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Assessment of paclobutrazol effect as foliar spray on spike yield parameters of tuberose (*Polianthes tuberosa. L.*) var. Prajwal

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Abstract

A field experiment was carried out in Horticulture Research Farm, Bidhan Chandra Krishi Vishwavidyalaya, Mohanpur, to study the effect of paclobutrazol as foliar spray at different dates, on growth, flowering and bulb yield of tuberose (*Polianthes tuberosa L.*) var. Prajwal. The experiment was carried out during the year 2016 - 2018 (March - March) to find out the suitable dose of paclobutrazol and suitable time of its spraying to get maximum flower production. The experiment was laid out in augmented factorial randomized block design with three replications. The first factor contains three different doses of Paclobutrazol application P₁ (100 ppm), P₂ (200 ppm), P₃ (300 ppm) as foliar spray and the second factor is with three different times of Paclobutrazol application i.e., S₁ (45 DAP), S₂ (65 DAP), S₃ (85 DAP). A control plot is made without any application of paclobutrazol to observe the difference in the treatment effect. The results reveal that, foliar application of 200 ppm of Paclobutrazol (P₂) on the tuberose plants had given the maximum spike yield per plot, spike yield per hectare, number of flowers per spike and the weight of 10 florets. With respect to different spraying times foliar application of paclobutrazol at 65 DAP (S₂) on the tuberose plants had given the maximum spike yield per plot, spike yield per hectare, number of flowers per spike and the weight of 10 florets. Significantly maximum number of spikes per plot, spikes per hectare, number of florets per spike and weight of 10 florets were observed with the treatment combination P₂S₂ (200 ppm PBZ and 65 DAP).

Keywords: Tuberose, paclobutrazol, spraying time, spike yield and days after planting

Introduction

Tuberose (*Polianthes tuberosa L.*), is an important commercial flower crop and is extensively cultivated in many sub-tropical and tropical parts of the world including India. It is a native of Mexico, belongs to the family Amaryllidaceae. Tuberose is a bulbous perennial plant with tuberous roots producing long spikes, which bear waxy white and fragrant flowers profusely throughout the year. In India, commercial tuberose cultivation is confined to one species *Polianthes tuberosa*, which is basically a white flowered type. There are four tuberose cultivars popularly grown in India viz., single, double, semi double and variegated. The cultivar single occupies the foremost position than the other. Apart from domestic consumption, tuberose cut spikes has got a very good export potential to other countries. Tuberose floral concrete and essential oil are fetching higher price than any other floral concretes and essential oils. Paclobutrazol the so called growth retardant is generally used widely in the orchard plants like mango which regulates its alternate bearing habit but it is used very rarely in the flower crops. Paclobutrazol indirectly helps in increasing the flower quality and yield in the flower crops by regulating the gibberellin activity (Khan and Pal, 2009) [2]. There is very mere information regarding paclobutrazol effect in the floriculture sector hence we conducted this experiment to assess effect of paclobutrazol in different spraying times.

Material and Methods

The experiment was carried out during the year 2016 - 2018, at the Horticulture Research Farm, Mondouri, at the Bidhan Chandra Krishi Vishwavidyalaya, Mohanpur. The experiment was laid out in augmented factorial randomized block design with three replications. First factor comprises of three different doses of paclobutrazol application P₁ (100 ppm), P₂ (200 ppm), P₃ (300 ppm) as foliar spray and the second factor is with three different times of Paclobutrazol application i.e., S₁ (45 DAP), S₂ (65 DAP), S₃ (85 DAP). Along with these treatments one control plot is made. During the field preparation, well rotten farm yard

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manure @ 1.5 kg/m² was applied as basal dose 15 days before planting and mixed properly with soil. N: P: K @ 150: 200: 200 kg/ha was applied, in which, half N, full P and K applied as basal, remaining N applied as split doses, 30 and 45 days after planting. The size of the plot was 1.5 m x 1.0 m with a spacing of 30 cm x 30 cm.

Bulbs of tuberosc cv. Prajwal were provided by Horticulture Research Farm, Mondouri, Bidhan Chandra Krishi Vishwavidyalaya. Before planting the bulbs were stored in well ventilated semi shady place for two months. Older leaves emerging from the neck of the bulbs were trimmed off. Before planting, the bulbs were treated with fungicide copper oxychloride (0.1%) and the individual bulbs weighing 15-30 g with 1.5- 2.5 cm in diameter were selected for planting.

In this article the data was furnished for the parameters like Number of florets per spike, weight of 10 florets, spike yield per plot and spike yield per hectare. Five plants were selected randomly from each plot for recording data on the above mentioned yield attributes. The data on flowering were recorded during the course of investigation and subjected to statistical analysis as per Panse and Sukhatme (1967) [4]. The appropriate standard error of mean S.E. (m) and the critical difference (C.D.) were calculated at 5% level of probability.

