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Influence of Paclobutrazol as Foliar Spray on Flowering parameters of Tuberose (*Polianthes tuberosa* L.) var. Prajwal

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ABSTRACT

The field experiment was conducted 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 amicable 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 P_1 (100 ppm), P_2 (200 ppm), P_3 (300 ppm) as foliar spray and the second factor is with three different times of Paclobutrazol application i.e., S_1 (45 DAP), S_2 (65 DAP), S_3 (85 DAP). A control plot is made without any application of paclobutrazol for assessing the performance of the paclobutrazol. Combining the two year data, the pooled data reveals that, the number of days taken for first floret opening was obtained earlier, and the spike diameter was maximum with the application of P_2 (200 ppm) at S_1 (45 DAP) respectively. While the spike length was observed maximum with the application of P_2 (200 ppm) at S_3 (85 DAP). The rachis length was found maximum with the application of paclobutrazol P_1 (100 ppm) at S_3 (85 DAP). Whereas all the flowering parameters were found minimum in the control treatment. It can be concluded that, the flowering parameters of tuberose var. Prajwal can be improved with the application of paclobutrazol @ 200 ppm at 85 days after transplanting (DAP).

Key words: *Tuberose, Paclobutrazol, Spraying time, Flowering and Days after planting*

INTRODUCTION

Among the commercially grown flowers in India, Tuberose (*Polianthes tuberosa* L.) occupies prime position because of its popularity as a cut flower, loose flower as well as its potential in perfume industry. It is a bulbous geophyte which produces white and waxy florets which are used mainly for making garlands, bouquets, bridal make up and other floral arrangements. The florets borne on long spike stand long distance transport, remain fresh for long and are excellent for table decoration. The plants are also used in landscaping as a component in beds and borders and as potted plants.

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Plant growth regulators are known to coordinate and control various phases of growth and development, including flowering at optimum concentrations. It is generally accepted that exogenously applied growth substances act through the alteration in the levels of naturally occurring hormones, thus modifying the growth and development of the plant. Hence, the present study was undertaken to study the effects of paclobutrazol as foliar spray on flowering of tuberose variety Prajwal.

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 P_1 (100 ppm), P_2 (200 ppm), P_3 (300 ppm) as foliar spray and the second factor is with three different times of Paclobutrazol application i.e., S_1 (45 DAP), S_2 (65 DAP), S_3 (85 DAP). Along with these treatments one control plot is made. During the field preparation, well rotten farm yard manure @ 1.5 kg/m^2 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 tuberose cv. Prajwal were provided by Horticulture Research Farm, Mandouri, 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.

Five plants were selected randomly from each plot for recording data on various flowering attributes. The data on flowering were recorded during the course of investigation and subjected to statistical analysis as per Panse and Sukhatme[4]. The appropriate standard error of mean S.E.(m) and the critical difference (C.D.) were calculated at 5% level of probability.

RESULTS AND DISCUSSION

The flowering parameters discussed in this article are, Days taken to first floret opening after spike emergence, Spike length, Rachis length and Spike diameter.

Paclobutrazol

The results presented in Table 1 shows that, days taken for first floret opening after spike emergence was significant with the effect of paclobutrazol. In the year 2016-17, the application of P_2 (Paclobutrazol 200 ppm) has given the earliest first floret opening after spike emergence (21.38 days) which was at par with P_1 (22.78 days), while the maximum days taken for first floret opening (22.95 days) was observed in P_3 (Paclobutrazol 300 ppm). In the year 2017-18, minimum number of days taken for first floret opening (20.28 days) was in P_2 (paclobutrazol 200 ppm), and it was followed by P_1 (21.63 days) and the maximum number of days taken for first floret opening (22.50 days) was taken by P_3 (Paclobutrazol 300 ppm).

While in the pooled data for number of days for first floret opening after spike emergence, minimum number of days taken for first floret opening after spike emergence (20.83 days) was observed in P_2 (Paclobutrazol 200 ppm) which was followed by P_1 (22.21 days), while the maximum days taken for first floret opening after spike emergence (22.72 days) was observed in P_3 (Paclobutrazol 300 ppm). The above results might be due to the fact that the reserve food material can be utilized for reproductive purpose with restriction on vegetative growth due to gibberellins action of paclobutrazol (Joshi and Reddy, 2006 in China aster). Similar results were found by Dani *et al.*[1] in African marigold.

