

USE OF *CENTELLA ASIATICA* EXTRACT AS DETOXICATING AGENT AGAINST COMBINED TOXICITY OF GAMMA RADIATION AND CADMIUM CHLORIDE

VINOD AGARWAL, JYOTI SHARMA, JAIMALA, SUBHASH PAHADIYA and RADHA SHARMA

Department of Zoology, University of Rajasthan, Jaipur-302004, India.

Present study brings out the protective effect of *Centella asiatica* extract against a low dose of a heavy metal (Cd) and against combined action of cadmium chloride and Co^{60} gamma radiation. Animals were divided into two groups and were treated with *Centella asiatica* extract (aqueous solution) Co^{60} gamma radiation and $CdCl_2$ alone and in combination. Mortality, body weight, organ weight, haematocrit value and haemoglobin percentage were recorded. It is observed that *Centella asiatica* extract protected the animals against combined injury. The causes behind it are critically discussed.

Keywords : Cadmium Chloride; *Centella asiatica*; Radiation injury; adioprotection.

Introduction

There are a large number of plants which possess medicinal properties and *Centella asiatica* is one of them, Commonly known as Brahmi (in Hindi) and mundukparmi (in Sanskrit). It's extract is recommended for wound healing and treatment of skin lesions and diseases such as leprosy, lupus, eczema and psoriasis. it is a brain tonic, which improves learning, memory and strengthens C.N.S.¹⁻³. The plant is acrid, bitter, sweetish, digestible, laxative, cooling, alexiteric and cures a large number of diseases⁴. This plant acts as a free radical scavenger and has antielastase activity. It protects intestinal mucosa against radiation injury and activates enzymatic mechanisms. It is protective against membrane peroxidation and lipid peroxidation also⁵.

Cadmium is an important environmental pollutant because it is widely used in industry and it is present in a number of agricultural products. It is found in pigments, batteries, plastic, cigarettes and some fertilizers, as well as in food and water via environmental pollution. It is non biodegradable and has a long biological half life. These characteristics have made cadmium a cumulative toxic element which causes tissue damage.

The present investigation was performed to find out the protective effect of *Centella*

asiatica extract against combined action of cadmium and gamma radiation.

Material and Methods

Extract of the whole plant of *Centella asiatica* was dissolved in distilled water and animals were fed by gastric intubation at 100 mg/kg body weight dose level.

Approximately 6-8 week old *Swiss albino mouse* weighing 25 ± 2 gms were used for the experiments. The animals were selected from an inbred colony maintained in the laboratory on standard mice feed and water *ad libitum*. Cadmium was given at 2 mg/kg body weight by intraperitoneal injection in aqueous solution.

The animals were divided into two groups.

1. Control group and
 2. Experimental group
1. Control group was divided into four sub groups -
 - (a) Normal without any treatment
 - (b) $CdCl_2$ only (2 mg/Kg b.w.)
 - (c) Radiation only (8 Gy of Co^{60} gamma radiation)
 - (d) Plant extract only (100 mg/kg b.w.)
 2. Experimental group was also divided into four subgroups -
 - (a) *Centella asiatica* extract + $CdCl_2$
 - (b) *Centella asiatica* extract in distilled water at the rate of 100 mg/kg b.w.

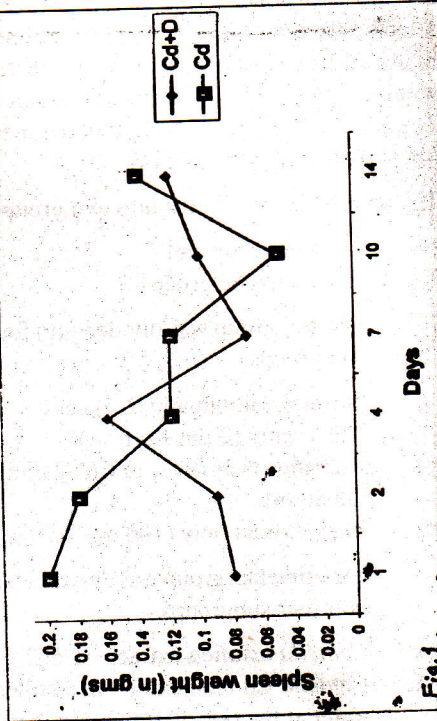


Fig. 1.