Results

Number of florets per spike

The data presented in Table 1 shows that the data with respect to number of florets per spike was found significant. The maximum number of florets per spike (51.05, 53.91 and 52.48 during 2016, 2017 and Pooled respectively) was recorded in P₂ (Paclobutrazol 200 ppm). Significantly, minimum number of florets per spike (44.37, 48.44 and 46.41 during 2016, 2017 and Pooled respectively) was recorded in P₁ (Paclobutrazol 100 ppm).

The effect of different spraying times on the number of florets per spike was found significant. The maximum number of florets per spike (49.70, 53.21 and 51.41 during 2016, 2017 and Pooled respectively) was found in S₂ (Spraying 65 DAP) and the minimum number of florets per spike (45.81, 50.83 and 48.32 during 2016, 2017 and Pooled respectively) was observed in S₃ (Spraying 85 DAP). These results are in conformity with Padaganur *et al.* (2005) [3] in Tuberose.

The data in the Table 2 shows that the interaction effects of different levels of paclobutrazol and spraying time of paclobutrazol on number of florets per spike of spike was significant. In the pooled data, the treatment P₂S₂ (200 ppm PBZ and 65 DAP) had given the maximum number of florets per spike (54.26), it was followed by P₂S₁ (53.36) and the lowest number of florets per spike (45.78) was observed in the control plot.

Weight of 10 florets

The effect of different paclobutrazol levels on weight of 10 florets was found significant. Significantly maximum weight of 10 florets (21.80 g, 21.85 g and 21.83 g during 2016, 2017 and Pooled respectively) was recorded in P₂ (Paclobutrazol 200 ppm) while the minimum weight of 10 florets (19.75 g, 19.31 g and 19.53 g during 2016, 2017 and Pooled respectively) was recorded in P₁ (Paclobutrazol 100 ppm).

Regarding the spraying times, the maximum weight of 10 florets (22.10 g, 22.32 g and 22.21 g during 2016, 2017 and Pooled respectively) was found in S₂ (Spraying 65 DAP) and the minimum weight of 10 florets (19.76 g, 19.31 g, 19.54 g during 2016, 2017 and Pooled respectively) was observed in S₃ (Spraying 85 DAP). These results are in conformity with Dani *et al.* (2005) [1] in African marigold.

The data in the Table 2 shows that the interaction effects of different levels of paclobutrazol and spraying time of paclobutrazol on weight of 10 florets per spike was significant. In the pooled data, the treatment P₂S₂ (200 ppm PBZ and 65 DAP) had given the maximum weight of 10 florets (23.26 g), it was followed by P₂S₁ (22.41 g) and the lowest weight of 10 florets (17.67 g) was observed in the control plot.

Spike yield/plot

Data presented in the Table 1 reveals that the effect due to different levels of paclobutrazol on the spike yield/plot was found significant. The maximum spike yield/plot (23.70, 41.69 and 32.70 during 2016, 2017 and Pooled respectively) was recorded in P₂ (Paclobutrazol 200 ppm), and the minimum spike yield/plot (19.26, 33.53 and 30.84 during 2016, 2017 and Pooled respectively) was recorded in P₁ (Paclobutrazol 100 ppm).

Pertaining to different spraying times, the maximum spike yield/plot (23.07, 40.67 and 31.87 during 2016, 2017 and Pooled respectively) was found in S₂ (Spraying 65 DAP) and the minimum spike yield/plot (20.88, 34.93 and 27.91 during 2016, 2017 and Pooled respectively) was observed in S₃ (Spraying 85 DAP). Similar results were confirmed by Khan and Pal (2009) [2] in Tuberose.

With respect to the interaction effect of paclobutrazol and spraying times the data in the table 2 shows that in the pooled data, the treatment P₂S₂ (200 ppm PBZ and 65 DAP) had given the maximum spike yield/plot (34.58), it was followed by P₂S₁ (33.12) and the lowest spike yield/plot (21.68) was observed in the control plot.

Table 1: Effect of Paclobutrazol and spraying time on yield parameters of tuberose cv. Prajwal

Treatments	Number of florets per spike			Weight of 10 florets (g)			Spike yield per plot			Spike yield per hectare (Lakhs)		
	Main crop 2016-17	Ratoon Crop 2017-18	Pooled	Main crop 2016-17	Ratoon Crop 2017-18	Pooled	Main crop 2016-17	Ratoon Crop 2017-18	Pooled	Main crop 2016-17	Ratoon Crop 2017-18	Pooled
Paclobutrazol (P)												
P ₁ (100 ppm)	44.37	48.44	46.41	19.75	19.31	19.53	19.26	33.53	26.39	1.02	1.78	1.40
P ₂ (200 ppm)	51.05	53.91	52.48	21.80	21.85	21.83	23.70	41.69	32.70	1.26	2.22	1.74
P ₃ (300 ppm)	48.61	52.66	50.64	21.38	21.59	21.49	22.75	38.65	30.84	1.21	2.06	1.63
S.Em(±)	0.542	0.578	0.396	0.233	0.235	0.165	0.244	0.415	0.933	0.127	0.221	0.497
C.D at 5%	1.610	1.718	1.137	0.692	0.698	0.474	0.726	1.233	5.69	0.379	0.657	3.028
Spraying time (S)												
S ₁ (45 DAP)	48.52	51.04	49.78	21.05	21.11	21.08	21.75	38.25	30.00	1.16	2.04	1.60
S ₂ (65 DAP)	49.70	53.12	51.41	22.10	22.32	22.21	23.07	40.67	31.87	1.23	2.16	1.70
S ₃ (85 DAP)	45.81	50.83	48.32	19.76	19.31	19.54	20.88	34.93	27.91	1.11	1.86	1.48
S.Em(±)	0.542	0.578	0.396	0.233	0.235	0.165	0.244	0.415	0.889	0.127	0.221	0.497
C.D at 5%	1.610	1.718	1.137	0.692	0.698	0.474	0.726	1.233	5.412	0.379	0.657	3.02
Control	44.21	47.34	45.78	17.81	17.54	17.67	17.26	26.11	21.68	0.92	1.39	1.15

