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EFFECT OF SIMULATED WATER STRESS ON IAA OXIDASE IN GROUNDNUT (*ARACHIS HYPOGEA*) SEEDLINGS

S. T. MATHEWS, V. M. LATHA,
V. N. SATAKOPAN and R. SRINIVASAN
Department of Biochemistry,
P. S. G. College of Arts and Science,
Coimbatore 641 014, India.

A variety of physiological and biochemical changes take place in plants subjected to water stress. Several enzymatic activities are modulated during water stress. These include peroxidase[1] and indoleacetic acid (IAA) oxidase[2]. It is well-known that IAA oxidase activity is responsible for oxidation of IAA, but the function of peroxidase still remains unclear. There are reports that peroxidase may also be involved in the maintenance of satisfactory auxin levels in plants tissues by degrading excess amounts[3]. Much controversy centres round the molecular identities of IAA oxidase and peroxidase due to their close physical association. According to one view the two activities are resident on a single enzyme while another hypothesis suggests that these two are separable and distinct enzymes[4]. Since these enzymes have a regulatory function in auxin metabolism, they have been examined again under simulated water stress conditions.

The G-2 variety of groundnut seeds (*Arachis hypogea*), obtained from the Gujarat Cooperative Oil Seeds Growers' Federation were germinated at room temperature in the normal way. Water stress was created by transferring the one-week-old seedlings to varying osmoticum solutions of polyethylene glycol '6000' for different durations. A range of 4 water potentials (−3, −5, 7.5 and −10 bars) were created by dissolving 11.5, 19.6, 23.5 and 28.9 g of polyethylene glycol '6000' in 100 ml of distilled water respectively[5]. The effect of concentration and temperature on water potential of PEG '6000' solutions differs from those for most salts and sugars and is apparently related to structural changes in the PEG polymer. The weights represent the actual values experimentally verified. The empirical equation given below roughly represents the relationship between water potential, temperature and concentration of PEG.

$$\Psi = -(1.18\times10^{-2})\,C-(1.18\times10^{-4})\,C^2 + (2.67\times10^{-4})\,CT+(8.39\times10^{-7})\,C^2\,T,$$

where Ψ is the water potential in bars, C the concentration of PEG in g/kg of water and T the temperature in degrees celsius. The seedlings were grown under the above mentioned stresses for 24, 72, 120 and 168 h. For control, one-week-old seedlings were grown in distilled water for the same duration. The total peroxidase activity in leaves was measured by the method of Machly[6] and the IAA oxidase activity measured by the method of Darbyshire[7].

The results obtained for the peroxidase activity are shown in figure 1. The peroxidase activity in leaves in the control group increased steadily up to the 7th day. The same pattern was also seen for the test groups as well, but the activity considered for each day was considerably less than that for the control group. The pattern was,

Control > −3 bar > −5 bar > −7.5 bar > −10 bar.