1. Cd+D = Drug+CdCl₂
2. Cd = CdCl₂ control

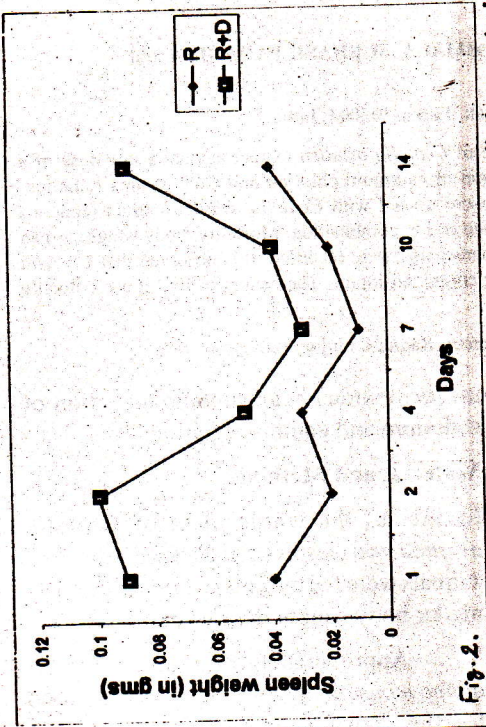


Fig. 2.

1. R = Radiation control
2. R+D = Drug+radiation

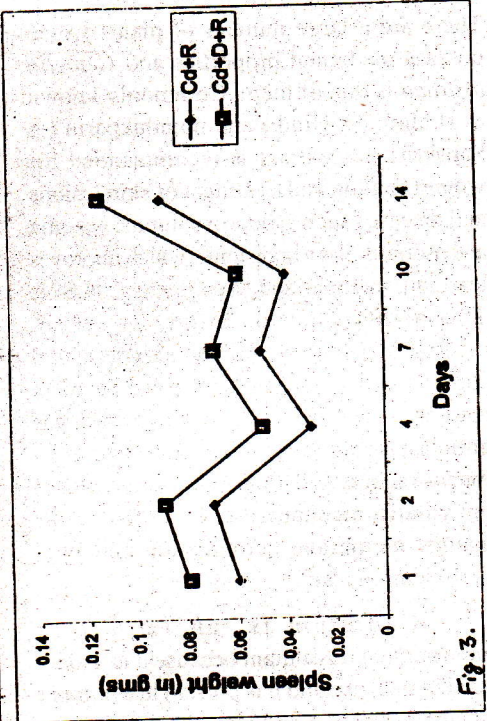


Fig. 3.

1. Cd+R = CdCl₂+radiation
2. Cd+D+R = Drug+CdCl₂+radiation

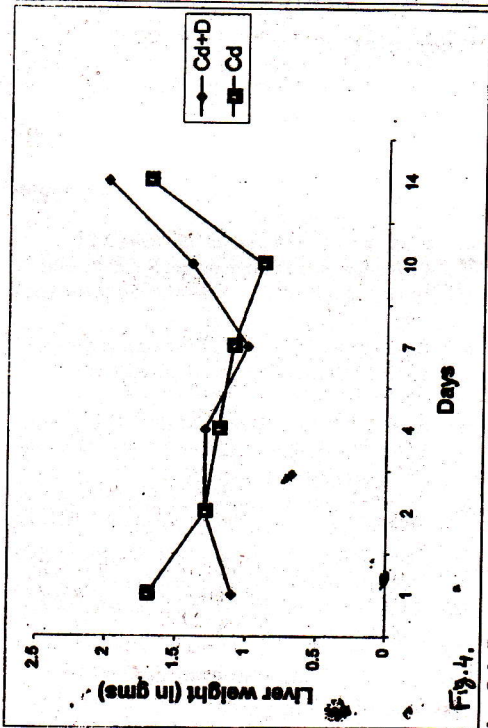


Fig. 5.

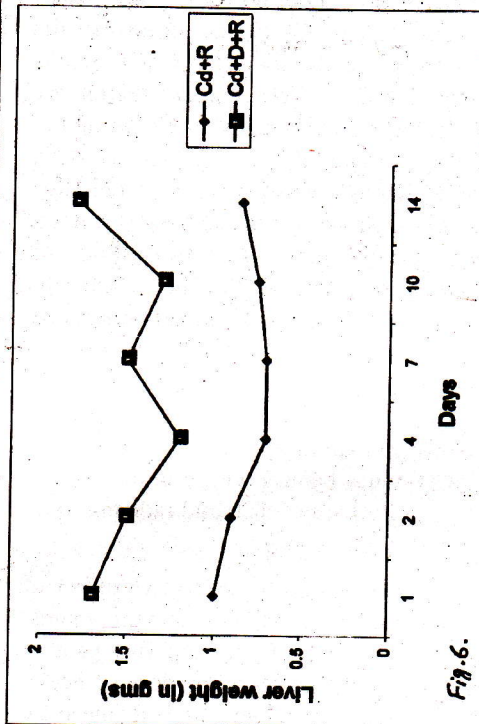
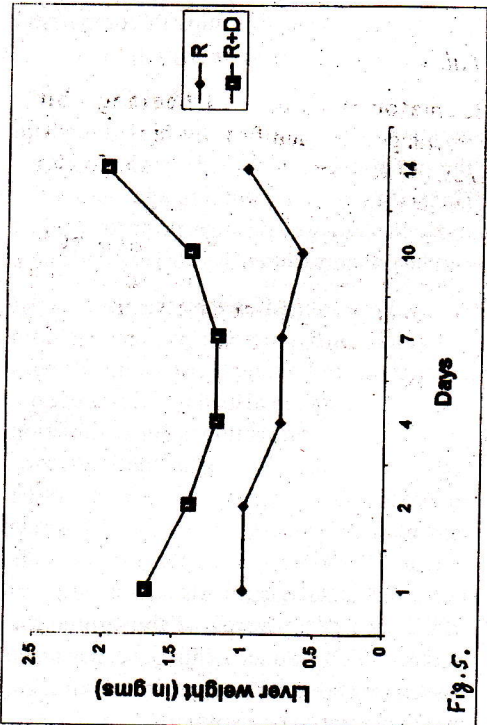


