T_0) are presented in Table 1. The results obtained are in agreement with those Baruas and Das (1997) in Bottle gourd, respectively.

The data regarding to the effect of plant growth regulators and thiourea on all the fruit quality attributes are depicted in Table 2. Ethrel 450 ppm contributed maximum crude protein content, ascorbic acid and TSS in fruits as compared to control. These results are consonance with the finding of Shafeek *et al.* (2016) in summer squash guard.

The maximum fruit yield per vine and per hectare under ethrel 450 ppm (T_6) might be due to higher number of female flower, higher number of fruits and higher fruit weight under ethrel 450 ppm (T_6) are presented to table 2. These finding are in close fonformity with those of Kumar *et al.* (2006) in bottle gourd, Das and Das (1996) in pumnpkin and Jadav *et al.* (2010) in cucumber.

Table 1. Impact of plant growth regulators and thiourea on vegetative growth and flowering parameters of bottle gourd [Lagenaria siceraria (Mol.) cv. Pusa Summer Prolific Long]

Treatment	Vegetative growth parameters					Flowering attributes	
	Vine length (m)	No. of nodes /vine	Leaf area (cm^2)	No. of primary branches/vine	No. of secondary branches/vine	No. of male flowers/vine	Days taken to first male flower appearance
T_0: Control	**4.50**	**20.12**	**210.40**	**8.01**	**4.05**	**95.17**	**58.12**
T_1: NAA 100 ppm	6.80	24.42	260.10	13.40	6.15	80.49	40.70
T_2: NAA 200 ppm	6.17	25.50	261.00	11.60	5.60	85.50	40.40
T_3: NAA 300 ppm	6.80	26.40	274.00	10.70	5.40	71.40	40.00
T_4: Ethrel 150 ppm	5.50	24.40	240.00	14.70	6.30	76.55	49.00
T_5: Ethrel 300 ppm	5.00	23.13	226.60	16.18	7.16	68.51	47.50
T_6: Ethrel 450 ppm	4.53	22.01	215.00	17.25	7.60	65.60	46.55
T_7: CCC 100 ppm	4.50	19.92	225.56	18.50	8.20	78.23	56.05
T_8: CCC 200 ppm	4.40	18.98	214.80	18.78	8.32	73.81	54.00
T_9: CCC 300 ppm	4.36	18.05	203.26	20.97	9.30	70.18	52.00
T_{10}: Thiourea 250 ppm	5.79	25.82	243.05	13.39	6.14	75.80	45.79
T_{11}: Thiourea 500 ppm	5.47	23.35	258.10	11.58	5.25	70.77	41.20
T_{12}: Thiourea 750 ppm	5.00	22.15	258.90	11.70	5.41	70.68	41.17
SEm±	0.35	1.23	10.95	0.75	0.34	4.33	1.98
CD at 0.05%	1.01	3.58	31.95	2.19	0.98	12.63	5.79

Table 2. Impact of plant growth regulators and thiourea on physio-chemical quality and yield parameters of bottle gourd [Lagenaria siceraria (Mol.) cv. Pusa Summer Prolific Long]

Treatment	Physio-chemical quality parameters			Yield parameters	
	TSS (^{0}B)	Crude protein contents	Ascorbic acid contents	Yield/vine (kg)	Yield/hectare (q)
T_0: Control	5.03	0.200	11.66	5.70	349.25
T_1: NAA 100 ppm	5.07	0.210	12.10	6.15	378.19
T_2: NAA 200 ppm	5.17	0.217	12.40	6.40	396.76
T_3: NAA 300 ppm	5.21	0.220	12.50	6.95	472.55
T_4: Ethrel 150 ppm	5.16	0.216	12.46	7.02	499.15
T_5: Ethrel 300 ppm	5.26	0.222	12.75	7.45	533.86
T_6: Ethrel 450 ppm	5.31	0.226	12.90	7.55	549.84
T_7: CCC 100 ppm	5.14	0.215	12.35	6.14	426.35
T_8: CCC 200 ppm	5.23	0.221	12.65	6.40	447.96
T_9: CCC 300 ppm	5.28	0.224	12.82	6.70	473.42
T_{10}: Thiourea 250 ppm	5.15	0.211	12.25	6.08	377.26
T_{11}: Thiourea 500 ppm	5.18	0.212	12.21	6.30	393.71
T_{12}: Thiourea 750 ppm	5.20	0.219	12.49	6.65	416.32
SEm±	0.24	0.011	0.42	0.32	18.97
CD at 0.05%	NS	0.033	NS	0.94	55.36

REFERENCES

Anonymous (2011). Vital Agriculture statistics. Directorate of Agriculture, Government of Rajasthan, Jaipur. pp. 155.

Anonymous (2014). Area and production of fruit and vegetable crops in India. Indian Horticulture database. Government of India, Gurgoan. p. 152-159

Baruas, G.K.S. and Das, R.K. (1997). Effect of plant growth regulators on yield of bottle gourd at different sowing dates. *Annals of Agricultural Research,* **18** (3) : 371-374.

Chhonkar, V.S. and Singh, S.N. (1959). Effect of L-Napthalone acetic acid on the growth, quality and yield of tomato. *Indian Journal of Horticulture,* **16** (4): 236-242.

Chovatia, R.S., Ahlawat, T.R., Kavathia, Y. A., Jivani, L.L. and Kaila, D.C. (2010). Effect of plant growth regulators on vegetative growth, flowering and yield of bitter gourd cv. Priya. *Indian Journal of Horticulture,* **67** (1): 254-258.

Das, B.C. and Das, T.K. (1996). Studies on the response of GA_3, NAA and ethrel on vegetative growth and yield of pumpkin. *Orissa Journal of Horticulture,* 2**4** (1-2) : 74-78.

Das. T.K. and Maurya, A.N. (1992). Efficacy of growth regulating substances on vegetative growth and yield of pumpkin. *Orissa Journal of Agricultural Research,* **5** (1-2) : 69-74.

Jadav, R.G., Patel, T.V., Parmer, A.B. and Saiyad, M.Y. (2010). Sex modification of cucumber vegetable through PGRs. *Journal of Pure Applied Sciences,* **18** : 13-14.

Kabir, J., Chatterjee, R., Biswas, B. And Mitra, S.K. (1989). Chemical alteration of sex expression in bitter gourd. *Progressive Horticulture,* **21** (1-2) : 69-72.

Kumar, S., Dixit, S.K. and Mishra, H.R. (2006). Effect of plant growth regulators on yield and yield attributing characters of bottle gourd. *Advances of Plant Science,* **19** (2) : 419-421.

Randhawa, K.S. and Singh, D. (1976). The effect of certain growth influencing substances and sowing techniques on the vegetative growth, sex ratio, early and total yield of bottle gourd. *Journal of Research Punjab Agriculture University* **13** : 367-371.

Shafeek, M.R., Helmy, Y.I., Ahmed, A.A. and Ghoname, A.A. (2016). Effect of foliar application of growth regulators (GA3 and Ethereal) on growth, sex expression, quality and yield of summer squash plants (Cucurbita peop L.) under plastic house condition. *International Journal of ChemTech Research,* **9** (6): 70-76.

Sircar, S.M. (1971). Flowering, parthenocarpy and fruit setting. Plant Hormone Research in India, 1 : 11.