ISSN 0976 – 3333

Available Online at www.ijpba.info

International Journal of Pharmaceutical & Biological Archives 2011; 2(5):1405-1409

ORIGINAL RESEARCH ARTICLE

Protective Effect of *Cuminum cyminum* and *Coriandrum sativum* on Profenofos Induced Liver Toxicity

Arun Kumar*, **Ranjit Kumar, Neeraj Kumar, A. Nath, J.K.Singh, Mohammad Ali**

Cancer Biology Laboratory, Mahavir Cancer Institute & Research Centre, Patna, India.

Received 02 Jul 2011; Revised 09 Oct 2011; Accepted 17 Oct 2011

ABSTRACT

In recent years there is an immense pressure on farmers to harvest more grains for growing population. For higher production they are extensively using the pesticides which are hazardous to human health. As such, it becomes necessary to evaluate the effect of these pesticides on human health and search for a subsequent protective agent against there hazardous effects. In the present investigation an organophosphate (profenofos) was administered @ 25mg/Kg b.w for 30 days to swiss albino mice to observe its effect on liver. Further, *Cuminum cyminum* and *Coriandrum sativum* extracts were administered to the profenofos intoxicated group @ 100mg/Kg b.w and 1000 mg/Kg b.w respectively for 30 days to evaluate their protective efficacy. An elevated level of liver function test (LFT) was observed in profenofos intoxicated group in comparison to the control. However, the two antidotes administered group showed decreasing trend of LFT. The finding suggests the vital role of the plant extracts in reducing the hepatotoxicity at the cellular and biochemical levels. Of the two medicinal plants, cumin was found to be more effective for its hepato-protective role than that of Coriander.

Key words: Liver, Profenofos, *Cuminum cyminum* and *Coriandrum sativum*, LFT, Swiss albino mice.

INTRODUCTION

Profenofos (O-(4-bromo-2-chlorophenyl) O-ethyl S-propyl phosphorothioate) is a natural and toxic organophosphorous insecticide [11,17]. Effect of Profenofos on animal occurs through food and water (WHO, 1990). It is largely known to cause toxicity in liver and kidney. Profenofos causes different symptoms of toxicity and biochemical changes in the enzyme activity of the liver and brain following two sub lethal doses of profenofos in mice [24]. Certain organophosphorous are also associated with carcinogenesis. Since, DNA damage has been correlated with cancer development [12], genotoxic studies have been carried out on organophosphorous[7,9,23]. It has also been reported that organophosphorous can induce oxidative stress by generating free radicals and altering antioxidant levels of the free radical scavenging enzyme activity [26]. Cumin (*Cuminum cyminum*) seeds have anti-carcinogenic properties. In one study, it was observed that cumin prevents the development of stomach or liver tumours in laboratory animals. This cancer-protective effect may be due to cumin's potent free radical scavenging abilities and its effect to enhance liver detoxification enzymes [10]. Coriander (*Coriandrum sativum*) is used as an antispasmodic, carminative and stimulant. Coriander is also used for the treatment of measles, stomach-ache, nausea, hernia [3] .

MATERIALS AND METHODS

Animals:

Thirty female swiss albino mice (28g to 32g) were obtained from animal house of Mahavir Cancer Institute & Research Centre, Patna, India (CPCSEA Regd. No. 1129/bc/07/CPCSEA, dated 13/02/2008). The research work was approved by the IAEC (Institutional Animal Ethics Committee) with no. IAEC/2010/08/05. Food and water to mice were provided *ad libitum* (prepared mixed formulated feed by the laboratory itself). Animals were maintained in colony rooms with 12 hrs light/dark cycle at 22 ± 2^{o} C.

Chemicals:

Commercially available Profenofos, [O-(4-bromo-2-chlorophenyl) O-ethyl S-propyl phosphorothioate] (50% E.C, specific gravity 1.34, trade name: "Carina", PI Industries Ltd.) was purchased from the local market. Commercially available kit for Chemical analyses like SGPT,

***Corresponding Author:** Dr. Arun Kumar**, Email:** arunk31@rediffmail.com, **Phone No:** +91- 9334740800

SGOT and Bilirubin was used of crest coral clinical system, Goa, India.

