Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(5): 970-972
Received: 01-07-2018
Accepted: 03-08-2018

Amruta Pawar
Horticulture Section, College of Agriculture, Amravati Road, Nagpur, Maharashtra, India

Neha Chopde
Horticulture Section, College of Agriculture, Amravati Road, Nagpur, Maharashtra, India

Bhavishya Nikam
Horticulture Section, College of Agriculture, Amravati Road, Nagpur, Maharashtra, India

Correspondence
Amruta Pawar
Horticulture Section, College of Agriculture, Amravati Road, Nagpur, Maharashtra, India

Thiourea and salicylic acid influences growth, yield and quality of gladiolus

Amruta Pawar, Neha Chopde and Bhavishya Nikam

Abstract
An experiment entitled "Effect of thiourea and salicylic acid on growth, yield and quality of gladiolus" was carried out at Horticulture Section, College of Agriculture, Nagpur (M.S.), India during the year 2017-18 with nine treatments of thiourea and salicylic acid viz., T_1 – Thiourea 1%, T_2 – Thiourea 2%, T_3 – Salicylic acid 100 ppm, T_4 – Salicylic acid 150 ppm, T_5 – Thiourea 1% + Salicylic acid 100 ppm, T_6 – Thiourea 2% + Salicylic acid 100 ppm, T_7 – Thiourea 1% + Salicylic acid 150 ppm, T_8 – Thiourea 2% + Salicylic acid 150 ppm and T_9 – Control in randomized block design. The results revealed that, the T_7 – Thiourea 1% + Salicylic acid 150 ppm recorded significantly minimum days for 50% sprouting of corms and maximum shoots plant^{-1}, leaves plant^{-1}, longevity of spike, spikes ha^{-1}, diameter of spike, length of rachis, vase life whereas, T_4 – Salicylic acid 150 ppm recorded minimum days for 1st spike emergence and days for opening of first floret.

Keywords: Gladiolus, yield, growth, quality, thiourea, salicylic acid

Introduction
Gladiolus (*Gladiolus grandiflorus* L.) is one of the most beautiful and fascinating bulbous cut flower. It is grown all over the world for its majestic flower spike with brilliant coloured flowers and regarded as "queen of bulbous plants". The popularity of this crop as a cut flower is increasing day by day because of its keeping quality and extensive in range of colors of the spikes. This flower crop possesses a great potential for export market especially during winter. In Vidharbha region, the growers are raising this crop mainly in the winter season. Presently, the area under this crop is less. But, it is likely to be increased in the near future because of heavy demand for these flowers in the market. So to increase the production of flowers and corms and to break the dormancy of corms it is necessary to give pre-soaking treatments or foliar spray and find out the suitable concentrations of chemicals like thiourea and salicylic acid.

Materials and Methods
A field experiment was carried out at Horticulture Section, College of Agriculture, Nagpur during *rabi* season of the year 2017-2018 to study the effect of thiourea and salicylic acid on growth, flower yield and quality of gladiolus with nine treatments and three replications laid out in Randomized Block Design. The treatments comprised of various concentrations and combinations of thiourea and salicylic acid *viz.*, T_1 – Thiourea 1%, T_2 – Thiourea 2%, T_3 – Salicylic acid 100 ppm, T_4 – Salicylic acid 150 ppm, T_5 – Thiourea 1% + Salicylic acid 100 ppm, T_6 – Thiourea 2% + Salicylic acid 100 ppm, T_7 – Thiourea 1% + Salicylic acid 150 ppm, T_8 – Thiourea 2% + Salicylic acid 150 ppm and T_9 – Control. Corms was given pre-soaking treatment of 24 hours and thereafter foliar spray at 30 days after planting with different chemicals as per the treatment. The experimental plot was brought to fine tilth by ploughing, clod crushing and harrowing. At the time of land preparation, well-rotted FYM @ 20 t ha^{-1} was mixed uniformly in the soil before last harrowing. The fertilizer dose of 300 kg ha^{-1} nitrogen, phosphorus 200 kg ha^{-1} and potassium 200 kg ha^{-1} was applied in the form of urea, single super phosphate and muriate of potash, respectively. Full dose of phosphorus and potash were applied at the time of planting, while, nitrogen was applied in three equal split doses at 2 leaf, 4 leaf and 6 leaf stages. The field was laid out with flat beds of the dimension 1.8x1.2m. Various observations on growth, flowering, yield and quality parameters v*iz.*, days for 50 per cent sprouting of corms (days), shoots plant^{-1}, leaves plant^{-1}, days for first spike emergence (days), days for opening of first floret (days), longevity of spike (days), spikes ha^{-1}, diameter of spike (cm), length of rachis (cm), vase life (days), etc. were recorded at proper stages and the data was statistically analyzed by the methods suggested by Panse and Sukhatme (1967) [10].

