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Seed production potential of long day and intermediate group of onion genotypes as affected by period of cold treatment and growth regulator

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Abstract
The Flowering and seed production behaviour in long day and intermediate group of onion genotype differed significantly for growth and yield parameters. Granex it took more days to flower initiation 50 percent flowering completion of flowering and maturity the growth and yield parameters increased significantly with an increase in period of cold treatment from 35 to 75 days. The GA_3 treatment differed significantly of growth and yield parameters and also for quality attributes over no spray. The 75 days cold treatment sprayed with 200ppm GA_3 recorded maximum girth of the base of the umbel, more days to maturity, more umbels per plant, flower per umbel, seed per umbel, seed yield per umbel, seed yield per plant, 1000 seed weight and maximum seed yield per hector (992 kg) the interaction effect between cold treatment and GA_3 differed significantly. The interaction effects between genotypes, period of cold treatments and growth regulator were not significant for plant growth and yield components.

Keywords: Genotypes, cold treatment and growth regulator

Introduction
Onion (*Allium cepa* L) is an important vegetable and spice crop produced in all the regions of India. It is also an important foreign exchange earner for the country. based on photo periodic requirement onions are classified into two types *viz,*. Short day and long day types. The short day types that are grown in the tropical and subtropical plains of India during winter, which will not flower unless the light period is shorter than a particular critical time. Many of the species originating from the low latitude on either side of the equator where the natural day length does not exceed 14 hrs are short day plants, the long day type onions are suitable for cultivation in the temperate regions during spring season. Cultivation of long day types of onion in the hilly regions is restricted due to paucity of seeds and problems of flowering and seed setting. The flower formation and bolting of onion are induced by the low temperature and the flowering of the vernalized plants is promoted under long day conditions (saito,1983) [11] The temperature and period of cold treatment required for flower stalk development and flowering also vary with the genotypes. Therefore, it is also important to understand the relationship between vernalization and photoperiod effects in different genotypes.

Materials and methods: The experiment was conducted at Indian institute of Horticulture research, Hessaragatta during 2010-11. Mother bulbs of onion genotypes *viz.*, Granex, Superex, Red crealo and IHR-722 were obtained from Indian institute of Horticultural research, Hessaragatta, Bangalore and used in this experiment. Selected four genotypes *viz.*, Granex, superex (Long day), Red crealo and IHR-722 (Inter mediate group) medium size mother bulbs of 15 kg of three samples in each genotype were packed in ploythene bags with small pin holes. Were subjected to cold treatment for 35. 55 and 75 days at 6c. The samples were kept in the cold storage at a temperature of 6c and at staggered dates in such a way that the bulbs were subjected to three levels of cold treatment then the samples were drawn from the cold storage at once after subjecting the bulbs to different periods of cold treatment.

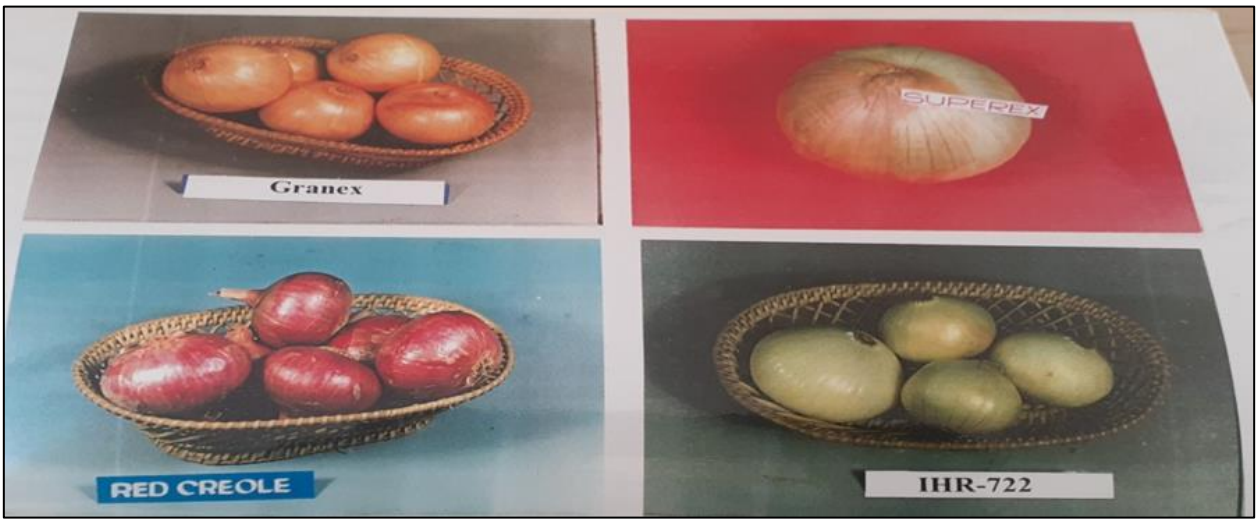

Plate 1: Mother bulbs of long day and intermediate onion genotypes

Application of GA3: Gibberlic acid solution of 100ppm and 200 ppm was prepared by dissolving 100mg and 200mg GA3 salt in separate beakers using small quantity of alcohol and then volume of each concentration ras made up to 1000ml by adding distilled water. Then the GA3 solution was sprayed on the onion plants by using hand sprayer at 45 days after bulb planting

Results and discussion

The onion genotypes *viz*., Granex, Superex, Red crealo and IHR-722 found to affect the seed yield and seed yield components. Granex recorced maximum seed yield (512kg) followed by superex (489kg) and Red crealo (478kg) while IHR-722 recorded lowest seed yield of 386 kg/ha. The maximum yield in Granex was due to higher number of umbels/plant (2.56), Number of flowers per umbel (190.56), number of seeds per umbel (273.14), seed yield per umbel (1.12g), seed yield per plant(327g),1000 seed weight (3.99g). The genotypic differences in yield and yield parameters were observed in onion by Aguiar *et al* (1983) [2] and in turnip by Hideyuki Thadashi *et al*. (1994) [7].

