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EFFECTS OF PLANT GROWTH REGULATORS (PGRS) ON NITROGEN METABOLISM IN MEDICINALLY IMPORTANT PLANT *SIMAROUBA GLAUCA* DC.

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ABSTRACT

Simarouba glauca is medicinally important oil yielding evergreen tree. A field experiment was conducted to compare the effects of PGRs ((6-BA, GA, SA, CCC, Cysteine and Methionine) with different concentrations (5 and 20 ppm) on the nitrogen metabolism of *S.glauca seedlings*. The results showed that PGRs significantly increased the activity of enzyme NR. The nitrate content was deceased in roots and slightly accumulated in leaves due to foliar sprays. The level of nitrogen content was increased in response to cysteine, methionine and SA after foliar spray treatment. Thus overall nitrogen fraction was well maintained in response to PGRs which will be found beneficial for overall development of *s. glauca* seedling.

KEYWORDS: *Simarouba glauca*, Nitrogen Metabolism, PGRs, Foliar spray

INTRODUCTION

Simarouba glauca commonly known as **Laxmitaru** or **Paradise** tree.Paradise tree, a native of South and Central America and now grown widely in Karnataka, Andhra pradesh and Maharashtra. *S. glauca* is a valuable medicinal plant. Various parts of laxmitaru are utilized for extraction of crude drugs and seeds are considered as important source of oil used for edible as well as biofuel production. Nitrogen (N) is the most indispensible inorganic nutrient for growth and development of plant.[1 ,2] Total nitrogen content gives an idea of overall status of nitrogen in plant tissue. Nitrate reductase (NR) is an important enzyme in nitrate assimilation involves generation of nitric oxide in plants. The involvement of NR in generation of NO through catalyzing the reduction of nitrite is considered as an important physiological fuction of

NR plants [3,4] Hence it was thought worthwhile to study Nitrogen Metabolism in *S. glauca* in response to foliar application of 6-BA, GA, SA, CCC, cysteine and methionine.

MATERIAL AND METHODS

The fully developed seedlings of *S. glauca* were planted in field plots of 2mX 2m size in the month of July. The seedlings were allowed to establish in field for three months. The plots were equally irrigated with tap water. After establishment of seedlings each plots were sprayed with respective 5 and 20ppm concentration of growth regulators during month of October 2010. Foliar sprays were given in duplicate after every 7 days for four weeks. The influence of foliar application of 5 and 20 ppm PGRs like Benzylaminopurine (6-BA), Gibberellic acid (GA), Salicylic Acid (SA), Chlorocholine Chloride (CCC), Cysteine and Methionine on Nitrogen Metabolism of *S. glauca* was studied. The method given by Hawk *et al.*[5] was followed for total nitrogen content from leaves, stem and roots of *S. glauca* .The *in vivo* method described by Jaworski[6] was applied for detection of nitrate reductase activity The nitrate contents in the, leaves, stem and roots were determined using rapid colorimetric method by nitration of salicylic acid suggested by Cataldo *et al.*[7]

RESULT AND DISCUSSION

The results of foliar application of PGRs on nitrogen content of the S. *glauca* are revealed in the Fig No. 1. Data presented in fig 2 indicate that the activity of nitrate reductase was decreased due to foliar sprays of 5 and 20 ppm 6 – BA, 5 ppm CCC, 5 ppm SA, while the NR activity induced due to 5 and 20 ppm of GA, 20 ppm CCC, 20 ppm SA and 5 and 20 ppm methionine foliar sprays. Fig.3 shows The nitrate content was accumulated in response to 5 and 20 ppm 6 BA, 5 ppm CCC, 5 and 20 ppm cysteine, 5 ppm – SA and 20 ppm methionine foliar sprays. The content of nitrate was decreased in response to 5 and 20 ppm GA, 20 ppm CCC, 20 ppm SA and 5 ppm methionine in leaf tissue. In root tissue the nitrate content was found to be increased in response to 5 ppm 6- BA, 20 ppm GA, 20 ppm CCC and 20 ppm SA found to be decreased in other treatments.

