The Antigenotoxicity of *Eruca sativa* Mill Extract on Bone marrow Cells of Male Albino Mice Treated With Vincristine

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Abstract
Chemotherapy drugs have a major role in fighting cancer but, that doesn’t mean they are clear from side effect on human health. One of these drugs is vincristine this study, the chemopreventive potency of the crude extract of *Eruca Sativa* Mill Which have a good reputation as antioxidant and anticancer against chromosomal aberration and suppressed mitotic index in bone marrow cells of male albino mice treated with 50µl of vincristine intrapritoneally(ip) have been detected.

Results showed a significant increasing in the percentage of the mitotic index nearly to the control group and a significant decrease in chromosomal aberration after (35) days of treatment with 250 mg/kg crude extract of *Eruca sativa*. These results suggested a strong antigenotoxicity effect against vincristine damages on bone marrow cells.

Key Words: Antigenotoxicity, Bonemarrow cell, Vincristine, *Eruca Sativa*

Introduction
Folk medicine uses many medicinal herbs, Which are not free from Toxic effects. Some of them can cause adverse effects or interact with other medication [1]. It is Known that green plants in general are primary source of antimutagens as Well as a natural toxic agent can be considered as mutagenic, clastogenic and carcinogenic both in *vivo* and *in vitro*. In this study the extract of *Eruca sativa* Mill Which commonly Known as Rocket plant or Aljarjeer was used. It is a herbaceous plant with great importance as salad vegetable and spice, especially among Mediterranean people [6]. It is one of Brassicaceae family possesses medicinal and therapeutic properties including inhibition of tumorigenesis [7], eye infection, digestive and kidney problems, antiscrbutic, diuretic and it's always considered potent aphrodisiac [6]. Also, it has been reported the antioxidant and anticancer abilities [8]. Another research showed the cytoprotective and antiulcer activities [9]. Lamyet *et al.* [10] showed the antigenotoxicity of rocket extract on (HepG2) cells (human hepatoma cells). Non aqueous extract of this plant showed maximum antibacterial activity against BLB bacterial leaf blight disease of rice [11]. Also, antimicrobial resistant gram negativity and positive bacteria [12]. Methanolic extract of rocket enhanced the activity of clarithromycin against resistant *E. coli* strains [13]. Finally, the rocket seed extract was used as anti-inflammatory [14].
Material and Methods

A- *Eruca sativa* extraction:

The plant material was purchased from local market in Baghdad, Iraq. For the extraction, the plant was first washed free of sand, then crushed into very small pieces and the juice was subsequently squeezed out [10].

B- Animal treatment:

Twenty-four adult male mice with weight range between (30-36) gm were purchased from Biotechnology Research Center and maintained on (10-14) hour light dark cycle in the animal house. Control and treated mice were provided with food and water *ad libitum*, there were no differences in food intake, each composed of eight mice. The first group received normal saline as control group. The second group received 50µl of vincristine obtained from BDH chemicals (i.p) intraperitoneally. The third group received the same dose of vincristine then treated with 250 mg/kg of body weight crude extract of *Eruca sativa* for 35 days of treatment.

C- Cytogenic experiments:

1-Chromosome preparation from mouse bone marrow. This preparation was done according to Allen et al. [15].

2-Mitotic Index (M.I)

The slides were examined under high dry power (40X) of light microscope and (1000) divided and non-divided cells were counted and the percentage rate was calculated for only the divided ones according to the following equation:

\[
\text{M.I} = \frac{\text{No.of dividing cells} \times 100}{\text{No.of dividing cells} + \text{No.of non dividing cells}}
\]

D- Statistical analysis:

Statistical analysis was performed using (ANOVA) test. Statistical significance was determined at p<0.05 [17]

Results

A- The effect of *Eruca sativa* extract on mitotic index in bone marrow cells of male albino mice treated with vincristine:

Table (1) showed a significant (p<0.05) decrease in mitotic index of albino mice bone marrow treated with vincristine but, after the use of *Eruca sativa* extract there was an increase in the percentage of mitotic index similar to that found in control group.

B- The effect of *Eruca sativa* extract on chromosomal aberration induced by vincristine in bone marrow cells of male albino mice:

There was significant increase (p<0.05) in the percentage of chromosome aberration compared with control group Table (2), the percentage of ring chromosome, was similar to that found in control. Due to the use of *Eruca sativa* extract, obvious decrease in the percentage of chromosome aberration was found.