Plant Materials:

Cuminum cyminum (cumin) is an annual herb belonging to family Apiaceae. It is slender branched stem 20–30 cm tall. The leaves are 5–10 cm long, pinnate or bipinnate, thread-like leaflets. *Coriandrum sativum* (coriander) also known as Chinese parsley or cilantro is an annual herb of the Apiaceae native to the eastern Mediterranean region and southern Europe [16]. Fresh coriander leaves were collected from the local garden of Patna while cumin seeds were purchased from local herbal store in Patna, India. The identity of the leaves of coriander and seeds of cumin was confirmed by Dr. Ramakant Pandey (Botanist), Department of Biochemistry, Patna University, Patna, Bihar, India. The coriander leaves were washed with distilled water and extract was made by dissolving it in distilled water using mortar and pistal. The dose was finally made to 1000 mg/kg body weight for oral administration. The cumin seeds were dried and were then powdered and extract was made by dissolving it in distilled water using a mortar and pistal. The dose was made to 100mg/kg body weight for oral administration.

Treatment Protocol:

The animals were grouped into four sub-groups-control, profenofos treated, cumin treated and coriander treated. The profenofos treated group was administered @ 25mg/b.w. for 30 days to observe the Profenofos induced hepatotoxicity. Upon profenofos treated group then cumin @ 100 mg/kg b.w and coriander @ 1000 mg/Kg b.w was administered for 30 days.

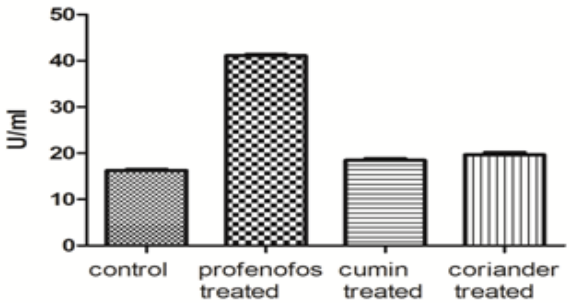
Biochemical Analyses:

After the entire treatment protocol the experimental animals were sacrificed. Blood was collected by orbital sinus puncture method. Serum Glutamic Pyruvate Transaminase (SGPT) and Serum Glutamic Oxaloacetate Transaminase (SGOT) activities were measured according to the method described [22], while Bilirubin activity was measured according to the method described [15].

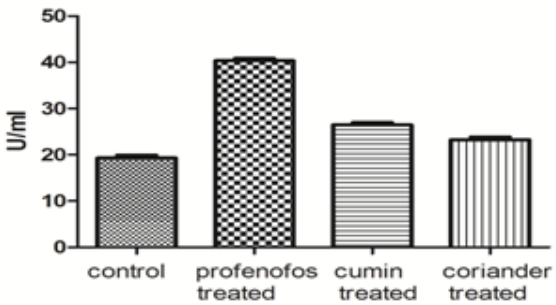
Statistical analysis: Results are presented as mean ± S.D and total variation present in a set of data was analysed through one-way analysis of variance (ANOVA). Difference among means has been analysed by applying Dunnet's '*t*' test at 99.9% ($p< 0.001$) confidence level. Calculations were performed with the GraphPad Prism Program (GraphPad Software, Inc., San Diego, USA).

RESULTS

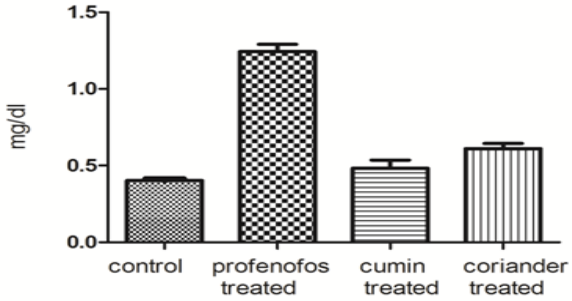
SGPT, SGOT and Bilirubin activity: Hepatic damage induced by Profenofos caused significant ($p< 0.001$) increase in marker enzymes SGPT, SGOT and serum bilirubin. Oral administration of *cumin* and *coriander* significantly ($p< 0.001$) lowers the levels of marker enzymes SGPT and SGOT. It also lowers serum bilirubin level (**Fig 1,2 &3**)



Graph Fig.1. Effect of *cumin* and *coriander* on profenofos induced toxicity showing SGPT activity (n=6, values are mean ± S.D)



Graph Fig.2. Effect of *cumin* and *coriander* on profenofos induced toxicity showing SGOT activity (n=6, values are mean ± S.D)



Graph Fig.3. Effect of *cumin* and *coriander* on profenofos induced toxicity showing serum bilurubin activity (n=6, values are mean ± S.D)

DISCUSSION

Liver is the major site of metabolism, resulting in inactivation of exogenous chemicals or xenobiotics to non-toxic metabolites. Due to high metabolic capability and the portal blood supply, toxic responses occur relatively frequent in the liver compared to other organs.

