

ACUTE TOXICITY STUDY FOR *TINOSPORA CORDIFOLIA*

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Received on: 02/09/11 Revised on: 04/10/11 Accepted on: 23/10/11

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ABSTRACT

The aim of the present work is to examine acute toxicity studies for decoction of aerial parts (leaves and stem) as well as whole plant powder of *Tinospora cordifolia* in the form of aqueous slurry as per OECD guidelines in Swiss mice weighing 35 to 45gm. The dose of 3, 5, 7 and 9 ml per kg body weight of decoction and 2, 4, 6 and 8 gm/kg body weight of the whole plant powder were administered orally. All the groups of animals were almost continuously observed for mortality and behavioral changes during first 24 hrs and then daily for a fortnight. The observations of behavioral changes and changes in body weight, food and water intake as well as cage side observations were reported. There was no abnormality observed in all groups. The decoction of fresh leaves and stem as well as whole plant powder have no any significant toxic effect in Swiss mice and the plant material was found to be nontoxic.

KEYWORDS: *Tinospora cordifolia*, acute toxicity study, decoction, whole plant powder

INTRODUCTION

Tinospora cordifolia is a widely used shrub in folk and Ayurvedic system of medicines. The review presents a detailed survey of the literature on chemistry and medicinal properties of *Tinospora cordifolia*. The chemical constituents reported from this shrub belong to different classes such as alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides. The notable medicinal properties reported are anti-diabetic, anti-periodic, anti-spasmodic, anti-inflammatory, anti-arthritis, anti-oxidant, anti-allergic, anti-stress, anti-leprotic, anti-malarial, hepatoprotective, immunomodulatory and anti-neoplastic activities.

Toxicity is the fundamental science of poisons. The organization for Economic and Development (OECD) mentioned acute toxicity as the advance effect occurring within a short time of oral administration of a simple dose of a substance or a multiple doses given within 24 hrs. Phytochemical interactions of poisons lead to injury or death of living tissues. Toxicology is like science and an art like medicine. It includes observational data gathering and data utilization to predict outcome of exposure in human and animals. The ancient humans categorized some plants as harmful and some as safe¹⁻⁴.

All organisms are always exposed constantly and unavoidably to foreign chemicals or xenobiotics, which include both manmade chemicals such as drugs industrial chemicals pesticides, pollutants pyrolysis products in cooked foods, alkaloids secondary plant metabolites, and toxins produced by moulds, plants and animals⁵. Poisons are any agent capable of producing a deleterious response in a biological system, seriously injuring function or producing death. Toxicologists usually divide that exposure of animals into four categories which are acute, sub acute, sub chronic and chronic toxicity⁶⁻⁸. The aim of the present work is to study the toxic nature of *Tinospora cordifolia* decoction of fresh leaves and stem and its whole plant powder⁹⁻¹⁰.

MATERIALS AND METHODS

Tinospora cordifolia leaves were collected from Avsari Forest Park (Pune), Maharashtra, India. Herbaria of the plant was prepared and authenticated from BSI (Botanical Survey of India), Pune, India. After collection of the required quantity of the plant material, it was then carefully segregated, cleaned and dried in shade to constant weight. The plant material was kept in preset oven for few days at 45°C. The completely dried plant material free of moisture was powdered and sieved through a BSS Mesh No. 85 sieve and then

stored in an airtight plastic container. Fresh areal parts of plant were collected for preparation of decoction. The study protocol used for the study is given in table No. 1

Animal Maintenance

All animals were housed in polyurethane cages. The cages were provided with wheat husk bedding and were cleaned daily. The animals were provided with drinking water *ad libitum* and were fed on commercially available Mice feed supplied by Amrut Feed. The specifications of this feed were listed below in table No. 2. The feed was enriched with stabilized vitamins such as Vitamin A and D₃, Vitamin B₁₂, Thiamine, Riboflavin, Folic acid and supplemented with all minerals and microelements. Measured quantities of water and feed were supplied daily in each cage. The intake of water and food was recorded from the amount of water left in the feeding bottles and from the amount of feed left in the feed hopper¹¹⁻¹⁴.

