Research Article

RADIO-PROTECTIVE EFFECT OF LYCOPERSICON ESCULENTUM EXTRACT AGAINST RADIATION INDUCED CHROMOSOMAL ABERRATION IN SWISS ALBINO MICE

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ABSTRACT

Radioprotective effects of aqueous extract of tomato extract (Lycopersicon esculentum) have been studied by examining chromosome aberration in cells of bone marrow in irradiated mice. Healthy adult Swiss mice were injected intraperitoneally (ip) with 480 mg kg–1body weight, 960 mg kg–1 of or double distilled water (DDW).They were exposed to whole body irradiation of 2.0 Gy gamma radiation 30 min later. After 24 hr, chromosomal aberrations were studied in the bone marrow of the femur by routine metaphase preparation after colchicine treatment. Radiation (4.0 Gy) increased the number of aberrant cells from less than 1% in controls to almost 20%. Pre-treatment with the extract compounds resulted in a significant reduction in the Percentage of aberrant metaphases as well as in the different types of aberration scored. The extract was not toxic at 1500 mg kg–1 body weight. Being non toxic and Easily available dietary source Lycopersicon esculentum extract may be use for as radioprotective for human beings.

Keywords: Radioprotective, *Lycopersicon esculentum*, Chromosomal aberration.

INTRODUCTION

Tomato is one of the most important vegetable crops cultivated for its fleshy fruits. Botanical name of tomato is *Lycopersicon esculemtun* and belongs to family *Lycopersicae, Solanacae*. Tomato is protective supplementary food. Tomato contains Lycopene and Beta-carotene pigments. The role of the diet in preventing the occurrence of cancer has been a popular and important area of research. Studies suggest that diets rich in tomato intake may account for a reduction in the risk of several different types of cancer. Such as cancers of the lung, stomach, prostate gland, cervix, breast, oral cavity, pancreas, colorectum, and esophagus.[1]

There are many investigations which proved the potential of plant extract as radioprotective. Some of the plant's extract having potential radioprotective are Gingko biloba,[2] Centella asiatica,[3] Hippophae rhamnoides,[4] Ocimum sanctum,[5] Panax ginseng,[6] Podophyllum hexandrum,[7] Tinospora cordifolia,[8] Emblica officinalis,[9] Phyllanthus amarus,[10] Amaranthus paniculatus,[11] Piper longum,[12] Syzigium cumini,[13] Mentha arvensis,[14] Mentha piperita,[15] Zingiber officinale,[16] Ageratum conyzoides,[17] Aegle marmelos[18] and Aphanamixis polystachya.[19]

They were Patt and his co-worker who introduced that pretreatment of rats with cysteine protected them against the radiation-induced lethality.[20] These Lycopene and other carotenoids are efficient antioxidant and used as oral sun protectants and contribute to the maintenance of skin health. These macula carotenoids are suggested to play a role in protection against light-dependent damage.[21] promoted us to go assessing it's radioprotective potential at chromosomal level.

MATERIALS AND METHODS

Animal Swiss albino mice (Mus musculus) of either sex, 6–8 weeks old with body weight of 24 ± 2 g, were used from animal house of department of research, Cancer Hospital and Research Center, Bhopal, India, as per norms laid down by CPCSEA. Mice were given standard mouse feeding pellets and water ad libitum.

Irradiation Mice were irradiated by 60 Co source in the cobalt teletherapy unit (ATC-C9) at Radiation Oncology Department, Jawaharlal Nehru Cancer Hospital and Research Center, Bhopal, India. Mice were placed in ventilated Plexiglas cages and irradiated in a group of 6 mice. The source to skin distance was 80 cm with irradiation time 2'.99" min. The mice were irradiated with 4.0 Gy γ-rays.

Preparation of extract

Tomatoes were procured from herbal garden of our research center. Tomato extract was prepared from cleaned Tomato. The extract was concentrated and dried into powder at 60°C. using water bath. The total weight of powder was measured.

