

## A REVIEW ON PHYTOCHEMICAL CONSTITUENTS AND PHARMACOLOGICAL ACTIVITIES OF *EUPHORBIA HELIOSCOPIA*

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### ABSTRACT.

*Euphorbia helioscopia* (L.) (Euphorbiaceae) typically best-known as "Sun spurge" is an erect parsimoniously furred to glabrescent promising green fleshy annual herb up to 50 cm tall, found in the wild, throughout subcontinent. Traditionally the plant is used in skin eruption, cholera, galactagogue and leaves are used as laxative. The phytochemical constituents existing in the plant consist of terpenoids (euphornin L, euphoscopin F, epieuphoscopin B, euphoscopin B, euphoscopin C Euphoheliosnoid D, helioscopinolide A, Euphornin N, Euphoheliosnoids A, Euphoheliosnoids B, Euphoheliosnoids C), glycosides (Quercetin-3- $\beta$ -glucoside, quercetin-3- $\beta$ -galactoside, quercetin-3- $\beta$ -galactoside-2"-gallate, 3 $\beta$ , 7 $\beta$ , 15 $\beta$ -trihydroxy-14-oxolathyrin-5E, 12E-dienyl-16-O- $\beta$ -D-glucopyranoside) and aminoacids. Pharmacological studies reported Anti-viral, Cytotoxic, Anti-fungal, Anti-bacterial, Anti-tumor, Wound healing affect, Vassodepressor and Phytodermatitis properties of *Euphorbia helioscopia*

KEY WORDS: *Euphorbia helioscopia*; Euphoheliosnoids; Quercetin glycosides; Euphornin

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## INTRODUCTION:

The genus Euphorbia comprises the largest genus belong to spurge family that belong to virtually 2000 species. It comprises into several subgenera and division.<sup>1</sup> Euphorbia helioscopia L which is titled as Chinese medicinal herb consist to family Euphorbiaceae<sup>2</sup>. Euphorbiaceae is the heading family between the Angiospermae having 300 genera and 5000 species<sup>3</sup>.

A literature study brought out that the chemical components of E. helioscopia L. have been intensively enquired, which includes different types of secondary metabolites like Flavonoids, Gallic acid, Egalllic acid and Flavellagic acid<sup>4</sup>.

## TAXONOMY<sup>5</sup>

Kingdom: Plantae (Plants)

Phylum: Magnoliophyta (flowering plants)

Class: Magnoliophyta (dicotyledon)

Order: Euphorbiales

Family: Euphorbiaceae

Genus: Euphorbia

Species: Euphorbia helioscopia (L.)

## COMMON NAMES ALL OVER THE WORLD<sup>6</sup>

- 1) Sun spurge - English
- 2) Wolf's-milk - English
- 3) Euphorbe réveil-matin - French
- 4) Sonnwend-Wolfsmilch - German
- 5) Todaigusa- Japanese
- 6) Leiteira-do-sol - Portuguese
- 7) Maleteira - Brazil

## TRADITIONAL USES:

The entirely plant has been used traditionally since long. It has blooming time period from February till May. It is typically known as gandi-buti<sup>7</sup>, Chhatri dodak<sup>8</sup>, Piryano doolai<sup>9</sup>. Latex is used in extravasation. Seeds with black pepper are given in cholera<sup>10</sup>. It is besides employed as glactagogue. Leafages are cooked and given to mad dogs. Roots are employed as laxative<sup>11</sup>.



