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Physiological and phenological basis yield potential in chilli cv Byadagi as influenced by growth regulators and nutrients

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Abstract
A filed experiment was conducted to find out the effect growth regulators and nutrients on physiological and phenological traits and yield potential in chilli. The data indicated that the plant height increased significantly due to NAA (50 and 100ppm) application whereas CCC treatments reduced the plant height. The partitioning of dry matter towards leaf, stem and reproductive parts increased significantly due to application of both growth regulator and nutrients. The treatments with CCC and NAA recorded higher values over other treatments. The yield components such as number of fruits per plant and average fruit weight were increased due to CCC treatments. Whereas leaf area index and fruit length were found to be higher in NAA treatments. All the growth regulator treatments significantly increased the fruit yield and this was significantly more with CCC (1000ppm) followed by CCC (500ppm).

Keywords: Chilli, growth regulators, nutrients and morphological traits

Introduction
Chilli is gaining commercial importance as spice and also consumed as green vegetables. There is a great potential to increase yield in chilli either by reducing flower drops or by increasing fruit set. To achieve this, plant growth regulators are considered as a new generation of agrochemicals after fertilizers, pesticides and herbicides. Plant growth regulators have potential ability to increase productivity of vegetables. The plant growth regulators and nutrients have contributed a great deal to the progress of horticulture by modified morpho-phygiological behaviour of vegetable crops. Hence a study was initiated to find out the suitable growth regulator and nutrients and their concentration for increasing the productivity potential in chilli.

Materials and Methods
The experiment was carried out with a chilli variety Byadagi Kaddi at the main agricultural research station, university of agricultural sciences, Dharwad. A field experiment consist of 15 treatments viz., Cycocel 500 and 1000ppm, NAA 50 and 100ppm, $ZnSO_4$ 0.25 and 0.50%, $FeSO_4$ 0.25 and 0.50%, $MgSO_4$ 0.25 and 0.50% and control (water spray). The experiment laid out in randomized block design with three replications, all the agronomic practices were taken up periodically. The sprays of growth regulators and nutrients were taken up at 45 and 65 days after transplanting. Five plant from each plot were selected randomly for recording various morpho-physiological observations at different intervals. Ten plants were harvested randomly in each individual plots for recording yield and yield components. The data on morpho-physiological traits and fruit yield were subjected to statistical analysis as suggested by Panse and Sukhatme (1984) [5].

Results and Discussion
Significant differences in plant height were noticed among growth regulator and nutrient treatments. It is interesting to note that there was a significant increase in the plant height over control in all the treatments except cycocel treatments, where there was a significant decrease in plant height.
Among the various growth regulator and nutrient treatments, NAA (100ppm) recorded significantly higher plant height (87.8cm), leaf area index (0.91), fruit length (14.62cm) and fruit volume (0.56CC) compared to other treatments (Table 1).

An increase in these parameters could be attributed to the increase in meristematic activity of apical tissue due to exogenous application of auxin, (NAA) which involved in increasing photosynthesis activity, rapid cell elongation and cell division in actively growing portion of the plant. (Dicks, 1980) [1].

The application of growth regulators and nutrients significantly increased the total dry matter and it's partitioning towards leaf, stem and reproductive parts and it was found that the increase was more with cycocel. Srivastava (1985) reported that the application of cycocel was found to increase the photosynthesis and dry matter partitioning in both in rabi and summer sunflower.

In the present study, it is found that there was a significant increase in the dry matter production of leaf, stem and reproductive parts due to growth regulator and nuterient treatments in general and cycocel (1000ppm) in specific (Table 2). However there was a significant decrease in leaf area index due to cycocel treatments, this could be attributed mainly to decrease in the leaf area.

The fruit yield in Chilli depends on the accumalation of photosynthates and partitioning of these assimilates into different parts. The fruits yield in Chilli was found to be strongly influenced by the application of different growth regulators and nutrients indicating the role of these chemicals in increasing the fruit yield through their effect on various morpho-physiological traits. The applications of CCC (1000ppm) resulted in significant increase in fruit yield as compared to other treatments. Several workers have also indicated significant increase in bulb yield of onion due to application of CCC (Kaynas, 1990) [3]. Growth regulator treatments significantly influenced the number of fruits per plant, average fruit weight, number of seeds per fruit, fruit girth, fruit length, fruit volume and harvest index. The application of CCC in general enhanced the average fruit weight, number of seeds per fruit and fruit girth to a greater extent than NAA treatments. This indicates that CCC and NAA treatments had more profound effect on yield components and thereby resulted in higher fruit yield. Kaynas (1990) [3] and Madalgeri and Ganiger (1993) [4] also reported increased yield of onion and potato respectively and high yield was attributed to increased yield components. The results of the present study indicated that CCC (1000 and 500ppm) or NAA (100ppm) folior spray at blooming (45 DAT) and fruit development stage (65 DAT) of Byadagi chilli variety gave higher fruit yield.