The dried extract was stored at 4°C. The extract was dissolved in DDW. Tomato Extract was given as 160, 480, 960 and 1500 mg kg–1 body weight of mouse per day in DDW orally to Swiss albino mice for 15 consecutive days. The extract was non-toxic and no mortality was observed till day 30. An optimum dose of 480 mg kg–1 body weight and 960 mg kg-1 of Tomato extract was selected 480 mg kg–1 body weight and 960 mg kg–1body weight dose was taken for the study. Groups of four mice were injected intraperitoneally (ip) with 480mg kg–1 or 960 mg kg–1of extract 30 min before whole body exposure to 4.0 Gy gamma radiation. One group of six animals were injected with DDW and exposed to 2 Gy gamma radiations (Rt)

and another four animals were sham-exposed (control). 24 hr. after irradiation/sham-irradiation the bone marrow chromosomes were prepared for analysis.[22] The animals were injected ip with 0.025% colchicine (Sigma, USA) and 2 hr. later they were killed by cervical dislocation. Bone marrow from femur was flushed out into normal saline, treated with 1% sodium citrate and fixed in (Carnoy's fixative) methanol-acetic acid (3:1). The cells were spread on clean slides and stained by 3% Giemsa (Sigma, USA); metaphase plates were observed and chromosomal aberrations were scored using oil immersion (with 100x object lens) under a light microscope. 400 metaphases were scored per animal. The number of aberrant cells as well as different types of aberration, such as chromosome and chromatid breaks (total breaks), fragments and rings. Statistical Analysis Student's t-test was employed to analyze the results. P-values<0.05 were considered significant.

RESULTS AND DISCUSSION

The results are presented in Table 1. The sham-treated control group had 0.56% aberrant cells which consisted of breaks and fragments. No complex aberrations such as dicentrics or rings were noted. Radiation significantly increased the percentage of aberrant cells, along with all types of aberration (breaks, fragments, dicentrics and rings). Pre-treatment with all the Tomato extract significantly reduced the percentage of aberrant cells, breaks and fragments compared with Radiation treated.

Table 1: Chromosomal aberration in mice after 4 Gy administration.

Aberration	Group[a]		
	Control	Radiation only	Drug (960MgKg^{-1})[b] + Radiation
Total Abberation	0.56±0.5	70.25 ±1.26[d]	34.4±0.58[c]
Break	0.04±0.02	14.5±1.3	10.75±0.5
Fragment	0.42±0.5	50.5±2.08	23.82
Ring	0	6±0.82	3±0.82
Dicentric	0	4.25±1.26	2.25±0.5
Polyploidy	0	6.25±0.96	2.25±0.5
Pulverised	0	5.75±0.5	2±0.82
Severely Damaged	0	4±0.82	0
Double Minutes	0	2.25±0.5	0

a- Each group consists of six animals.
b- Drug was administered regularly 3 days before exposure to 4 Gy radiations.
c- Significant protection against radiation at P<0.05
d- Significant level of induction, P<0.05

High levels of gamma irradiation can induce mortality in mammals. With respect to radiation damage to humans, it is important to protect biological systems from radiation-induced genotoxicity or lethality. The main radioprotective class is thiol synthetic compounds such as amifostine. Amifostine is a powerful radioprotective agent compared with other agents, but this drug is limited in the use inclinical practice due to side effects and toxicity.[23-25] The search for less-toxic radiation protectors has spurred interest in the development of natural products. Lycopene did not caused direct maternal or developmental toxicity in rats or rabbits at dosages as high as 2000 or 3000 mg/kg/day.[26] and Synthetic crystalline lycopene provides an alternative to extracts of naturally occurring lycopene for use in dietary supplements and functional foods. BASF Lycopene 10 CWD and Lyco Vit 10% formulated products each contain approximately 10% synthetic lycopene. These products were evaluated for toxicological and behavioural effects during a 13-week oral dosing study with male and female Wistar rats. The no-observed-adverse-effect level (NOAEL) for this study was concluded to be 3000 mg/kg body weight per day for both Lycopene CWD and Lyco Vit.[27]

It was found that tomato extract are good radioprotectors of bone marrow at non-toxic dose suggests that it may be promising agents for human radiation.

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