**Figure 1: Image of Euphorbia helioscopia**

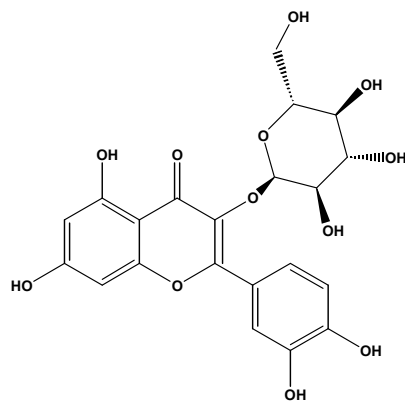
## PHYTOCHEMISTRY

### TERPENOIDS

The genus Euphorbia (Euphorbiaceae) by and large constitutes diterpenoid, responsible for the tumor- stimulating, skin discomfort and cytotoxic activities <sup>12</sup>. Diterpenoid such as euphornin L, euphoscopin F, epieuphoscopin B, euphoscopin B and euphoscopin C include in *Euphorbia helioscopia*. Amongst, Euphornin L and euphoscopin F showed considerable cytotoxicity against HL-60 cell lines with IC50 values of 2.7 and 9.0  $\mu\text{M}$ , respectively <sup>13</sup>. Euphoheliosnoid D, helioscopinolide A <sup>14</sup>, Euphornin N, Euphoheliosnoids A, Euphoheliosnoids B, Euphoheliosnoids C is known as jatrophone-type diterpenoid, isolated as a novel natural product from the Chinese medicinal herb Euphorbia helioscopia L <sup>15,16</sup> whereas 3 $\beta$ , 7 $\beta$ , 15 $\beta$ -trihydroxy-14-oxolathyr-5E, 12E-dienyl-16-O- $\beta$ -d-glucopyranoside belong to lathyrane diterpene glycoside <sup>17</sup>. *Euphorbia helioscopia* have also isolate toxic substance which is recognized euphornins A, B and C <sup>18</sup>.

### GLYCOSIDES:

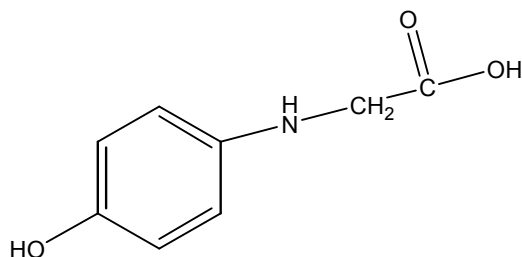
Quercetin glycosides, Quercetin-3- $\beta$ -glucoside, quercetin-3- $\beta$ -galactoside and quercetin-3- $\beta$ -galactoside-2"-gallate are the number of flavonoids exists in *Euphorbia helioscopia* <sup>19, 20</sup>. It also contains diterpene glycoside, named 3 $\beta$ , 7 $\beta$ , 15 $\beta$ -trihydroxy-14-oxolathyr-5E,12E-dienyl-16-O- $\beta$ -d glucopyranoside, was isolated from Euphorbia helioscopia L <sup>21</sup>.



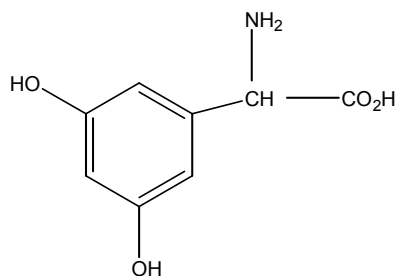
**Figure 2: Quercetin-3-β-D-glucoside**

#### AMINOACIDS:

Hydroxyphenylglycine and 3, 5-dihydroxyphenylglycine, are the aminoacids isolated from the latex of *Euphorbia helioscopia* L.<sup>22</sup>.



**Figure 3: N-(4-Hydroxyphenyl)glycine**



**Figure 4: 3, 5-dihydroxyphenylglycine**

#### PHARMACOLOGICAL ACTIVITIES REPORTED

##### ANTI-VIRAL ACTIVITY:

The antiviral agent of *Euphorbia helioscopia* was expressed by plaque reduction assay. Methanol is used in maceration. Plant extract were prepared through Soxlet apparatus. After employing many enriching levels of phage CP51, phage

titration was executed to ascertain the phage concentration in phage lysate for designating the dilution factor of the phage to be used as negative control for the next working stage. Trifluridine is used as a positive control. It was pre-incubated with phage CP51 for 30 min at 25C to assure its ability to inhibit the adsorption of virus to host cell. The growth and reproduction of phage was inhibited by more than 50% at concentration of 1 and 0.25 mg mL<sup>-1</sup> respectively. In order to test the effect of extract on transcription process, *Bacillus cerus*, phage CP51 and the extract were incubated together. The growth and reproduction of phage was inhibited by more than 50% at concentration of 0.75 and 0.125mg mL<sup>-1</sup> respectively<sup>23</sup>.

### CYTOTOXIC ACTIVITY

*Euphorbia helioscopia L.* has been employed as a conventional therapy for cancer in China. Euphornin is one of the key bioactive components in *Euphorbia helioscopia L.* Euphornin was one of the constituents that is responsible for cytotoxicity and was assessed by mice lung denocarcinoma cells (LA795).<sup>24</sup>