Table 2: Interaction effect of Paclobutrazol and Spraying time on yield parameters of tuberose cv. Prajwal

Treatments	Number of florets per spike			Weight of 10 florets (g)			Spike yield per plot			Spike yield per hectare (Lakhs)		
	Main crop 2016-17	Ratoon Crop 2017-18	Pooled	Main crop 2016-17	Ratoon Crop 2017-18	Pooled	Main crop 2016-17	Ratoon Crop 2017-18	Pooled	Main crop 2016-17	Ratoon Crop 2017-18	Pooled
Paclobutrazol x Spraying time												
P ₁ S ₁	43.25	47.00	45.13	19.40	19.11	19.25	18.23	34.21	26.22	0.97	1.82	1.39
P ₁ S ₂	45.64	49.67	47.66	21.63	20.47	21.05	20.14	38.14	29.14	1.07	2.03	1.55
P ₁ S ₃	44.23	48.67	46.45	18.21	18.36	18.28	19.41	28.23	23.82	1.03	1.50	1.27
P ₂ S ₁	52.95	53.77	53.36	22.36	22.47	22.41	24.11	42.14	33.12	1.29	2.25	1.77
P ₂ S ₂	53.21	55.31	54.26	22.89	23.64	23.26	25.64	43.52	34.58	1.37	2.32	1.84
P ₂ S ₃	47.00	52.64	49.82	20.14	19.45	19.79	21.36	39.42	30.39	1.14	2.10	1.62
P ₃ S ₁	49.36	52.36	50.86	21.41	21.77	21.59	22.91	38.41	30.66	1.22	2.05	1.64
P ₃ S ₂	50.26	54.41	52.34	21.78	22.87	22.32	23.45	40.37	31.91	1.25	2.15	1.70
P ₃ S ₃	46.22	51.21	48.72	20.94	20.14	20.54	21.89	37.16	29.52	1.17	1.98	1.57
S.Em(±)	0.939	1.002	0.686	0.404	0.407	0.286	0.423	0.719	1.331	0.22	0.38	0.70
C.D at 5%	2.789	N. S	1.969	1.199	N. S	0.882	1.257	2.136	5.225	0.65	1.13	2.78

Spike yield/ ha

The maximum spike yield/ha (1.26 lakhs, 2.22 lakhs and 1.74 lakhs during 2016, 2017 and Pooled respectively) was recorded in P₂ (Paclobutrazol 200 ppm) while the minimum spike yield/ha (1.02 lakhs, 1.78 lakhs and 1.40 lakhs) was recorded in P₁ (Paclobutrazol 100 ppm).

The effect of different spraying times on the spike yield/ha was found significant. The maximum spike yield/ha (1.23 lakhs, 2.16 lakhs and 1.70 lakhs during 2016, 2017 and Pooled respectively) was found in S₂ (Spraying 65 DAP) and the minimum spike yield/ha (1.11 lakhs, 1.86 lakhs and 1.48 lakhs during 2016, 2017 and Pooled respectively) was observed in S₃ (Spraying 85 DAP). Similar results were reported by Saiyad *et al.* (2010) [5] in Gaillardia.

The data in the Table 2 shows that the interaction effects of different levels of paclobutrazol and spraying time of paclobutrazol on spike yield/ha was significant. In the pooled data, the treatment P₂S₂ (200 ppm PBZ and 65 DAP) had given the maximum spike yield/ha (1.84 lakhs), it was followed by P₂S₁ (1.76 lakhs) and the lowest spike yield/ha (1.15 lakhs) was observed in the control plot.

Discussion

Foliar application of 200 ppm of Paclobutrazol (P₂) on the tuberose plants had given the maximum spike yield per plot, spike yield per hectare, number of flowers per spike and the weight of 10 florets. The increased flower yield might be due to growth suppressing effect on plant height thereby ceasing the terminal growth and utilizing the available auxin for the formation of flowers (Yadav, 1997). Also, the more-number leaves this treatment had accumulated more carbohydrates through photosynthesis and were directly used for increasing flower weight, number of flowers and flower diameter which ultimately increased the flower yield. These results are in conformation with Khan and Pal (2009) [2] in Tuberose and Saiyad *et al.* (2010) [5] in Gaillardia.

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