Fig. 6.

orally, one hour before irradiation

- (c) CdCl₂ + Co⁶⁰ gamma radiation - 8 Gy
 (d) CdCl₂ + *Centella asiatica* extract + Co⁶⁰ gamma radiation - 8 GY

After treatment animals were killed at 1,2,4,7,10,14 and 28 days. Observations were recorded during this period such as mortality, body weight, organ weight, haematocrit value, haemoglobin percentage and tissues were preserved for further studies.

Results and Discussion

After this experiment it was observed that the given dose of CdCl₂ affects body function of the animals but is not sufficient to cause any mortality. Weight of almost all the organs was affected in the CdCl₂ treated animals. 8 Gy of Co⁶⁰ gamma radiation is a sublethal dose. Mortality was observed in this group and all the organs of the body were affected. Various types of radiation sickness was observed such as diarrhoea, body weight loss, reduction in food and water intake and ruffled hair. Animals treated with *Centella asiatica* extract were healthier in comparison to the normal animals which were not given any treatment. *Centella asiatica* extract protects the animals against radiation injury as well as against CdCl₂ induced injury. Those animals which were treated with CdCl₂ and radiation both showed more damage.

The impact of protective effect of *Centella asiatica* extract treatment [against combined action of cadmium and gamma radiation and against a low dose of heavy metal (Cd)] increased the survival time in the irradiated animals as well as in the cadmium chloride treated animals. It also increased survival time in the animals which were given combined treatment. Liver and spleen were the major organs which showed comparatively less reduction in their weight in all the drug treated animals (Fig. 1-6).

Haematocrit value and haemoglobin percentage was significantly higher in the plant extract treated groups in comparison to their respective controls.

Given dose of CdCl₂ affects body organs adversely⁷. When CdCl₂ is given with the radiation, degree of damage increases. *Centella asiatica* protects against CdCl₂ induced damage and also protects against combined injury caused by CdCl₂ and radiation.

Protection offered by the plant extract is evidenced by increase in haemoglobin percentage and haematocrit value. Weight of liver and spleen also showed protection. Causes of the protection against radiation injury might be antioxidant activity, free radical scavenging or protection of the enzymatic machinery. Protection of intestine against injury might also played some role because that have facilitated better absorption of the drug⁸⁻¹⁰. Causes of the protection against CdCl₂ induced injury seems to be associated with some enzymatic mechanisms, which are yet to be explored.

References

1. Ashok D B and Vaidya 1997, *Int. J. of Pharmacol.* **29** S340
2. Diwan P V, Karwande I and Singh A K 1991, *Fitoterapia* **62** 253
3. Nalini K, Aroor A R, Karanth K S and Rao A 1992, *Fitoterapia* **63** 232
4. Karnick C R 1989, *Indian Medicine* **2** 21
5. Chandraprabha D, Annapurani S and Murthy N 1996, *Ind. Jou. of Nutrition and Dietetics* **33**(6) 128
6. Kok Wahhew, William A, Ericsson and Michael J Welsh 1993, *Toxicology and Applied Pharmacology* **121** 15
7. Samina Khan, Khan M A, Bhatnagar, Yadav Poonam and Sarkar S 1991, *Ind. Jou. of Experimental Biology* **29** 823
8. Chandraprabha D, Annapurani S and Murthy N 1996, *Ind. Jou. of Nutrition and Dietetics* **33**(5) 100
9. Padma P R, Bhavaneswari V and Sihambuchelvik 1998, *Ind. Jou. of Nutrition and Dietetics* **35**(1) 1
10. Roullard-Guellec F 1997, *Acta-Botanica Gallica* **144**(4) 489