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EFFECT OF DIFFERENT SPACING AND PLANT GROWTH REGULATORS ON GROWTH PARAMETERS OF SPIDER LILY UNDER MIDDLE GUJARAT AGRO CLIMATIC CONDITIONS

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Abstract: The research experiment was carried out on 'influence of different spacing and plant growth regulators on growth and flower yield of spider lily under middle Gujarat agro climatic conditions' at College Nursery, Department Of Horticulture, B.A. College of Agriculture, Anand Agricultural University, Anand during the year 2013-14 to 2015-16. Three different planting distance and foliar spray of two different plant growth regulators viz, gibberellic acid and napthalic acetic acid were used as treatment and it was comprised four replications. The result obtain from the present investigation concluded that, spider lily crop grown at distance of 60 x 60 cm and two spray of Gibberellic acid @ 200 mg per litre was most effective treatment for getting vigorous growth of crop.

Keywords: Napthalic acetic acid (NAA), Gibberellic acid (GA3), Spider lily, Split Plot Design (SPD), Farm Yard Manure (FYM).

Introduction

The important commercial flower crops of Gujarat state are rose, jasmine, marigold, gaillardia, tuberose, chrysanthemum and spider Lily. Among these, spider Lily is becoming very popular with the farmers of Gujarat due to regular high returns per unit area from the crop and its hardy nature. Spider lily is commercially grown and its area is increasing day by day. The successful production of spider lily depends up on many factors like soil fertility, irrigation and plant density. Spider lily is a hardy plant, free from serious pest and diseases and other physiological disorders. Plant growth regulator is very essential substances for improved quality of flowers. Use of plant growth regulators helps to improve the yield and quality in many crops. Similarly in flowering plants also plants growth regulators are effective to increase number of flowers and quality. Plant growth regulators are used for increasing vegetative growth, flower yield and increase in vase life of flowers in different flower crops.

Materials and methods

The research experiment was carried out on 'Effect of different spacing and plant growth regulators on growth and flower yield of spider lily under middle Gujarat agro

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climatic conditions' at College Nursery, Department of Horticulture, B.A. College of Agriculture, Anand Agricultural University, Anand during the year 2013-14 to 2015-16. Local cultivar of spider lily was used in experiment and planted in second fortnight of July, 2013. The recommended dose of fertilizer 20 ton per hectare FYM, 300 Kg nitrogen, 200 Kg phosphorus and 200 Kg potash per hectare were given in the experiment. In which, nitrogen was applied in 4 equal splits in June, September, December and March months while, Farm Yard Manure (FYM), phosphorus and potash were applied as basal dose.

Three different planting distance and foliar spray of two different plant growth regulators viz, gibberellic acid and napthalic acetic acid were used as treatment and it was comprised four replications. Split Plot Design (SPD) was used for statistical analysis purpose. There were 10 treatments comprised of (1) 90 x 45 cm planting distance, (2) 60 x 60 cm planting distance, (3) 60 x 45 cm planting distance, (4) Foliar spray of gibberellic acid @ 100 mg/l, (5) Foliar spray of gibberellic acid @ 150 mg/l, (6) Foliar spray of gibberellic acid @ 200 mg/l, (7) Foliar spray of Napthalic acetic acid (NAA) @ 50 mg/l, (8) Foliar spray of Napthalic acetic acid (NAA) @ 100 mg/l, (9) Foliar spray of Napthalic acetic acid (NAA) @ 150 mg/l, (7) Water Spray (control) and (10) No spray (control). Spraying of plant growth regulators twice at 45 and 60 days after planting of bulb in first year. From second year onwards spraying was done at 45 an 60 days after cutting of leaves. Cutting of leaves were done in the month of March.

Result and discussion

Number of leaves per plant

The data presented in Table-1 revealed that the individual effect of spacing and PGRs on number of leaves per plant was found non-significant during the year 2013-14, 2014-15 and 2015-16 as well as in pooled analysis. Whereas, the effect of plant growth regulators on number of leaves per plant was found non-significant during the individual years while, it was found significant in pooled mean. The significantly maximum number of leaves per plant was recorded with treatment of gibberellic acid @ 100 mg/l (8.67) as compared to water spray (control) (7.95) followed by gibberellic acid @ 200 mg/l (8.50). It might be due to quick, better and vigorous vegetative growth and also due to increase in plant height. This result is in accordance with the findings of Das *et al.* (1992) in Lily and Ravidas *et al* (1992), Misra *et al* (1993), Maurya and Nagda (2002) in gladiolus.

The interaction effect on number of leaves per plant was found non-significant during all the years as well as pooled analysis.

