ANTIOXIDANT AND ANTICANCER ACTIVITY OF GARCINIA MORELLA FRUIT ON T CELL MURINE LYMPHOMA

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Lymphoma is the most common type of blood cancer. Two main forms of lymphoma are Hodgkin’s lymphoma and Non Hodgkin’s lymphoma. Lymphoma occurs when cells of the immune system called lymphocytes, a type of white blood cell, grow and multiply uncontrollably.

**American Cancer Society** estimated new cancer cases in men and women in 2016.
India is known for its traditional medicinal systems Ayurveda, Siddha, and Unani.

Plant selected: 
- *Garcinia morella* fruit
- Dried samples stored for years

Diseases:
- Dysentery
- Gastritis
- Inflammatory diseases

Antioxidant

ROS ↔ ANTIOXIDANTS

DISEASE ↔ HEALTH
**Preparation of Extracts**

1. **Plant Samples** washed cut and dried
2. Dried samples grounded to fine powder
3. Dried powder
4. Methanol
5. Extraction by maceration
6. Evaporate the extracts by rotar evaporator
7. Store the dried extracts in -20°C
**In vitro antioxidant activity of GF, GB and GL extracts**

<table>
<thead>
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<th>Activity</th>
<th>Graph</th>
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<tr>
<td>DPPH radical scavenging activity</td>
<td><img src="image1" alt="DPPH Radical Scavenging Activity Graph" /></td>
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<tr>
<td>Reducing power activity</td>
<td><img src="image2" alt="Reducing Power Activity Graph" /></td>
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<tr>
<td>Lipid peroxidation inhibition</td>
<td><img src="image3" alt="Lipid Peroxidation Inhibition Graph" /></td>
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A) DPPH radical scavenging activity  
B) Reducing power activity  
C) Lipid peroxidation inhibition activity of methanol extracts of *G. morella* fruit (GF), bark (GB), leaf (GL) and standard BHT.
In vitro cytotoxic effect of *G. morella* fruit (GF), bark (GB) and leaf (GL) extracts on Dalton’s ascites lymphoma (DLA)

In vitro cell viability of DLA cells monitored by A) MTT assay and C) FACS analysis after 3 h treatment of DLA cells with different concentrations of GF, GB and GL and B) trypan blue dye exclusion assay of DLA cells on treatment with GF at different concentrations for 3 h. All the results are expressed in mean ± SD (n=3).
**IN VIVO EXPERIMENTAL DESIGN**

**Animals were injected with DLA cells (0.2 ml of 2×10^6 cells/mouse)**

**Group I**: Normal animals without inoculation with DLA cells.
**Group II**: DLA animals + Vehicle control (Fed with 0.3% CMC)
**Group III**: DLA animals + 10 mg/kg Cyclophosphamide
**Group IV**: DLA animals + 100 mg/kg GF methanolic extract
**Group V**: DLA animals + 200 mg/kg GF methanolic extract
**Group VI**: DLA animals + 200 mg/kg GL methanolic extract.
**Group VII**: DLA animals + 200 mg/Kg GB methanolic extract

**Drug administration by oral gavage**

**On 10th day of Drug administration animals were sacrificed and blood, serum and liver tissues collected**
GF (200mg/kg) restored Haematological and Biochemical parameters of DLA induced mice.
Effect of the *G. morella* extracts on longevity of Daltons lymphoma induced mice is represented by Kaplan meir curve. GF (200mg/kg) significantly increases (66%) lifespan of DLA induced animals.
Effect of GF treatment on neovascularisation

The figure (A), (B) and (C) represents the inner peritoneum lining of untreated, Standard treated and GF 200 mg/kg treated DLA induced animals respectively.

Effect of GF treatment on liver histology

The figures (D), (E) and (F) is the liver histology of DLA induced untreated, Standard treated and GF200 mg/kg treated animals.
GF EXTRACT INDUCES APOPTOSIS OF DLA CELLS

Fold change in level of Caspase3 enzyme of DLA cells upon treatment with GF150 and GF250 µg/ml

DNA Fragmentation assay.
Lane 1) 200bp DNA ladder
Lane 2) DLA +GF50,
Lane 3) DLA + GF 100,
Lane 4) DLA +GF150,
Lane 5) DLA +GF200,
Lane 6) DLA untreated cells
Morphological changes of DLA cells on treatment with GF for 3 hours stained with AO/EtBr  
A) Untreated DLA cells  
B) DLA cells treated with GF150 µg/ml  
C) DLA cells treated with GF250 µg/ml

SEM images of DLA cells on treatment with GF for 3 hours  
A) Untreated DLA cells  
B) DLA cells treated with GF150 µg/ml  
C) DLA cells treated with GF250 µg/ml
**Conclusion**

- *Garcinia morella* fruit methanolic extract has highest *in vitro* antioxidant activity in comparison to leaf and bark extracts.

- *G. morella* fruit methanolic extract possess significant *in vitro* and *in vivo* anticancer activity against T cell lymphoma.

- *G. morella* fruit methanolic extract shows apoptotic effect on DLA cells.

- Treatment of DLA induced mice with GF(200mg/kg) also significantly inhibited neovascularisation in the peritoneum of the mice and restored the liver histology.