Induction of antioxidative enzyme by the Ayurvedic herb

Desmotrichum fimbriatum Bl. in mice

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The herb Desmotrichum fimbriatum Bl. (family: Orchidaceae), sold as Jibanti in West Bengal, is used in ‘Rasayana therapy’ in Ayurveda. Its effect on the modulation of the two antioxidant enzymes peroxidase and catalase has been studied in mice liver during ‘cold water swim’ (CWS) stress using appropriate controls. The drug, i.e. the aqueous ethanolic extract of the herb (whole plant) was found to increase peroxidase titre in the hepatic cells of normal mice. But in the stressed group, the drug displayed no effect on the peroxidase content, while it elicited an elevation of the catalase content. α-Tocopherol was used as the standard drug. These data suggested that the drug can ameliorate the peroxidative damage caused in mice by CWS stress.

A terrestrial herb Jivanti is traditionally used in ‘Rasayana therapy’ in Ayurveda. The herb Desmotrichum fimbriatum Bl. syn. Dendrobium macraei Lindl. (family: Orchidaceae), indigenous to Mumbai (Western Ghats), Chennai, Sikkim and Khasi Hills, is sold as Jibanti in W. Bengal and used for the same purpose as above1,2. Since all kinds of stress are known to induce peroxidative damage3 and since our previous experiments have demonstrated4 that the aqueous ethanolic extract of the whole plant of D. fimbriatum, henceforth called the drug, counteracts the CCl4-induced peroxidative damage in mice by triggering a surge in the free radical-scavenging enzyme catalase, it was planned to study the effect of this drug on both peroxidase and catalase in mice, subjected to ‘cold wet swim’ (CWS) stress5.

Animals—Adult, male Swiss albino mice (Mus musculus) of average body weight 20 g were collected from a local animal dealer and acclimatised in the laboratory conditions for a week. During this period the mice were provided with adequate food and water. The mice were divided into six groups: (1) control (C), (2) stressed (ST), (3) drug-treated (D), (4) drug-treated + stressed (DST), (5) standard drug-treated (S) and standard drug-treated + stressed (SST) and caged separately with six mice in each cage.

Drug and dose—The herb (80 g), collected from a local supplier and identified by a Systematic Botanist, was shade-dried, powdered and extracted with 70% aqueous ethanol (2×1.25 lit) by cold percolation. The combined percolates were evaporated to residue under vacuum (to remove ethanol) and lyophilised (to remove water) to furnish a dry mass (5.34 g) which was used as the drug, while α-tocopherol (Merck, India) was used as the standard drug. The drug (dried plant extract) at doses of 25 mg/kg body wt. was fed to the mice of the D and DST groups while α-tocopherol at doses of 60 mg/kg body wt. was fed to the mice of the S and SST groups, both orally and on every alternate day for eight days.

Stress—Only the ST, DST and SST groups of mice were subjected to the CWS stress method5, in which acute psycho-physical stress was induced into the mice by forcing them to swim in cold (10°C) water for 45 min. But in the DST and the SST groups, the stress was applied 24 hr after the last dose of treatment with the drug (dried plant extract) and α-tocopherol, respectively.

Assay of enzymes—The mice were autopsied on eightth day and about 10 mg portions of the liver tissues were taken out immediately. In each case, the liver was exposed to cold phosphate buffer (6.7×10−3 M, pH 7) and homogenized in a glass homogenizer. The homogenate was centrifuged in cold condition. The liver peroxidase (EC 1.11.1.7) and catalase (EC 1.11.1.6) contents of the supernatant were measured spectrophotometrically6. The statistical analysis of the data was performed by Anova test7.
The results, presented in Table 1, showed that the hepatic peroxidase increased significantly in the drug-treated (D) and standard drug-treated (DST) but remained practically unaltered in the stressed mice (ST and SST groups). But in the case of catalase, the titre was found to increase appreciably in the DST and SST groups in comparison to those in the ST and D groups and the increase was more in the DST group than in the SST group.

CWS stress, like any other stress, is known to trigger a surge in superoxide free radicals in liver, which initiates lipid peroxidation, and the latter leads to changes in fluidity and permeability of membranes. This is reflected in the lower titre values of both peroxidase (consumed in lipid peroxidation) and catalase (consumed in the scavenging of free radicals) in the stressed group (ST) of mice. But the exposure of the mice, treated separately with the drug and the standard drug and then subjected to CWS stress (i.e. the DST and SST groups, respectively) resulted in elevation of the catalase titres. The extract of *D. fimbriatum* may thus be conceived of having a 'Rasayanee' in Ayurvedic medicine in Bengal.

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### References


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**Table 1—Effect of *D. fimbriatum* on CWS stress-induced Liver peroxidase and catalase in mice**

<table>
<thead>
<tr>
<th>Groups of mice</th>
<th>Peroxidase* (A OD/min/mg protein)</th>
<th>Catalase** (units/mg tissue)</th>
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</thead>
<tbody>
<tr>
<td>Control (C)</td>
<td>0.182 ± 0.014</td>
<td>0.755 ± 0.222</td>
</tr>
<tr>
<td>Stressed (ST)</td>
<td>0.148 ± 0.019</td>
<td>0.388 ± 0.037</td>
</tr>
<tr>
<td>Drug-treated (D)</td>
<td>0.249 ± 0.025</td>
<td>0.354 ± 0.036</td>
</tr>
<tr>
<td>Drug-treated + Stressed (DST)</td>
<td>0.239 ± 0.068</td>
<td>0.577 ± 0.056</td>
</tr>
<tr>
<td>Standard (S)</td>
<td>0.323 ± 0.012</td>
<td>0.485 ± 0.10</td>
</tr>
<tr>
<td>Standard + Stressed (SST)</td>
<td>0.212 ± 0.18</td>
<td>0.544 ± 0.10</td>
</tr>
<tr>
<td>Mean S.E.</td>
<td>0.0573</td>
<td>0.1002</td>
</tr>
<tr>
<td>C.D.</td>
<td>0.120</td>
<td>0.2105</td>
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*P < 0.01; **P < 0.05*