Cage Side Observations

The examination of the behavior of animals was reported by recording general observations of each animal on a daily basis from the stage of dosing to the end of the study. Any changes or abnormalities recorded could be an indication of toxicity. The test animals at all dose levels of *Tinospora cordifolia* showed no significant changes in behavior before and after administration. Table No. 3 shows the dosage regime for *Tinospora cordifolia* decoction and whole plant powder. Table No 4 indicates the general cage side observations for all parameters studied. Table No. 5 and 6 shows the mortality record for decoction and whole plant powder of *Tinospora cordifolia*.

Body Weight Changes

Body weight is an important factor to monitor the health of an animal. Loss in body weight is frequently the first indication of the onset of an adverse effect. A dose, which causes 10% or more reduction in the body weight, is considered to be a toxic dose. It is considered to be the dose, which produces minimum toxic effect, irrespective of whether or not it is accompanied by any other changes. All the animals from treated groups did not show any significant decrease in body weights for all the 14 days as compared with the zero day values. There was no significant change in food and water intake of the test animals at all dose levels of the decoction and the plant material.

Mortality

Mortality is the main criteria in assessing the acute toxicity (LD₅₀) of any drug. There was no mortality recorded even at the highest dose

level i.e. 9ml/kg for decoction and 8g/Kg body weight for plant powder of *Tinospora cordifolia*.

CONCLUSION

The acute toxicity study of *Tinospora cordifolia* was carried out on Swiss mice with a dose of 3, 5, 7 and 9ml/Kg decoction and 2, 4, 6 and 8g/Kg body weight Whole Plant Powder orally. The single administration exposure of the *Tinospora cordifolia* in the form of aqueous slurry was carried out and the exposure route was oral with water as a vehicle.

From the results of this study, it is observed that there is no change in body weight, food and water consumption by the animals from all dose groups. There was no mortality recorded even at the highest dose level i.e. 9ml/Kg for decoction and 8 gm/Kg for whole plant powder of *Tinospora cordifolia*.

The observations of changes in body weight, food and water intake as well as cage side observations were reported. There is no any sign of toxicity. There was no mortality recorded even at the highest dose level of decoction and plant material.

REFERENCES

1. Indian Herbal Pharmacopoeia, pub: Regional Research Laboratory, Jammu Tawi & Indian Drug Manufacturer's Association Mumbai, 1999; (2): 85-92.

2. Pingale SS and Avvaru Radha Krishna. Acute Toxicity Study for Achyranthes Aspera Leaves, Journal of Pharmacy Research, 2011; 4(1): 2221-2222.
 3. Pingale SS and Shewale SS. Acute Toxicity Study of Phyllanthus Amarus, International Journal of Pharmaceutical Sciences Review and Research 2011; 9(1): 81-84.
 4. Pingale SS and Virkar PS. Evaluation of Acute Toxicity for Abutilon Indicum, Scholars Research Library, Der Pharmacia Lettre, 2011; 3(3): 37-42.
 5. Pingale SS. Toxicity Study for Celocia Argentea Leaves, International Research Journal of Pharmacy, 2011; 2 (1): 263-266.
 6. Skoog DA, West DM, Holler FJ. Fundamentals of Analytical Chemistry, Saunders College Publishing, USA, 7th edition, 1996, 1-15.
 7. Ambast SP, The Useful plants of India, Publication and Information Division, CSIR, New Delhi, India, 1986.
 8. Asolkar LV, Kakkar KK, Chakra OJ. Second Supplement to glossary of Indian medicinal plants with active principles. Part I(A-K). Publication and Information Division, CSIR, New Delhi, India, 1992.
 9. Chopra RN, Chopra LC, Varma BS. Supplement to Glossary of India medicinal plants. Publication and Information Division, CSIR, New Delhi, India, 1969.
 10. Sane RT. Standardisation, Quality control and GMP's for Herbal Drugs, Indian Drugs, 2002; 39(3): 184 -190
 11. Pingale SS. Acute Toxicity Study of Ocimum Sanctum, International Research Journal of Pharmacy, 2010; (1): 409-413.
 12. Pingale SS and Pokharkar RD. Acute toxicity study for Cissus quadrangularis whole plant powder, Pharmacologyonline Newsletter, 2008; 2:256-262.
 13. Pingale SS, Pingale MS and Pokharkar RD. Acute toxicity Study for Argemone mexicana L. Root Bark Powder, Pharmacologyonline Newsletter, 2008; 1: 24-31
 14. Pingale SS, Pingale MS and Pokharkar RD. Stability study of a herbal drug, Pharmacologyonline Newsletter, 2008; 1: 20-23