The spike length decreased with the increase in the paclobutrazol doses. In the year 2016-17, irrespective of paclobutrazol levels maximum (96.57 cm) spike length was

observed in the P_1 (Paclobutrazol 100 ppm) and it was found at par with P_2 (95.76 cm), while the minimum spike length (92.33 cm) was shown in P_3 (Paclobutrazol 300 ppm). During the year 2017-18, significantly maximum (95.66 cm) spike length was observed in the P_2 (Paclobutrazol 200 ppm) and it was found at par with P_1 (94.28 cm), while the minimum spike length (91.59 cm) was shown in P_3 (Paclobutrazol 300 ppm).

In the pooled data, irrespective of paclobutrazol levels, significantly maximum (95.71 cm) spike length was observed in the P_2 (Paclobutrazol 200 ppm) and it was found at par with P_1 (95.52 cm), while the minimum spike length (91.96 cm) was shown in P_3 (Paclobutrazol 300 ppm). Similar type of results was obtained by Sebastian *et al.*[6] in carnation.

The data regarding the rachis length of spike reveals that, in the year 2016-17, irrespective of paclobutrazol levels, maximum (31.90 cm) rachis length was observed in the P_1 (Paclobutrazol 100 ppm) and it was found at par with P_2 (30.77 cm), while the minimum rachis length (30.25 cm) was shown in P_3 (Paclobutrazol 300 ppm). During the year 2017-18, significantly maximum (35.88 cm) rachis length was observed in the P_1 (Paclobutrazol 100 ppm) and it was found at par with P_2 (31.34 cm), while the minimum rachis length (28.17 cm) was shown in P_3 (Paclobutrazol 300 ppm).

In the pooled data, significantly maximum (33.89 cm) rachis length was observed in the P_1 (Paclobutrazol 100 ppm) and it was found at par with P_2 (31.06 cm), while the minimum rachis length (29.21 cm) was shown in P_3 (Paclobutrazol 300 ppm). Similar results were obtained by Padaganur *et al.*[3] in Tuberose and Suradinatha and Hamdani[7] in Rose.

The data on spike diameter presented in the Table 1 shows that, in the year 2016-17, maximum (0.81 cm) spike diameter was observed in the P_2 (Paclobutrazol 200 ppm) and it was found at par with P_3 (0.78 cm), while the minimum spike diameter (0.76 cm) was shown in P_1 (Paclobutrazol 100 ppm). During the year 2017-18, significantly maximum (0.86 cm) spike diameter was observed in the P_2 (Paclobutrazol 200 ppm) and it was found at par with P_3 (0.84 cm), while the minimum spike diameter (0.82 cm) was shown in P_1 (Paclobutrazol 100 ppm).

During both the years, irrespective of paclobutrazol levels, spike diameter was found maximum (0.83 cm) in P_2 (Paclobutrazol 200 ppm) and it was found at par with P_3 (0.81 cm), while the minimum spike diameter (0.79 cm) was shown in P_1 (Paclobutrazol 100 ppm). Similar results were obtained by Padaganur *et al.*[3] in Tuberose and Suradinatha and Hamdani[7] in Rose.

Increasing doses of the paclobutrazol reduced the spike length and rachis length of tuberose plants. This might be due to inhibition of longitudinal cell expansion and division in the sub apical meristematic region, while the increased spike diameter might be due to transverse cell expansion and division[5].

Spraying time

The effect of different spraying times of paclobutrazol were discussed here under. In the main crop (2016-17), the treatment S_2 (Spraying 65 DAP) had given the earliest floret opening after spike emergence (21.83 days), it was followed by S_1 (22.11 days), whereas the spraying time of paclobutrazol S_3 (Spraying 85 DAP) has taken the maximum number of days (23.17 days) for first floret opening after spike emergence. In the ratoon crop the treatment S_3 (Spraying 85 DAP) had given the earliest floret opening after spike emergence (20.83 days), it was followed by S_1 (21.64 days), whereas the spraying time of paclobutrazol S_2 (Spraying 65 DAP) has taken the maximum number of days (22.94 days) for first floret opening after spike emergence.

The pooled data for number of days for first floret opening after spike emergence was non-significant with the application of different spraying times of paclobutrazol.

The data in the Table 1 shows that effect of different spraying times of paclobutrazol on spike length was significant. In the main crop, the maximum spike length (96.55 cm) was found in S_3 (Spraying 85 DAP) and it was followed by S_2 (95.03 cm) and the minimum spike length (93.25 cm) was

observed in S_1 (Spraying 45 DAP). While in the ratoon crop i.e., (2017-18), the effect of different spraying times on spike length was found non-significant.

The pooled data showed that, the effect of different spraying times on spike length was found significant. The maximum spike length (95.81 cm) was found in S_3 (Spraying 85 DAP) and it was followed by S_2 (94.31 cm) and the minimum spike length (93.05 cm) was observed in S_1 (Spraying 45 DAP).

