Serum-biochemical profile and immunomodulatory effect of *Aegle marmelos*, *Chelidonium majus* and *Boerhaavia diffusa* homeopathic mother tincture supplementation in guinea fowl

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**ABSTRACT**

An experiment was undertaken on a total one hundred eighty, guinea fowls (*Numida meleagris*) of day old age, which were randomly divided into four groups [Control, Bael (*Aegle marmelos*), Chelidonium (*Chelidonium majus*) and Punarnava (*Boerhaavia diffusa*) mother tincture], each group having three replications consisting of fifteen guinea fowls each, for a period of 12 weeks to test their effect on serum biochemical profile and immune response. Results revealed that inclusion of Bael, Chelidonium and Punarnava decreased serum cholesterol and serum glucose levels with minimum in Bael, however all treatments acted as immunomodulator with best immune enhancement recorded in Chelidonium supplemented group.

**Key words:** Aegle marmelos, Boerhaavia diffusa, Chelidonium majus, Immunomodulator, Guinea fowls, Serum-Biochemical.

**INTRODUCTION**

India is a rich source of traditional medicines and medicinal plants are the useful alternative of antibiotics in poultry production due to their wide range of safety margin. Now a day’s the demand of natural products has increased due to freedom from side effects, reduced risk of toxicity and being environment friendly. In order to improve health and fulfill consumer expectations in relation to food quality, poultry producers commonly use natural feed supplements, mainly herbs and plant extract (Gardzielewksa et al., 2003). In addition plant extract and herbs have been reported to activate the immune system having immunomodulatory and health beneficial properties (Bhatt et al., 2013 and Tiwari et al., 2014). As an alternate to herbal extracts, homeopathic mother-tinctures are better option due to their fast action, easy acceptance by the body, especially the gastrointestinal system for long term effectiveness. Use of homeopathic mother tinctures in poultry is relatively a new concept. Looking to the role of these mother tinctures an experiment was conducted to study serum-biochemical profile and immunomodulatory effect of Aegle marmelos, Chelidonium majus and Boerhaavia diffusa homeopathic mother tincture in guinea fowls.

**MATERIALS AND METHODS**

An experiment on one hundred eighty guinea fowl (*Numida meleagris*) keets from their initial nursing day old age was carried out at Instructional Poultry Farm (IPF), College of Veterinary and Animal Sciences, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar. These were randomly divided into four groups (T1-Control, T2-Bael, T3-Chelidonium and T4-Punarnava mother tincture supplemented group), having three replications consisting of fifteen guinea fowls each. All the birds were reared on deep litter system and provided standard diet. The respective homeopathic mother tinctures as per the groups were added @ 0.05ml, 0.08ml and 0.1ml per bird in the drinking water at morning time at the age of 1-4 weeks, 5-8 weeks and 9-12 weeks respectively; excluding the control group birds which were given plain drinking water. Delayed type of hypersensitivity test was conducted on the 40th day of experiment by randomly selecting six guinea fowls from each group for the sensitization test. The sensitized guinea fowls were challenged two weeks later and assessment of reaction was done 24 hrs post challenge. At the end of feeding trial on 84th day, two guinea fowls from each replicate (6 birds/treatment) were randomly selected for blood collection from each group to study the effect of homeopathic mother tinctures on serum-biochemical parameters and humoral immune response and were subjected to statistical analysis as per Snedecor and Cochran (1994).

**RESULTS AND DISCUSSION**

**Glucose:** Table 1 shows that the glucose in the present investigation revealed a significant (P<0.05) impact of homeopathic mother tinctures in guinea fowls (*Numida meleagris*) with maximum value in treatment group T1 (208.16 mg/dl) while minimum in group T2 (187.65 mg/dl). The value of serum glucose was significantly (P<0.05) decreased in T2 group which may probably be due to hypoglycaemic activity of Bael. Bael is...
widely used in Indian Ayurvedic medicine for the treatment of Diabetes mellitus due to the presence of coumarins such as marmelosin, alloimperatorin, β-sitosterol and D-α-phellandrene in Aegle marmelos (Bael) fruits. The findings of present experiment confirm previous reports of Krishna and Usha (2009), Kurde and Shinde (2006) and Vinodhini (2010). In contrast to the results of present experiment on Chelidonium mother tincture, Swanston et al. (1990) reported little effect of chelidonium in streptozotocin diabetic rat. In agreement to the results of present experiment, Thapliyal et al. (2011) noted that Boerhaavia diffusa leaf extract significantly decreased blood glucose level in diabetic rats.

