

Influence of growth regulators and nutrients on biophysical and biochemical parameters associated with yield potential in Chilli cv. BYADAGI KADDI

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ABSTRACT

A field experiment was conducted during *kharif* 1998, to study the influence of growth regulators and nutrients on biophysical and biochemical parameters associated with fruit yield in Chilli (cv. BYADAGI KADDI). The result revealed that the biophysical parameters viz, photosynthetic rate and transpiration rate had a significant positive association with fruit yield and these were maximum with NAA and CCC treatments. The biochemical parameters viz., nitrate reductase activity, total chlorophyll, carotene and ascorbic acid contents showed positive association with fruit yield, and higher increase with CCC for all these fruits except carotene content.

Key words : Chilli, Cycocel (CCC), NAA, ZnSO₄, FeSO₄, MgSO₄, Miraculan, Cytozyme.

INTRODUCTION

The bio regulation of growth, yield and plant composition by externally supplied synthetic chemicals and nutrients is one of most exciting research areas of the present time. Such bio regulation controlling internal plant metabolism by applying specific growth regulators and nutrients at proper stage of development is of the great significance.

Chilli is an important spice crop and India is largest producer of it in the world. They are good source of vit A and C. In addition to yield, many researchers indicated the influence of growth regulators on biochemical parameters like T.S.S (Hulamani, 1988) and ascorbic acid (Chandra and Shivaraj, 1972; Desai and Patil, 1984) in Chilli. The biophysical and biochemical parameters are known to affect the yield in many ways, as they are inter linked with photosynthetic process. It is better to identify the influence of growth regulators and nutrients on biophysical and biochemical parameters, which have close relationship with fruit yield, with this background, the present study was taken up.

MATERIALS AND METHODS

The experiment was conducted to study the influence of growth regulators and nutrients on productivity potential of chilli variety Byadagi Kaddi during *kharif* 1998 at the main Agricultural Research Station, University of Agricultural Sciences, Dharwad. A field experiment consisted of 15 treatments viz, Cycocel 500 and 1000ppm, NAA 50 and 100ppm, Miraculan 1000 and 2000ppm, Cytozyme 1000 and 2000 ppm, ZnSO₄ 0.25 and 0.50 per cent, FeSO₄ 0.25 and 0.50 per cent, MgSO₄ 0.25 and 0.05 per cent, and control. Laid out in Randomized Block Design with three replications. These growth regulators and nutrients with required concentration were sprayed

at blooming (45DAT) and fruit development stage (65 DAT).

Measurement of various biophysical parameters viz., rate of photosynthesis and transpiration were made at 75 days after transplanting, using a CO₂ Gas-analyser (CI-301) and stomal number was measured by the leaf impression method and the biochemical parameters viz., total chlorophyll, NRA^{ase}, carotene and ascorbic acid contents were measured by following the method of Arnon (1949), Saradhambal *et al.* (1978), Lippert and Hall (1973) and Sadashivan and Manikam (1992) at 75 days after transplanting, respectively. The data on biophysical, biochemical parameters and fruit yield were subjected to statistical analysis as suggested by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Photosynthesis is the primary process, which form the basis for yield determination. Several workers reported increased rate of photosynthesis with application of growth regulators in soybean (Pankajkumar 1998). In the present investigation it is clear that the growth regulator and nutrient treatments significantly increased the photosynthesis rate and it was maximum with NAA and CCC treatments indicating the role of these chemicals in increasing the rate of photosynthesis, there by increase in the fruit yield (Table 1). The rate of transpiration was also significantly increased due to application of growth regulator and nutrients. If moisture content in the soil is not a limiting factor, then increased rate of transpiration leads to increased dry matter production and consequently the yield. Similar observation of increased yield potential due to higher transpiration rate was also indicated by Pankaj kumar (1998) in Soybean. However, the number of stomata was not influenced by the application of growth

Table 1 : Influence of growth regulators and nutrients on biophysical parameters associated with fruit yield in Chili

Treatments	Photosynthetic rate (μ mole $\text{CO}_2 \text{ m}^{-2}, \text{ s}^{-1}$)	Transpiration rate ($\mu\text{g H}_2\text{O m}^{-2}, \text{ s}^{-1}$)	Stomatal number (mm^{-2})	Fruit yield (g plant^{-1})
CCC (500ppm)	14.56	12.12	183	43.43
CCC (1000ppm)	14.77	12.33	181	44.46
NAA (50ppm)	14.81	12.52	173	42.74
NAA (100ppm)	15.22	12.68	175	40.02
Miraculan (1000ppm)	14.10	11.55	178	41.48
Miraculan (2000ppm)	14.16	12.16	176	41.79
Cytozyme (1000ppm)	13.89	12.22	181	40.77
Cytozyme (2000ppm)	14.01	12.65	179	41.07
ZnSO ₄ (0.25%)	13.91	11.51	176	41.46
ZnSO ₄ (0.50%)	14.20	11.62	178	42.11
FeSO ₄ (0.25%)	13.79	10.93	177	39.58
FeSO ₄ (0.50%)	13.83	11.27	180	39.96
MgSO ₄ (0.25%)	13.91	11.31	181	38.68
MgSO ₄ (0.5%)	13.96	13.45	178	39.44
Control	13.12	10.22	179	34.66
Mean	14.14	11.90	178.3	40.97
S.E. \pm	0.21	0.24	4.14	1.49
C.D. (P=0.05)	0.61	0.69	NS	4.33

NS - Non significant

regulators and nutrients and it appears that it is genetic character (Table 1).

