ANTICANCER ACTIVITY OF *GYROCARPUS ASIATICUS* AND *SOPHORA INTERRUPTA* ON DALTON’S LYMPHOMA ASCITES (DLA) INDUCED MICE

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ABSTRACT

The anticancer activity of methanolic extract of *Gyrocarpus asiaticus* and *Sophora interrupta* was carried out against Dalton’s Lymphoma ascites (DLA) cells in swiss albino mice with two different extracts. The various activities such as % increase in life span, body weight, cell count and haematological parameters were assessed. The methanolic extracts of both the plants significantly increased the life span. After 14 days of inoculation, the haematological parameters assessed were also showing a significant effect. The results clearly indicate that both the plant extracts have significant anticancer activity.

**Keywords:** Anticancer, *Gyrocarpus asiaticus*, *Sophora interrupta*, haematological parameters.

1. INTRODUCTION

Cancer is a major health issue across the world. It is a condition where there is loss of control on cell cycle¹. It is well known that no single factor is responsible for developments of tumours. There are various factors involved such as racial, geographical, cultural, hormonal etc. In spite of new drugs emerging the prevalence of cancer is increasing.²

Medicinal plants play a huge role in human life specifically in Indian set up. India possesses the largest number of medicinal plants³. Medicinal properties of few plants have been...
established but there are lot numbers of plants where their pharmacological properties have not been established yet.

WHO states that about three quarters of world population currently use medicinal plants to treat disease. Keeping this in as the background the present work of evaluation of anticancer activity in medicinal plants was carried out.

*Gyrocarpus asiaticus* is one of the species in the genus *Gyrocarpus* belonging to the family Hernandiaceae with the class Magnoliopsida. The plant has lot of pharmacological activities such as anti-cancer, anti-inflammatory, anti-bacterial. The preliminary phytochemical studies showed high amount of phenolics, steroids, terpenoids, tannins and flavonoids. The phenolic content of the bark was also estimated.

*Sophora interrupta* belongs to the family Fabaceae (Leguminaceae, Papilionaceae) which is commonly called as Edwaria madarasaputna. There are more than 200 species belongs to this family which have various pharmacological activities such as anti-cancer, anti-inflammatory, antispasmodic etc. The preliminary phytochemical studies showed the presence of phenolics, steroids, flavanoids.

### 2. MATERIAL AND METHODS

#### 2.1. Plant extracts

The methanolic extract of bark of *Gyrocarpus asiaticus* and the methanolic extract of whole plant of *Sophora interrupta* was used for the study.

#### 2.2. Animals

Male Swiss albino mice (20-25 gm) were used throughout the study. They were housed in micro nylon boxes in a control environment (temp 25±2°C) and 12 hrs dark/light cycle with standard laboratory diet and water *ad libitum*.

#### 2.3. Cells

Dalton’s Lymphoma ascites (DLA) cells were supplied by Amala cancer research center, Trissur, Kerala, India. The cells maintained in vivo in Swiss albino mice by intraperitoneally transplantation. While transforming the tumor cells to the grouped animal the DLA cells were aspirated from peritoneal cavity of the mice using saline. The cell counts were done and further dilution were made so that total cell should be 1 x 10^6, this dilution was administered intraperitoneally.
2.4. Anti tumor activity

Swiss Albino mice were divided into seven groups of six each. All the animals in six groups were injected with DLA cells (1 x 10⁶ cells per mouse) intraperitoneally, and the remaining one group is normal control group.

Group 1 served as the normal control.

Group 2 served as the tumor control. Group 1 and 2 receives normal diet and Water.

Group 3 served as the positive control, was treated with injection fluorouracil at 20mg/kg body weight, Intra peritoneally.

Group 4 Served as a treatment control group and was administered G.asiaticus extract at a dose of 200mg/kg orally.

Group 5 Served as a treatment control group and was administered G.asiaticus extract at a dose of 400mg/kg orally.

