Understanding the adaptive responses in jute to water stress

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Drought stress severely affects the production of jute *(Corchorus capsularis)*, a very important fiber crop widely used in the textile industry. We have identified and isolated transcripts induced upon treatment of jute (JRC 412) seeds with $CaCl_2$ (calcium chloride) and BABA (β-amino butyric acid), as elicitors, through the differential display analysis. BABA has been reported earlier as an elicitor which activates various biotic as well as abiotic stress responses in jute. Jute seeds were imbibed with elicitors to compare and study the response of the plants to water deficit. Biochemical parameters i.e. proline, proline oxidase and catalase and peroxidase, associated with the priming and Systemic Acquired Resistance (SAR) of the plant were also studied. Our findings suggest that jute seedlings, from seeds imbibed with $CaCl_2$ had greater drought stress tolerance than seedlings from seeds imbibed with BABA, as compared to non-elicited controls. The activity levels of the primary osmo-regulator proline as well as the free radical scavenger peroxidase were greater in the $CaCl_2$ treated seeds as opposed to the imbibitions with BABA. Through the differential display approach we have also isolated several transcripts that may have a direct influence on stress tolerance of jute plants. Interestingly, these transcripts were up-regulated in non-stressed, elicitor-exposed jute seedlings. This may serve to explain the subsequent tolerance of the seedling to water deficit. The significance of the isolated differentially expressed genes suggests elicitation with the help of an external ligand does in fact prime the plant towards increased levels of stress tolerance. Our findings can aid in a biotechnology based approach toward developing methodologies for the cultivation of crops under stress conditions. A primary approach would be to use a readily available elicitor, such as $CaCl_2$ to develop drought tolerance in seedling. A secondary approach would be to use the transcripts (associated with drought tolerance) as probes for identifying suitable cultivars (whether natural or hybrids) with the potential to tolerate drought stress.

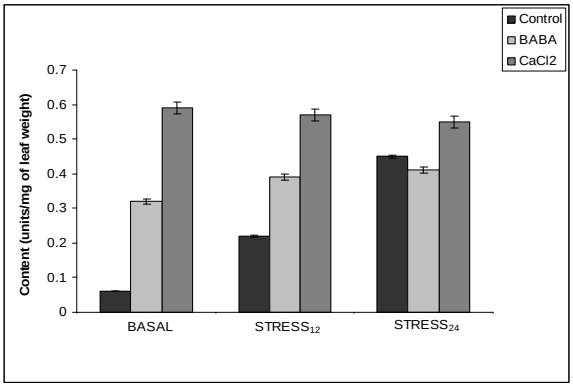

Figure I - Proline contents from leaves of basal (non-stressed) and stressed (water withdrawal) plants. The numbers accompanying the stress label indicate hours of water withdrawal.

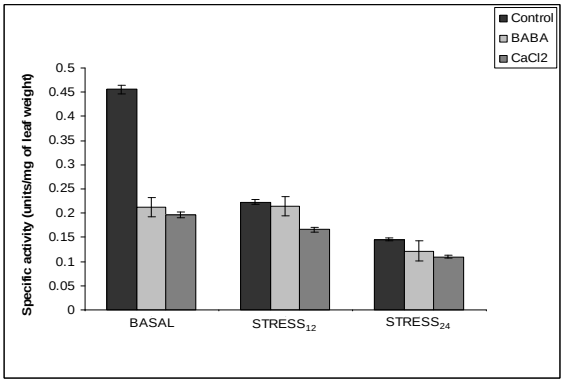

Figure II – Specific activity of proline oxidase from leaves of basal (non-stressed) and stressed (water withdrawal) plants. The numbers accompanying the stress label indicate hours of water withdrawal.

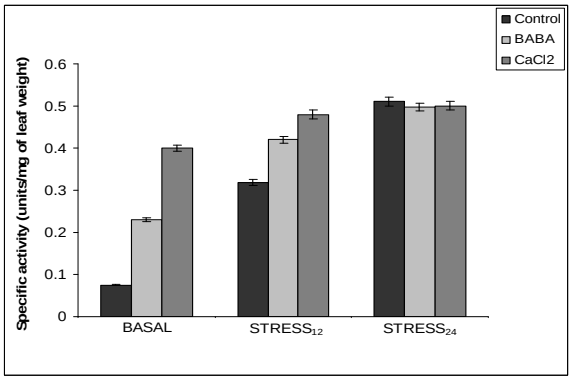

Figure III – Specific activity of peroxidase from leaves of basal (non-stressed) and stressed (water withdrawal) plants. The numbers accompanying the stress label indicate hours of water withdrawal.

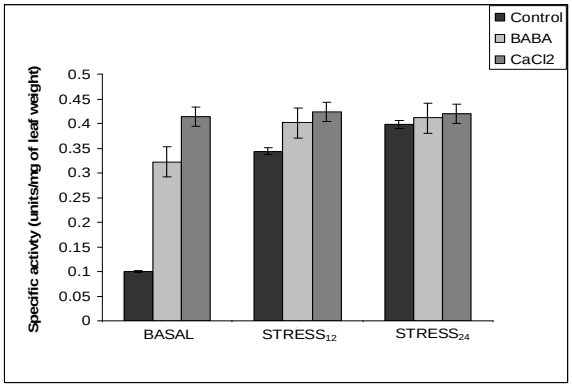

Figure IV – Specific activity of catalase from leaves of basal (non-stressed) and stressed (water withdrawal) plants. The numbers accompanying the stress label indicate hours of water withdrawal.