JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Effect of Salicylic Acid on Total Nitrogen and Nitrogen Fractions of Arachis hypogaea L.

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Abstract:

The present study was conducted to understand the effect of foliar application of Salicylic Acid (SA) on nitrogen content and soluble nitrogen fractions of groundnut crop. In the study, 30 days old groundnut plants were treated with different concentrations (5, 50, 100 and 200 ppm) of SA. The results showed that all the applied treatments of SA increased total nitrogen content in leaves and roots as well as leaf and seed protein content of groundnut over control. In contrary to it, SA showed decreased nitrate content in groundnut leaves. It could be concluded that SA mediated increased soluble protein contents might be involved in improving nutritive quality of groundnut. SA may also help to diminish the adverse effect of nitrate accumulation in groundnut plant. From these studies, 5 ppm SA should be recommended to enhance nutritive quality of groundnut seeds.

Key Words: Groundnut, Nitrate content, Nitrogen content, Salicylic acid, soluble proteins

Introduction:

Arachis hypogaea L. (Groundnut) is an annual oilseed legume crop of India. Groundnut seeds are rich source of proteins and an edible oil, naturally containing from 40-50% (Kyari, 2008). Now days incase oilseed crops the main challenge before plant scientist is to develop strategy to improve nutritive quality as well as to develop high yielding and disease resistant varieties. Several studies reported effect of climate, fertilizers, irrigation and plant growth regulators on the yield parameters, fatty acid composition, amino acid, oil and protein content of groundnut (Verma *et al*., 2008, Jadhav and Bhamburdekar, 2014, Jadhav, 2017). Salicylic acid is a natural endogenous phenolic signal molecule and it plays a major role in growth and development of plants (Raskin, 1992; Huang *et al*., 2008). Salicylic acid is involved in photosynthesis (Cag *et al*., 2009), stomatal regulation, transpiration and nutrient uptake (Gunes *et al*., 2005), flowering, inhibition of fruit ripening (Srivastava and Dwivedi, 2000). Salicylic acid has drawn the attention of physiologist due to its ability to induce systemic acquired resistance (SAR) in plants leading to defense mechanism against various biotic and abiotic stresses (Syeed *et al*., 2011, Idress *et al*., 2011).

Thus during the present investigation an attempt was made to understand the effect of foliar application of salicylic acid on the soluble nitrogen fractions of groundnut.

Material and Methods:

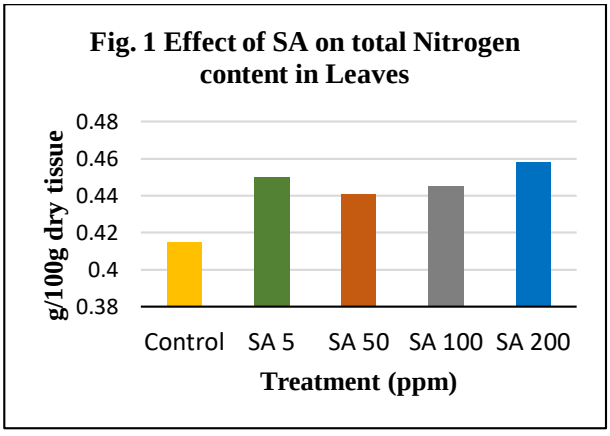
The seeds of groundnut cultivar SB-11 were collected from agricultural research station, Karad. The experiment was laid out in Randomized Complete Block Design (RCB) with three replications. Seeds were sown in 5×3 m field plots. Fifteen days old plants were sprayed with different concentrations (5, 50, 100 and 200 ppm) of ASA (40-50 ml/pl.) in 3 doses by keeping 4 days interval. The plants receiving foliar sprays of distilled water were served as control. The physiological parameters were studied at the end of foliar treatments.

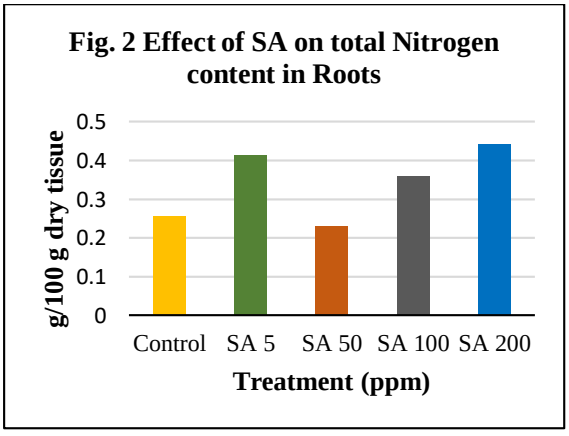
Soluble Nitrogen Fractions: 500 mg oven dried leaf material was homogenized in 20 ml alcohol (80%) and then filtered through Whatman No 1 filter paper. The filtrate was condensed on boiling water bath to 1-2 ml. Then 10 ml distilled water were added and mixed well. The filtrate were collected and final volume was made to 100 ml with distilled water. From this soluble proteins and nitrate content were estimated.

