INDIAN JOURNAL OF
ARID HORTICULTURE
2015, Vol. 10 (1-2):81-84

Effect of plant growth regulators and thiourea on growth, yield and quality of bottle gourd cv. Pusa summer prolific long

Reena Kumari, Ashok Kumar Meena*, S P Singh and K K Meena
Department of Horticulture, S.K.N. College of Agriculture, Jobner-303329,
*Corresponding author email: ashokageco@gmail.com
(Received: 31.01.2015; Accepted: 10.09.2015)

Abstract

The present experiment was carried out on Bottle gourd cv. Pusa summer prolific long during kharif season 2012 with objective to know the effect of plant growth regulators and thiourea on growth, yield and quality of bottle gourd. 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 replicated three times in a randomized block design keeping plot size of 6 m x 3 m. Regarding growth parameter. The exogenous 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 but minimum vine length (4.36 m), nodes per vine (18.05) and leaf area (203.26 m^2) were observed in this treatment. The results showed that ethrel 450 ppm significantly increased female flower (22.65), fruit length (61.50 cm), fruit set (67.11%), fruit retention (50.20%), fruit weight (1.311 kg) fruit yield per vine (7.55 kg) and per hectare (549.84 g), net return (212120 per hectare) and B:C ratio (3.38). All over the results showed that most effective treatment for increasing the fruit growth and yield of bottle gourd was ethrel 450 ppm with cost benefit ratio (3.38).

Key words : Thiourea, Etherel, NAA

Introduction

Bottle gourd [*Lagenaria siceraria* (Molina) Standl.] cv. Pusa summer prolific long is a commonly grown and used vegetable in India. It is economically found growing in Ethiopia, Africa and Central America. It belong to family cucurbitaceaes. Besides an important vegetable crop it has also got good medicinal value as well as nutritional value. Due to these qualities and people now a days becoming more health conscious. The intake of its demand have been increasing day by day. The fruits are also used as vegetable or for making sweets/halwa, kheer, petha, barfi and pickles. In India, bottle gourd is grown in the area of 11.69 thousand hectares with annual production of 142.82 thousand tones and having 12.21 tonnes/hectares productionvity (Sindhu, 2002). 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 play an important role in sex expression and yield of bottle gourd (Sircar, 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

A field experiment on Bottle gourd cv. Pusa summer prolific long was carried out during kharif season of the year 2012 at college farm, S.K.N. College of Agriculture, Jobner (Jaipur). The soil having 8.2 pH, 0.85 EC (dSm^{-1}) and 0.13% organic carbon. 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 tested in randomized block design with three replications. The gross plot size was 6m x 3m with spacing of 2.5 m x 0.75 m (row x plant spacing). The bottle gourd three to four seeds per pit were 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 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.

Results and Discussion

The data regarding 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 (T3) and minimum with CCC 300 ppm (T9) but treatment NAA 200 ppm (T2) was found at par with NAA 300 ppm (T3). Chhonkar and Singh (1959) opined that the increase in vine length under application of NAA was on account of its stimulatory effect on observation 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).

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 2. The treatment NAA 200 ppm (T_2), NAA 100 ppm (T_1), Ethrel 150 ppm (T_4), Ethrel 300 ppm (T_5), Thiourea 250 ppm (T_{10}). Thiourea 800 ppm (T11) and thiourea 750 ppm (T_{12}) were found statistically at par with NAA 300 ppm (T3).

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 number of primary branches and secondary branches were found in control respectively (Table 3). 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 4. The results obtained are in agreement with those Baruas and Das (1997) in Bottle gourd, respectively.

The application of Ethrel significantly scheduled the days taken to first female flower reduced the days taken to first female flower appearance as compared to control are presented to Table 4. Among different treatment ethrel 450 ppm (T_6) showed minimum days for first female flower appearance as compared to control. The results were obtained by Verma et al. (1984) in bitter gourd.

The response of different treatment of different treatment on number of male and female flower per vine differed significantly (Table 5). As regards the number of male and female flower, it was observed that ethrel 450 ppm (T_6) treatment produced minimum number of female flowers per vine, respectively as compared to control where maximum number of male flowers and minimum number of female flowers per vine was produced. The results obtained area in accordance with the earlier findings of Sindhu et al. (1982) in Muskmelon, Saimbhi and Thakuar (1974) in bottle gourd.

Effect of plant growth regulators and thiourea was significantly different on fruit characters. The maximum fruit length was observed under ethrel 450 ppm (T_6) as compared to minimum fruit length in control (T0), respectively (Table 6). These results are in conformity with Singh and Choudhary (1989) and Kumar et al. (2006) in bottle gourd.

The maximum fruit set was found under ethrel 450 ppm (T_6) and minimum in control (T_0) are presented to Table 7. The results reported by Hidayatullah et al. (2009) in monoecious cucumber.

The maximum fruit retention was found under ethrel 450 ppm (T_6) and minimum in control (T_0) are presented to table 7. This findings is in accordance with Singh and Agrez (2000) in mango.

Results showed that spray of plant growth regulators and thiourea significantly increased the fruit weight are presented to Table 8. The maximum fruit weight was recorded under ethrel 450 ppm (T_6) and minimum in control (T_0). These finding are in close consonance with those of Kshirsagar et al. (1996) in cucumber Sharma et al. (1988) and Patel (1992) in bottle gourd.

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 8. These finding are in close fonformity with those of Kumar et al. (2006) in bottle gourd, Das and Das (1996) in pumpkin and Jadav et al. (2010) in cucumber.

Among the different treatment of plant growth regulators and thiourea significantly higerh net returns and B:C ratio were obtained under the application of ethrel 450 ppm (T_6). This was due to higher yield in the treatments ethrel 450 ppm (T_6) resulting in higher net returns are presented to table 10).

