Effect of Garlic Extract on Esterases Activity in Tissue of Male Albino Rats

Sashank Srivastava and P.H. Pathak

Department of Zoology, D.D.U. Gorakhpur University, Gorakhpur -273 009, India

Abstract: The prophylactic efficacy of garlic (Allium sativum Linn.) extract was studied on some biochemical parameters in male albino rats. The garlic extract was tested in three different doses 1, 2 and 4ml/ kg body weight daily for a period of 7, 14, 21 and 28 days. The significant (P<0.01) increase in Acid Phosphatase (AcPase) and Alkaline Phosphatase (AlPase) was observed when rats were fed with low and medium dose whereas significant (P<0.01) decreased was observed in these parameters when rats were fed with 4ml/kg body weight of garlic extract. The above study clearly indicated that phosphomonoesterases substantially affected by garlic extract and may be used as convenient markers in teratological studies.

Key words: Garlic Extract - Biochemical Parameters - Acpase - Alpase - Albino Rats

INTRODUCTION

Epidemiologic studies, during the last decade, have revealed an inverse relationship between garlic consumption and the incidence of certain forms of diseases, including stomach, colon and laryngeal cancers [1]. The importance of garlic has already been recognized in early Egyptian, Chinese and Indian civilizations, centuries ago as an herbal or traditional medicine. Today, in many parts of the world garlic is being used both as prophylaxis and for the cure of variety of diseases including acute and chronic infections like gastritis, dysentery, typhoid fever, cholera, tuberculosis, pneumonia, diabetes mellitus, heart disease and hypertension [2]. Allicin, diallyldisulfide-oxide, an active ingredient of garlic is a systemic vasodilator [3]. Ether extracts of garlic and partially purified distilled extracts of garlic have been reported to inhibit human platelet aggregation in vitro [4]. Treatment with garlic extracts was found to improve the activation of natural killer cells, the T-lymphocytes [5]. Also in vitro and in vivo studies showed that garlic extracts stimulate immune functions [6]. However, the pharmacologic properties of Allium sativum L., belonging to family: Liliaceae, requires intensive investigations.

Biochemical investigations of the effect of garlic in rats are limited to lipid metabolic studies only. The purpose of this study was to investigate the effect of garlic extract on the level of esterases (AcPase and AlPase) activities in liver of male albino rats.

MATERIALS AND METHODS

The Extract: Six months old (after harvest) garlic bulbs were collected from the local market. Garlic bulbs were separated, peeled and washed with distilled water. After drying in shed, about 500 g of clean garlic bulbs were crushed with the help of electronic grinder. The extract was strained through muslin cloth after squeezing the crushed materials [7].

Experimental Animal: Healthy adult male albino rats weighing approximately 150-200 g were selected for the experiment. All animals were acclimatized for a week in the laboratory before use [8]. The animals were housed five per cage under controlled conditions of a 12 h light/dark cycle, 50% of humidity and 26°C±2°C, with minimum noise levels [9]. Animals had free access to tap water ad libitum and normal diet.

Experimental Design: The animals were divided into four groups. Group A animals, which served as healthy control, were given normal feed and tap water ad libitum throughout the experimental tannure. Rats of group B, C and D were fed with 1, 2 and 4ml/ kg body weight garlic extract daily for 7, 14, 21 and 28 days daily. In all the groups, the extract was forced fed by using ball - tipped needle every day between 11.00 a.m. to 12.00 pm [10, 11].

Biochemical Studies: Assay for the activity of phosphatase was carried out according to Andersch and...
Szcypinski [12] as modified by Bergmeyer [13] and Singh and Agrawal [14] using p-nitrophenyl phosphate as substrate. Tissue homogenate (2% w/v) was prepared in ice cold 0.9% NaCl and centrifuged (5000g × 15min) at 0°C. The supernatant was decanted and used as an enzyme source. Standard curve was drawn with p-nitrophenol.

All the experiments were replicated five times and subjected to statistical analysis by two way analysis of variance (ANOVA), followed by student’s t-test, wherever required [15].

RESULTS

There was a significant increase / decrease in the mean values of acid phosphatase (AcPase) and alkaline phosphatase (AlPase) in male albino rats. In group B and C, the AcPase increased significantly (P<0.01) to the extent of 9.57 and 15.65% respectively whereas in group D there was a significant decrease (P<0.01) of 3.75% in acid phosphatase (Table 1, Figure 1).

