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RESEARCH ARTICLE :

Studies on spacing and time of planting on vegetative, floral and rhizome parameters of Alstroemeria cv. 'ALLADIN

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SUMMARY : A field experiment on different regimes of spacing and date of planting in growth, flowering and rhizome production of Alstroemeria cv. ALLADIN was conducted at the Experimental field of the Division of Floriculture and Landscape Architecture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, during 2008-2009. The 9 treatment combination consists of three regimes of spacing (4, 5 and 6 plants m^{-2}) and three dates of planting (3rd week of April, Ist week of May and 3rd week of June). The result revealed that among different treatment combinations wider spacing resulted in significantly increased shoot emergence for the first three months. Thereafter, no significant effect of varied spacing on shoot number/plant was recorded. Earlier planting resulted in significantly more shoots per plant however, differences in shoot number per plant on account of varying planting dates evened out. The plants spaced at 4 m^{-2} yielded significantly more spikes than those spaced at 6 m^{-2}. Highest total flower production per plant over one year period (57.578) was recorded with a spacing of 4 plants m^{-2} whereas highest total flower yield per unit area (270.267 m^{-2}) was recorded with 6 plants m^{-2} spacing. 215.608 and 241.138 spikes m^{-2} were recorded with 5 and 4 plants m^{-2} spacing respectively. Spacing at 4 plants m^{-2} resulted in highest rhizome yield per plant (0.319 kg) as against 0. 292 kg with 6 plants m^{-2}. Similarly rhizome number per plant was significantly higher in plants spaced at 4 m^{-2} (8.830 rhizomes per plant) as against 7.000 rhizomes per plant recorded with 6 plants m^{-2}. However, 6 plants m^{-2} yielded highest rhizome weight (1.719 kg m^{-2}) per unit area as compared to other spacing's.

KEY WORDS :
Alstroemeria, Date of planting, Spacing, Yield

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BACKGROUND AND OBJECTIVES

Alstroemeria commonly known as the Peruvian Lily or the Lily of the Incas is a native of South America. The genus is a rhizomatous monocot and belongs to family Amaryllidaceae and Liliaceae. Alstroemeria is mainly cultivated in the Netherlands, Columbia, United States and England. In

Kenya in terms of popularity and foreign exchange Alstroemeria stands third after roses and statice. The popularity of this flower is still growing and has attained the status of one of the ten most important cut flowers in the world.

Alstroemeria is an important cut flower and potential emerging pot plant in international trade. At present, it is being grown as cut flower crop in Netherlands under protected conditions in 100 ha area and in rest of the world, the area under its cultivation is about 400 ha.The crop has a premium potential as a cut flower because it needs relatively low temperatures for growth and development which is a valuable property in view of the steadily rising energy costs and secondly the plants bear attractive flowers with wide range of colours and excellent keepability.

In India, Alstroemeria was introduced in 2001 by Ministry of agriculture, GOI, under FAD programme at three Model Floriculture Centres in India at Ooty (Tamil Nadu), Chial (Himachal Pradesh) and Srinagar (Jammu and Kashmir). The five varieties of Crop was introduced in SKUAST-K, Shalimar in 2005-06 under ICAR sponsored Horticulture Mini Mission-I. Since Alstroemeria is a relatively new crop, information on its performance at different planting densities and date of planting is important. Owing to this fact an experimental trial was conducted during 2008-2009 with an objective to standardize planting geometry and time of planting under Kashmir conditions.

RESOURCES AND METHODS

Studies on different regimes of spacing and date of planting in growth, flowering and rhizome production of Alstroemeria cv. ALLADIN was conducted at the Experimental field of the Division of Floriculture and Landscape Architecture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, during 2008-2009. The planting materials used were nine month old plants imported through a nursery man in India. These plantlets were planted in a well prepared soil with silty clay loam in texture having good water holding capacity. The organic carbon of the soil was found to be 0.98 per cent and pH of 6.93. The experiment was conducted in Completely Randomized Block Design with three replications for each treatment. The irrigation was done weekly for the plants during hot months. The half dose of N in the form of urea and full dose of P_2O_5 and K_2O in the form of single super phosphate and muraite of potash were applied as a basal dose just before planting and remaining half dose of N was applied in two split doses at 40 and 60 days after planting Micronutrients were also applied at the concentration of 0.5 per cent twice a week. The observations were recorded on vegetative shoot production, spike production, spike length and rhizome production. The collected data were pooled and analysed.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Growth parameters :

The analysis of data (Table 1) revealed that among different treatment combinations wider spacing (4 plants m^{-2}) resulted in significantly increased shoot emergence

Table 1 : Effect of spacing and time of planting on vegetative shoot production in Alstroemeria cv 'ALLADIN'

Treatments	July	Aug.	Sept.	Oct.	April	May	June	July
	2005-06				2006-07			
Spacing								
S_1	10.13	14.14	16.87	21.130	16.158	21.453	23.782	27.883
S_2	10.56	14.58	17.150	23.548	15.247	20.691	22.353	26.130
S_3	10.73	14.45	17.33	24.156	14.163	20.452	22.443	26.057
C.D. (P=0.05)	NS	NS	NS	1.23	0.455	0.836	0.418	NS
Time								
T_1	11.573	15.057	17.130	22.443	15.882	21.336	23.667	28.083
T_2	9.542	14.883	16.883	22.057	15.503	21.183	23.433	27.876
T_3	8.178	13.193	14.530	20.153	14.176	20.833	23.333	27.630
C.D. (P=0.05)	0.857	1.056	1.121	1.232	0.455	0.836	NS	NS

NS=Non-significant

(16.158, 21.453, 23.782) for the first three months (April, May, June). It may be due to readily and largely availability of nitrogen, which is integral part of chlorophyll, that is the primary absorber of light energy needed for photosynthesis. Hence, it is favourable for vegetative growth and imparting plant metabolism. Besides wider spacing does not create any competition among the plant. All the plants carry equal opportunity of light, nutrient, moisture etc. and produce vigorous growth. These results are in conformity with findings of Cireasa (1984) and Jhon *et al*. (1991). Thereafter, no significant effect of varied spacing on shoot number/plant was recorded.