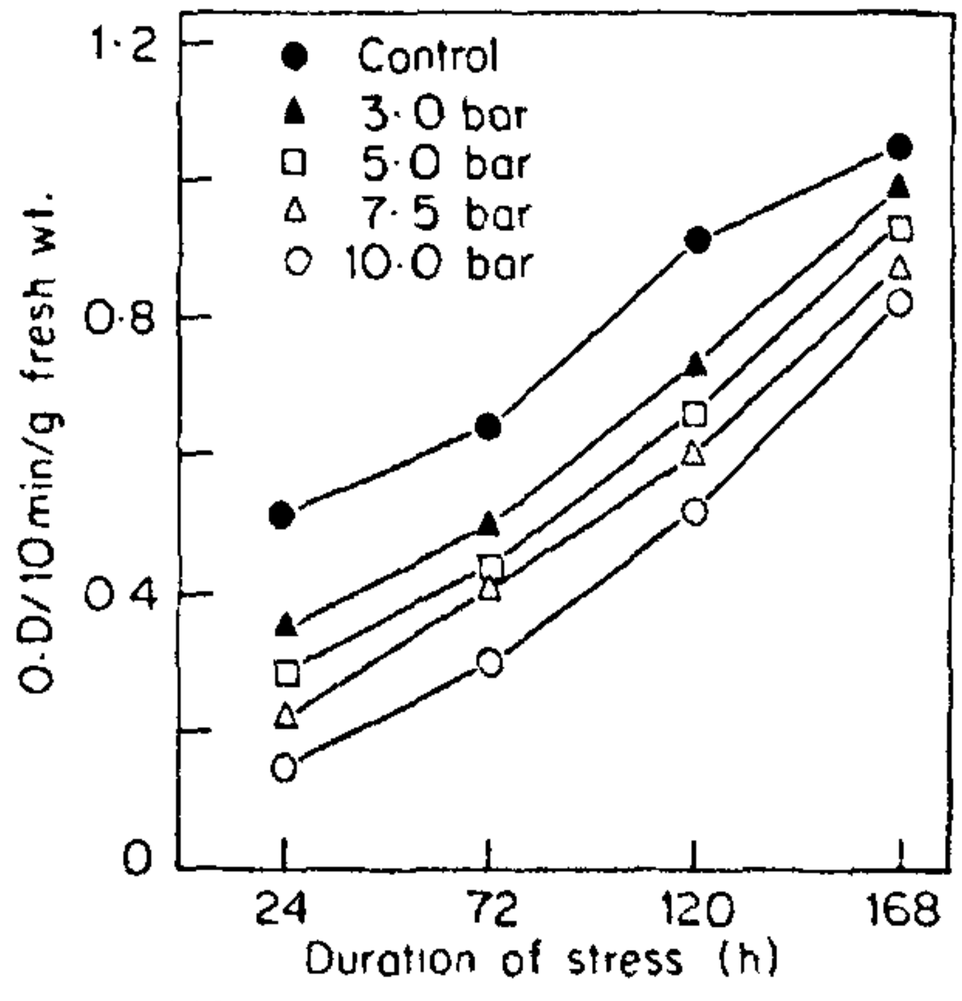

Figure 1. Effect of water stress on peroxidase activity.