According to Alpaslan *et al.*[8] application of SA increases N content in maize. SA treatment increased content of N in *Ocimum basilicum* and *Majorana hortensis.*[9] Stimulation in nitrogen content in shoots and roots of maize seedlings by application of different concentration of SA was reported by Awasthi and Garg.[10] An inhibition of total nitrogen level in *Vigna mungo* plants obtained from SA presoaked seeds.[11] Nitrogen uptake by single storage roots and leaves of carrot plant was enhanced by foliar application of urea + Mo + 6-BA + sucrose nutrition.[12]

Total nitrogen was enhanced in leaf tissue of sugarcane cultivar Co-671 due to pretreatment of DW, CCC and ethephon.[13] Study of Lone[14] revealed that foliar application of CCC increases N uptake in *Brassica juncea*. The increased levels of nitrogen content in response to cysteine, methionine and SA after foliar spray treatment appears to be beneficial in terms of enhanced nitrogen content of plants which might be useful for the improvement of many metabolic reactions and stimulation of IAA and cytokinin like growth hormones.

The effect of various PGRs on the ability nitrate reductase has been studied by several researchers. Lips and Roth- Bajerano[15] have been observed that GA in combination with cytokinins caused an increase in NRA in tobacco plants. Khan *et al*.[16] noticed enhanced nitrate reductase activity of mustard leaves in response to GA at optimal basal application of nitrogen. Jain and Srivastava[17] reported increase in NR activity by salicylic acid in maize. The higher doses of SA caused enhancement in NR activity in germinating moong seeds.[18] According to Kalarani *et al*.[19] NR activity was increased by 100 ppm foliar application of SA in *Lycopersicon esculentum* L. An increase in NR activity by cytokines in nitrate fed plants has been reported by Lu *et al*.[20] Hemalatha[21] noticed increase in NR activity in response to 6-BA in rice. According to Singh *et al.*[22] CCC at 100 ppm enhanced NR activity in case of wheat under water stress. External application of GA on yield and nitrate content of spinach was studied by Paspatis.[23] Salicylic acid decreases nitrate content in the leaves of Chinese chive.[24] Study of Koukounaras *et al*.[25] revealed that 6-BA did not affect nitrate content in leaves of stored rocket (*Eruca sativa* Mill). We also noticed increased levels of nitrate in response to 6-BA as indicated by Sakakibara *et al*.[26] and Takei *et al*.[27]

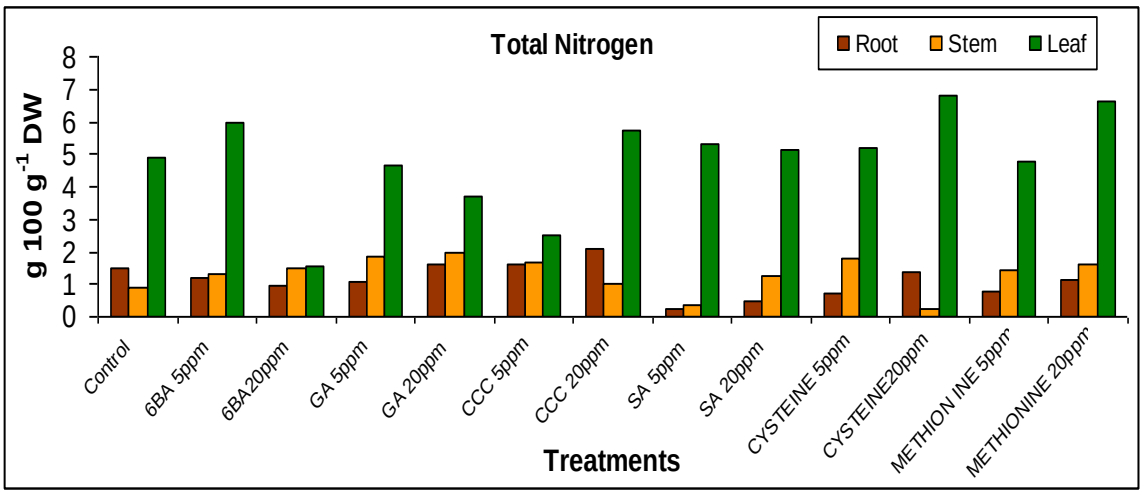

Fig1 Effect of foliar spray of PGRs on the content of total nitrogen in root, stem and leaves of *S. glauca*.

