Current Trends in Technology and Science
www.ctts.in, ISSN: 2279-0535, November 2022, Volume: 11, Issue: 6

Modulatory Effect of Moringa Oleifera Against Radiation and Mercury-Raised Blood in Albino Mice

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Abstract:- The discovery of X-rays by Roentgen in 1895 and radioactivity by Becquerel in 1896 can be considered the turning point in human health care as the X-rays allowed to peep inside the human body (Roentgen, 1895). Although harmful effects of ionising radiations were reported within a few months of discovering X-rays, the real magnitude was unknown. The study of occupational workers like physicians and scientists handling radioactivity gave a clear picture of the harmful effects of ionising radiation, which was further strengthened after studying Japanese atomic bomb survivors of 1945. It is now reasonably well established that radiation produces deleterious effects on organisms, and widespread use of radiation in diagnosis therapy, industry, and energy sector and inadvertent exposure during air and space travel, nuclear accidents, and nuclear terror attacks requires safeguarding against human exposures. Lead shielding and other physical measures are cumbersome to use in such situations. Therefore pharmacological intervention could be the most prudent strategy to protect humans against the harmful effect of ionising radiation. The hazards to public health arising from radiation produced by man concern, to a large degree, those low doses and low dose rates relate to carcinogenesis or leukemogenesis, developmental abnormalities and the production of genetic mutations in the gonads, which are passed on to the offspring. In the present time, of course, medical x-rays, both diagnostic and therapeutic, represent the largest manufactured source of radiation exposure to the general population.

Keywords: Radiation, Cadmium chloride, Blood, Moringa olifera

I. INTRODUCTION

The increasing use of ionising radiation for diagnostic and therapeutic purposes has drawn the attention of many radiobiologists towards the undesired side effects of such exposures. Panchariya *et al.* (2019) investigated the protective efficacy of *Moringa Oleifera* against radiation and mercury-induced biochemical changes in the blood of mice after exposure to 2.0 Gy of gamma radiation and mercuric chloride individually or simultaneously. An increasing trend in the values of SGOT and SGPT was observed in all the groups. Selim *et al.* (2009) studied the effects on the red blood cell membrane from three different but correlated properties: electrical, mechanical and chemical, and to derive useful parameters for evaluating radiation effects. AC conductivity of cell suspension was measured in the frequency range of 40 kHz to 5 MHz, and the osmotic fragility of the membrane and solubilisation of the membrane by detergent were also measured. Adult male rats were exposed to 1, 2.5, 3.5, 5, 7.0 and 9.0 Gy gamma radiation from a Cs^{137} source. The results showed a decrease in the AC conductivity, average osmotic fragility and average membrane solubilisation. The effect of radiation on the red blood cell membrane was discussed. Singh *et al.* (2010) elucidate the role of granulocyte colony-stimulating

factor (G-CSF) induced in response to alpha-tocopherol succinate (TS) administration in protecting mice from total body irradiation (TBI). The dose, route, and schedule of TS administration for optimal G-CSF induction were determined by giving TS through subcutaneous (sc) and oral routes to male CD2F1 mice. Multiplex Luminex determined the level of cytokine in serum. The role of G-CSF on survival after TBI was determined by first treating mice with a protective dose (400 mg/kg) of TS 24 h before exposure to a lethal dose (9.2 Gy, 0.6 Gy/min) of cobalt-60 gamma-irradiation. The treated mice were then given neutralising antibodies to G-CSF 16 h before TBI to abrogate the radioprotective efficacy of TS. The efficacy of whole blood samples obtained from TS-treated mice was evaluated to protect naïve lethally irradiated mice. The hematopoietic stem cells in blood from TS-treated mice were analysed by fluorescence-activated cell sorting.