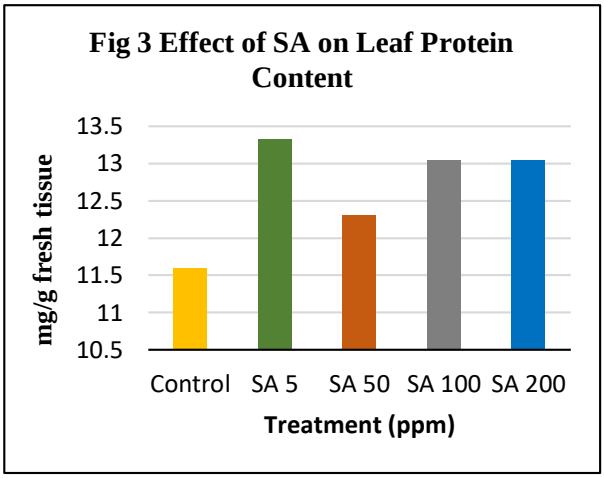
Nitrate and Soluble Protein Content: The nitrate content was determined by the method of Kolhoff and Noponen (1933). The soluble proteins of leaves were determined following the method by Lowry *et al.* (1951). Protein content of seeds of treated groundnut plants was determined by the Kjeldahl N analysis method (Nelson and Sommers 1980).

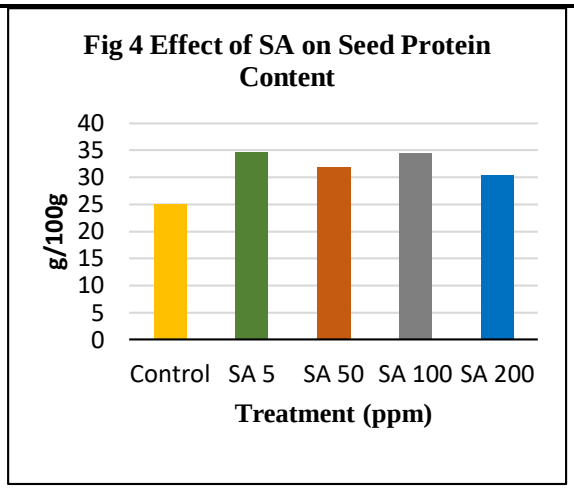
Results and Discussion:

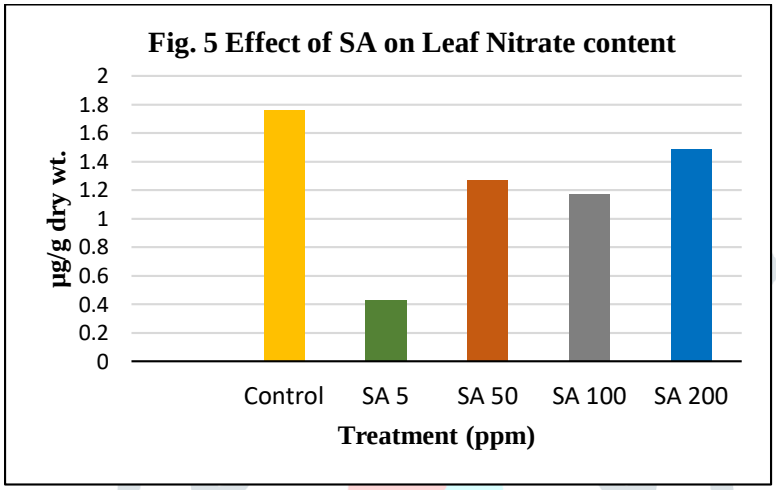
The results revealed that the exogenous application of all the concentrations of Salicylic acid (SA) significantly increased the total nitrogen content of leaf and root as well as leaf and seed protein content. Noteworthy increase in nitrogen and protein content was noticed with the treatment of 5 ppm and 200 ppm SA (Fig 1 to 4) which was followed by 50 ppm and 100 ppm SA. As shown in figure 5 decreased nitrate content in groundnut leaves was recorded with all the concentrations of SA. As groundnut is legume crop its nitrogen requirement is higher than the cereals. Earlier similar results also reported with the application of Acetyl salicylic acid in groundnut (Jadhav, 2018). Our results show close conformity with the findings of Tuna *et al.* (2007) in maiz. They reported SA and its derivatives mediated increased nitrogen content. The decreased leaf nitrate content with SA is in close agreement with the results found by El-Khallil (2009). He stated correlation in decreased nitrate content and increased Ca2+ which has shown to increase the activity of nitrate transporter. The results of present study pertinent to higher protein contents show conformity with those of Paul and Sharma (2000) and Jadhav and Bhamburdekar (2012).











It is clear that the higher nitrogen content in roots due to SA might be involved in higher nodule development for leghemoglobin content whereas increased nitrogen content may possibly favors the uptake of other minerals as indicated by Moussa (2000). Decreased content of nitrate could help to diminish adverse effects of nitrate accumulation in plants. As groundnut is oilseed legume crop and rich source of protein, Salicylic acid mediated significant increase in nitrogen and soluble protein content may prove efficacious to improve nutritive quality of groundnut seeds. SA mediated increased protein content may also beneficial in immune response against adverse abiotic and biotic stress in groundnut crop.

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