Group 6 Served as a treatment control group and was administered S.interrupta extract at a dose of 200mg/kg orally.

Group 7 Served as a treatment control group and was administered S.interrupta extract at a dose of 400mg/kg orally.

Cancer cell count

The fluid (0.1ml) from the peritoneal cavity of each mouse was withdrawn by sterile syringe and diluted with 0.8 ml of ice cold Normal saline or sterile Phosphate Buffer Solution and 0.1 ml of tryphan blue (0.1 mg/ml) and total numbers of the living cells were counted using heamocytometer.

Body weight

All the mice were weighed, from the day 0 to 14th day of the study. Average increase in body weight on the 14th day was determined.

Percentage increase in life span (ILS)

% ILS was calculated by the following formula

\[
\% \text{ ILS} = \frac{\text{Life span of treated group}}{\text{Life span of control group}} - 1 \times 100
\]

Haematological parameters: ⁹,¹⁰

In this study, drug treatment was given after the 24 hrs of inoculation, once daily for 14 days. On day 14, after the last dose, all mice from each group were sacrificed by euthanasia. Blood
was withdrawn from each mouse by retro orbital plexus bleeding and the following parameters were checked.

a. WBC count  
b. RBC count  
c. Hb content  
d. Platelet count  
e. Packed cell volume

RESULTS AND DISCUSSION

Effect of extracts on % life span, cell count and body weight:

The results are tabulated in table 1

Table 1 Effect of plant extracts on the life span, body weight and cancer cell count of tumor induced mice.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Number of animals</th>
<th>% increase in life span</th>
<th>Increase in Body weight (g)</th>
<th>Cancer cell count 1x10^6/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>6</td>
<td>&gt;&gt;30 days</td>
<td>2.34±0.66</td>
<td>-</td>
</tr>
<tr>
<td>G2</td>
<td>6</td>
<td>48%</td>
<td>7.82±0.99&lt;sup&gt;a**&lt;/sup&gt;</td>
<td>2.78±0.52&lt;sup&gt;a**&lt;/sup&gt;</td>
</tr>
<tr>
<td>G3</td>
<td>6</td>
<td>92%</td>
<td>3.91±0.66&lt;sup&gt;b**&lt;/sup&gt;</td>
<td>1.55±0.57&lt;sup&gt;b**&lt;/sup&gt;</td>
</tr>
<tr>
<td>G4</td>
<td>6</td>
<td>78%</td>
<td>4.56±0.98&lt;sup&gt;b**&lt;/sup&gt;</td>
<td>1.91±0.62&lt;sup&gt;b**&lt;/sup&gt;</td>
</tr>
<tr>
<td>G5</td>
<td>6</td>
<td>76%</td>
<td>4.63±0.93&lt;sup&gt;b**&lt;/sup&gt;</td>
<td>1.80±0.64&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>G6</td>
<td>6</td>
<td>74%</td>
<td>4.46±0.84&lt;sup&gt;b**&lt;/sup&gt;</td>
<td>1.78±0.45&lt;sup&gt;b**&lt;/sup&gt;</td>
</tr>
<tr>
<td>G7</td>
<td>6</td>
<td>70%</td>
<td>4.44±0.68&lt;sup&gt;b**&lt;/sup&gt;</td>
<td>1.87±0.34&lt;sup&gt;b**&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

G1 – Normal Control, G2 – Cancer Control, G3 – Positive control, G4 – Treatment control (G.asiaticus-200mg/kg), G5 – Treatment control (G.asiaticus-400mg/kg), G6 – Treatment control (S.interrupta-200mg/kg), G7 – Treatment control (S.interrupta-400mg/kg),

All values are expressed as mean ± SEM for 6 animals in each group.