Plant spread (E-W)

The data presented in Table-2 revealed that the effect of spacing on plant spread (E-W) was found non-significant during the individual years as well as in pooled analysis. The individual effect of plant growth regulators on plant spread (E-W) was found significant during the individual years as well as in pooled analysis. The significantly maximum number of plant spread (E-W) was recorded with treatment of gibberellic acid @ 200 mg/l as compared to no spray (control) during the year 2013-14, 2014-15 and 2015-16 and in pooled analysis. An increase in plant spread by GA_3 was due to its effect on stem elongation by increasing cell elongation in sub-apical meristem. The rapid growth is a result of both, more number of cells formed and increased elongation of the individual cells. This result confirm with the result of Das *et al*. (1992) and Misra *et al*. (2000) in Lily.

The interaction effect of spacing and plant growth regulators on plant spread (E-W) was found significant during all the years while, it was found non-significant in pooled analysis.

Plant spread (N-S)

The data presented in Table-3 revealed that the individual effect of spacing on plant spread (N-S) was found non-significant during the individual years but, it was significant in pooled analysis. The significantly maximum number of plant spread (N-S) was recorded with treatment of spacing (90 x 45 cm) (1.76 m) as compared to another spacing in pooled mean. Whereas, the individual effect of plant growth regulators on plant spread (N-S) was found significant during all the years as well as in pooled mean. The significantly maximum number of plant spread (N-S) was recorded in the treatment gibberellic acid @ 200 mg/l as treatment as compared to rest of the treatments during all the years and in pooled analysis. Leaf area is an important attribute as it has direct relevance with interception of light and photosynthesis and ultimately with over all growth and development. In current investigation, the leaf area was significantly influenced by flower sprays of growth regulators. It might be due to cell division cell elongation and cell division by gibberellic acid. This was also supported by the findings of Khan and Tiwari (2003) in dahalia and Ravidas *et al*. (1992) in gladiolus.

The interaction effect of spacing and plant growth regulators on plant spread (N-S) was found significant during the years 2013-14 and 2014-15 while, it was found non-significant during the year 2015-16 and in pooled analysis.

Stalk length (cm):

The data presented in Table-4 revealed that the individual effect of spacing on stalk length was found significant during the year 2013-14, 2014-15 and in pooled analysis. The significantly maximum stalk length was recorded with treatment of spacing (60 x 60 cm) as compared to another spacing while, effect of spacing on stalk length was found non-significant during the year 2015-16. The individual effect of plant growth regulators on stalk length was found non-significant during the all the years and in pooled analysis.

The interaction effect of spacing and plant growth regulators on stalk length was found non-significant during all the years and in pooled analysis.

Conclusion

The result obtain from the present investigation concluded that, spider lily crop grown at distance of 60 x 60 cm and two spray of Gibberellic acid @ 200 mg per litre was most effective treatment for getting vigorous growth of crop as compared to control. Spraying of Gibberellic acid twice at 45 and 60 days after planting of bulb in first year. From second year onwards, spraying was done at 45 an 60 days after cutting of leaves. Cutting of leaves were done in the month of March.

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Table 1: Effect of spacing and plant growth regulators on number of leaves per plant of spider lily (Pooled of year)

Treatments	Year			Pooled of year
	2013-14	2014-15	2015-16	
(A) Effect of spacing				
S_1 – 90 x 45 cm	8.62	8.69	7.66	8.32
S_2 – 60 x 60 cm	8.76	8.66	7.56	8.35
S_3 – 60 x 45 cm	8.75	8.54	7.55	8.28
S.Em±	0.11	0.07	0.09	0.05
CD at 5%	NS	NS	NS	NS
(B)Effect of PGR's				
T_1 -Gibberellic acid – 100 mg/l	9.10	8.97	7.97	8.67
T_2 - Gibberellic acid – 150 mg/l	8.85	8.60	7.60	8.35
T_3 - Gibberellic acid – 200 mg/l	8.80	8.85	7.85	8.50
T_4 - NAA – 50 mg/l	8.72	8.42	7.42	8.18
T_5 - NAA – 100 mg/l	8.52	8.33	7.33	8.06
T_6 - NAA – 150 mg/l	8.55	8.77	7.68	8.33
T_7 - Water Spray (control)	8.30	8.27	7.31	7.95
T_8 - No spray (control)	8.83	8.82	7.82	8.48
S.Em±	0.21	0.19	0.173	0.11
CD at 5%	NS	NS	NS	0.31
Interaction				
S.Em±	0.36	0.34	0.30	0.19
CD at 5%	NS	NS	NS	NS
C.V.%	8.38	7.82	7.88	8.05
YS				NS
YT				NS
YST				NS

Table 2: Effect of spacing and plant growth regulators on plant spread (E-W) of spider lily (Pooled of year)

