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Short communication

Effect of planting dates on growth, flowering and seed production of snapdragon

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ABSTRACT

Studies were carried with an objective to identify the best date of planting to get optimum growth, flowering and seed production of snapdragon. The experiment was conducted for two years under mid-hill conditions of Himachal Pradesh. Planting was done at an interval of 15 day starting from September 17 in both the years with planting dates as; September 17, October 2, October 17, November 1, November 16 and December 1. The maximum plant height (91.83 cm), plant spread (36.68 cm), number of stems per plant (6.08), stem length (82.00 cm), early flower bud formation (70.18 days) and flowering (107.35 days) with maximum duration of flowering (39.97 days), number of flowers per stem (31.70), number of pods per stem (30.87), seeds per pod (390.76), seed yield per plant (8.44 g) and 1000-seed weight (0.13 g) were recorded when planting was done on September 17. However, pod formation was earliest (182.48 days) in December 1 planting.

Key words: *Antirrhinum majus*, planting time, quantitative traits.

Antirrhinum majus L. commonly known as snapdragon is a herbaceous plant having flower with inquisitive shape and brilliant colours (Huxley *et al*., 5). *Antirrhinum* is used as cut flower and bedding plant throughout the world. It is native to Mediterranean region and belongs to family Plantaginaceae. *Antirrhinum* is a facultative long day plant and flowering hastens under long days; but also occurs under short days. A number of studies carried out on Antirrhinum suggest that longer photoperiod and warmer temperature results in early flowering (Sanderson and Link, 7).

Flower seed production is now gaining popularity in India as it is having great export potential. It has increased profit 2.5 to 3 times more as compared to wheat in Punjab (Singh *et al*., 8). Similarly in H.P. seed production of flowers is relatively remunerative enterprise. Planting dates depend upon the environmental conditions and the geographical location of the area. Same date of planting cannot be standardized for all geographical location of the zone because of difference in the natural environmental conditions. Therefore, attempts were made to examine an applied possibility of plant scheduling of snapdragon by planting it at different dates to find out the optimum time of planting for flower and seed production.

The experiment was carried out at the experimental farm of the Department of Floriculture and Landscape Architecture, YSPUH&F, Nauni, Solan, Himachal Pradesh for two tears. Solan is located at an elevation of 1276 m above mean sea level lying between 32°51'0'' North latitude and 77°11'30'' East longitude. The climate is sub-temperate with an annual rainfall between 800-1300 mm. Experiment was conducted on plants obtained from open-pollinated seeds of snapdragon. Nursery raising was done 1 to 1½ months before transplanting depending upon the planting date. One week before planting, well rotten farm yard manure (5 kg/m^2) was applied uniformly along with full doses of phosphorous and potassium along with half dose of nitrogen were incorporated into the beds. The remaining half dose of nitrogen was applied after 30 days of planting. Nitrogen, phosphorus and potassium (30 g/ m^2 each) were applied through urea (46%), single super phosphate (16% P_2O_5) and muriate of potash (60% K_2O) mixed in the soil @ 65.22, 187.2 and 50 g/ m^2. The transplanting of uniform sized seedlings was done at a spacing of 30 cm × 30 cm from plant to plant and row to row accommodating nine plants per square meter area. Transplanting was done on six different dates starting from September 17 to December 1 at an interval of 15 days, *viz.* September 17, October 2, October 17, November 1, November 16 and December 1. Pinching was done at 4 node stage by removing the apical growing portion of the plant in order to produce multi-stemmed plants. The experiment was laid out in randomized block design with six planting dates as treatments and four replications. The data

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were subjected to statistical analysis employing a Randomized Block Design and were analyzed by one-way ANOVA using OP STAT statistical software.

Significant effect of planting time on vegetative growth, flowering and seed yield of snapdragon was observed (Table 1 & 2). Maximum plant height (91.83 cm), plant spread (36.68 cm), number of stems per plant (6.08) and stem length (82.00 cm) were obtained with September 17 planting followed by October 2 planting (Table 1). Warmer weather conditions prevailing during earlier planting dates might have resulted in luxuriant vegetative growth producing more number of stems per plant and finally increased plant spread. In a similar studies on planting dates in pyrethrum maximum plant height, number of shoots per plant, percentage of flowering plants and number of flowers per plant with early planting, *i.e.* 3rd of November, whereas with delay in planting (*i.e.* on 23rd November and 13th December) a corresponding decline in all the parameters was observed (Singh *et al.*, 9).