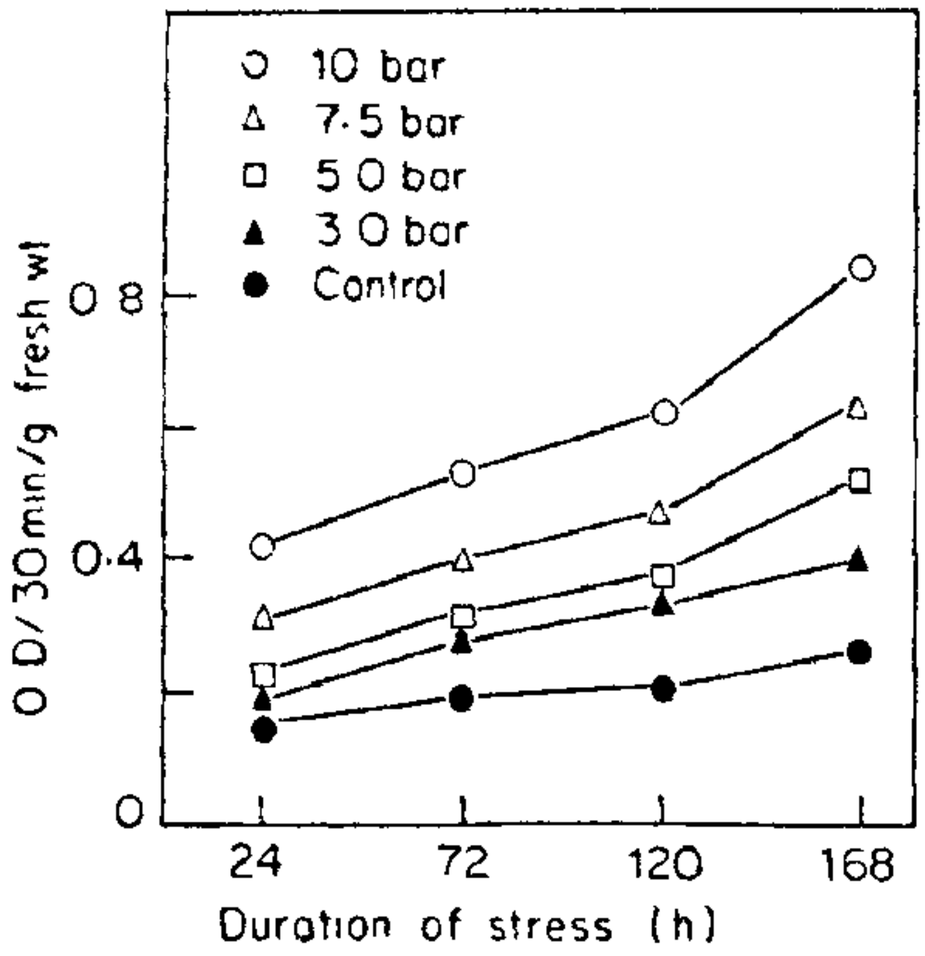

Figure 2. Effect of water stress on IAA oxidase activity.

The results obtained for the IAA oxidase activity for the various groups are shown in figure 2. The IAA oxidase activity in leaves of seedlings belonging to the control group shows a marginal increase from day 1 to day 7. The same pattern is seen in the test groups under water stress, the increase being steeper than in the control group. The IAA activity in leaves of the test group was considerably higher than that for the control group. The pattern was,

Control < -3 bar < -5 bar < -7.5 bar < -10 bar.

Thus it is clear that during water stress, the peroxidase activity declines while the IAA oxidase activity increases. Maintenance of normal auxin levels is important for the well-being of the plant tissues. Considering that both IAA oxidase and peroxidase might be involved in preventing deleterious accumulation of auxins, it is likely that during water stress there is a fall in peroxidase level and this is compensated by an accompanying increase in IAA oxidase activities. The results also suggest that the two enzymes are separate and individual entities.

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A REPORT ON THE LEVEL OF PROTEIN CATABOLISM IN DOXORUBICIN-TREATED RATS

A. GEETHA, R. SANKAR and
C. S. SHYAMALA DEVI
Department of Biochemistry, University of Madras, Madras 600 025, India.

THE anthracyclin glycoside doxorubicin (former generic name, adriamycin) is a widely used anticancer drug. In addition to its well-known cytotoxicity[1], doxorubicin has cardiotoxic[2] and nephrotoxic[3] effects. Considerable evidence from *in vitro* and *in vivo* studies suggests that activation of the drug to the semiquinone-free radical is an important step in the cascade of doxorubicin-induced events[4]. Some activated oxygen species formed during the reoxidation of semiquinone radicals can damage a variety of cellular macromolecules, including enzymes[5]. Since liver is the major organ involved in detoxification and degradation, an attempt has been made to study the level of protein catabolism in liver. Here, we report the activities of a few enzymes viz. transaminases, arginase, ornithine transcarbamylase and the levels of blood urea, serum and liver protein.

Doxorubicin was bought from Sigma Chemicals, USA. Weanling male albino rats derived from Wistar strain, weighing from 50 to 60 g were selected for the study. The animals were from the Institute of Forensic Science, Madras.

All the animals were given commercial pelleted feed (Hindustan Levers, Bombay). Food and water were given *ad libitum*. The rats were divided into 2 groups. Group I served as control. Group II animals were treated with doxorubicin (7.5 mg/kg body wt) intravenously for 2 days in 0.2 ml of sterile saline[3]. The control animals were injected with 0.2 ml of sterile saline. The animals were killed after 4–5 days, by cardiac puncture and 1 ml of blood was collected in potassium oxalate and the remaining blood was collected without any anticoagulant and the serum was separated. The method of Geyer and Dabich[6] was adopted for urea estimation.