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INFLUENCE OF NACL MEDIATED SALINITY STRESS ON LIPID PEROXIDATION IN GERMINATING SEEDS OF SOYBEAN

PATIL DHAIRYASHEEL B.*[1] AND BHAMBURDEKAR SHARAD B[2].

*[1&2] *P. G. Department of Botany, Plant Physiological Section, Krishna Mahavidyalaya, Rethare Bk. - 415 110, Tal. Karad Dist. Satara (MS) India.*

ABSTRACT

Salinity is one of the major abiotic stress that affects the growth and development of many important legume plants. Soybean is a most important oilseed legume cash crop of the world. It is also considered as an important source of high quality cheap protein and oil. In the present investigation, the effect of different concentrations of NaCl (50 mM, 100 mM, 150 mM and 200 mM) on lipid peroxidation during germination of soybean seeds was studied. The lipid peroxidase activity remarkably increases as concentration of salinity increases. The result revealed that, the activity of lipid peroxidation significantly increases up to 72 hrs in all treatments except 50 mM NaCl treatment.

KEYWORDS: Soybean, NaCl Salinity, Lipid peroxidase

PATIL DHAIRYASHEEL B.
P. G. Department of Botany, Plant Physiological Section, Krishna Mahavidyalaya, Rethare Bk. - 415 110, Tal. Karad Dist. Satara (MS) India.

***Corresponding author**

INTRODUCTION

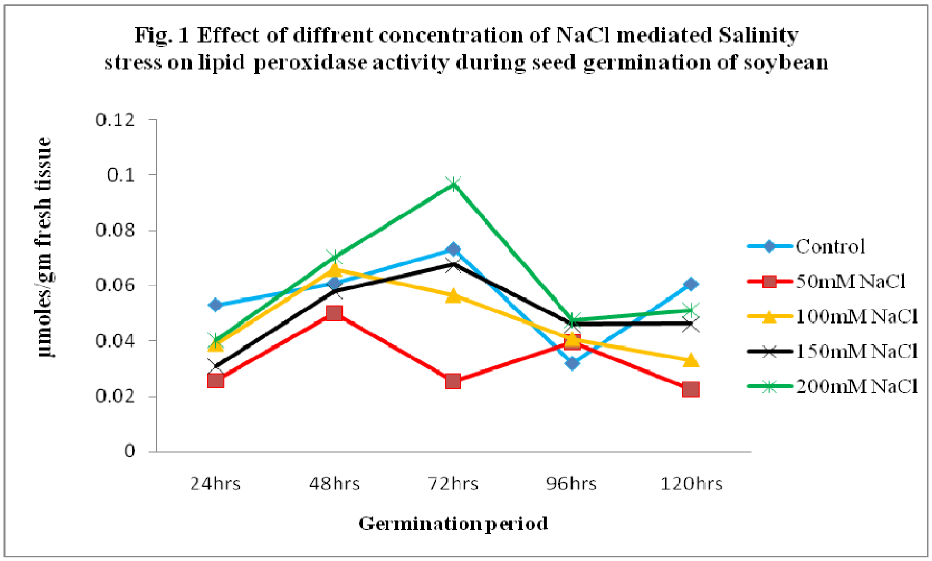
Soybean plays a crucial role in world food trade. It has the highest level of protein (40%) in comparison with other leguminous plant. The oil content (18%) in the soybean is second only to groundnut among food legume. In worldwide, 20% of irrigated land and 2.1% of dry land agriculture suffers from the salt problem [1]. Several biotic, abiotic and socio-economic constraints limit the productivity of soybean in India [2]. Recently, Patil *et al.,* [3] reported that NaCl mediated salinity stress adversely affects the germination percentage in soybean. Seed germination is much more complex process and sensitive life stage of plant that involves transition of metabolically quiescent to active and growing entity. According to Bailly [4] seed germination and post-germination seedling development are well regulated process in plant physiology involving high metabolic activity and generation of reactive oxygen species (ROS) in the cell. Reactive oxygen species (ROS) play dual role in plants as they acts as signalling molecule in cell and simultaneously acts as toxic product accumulating under stress conditions [5]. Generally, reactive oxygen species are highly cytotoxic and can easily react with lipids, proteins, nucleic acids etc. causing lipid peroxidation, degradation of proteins and mutaganesis respectively [6, 7, 8]. Oxidative degradation of lipid is termed as lipid peroxidation. In lipid peroxidation process polyunsaturated fatty acids in biological membrane system undergoes changes reaction as a result form lipid hydroperoxides [9, 10]. MDA is the final product of lipid peroxidase. It may acts as marker for lipid peroxidation and formed by the reaction of ROS with lipid molecules [11]. No information can be deciphered from the literature on the influence of NaCl-salinity on lipid peroxidation during germinating soybean seeds.

MATERIALS AND METHODS

Morphologically healthy seeds of soybean (JS-335) were first surface sterilized with 1% of $HgCl_2$ for 2 mins and then washed with distilled water to remove toxic elements. Petri-plates were sterilized with absolute alcohol and lined with filter paper at bottom. Twenty uniform seeds were placed in each petri-plate. The desired treatments were given by adding $15cm^3$ of aqueous treatment solutions (water-control, 50 mM, 100 mM, 150 mM and 200 mM of NaCl). The petri-plates were incubated in a BOD incubator at 26 ± 2^0C in dark and investigations were covered at different stages of germination from 24 to 120 hrs. The activity of enzyme lipid peroxidase was studied by method of Cakmak and Hort [12] and expressed in term of µmoles/gm of fresh tissue.

RESULTS AND DISCUSSION

The results obtained in present study is shown in Fig.1. The results revealed that, the activity of lipid peroxidase was significantly increased by all the treatment upto 48hrs but noteworthy induction was found by 200 mM NaCl treatment up to 72 hours, however decline in activity in lipid peroxidation was reported to increase in germination period with all the treatment except 50 mM NaCl treatment.



The oxidative stress may be observed in germinating soybean seeds due to salinity stress. These results are also in agreement with reports of Anita and Usha [13]. They stated that salinity stress is enhancing lipid peroxidase activity in leaves of soybean cultivars. According to Neto *et al.,* [14] the increase in lipid peroxidase activity is a one of the criteria to differentiate salt sensitive and salt tolerance variety. They reported that maize genotype increases different peroxidase activities due to salt treatment indicates salt tolerance nature in maize. Estandiari *et al.,* [15] observed increase lipid peroxidase activity in wheat seedlings under salinity. Similarly, Increase in MDA contents under salt stress was also found in rice [16], alfalfa [17], cotton [18]. Sreenivasulu *et al.,* [19] emphasized that the accumulation of MDA was more in the salt susceptible than in the salt tolerance cultivars. In the present study, the decrease in lipid peroxidase activity reported after 72 hrs similar, report was also noticed by Liang *et al.,* [20] in salt treated barley plant. The intensity of stress factor has a direct correlation with lipid peroxidation development. The balance between lipid peroxidation and antioxidant system is serve as pre-requisite for proper functioning of cells.

CONCLUSION

Thus, it has been concluded that, salinity induced product of lipid peroxidation may act as signal molecule that might help to reduce adverse effects of salinity on further development of soybean plants. Present study will help to study correlation between antioxidant enzymes and lipid peroxidase under salinity stress.

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