The rachis length of the spike increased with the increase in the spraying time. In the main crop, the data relating to rachis length was non-significant. While in the ratoon crop i.e., (2017-18), the effect of different spraying times on rachis length was found significant. The maximum rachis length (32.94 cm) was found in S_3 (Spraying 85 DAP) and it was followed by S_2 (31.37 cm) and the minimum rachis length (30.53 cm) was observed in S_1 (Spraying 45 DAP).

The pooled data in the Table 1 showed that, the effect of different spraying times on rachis length was found significant. The maximum rachis length (32.24 cm) was found in S_3 (Spraying 85 DAP) and it was followed by S_2 (31.37 cm) and the minimum rachis length (30.53 cm) was observed in S_1 (Spraying 45 DAP).

The data in the Table 1 shows that effect of different spraying times of paclobutrazol on spike diameter was significant. In the main crop, the maximum spike diameter (0.80 cm) was found in S_1 (Spraying 45 DAP) and it was followed by S_2 (0.78 cm) and the minimum spike diameter (0.76 cm) was observed in S_3 (Spraying 85 DAP). While in the ratoon crop i.e., (2017-18), the effect of different spraying times on spike diameter was found significant. The maximum spike diameter (0.85 cm) was found in S_1 (Spraying 45 DAP) and it was followed by S_2 (0.84 cm) and the minimum spike diameter (0.81 cm) was observed in S_3 (Spraying 85 DAP).

The pooled data in the Table 1 showed that, the effect of different spraying times on spike diameter was found significant. The maximum spike diameter (0.83 cm) was found in S_1 (Spraying 45 DAP) and it was followed by S_2 (0.81 cm) and the minimum spike diameter (0.79 cm) was observed in S_3 (Spraying 85 DAP). These results might be due to early action of paclobutrazol that enhances the transverse cell division and expansion which causes increase in spike diameter. Similar results were found by Padganur *et al.*[3] in tuberose and Dani *et al.*[1] in African marigold.

Table 1: Effect of Paclobutrazol at different spraying times on flowering of Tuberose (*Polianthes tuberosa*. L) var. Prajwal

Treatments	Number of Days taken for first floret opening (days)			Spike length (cm)			Rachis length (cm)			Spike diameter (cm)		
	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)	22.78	21.63	22.21	96.75	94.28	95.52	31.90	35.88	33.89	0.76	0.82	0.79
P_2 (200 ppm)	21.38	20.28	20.83	95.76	95.66	95.71	30.77	31.34	31.06	0.81	0.86	0.83
P_3 (300 ppm)	22.95	22.50	22.72	92.33	91.59	91.96	30.25	28.17	29.21	0.78	0.84	0.81
S.Em(±)	**0.350**	**0.246**	**0.214**	**0.871**	**0.653**	**0.615**	**0.348**	**0.359**	**0.250**	**0.008**	**0.009**	**0.006**
C.D at 5%	**1.040**	**0.738**	**0.303**	**2.588**	**1.491**	**3.740**	**1.035**	**1.066**	**0.717**	**0.024**	**0.027**	**0.017**
Spraying time (S)												
S_1 (45 DAP)	22.11	21.64	21.87	93.25	92.86	93.05	30.42	30.65	30.53	0.80	0.85	0.83
S_2 (65 DAP)	21.83	22.94	21.88	95.03	93.59	94.31	30.94	31.80	31.37	0.78	0.84	0.81

S_3 (85 DAP)	23.17	20.83	22.00	96.55	95.06	95.81	31.54	32.94	32.24	0.76	0.81	0.79
S.Em(±)	**0.350**	**0.246**	**0.214**	**0.871**	**0.653**	**0.135**	**0.348**	**0.359**	**0.250**	**0.008**	**0.009**	**0.006**
C.D at 5%	**1.040**	**0.738**	**N. S**	**2.588**	**N. S**	**0.820**	**N. S**	**1.066**	**0.717**	**0.024**	**0.027**	**0.017**
Control	24.23	24.75	24.66	83.25	85.36	84.21	28.36	25.74	27.05	0.74	0.78	0.76
Interaction effect (P X S)												
S.Em(±)	**0.606**	**0.427**	**0.371**	**1.509**	**1.131**	**0.723**	**0.603**	**0.622**	**0.433**	**0.013**	**0.015**	**0.010**
C.D at 5%	**N. S**	**N. S**	**N. S**	**4.483**	**3.361**	**N. S**	**N. S**	**N. S**	**N. S**	**N. S**	**N. S**	**N. S**

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