The effect growth regulators and nutrients on total chlorophyll content in leaf exhibited significant differences. The application of CCC and NAA resulted in significantly higher total chlorophyll content, nitrate

reductase activity, ascorbic acid content and carotene content in fruits and there was higher increase with CCC for all these traits (Table 2). The variation in chlorophyll content due to growth regulators and nutrients may be attributed to decreased chlorophyll degradation and increased chlorophyll synthesis. These results are in

Table 2 : Influence of growth regulators and nutrients on biochemical parameters associated with fruit yield in Chili

Treatments	Total chlorophyll (mg. g. fresh weight ⁻¹)	Nitrate reductase activity (μ mole g^{-1} fresh weight hr^{-1})	Caroten (mg 100g fresh weight ⁻¹)	Acorbic acid (mg g^{-1} fresh weight ⁻¹)	Fruit yield (kg ha^{-1})
CCC (500ppm)	2.48	360.3	583	121.3	1189
CCC (1000ppm)	2.59	397.7	591	117.6	1475
NAA (50ppm)	2.26	295.1	595	135.0	1152
NAA (100ppm)	2.33	313.5	603	140.6	1175
Miraculan (1000ppm)	2.31	343.5	561	112.0	1130
Miraculan (2000ppm)	2.38	375.2	572	102.3	1139
Cytozyme (1000ppm)	2.36	313.7	570	124.6	1113
Cytozyme (2000ppm)	2.39	345.0	578	112.0	1118
ZnSO ₄ (0.25%)	2.21	312.6	581	114.0	1119
ZnSO ₄ (0.50%)	2.26	326.2	592	119.0	1140
FeSO ₄ (0.25%)	2.36	346.3	532	103.6	1073
FeSO ₄ (0.50%)	2.39	375.0	551	116.6	1087
MgSO ₄ (0.25%)	2.36	281.6	512	100.0	1054
MgSO ₄ (0.5%)	2.41	313.2	543	113.0	1076
Control	1.06	249.5	478	91.0	933
Mean	2.27	329.9	562.8	114.8	1131.53
S.E. \pm	0.39	12.2	11.9	3.9	41.63
C.D. (P=0.05)	1.12	35.2	34.5	11.2	120.60

accordance with Starman *et al.* (1990) who explained that the application of ancymidol (growth retardant) to sunflower resulted in higher chlorophyll content without modification of leaf anatomy and decreased chlorophyll degradation. The delay in leaf senescence could also be attributed to higher chlorophyll content. The nitrate reductase is the key enzyme in nitrogen metabolism and the nitrate reductase activity (NRA) was found to correlated with drymatter production and partitioning in soybean (Antony, 1995).

The ascorbic acid and carotene contents also increased with the application of growth regulators and nutrients. Similar results of increase in ascorbic acid content was noticed by Revanappa *et al.* (1997) in chilli varieties. From the present investigation, it is clear that with the use of growth regulator and nutrients, the fruit yield and quality can be improved.

REFERENCES

- Antony, Edna (1995).** Nitrogen Utilization studies in groundnut genotypes. M.Sc (Ag.) Thesis, University of Agricultural Sciences, Dharwad (Karnataka).
- Arnon, D.I. (1949).** Copper enzymes in isolated chloroplasts: Polyphenol oxidase in [*Beta vulgaris* (L.)] *Plant Physiol.*, **24** : 37-40.
- Chandra, R. and Ahivaraaj, A. (1972).** Influence of exogenous hormones on flowering, flower shedding and fruit set of Chilli. *Andhra Agric. J.*, **19** : 34-35.
- Desai, B.B. and Patil, U.B. (1984).** Chemical regulation of yield and composition of Chilli fruits. *Indian J. Agric. Chem.*, **17**: 107-110.
- Lippert and Hall (1973).** Heterosis and combining and combining ability in chilli peppers by diallele analysis., *Crop Sci.*, **15** : 323-325.
- Pankaj Kumar (1998).** Influence of growth regulators on physiological aspect in soybean. M.Sc (Ag.) Thesis, University of Agricultural Sciences, Dharwad.
- Panase, V.G. and Sukhatme, P.V. (1967).** *Statistical Methods for Agricultural Workers*. Indian Council of Agricultural Publication Research, New Delhi; pp.167-174.
- Revanappa, Nalawadi, U.G. and Chetti, M.B. (1997).** Influence of growth regulators on qualitative and quantitative yield and net returns in green chilli cultivars, *Karnataka J. Agri. Sci.*, **10** : 1044-1048.
- Saradhambal, K.V., Singh, S.P., Prakasa, S. and Naik, M.S. (1978).** Effects of bacterial blight on the activities of nitrate reductase and peroxidase in rice plants. *Indian J. Biochem. & Biophys.*, **15** : 105-107.
- Starman, T.W., Kelly, J.W. and Pemberton, H.B. (1990).** The influence of ancimidol on morphology, anatomy and chlorophyll content in developing and mature *Helianthus annuus* Leaves. *Plant Growth Regu.*, **9** : 193-200.

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