Results and Discussion

Growth

The data presented in Table 1 revealed that, different treatments of thiourea and salicylic acid had significant effect on days for 50 per cent sprouting of corms (days), shoots plant^{-1} and leaves plant^{-1} in gladiolus. Significantly minimum days for 50 per cent sprouting of corms (days) was recorded in the plants treated with the treatment T_7 i.e. Thiourea 1% + Salicylic acid 150 ppm (7.45 days) which was statistically at par with treatments T_4 i.e Salicylic acid 150 ppm (7.49 days), T_1 i.e. Thiourea 1% (7.75 days) and T_3 i.e. Salicylic acid 100 ppm (8.34 days), whereas, the treatment T_9 i.e. control required maximum days for 50 per cent sprouting of corms (9.81 days). This might be due to its effect in reducing the levels of ABA, the prime factor, imposing dormancy in corms and cormels and thereby changing the endogenous hormonal balance in favour of promoters. The results are conformity with the findings of Sahu and Kumar (2014) in elephant foot yam in respect of thiourea and Padmalatha *et al*. (2013) [7] in gladiolus in respect of salicylic acid. The maximum shoots plant^{-1} in gladiolus were noted with the treatment T_7 i.e. Thiourea 1% + Salicylic acid 150 ppm (3.51 days) which was statistically atpar with T_5 i.e. Thiourea 1% + Salicylic acid 100 ppm (3.48), T_4 i.e. Salicylic acid 150ppm (3.46), T_8 i.e. Thiourea 2% + Salicylic acid 150ppm (3.39), T_6 i.e. Thiourea 2% + Salicylic acid 100ppm (3.27), and T_1 i.e. Thiourea 1% (3.26), whereas, the treatment T_9 i.e. control recorded minimum shoot plant^{-1} (2.72). This might be due to improvement in sprouting percentage of gladiolus corms due to soaking of corms with thiourea and salicylic acid. The present work is in agreement with previous findings of Badoni *et al.* (2016) [1] in potato. Maximum leaves plant^{-1} in gladiolus were recorded with the treatment T_7 i.e. Thiourea 1% + Salicylic acid 150 ppm (19.61) which was atpar with T_1 i.e. Thiourea 1% (18.85), T_8 i.e. Thiourea 2% + Salicylic acid 150 ppm (18.79), T_4 Salicylic acid 150ppm (18.77) and T_5 i.e. Thiourea 1% + Salicylic acid 100 ppm (18.48), however, T_9 i.e. control noted minimum leaves plant^{-1} (16.74). This might be due to the fact that, thiourea is reported to delay leaf aging and senescence and enhances the photosynthetic efficiency leading to increased vegetative growth. Similarly, salicylic acid is reported to decrease ethylene production and stimulate plant growth. Similar results were also reported by Patel *et al*. (2016) [11] in mango seedlings in respect of thiourea and Maniram *et al*. (2012) [6] and Padmalatha *et al.* (2014)^b [9] in gladiolus in respect of salicylic acid.

Flowering

There was significant effect of thiourea and salicylic acid on days for first spike emergence (days), days for opening of first floret (days) and longevity of spike (days). Significantly, earliest first spike emergence (55.48 days) and opening of first floret (64.55 days) was noticed with the treatment T_4 i.e. Salicylic acid 150 ppm and it was found to be at par with the treatment T_7 i.e. Thiourea 1% + Salicylic acid 150 ppm for first spike emergence (56.42 days) and days for opening of first floret (65.69 days), whereas, the treatment T_2 i.e. Thiourea 2% recorded maximum days for first spike emergence (63.55 days) and opening of first floret (72.59 days) in gladiolus. These results are in concurrence with the findings of Padmalatha *et al.* (2014)^a [8] and Chaudhary *et al*. (2015) [3]. This might be due to stimulation of alternate respiration. In flower induction it appears that alternate respiration plays an important role in an increased vigour of plants. Longevity of spike was maximum in T_7 i.e. Thiourea 1% + Salicylic acid 150 ppm (10.18) which was at par with treatments T_4 i.e. Salicylic acid 150 ppm (10.03 days), T_3 i.e. Salicylic acid 100 ppm (9.91 days) and T_8 i.e. Thiourea 2% + Salicylic acid 150 ppm (9.86 days), whereas, the treatment T_9 i.e. control noted minimum longevity of spike (8.55 days). This might be due to increased vigour of plants, early spike emergence and the production of better quality spikes with longer length and more number of floret spike^{-1} which might have helped the spikes to last longer on the plant. The results are in line with the findings of Maniram *et al.* (2012) [6] and Hatamzadeh *et al*. (2012) [5] in gladiolus.

