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A study of chlorophyll (Chl) of *Solanum trilobatum* L. - Its chemical characterization and anticarcinogenic effect

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Background: Chlorophyll is a chlorin pigment, which is structurally similar to and produced through the same metabolic pathway as other porphyrin pigments such as heme. At the center of the chlorin ring is a magnesium ion. The chlorin ring can have several different side chains, usually including a long phytol chain. Chlorophyll consumption increases the number of red blood cells and therefore, increases oxygen utilization by the body. Chlorophyll also reduces the binding of carcinogens to DNA in the liver and other organs. It also breaks down calcium oxalate stones for elimination, which are created by the body for the purpose of neutralizing and disposing of excess acid. Chlorophyll protects against a whole host of carcinogens found in fungus-laden foods such as nuts and grains, the toxins from cooked meats, and air-borne carcinogens (from pollution). It blocks the metabolism in the body of harmful chemicals known as procarcinogens that damage DNA. Studies published in the journals of Carcinogenesis and Food and Chemical Toxicology clearly display that chlorophyll inhibits carcinogenesis.

Objective: To extract and estimate the chlorophyll content of *Solanum trilobatum* L. (Pea elephant) and characterise by UV-visible spectroscopy, infra-red absorption spectroscopy and thin layer chromatography. To study the *In vitro* efficiency of pure and partially purified chlorophyll on HepG2 cell lines and Vero cell lines.

Methods: In the present study, the chlorophyll was extracted from the leaves of *Solanum trilobatum* L. (Pea elephant) and characterized by UV-visible spectroscopy, infra-red absorption spectroscopy and thin layer chromatography. The anticarcinogenic property of chlorophyll was studied *in vitro* against two types of cell lines: HepG2 cell lines (human hepatocellular carcinoma) and Vero cell lines (African green monkey kidney).

Results: It was found that the inhibitory effect of chlorophyll was found on cancer cell lines (IC_{50} value at 48 hrs was 62.5 µg/ml) and absent on Vero cell lines. Standard chlorophyll was used as control for all the studies.

Conclusion: The results of the present study shows that the chlorophyll has a higher safety ratio which is a good indicator for use in cancer treatment as the extract inhibits only the growth of cancer cells but not normal cells. Therefore consumption of the leaves of *Solanum trilobatum* L. (pea elephant) or as chlorophyll may impart anticancer effects.

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Calibration of CR-39 using stochastic simulation for 10B measurements in autoradiography

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To determine boron concentration as a function of ion tracks number per unit area of a polycarbonate surface, an experiment was performed. Eleven CR-39 polycarbonate samples covered by $H_3{}^{10}BO_3$ solution with known amounts of ^{10}B concentration were irradiated in a thermal neutron flux of 8×10^9 $n.cm^{-2}.s^{-1}$ in pneumatic facility of Tehran research reactor (TRR). Alpha and lithium tracks were produced on CR-39 surface as a consequence of ^{10}B (n, α)^7 Li reactions. After etching process using a solution of ethanol 30% and KOH 70%, the revealed tracks were counted under an optical microscopy Model: 3100.5000 Triton-II with 500 times as much optical magnification. The experiment was also modeled using a stochastic simulation considering the random characteristic of the boron neutron capture reaction. Comparing experimental and theoretical results, the calibration factor, i.e., the ratio of counted tracks number in the experiment to the number of produced ions in simulation was obtained. Furthermore, the absorbed dose due to ion particles LET was quantified by means of the absorbed dose curve, which correlates with boron concentration in the samples. The later curve was also obtained by modeling the experiment using FLUKA code simulation.

Keywords: Autoradiography, Boron Neutron Capture Therapy, CR-39 Calibration, FLUKA code simulation