

(84)

Efficacy of Exogenous Sodium Nitroprusside, Salicylic Acid and Moringa (*Moringa oleifera*) Leaf Extracts as Biostimulants on Growth and Physiological Attributes of Rubber (*Hevea brasiliensis*) under Sub-optimal Climatic Conditions

Nayanakantha N.M.C.^{1,3*}, Nakandala D.S.A.¹, Silva T.U.K.¹, Herath H.M.N.N.¹, Herath V.², Senevirathna P.¹

¹Plant Science Department, Rubber Research Institute, Agalawatta, Sri Lanka

²Department of Biology, University of Peradeniya, Peradeniya, Sri Lanka

³Department of Biosystems Technology, Uva Wellassa University, Badulla, Sri Lanka

*nayanakanthachamil7@gmail.com

Abstract

Stress phenomena that coincide, such as drought and heat, have been shown to affect the growth of rubber (*Hevea brasiliensis*) negatively under sub-optimal climatic conditions in nontraditional drier areas of Sri Lanka. Exogenous sodium nitroprusside (SNP), salicylic acid (SA), and moringa leaf extract (MLE) as bio-stimulants have been shown to improve the growth and physiology of crop plants under sub-optimal climatic conditions. Therefore, the present study aimed at exploring the effect of the above bio-stimulants on the growth and physiology of rubber under sub-optimal climatic conditions. Rubber plants of clone RRIC 121 cultivated in Hingurana, Ampara, Dry Zone (DZ) were spray treated with SNP at 100 and 200 μM , SA at 0.1 and 0.2 μM , and MLE at 5, 10% concentrations at monthly intervals for six months. Physiological parameters viz. chlorophyll content (cc), stomatal conductance (gs), and leaf water potential (Ψ) were recorded before and after three months from the commencement of treatments while growth measurements (girth and height) were recorded at three and ten months of treatments. Significantly higher girth values were recorded in plants treated with SNP, SA, and MLE at all concentrations compared to control and mock treatment after ten months from the commencement of treatments. Significantly higher chlorophyll values were recorded in plants treated with SNP at 100 μM (50.6 ± 1.85), 200 μM (53.4 ± 1.24), SA at 0.1 μM (49.5 ± 1.49), MLE at 5% (50.1 ± 1.98) and 10% (51.1 ± 1.35) concentrations compared to control (41.9 ± 1.15) and mock treatment (44.6 ± 1.32) respectively after ten months from the commencement of treatments. Significantly higher leaf water potential values were recorded in plants treated with SNP, SA, and MLE at all concentrations compared to control and mock treatments after three months of the first treatment. Significantly lower stomatal conductance values were recorded in plants treated with SNP at 200 μM , SA at 0.1 and 0.2 μM , and MLE at 10% concentrations compared to control and mock treatments after three months from the first treatment. Improved growth and physiological attributes of rubber plants could be attributed to the beneficial effect of SNP, SA, and MLE as bio-stimulants. Therefore, exogenous application of the above bio-stimulants may be utilized for growth improvement in *Hevea* sp. under sub-optimal climatic conditions.

Keywords: Bio-stimulants, Growth, Physiological parameters, Rubber, Sub-optimal climatic conditions