

Aegle marmelos (BAEL) and Its Phytonutrient in the Treatment and Prevention of Cancer: A Review

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ABSTRACT:-

Aegle marmelos, usually referred to as Bael, and belonging to the family Rutaceae, is an essential medicinal plant in Ayurveda. This plant extract is prepared by boiling the leaves or roots in water. It is useful as a purgative, an antipyretic, and a guaifenesin. These extracts are also useful in hearing loss (anacusis), inflammation, postnasal drip, diabetes mellitus, and asthmatic complaints. These fruits are used in the treatment of diarrhoea, dysentery, stomach aches, and cardiac ailments. Scientific studies have validated many of Bael's ethnomedicinal properties, including hypoglycemic, astringent, antidiarrheal, analgesic, anti-inflammatory, antipyretic, and gastroprotective properties. In together, studies also show that Bael and the same of Bael phytonutrients maintain antineoplastic, radioprotective, chemoprotective, and chemopreventive effects and properties in the treatment and prevention of cancer.

Keywords- :-Aegle marmeloes, Beal, anticancer, chemoprevention, anti-inflammatory, radiomodulation.

I. INTRODUCTION-

The International Agency for Cancer Research recently reported that cancer is the second-leading cause of death globally; in 2008, approximately 12.7 million new cancer cases and 7.6 million cancer deaths occurred. [1] By the year 2020, predictions report the incidence of cancer will increase 3-fold, with an unequal rise in cancer cases and deaths in developing countries with limited resources to take on the problem. [2]

Depending on the stage, tumour location, and health of the patient, cancer may be treated with surgery or ionising radiation. The use of chemotherapy, ionising radiation, and their combined use cause baneful effects, resulting in killer T-cell effects on healthy normal cells. [3]

These treatments are very costly because it is a large number of patients living in the developing countries like to use preference

medicine for the managing cancer token and pain. [4] Ayurveda, one of the oldest systems of medicine, emphasises disease prevention and good health by adopting proper lifestyles and therapeutic measures that will restore the body.

Figure: Photographs of beal plant with the fruit and leaf.

Presymptomatic studies with experimental animals have shown the commonly used Ayurvedic plants are effective and have the potential for human use in the future. [4] It is also noted as Sripal in English, Shivadruma (the tree of Shiva) in Sanskrit, and Bael in Hindi. Bael is one of the paramount medicinal plants in Ayurveda. According to Charaka (1500 BC), the high preacher of Ayurveda, which has been in presence for a long time and is comprehensively used in India. The immature fruits of Bael are useful in the treatment of diarrhoea, dysentery with spells of constipation, and stomach aches. [34]

These plant roots are also important components of the Ayurvedic drug dysentery, diarrhea, flatulence, fever [6] the leaves of bale are accept to reduce fault, bleeding piles, dropsy (edema) [6] Chemical analysis of Bael contains tannins, essential oils like caryophyllene, cineole, citral, d-limonene and eugenol, [7]. The ayurvedic uses of Bael are antimicrobial effects, antifungal (clotrimazole), hypoglycemic, astringent, antidiarrheal, antidyenteric, demulcent, analgesic, anti-inflammatory, anti pyretic, hypoglycemic, ant proliferative, wound-healing, insecticidal, anticancer, anti diabetic, and cardioprotective properties. [7] Here, we consider the role of Bael in its treatment and prevention of cancer.

Bale as an Anticancer (antineoplastic) Agent:-

Radiotherapy is the main stay in cancer and treatment for nearly 3 decagon. They are clinically used chemotherapeutic agents maintain ingrained normal tissue toxicity, thereby concession the therapeutic advantage. [8]

Preclinical studies are shows the Bael leaf extracts were effective in inhibiting and the evolution of cancer of the blood K562, T-lymphoid Jurkat, B-lymphoid Raji, erythroleukemic HEL, melanoma Colo38, and chest cancer section MCF7 and MDA-MB-231.[9, 10].The booze extract of the fruit it also shows to maintain cytotoxic effect on SKBR3 (human breast adenocarcinoma cells) in vitro.[11] [16], cineole, [17] and dlimonene[17] present in Bael maintain antineoplastic effects. In these experiments have also shown the other Phytonutrients such as eugenol,[12-14], citral,[15].

Eugegol -

It is the allyl chain-substituted guaiacol (2-methoxyphenol) and a part of the cinnamic acids class of synthetic compound in sweet flower. Cell culture studies have eugenol maintain cytotoxic effects against salivary gland tumor cell line (HSG) and normal human gingival fibroblast (HGF) in vitro.[12] Eugenol maintained cytotoxic effects on the malignant HepG2 hepatoma cells, malignant Caco-2 colon cells[13].

The free trade of E2F1 may be a important Aspect of the eugenol-interfere melanoma evolution barrier both in vitro. The eugenol treatment of inhibited cell rise, retard tumor growth kinetics, reduced the tumor size by nearly 40%, increases the average viability time by nearly 20%, and barriered invasion and metastasis in nearly 50% of the animals in analogy with the control group. [14].

Citral-

Citral (3,7-dimethyl-2,6-octadien-1-al), a main component of Bale, it has been freshly appearance to activate Cell death in several hematopoietic cancer cell lines and the programmed cell death activity was similar to that of staurosporine, a Streptococci staurosporeus-derived antineoplastic antibiotic with dominant effects.[15] In Chaouki et al [16] inhibited induced apoptosis of the human breast cancer cell line MCF-7.