Table 1. Effect of plant growth regulators and thiourea

	Treatments	Vine length (m)	No. of nodes per vine	Leaf area (cm^2)	No. of primary branches per plant	No. of secondary branches per plant	Male flower	Female flower	No. of male flower per plant	No. of female flower per plant	Length of fruit (cm)	Fruit set	Fruit retention	Fruit weight (kg)	Fruit yield /vine (kg)	Fruit yield/ hectare (g)	Net returns	B:C ratio
T_0	Control	4.50	20.12	210.40	8.01	4.05	58.12	56.13	95.17	14.40	38.15	48.80	15.60	1.103	5.70	349.25	112546	1.81
T_1	NAA 100 ppm	6.80	24.42	260.10	13.40	6.15	40.70	50.20	80.49	17.52	49.10	56.20	31.40	1.107	6.15	378.19	126147	2.00
T_2	NAA 200 ppm	6.17	25.50	261.00	11.60	5.60	40.40	49.30	85.50	18.57	52.90	63.40	31.80	1.116	6.40	396.76	134530	2.11
T_3	NAA 300 ppm	6.80	26.40	274.00	10.70	5.40	40.00	47.60	71.40	19.26	53.00	65.00	35.00	1.224	6.95	472.55	171594	2.65
T_4	Ethrel 150 ppm	5.50	24.40	240.00	14.70	6.30	49.00	45.00	76.55	19.68	52.00	58.20	43.74	1.280	7.02	499.15	187257	3.00
T_5	Ethrel 300 ppm	5.00	23.13	226.60	16.18	7.16	47.50	43.28	68.51	22.07	56.25	65.40	49.23	1.290	7.45	533.86	204373	3.27
T_6	Ethrel 450 ppm	4.53	22.01	215.00	17.25	7.60	46.55	35.10	65.60	22.55	61.50	67.11	50.20	1.311	7.55	549.84	212120	3.38
T_7	CCC 100 ppm	4.50	19.92	225.56	18.50	8.20	56.05	52.89	78.23	18.60	44.33	59.66	22.87	1.250	6.14	426.35	150415	2.40
T_8	CCC 200 ppm	4.40	18.98	214.80	18.78	8.32	54.00	52.13	73.81	19.08	46.65	61.25	26.50	1.260	6.40	447.96	160539	2.53
T_9	CCC 300 ppm	4.36	18.05	203.26	20.97	9.30	52.00	52.08	70.18	20.44	48.35	64.15	29.00	1.272	6.70	473.42	172591	2.69
T_{10}	Thiourea 250 ppm	5.79	25.82	243.05	13.39	6.14	45.79	50.25	75.80	18.51	57.80	57.45	29.55	1.117	6.08	377.26	126374	2.03
T_{11}	Thiourea 500 ppm	5.47	23.35	258.10	11.58	5.25	41.20	49.10	70.77	17.50	52.50	61.85	30.81	1.125	6.30	393.71	134422	2.15
T_{12}	Thiourea 750 ppm	5.00	22.15	258.90	11.70	5.41	41.17	49.08	70.68	17.48	52.53	64.55	30.79	1.127	6.65	416.32	145550	2.32
	SEm±	0.35	1.23	10.95	0.75	0.34	1.98	2.80	4.33	1.19	2.64	2.55	2.21	0.050	0.32	18.97	9042	0.14
	CD (P=0.05)	1.01	3.58	31.95	2.19	0.98	5.79	8.18	12.63	3.47	7.70	7.45	6.46	0.14	0.94	55.36	26393	0.42

Reference

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

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.

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,* 24 (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.

Hidayatullah, A., Bano and Khokhar, K.M. 2009. Sex expression and level of phytohormons in monocuious cucumber as effected by plant growth regulator. *Sarhad Journals of Agriculture,* 25 (2): 173-177

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.

Kshirsagar, D.B., Desai, V.T., Patil, B.T. and Pawar, B. 1996. Effect of plant growth regulators on sex expression and fruiting in cucumber cv. Himangi. *Journal of Maharashtra Agricultural Universities,* 20 (3) : 473-474.

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.

Patel, A.K. 1992. Assessment of the effectiveness of MH and CEPA on growth, sex behaviour and yield of bottle gourd. *South Indian Horticulture,* 36 (6) : 336-339.

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.

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.

Saimbhi, M.S. and Thakur, M.R. 1974. Growth, sex expression and yield of bottle gourd as affected by CEPA-TIBA and CCC. *Haryana Journal of Horticultural Sciences,* 3 (3&4) : 195-200.

Sharma, N.K. Arora, S.K. and Dhankar, B.S. 1988. Effect of plant growth substances on growth, flowering , sex expression and fruit yield in bottle gourd. *Haryana Agricultural University Journal of Research,* 18 (4) : 291-297.

Sidhu, A.S. 2002. Current status of vegetable research in

India, Tropical Seed Company Publication and Research Articles.

Sidhu, A.S., Pandita, M.L. and Hooda, R.S. 1982. Effect of growth regulators on growth, flowering, yield and quality of muskmelon. *Haryana Agricultural University Journal of Research*, 12 : 231-235.

Singh, R.K. and Choudhary, B. 1989. Differential response of three genera of cucurbits to boron and plant growth regulators. *Indian Journal of Horticulture*, 46 (2) : 215-221.

Singh, Z. and Agrez, V. 2000. Fruit set, fruit retention and yield of mango in relation to ethylene. International symposium on tropical and subtropical fruits, *ISHS Acta Horticulturae*, 575.

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

Verma, V.K., Sirohi, P.S. and Choudhary, B. 1984. Note on the response to chemical seed treatment on sex expression and fruiting in bitter gourd. *Indian Journal of Horticulture*, 41 : 113-115.