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Effect of *Amaranthus spinosus* (Meghnads) & Turmeric (*Curcuma longa*) *on* Chronic Arsenicosis in Cattle

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ABSTRACT

About 100 milch animals hair sample were collected from 5 villages namely Dakhin Panchpota, Noonaghata, Mitrapur, Goetra, Ranaghat of Nadia district, West Bengal, India and these samples were processed to estimate the concentration of arsenic. Out of them 30 cattle having arsenic concentration in the range of 2.5 to 4.5 mg/kg in hair was chosen for this experiment. These milch were divided into three groups' i.e. Group I (G_1) animals received turmeric powder, whereas Group II (G_2) received Turmeric (*Curcuma longa*) + *Amaranthus spinosus* (Meghnads) and Group III (G_3) served as untreated control. Arsenic content of milk, feces, hair & urine was estimated before and after administration of turmeric powder (*Curcuma longa*) at the dose of 30 grams to each animal of Group I (G_1)/ day for 3 months (90 Days) and turmeric powder 15g (*Curcuma longa*) + *Amaranthus spinosus* (Meghnads) 15g / day to each animals Group II (G_3). Turmeric & *Amaranthus spinosus* significantly decreased arsenic load in milk, urine, hair & feces after 3 month. In Milk, arsenic concentration was decreased significantly which may be beneficial for animals and human consumption.

Keywords: Arsenicosis, Milch Cattle, Turmeric (*Curcuma longa*), *Amaranthus spinosus* (Meghnads).

INTRODUCTION

In animals the exposure to arsenic involves a biotransformation process leading to the excretion of methylated metabolites, such as parental inorganic species (arsenite & arsenate).The order of toxicity from greatest to least follows this schematic: inorganic As^{+3} (arsenite) > inorganic As^{+5} (arsenate) > trivalent organics > pentavalent organics (Garland, 2007). Curcumin, an active ingredient of Turmeric (*Curcuma longa*), a commonly household spice, which is rich source of polyphenols. This compound has been extensively studied as a chemo-preventive agent against many type of cancer. It was observed that DNA damage induced by arsenic could be efficiently reduced by curcumin & their effect was more pronounced when lymphocyte was preincubated & their curcumin prior to arsenic insult (Khan & Ho., 2011).

The enzymetic and non-enzymetic antioxidant activities of *Amaranthus spinosus* (family: Amaranthaceae) has antioxidant substances that protect our cell against oxidative damage and reduced the risk of developing chronic degenerative disease. (Smitha & Sudha., 2011).

Vitamins content in extract of *Amaranthus* spinosus (Smitha & Sudha., 2011).

Vitamin A (µg/g)	Vitamin C (mg/g)	Vitamin E (µg/g)	Carotenoids (µg/g)
182.51	1.30	20.39	101.30

Vitamin C acts as a direct scavenger of free radicals and act as a reluctant in enzymic reactions (Nagel *et al.,* 1997). It acts as the main radical acceptor from vitamin E (Bohles, 1997) and suppresses the formation of carcinogens such as nitrosamines (Tannenbaum and Wishnok, 1987) and quinones (Tennar and Matsuskita, 1988). Vitamin E, the lipid soluble chain breaking antioxidant scavenges free radicals and prevents lipid peroxidation, thus stabilizing the cell membrane (Geetha *et al.*, 1990 and Lupulescu, 1994). Arsenic contamination in cattle occurs through ingestion of drinking water, paddy straw, crops and vegetables grown in arsenic prone area. Samples like hair, feces, milk, and urine are collected from arsenic affected animals Dakhin Panchpota, Noonaghata, Mitrapur, Goetra, Ranaghat village of Nadia district, west Bengal, India for total arsenic estimation.

MATERIAL & METHODS

About 100 milch animals hair sample were collected from namely Dakhin Panchpota, Noonaghata, Mitrapur, Goetra, Ranaghat of Nadia district, West Bengal and these samples were processed to estimate the concentration of arsenic. Out of them 30 cattle having arsenic concentration in the range of 2.5 to 4.5 mg/kg in hair was chosen for this experiment.

Estimation Of Total Arsenic

Total arsenic was estimated as per standard methods in atomic absorption spectrometer equipped with vapor generation accessories.

Instrument

For estimation of arsenic varian **AA240** model AAS equipped with vapor generation was used (model no. VGA77). Reducing agent (aqueous solution of 0.6 % Sodium borohydride in 0.5 % sodium hydroxide) and acid (40% hydrochloric acid) were prepared freshly before used.

Table. 1: Concentrate of arsenic in different samples of Nadia Dist., West Bengal in Group I Animals(Turmeric).