Cineole:-

-Cineole (1,8-cineole), also called as eucalyptol, is a terpene present in many aromatic plants such examples are: mugwort, sweet basil, rosemary, sage, and cardamom. In vitro studies also show a certain cineole induces cell death in the

humanleukemia cell lines Molt 4B and HL-60 cells, however it is not in human gastric cancer KATO III cells. In these case are authorobserve a collection- and time-addicted cell death in both Molt 4B and HL-60 cells, confirm the antineoplastic effects of 1,8-cineole are the action is cell specific.[17].

Limonene-

Limonene it is a monoterpene found in the peel from citrus fruits, dill, caraway, fennel, and celery.the chemotherapeuticactivity against pancreatic, mammary, and prostatic tumors.the most important is the observation that monoterpenes inhibit the posttranslational isoprenylation of cell growthregulatory proteins such as Ras.[18].

Monoterpenes are also observe to regressrat mammary tumors by increasing the expression of transforming growthfactor- β (TGF β), which isregulates mammary epithelial cell division and also causese tumor[18]. LIM as an affluence natural molecule with low poisonous and pleiotropic pharmacological activity in cancer cells, targeting=various cell-signaling pathways critically involved in the initiation, growth, and chemoresistance of cancer cells.[19].

Protective Effects of Bael and Its Phytonutrients Against the anti- tumour Effects of Ionizing Radiation, Doxorubicin, and Cyclophosphamide-Induced Toxicity :-

The uses of ionizing radiation are connect with injurious effects from the normal tissue damage.[20] The Therapeutic differential may be implement with chemical compounds that may particular admire the chemotherapeutic drugs or radiation's antineoplastic effects or by selectively protecting the normal cells from the injurious effects of radiation and chemotherapeuticagents (radioprotectors and chemoprotectors).[3, 21].

The hydroalcoholic extracts of these fruit and leaf were effective in amelioratingradiation induced sickness (eg, alopecia, dermatitis, diarrhea, redness, irritation) and mortality in the Swiss albino mice when conducted through the intraperitoneal route.[22, 23].

the leaf extract also conducted orally for 5 successive days before publicity to lethal doses of radiation effectivelyameliorated the radiation induced sickness and mortality in mice.[24] The leaf extract prevented radiation clastogenesis in the accomplished human peripheral blood lymphocytes and the bone marrow cells of mice, indicating its

effectiveness as an antimutagen.[25]The phytochemical eugenol[26]. oral administration of the hydroalcoholic extract of the Bael leaf maintain anticlasto genic effects and reduced the doxorubicin-induced micro nuclei in the mice bone marrow cells.[27] the Phytonutrients cardenolide present in the leaves protected mice against doxorubicin-activated car diotoxicity and hepatotoxicity by cytoprotective, antioxidant, and hypolipidemic action.[28].

Mechanism(s) accountable for the Chemopreventive and Radioprotective Activity:-

Mechanism studies suggest the radioprotective effects of Bael are multifactorial and are due to the free profound scavenging, antioxidant, immunomodulatory increase in the levels of glutathione and decrease in lipid peroxidation. in this leaf extract is observe to be a potent scrounge of both reactive oxygen species and reactive nitrogen species and a good iron chelator in the in vitro systems of studies.[22,34-35].

The methanol and acetone extort of the berrys are also observe to effective in reducing the hydrogen peroxide and aflatoxin B1–induced SOS response in chromotest, suggesting they maintain antimutagenic effects and prevent the mutagenesis, which is the antecedent for carcinogene sis.[36] Bael leaf has been reported to increase the activities of antioxidant enzymes (superoxide dismutase,catalase, and glutathione peroxidase) in mice,[37] irradiated mice,[34].The effect has been observed played a significant role in view of the fact that macrophages form the first line infract microbial invasion and neoplastic diseases.[34].

II. CONCLUSION -

Information accrued from presymptomatic studies hint that Bael is useful in the treatment and prevention of cancer. The fruits are used in treatment of diarrhea, dysentery, stomach ache, and cardiac ailments.The antineoplastic activities, studies Bael extracts and some of its phytonutrients such as , butyl p-tolyl sulfide, 6-methyl-4-chromanone, butylated hydroxyanisole, lupeol, citral, cineole (1,8 cineole), d-limonene, and eugenol are commemorate soon to be active inpreferred inhibiting increases of neoplastic cells.

The accessibility of accurate glucuronide standards for the measure the Phytonutrients will create the scientific observations more decent and reproducible. Studies should also be done on understanding which of the Phytonutrients are

responsible for the observed favorable effects and their its mechanism of action. Because of its wealth, low cost, and safety in consumption, Bael remains a species with tremendous capability and countless possibilities for further inquiry. As human beings have been dominant Bael since time imme morial, the major advantage lies in its easy acceptability,nontoxic nature, and easy affordability. Additionally, presymptomatic inquiries have also substantiate that the Bael leaf extract has a high margin of drug safety and does not maintain systemic, genotoxic, or genotoxic effects at excellent protective concentrations.35,40,66,67 When these observations are considered along with its beneficial effects in the prevention and treatment of cancer, it is safe to affect that Bael remains a species with tremendous capability but only when the lack in the existing knowledge are bridged. The results of such studies may be useful for the professional applications of Bael in humans and may open up a new therapeutic passage .

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