In group B and C, there was a significant increase (P<0.01) of 9.21 and 10.93% in AlPase, whereas a significant decrease (P<0.01) of 2.89% was observed in group D in alkaline phosphatase (Table 1, Figure 1).

DISCUSSION

Phosphatase (acid and alkaline) is nonspecific phosphomonoester having p specificity, capable for splitting of phosphate from organic phosphate at different pH. The enzyme alkaline phosphate and acid phosphate are known indicators of well -being of eukaryotic cells.

Table 1: Percent change in Acid Phosphatase (AcPase) and Alkaline Phosphatase (AlPase) level after following the programmed feeding of Allium sativum (garlic) extract daily for 7, 14, 21 or 28 days respectively in male albino rats

<table>
<thead>
<tr>
<th>Regimens</th>
<th>Treatments</th>
<th>Control (0)</th>
<th>1ml/kg (bd.wt)</th>
<th>2ml/kg (bd.wt)</th>
<th>4ml/kg (bd.wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(µ mol/30 min/mg protein)</td>
<td></td>
<td>55.12 ± 0.234 (100%)</td>
<td>56.72 ± 0.177**</td>
<td>58.56 ± 0.153**</td>
</tr>
<tr>
<td>Acid Phosphatase</td>
<td>Control (0)</td>
<td>5,551.46 ± 0.309 (100%)</td>
<td>57.39 ± 0.158**</td>
<td>60.22 ± 0.118**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1ml/kg (bd.wt)</td>
<td>5,551.46 ± 0.309 (100%)</td>
<td>59.34 ± 0.117**</td>
<td>61.24 ± 0.123**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2ml/kg (bd.wt)</td>
<td>5,551.46 ± 0.309 (100%)</td>
<td>7.81 ± 0.117**</td>
<td>9.57 ± 0.117**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4ml/kg (bd.wt)</td>
<td>5,551.46 ± 0.309 (100%)</td>
<td>11.24 ± 0.117**</td>
<td>15.65 ± 0.117**</td>
<td></td>
</tr>
<tr>
<td>Alkaline Phosphatase</td>
<td>Control (0)</td>
<td>45,886 ± 0.181 (100%)</td>
<td>46,028 ± 0.176 (100%)</td>
<td>46,184 ± 0.163 (100%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1ml/kg (bd.wt)</td>
<td>45,886 ± 0.181 (100%)</td>
<td>47,588 ± 0.144**</td>
<td>50,438 ± 0.150**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2ml/kg (bd.wt)</td>
<td>45,886 ± 0.181 (100%)</td>
<td>48,070 ± 0.164**</td>
<td>51,232 ± 0.180**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4ml/kg (bd.wt)</td>
<td>45,886 ± 0.181 (100%)</td>
<td>49,318 ± 0.145**</td>
<td>51,232 ± 0.180**</td>
<td></td>
</tr>
</tbody>
</table>

Values are expressed as Mean ± SE of five replicates, Values in parentheses are percent change with control taken as 100 percent

Data were analyzed through Two Way Analysis of Variance (ANOVA) followed by Student’s t-test

• NS’ not significant, * significant (P<0.05) and ** significant (P<0.01), when treated groups were compared with controls

Fig. 1: Change in percent level of Acid Phosphatase (AcPase) and Alkaline Phosphatase (AlPase) in male albino rats after fed with different volumes of raw garlic extract for 7, 14, 21 and 28 days daily
membranes [16-18] and are frequently associated with the transport of nutrients across the cell membrane [19, 20]. Although, the levels of these phosphomonoesterases were elevated significantly in liver of mice, the garlic effect appears at this site. The active substance present in the garlic (allicin and diallylsulphide), possibly, act directly on the serum phosphatase and the stimulatory effect produced there in, is important from the pharmacokinetic point of view. Whereas absorption of garlic extract in the liver is probably delayed, this ultimately shows a steady level of stimulation of phosphatase activity. In both cases however, increase in the level of these phosphomonoesterases might have led to variations in the phosphate pool of the animal, which might lead to disturbed energy sources available to the animal with the consequent disturbances in its metabolism [21]. According to de Duve [22], a number of hepatic enzymes are concentrated in small subcellular fraction, which sediments between the usual mitochondrial and microsomal fraction. These enzymes are presumed to be enclosed within a lipoprotein membrane. Acid phosphatases break the ester linkage in the molecules and also help in the autolysis of the cells [23].

ACKNOWLEDGEMENT

Authors (PHP) are thankful to University Grant Commission, New Delhi (No. F. No. 34-414/2008 (SR)) for financial support.

REFERENCES