**Cholesterol**: Serum cholesterol mean values (Table 1) in the present investigation showed a significant (P<0.05) effect of homeopathic mother tinctures in guinea fowls with maximum values in treatment group T1 (119.83 mg/dl) while minimum in group T2 (111.70 mg/dl). Findings of present experiment regarding Bael supplementation corroborate with those of, Kamalakkannan and Prince (2005) who noted that aqueous A. marmelos fruit extract exhibited anti-hyperlipidaemic effect in streptozotocin-induced diabetic rats. Krishna and Usha (2009) and Vijaya et al. (2009) noted significant (P<0.05) attenuation in the elevated level of serum total cholesterol in rats due to hypolipidaemic property of ethanolic extract of A. marmelos. Regarding Chelidonium, Gudev et al. (2004) and Banerjee et al. (2010) found decreased level of cholesterol in hepatotoxicity induced rats after administration of Chelidonium majus which are similar to result of present study in guinea fowl. As regards effect of B. diffusa, Desai et al. (2011) reported that administration of Boerhaavia diffusa root extract brought the increase in serum cholesterol level in Albino rats.

**Total serum protein**: The values of total protein are shown in Table 1. The maximum values were recorded in treatment group T3 (5.51 g/dl) while minimum in guinea fowls of group T1 (4.50 g/dl). Similar to the result of present study Immanuel et al., (2009) Meshram et al. and Sundaram et al. (2009) reported significantly (P<0.05) higher serum protein values in bael feeding than the untreated control group. Similar to the results of present experiment on Chelidonium supplementation to guinea fowls, Gawronska et al. (2009) reported significant (P<0.05) increase in total serum protein values. Increased total protein level in T3 group in the present experiment may be attributed to the stimulating effect of Chelidonium on the synthesis of protein in the liver.

**Albumin**: The mean values of serum albumin are shown in Table 1. Maximum value of serum albumin was recorded in treatment group T3 (2.33 g/dl) while minimum value in group T1 (2.00 g/dl). All groups were significantly different from each other as regards serum albumin.

Immanuel et al. and Sundaram et al. (2009) did not agree with the present finding on Bael and Vakil et al. (1989) observed no change due to supplementation of Chelidonium majus in human. However Gawronska et al. (2009) reported increase in serum albumin values in Chelidonium supplemented group of cancer patients.

**Globulin**: Maximum value of serum globulin (Table 1) was noted in the treatment group T3 (3.19 g/dl) while minimum value in T1 group (2.51 g/dl). As regards A. marmelos and B. diffusa, Ongmoo (2011) found a non-significant impact of both mother tinctures on serum globulin levels in layers, however results of Chelidonium mother tincture supplementation are similar with those of Vakil et al. (1989).

Albumin-globulin ratio also showed a significant (P<0.05) influence of homeopathic mother tinctures in guinea fowls with maximum in T2 (0.82) group and the minimum (0.73) in T3 group. The results on A. marmelos supplemented group are in accordance with Sundaram et al. (2009) who noted Aegle marmelos restored the albumin/globulin ratio in diabetic rats. The restoration of albumin/globulin ratio in the serum may be due to inhibition of proteolytic activity as well as enhanced insulin secretion and proper utilization of blood glucose.

**Serum Glutamate Oxaloacetate Transaminase (SGOT)**: Results showed significantly lowering effect of SGOT levels due to homeopathic mother tinctures treatments in guinea fowls with maximum value (162.24 IU/L) in group T1 and minimum (160.43 IU/L) in group T3 (Table 2). These results coincide with those of Sundaram et al. (2009) and Rajasekaran et al. (2009) for A. marmelos in rats and of Chelidonium majus, by Gawronska et al. (2009) and Banerjee et al. (2010). Reduction in SGOT level may be attributed to hepatoprotective action of Chelidonium majus alkaloid. Desai et al. (2011) found that hydro-alcoholic root extract of B. diffusa exhibited a significant (P<0.05) protective action on the liver.

