# Auxin Mediated Nucleic Acid and Protein Synthesis in Simazine Treated Maize Plants.

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## INTRODUCTION

Simazine [2-chloro-4, 6-bis-(ethylamino)-1, 3, 5-triazine], a pre-emergence systemic weedicide, acts as the specific inhibitor to Hill reaction (Moreland and Hill, 1962) of photosynthasis, and to nucleic acid and protein synthesis (Singh and West, 1967). Increased level of auxin due to inhibition in the activity of IAA-oxidase in simazine treated plot tissues, has been ascribed as the probable cause of enhanced protein synthesis (Evert & Van Assche, 1969). In the present communication, impact of auxin level in simazine treated maize plants on nucleic acid and protein metabolism has been presented.

## MATERIALS AND METHODS

Corn seeds (var. Ganga hybrid-1) were germinated in sand and when 5 days old, seedlings transferred to 500 ml. of half strength nutrient solution No. 2 described by Hoagland & Arnon (1950). After 24 hr., the plants were supplied with full strength nutrient solutions. Simazine treatment at the concentrations of $0.5 \times 10^{-3}$ M, $0.5 \times 10^{-2}$ M, and $0.5 \times 10^{-1}$ M was given according to the method of Gramlich and Davis (1967). After twenty days of the treatment, ten plants from each concentration were harvested. Shoot portion was used for the triplicate analysis of eacb chemical constituent. Chlorophyll, RNA & DNA were determined by the method of Sahai Srivastava and Ware (1967). Peroxidase activity was measured by the method of Parish (1969) and enzymic protein was determined by the method of Lowry *et al.* (1951). Total and soluble nitrogen were determined by Micro-Kjehldahl technique (Thimann and Laloraya, 1960) and the protein nitrogen content was assessed from the differance of the two determinations. Auxin in the leaf tissues was analysed by the method of Sheldrake and Northkote (1968).

## RESULTS AND DISCUSSION

Simazine treated maize plants appeared dark green due to higher concentrations used, induced greater synthesis and maintenance of the auxin level in

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the leaf tissues. Simazine proved inhibitory to the activity of peroxidase. Inhibition in the enzymatic activity increased with increasing concentration of the weedicide (Table 1). Changes in auxin level and peroxidase activity gave inverse relationship.

**Table 1**

**Effect of Simazine on Chlorophyll-Auxin and Peroxidase in Maize Plants.**

| Constituent | Control | Simazine concentration (Molar( | | |
|---|---|---|---|---|
| | | $0.5x10^{-30}$ | $0.5x10^{-20}$ | $0.5x10^{-10}$ |
| Chlorophyll (mg/g fresh weight) | 3.25 | 3.40 | 3.75 | 3.80 |
| Auxin (mg/g fresh weight) | 35.00 | 47.25 | 68.99 | 69.12 |
| Peroxidase $10^3$x specific activity | 4 45 | 2.50 | 1.75 | 1.25 |

Auxin level of plant tissues is dependent on the activity of IAA-oxidase and peroxidase (Hare, 1964). It is suggested that simazine controls the level of auxin by retarding the IAA destruction (Evert & Van Asscha, 1969) via oxidase activity. Peroxidase activity has been suppressed by simazine. This caused the accumulation of higher level of indigenous auxin. Contrary to this, stimulation of peroxidase resulted into growth reductions by lowering the indigenous IAA content of the plant (Eastin *et al.*, 1964).

The growth regulator has increased the level of both RNA and DNA in the leaf tissues (Table 2). A direct relationship between nucleie acid, auxin, protein and chlorophyll content of simazine treated plots was found.

**Table 2**

**Effect of simazine on nucleic acid and protein content of the leaf of maize plant.**

| Constituent | Control | Simazine concentration (Molar) | | |
|---|---|---|---|---|
| | | $0\ 5x10^{-30}$ | $0.5x10^{-20}$ | $0.5x10^{-10}$ |
| DNA (mg/g fresh weight) | 0.35 | 0.39 | 0.44 | 0.47 |
| RNA (mg/g fresh weight) | 4.53 | 6.50 | 6.80 | 6.85 |
| Protein (mg/g fresh weight) | 10.40 | 14.65 | 16.20 | 17.50 |

Simazine treated maize plants exhibited increased uptake of nitrogen from the growth medium, and the assimilation of the absorbed nitrogen was more towards the synthesis of protein. This increase has been found to be due to the increased activity of nitrate reductase (Tweedy & Ries, 1967). A direct relationship between chlorophyll and protein cotent of the leaf (Demis *et al.*, 1967), was suggestive to the fact that the action of simazine in maize plants appeared to be due to its effect on the chloroplast itself. However, a very active protein synthesizing system has been described in the chloroplat (Spencer & Wilmen. 1964) which, because of the difference in size of the ribosomes, appeared to be independent of cytoplasm. The high activity of the protein synthesising system in the chloroplast suggested a high turnover of protein.

Higher level of auxin in the simazine treated plants is in congruance with the thesis that nucleic acid and protein synthesis is controlled from the indigenous level of the auxin (Armstrong, 1966). Regulatory action of amino acids in co-ordinating RNA and protein synthesis is governed by auxin (Penny and Galston, 1969). It has also been suggested that auxin acts as a signal for polypeptide chain initiation in higher plant cells. This function requires the participation of an auxin specific s-RNA fraction (Armstrong, 1966). The data of the present investigation suggest that simazine mediated auxin synthesis controln the nucleic acid and protein level in the plant tissues.

## SUMMARY

Maize plants (var. Ganga Hybrid 1) were treated with O, $0.5x19^{-30}$M, $0.5x10^{-20}$M, $0.5x10^{-10}$M concentrations of simazine. Treated plants exhibited higher level of chlorophyll auxin, DNA, RNA and protein and a decreased activity of proxidas. Impact of increased level of auxin in simazine treated plants on nucleic acid and protein synthesis has been discussed.

## REFERENCES

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