Treatments	Year			Pooled of year
	2013-14	2014-15	2015-16	
(A) Effect of spacing				
S_1 – 90 x 45 cm	1.79	1.83	1.76	1.79
S_2 – 60 x 60 cm	1.76	1.78	1.77	1.77
S_3 – 60 x 45 cm	1.83	1.78	1.75	1.78
S.Em±	0.016	0.02	0.02	0.02
CD at 5%	NS	NS	NS	NS
(B)Effect of Plant growth regulators				
T_1 -Gibberellic acid – 100 mg/l	2.21	2.20	2.05	2.15
T_2 - Gibberellic acid – 150 mg/l	2.27	2.26	2.05	2.19
T_3 - Gibberellic acid – 200 mg/l	2.38	2.38	2.08	2.28
T_4 - NAA – 50 mg/l	1.66	1.70	1.67	1.67
T_5 - NAA – 100 mg/l	1.74	1.74	1.65	1.71
T_6 - NAA – 150 mg/l	1.70	1.70	1.63	1.67

T_7 - Water Spray (control)	1.24	1.24	1.49	1.32
T_8 - No spray (control)	1.12	1.15	1.48	1.25
S.Em±	0.025	0.02	0.04	0.07
CD at 5%	0.071	0.07	0.12	0.23
Interaction				
S.Em±	0.044	0.04	0.07	0.07
CD at 5%	0.124	0.12	0.20	NS
C.V.%	4.89	4.78	8.11	6.09
YS				Sig.
YT				Sig.
YST				Sig.

Table 3: Effect of spacing and plant growth regulators on plant spread (N-S) of spider lily (Pooled)

Treatments	Plant spread (N-S)			Pooled of year
	2013-14	2014-15	2015-16	
(A) Effect of spacing				
S_1 – 90 x 45 cm	1.73	1.84	1.73	1.76
S_2 – 60 x 60 cm	1.68	1.79	1.71	1.72
S_3 – 60 x 45 cm	1.70	1.78	1.71	1.72
S.Em±	0.016	0.01	0.02	0.01
CD at 5%	NS	NS	NS	0.03
(B)Effect of PGR's				
T_1 -Gibberellic acid – 100 mg/l	2.13	2.20	2.04	2.12
T_2 - Gibberellic acid – 150 mg/l	2.18	2.25	2.19	2.20
T_3 - Gibberellic acid – 200 mg/l	2.26	2.37	2.25	2.29
T_4 - NAA – 50 mg/l	1.61	1.69	1.64	1.64
T_5 - NAA – 100 mg/l	1.78	1.73	1.65	1.72
T_6 - NAA – 150 mg/l	1.40	1.70	1.63	1.57
T_7 - Water Spray (control)	1.19	1.23	1.16	1.19
T_8 - No spray (control)	1.09	1.15	1.17	1.13
S.Em±	0.025	0.03	0.04	0.04
CD at 5%	0.070	0.07	0.12	0.11
Interaction				
S.Em±	0.043	0.04	0.07	0.06
CD at 5%	0.121	0.13	NS	NS
C.V.%	5.00	4.75	8.53	6.34
YS				NS
YT				Sig.
YST				Sig.

Table 4: Effect of spacing and plant growth regulators on Stalk length (cm) of spider lily (Pooled)

Treatments	Year			Pooled of year
	2013-14	2014-15	2015-16	
(A) Effect of spacing				
S_1 – 90 x 45 cm	71.44	75.10	74.18	73.57
S_2 – 60 x 60 cm	75.06	77.91	76.86	76.61
S_3 – 60 x 45 cm	74.29	74.13	73.36	73.92
S.Em±	0.783	0.85	0.93	0.50
CD at 5%	2.71	2.97	NS	1.47
(B)Effect of PGR's				
T_1 -Gibberellic acid – 100 mg/l	72.35	74.66	73.62	73.54
T_2 - Gibberellic acid – 150 mg/l	74.00	76.76	75.71	75.49
T_3 - Gibberellic acid – 200 mg/l	73.12	78.75	77.69	76.52
T_4 - NAA – 50 mg/l	74.90	74.99	73.86	74.58
T_5 - NAA – 100 mg/l	75.65	74.50	73.37	74.50
T_6 - NAA – 150 mg/l	75.15	77.64	76.55	76.44
T_7 - Water Spray (control)	73.50	74.86	73.96	74.10
T_8 - No spray (control)	70.06	73.57	73.65	72.42
S.Em±	2.756	2.55	2.52	1.50
CD at 5%	NS	NS	NS	NS
Interaction				
S.Em±	4.773	4.42	4.37	2.61
CD at 5%	NS	NS	NS	NS
C.V.%	12.98	11.67	11.69	12.11
YS				NS
YT				NS
YST				NS