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**Table 1**: Effect of homeopathic mother tinctures on serum biochemical profile (mean±S.E.) of guinea fowls

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Total Serum Protein* (g/dl)</th>
<th>Albumin* (g/dl)</th>
<th>Globulin* (g/dl)</th>
<th>A/G* ratio</th>
<th>Glucose* (mg/dl)</th>
<th>Cholesterol* (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>4.50±0.01</td>
<td>2.00±0.01</td>
<td>2.51±0.01</td>
<td>0.80±0.01</td>
<td>208.16±0.77</td>
<td>119.83±0.31</td>
</tr>
<tr>
<td>T2</td>
<td>4.74±0.09</td>
<td>2.13±0.00</td>
<td>2.61±0.08</td>
<td>0.82±0.02</td>
<td>187.65±0.26</td>
<td>111.70±0.16</td>
</tr>
<tr>
<td>T3</td>
<td>5.51±0.02</td>
<td>2.33±0.00</td>
<td>3.19±0.02</td>
<td>0.73±0.01</td>
<td>203.65±0.55</td>
<td>116.40±0.26</td>
</tr>
<tr>
<td>T4</td>
<td>5.10±0.00</td>
<td>2.27±0.01</td>
<td>2.83±0.01</td>
<td>0.80±0.00</td>
<td>200.14±0.77</td>
<td>114.24±0.35</td>
</tr>
</tbody>
</table>

Values with different superscripts column wise differ significantly (P<0.05)
Table 2: Effect of homeopathic mother tinctures in delayed type hypersensitivity, enzymatic profile and serum immunoglobulin

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Enzymatic profile</th>
<th>Skin thickness*</th>
<th>Serum immunoglobulins*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SGOT* (IU/L)</td>
<td>SGPT (IU/L)</td>
<td>(mm)</td>
</tr>
<tr>
<td>T1</td>
<td>162.24±0.21</td>
<td>16.28±0.38</td>
<td>2.86±0.01</td>
</tr>
<tr>
<td>T2</td>
<td>161.93±0.08</td>
<td>15.14±0.38</td>
<td>3.00±0.01</td>
</tr>
<tr>
<td>T3</td>
<td>160.43±0.27</td>
<td>13.25±0.38</td>
<td>3.12±0.02</td>
</tr>
<tr>
<td>T4</td>
<td>161.37±0.14</td>
<td>14.76±1.14</td>
<td>3.06±0.01</td>
</tr>
</tbody>
</table>

Values with different superscripts column wise differ significantly (P<0.05)

**Serum Glutamate Pyruvate Transaminase (SGPT):** SGPT levels in the present investigation revealed non-significant effect of homeopathic mother tinctures in guinea fowls (Table 2). The results are in contrast to Rajasekaran et al. (2009) and Sundaram et al. (2009) who found significant (P<0.05) reduction in SGOT activity due to administration of A. marmelos. In accordance with results of present experiment on Chelidonium supplementation Vakil et al. (1989) and Rawling et al. (2009), while Gawronska et al. (2009) and Banerjee et al. (2010) observed decrease in the activity of SGPT. Orisakwe et al. (2003) reported statistically similar levels in B. diffusa extract administered albino rats.

**Cell mediated Immune Response (Delayed type hypersensitivity test):** Cell mediated immune response in the present investigation showed a significant (P<0.05) positive effect (Table 2) of all the homeopathic mother tinctures with maximum value of average skin thickness in treatment group T3 (3.12 mm) while minimum in group T1 (2.86 mm). The effect of Bael (Aegle marmelos) supplementation on cell-mediated immune response in the present experiment coincide with those of Patel and Asdaq (2010) and Pratheepa et al. (2011) who found the significant (P<0.05) role of Bael on cellular immunity in rat and fish. Values with different superscripts column wise differ significantly (P<0.05)

The better immune response in Chelidonium supplemented group may be attributed to its alkaloid Sanguinarine which stimulates phagocytic activity and promotes host protective responses. The results of present study are in accordance with Jagiello et al. (1998) and Zahariychuk (2003). Manu and Kutan (2008) and Manu and Girija (2009) noted increased cell mediated immune response in mice after administration of B. diffusa which enhanced proliferation of spleenocytes, thymocyte and bone marrow cells.

**Serum Immunoglobulin Response (Zinc sulphate turbidity test):** Maximum value of serum immunoglobulin was noted in the treatment group T3 (3.51 mg/dl) while minimum value in group T1 (3.29 mg/dl) as depicted in Table 2. Results of present investigation on Bael supplementation are supported with the findings of Patel and Asdaq (2010) who observed that Bael fruit extract significantly (P<0.05) increased the circulating antibody titre in indirect haemagglunation test and possesses potential for augmenting immune activity by cellular and humoral mediated mechanisms. The improved humoral immune response in Chelidonium majus supplemented group might be due to increase in immunoglobulin G (IgG) levels by its alkaloid Ukrain. Similar to findings of present experiment for B. diffusa Manu and Girija (2009) noted that Punarnavine along with the antigen, sheep red blood cells (SRBC), produced an enhancement in the circulating antibody titer and the number of plaque forming cells (PFC) in the spleen, thus indicating the immunomodulatory activity of Punarnava.

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**REFERENCES**