Minimum days from planting to flower bud formation and flowering were taken by September 17 planted crop (70.18 and 107.35 days) with maximum duration of flowering (39.97 days) and number of florets per stem (31.70) (Table 1). Snapdragon planted on 17th September flowered earlier because of congenial environmental factors such as mild temperature, high humidity and sunshine hours in both the years. It was also reported that delay in flowering of different bedding plants with decrease in mean daily temperature (Blanchard and Runkle, 1). According to the report as temperature decreased from 20 to 15°C, the time to flower increased by 4-8 days in French marigold, dahlia, petunia, snapdragon, and viola; 11-18 days in African marigold, cosmos, dianthus, gazania, moss rose, petunia, verbena, and zinnia; and 20-38 days in angelonia, blue salvia, browallia, and pentas. Maximum duration of flowering (41.43 days), number of flowers per stem (21.98) and biggest flowers (5.66 cm in diameter) were also recorded in September 17 planted crop. Extended flowering may be ascribed to optimum temperature conditions at the time of flowering. These results are in conformity with (Dhatt and Kumar, 3) who also reported maximum duration of flowering with early planting (October 20) in larkspur. More number of flowers per stem may be attributed to

Table 1. Effect of planting dates on vegetative growth and flowering of snapdragon.

Planting date	Plant height (cm)	Plant spread (cm)	No. of stems per plant	Stem length (cm)	Days taken for visible bud formation	Days taken for flowering	Duration of flowering (days)	No. of florets per stem
September, 17	91.83	36.68	6.08	82.00	70.18	107.35	39.97	31.70
October, 2	89.06	33.03	5.66	72.71	82.90	119.34	38.33	29.51
October, 17	86.90	31.96	5.73	70.13	112.37	140.64	37.94	28.73
November, 1	80.34	30.43	5.13	66.20	109.81	138.27	35.99	25.82
November, 16	74.59	28.49	4.66	62.52	107.15	136.88	34.39	24.09
December, 1	71.78	27.33	3.75	58.78	103.36	131.88	31.39	19.25
$LSD_{(P=0.05)}$	4.48	2.25	0.64	3.43	4.28	2.66	1.06	1.58

Data are the pooled means of two years

Table 2. Effect of planting dates on seed characters of snapdragon.

Planting date	Days taken for pod formation	No. of pods per stem	No. of seeds per pod	Seed yield per plant (g)	1000-seed wt. (g)
September, 17	203.93	30.87	390.76	8.44	0.13
October, 2	197.31	28.75	371.61	6.43	0.12
October, 17	192.00	27.15	313.38	5.83	0.11
November, 1	190.92	25.21	274.21	3.78	0.11
November, 16	186.66	22.76	268.21	3.18	0.11
December, 1	182.48	17.63	255.38	2.32	0.11
$LSD_{(P=0.05)}$	2.78	1.62	24.60	0.75	0.01

Data are the pooled means of two years

abundant growth in terms of more plant height, plant spread and number of stems per plant which in return increased photosynthetic area and ultimately increased photosynthetic assimilates.

Though, late planting i.e. December 1 resulted in earliest pod formation (182.48 days) but quality and quantity of seed was significantly low in comparison to all earlier plantings (Table 2). Warmer temperature and low relative humidity during pod formation of December 1 planted crop resulted in faster maturation of pods. In our study September 17 planted crop produced maximum number of pods per stem (30.87), number of seeds per pod (390.76), seed yield per plant (8.44 g). More number of pods per stem could be attributed to the corresponding abundant vegetative growth (plant height, plant spread and number of side stems per plant) and more number of flowers per stem in September 17 planted crop which ultimately resulted in more number of pods per stem. Similar results of increased seed production have been reported by Dubey *et al.* (4) in cosmos and Dhatt and Kumar, (2) in coreopsis. Higher seed yield per plant with seeds having higher weight was also observed in September 17 planting. More seed yield in September 17 planted crop might have been resulted due to increased number of pods per stem, along with more number of seeds per pod. These findings are in line with findings of increased seed yield with earlier planting in phlox (Kumar and Kaur, 6) and in larkspur (Dhatt and Kumar, 3).As regards 1000 seed weight, it was also recorded maximum in September 17 planting which could be attributed to favourable temperature (comparatively cooler) conditions prevailing at the time of flowering and at the time of seed maturity which resulted in better seed filling.

From the present findings it is evident that planting snapdragon in mid September produced more luxuriant vegetative growth which ultimately resulted in improved flowering and seed production. Thus, it may be concluded that to get maximum flower and seed yields in snapdragon mid-September is optimum planting time.

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