

# **INTRODUCTION**

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## A. INTRODUCTION

“Everything else may wait but not agriculture.”

- *Pandit Jawahar Lal Neharu.*

The ever-increasing population pressure has forced agricultural scientists of the world over to look for novel tools and techniques to increase the crop productivity. In the last 50 years output of world crop increased by 2.5 fold, with little increase in the land under cropping (Hoisington *et al.*, 1999). Taking into account the projected increase in world population, we must provide additional 2.5 fold increase during the last 50 years (James, 1997). The application of chemical fertilizers, supply of water through irrigation, chemical protection of crops from various pests and diseases etc. changed the agricultural scenario of the country whereas these primary causes for increased food production are largely exhausted. There thus remains a tremendous need to increase the growth and productivity of crop plants and is the only viable alternative left. Application of plant growth regulators is considered as one of the strategy, which is much involved in directing the plant growth in a positive manner. Phytohormones are effective in association with metabolism that provides energy and building blocks to develop the plant. Much attention has been paid to Auxins, Gibberellins, Cytokinins, Abscisic acid, Ethylene and Brassinosteroids. As salicylic acid has significant impact on various aspects in plants, it is argued that it should be raised to the status of phytohormone (Raskin, 1992a).

Salicylic acid is an aromatic phenolic compound belonging to the class of secondary metabolites. It is ubiquitous in plants and participated in the regulation of physiological processes in plants, such as photosynthesis, respiration, stomatal behaviour, flowering, ion uptake and translocation. It induces specific changes in leaf anatomy and chloroplast structure. SA causes thermogenesis in Arum flowers as it is calorogenic substance. SA is also shown to play a possible role in the heat acclimation as there is a transient increase in endogenous SA levels in heat shocked plants. SA has been implicated as one of the key component in the signal transduction pathway and is involved in local resistance and systemic acquired resistance. It also induces PR-gene expression and enhances disease resistance. Besides the role of SA in mitigating biotic stresses it has also been shown to play a role in responses to UV-B and ozone stresses. It influences various enzymes involved in different metabolic pathways. It

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has also been found that injection of SA in to the pith of stem induces photosynthesis (Smith *et al.*, 2001). In certain aspects of plant responses SA may be compared with other plant regulators. Thus it is obvious that a thorough understanding of responses of various crop species to this compound can give us better idea about the probable future role of salicylic acid in agriculture.

Keeping this view in mind, the physiology of groundnut plant was assessed following the foliar application of different concentrations of salicylic acid. For this purpose two promising cultivars of groundnut, SB-11 and W-44 were selected in view of their total seed yield potential (about 1200-1400 Kg/ha). Among all the oil seed crops, groundnut has first place in India. It accounts for more than 40% acreage and contributes about 60% of the total oil seed production in India (Singh *et al.*, 1998) Groundnut is grown on a large scale in almost all the tropical and subtropical countries of the world In India cultivation of groundnut is mostly confined to Gujarath, Andhrapradesh. Karnataka, Tamilnadu, Maharashtra, Panjab, Uttar Pradesh and Rajasthan. Groundnut plays an important role in the agricultural and industrial economy of the country. The productivity potential is very low in India (865 Kg/ha) as compared to other countries (2500 Kg/ha). The productivity can be improved by several ways, of which application of PGR may prove to be most useful. Review of literature indicates that not much work has been done on the impact of SA on the groundnut crop. In view of this the present work was conducted to find out the influence of different concentrations of SA on growth and various physiological aspects in the two groundnut cultivars.

The physiological studies mainly encompass the impact of foliar application of SA on growth. Changes in total chlorophylls were also studied to understand the effect of SA on the most important process photosynthesis.

The influence of salicylic acid on activity of few important enzymes was also investigated as the SA is involved in the enhancement of enzyme synthesis or its maintenance in active form. These enzymes include Nitrate Reductase, a key enzyme of nitrogen assimilation in plants, catalase, peroxidase and dehydrogenase, the antioxidant enzymes related to oxidative processes in plants. The impact of exogenous application of SA on stomatal conductance and water relations was studied.

The investigation was further extended to study the effect of different concentrations of SA on the uptake of mineral ions. Mineral nutrients play an important role in agricultural production. Groundnut crop requires all macronutrients

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and micronutrients for its growth and development; relatively in higher quantity as compared to many other crops (Hartzog and Adams, 1988, Singh, 2004, Singh and Chaudhary, 2007). Groundnut crop is susceptible to nutritional disorders caused due to insufficient mineral supply. Therefore it is essential to develop those practices which can reduce nutrients depletion and increase crop production. With this regard the effect of salicylic acid on uptake of ions was undertaken.

The dissertation is divided into four chapters.

Chapter- I 'Review of Literature', it has been taken in order to understand the work done on physiological roles and biosynthesis of salicylic acid in plants.

Chapter-II, 'The Material and Methods', the methodology followed for the investigation and detailed information about the selected cultivars is given in this chapter.

Chapter III, 'Result and Discussion', the significant findings of the research work have been presented and discussed. The recent and relevant literature has been consulted while discussing the findings of this study.

Chapter- IV, 'Summary and Conclusion', the significant findings are briefly summarized in the fourth chapter.

The last part of the dissertation 'Bibliography' includes the systematic presentation of relevant references concerned with our findings.

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