EFFECT OF *TAMARINDUS INDICA* L. PULP ON ENVIRONMENTALLY EXPOSED FLUOROTIC CATTLE

S. Sethi, S.K. Senapati, and R.C. Patra

Department of Veterinary Clinical Medicine

College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar-751003

Received 16-5-2015 Accepted 10-6-2015

Corresponding Author : supravasethivet@gmail.com

ABSTRACT

The present experiment was carried out in fluorotic cattle environmentally exposed to fluorine emission to assess the effect of *Tamarindus Indica* L. dried pulp at the dose rate of 100 gm/adult cattle of 4-6 years old. Dried powder of tamarind pulp was fed orally for a continuous period of sixty days. Fluoride level in plasma, urine and faecal sample was monitored on day 0, day 30 and day 60 of this experiment. The treatment resulted in gradual reduction of plasma and urine fluoride level significantly along with significant increase in the excretion of fluoride through faeces. The plasma alkaline phosphatase activity has reduced significantly on both day 30 and day 60.

KEY WORDS: Fluoride, Cattle, Tamarind, Alkaline pohosphatase

INTRODUCTION

Fluorosis is one of the major health problem affecting both human and animal all over the world (Mehedintu *et al*., 2000). Indiscriminate feeding habits of cattle plays a vital role in ingestion of excess fluoride through fodder and water contaminated with effluents from fluoride emitting industries such as aluminium smelters (Swarup *et al.,* 1998), super phosphate fertilizer plants (Patra *et al.,* 2000) and brick kilns processing unit (Singh and swarup, 1995). Semi intensive system of animal rearing also exposed the animals to fluorosis through inhalation. Clinically this disease is manifested by mottling, discoloration and pitting of the enamel, excessive abrasion of the teeth and bony exostoses with lameness. Economic value of the affected animals also decreases through reduced productivity, production and working capability.

Chemical ameliorative agents like aluminium sulphate, aluminium chloride, calcium chloride, boron and aluminium hydroxide has limited significance because of adverse side effects and toxicity so they are not recommended in concomitant exposure. Fluorotic cattle reared within 2-2.5 km of fluoride emitting industries requires continual treatment for which an alternative to chemical ameliorative agents tamarind pulp containing chelating agents ,minerals and antioxidants was evaluated in the present study with an objective to reduce the body fluoride burden and alleviating the fluorosis related clinical signs without any side effects.

MATERIALS AND METHODS

Forty fluorotic cattle aged between four to six years of either sex reared within a 2-2.5 km of radius from aluminium smelter plant in Odisha were selected for the present study. These animals were divided into two equal groups consisting of 20 animals in each group named as Group-I and Group-II. Group-I animals were taken as disease control and left untreated. Group-II animals were treated with dried powder of tamarind pulp 100 gm per animal orally once daily for a period of 60 days. The biotic samples like blood, urine and faecal samples were collected on day 0, 30 and 60 of the experimental period and analyzed for fluoride level and haemato biochemical alterations. The clinical signs productive and working capabilities were also observed.

Heparinised blood was collected for estimation of fluoride concentration, haemoglobin (gm%), pack cell volume (PCV), total erythrocyte count (TEC) and alkaline phosphatase (ALP) activity. Mean fluoride concentration in plasma, urine and faecal samples were measured in ion specific potentiometry following the method of Cernik *et al*. (1970). The above parameters were studied on day 0, 30 and 60 of treatment. Statistical analysis of the data was performed following the standard method of Snedecor and Cocharn (1967).

RESULTS AND DISCUSSION

The fluoride levels in plasma, urine and faeces as well as the haematobiochemical alterations like haemoglobin, packed cell volume, total erythrocyte count and alkaline phosphatase values in different groups at different observation periods are given in Table –1.

Table-1 Effect of Tamarind pulp administration on haemato-biochemical profile of fluorotic cattle

Parameter	Group	Day 0	Day 30	Day 60
Plasma fluoride (ppm)	Group-I	0.748 ± 0.014^{B}	0.775 ± 0.0125^{D}	0.7817 ± 0.017^{D}
	Group-II	0.768 ± 0.014^{cB}	0.384 ± 0.013^{bB}	0.287 ± 0.015^{aB}
Urinary fluoride (ppm)	Group-I	13.866 ± 0.382^{B}	14.000 ± 0.345^{D}	14.400 ± 0.410^{D}
	Group-II	13.500 ± 0.428^{cB}	7.221 ± 0.021^{bB}	6.043 ± 0.222^{aB}
Faecal fluoride (ppm)	Group-I	24.016 ± 0.540^{B}	24.350 ± 0.520^{B}	24.630 ± 0.510^{B}
	Group-II	24.366 ± 0.530^{aB}	37.650 ± 1.284^{bD}	46.140 ± 1.470^{cD}
Haemoglobin (gm**%)**	Group-I	7.800 ± 0.154^{A}	7.633 ± 0.130^{A}	7.533 ± 0.160^{A}
	Group-II	7.533 ± 0.169^{aA}	8.333 ± 0.240^{bA}	9.767 ± 0.181^{cB}
PCV(**%)**	Group-I	23.000 ± 0.517^{A}	22.833 ± 0.401^{A}	22.500 ± 0.428^{A}
	Group-II	22.333 ± 0.333^{aA}	24.833 ± 0.654^{bA}	29.000 ± 0.517^{cB}
TEC($x10^6$/cu mm)	Group-I	3.799 ± 0.098^{A}	3.771 ± 0.080^{A}	3.717 ± 0.075^{A}
	Group-II	3.660 ± 0.117^{aA}	4.157 ± 0.090^{bA}	4.789 ± 0.091^{cB}
ALP(U/L)	Group-I	320.195 ± 1.999^{B}	322.414 ± 1.480^{D}	324.429 ± 1.395^{D}
	Group-II	323.763 ± 1.503^{cB}	284.303 ± 4.466^{bB}	161.937 ± 5.884^{aB}

Group I: Disease control group , Group II: Tamarind treated group. The mean (mean± SE, n= 6) Value bearing no common superscript (small letter in a row and capital letter in a column) are significantly different at p<0.05.