After exposure to combined treatment, the values were more severe, showing a synergistic effect. Early and fast recovery in the *Moringa*-treated animals may be due to the protection provided by the *Moringa*. Panchariya *et al.* (2019) investigated the protective efficacy of *Moringa Oleifera* against radiation and mercury-induced biochemical changes in the blood of mice after exposure to 2.0 Gy of gamma radiation and mercuric chloride individually or simultaneously. An increasing trend in the values of SGOT and SGPT was observed in all the groups. Mercury, identified thousands of years ago, is one of the oldest toxicants known (Mandava and Chhunchha, 2010). Although in recent years, environmental and occupational exposures to mercury have significantly reduced, this metal still threatens human health from multiple sources: air, water and food (Brkljacic *et al*., 2004). Once absorbed, mercury distributes widely to all tissues. The principal target organs of inorganic mercury are the kidney and liver (Sanchez *et al.*, 2006). Previous studies have revealed that mercuric chloride caused histopathological and ultrastructural lesions in the liver, evidenced by peri-portal fatty degeneration and cell necrosis (Waan, 2009). Ibegu *et al.* (2014) reported that the liver of mercury-treated rats showed congestion of hepatoportal blood vessels, congestion of the central vein, oedema in the portal tract and fatty changes indicating the toxic effect of mercuric chloride. It has been shown that in the chronically diseased liver, some cells are activated by factors released by the liver hepatocytes and Kupffer cells, proliferate, and acquire the features of myofibroblasts, with or without the lipid droplets. After exposure to combined treatment, the values were more severe, showing a synergistic effect. Early and fast recovery in the *Moringa*-treated animals may be due to the protection provided by the *Moringa*

II. MATERIAL AND METHOD

ANIMALS:- Six to eight weeks-old male Swiss albino mice were procured from Lala Lajpat Rai University of Veterinary and Animal Science, Hisar and maintained at 20-25^{0}C. The animals were provided with standard mice feed and tap water *ad libitum*.

Moringa Oleifera:- The dried powder of *Moringa Oleifera* was procured from the Umalaxmi organics private limited, Jodhpur (Raj) and an aqueous extract of the same was obtained in the department. The plant extract of *Moringa* was fed orally at a dose of 150 mg per kg of body weight. The *Moringa* extract was given daily for seven days prior to individual or combined treatment of mercuric chloride and radiation and continued until the last autopsy interval.

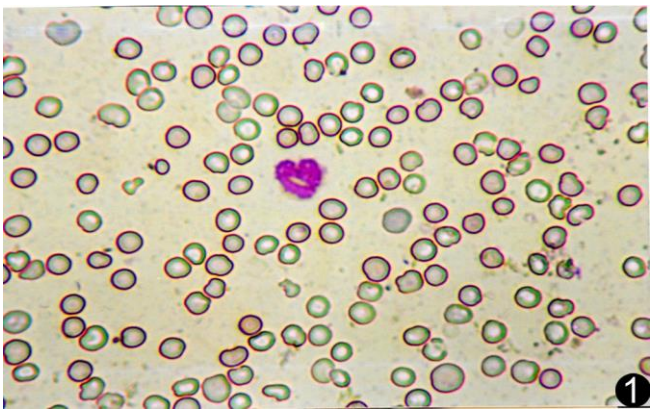
Mercury:-The mercury salt in the form of mercuric chloride of analytical grade was used for the present study. It was purchased from Ranbaxy Laboratories

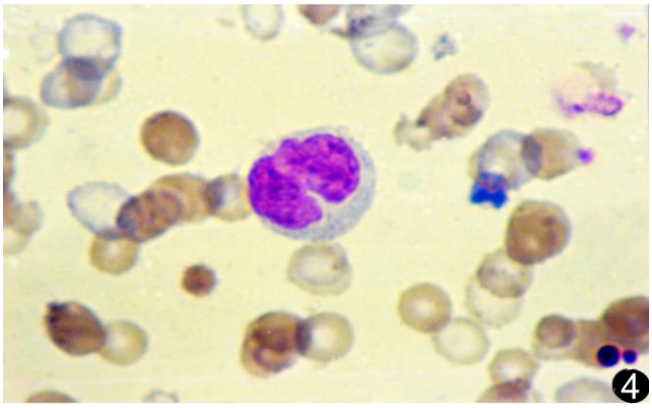
Ltd., India. It was administered orally in drinking water at a dose of 0.5ppm.