In the present study, serum transaminases were used as an index of hepatocellular injury in study of profenofos induced intoxication. Generally, the serum transaminase level reflects the level of hepatic necrosis. The profenofos induced toxicity increased the levels of SGPT and SGOT.The low dose of *cumin* and *coriander* effectively protect the liver damage as evident from the decreased activities of serum transaminases. Thus, *cumin* and *coriander* treatment restores the normal SGPT and SGOT levels.

Bilirubin is an endogenous anion derived from haemoglobin degradation. Bilirubin in the body maintains balance between production and removal of pigments in body. Hyperbilirubinemia results from the overproduction or impaired uptake, conjugation or excretion/regurgitation of unconjugated or conjugated bilirubin from hepatocytes and its release to bile ducts. Increased bilirubin level in the profenofos treated mice indicates hepatic injury. However, the administration of *cumin* and *coriander* it showed significant decrease in bilirubin level. Such finding reflects hepato- protective activity of *cumin* and *coriander*. In recent years, hypolipidemic effect[6], immunomodulatory effect[2], antibacterial effect[1,5,20,21], antioxidant and hepato-protective properties[25], anti-inflammatory effect[14], anti-diabetic effects[19] and diuretic properties[13] of cumin and coriander have been well reported. The reports shows,biochemical changes in rats especially the free radicals on profenofos exposure [18].

From the aforesaid findings it can be concluded that extracts *cumin* and *coriander* have the great capability to normalize the physiological activities of the body as well as restoration of cellular status of liver. Profenofos at one hand damages the vital tissues of the body at great extent. The cytoprotective properties of these medicinal plant extracts restores the cellular integrity. The essential oils of *cumin* and *coriander* are playing the vital role to ameliorate the profenofos induced toxicity. Thus, both the medicinal plants show the hepatoprotective role. Furthermore, among the two medicinal plant extracts used, *cumin* was found to be more effective in its hepatoprotective role rather than *coriander*. The entrance of hazardous pesticide (profenofos) into our body cannot be checked but by the use of *cumin* and *coriander* extracts as potent antidote can solve the problem to great extent, normalizing the physiology of the body in general and restoring the cellular status of vital organs of the body.

ACKNOWLEDGEMENT

The authors are thankful to Mahavir Cancer Institute and Research Centre, Phulwarisharif, Patna for providing the necessary laboratory and library facilities.

REFERENCES

1. Allahghadri T, Rasooli I, Owlia P, Nadooshan MJ, Ghazanfari T, Taghizadeh M, Astaneh SD. Antimicrobial property, antioxidant capacity, and cytotoxicity of essential oil from cumin produced in *Iran. J Food Sci.* 2010; 75(2):H54-61.
2. Chauhan PS, Satti NK, Suri KA, Amina M, Bani S. Stimulatory effects of *Cuminum cyminum* and flavonoid glycoside on Cyclosporine-A and restraint stress induced immune-suppression in Swiss albino mice. *Chem Biol Interact.*. 2010; 15;185(1):66-72.
3. Chithra V, Leelamma S. *Coriandrum sativum* changes the level of lipid peroxide and activity of antioxidant enzyme in Experimental animals. *Indian J Biochem Biophys*. 1999; 36:56-91.

