International Journal of Agricultural Sciences
Volume 8 |Issue 1| January, 2012 | 1-4

RESEARCH PAPER

Influence of growth regulators and crossing period on flowering, seed yield and quality of chilli hybrid HCH-9646

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Abstract **:** Application of growth regulators before flowering and at fruit initiation stage reduced the number of days for flowering and increased the seed yield and quality of chilli hybrid HCH-9646. Among them spraying NAA (20 ppm) before flowering and at fruit initiation stage recorded higher seed yield (9.06 g/plant) followed by 2,4-D at 1 ppm (9.05 g/plant) and GA_3 at 50 ppm (8.53 g) indicating their utility in enhancing seed production of chilli hybrid. Flowering behaviour, seed yield and quality of hybrid seeds produced at two different durations of crossing in HCH-9646 was assessed. The number of flowers crossed per plant, number of crossed fruits retained per plant, fruit set percentage and seed yield per plant increased from first crossing period (P_1-45 days) and reached to maximum in second crossing period (P_2-60 days), respectively during 2006 and 2007 *Kharif*. While, seed quality parameters declined as the crossing period prolonged.

Key Words **:** Growth regulators, Crossing period, Hybrid chilli, Seed yield

View Point Article **:** Kivadasannavar, Priya, Deshpande, V.K., Masuthi, Dileepkumar and Haleshkumar, H.B. (2012). Influence of growth regulators and crossing period on flowering, seed yield and quality of chilli hybrid HCH-9646. *Internat. J. agric. Sci.*, **8**(1): 1-4.

Article History **: Received :** *26.04.2011;* **Revised :** *25.06.2011;* **Accepted :** *01.10.2011*

INTRODUCTION

Chilli is gaining commercial importance as spice and also consumed as green vegetable. There is a great potential to increase yield in chilli either by reducing flower drops or by increasing fruit set. Plant growth regulators being considered as new generation of agro-chemicals after fertilizers, pesticide and herbicides have potential ability to increase productivity of vegetables. The plant growth regulators have contributed a great deal to the progress of horticulture by modified and controlling growth behaviour of vegetable crops. To exploit the hybrid vigour, flowers on the female plants are emasculated and pollinated from desired pollen parent by hand and the late season flowers are removed leading only the hybridized fruits. However, no information is available on how hand crossing periods affect hybrid seed yield. Hence, a study was noticed to find out the suitable growth regulator and the effect of hand crossing periods on flowering behaviour, hybrid seed yield and quality.

MATERIALS AND METHODS

A field experiment for HCH-9646 hybrid seed production was laid out at Agricultural Research Station, Bailhongal farm, during *Kharif* 2006 and repeated in 2007 in a Randomized Block Design with factorial concept. Experiment consisted of two factors, first factor was growth regulator spray involving of four treatments *viz.,* GA_3 at 50 ppm, NAA at 20 ppm, 2, 4-D at 1 ppm and no spray (control) and second factor was of two crossing periods *viz.,* 45 days and 60 days. Twenty five days old seedlings were transplanted, single seedling per hill in each plot of 3 m x 3 m. The half dose of nitrogen (75 kg/ha) and full dose of phosphorus (75 kg/ha) and potassium (75 kg/ha) were applied at transplanting time and the remaining nitrogen (75 kg/ha) was applied as top dressing after six weeks of transplanting. These growth regulators were sprayed before

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flower initiation and at the time of fruit initiation stage. The crossing was carried out as per the treatments after first flowering. The plant protection measures were taken to control pest and diseases as and when required along with intercultural operations. In each plot five female plants were randomly selected and tagged for recording biometric observations on days to flower initiation, days to 50 per cent flowering, days to peak flowering, number of flowers crossed per plant, number of F_1 hybrid fruits retained per plant, fruit set (%), fruit length (cm) fruit girth (cm), fruit weight per plant (g), seed weight per fruit (g), number of seeds per fruit, seed yield per plant (g). The resulting F_1 hybrid seeds were evaluated for their 100 seed weight (g), seed germination (%) (Anonymous, 1999), seedling vigour index (Abdul Baki and Anderson, 1973), seedling dry weight (g) and electrical conductivity of seed leachate (dS/m).The statistical analysis of data was done and presented in Tables 1, 2 and 3.

RESULTS AND DISCUSSION

Pooled data (2006 and 2007 *Kharif*) was taken into consideration for interpretation. Among the growth regulators GA_3 50 ppm recorded significantly less number of days for initiation of flowering (24.9 days), days to 50 per cent flowering (34.2 days), days to peak flowering (44.83 days) and as compared to more in control (32.3, 46.2 and 58.0 days, respectively) (Table 1). The reduction in number of days and early induction of flowering can be ascribed to increased meristematical activity due to application of auxins, as the growth regulators are involved in increasing photosynthetic activity, efficient translocation and utilization of photosynthetic metabolic products causing the rapid cell elongation and cell division in the growing portion of the plant or stimulation of growth, besides increasing the uptake of nutrients (Natesh, 2005) in chilli. Similar results were also noticed by Kumar (2007) in tomato.

