

**EFFECT OF EXOGENOUS NITRIC OXIDE ON
GROWTH AND PHYSIOLOGICAL PARAMETERS
OF THE RUBBER CLONE PB 260 SUBJECTED TO
DROUGHT**

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ABSTRACT

Rubber cultivation is being expanded into non-traditional areas of Sri Lanka where drought stress is one of the major abiotic stresses limiting growth and development of rubber plants. Therefore, it is imperative to find ways to improve growth, development and abiotic stress tolerance in rubber plants grown in non-traditional areas. Nitric oxide, NO is a bioactive molecule involved in diverse biological pathways from seed germination up to senescence and proved to be protective against damages provoked by abiotic stress conditions. This study was carried out to investigate the effect of sodium nitroprusside (SNP) as an exogenous NO donor on physiological parameters (chlorophyll content, photosynthesis rate and stomatal conductance) and growth attributes *viz.*, dry weight of shoots, leaf area, number of leaves and internode length in the rubber (*Hevea brasiliensis*) clone PB 260 under drought stress condition. Six treatments were imposed for polybagged rubber plants namely control (normal watering), T1 (drought stress, no watering), T2 (50 μ M SNP + normal watering), T3 (50 μ M SNP + drought stress), T4 (100 μ M SNP + normal watering) and T5 (100 μ M SNP + drought stress) grown under glass house condition. Photosynthesis rate (*A*) and Stomatal conductance (*g_s*) were recorded at 0, 2, 4, 7 and 14 day's intervals. Chlorophyll content was recorded at 0, 7, and 14 days and also two weeks after the post treatments. Growth parameters were recorded after maturing of the new shoot during post treatment period. Drought stress negatively affected the growth and physiological parameters of rubber plants. Although there was no significant difference in net photosynthesis rate among drought stressed plants and also among irrigated plants since 4 days onwards from drought treatment, a significant increase in photosynthesis rate was observed in drought stressed plants treated with 100 μ M of SNP compared to drought stressed plants devoid of SNP treatments. Stomatal conductance was significantly decreased with increase in water stress duration irrespective of SNP treatments since 4 days onwards. A significantly higher chlorophyll content was observed in drought stressed plants coupled with SNP treatment at 100 μ M as compared to drought stressed plants devoid of SNP treatments. Interestingly, SNP treatment at both concentrations (50 and 100 μ M) was resulted in significant increase in the chlorophyll content in drought stressed plants as compared to drought stressed plants devoid of SNP treatments two weeks after stopping the drought treatments. The overall growth of rubber plants increased with SNP treatment as compared to control under normal irrigation. However, the growth of the new shoots emerged after imposing of

drought treatment was poor compared to that treated with SNP before imposing drought treatments. Plants subjected to drought stress without SNP possessed significantly the lowest number of leaves in the new shoots compared to the control and drought stressed plants with SNP treatment. There was a slight increase in dry weight of the new shoots of rubber plants treated with 50 μ M and 100 μ M of SNP, respectively, followed by drought as compared to the plants subjected to drought alone. Results of the present study reveal that a single application of SNP as a NO donor at the beginning of drought stress proved to be beneficial in alleviating the negative effects of drought stress on physiological and growth attributes of rubber plants. Therefore, the improved growth and physiological characteristics of rubber plants grown under glass house condition and subjected to drought stress could be directly attributed to the beneficial effect of SNP as a NO donor in modifying phytohormone signalling pathways, enhancing antioxidant enzyme activity and thereby protecting chloroplast and other organelles from oxidative damage, increase in nutrient uptake and effective allocation of photo assimilates. To our knowledge, this is the first report to explore the effect of NO on drought alleviation in rubber plants.

Key words: drought stress, nitric oxide, rubber, PB 260