Spike yield

The effect of Thiourea and Salicylic acid on spikes ha^{-1} was statistically significant (Table 1). The treatment T_7 i.e. Thiourea 1% + Salicylic acid 150 ppm recorded significantly maximum spikes ha^{-1} (2.47 lakhs) which was found statistically at par with T_4 i.e. Salicylic acid (2.22 lakhs), T_8 i.e. Thiourea 2% + Salicylic acid 150 ppm (2.38 lakhs), whereas, the treatment T_9 i.e. control noted minimum spikes ha^{-1} (1.99 lakhs). This might be due to the fact that salicylic acid and thiourea delays leaf ageing and senescence and enhances photosynthetic efficiency leading to increased growth and yield of plants. The results are in close agreement with the findings of Germchi *et al*. (2011) [4] in potato, Shanu *et al*. (2013) [13] in coriander, Singh *et al*. (2012) [6, 14] in okra and Maniram *et al*. (2012) [6] in gladiolus.

Flower quality

The effect of thiourea and salicylic acid on diameter of spike (cm), length of rachis (cm) and vase life (days) of flower in gladiolus was found to be significant. Gladiolus plants treated with the treatment T_7 i.e. Thiourea 1% + Salicylic acid 150 ppm recorded significantly maximum diameter of spike (0.78 cm) which were statistically at par with the treatment T_4 i.e. Salicylic acid (0.76 cm),), T_3 i.e. Salicylic acid 100 ppm (0.74), T_8 i.e. Thiourea 2% + Salicylic acid 150 ppm (0.73 cm) and T_1 i.e. Thiourea 1% (0.72 cm), however, minimum diameter of spike (0.61cm) was noted with the treatment (T_9). This might be due to the general improvement in vegetative growth of the plants that helped in production of quality spikes. The results are in accordance with Maniram *et al*. (2012) [6] and and Pavan Kumar *et al*. (2015) [12] in China aster. Maximum length of rachis (41.01cm) was noticed with the treatment T_7 i.e. Thiourea 1% + Salicylic acid 150 ppm which was found statistically at par with the treatments T_4 i.e. Salicylic acid 150 ppm (40.78 cm) and T_3 i.e. Salicylic acid 100 ppm (39.72 cm) whereas, the treatment T_9 i.e. control noted minimum length of rachis (33.16 cm) in gladiolus. Enchancement in growth of gladiolus plant due to application of salicylic acid and thiourea might have increased rachis length. The similar results were reported by Maniram *et al*. (2012) [6] and Chahal *et al*. (2013) [2] in gladiolus. Significantly maximum vase life was noted in treatment T_7 i.e. Thiourea 1% + Salicylic acid 150 ppm (10.08 days) which was followed by T_4 i.e. Salicylic acid 150 ppm (10.01 days) and T_8 i.e. Thiourea 2% + Salicylic acid 150ppm (9.77 days) whereas, the treatment T_9 (control) recorded minimum vase life of flower (7.89 days). Salicylic acid has decreases transpiration and evaporation of tissues as well as decreasing respiration, which might have reduced the loss of fresh weight in cut flower and increased vase life of gladiolus spikes. Similarly, thiourea treatment causes internal physiological changes like assimilate distribution within the plant system which resulted in to an improvement in the quality of

gladiolus flowers due to which turgidity of spikes was maintained and vase life of cut flower might have been increased. The results obtained in this investigation are in close agreement with the findings of Hatamzadeh *et al*. (2012) [5] and Chahal *et al.* (2013) [2] in gladiolus.

Table 1: Effect of thiourea and salicylic acid on growth, yield and quality of gladiolus.

Treatments	Days for 50% sprouting of corms (days)	Shoots plant^{-1}	Leaves plant^{-1}	Days for first spike emergence (days)	Days for opening of first floret (days)	Longevity of spike (days)	Spikes ha^{-1} (lakhs)	Diameter of spike (cm)	Length of rachis (cm)	Vase life (days)
T1 - Thiourea 1%	7.75	3.26	18.85	59.57	70.65	9.23	2.37	0.72	38.89	8.81
T2 - Thiourea 2%	9.37	2.85	17.74	63.55	72.59	8.72	2.07	0.63	35.76	8.28
T3 - SA 100 ppm	8.34	2.94	17.98	60.68	69.26	9.91	2.22 2.22 2.22	0.74	39.72	9.67
T4 - SA 15 0ppm	7.49	3.46	18.77	55.48	64.55	10.03	2.43	0.76	40.78	10.01
T5 - Thiourea 1%+ SA 100 ppm	9.07	3.48	18.48	58.08	68.15	9.03	2.14	0.65	36.58	8.55
T6- Thiourea 2%+ SA 100 ppm	9.44	3.27	18.16	61.07	71.93	8.92	2.08 2.08	0.62	36.97	8.47
T7- Thiourea 1%+ SA 150 ppm	7.45	3.51	19.61	56.42	65.69	10.18	2.47	0.78	41.01	10.08
T8- Thiourea 2%+ SA 150 ppm	8.84	3.39	18.79	57.71	68.59	9.86	2.38	0.73	38.99	9.77
T9 – Control	9.81	2.72	16.74	62.99	70.63	8.55	1.99	0.61	33.16	7.89
SE (m) ±	0.43	0.10	0.46	0.35	0.33	0.16	0.04	0.02	0.46	0.12
CD at 5%	1.26	0.30	1.38	1.05	1.00	0.48	0.13	0.06	1.38	0.36