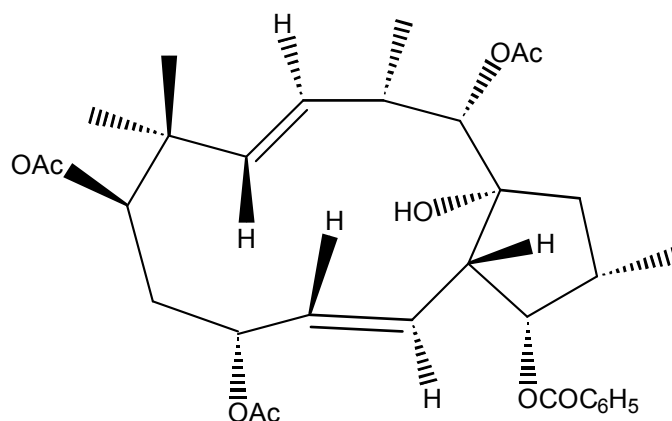


Figure 5: Euphornin

### ANTI-TUMOR ACTIVITY:

Antitumor activity of the root of *Euphorbia helioscopia L.* (EWE) in Vitro was examined in aquatic extract. Viable cells count, MTT staining and colonal development assays of three types of cancer cells were used to evaluate the antitumor activity. To Determine by viable cells count, the IC<sub>50</sub> values of EWE against 7721, Hela, MKN-45 cells were 1.26, 1.98, 1.72 mg/ml respectively (72 h). Determined MTT staining, the IC<sub>50</sub> values EWE against 7721, Hela, MKN-45 cells were 1.43, 1.67, 0.97 mg/ml. Determined by colonal formation, the inhibition rate of EWE (4 mg/ml) against 7721, Hela, MKN-45 cells were 59.8%, 66.4%, 70.5%. The results showed that EWE had noticeable antitumor activity<sup>25</sup>.

### ANTI-FUNGAL ACTIVITY

Test fungi namely *Trichphyton longifusus*, *Candida albicans*, *Aspergillus flavus*, *Microsporium canis*, *Fusarium solani*

and *Candida glabrata* were employed for fungitoxic effect of the Dichloromethane and methanol extracts of the aerial parts of *Euphorbia helioscopia* L. Dichloromethane extract showed 90% Inhibition against *Fusarium solani*, at the concentration of 400 µg /ml for incubation period of seven days at 27°C with reference to miconazole as standard. While methanol extract was found to be inactive<sup>26</sup>.

#### **ANTI-BACTERIAL ACTIVITY**

Antibacterial activity of the extracts was performed against *Escherichia coli*, *Bacillus subtilis*, *Shigella flexneri*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Salmonella typhi*. Both the extracts exhibited non-significant activity against *Bacillus subtilis* and *Salmonella typhi* at the concentration of 3 mg /ml<sup>27</sup>.

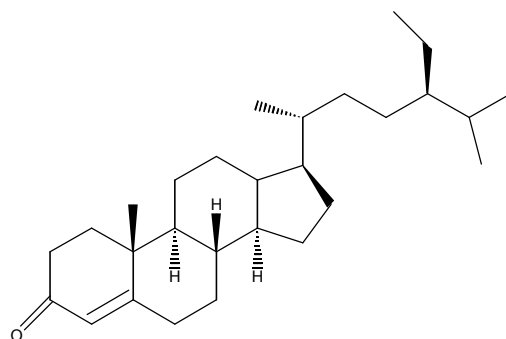
#### **WOUND HEALING EFFECT**

The wound healing effect of ethanol and aqueous extracts of *Euphorbia helioscopia* was studied in wound rats. Incision, excision and dead space models were used in rats. After application of both extracts it was found that the area of epithelialisation enhanced, followed by an increase in wound contraction, skin breaking strength, tissue granulation, dry weight and hydroxyproline contents. In the excision wound repair model, the animals treated with the ethanol extract showed faster epithelialisation ( $12.2 \pm 0.5$  mm<sup>2</sup>) than those treated with the aqueous extract ( $16.5 \pm 0.3$  mm<sup>2</sup>). The positive control (1% w/w nitrofurazone gel) produced an epithelialisation area of  $11.2 \pm 0.4$  mm<sup>2</sup>. In the incision wound repair model, the animals treated with both the ethanol and aqueous extracts showed an increase in breaking strength ( $383.7 \pm 3.6$  g), ( $348.1 \pm 3.2$  g) respectively, when compared to the control ( $235.4 \pm 2.8$  g). In the dead space wound

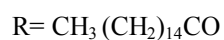
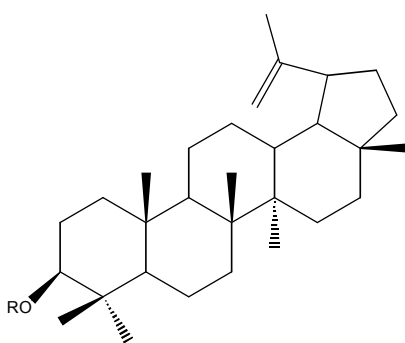
model, the ethanol extract treated animals showed a more significant increase in dry weight of granulation tissue ( $168.5 \pm 0.6$  mg/kg) compared to the aqueous extract and control group<sup>28</sup>.