The period of cold treatment has largely influenced the seed yield and yield components. The mother bulbs subjected to cold treatments(6c) for 75 days recorded maximum seed yield (614 kg/ha) followed by 55 days(426kg/ha)and the lowest yield with 35 days(358kg/ha).the maximum yield in 75 days cold treatment was due to higher number of umbels/plant93.08g),flowers per umbel(159.52),number of seeds per umbel(260.63),and increased seed yield per umbel(1.07g) and seed yield per plant(3.69g).several workers observed similar response for artificial vernalization. Aguiar (1984) [1] reported that bulbs subjected for cold treatments at 8 to 10c for 90 days increased the number of seed stalks per plant. Similarly Msika *et al*. (1994) [9] obtained maximum seed yield per plant, when mother bulbs were vernalized at 8-9c for 12 weeks. Mother bulbs of Texas early Grano-502 vernalized at 11 c for a period of 60 days was effective in inducing flowering and recorded increased seed yield (Ramos-de-salarzno and Azocar Ramos, 1994) [10].

Spraying of growth regulator at 45 days of plant growth has tremendous influence on seed yield and yield parameters.200ppm GA_3 recorded maximum yield 732kg/ha, which is significantly superior to 100 ppm GA_3 (520kg/ha). But with control the seed yield was lowest (146kg/ha). The significant improvement in number of umbels per plant (3.33), flowers per umbel (192.27), seeds per umbel (316.11), seed yield per umbel (1.3g), seed yield per plant (4.39g) and 1000 seed weight (3.96g) has contributed for substantial increase in seed yield due to spraying 200ppm GA_3. The response of GA_3 spray was reported by several researchers ranging from 25 to 1000ppm. Cargon and Montano (1975) [6] observed 42 percent improvement in flowering with 100ppm GA_3 spray in Yellow grano cultivar. While, Loper and Waller (1982) [8] observed increased number of flowers with 500ppm GA_3 spray in onion. Whereas Bhople (1999) [4] observed increased number of flower per umbel with 75ppm GA_3 compared to 25 and 50ppm.

Table 1: Flowering and seed yield parameters and yield/ha in long day and intermediate group of onion genotypes an influenced by periods of cold treatment and growth Regulator spray.

Treatments	No. of umbels/ plant	No. of flowers/ umbel	No. of seeds /umbel	Seed yield /umbel (g)	Seed yield /plant (g)	1000 seed wt. (g)	Seed yield/ha (kg)
A Genotypes							
Granex	2.51	195.62	278.14	1.12	3.07	3.99	512
Superex	2.48	157.60	263.88	1.07	2.97	3.83	489
Red crealo	2.85	124.80	224.74	0.93	2.86	3.72	478
IHR-722	2.44	105.00	211.18	0.86	2.31	3.62	386
S.Em±	0.15	1.93	2.23	0.01	0.13	0.01	27.30
C.D. (P=0.05)	NS	5.45	6.31	0.03	0.46	0.03	76.90
B Period of Cold Treatment							
T1-35 days	2.22	133.58	231.97	0.94	2.17	3.74	358
T2-55 days	2.41	144.13	240.86	0.97	2.55	3.81	426
T3-75 days	3.08	159.52	260.63	1.07	3.69	3.81	614

S.Em±	0.13	1.67	1.93	0.01	0.14	0.08	23.60
C.D. (P=0.05)	0.37	4.71	5.46	0.02	0.40	0.02	66.50
C Growth Regulators							
Gr0-Control	1.80	70.36	122.86	0.48	0.87	3.66	146
Gr1-100ppm GA_3	2.58	174.61	294.50	1.21	3.15	3.79	520
Gr2-200ppm GA_3	3.33	192.27	316.11	1.30	4.39	3.92	732
S.Em±	0.13	1.67	1.93	0.01	0.14	0.08	23.60
C.D. (P=0.05)	0.37	4.71	5.46	0.02	0.40	0.02	66.60

The interaction effect due to period of cold treatments and growth regulators found highly significant irrespective of genotypes. Cold treatment for 75 days and 200m GA_3 spray found to be ideal in getting maximum seed yield (992.21kg/ha). Similar response for higher number of flowers and seed weight with increased period of cold treatment and higher concentration of 300ppm GA_3 has been reported by Beaulieu *et al*. (1998) [3].

The results of this study indicated that, the seeds of long day genotypes *viz*. Granex, Superex and intermediate genotypes Red crealo and IHR-722 can be produced effectively under Bangalore conditions, by subjecting the mother bulbs for cold treatment (6ºC) for 75 days and spraying the seed crop with 200ppm GA_3 at 45 days recorded after planting.

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