Crossing period recorded non-significant results for days to flower initiation, days to 50 per cent flowering and days to peak flowering. While, interaction was significantly lower in G_1P_1 (24.8, 34.1 and 44.8 days) and higher in G_4P_2 (32.5, 46.3 and 58.0 days) for days to flower initiation, days to 50 per cent flowering and days to peak flowering, respectively (Table 1).

Significant differences due to growth regulator spray and crossing period were noticed in seed yield and its components. Higher number of crossed fruits retained per plant (29.62), fruit set (41.61%), fruit length (14.02 cm), fruit girth (1.81 cm), fruit weight per plant (67.98 g), seed weight per fruit (0.36 g), number of seeds per fruit (69.3) and seed yield

Table 1 : Effect of growth regulator and crossing period on flowering behaviour and hybrid fruit set percentage of chilli hybrid HCH-9646

Growth regulator spray	Days to flower initiation	Days to 50% flowering	Peak flowering	No. of flowers crossed/ plant	No. of fruits retained/ plant	Fruit set (%)
G_1	24.9	34.2	44.8	71.48	28.14	39.44
G_2	25.6	34.7	45.5	71.36	29.62	41.61
G_3	26.1	35.3	46.3	71.96	27.62	38.86
G_4	32.3	46.2	58.0	71.49	18.49	26.12
S.E.±	0.7	0.9	0.6	0.48	0.95	1.34
C.D. (P=0.05)	2.3	2.7	2.29	NS	2.86	4.04
Crossing period						
P_1	27.2	37.5	48.6	67.60	25.71	34.99
P_2	27.3	37.7	48.6	75.55	26.22	38.03
S.E.±	0.5	0.6	0.8	0.34	0.15	0.58
C.D. (P=0.05)	NS	NS	NS	1.02	0.45	1.74
Interaction (G x P)						
G_1P_1	24.8	34.1	44.8	67.85	27.61	38.16
G_1P_2	25.0	34.3	44.8	75.11	28.67	40.72
G_2P_1	25.6	34.6	45.5	67.60	29.28	39.87
G_2P_2	25.6	34.8	45.5	75.13	29.96	43.34
G_3P_1	26.1	35.1	46.3	67.46	27.29	37.33
G_3P_2	26.1	35.5	46.3	76.46	27.94	40.40
G_4P_1	32.1	46.1	58.0	67.50	18.66	24.58
G_4P_2	32.5	46.3	58.0	75.48	18.33	27.67
Mean	30.6	37.6	48.6	71.57	25.97	36.51
S.E.±	1.0	1.3	1.0	0.69	1.35	1.90
C.D. (P=0.05)	3.2	3.9	3.2	2.08	4.07	5.73

G_1 – GA3 @ 50 ppm G_2 – NAA @ 20 ppm G_3 – 2, 4-D @ 1 ppm G_4 – No spray
P_1 – Upto 45 days (DAT) P_2 – Upto 60 days (DAT) NS = Non-significant

per plant (9.06 g) compared to control (Table 1) were noticed in plants sprayed with the NAA 20 ppm. The increase in seed yield and its components may be due to influence of growth regulators on lower flower and fruit drop and higher fruit set. The plants sprayed with growth regulators remained physiologically more active to build up sufficient food reserve (source) for developing flowers and seeds (sink). Such results were also obtained by Chandra and Shivaraj (1972) and Balaraj (1999) in chilli.

Crossing period upto 60 days (P_2) recorded higher number of crossed fruits retained per plant (26.22), fruit set (38.03%), seed yield per plant (8.59 g) over the crossing period of 45 days (P_1). The retention of higher number of crossed fruits per plant in crossing period of 60 days due to more number of flowers crossed in that period. Similarly Doddagoudar (2007) noticed higher number of crossed flowers, crossed bolls and hybrid seed yield/plant in middle crossing period compared to early and late crossing periods.

Interaction was found to be significantly higher in G_2P_2 for number of fruits retained per plant (29.96), fruit set (43.34%), fruit length (14.05 cm), fruit girth (1.81 cm), fruit weight per plant (67.99 g), seed weight per fruit (0.36 g), number of seeds per fruit (69.52), seed yield per plant (9.09 g) over other treatments.

Higher 100 seed weight (0.62 g), germination (85.26%), seedling vigour index (1477), seedling dry weight (0.33 g) and lower EC of seed leachate (0.80 dS/m) were observed in NAA 20 ppm. Growth regulators spray brought certain changes in seed development due to which there would be greater accumulation of food reserves resulting in higher seed quality parameters in chilli was noticed.

Early crossing period of 45 days (P_1) recorded significantly higher germination (80.97%) over the late crossing period and rest of the quality parameters showed non-significant difference. The variation in germination percentage with the advancement of crossing period might be due to inadequate supply of plant nutrients at growth stages and reduction in translocation of photosynthates from source to sink. With ageing of the plant particularly for later crossed seeds which may get less time for development of maturity which lead to development of shirvelled seeds. These results are in conformity with the findings of Waghmode *et al.* (2000) and Anonymous (2002) in cotton.

