

Ameliorating potential of Ashwagandha on cadmium chloride induced changes in weights of visceral organs

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Abstract

The present study was carried out to evaluate the protective effect of Ashwagandha on Cadmium chloride induced changes in weights of visceral organs of male rats. Thirty male Wistar rats were divided equally into three groups. Group I was fed on balanced diet of rat pellets for a period of sixty days. The rats in group II were given freshly prepared cadmium chloride solution in the deionised drinking water @200 ppm daily for 60 days. The rats in Group III were fed on Ashwagandha plant powder thoroughly mixed in rat feed at the concentration of 0.5g/Kg (w/w) corresponding to 500 ppm level. Simultaneously the rats were given cadmium-chloride @200 ppm in deionised drinking water throughout the experimental period. It is concluded that oral administration of Ashwagandha (*Withania somnifera*) plant powder for 60 days significantly improved the weights of testes, accessory sex organs, liver and kidney in male rats. Simultaneous medication of Ashwagandha (500 ppm in feed) reduced the severity of cadmium chloride toxicity in male Wistar rats.

Keywords: Ashwagandha, cadmium chloride, visceral organ, rat, liver, kidney.

Introduction

Cadmium is a well known toxicant. The largest source of cadmium release to the general environment is the burning of fossil fuels or incineration of municipal waste materials. Cadmium chloride causes reduction in weights of testes, seminal vesicle and epididymis (Laskey *et al.*, 1984, Saksena *et al.*, 1987). Cadmium causes reduction in feed intake and body weight in calves.

Ashwagandha (*Withania somnifera*) is known since the ancient ages in our country for its medicinal values. Ayurveda, the oldest system of traditional medicine, which is very popular in these days recommends herbal remedies to cure of variety of diseases. *Withania somnifera* reported to cause increase in weights of testes, seminal vesicle and bulbourethral gland. (Rathor, 1999). The root of the plant has been reported to ameliorate the toxicities of lead (Chaurasia *et al.*, 2000) and cadmium (Gupta and kar, 2002) in laboratory animals.

The present investigation was carried out to access the effect of simultaneous administration of cadmium chloride and *Withania somnifera* on weights of testes, accessory sex organs, liver and kidney in male rats.

Material and Methods

Thirty male Wistar rats which were procured from

Raj Biotech India Ltd., Wing, Satara (MS) and maintained by the Department of Veterinary Pharmacology and Toxicology, College of Veterinary and Animal Sciences, MAFSU, Parbhani (M.S.). Thirty male Wistar rats were randomly selected for present investigation. They were divided into three groups each consisting of ten rats. The treatment was continued daily for sixty consecutive days.

Group I was fed on balanced diet of rat pellets for a period of sixty days. The rats in group II were given freshly prepared cadmium chloride solution in the deionised drinking water @200 ppm daily for 60 days. The rats in Group III were fed on *Withania somnifera* plant powder thoroughly mixed in rat feed at the concentration of 0.5g/Kg (w/w) corresponding to 500 ppm level. Simultaneously the rats were given cadmium-chloride @200 ppm in deionised drinking water throughout the experimental period.

The testes and accessory sex organs *viz.*, seminal vesicles and prostate glands were dissected out without fascia carefully and weighed separately. Similarly liver and kidneys were dissected out without fascia and weighed, separately.

Results and Discussion

Weight of testes and epididymis: Table 2 summarises the mean weights of testes, seminal vesicle, prostate gland, *caput epididymis*, *cauda epididymis*, *corpus*

Table.- 1. Weights of liver and kidney of rats treated with cadmium chloride alone and cadmium chloride with *W. somnifera* L. plant powder.

Group	Weight of organs (g) (Mean±SE)	
	Liver	Kidney
I-Control (Normal feed)	10.18±0.13a (9.6-10.8)	2.59±0.04 a (2.4-2.8)
II-Cadmium chloride alone	9.42±0.25 b (8.2-10.6)	1.66±0.01 b (1.6-1.72)
III-Cadmium chloride with <i>W.somnifera</i> @ 500 ppm	9.80±0.20 a (8.8-10.6)	2.28±0.05 c (2.0-2.56)
CD	0.57	0.11

* Each group contained ten rats

Mean values in columns with different superscript are significantly variable (P<0.01).

Mean values in columns with similar superscript are not significantly variable (P<0.01).

epididymis.