Tamarind supplementation helps in significant reduction of fluoride level in plasma and urine however excretion in faeces has enhanced significantly. It was also noticed that plasma, urine and faecal fluoride level in Group-I showed increasing trend at a non significant level during 60 days of observation period. The faecal fluoride concentration was enhanced significantly ($P<0.05$) in Group-II from day 0 to day 60 and significantly increasing trend was observed in haemoglobin, packed cell volume, total erythrocyte count and decreasing trend in alkaline phosphatase activity. On the other hand, a gradual decreasing trend was observed in haemoglobin, packed cell volume, total erythrocyte count and gradual increasing trend was observed in ALP value in disease control group

After supplementation of tamarind to Group- II the plasma fluoride concentration was significantly ($P<0.05$) reduced on both day 30and day 60 from day 0. The effect of tamarind in efficient reduction of plasma fluoride concentration in the fluorotic cattle may be attributed from chelating effects of tannin, fiber as reported by Almeida *et al.* (2009). Tamarind also contains tartaric acid, ascorbic acid along with high concentration of calcium, copper, amino acids, vitamins as reported by Ishola *et al.* (1990) which may be contributory factors to reduce the plasma fluoride level either by chelating in gastro intestinal tract enhancing its excretion through faeces as well as affecting fluoride mobilization through different body systems.

Supplementation of tamarind reduced the urinary fluoride concentration significantly ($P<0.05$) both on day 30 and day 60. The reduced urinary fluoride concentration may be due to its lack of absorption from gastro intestinal tract as most of it gets chelated by tamarind and excreted through faeces. Tamarind also plays role for enhancing mobilization of plasma fluoride to bone there by fluoroide concentration in both plasma and urine reduces.

Tamarind also helps in increasing fluoride excretion through faeces significantly ($P<0.05$) on day 30 and further on day 60. The effect of tamarind in efficient removal of fluoride through faeces in the fluorotic cattle may be attributed from chelating effects of tannin or may be due to presence of tartaric acid, ascorbic acid along with high concentration of calcium, copper, amino acids, vitamins in tamarind.

The increasing trend in haemoglobin, packed cell volume and total erythrocyte count from day 0 to day 60 continues at a significant ($P<0.05$) level in Group- II. The effect of tamarind in enhancing these haematological parameters in the fluorotic cattle may be attributed from hepato protective effect of tamarind because of its high content of ascorbic acid and beta-carotene as reported by Olatunde *et al.* (2002) and Pimple *et al.* (2007). The high concentration of antioxidants in tamarind due to the presence of high concentrations of polyphenols and flavonoids (Ranjan *et al.,* 2009) scavenge oxygen free radicals and thus exert a beneficial effect on the body system which might have stimulated the bone marrow by releasing oxidative stress.

In Group- II activity of alkaline phosphatase has been reduced significantly ($P<0.05$) The beneficial effect of tamarind on reduction of plasma alkaline phosphatase activity may be due to the presence of calcium, other minerals and antioxidants. Supplementation of calcium has been reported to decrease the plasma alkaline phosphatase activity in experimental fluorosis in laboratory animals. This indicates that dried powder of tamarind pulp has protected the fluorosis related bone damage in cattle reared in a industrial fluorotic area.

ACKNOWLEDGEMENTS

The authors are highly thankful to Dean, College of Veterinary Science and Animal Husbandry for providing necessary research facilities for completing this M.V.Sc study

REFERENCES :

Almeida, M. M. B., Desousa, P. H. M., Fonseca, M. L., Magalhaes, C. E. C., Lopesm, DE. F. G., Delemos T. L. G. (2009). *Ciencia e Technologia de Alimentos*, **29**:581-586.

Cernik, A. A., Cooke, J. A. and Hall, R. J. (1970). Nature. **227**:1260-1261.

Ishola, M. M., Agbaji, E. B. and Agbaji, A. S. (1990). J Sci Food Agr, **51**:141-143.

Mehedintu, C., Avram, N., Medrea, N., Dutescu, C.(2000). Res Vet Med, **8**:89-98.

Olatunde, F. E., Olwatosin. A. A. and Godwin, E. O. (2002). *Pharmacol Toxicol*, **91**:129-134.

Patra, R. C., Dwivedi, S. K., Bhardwaj, B., Swarup, D. (2000). Sci Total Environ, **253**:145-150.

Pimple, B. P., Kadam, P. V., Badgujar, N. S., Bafna, A. R. and Patil, M. J. (2007). *Ind j pharmaceutical sci*, **69(6)**:827-831.

Ranjan, R., Swarup, D., Patra, R. C. and Chandra, V. (2009). Indian J Exp Biol , **47**:900–905.

Singh, J. L. and Swarup, D. (1995). Agri practice, **16**:25-30.

Snedecor, G.W. and Cochran,W.G. (1975). Statistical methods 7th Edn. Oxford and IBH publishing Co. New Delhi.

Swarup, D., Dwivedi, S. K., Dey, S. and Ray, S. K. (1998). Indian J Anim Sci , **68**:605-608.

❑