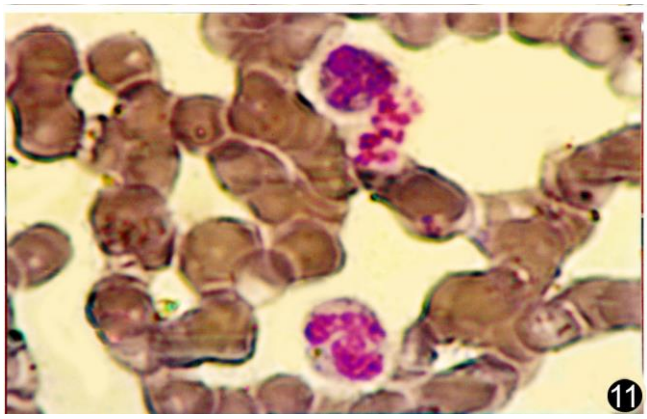
III. RESULTS AND DISCUSSION

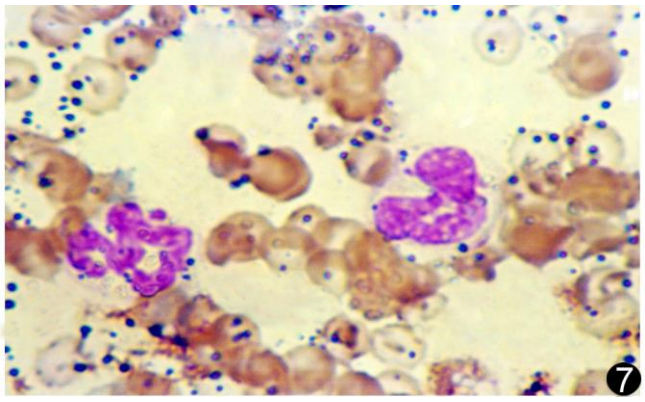
The animals were divided into the following groups		
Group – I :	Sham-irradiated animals (normal).	
Group – II :	Mercuric chloride treated animals	
Group - III:	Only irradiated animals	
	Sub-group III (a):	2.0 Gy
	Sub-group III (b):	4.0 Gy
Group – IV :	(Radiation + Mercuric chloride)	
	Sub-group IV (a) :	2.0 Gy + Mercuric chloride
	Sub-group IV (b) :	4.0 Gy + Mercuric chloride
Group – V :	Mercuric chloride + *Moringa*	
Group – VI :	(Radiation +*Moringa*)	
	Sub-group VI (a) :	2.0 Gy + *Moringa*
	Sub-group VI (b):	4.0 Gy + *Moringa*
Group – VII :	(Radiation + Mercuric chloride + *Moringa*)	
	Sub-group VII (a) :	2.0 Gy + Mercuric chloride + *Moringa*
	Sub-group VII (b) :	4.0 Gy + Mercuric chloride + *Moringa*
PARAMETERS		
	The following parameters were taken into consideration :	
	(i) Haematological Parameters	
		(RBC, WBC, Hb, PCV, MCV, MCH, MCHC and DLC)
	(ii) Biochemical Parameters:	SGOT and SGPT

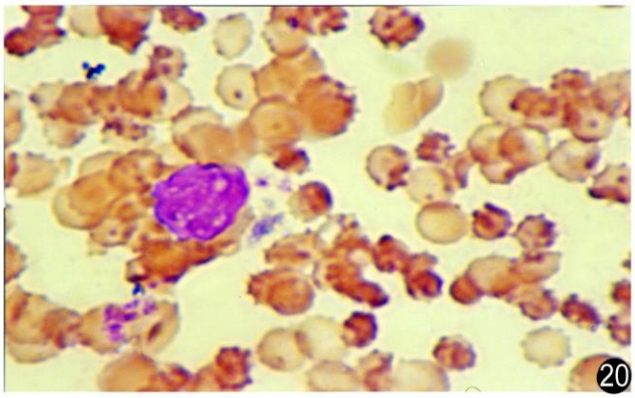
The RBC, WBC, Hb and PCV values were found to decrease in all the groups compared to the normal group, but the decrease in these values was lesser in Liv.52 treated groups (V to VII) compared to non-drug treated groups (II to IV). The values of MCV were also found to decrease, but the difference from normal was significant at previous intervals and at later intervals. The values of MCH increased in all the groups compared with the normal group after 1, 2, 4, 7, 14 and 28 days of post-treatment intervals.











The increase in the value of MCH was lesser in Liv.52 treated groups (V to VII) compared to non-drug-treated groups (II to IV). Besides this, values of MCHC increased in all the groups at various intervals but were lower in the Moringa treated groups (V to VII) compared to non-drug-treated groups (II to IV). The difference from the normal was non-significant in all the groups.

Conclusion

The value of lymphocytes declined to day 14 in non-drug-treated groups and day 7 in the *Moringa*-treated groups. Similarly, the values of monocytes and granulocytes percentage increased up to day 14 in the non-drug-treated animals and day 7 in the drug-treated animals. After that, a decrease in the value was noted up to day 28 without reaching the normal. The values of SGOT and SGPT elevated up to day 14 in the non-drug-treated groups and day 7 in the *Moringa*-treated groups. After that, a fall in the value was seen up to day 28.

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