#### **VASODEPRESSOR ACTIVITY**

A jatrophone diterpene ester, 5,11-jatrophadiene-3-benzoyloxy-7,9,14-tri-acetyloxy-15-ol and 2 lupane derivatives, lup-20(29)-ene-3-acetate and lup-20(29)-ene-3-palmitate, together with common triterpenoids of Euphorbiaceae, 24-methylene cycloartanol, 24-methylenecycloart-3-one, cycloartanol, and stigmast-4-ene-3-one were isolated from the aerial parts of *Euphorbia helioscopia* L. The fractions and the isolates were tested for their vasodepressor effects using Wistar Albino rats. 5,11-jatrophadiene-3-benzoyloxy-7,9,14-tri-acetyloxy-15-ol, lup-20(29)-ene-3-acetate, and stigmast-4-ene-3-one were found to possess relevant activity<sup>29</sup>.



**Figure 6: Stigmast-4-ene-3-one**



**Figure 7: lup-20(29)-ene-3-acetate**

**Figure 8: 5,11-jatrophadiene-3-benzoyloxy-7,9,14-tri acetyloxy-15-ol**

#### PHYTODERMATITIS:

Euphorbia.helioscopia produce a typical milky juice that causes toxic reactions following contact with skin and mucous membranes<sup>30</sup>. Phorbolsters are considered to be responsible for the toxicity of the latex of Euphorbiaceae but in the case of Euphorbia helioscopia, 12-Desoxyphorbol-13-phenylacetate-2-O-acetate for phytodermatitis<sup>31</sup>.

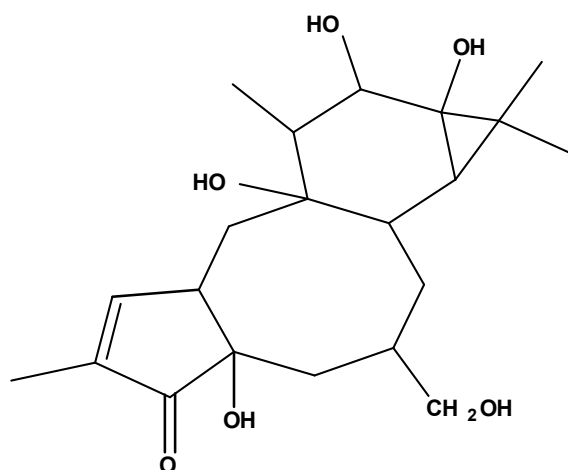


Figure 8 : Phorbol

#### ANTHELMINTIC ACTIVITY:

The anthelmintic potentials of the aqueous and methanol extracts of aerial parts (stem, leaves and flowers) *Euphorbia helioscopia* was investigated by worm motility inhibition (WMI) assay and egg hatch assay (EHA) for *in vitro* assessment, and a faecal egg count reduction (FECR) assay for an *in vivo* study. The *in vitro* study revealed anthelmintic effects of crude methanolic extracts of *E. helioscopia* on live *Haemonchus contortus* worms as evident from their paralysis and/or death at 8 h after exposure to different concentrations (12.5 mg ml<sup>-1</sup>, 25 mg ml<sup>-1</sup> and 50 mg ml<sup>-1</sup>) of aqueous and methanolic extracts. Aqueous and methanolic extracts of *E. helioscopia* has also shown low percent of inhibitory egg hatching as compared to levamisole.<sup>32</sup>

#### ANTIOXIDANT ACTIVITY:

The total antioxidant capacity (TAC) of *Euphorbia helioscopia* (EHL) was investigated, by initially extracting the antioxidant components in methanol and subjected to partitioning in solvents of different polarity. Antioxidant and free radical scavenging activity of the extract was investigated using antioxidant assays such as 2,2'-azinobis(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS), radical cation scavenging, the ferric reducing antioxidant power (FRAP), 2,2'-diphenyl-1-picrylhydrazil (DPPH) scavenging, total phenolic content (TPC), total flavonoid content (TFC) and total antioxidant activity was determined using ferric thiocyanate method, Superoxide anion radical scavenging activity and Metal Chelating activity. Using ABTS•+ decolorization assay and FRAP assay, *Euphorbia helioscopia* has showed a wide range of antioxidant activity in almost all the assay methods employed.<sup>33</sup>



## DISCUSSION:

The Study compiled all the facts and findings about the plant **Euphorbia helioscopia**. The main aim of the study was to gather all information about the Plant and to compile them and to gather Scientific Findings to verify the Ethno-medicinal claims about the Plant. As the plant has been in use in traditional system of Medicine, since long in Asian subcontinent, it has many therapeutic claims, to verify those claims various researchers have undertaken various Experimental Research. In the present study we have tried to gather all the claims and experimentally proven results, which will act as single point information source about the plant for further use by scientific community.

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