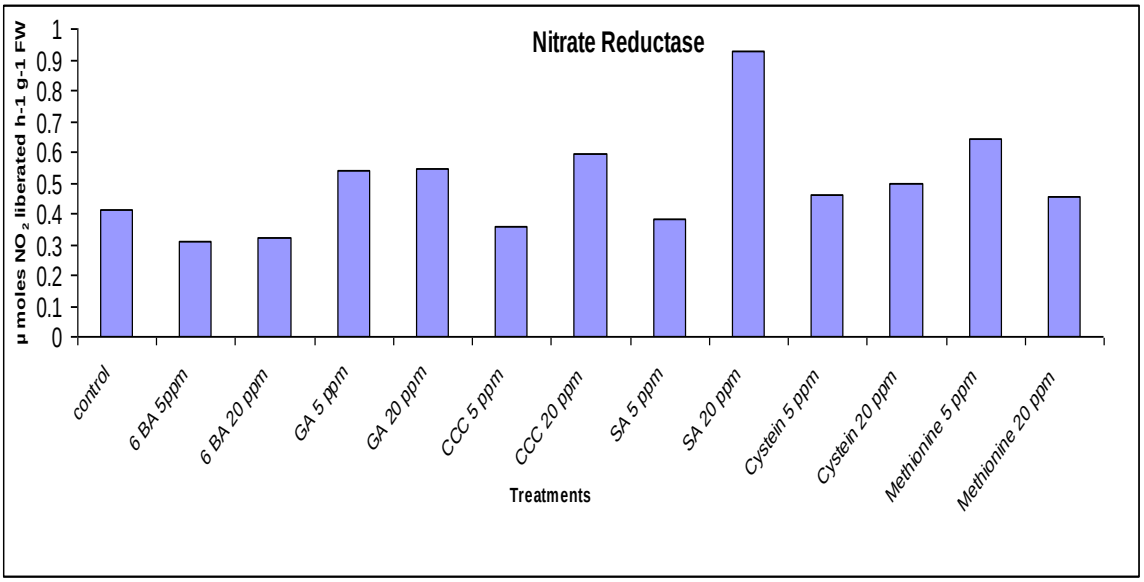

Fig. 2: Effect of foliar spray of PGRs on the activity of enzyme nitrate reductase in the leaves of *S. glauca.*

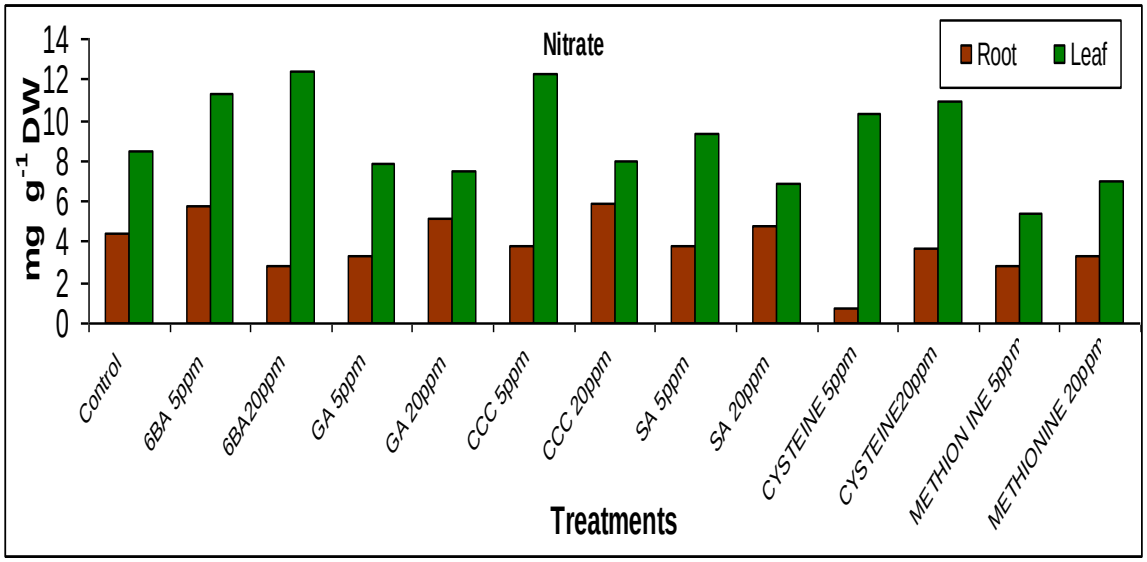

Fig. 3: Effect of foliar spray of PGRs on the content of nitrate in root and leaves of *S. glauca.*

CONCLUSIONS

This study highlights the level of nitrogen content of leaf tissue results in higher levels of crude proteins, which might be helpful for application of *S. glauca* leaves as a fodder for feeding cows and goats. The favorable effect of plant growth regulators on enzyme nitrate reductase may be due to either stimulation of enzyme protein synthesis or enhancement of nitrate uptake by plants during foliar sprays or it may helps in providing nitrogen pool to various metabolic reactions

which lead to synthesis of various amino acids and proteins during germination. This would undoutabally improves the nitrogen use efficiency of *S. glauca* seedlings during initial phases of growth.

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