Interaction was found to be significantly more in G_2P_1 for 100 seed weight (0.68 g), germination (85.27%), seedling vigour index (1485), seedling dry weight (0.33 g) and minimum

Table 2 : Effect of growth regulator and crossing period on hybrid seed yield and its attributing characters in chilli hybrid HCH-9646

Growth regulator spray	Fruit length (cm)	Fruit girth (cm)	Fruit weight/ plant (g)	Seed weight/ fruit (g)	No. of seeds/ fruit (g)	Seed yield/ plant (g)
G_1	13.22	1.24	61.63	0.29	65.00	8.53
G_2	14.02	1.81	67.98	0.36	69.30	9.06
G_3	13.12	1.51	62.23	0.32	68.93	9.05
G_4	11.60	0.90	53.98	0.25	58.28	7.60
S.E.±	0.11	0.06	1.02	0.008	0.40	0.09
C.D. (P=0.05)	0.33	0.18	3.08	0.02	1.20	0.27
Crossing period						
P_1	12.92	1.35	61.43	0.31	65.29	8.53
P_2	13.07	1.37	61.48	0.31	65.29	8.59
S.E.±	0.08	0.04	0.002	0.006	0.28	0.01
C.D. (P=0.05)	NS	NS	0.006	NS	NS	0.03
Interaction (G x P)						
G_1P_1	13.21	1.21	61.61	0.29	65.29	8.48
G_1P_2	13.23	1.26	61.64	0.29	64.82	8.58
G_2P_1	14.00	1.81	67.96	0.36	69.19	9.04
G_2P_2	14.05	1.81	67.99	0.36	69.52	9.09
G_3P_1	13.08	1.51	62.15	0.32	69.68	9.03
G_3P_2	13.17	1.51	62.31	0.32	69.08	9.05
G_4P_1	11.37	0.88	53.99	0.25	58.11	7.58
G_4P_2	11.82	0.91	53.96	0.25	58.44	7.63
Mean	12.99	1.36	61.45	0.31	65.39	8.56
S.E.±	0.16	0.08	1.44	0.01	0.56	0.13
C.D. (P=0.05)	0.48	0.24	4.34	0.03	1.69	0.39

G_1 – GA3 @ 50 ppm G_2 – NAA @ 20 ppm G_3 – 2, 4-D @ 1 ppm G_4 – No spray
P_1 – Upto 45 days (DAT) P_2 – Upto 60 days (DAT) NS – Non-significant

Table 3 : Effect of growth regulator and crossing period on seed quality parameters of chilli hybrid HCH-9646

Growth regulator spray	100 seed weight (g)	Seed germination (%)	Seedling vigour index	Seedling dry weight (g)	EC (dS/m)
G_1	0.66	81.16 (64.23)	1347	0.30	0.84
G_2	0.68	85.26 (67.37)	1477	0.33	0.80
G_3	0.66	80.11 (63.51)	1288	0.28	0.87
G_4	0.50	77.18 (61.41)	1216	0.26	0.88
S.E.±	0.005	0.26	6.32	0.003	0.002
C.D. (P=0.01)	0.01	1.09	26.54	0.01	0.008
Crossing period					
P_1	0.63	80.97 (64.08)	1331	0.29	0.85
P_2	0.62	80.89 (64.01)	1332	0.29	0.85
S.E.±	0.003	0.008	4.47	0.002	0.001
C.D. (P=0.01)	NS	0.02	NS	NS	NS
Interaction (G x P)					
G_1P_1	0.66	81.03 (64.16)	1347	0.30	0.84
G_1P_2	0.66	81.29 (64.30)	1346	0.30	0.84
G_2P_1	0.68	85.37 (67.45)	1485	0.33	0.80
G_2P_2	0.68	85.15 (67.29)	1468	0.32	0.81
G_3P_1	0.66	80.05 (63.44)	1287	0.29	0.87
G_3P_2	0.66	80.16 (63.51)	1289	0.28	0.87
G_4P_1	0.51	77.41 (61.62)	1223	0.26	0.88
G_4P_2	0.50	76.96 (61.27)	1209	0.26	0.88
Mean	0.63	80.93 (64.08)	1332	0.29	0.85
S.E.±	0.007	0.36	8.94	0.005	0.003
C.D. (P=0.01)	0.02	1.51	26.83	0.02	0.01

G_1 – GA3 @ 50 ppm G_2 – NAA @ 20 ppm G_3 – 2, 4-D @ 1 ppm G_4 – No spray
P_1 – Upto 45 days (DAT) P_2 – Upto 60 days (DAT) NS =Non-significant

electrical conductivity (0.80 dS/m) over other treatment combinations.

The results of the present study indicated that NAA 20 ppm foliar spray before flowering and at fruit initiation stage gave higher hybrid seed yield which accounts for 6.21 per cent over GA_3 (50 ppm). Laboratory grade 2,4-D (1 ppm) was the next best treatment yielding 9.05 g per plant F_1 hybrid seed accounting for 0.11 per cent reduction in yield over NAA can be effectively used in hybrid seed production.

Chilli crop pollination upto 60 days of crossing period showed higher fruit set, seed yield and seed quality.

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