The mean weights of testes, seminal vesicle, prostate gland of control (Group-I) were 3.09±0.02, 1.45±0.01, 0.71±0.02 g, respectively. The weights of organs in rats treated with cadmium chloride (Group-II) were 2.59±0.04, 0.92±0.03, and 0.66±0.01g, respectively. In cadmium chloride treated with *Withania somnifera* whole plant powder (Group III), the mean weights of organs were 2.98±0.01, 0.94±0.02 and 0.69±0.02 g, respectively.

The mean weights of *caput epididymis*, *cauda epididymis* and *corpus epididymis* of control (Group-I) rats were 0.33±0.01, 0.29±0.02, 0.12±0.01 g, respectively. The mean weights of these organs in rats treated with cadmium chloride in (Group-II) were 0.29±0.01, 0.27±0.02 and 0.11±0.00 g, respectively. In cadmium chloride treated with *Withania somnifera* whole plant powder (Group-III) the mean weights of these organs were 0.32±0.01, 0.29±0.01, and 0.11±0.00 g, respectively. The mean weights of testes, seminal vesicles, prostate gland, *caput epididymis* were significantly reduced (P<0.01) in cadmium chloride-induced rats (Group-II) as compared to control (Group-I). *Laskey, et. al.*, (1984) reported similar observations with regards to weight of testes, which were reduced by 40-50 per cent in adult male rats receiving 16 or 33 mM Cd/kg body weight. However, there was no significant difference in cauda epididymis and corpus

epididymis in all groups.

Decrease in the size of testicular tissue may be attributed to cadmium by the way of elevating testicular melondialdehyde (MDA) and decreasing activities of testicular antioxidant enzymes. Thereby, the levels of 3b and 17b hydroxysteroid dehydrogenase as well as serum testosterone levels were also lowered (Gupta *et al.*, 2004).

There was significant improvement (P<0.01) in the weights of testes in cadmium chloride with *Withania somnifera* rats (Group-III) indicating stimulatory effect of *Withania somnifera* on development and functional activity of male reproductive system (Rathor, 1999; *Abdel-Mgied et al.*, 2001; Bankar, 2004).

Weights of liver and kidney: Table 1 summarise the mean weights of liver and kidney in different groups. Control rats (Group-I) the weights of liver and kidney were 10.18±0.13 and 2.59±0.04 g, respectively. The mean weights of liver and kidney among the cadmium chloride alone (Group-II) treated rats were 9.42±0.25, 1.66±0.01 g, respectively. The mean weights of liver and kidney in cadmium treated with *Withania somnifera* whole plant powder (Group-III) were 9.80±0.20 and 2.28±0.05 g, respectively.

The mean weight of liver in cadmium chloride treated rats was significantly decreased (P<0.01) as compared to control (Group-I); whereas, the mean weight of liver in cadmium chloride with *W. somnifera*

Table.- 2. Weights of testes and accessory sex organs of rats treated with cadmium chloride alone and cadmium chloride with *W.somnifera* whole plant powder

Group	Weights of organs (g) (Mean±SE)					
	Testes	Seminal vesicle	Prostate gland	Caput	Cauda	Corpus
I-Control (Normal feed)	3.09±0.02a (2.98-3.15)	1.45±0.01 a (1.38-1.5)	0.71±0.02 a (0.6-0.78)	0.33±0.01 a (0.3-0.36)	0.29±0.02 (0.21-0.39)	0.12±0.01 (0.1-0.16)
II-Cadmium chloride alone	2.59±0.04 b (2.4-2.8)	0.92±0.03 b (0.73-1.08)	0.66±0.01 b (0.6-0.7)	0.29±0.01 b (0.27-0.32)	0.27±0.02 (0.21-0.37)	0.11±0.00 (0.1-0.12)
III-Cadmium chloride with <i>W.somnifera</i> @ 500 ppm	2.98±0.01 c (2.96-3.00)	0.94±0.02 b (0.88-1.02)	0.69±0.02 ab (0.6-0.76)	0.32±0.01 a (0.28-0.36)	0.29±0.01 (0.25-0.34)	0.11±0.00 (0.1-0.14)
CD	0.07	0.06	0.04	0.02	0.04	0.01

was at par with control. The mean weight of kidney in cadmium chloride treated rats was significantly lesser ($P < 0.01$) than control (Group-I); whereas, the mean weight of kidney in cadmium chloride with *W.somnifera* was significantly higher ($P < 0.01$) than cadmium chloride treated rats (Group-II).

It is concluded that oral administration of Ashwagandha plant powder for 60 days significantly improved the weights of different visceral organs. Simultaneous medication of Ashwagandha (500 ppm in feed) reduced the severity of cadmium chloride toxicity in male Wistar rats.

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