Table 2 : Effect of spacing and time of planting on spike production in Alstroemeria cv 'ALLADIN'

Treatments	July	Aug.	Sept.	Oct.	April	May	June	July	Total flowers plant ^{1}	Spikes m^{-2}
	2005-06							2006-07		
Spacing										
S_1	4.220	5.820	5.597	6.443	10.570	12.166	6.883	5.500	57.578	215.606
S_2	4.533	5.660	5.453	6.333	9.883	11.853	6.583	4.556	56.233	241.138
S_3	4.250	5.532	5.277	6.148	10.156	11.500	6.057	4.667	54.228	270.267
C.D. (P=0.05)	NS	NS	NS	NS	NS	0.453	0.310	NS	2.571	20.458
Time										
T_1	5.333	6.018	5.813	6.270	9.888	11.357	6.450	5.445	57.659	256.508
T_2	3.150	4.532	5.550	6.152	9.730	10.883	6.333	5.330	55.837	239.059
T_3	2.667	4.163	5.330	5.883	9.667	10.830	6.410	5.158	54.539	231.445
C.D. (P=0.05)	0.583	0.308	0.213	NS	NS	NS	NS	NS	2.571	20.458

NS=Non-significant

Table 3 : Effect of spacing and time of planting on spike length in Alstroemeria cv 'ALLADDIN'

Treatment	July	Aug.	Sept.	Oct	April	May	June	July
	2005				2006			
Spacing								
S_1	66.371	79.453	90.662	92.370	76.852	94.458	88.716	80.353
S_2	65.883	80.508	92.158	96.883	79.163	96.156	94.450	84.193
S_3	66.441	80.667	94.443	97.158	82.458	98.230	94.558	84.731
C.D. (P=0.05)	NS	NS	3.450	3.450	2.870	4.137	4.258	3.750
Time								
T_1	67.450	79.333	93.317	93.317	80.916	91.276	90.156	81.556
T_2	64.158	78.150	93.518	93.518	81.453	92.450	89.443	80.333
T_3	62.557	77.458	94.153	94.153	80.158	91.667	90.238	80.667
C.D. (P=0.05)	2.330	1.832	NS	NS	NS	NS	NS	NS

NS=Non-significant

Table 4 : Effect of spacing and time of planting on rhizome production in Alstroemeria cv 'ALLADIN'

Treatments	Rhizome wt. per plant (kg)	Rhizome no. per plant	Wt. of rhizome (kg) m^{-2}
Spacing			
S_1	0.319	8.830	1.192
S_2	0.306	8.118	1.452
S_3	0.292	7.000	1.719
C.D. (P=0.05)	0.010	0.247	0.250
Time			
T_1	0.322	8.381	1.534
T_2	0.307	8.044	1.443
T_3	0.289	7.524	1.387
C.D. (P=0.05)	0.010	0.247	NS

S_1 = 4 plants m^2, S_2 =5 plants m^2, S_3 =6 plants m^2 T_1 = Planting 3rd week of April, T_2= Planting Ist week of May, T_3 = Planting 3rd week of June

Earlier planting resulted in significantly more shoots per plant however, differences in shoot number per plant on account of varying planting dates evened out.

Flowering parameters :

There is a significant influence of different regimes of spacing and time of planting on all flowering parameters *viz.*, spike production and spike length. (Table 2 and 3). Highest total flower production per plant over one year period (57.578) was recorded with a spacing of 4 plants m^{-2} whereas highest total flower yield per unit area (270.267 m^{-2}) was recorded with 6 plants m^{-2} spacing. 215.608 and 241.138 spikes m^{-2} were recorded with 5 and 4 plants m^{-2} spacing, respectively. Plants planted in 3rd week of April produce highest flower production of (57.659) per plant with maximum flower yield of (256.508 m^2) per unit area. The probable reason for good flowering may be due to higher supply of nitrogen and wider spacing that reduces competition among the plants, which facilitates better growth for each plant. These findings are in confirmation with Cireasa (1984), Arora and Saini (1976); Ravindra *et al.* (1986) and Bijmol and Singh (2001) and Khan *et al.* (2000). Closely spaced plants (6 m^{-2}) yielded significantly longer spikes from September onwards. However, time of planting had no significant effect on spike length except in July and August of the first year.

Rhizome parameters :

Spacing at 4 plants m^{-2} resulted in highest rhizome yield per plant (0.319 kg) as against 0.292 kg with 6 plants m^{-2}whereas time of planting has no significant effect on rhizome production. An explanation for this is that the greater inter-plant spaces allowed more unrestricted new horizontal rhizome growth than vertical root growth. This is in conformity with Liseicka and Szczepaniak (1992) and Douglas *et al.* (2004).

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