4. Derakhshan S, Sattari M, Bigdeli M.. Effect of sub-inhibitory concentrations of cumin (*Cuminum cyminum* L.) seed essential oil and alcoholic extract on the morphology, capsule expression and urease activity of *Klebsiella pneumoniae*. *Int J Antimicrob Agents*. 2008; 32(5):432-6.
5. Derakhshan S, Sattari M, Bigdeli M.. Effect of cumin (*Cuminum cyminum*) seed essential oil on biofilm formation and plasmid Integrity of *Klebsiella pneumoniae*.*Pharmacogon. mag.* 2010; 6(21):57-61.
6. Dhandapani S, Subramanian VR, Rajagopal S, Namasivayam N. Hypolipidemic effect of *Cuminum cyminum* L. on alloxan-induced diabetic rats. *Pharmacol Res*. 2002; 46(3):251-5.
7. Dolora,P., Torricelli,F. and Antonelli,N. Cytogenetic effects on human lymphocytes of a mixture of 15 insecticides commonly used in Italy. *Mutat. Res.* 1994; 325: 47–51.
8. Galigher AE., Kozloff E N. Essential Practical Microtechnique, 2nd edition, Lea and Febiger, Philadelphia; 1971: 77.
9. Gallo, M.A. and N.J. Lawryk. Orgaophosphorus pesticides. In: Hayes, Jr., W.J., Laws, Jr., E.R. (Eds.), Handbook of Pesticide Toxicology, Classes of Pesticides, vol. 2. Academic Press, San Diego (Chapter 16) 1971.
10. Gagandeep, Dhanalakshmi S, Méndiz E, Rao AR, Kale RK. Chemopreventive effects of *Cuminum cyminum* in chemically induced forestomach and uterine cervix tumors in murine model systems, *Nutr Cancer*. 2003; 47(2):171-80.
11. Gompertz, D. Organophosphorus pesticides. In: *World Health Organization* (Ed.), Biological Monitoring of Chemical Exposure in the Workplace, Guidelines, vol. 1. Geneva; 1996.
12. Hagmar,L.; Brogger,A. and Hansteen,I.L. Cancer risk in human predicted by increased levels of chromosomal aberrations in lymphocytes: Nordic study group on the health risk of chromosome damage. *Cancer Res.*, 1994; 54, 2919–2922.
13. Jabeen Q, Bashir S, Lyoussi B, Gilani AH.. Coriander fruit exhibits gut modulatory, blood pressure lowering and diuretic activities.; *J Ethnopharmacol*.; 2008; 122(1):123-30.
14. Jagtap AG, Shirke SS, Phadke AS. Effect of polyherbal formulation on experimental models of inflammatory bowel diseases. *J Ethnopharmacol*.. 2004; 90(2-3):195-204.
15. Jendrassik L and Grof P. *Biochem*. 1938; 2,297: 81.
16. Li, Rong; Zi-Tao Jiang. Chemical composition of the essential oil of *Cuminum cyminum L*. from China. *Flavour and Fragrance Journal*. 2004; 19 (4): 311–313.
17. Lin, L.; Liu, J.; Zhang, K. and Chen, Y. An experimental study of the effects of Profenofos on antioxidase in rabbits *Wei Sheng Yan Jiu*. 2003; 32(5):434-5.
18. Mogda K. Mansour, Afaf A.I. El-Kashoury, M.A.Rashed and K.M.Koretem. Oxidative and biochemical alterations induced by profenofos insecticide in rats. *Nature and Science*. 2009; 7(2) : 1-15.
19. Otoom SA, Al-Safi SA, Kerem ZK, Alkofahi A. The use of medicinal herbs by diabetic Jordanian patients. *J Herb Pharmacother*. 2006.; 6(2):31-41.
20. Pajohi MR, Tajik H, Farshid AA, Hadian M. Synergistic antibacterial activity of the essential oil of *Cuminum cyminum* L. seed and nisin in a food model. *J Appl Microbiol*.. 2011; doi: 10.1111/j.1365-2672.2011.04946.x. [Epub ahead of print].
21. Rahman MS, Parvez MA, Islam MR, Khan MM.. : Antibacterial activity of natural spices on multiple drug resistant Escherichia coli isolated from drinking water, Bangladesh. *Ann Clin Microbiol Antimicrob*. 2011; 10(1):10. [Epub ahead of print].
22. Reitmann, S., Frankel,S. For the determination of SGPT and SGOT activity in serum. *Amer.J.Clin.Path.*. 1957; 28:56.
23. Rupa, D.S., Reddi, P.P. and Reddi, O.S. Clastogenic effect of insecticides in peripheral lymphocytes of cotton-field workers. *Mutat. Res.*, 1991; 261, 177–180.
24. Saeed, R. M., Al-Koly, M. A., and Ali, M. A.. Hepatic, renal and pulmonary responses in pregnant mice and their fetuses induced by profenofos. *Journal of Union of Arab Biologists: Zoology*. 1995; 3(A):359-386.
25. Samojlik I, Lakić N, Mimica-Dukić N, Daković-Svajcer K, Bozin B. Antioxidant and hepatoprotective potential

of essential oils of coriander (*Coriandrum sativum* L.) and caraway (*Carum carvi* L.) (Apiaceae). *J Agric Food Chem*.. 2010; 58(15):8848-53.

26. Sharma, Y.; Bashir, S.; Irshad, M.; Gupta, SD.; and Dogra, TD. Effects of acute dimethoate administration on antioxidant status of liver and brain of experimental rats. *Toxicology*. 2005; 206:49-57
27. World Health Organisation (WHO). The WHO recommended classification of pesticides by hazard and guidelines to classification 1990–1991, WHO/PCS/90.1, *World Health Organization*, Geneva, Switzerland .1990.
28. Wu TT, Tsai CW, Yao HT, Lii CK, Chen HW, Wu YL, Chen PY & Liu KL. Suppressive effects of extracts from the aerial part of *Coriandrum sativum* L. on LPS-induced inflammatory responses in murine RAW 264.7 macrophages. *J Sci Food Agric.* 2010 ; 90(11):1846-54.