Table 1: Effects of Growth regulators and nutrients on physiological and phenological traits associated with productivity in Chilli cv. Badagi Kaddi

Treatment	Plant height (cm)	Leaf area index (LAI)	No. of fruits per plant	Fruit length (cm)	Fruit volume (cc)	Average fruit weight (mg)	Fruit yield kg/ha
CCC (500ppm)	70.5	0.80	81.9	13.17	0.39	530	1189
CCC (1000ppm)	68.5	0.78	83.5	14.22	0.40	532	1475
NAA (50ppm)	86.1	0.86	81.2	14.31	0.52	526	1152
NAA (100ppm)	87.8	0.91	81.3	14.62	0.56	529	1175
Miraculan (1000pm)	84.3	0.81	79.6	12.99	0.36	522	1130
Miraculan (2000ppm)	85.9	0.89	79.7	13.01	0.39	524	1139
Cytozyme (1000ppm)	80.7	0.81	78.4	13.16	0.26	520	1113
Cytozyme (2000ppm)	84.0	0.83	78.6	13.32	0.27	522	1118
$ZnSO_4$ (0.25%)	80.6	0.76	80.1	12.53	0.23	517	1119
$ZnSO_4$ (0.50%)	82.1	0.78	81.1	12.67	0.29	519	1140
$FeSO_4$ (0.25%)	81.1	0.77	76.7	11.22	0.21	516	1073
$FeSO_4$ (0.50%)	82.8	0.78	77.1	12.16	0.28	518	1087
M_8SO_4 (0.25%)	80.3	0.75	75.0	10.70	0.22	515	1054
$MgSO_4$ (0.5%)	80.7	0.77	76.2	11.05	0.25	517	1076
Control	78.1	0.73	68.0	9.29	0.09	509	933
Mean	80.90	0.80	78.57	12.50	0.33	521.66	1131.53
S.Em ±	0.42	0.007	2.36	0.56	0.04	3.14	41.63
CD @ (5%)	1.21	0.020	6.85	1.61	0.12	9.10	120.60

Table 2: Effects of growth regulators and nutrients on dry matter partitioning and yield components associated with productivity in Chilli CV Byadagi Kaddi

Treatment	Leaf dry weight (g plant^{-1})	Stem dry (g plant^{-1})	Reproduction dry matter (g plant^{-1})	No. of seeds per fruit	Pulp to seed ratio	Harvest index (%)	Fruit yield kg/ha
CCC (500ppm)	12.51	135.96	43.43	80.3	0.91	22.63	1189
CCC (1000ppm)	12.54	141.60	44.46	87.1	0.92	22.38	1475
NAA (50ppm)	12.20	123.56	42.74	81.6	0.91	23.94	1152
NAA (100ppm)	12.30	132.88	43.02	85.2	0.91	22.85	1175
Miraculan (1000pm)	11.19	130.53	41.48	80.5	0.86	22.64	1130
Miraculan (2000ppm)	12.09	138.22	41.79	82.5	0.87	21.75	1139
Cytozyme (1000ppm)	12.08	120.85	40.77	78.6	0.86	23.47	1113
Cytozyme (2000ppm)	12.55	127.98	41.07	80.8	0.90	22.61	1118
$ZnSO_4$ (0.25%)	11.17	115.57	41.46	75.3	0.87	24.64	1119
$ZnSO_4$ (0.50%)	11.63	122.56	42.11	79.6	0.83	23.88	1140
$FeSO_4$ (0.25%)	11.48	117.44	39.58	74.3	0.87	23.48	1073
$FeSO_4$ (0.50%)	11.67	121.17	39.96	78.6	0.89	23.12	1087
M_8SO_4 (0.25%)	11.04	116.58	38.68	73.1	0.86	23.25	1054
$MgSO_4$ (0.5%)	11.62	120.34	39.44	76.3	0.88	23.01	1076
Control	10.52	113.62	34.66	63.3	0.97	21.82	933
Mean	11.77	125.25	40.97	78.87	0.88	23.03	1131.53
SEm ±	0.22	0.74	1.36	2.86	0.02	0.15	41.63
CD @ (5%)	0.63	2.13	3.93	8.31	0.06	0.43	120.60

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