References

1. Badoni A, Ahmad A, Singh A, Panwar A, Kailkhura S, Chandra N *et al*. Effect of thiourea seed treatment on plant growth and yield of seed potato crop production. Global J Bio- sci. Biotech. 2016; 5(1):135-139.
2. Chahal D, Malik RK, Rana SC. Studies on effect of growth regulators and herbicides on gladiolus. Indian J Agric. Res. 2013; 47(2):108-115.
3. Chaudhary A, Mishra A, Bola PK, Nagar KK, Chaudhary P. Effect of foliar application of zinc and salicylic acid on flowering and yield of African marigold cv. Pusa Narangi Gainda. Hortflora Res. Spectrum. 2015; 4(4):351-355.
4. Germchi S, Behroozi FG, Badri S. Effect of thiourea on dormancy breaking and yield of potato (*Solanum tuberosum* L.) minitubers Marfona cv. In greenhouse. 2011 International Conference on Environmental and Agriculture Engineering IPCBEE. 2011; 15:19-24.
5. Hatamzadeh A, Mehrnaz Hatami, Ghasemnezhad M. Efficiency of salicylic acid delay petal senescence and extended quality of cut spikes of *Gladiolus grandiflorus* cv 'Wing's Sensation'. African J Agri. Res. 2012; 7(4):540-545.
6. Maniram M, Kumar S, Malik M, Kumar Singh, Pal V. Impact of spacing, doses of vermicompost and foliar application of salicylic acid on growth and flowering of gladiolus (*Gladiolus grandiflorus* L.) cv. White Prosperity. Annals Hort. 2012; 5(2):272-279.
7. Padmalatha T, Satyanarayana Reddy G, Chandrasekhar R, Siva Shankar A, Chaturvedi A. Effect of pre-planting soaking of corms with chemicals and plant growth regulators on dormancy breaking and corm and cormel production in gladiolus. Int. J Plant, Animal and Environ. Sci. 2013; 3(1):28-33.
8. Padmalatha T, Satyanarayana Reddy G, Chandrasekhar R, Siva Shankar A, Chaturvedi A. Effect of pre-planting treatment of corms with chemicals and plant growth regulators on vegetative growth, flowering and post-harvest life in gladiolus. Indian J Agric. Res. 2014[a]; 48(4):301-306.
9. Padmalatha T, Satyanarayana Reddy G, Chandrasekhar, AR, Siva Shankar, Chaturvedi A. Effect of foliar sprays of bio-regulators on growth and flowering in gladiolus plants raised from cormels. Progressive Hort. 2014[b]; 46(2): 288-294.
10. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. New Delhi, Publication and Information Division, ICAR, 1967.
11. Patel RJ, Ahlawat TR, Singh A, Momin SK, Chaudhari G. Effect of pre-sowing treatments on stone germination and shoot growth of mango (*Mangifera indica* L.) seedlings. Int. J Agric. Sci. 2016; 8(52):2437-2440.
12. Pavan Kumar K, Padmalatha T, Pratap M, Reddy SN. Effect of plant bio- regulators on growth, flowering and seed yield in China aster (*Callistephus chinensis* L. Nees) cv. Kamini. Indian J Agric. Res. 2015; 49(4):348- 352.
13. Shanu IS, Naruka PP, Singh RPS, Shaktawat KS, Verma. Effect of seed treatment and foliar spray of thiourea on growth, yield and quality of coriander (*Coriandrum sativum* L.) under different irrigation levels. Int. J Seed Spices. 2013; 3(1):20-25.
14. Singh SP, Paliwal R, Choudhary MR. Effect of bioregulators and zinc on growth and yield of okra (*Abelmoschus esculentus* L. Moench.). Progressive Hort. 2012; 44(1):15-18.