SAMPLE NO.	**GROUP I** (Administration of Turmeric powder for 90 days)							
	0 DAYS				90 DAYS			
	URINE (mg/L)	FACES (mg/kg)	HAIR (mg/kg)	MILK (mg/L)	URINE (mg/L)	FACES (mg/kg)	HAIR (mg/kg)	MILK (mg/L)
G_1 1	O.24	0.89	3.21	0.04	0.32	1.04	3.11	0.02
G_1 2	0.35	0.90	3.01	0.08	0.41	1.20	2.86	0.05
G_1 3	0.29	1.02	2.92	0.1	0.37	1.46	2.54	0.09
G_1 4	0.28	0.76	3.84	0.02	0.41	1.10	3.32	0.01
G_1 5	0.36	0.88	3.23	0.06	0.49	1.21	2.98	0.02
G_1 6	0.31	0.95	3.56	0.5	0.39	1.85	3.37	0.40
G_1 7	0.19	0.72	2.58	0.05	0.27	1.03	2.23	0.03
G_1 8	0.16	1.12	4.06	0.03	0.22	1.59	3.75	0.01
G_1 9	0.33	0.88	2.88	0.07	0.51	1.28	2.39	0.03
G_1 10	0.20	0.98	3.49	0.06	0.36	1.16	3.07	0.03
TOTAL	2.71	9.1	32.78	1.01	3.75	12.92	29.62	0.69
AVERAGE	0.27	0.91	3.27	0.10	0.37	1.29	2.96	0.07

Table -2: Concentrate of arsenic in different samples of Nadia Dist., West Bengal in Group II Animals(Turmeric powder+ *Amaranthus spinosus*).

SAMPLE NO.	**GROUP II** (Turmeric powder+ *Amaranthus spinosus* for 90 days)							
	0 DAYS				90 DAYS			
	URINE (mg/L)	FACES (mg/kg)	HAIR (mg/kg)	MILK (mg/L)	URINE (mg/L)	FACES (mg/kg)	HAIR (mg/kg)	MILK (mg/L)
G_1 1	0.36	0.90	3.12	0.05	0.40	1.37	2.57	0.03
G_1 2	0.23	0.88	3.10	0.07	0.46	1.22	2.56	0.04
G_1 3	0.30	0.77	3.74	0.06	0.39	1.64	2.45	0.05
G_1 4	0.27	1.06	3.57	0.08	0.42	1.29	3.01	0.03
G_1 5	0.32	0.95	3.32	0.12	0.49	1.12	2.76	0.06
G_1 6	0.35	0.88	3.65	0.6	0.40	1.88	3.01	0.21
G_1 7	0.17	1.19	2.42	0.06	0.28	1.11	3.11	0.03
G_1 8	0.19	1.01	4.01	0.04	0.27	1.64	2.45	0.02
G_1 9	0.34	0.81	2.79	0.05	0.44	1.52	2.13	0.04
G_1 10	0.29	0.92	3.51	0.08	0.38	1.44	2.58	0.02
TOTAL	2.82	9.37	33.23	1.21	3.93	13.23	26.63	0.53
AVERAGE	0.28	0.93	3.32	0.12	0.39	1.33	2.66	0.05

Table -3: Concentrate of arsenic in different samples of Nadia Dist., West Bengal in Group III Animals(untreated control).

SAMPLE NO.	GROUP III (untreated control)							
	0 DAYS				90 DAYS			
	URINE (mg/L)	FACES (mg/kg)	HAIR (mg/kg)	MILK (mg/L)	URINE (mg/L)	FACES (mg/kg)	HAIR (mg/kg)	MILK (mg/L)
G_2 1	O.32	0.92	3.02	0.06	0.33	1.01	3.21	0.07
G_2 2	0.27	0.92	2.61	0.07	0.30	0.98	2.86	0.08
G_2 3	0.30	0.79	3.22	0.05	0.31	0.76	3.54	0.05
G_2 4	0.25	1.13	2.97	0.07	0.24	1.32	3.07	0.06
G_2 5	0.31	0.84	3.92	0.2	0.33	1.02	3.67	0.3
$G_2$6	0.29	1.01	3.21	0.4	0.30	1.22	3.87	0.44
G_2 7	0.15	0.79	3.01	0.08	0.14	1.01	3.77	0.09
G_2 8	0.24	0.96	3.91	0.05	0.25	0.81	3.98	0.07
G_2 9	0.17	0.94	2.83	0.1	0.15	0.82	3.23	0.21
G_2 10	0.21	0.91	3.76	0.07	0.27	1.03	3.81	0.09
TOTAL	2.51	9.21	32.46	1.15	2.62	9.98	35.01	1.46
AVERAGE	0.25	0.92	3.25	0.12	0.26	0.99	3.50	0.15

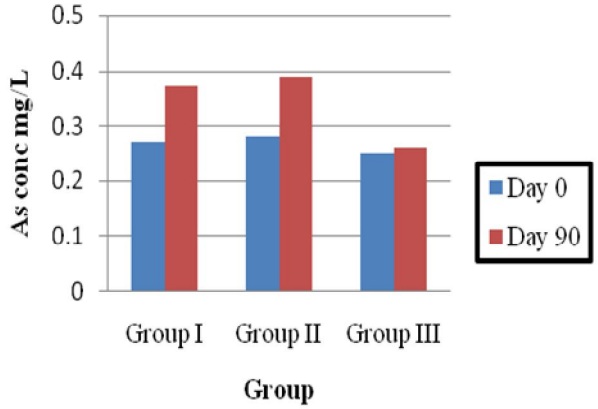

Fig. 1: Concentration of arsenic in Urine of cattle from Nadia district after Turmeric & *Amaranthus spinosus* administration for 90 days.