Discussion

In spite of the benefits of chemotherapeutic drugs against cancer. It also, can cause chromosomal abnormalities due to interfering with cell division and targeting the synthesis and function of DNA by binding to it [18]. They considered a clastogenic compound [19, 20]. Also, they can affect the fertility and progeny outcome [22]. Vincristine is one of these drugs which used as anticarcinogenic. Various types of secondary tumors in normal cells could result from prolonged use of these drugs. So, supplementation with natural antioxidant material may be reduced the genotoxicity caused by chemotherapy [22, 23]. Due to the good reputation of *Eruca sativa* or rocket plant or aljarjeer
which is widely used in folk medicine; this study tried to evaluate the effect of this plant extract on the genotoxicity caused by vincristine. The results in table 1 and 2 showed a significant arising in mitotic index percentage and a significant decrease of chromosome abnormalities and that is similar to the results of Lamy et al. [10] when they noticed the antigenotoxicity of rocket extract on human hepatoma (HepG2) cells towards benzo (a) pyrene induced DNA damage. Many researches explained the antimutagenic potential of different plant extracts [24,25,26,23].

Concerning the results of this study, the putative role of *Eruca sativa* extract on cancer chemoprevention due to the bioactivity of (GLS) Glucosinolate hydrolysis product namely (Isothiocynate) ITCs and its derived Erucin (ER) which is a major component found in rocket salad leaves and other parts.

There is so many evidences about the cancer chemoperevention of ER in vitro and in vivo studies [8]. The antioxidant effect of ER due to its reactivity with hydrogen peroxide and alkylhydroperoxides accumulated in cell and peripheral blood to form water and an alcohol [27,28], or induction of phase II enzyme, or acting as precursor of sulforaphene (potent inducers detoxification electrophiles and increase cellular antioxidant defenses) [28,29].

Other compounds beside ITCs may also protect DNA from damage, like: polyphenolic compounds, carotenoids, volatile oils, flavonoids [10,14,30,31,32,33,34]. Vitamin C which also antioxidant both in vitro and in vivo has the potential of altering the genotoxic effects of reactive oxygen metabolic (ROMS) which can promote carcinogenesis by damaging DNA [35,36]. All these compounds known for their chemopreventive activities and the interaction of these compounds led to the strong antigenotoxicity of *Eruca sativa* extract [10].

**References**

causing bacterial leaf blight disease of rice and characterization of bioactive compounds. PHD thesis, Quaid-i-Azam University, Islamabad.


Table (1): Percentage of mitotic index in male mice bonemarrow cells of different experimental groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mitotic index % (mean ± SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>A 10.66 ± 1.93</td>
</tr>
<tr>
<td>Vincristne (50µl)</td>
<td>B 3.83 ± 1.45</td>
</tr>
<tr>
<td>(250mg/kg) Eruc sativa extract</td>
<td>A 11.92 ± 2.03</td>
</tr>
</tbody>
</table>

Different letters (A,B,C) mean Significant at (p<0.05)
### Table (2): Percentage of chromosomal aberration in male mice bone marrow of different experimental groups

Different letters (A,B,C) mean significant at (p<0.05)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Chromosomal Aberration % m± SE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chromatid break</td>
</tr>
<tr>
<td>Control</td>
<td>A 0.05±0.005</td>
</tr>
<tr>
<td>Vincristine (50µ1)</td>
<td>B 0.22±0.097</td>
</tr>
<tr>
<td>(250mg/kg) Eruca sativa extract</td>
<td>C 0.00±0.000</td>
</tr>
</tbody>
</table>
الفعالية المضادة للسمية الجينية لمستخلص نبات الجرجير على خلايا نقي العظم لذكور الفئران البيض المعاملة بعقار الفنكرسيتين

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الخلاصة

العقاقير المضادة للأورام لها دور كبير وأساسي في محاربة السرطان، لكن هذا لا يعني خلو هذه العقاقير من التأثيرات الجانبية في صحة الإنسان، أحد هذه العقاقير هو الفنكرسيتين. في هذه الدراسة تم التحقق من القابلية الوقائية للمستخلص الخام لنبات الجرجير والذي يحتوي بسمعة جيدة بوصفها مضادًا لسرطان وضد التشوهات الكروموسومية وانخفاض دالة الانقسام لخلايا نقي العظم في ذكور الفئران البيض المعاملة بجرعة 50 مياكروجريم من الفنكرسيتين المحمل داخل الخلث البريتوتي. بنت النتائج زيادة معنوية في دالة الانقسام مقارنة بنسبة مجموعة السيطرة وكذلك انخفاض معنوي للتشوهات الكروموسومية بعد خمسة وثلاثين يوماً من المعاملة بجرعة 250 غم لكل كيلو غرام من وزن الجسم باستخدام الخام من نبات الجرجير. هذه النتائج تبين تأثيراً متساماً للسمية الجينية في خلايا نقي العظم الناتجة من المعاملة بعقار الفنكرسيتين.

الكلمات المفتاحية : الفعالية المضادة للسمية الجينية، خلايا نقي العظم، عقار الفنكرسيتين، الجرجير.