PREFACE
Cancer is one of the leading causes of death worldwide. Cancer prevalence in India is around 2.5 million with 0.8 million new cases and 0.5 million deaths each year. Cancer killed 5, 50,000 people across the country in 2010 (Dikshit et al., 2012). Over the past two or three decades, we have witnessed an enormous progress in the development of a vast variety of anticancer drugs and strategies. Nonetheless, the overall mortality rates from most cancers have not declined significantly. Most modern cancer therapies, besides being enormously expensive, are associated with serious side effects and morbidity. So the search continues for an ideal treatment that has minimal side effects and is cost-effective.

Cancer may be defined as uncontrolled tissue growth that results from an imbalance between cell division and apoptosis. It is a dynamic process that involves many complex factors, which may explain why a “magic bullet” cure for cancer has not been found. The existing treatment modules include chemotherapy, radiotherapy and surgery with a limited role in eradication of the disease. Multidisciplinary scientific investigations and approaches are making best efforts to fight this disease, but the adequate cure is yet to be brought into world medicine. A considerable number of anti-tumour agents currently used in the clinic are of natural origin. For instance, over half of all anticancer drugs approved internationally between 1940 and 2006 were natural products or their derivatives. Among them, plants have been the chief source of natural compounds used for medicine.

Carcinogenesis is a multistage process consisting of apparently three major steps—initiation, promotion and progression, and it takes many years to turn into complete malignancy. Therefore, there are ample opportunities to intervene in the pathogenesis of cancer, especially at early phases of oncogenesis. Chemoprevention, a promising strategy to prevent cancer, is defined as the use of either natural or synthetic substances or their combination to block, reverse or retard the process of carcinogenesis. Phytochemicals present in plants have been considered as potent chemopreventive agents. Various studies indicate that phytochemicals can modulate the complex multistage process of carcinogenesis (Khan et al., 2007). These compounds can be cancer-blocking and/or cancer-suppressing agents. The cancer-blocking agents prevent initiation phase by several mechanisms: enhancing carcinogen detoxification, modifying carcinogen uptake and metabolism, scavenging
reactive oxygen species (ROS) and other oxidative species, and enhancing DNA repair. Cancer suppressing agents inhibit cancer promotion and progression phases presumably by affecting or perturbing crucial factors that control cell proliferation, differentiation and apoptosis.

Carotenoids are a group of phytochemicals that are responsible for bright colours of fruits and vegetables. They are recognized as playing an important role in preventing human diseases and maintaining good health. In addition to being potent antioxidants, some carotenoids also contribute to dietary vitamin A. There is scientific evidence in support of the beneficial role of these phytochemicals in the prevention of several chronic diseases like cancer, cardiovascular diseases and age related macular degeneration. The antioxidant properties of carotenoids have been considered as the main mechanism by which they afford their beneficial effects. Recent studies also show that carotenoids may mediate their effects via other mechanisms such as gap junction communication, cell growth regulation, immune enhancement and as modulators of Phase I and II drug metabolizing enzymes (Bertram, 1999).

meso-Zeaxanthin, zeaxanthin and lutein are the only carotenoids present in the macula lutea of primate’s retina. They are thought to protect the macula from age related macular degeneration (AMD) through their role as blue-light filters and because of their antioxidant and singlet oxygen quenching properties. Previous studies on lutein and zeaxanthin showed their protecting effects against several chronic diseases, particularly cancer at various sites, heart disease and stroke. meso-Zeaxanthin is a subtle structural variation of zeaxanthin and it constitutes 33% of the total carotenoid content in the macula. There is no data available on the scientific evaluation of the effect meso-zeaxanthin against any degenerative disease conditions other than AMD. The present study investigated antioxidant and anti-inflammatory activities of carotenoid meso-zeaxanthin isolated from marigold flower extract both in vitro and in vivo. Anti-mutagenic effect of meso-zeaxanthin was analysed against both direct and indirect acting mutagens. Cytotoxic, anti-tumour and apoptosis inducing properties of meso-zeaxanthin was studied using transformed cells. Anti-carcinogenic effect of MZ was evaluated against nitroso diethyl amine (NDEA) induced hepatocellular carcinoma, 3-methylcholanthrene (3-MC) induced sarcoma and DMBA and croton oil induced two-stage skin papillomagenesis. The possible mechanism of anticarcinogenic action of this carotenoid was also studied by analysing its effect on
phase I and II xenobiotic metabolizing enzymes. Present study further assessed chemoprotective, radioprotective and hepato-protective properties of meso-zeaxanthin.