**a – Values are significantly different from control (G<sub>1</sub>) at P < 0.01
**b – Values are significantly different from cancer control (G<sub>2</sub>) at P < 0.01

In the DLA tumor control group, the average life span of animal was found to be 48% where as both plant extracts at a dose of 200mg/kg and 400mg/kg body weight increase the life span to 78%, 76%, 74% and 70% respectively. These values were significant. However the
average life span of 5-FU treatment was found to be 92%, indicating its potent antitumor nature. The antitumor nature of both plant extracts at a dose of 200mg/kg and 400mg/kg were evidenced by the significant reduction in percent increase in body weight of animal treated with both plant extracts at a dose of 200mg/kg and 400mg/kg body weight when compared to DLA tumor bearing mice.

Effect of extracts on haematological parameters

The results are tabulated in table 2

Table 2: Effect of plant extracts on Hematological parameters

<table>
<thead>
<tr>
<th>TREATMENT</th>
<th>Total WBC 10^3 cells mm^-3</th>
<th>Rbc Count 10^6 cells mm^-3</th>
<th>Hb g/dl</th>
<th>PCV %</th>
<th>Platelets Lakhs/cumm</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>10.12 ±1.40</td>
<td>4.48±0.99</td>
<td>12.58 ±1.40</td>
<td>14.46±2.43</td>
<td>3.41±0.82</td>
</tr>
<tr>
<td>G2</td>
<td>14.30 ±2.22**</td>
<td>2.56±0.34**</td>
<td>7.25 ±0.98**</td>
<td>30.47±3.37**</td>
<td>1.74±0.72**</td>
</tr>
<tr>
<td>G3</td>
<td>11.61 ±1.51b**</td>
<td>4.14±0.87b**</td>
<td>11.9 ±1.54b**</td>
<td>18.50±1.66b**</td>
<td>3.12±0.97b**</td>
</tr>
<tr>
<td>G4</td>
<td>12.54 ±1.78b**</td>
<td>3.67±0.67b**</td>
<td>10.25±1.44b**</td>
<td>22.43±1.41b**</td>
<td>2.87±0.66b**</td>
</tr>
<tr>
<td>G5</td>
<td>12.82±2.45b**</td>
<td>3.96±0.36b**</td>
<td>11.26±0.98b**</td>
<td>20.65±2.71b**</td>
<td>2.96±0.60b**</td>
</tr>
<tr>
<td>G6</td>
<td>12.62 ±2.15b**</td>
<td>3.85±0.53b**</td>
<td>10.51±1.62b**</td>
<td>21.48±1.77b**</td>
<td>2.70±0.90b**</td>
</tr>
<tr>
<td>G7</td>
<td>12.53 ±2.22b**</td>
<td>3.85±0.67b**</td>
<td>10.69±1.60b**</td>
<td>21.49±1.61b**</td>
<td>2.95±0.92b**</td>
</tr>
</tbody>
</table>

G1 – Normal Control, G2 – Cancer Control, G3 – Positive control, G4 – Treatment control (plant-1-200mg/kg), G5 – Treatment control (plant-1-400mg/kg), G6 – Treatment control (plant-11-200mg/kg), G7 – Treatment control (plant-11-400mg/kg).

All values are expressed as mean ± SEM for 6 animals in each group.

**a – Values are significantly different from control (G1) at P < 0.001
**b – Values are significantly different from cancer control (G2) at P < 0.01

RBC, Haemoglobin, Platelets were decreased and WBC count was significantly increased in the DLA control group compared to the normal control group. Treatment with both plant extracts at a dose of 200mg/kg and 400mg/kg significantly increases the Hgb content, RBC, Platelets and significantly decreased the WBC count to about normal level. All these results suggest the anticancer nature of the both plant extracts. However, the standard 5-FU at the dose of 20 mg/kg body weight produced better result in all these parameters.
CONCLUSION
All these reports clearly indicate that the methanolic extracts of *G.asiaticus* and *S.interrupta* possess good antitumour effect and phytochemical evaluation is in progress.

REFERENCES
5. Flowering plants of Chitoor district by Madhava Shetty