Table No. 1 Study Protocol

Name of the study	Acute toxicity study
Test material	<i>Tinospora cordifolia</i> decoction and powder
Animal model	Albino Swiss Mice
Animals procured from	Raj Biotech (INDIA) Ltd., Pune
Sex	Male and Female
Weight range of animals	Between 35 to 45 g
No. of dose groups	Four groups each
Animals per group	Two (1 male and 1 female)
Route of administration	Intragastric administration with the help of gavage No. 16
Dose volume	2.0 ml per animal
Vehicle	Distilled water
No. of administrations	Single
Concentration of dose	Decoction: 3, 5, 7 and 9ml/Kg and Whole Plant Powder: 2, 4, 6 and 8g/Kg body weight
Study duration	Acclimatization for 14 days, one day drug administration and 14 days observation period including holidays
Parameters observed	Cage side observations, daily food and water intake, daily body weight and daily mortality record etc

Table No. 2 Composition of Feed

Sr. No.	Name	Percentage
1	Crude Protein	20 - 21 % minimum.
2	Ether Extractive	04 - 05 % minimum.
3	Crude Fiber	04 % maximum.
4	Ash	08 % maximum.
5	Calcium	1.2%.
6	Phosphorus	0.6 % minimum.
7	NFE	54 %.
8	ME Kcal/Kg	3600.
9	Pallet Size	12 mm.

Table No. 3 Doses Regime

Sr. No.	Sex	Decoction Dose g/Kg Body weight	Whole Plant Powder g/Kg Body weight	No. of animals used	Total Vol. administered in cm3
1	Male	3	2	1	2
2	Female	3	2	1	2
3	Male	5	4	1	2
4	Female	5	4	1	2
5	Male	7	6	1	2
6	Female	7	6	1	2
7	Male	9	8	1	2
8	Female	9	8	1	2

Table No. 4 Cage Side Observations for All Animals

Sr. No.	Parameters	Cage Side Observations
1	Condition of the fur	Normal
2	Skin	Normal
3	Subcutaneous swellings	Nil
4	Abdominal distension	Nil
5	Eyes –dullness	Nil
6	Eyes – opacities	Nil
7	Pupil diameter	Normal
8	Ptosis	Nil
9	Colour & consistency of the faeces	Normal
10	Wetness or soiling of the perineum	Nil
11	Condition of teeth	Normal
12	Breathing abnormalities	Nil
13	Gait	Normal

Table No 5. Mortality Record for Decoction of *Tinospora cordifolia*

Group	3g/Kg	3 g/Kg	5 g/Kg	5 g/Kg	7 g/Kg	7 g/Kg	9 g/Kg	9 g/Kg
Sex	Male	Female	Male	Female	Male	Female	Male	Female
Hr. 1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Hr. 2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Hr. 3	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Hr. 4	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 3	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 4	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 5	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 6	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 7	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 8	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 9	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 10	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 11	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 12	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 13	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Day 14	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Mortality	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1

Table No 6. Mortality Record for Whole Plant Powder of *Tinospora cordifolia*

Group	2gm/Kg	2gm/Kg	4gm/Kg	4gm/Kg	6gm/Kg	6gm/Kg	8gm/Kg	8gm/Kg
Sex	Male	Female	Male	Female	Male	Female	Male	Female
Hr. 1	Nil							
Hr. 2	Nil							
Hr. 3	Nil							
Hr. 4	Nil							
Day 1	Nil							
Day 2	Nil							
Day 3	Nil							
Day 4	Nil							
Day 5	Nil							
Day 6	Nil							
Day 7	Nil							
Day 8	Nil							
Day 9	Nil							
Day 10	Nil							
Day 11	Nil							
Day 12	Nil							
Day 13	Nil							
Day 14	Nil							
Mortality	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1

Source of support: Nil, Conflict of interest: None Declared