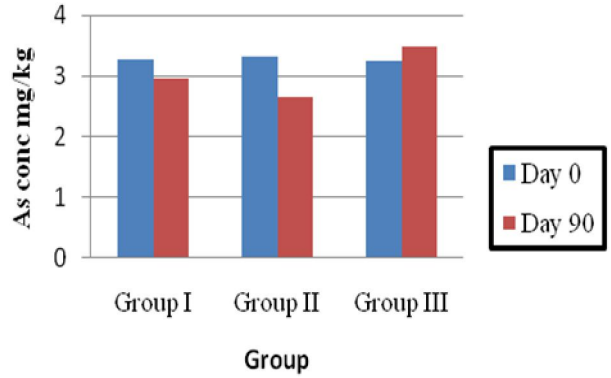

Fig. 2: Concentration of arsenic in Hair of cattle from Nadia district after Turmeric & *Amaranthus spinosus* administration for 90 days.

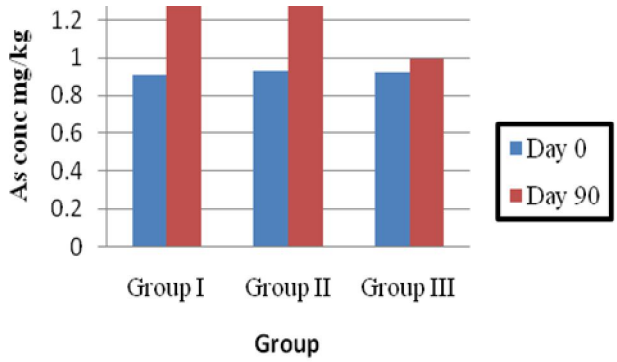

Fig. 3: Concentration of arsenic in Feces of cattle from Nadia district after Turmeric & *Amaranthus spinosus* administration for 90 days.

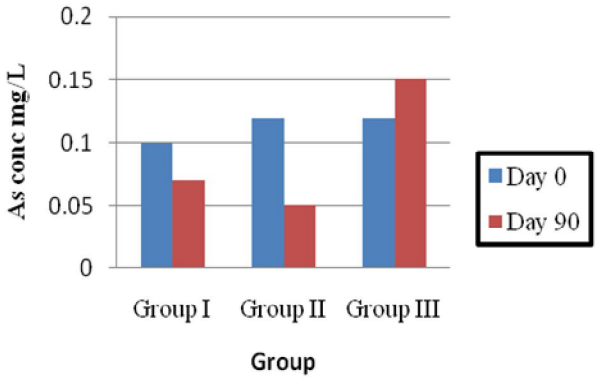

Fig. 4: Concentration of arsenic in Milk of cattle from Nadia district after Turmeric & *Amaranthus spinosus* administration for 90 days.

RESULT & DISCUSSION

The arsenic concentration in milk decreased by 30% and 58.3% compared with 0 day level in Group I (G_1) & Group II (G_2) animals respectively, which may be beneficial for animals and human consumption. On the other hand they increased the excretion of arsenic from urine and increased were 27.02 % & 28.20% in Group I (G_1) & Group II (G_2) animals respectively. Likewise Turmeric & *Amaranthus spinosus* increased the excretion of arsenic through feces and the percentage of increased was 29.45% & 30.07% in Group I (G_1) & Group II (G_2) animals respectively. Turmeric slightly decreased the concentration of arsenic content of the hair was 9.5 % & 19.88% in Group I (G_1) & Group II (G_2) animals respectively. The increased elimination of arsenic from urine, feces might be due to antioxidant effect and potentiality to chelate the toxicity by Turmeric & *Amaranthus spinosus*. The result of the present study was corroborated with the report of De (2008), Mandal (2008), Rana *et al.*, (2008) and Ghosh *et al.*, (2011).

CONCLUSION

However, we do not clarify in this study how turmeric & *Amaranthus spinosus* showed protection against arsenic action in milch cow. Therefore further study should be needed to explain the mechanism of turmeric & *Amaranthus spinosus* for the reaction of arsenic toxicity. One possibility is that curcumin & other antioxidant of turmeric inhibit the arsenic action as they act as ROS (Reactive oxygen species) scavengers (N. Tirkey *et al*., 2005 & D. Nandi *et al*., 2005). There is better result in Group II (G_2) animals (*Amaranthus spinosus* + Turmeric) in comparison to Group I (G_1) animals (Turmeric therapy only). These may be due to enzymetic and non-enzymetic antioxidant activities of *Amaranthus spinosus* (family Amaranthaceous) which protect our cell against oxidative damage and reduced the risk of developing chronic degenerative disease (Smitha K.R and Dr. G. Sudha., 2011) plus antioxidant properties of turmeric in Group II (G_2) animals.

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