

Pterocarpus marsupium Roxb and Alloxan-induced Diabetes Mellitus in Experimental Rabbits

—Dr. U. G. Pathak*

—Dr. M. Mishra**

—Dr. K. M. Dubey***

Indian Kino (Bija Sal, *Pterocarpus marsupium* Roxb.) is a large handsome tree with yellow flowers. It is commonly found in Central and Peninsular India and Nepal. Its leaves, flowers, and gum are believed to possess medicinal properties. Water in which a block of its wood is soaked overnight is believed to be useful in diabetes mellitus (Jain S.K. 1975). Many diabetics use tumblers made of its wood for keeping water overnight.

We decided to investigate the antidiabetic properties of such water (henceforth called the 'infusion') in rabbits with alloxan-induced diabetes. We also decided to compare this antidiabetic property with that of tolbutamide.

Material and Methods:

12 healthy albino rabbits of either sex (weight range 1.0-1.25 kg) were studied. They were all fed a standard laboratory diet consisting of green grass and sattu (roasted Bengal gram flour). After a run-in period of four weeks their fasting blood sugar levels were determined. These animals were now divided into 3 groups of 4 rabbits each.

*Asst Lecturer, Central Campus, Institute of Medicine, TU

**Professor of Medicine, Darbhanga Medical College & Hospital, Laheriasarain, Bihar, India

***Associate Professor of Biochemistry, Darbhanga Medical College, Laheriasarai Bihar India.

Group—A: The animals in this group were fed 2 teaspoonfuls of the infusion twice daily after meals during the period of study. The infusion was obtained by soaking a cube of wood 1.25 cm × 1.25 cm × 1.25 cm overnight in 100 ml of water. The blood sugar levels were determined at the start of the study (Day 0) and again 10 (Day 10) and 40 days (Day 40) after putting them on this infusion.

Group—B: The animals in this group were made diadetic by administering alloxan (Loba chemie Indoautranal) 180 mg/kg I.V. in a single dose (Brahmachari, H.D. and Augusti, R.T., 1962). The blood sugar levels in these animals were determined in the fasting state at the start of the study (Day 0) and again after 7 and 14 days of alloxan administration. On the 14th days those animals were fed 2 teaspoonful each of the infusion at 6 A.M. and their blood sugar levels were determined hourly for the next 4 hours. At the end of 21 days the fasting blood sugar level of these animals were again determined. They were now administered 2 teaspoonful of the infusion twice daily after meals for 7 days and on the 28th day their fasting blood sugar levels were again determined.

Group—C: The animals in this group were also given alloxan as in Group B. The blood sugar levels were determined in the fasting state at the start of the study (Day 0) and again 7 days later. 14 days later they were administered Tolbutamide (Hoechst Pharmaceuticals) 100 mg orally in a single dose at 6.00 A.M. and their blood sugar levels were determined at hourly intervals for the next 4 hours.

Animals in Group B and C were made to fast for 18 hours before giving them the infusion or Tolbutamide on Day 14. On other days in Groups B and C and every time in Group A the readings were obtained in the fasting state. Blood was obtained by cardiac puncture of the animals and blood sugar levels determined by Hagedorn and Jensen's method (Varley, 1976).

The paired test (England, 1975) was used for statistical analysis.

Results :

Group—A :

In this group the mean blood sugar levels 10 days and 40 days after putting

the animals on the infusion were statistically not significantly different from the levels at the start of the study.

TABLE I

Fasting blood sugar levels, in mg. per 100 ml, in Group A at the start (Day 0) and 10 and 40 days after twice daily administration of the infusion.

Rabbit No.	Day 0	Day 10	Day 40
1	58	93	81
2	81	93	104
3	104	104	96
4	128	96	108
Mean	92.75	96.5	97.25
S.D.	30.08	5.20	11.92
S.E.M.	15.04	2.60	4.96

Group—B.:

In this group the mean blood sugar levels during the 4 hours after the administration of the infusion on the 14th day showed no statistically significant differences from the levels present on Day 7 i.e. a week after administration of alloxan and a week before the administration of the infusion.

The mean fasting blood sugar levels of these animals on Day 28 were not significantly different from the levels on Day 21. In other words, twice daily administration of the infusion for 7 days made no significant difference to the blood sugar levels of rabbits with alloxan induced diabetic.

TABLE II

Blood sugar levels, in mg. per 100 ml, in Group B at the start of the study (Day 0) and at 7 days' intervals after the administration of alloxan.

Rabbit No.	Day 0	Day 7	Day 14				Day 21	Day 28
			1 hr.	2 hrs.	3 hrs.	4 hrs.		
5	58	67	46	58	92	116	116	104
6	75	67	67	46	67	58	81	116
7	67	93	67	81	92	116	93	104
8	58	81	58	92	104	92	116	104
Mean	64.5	77	59.5	69.25	88.75	95.5	101.5	107
S.D.	8.19	12.54	9.95	20.99	15.56	27.44	17.45	6
S.E.M.	4.09	6.27	4.97	10.49	7.78	13.72	8.72	3

The infusion was given in the morning of the 14th day after alloxan administration and blood sugar levels determined hourly thereafter for 4 hours.

Group—C.:

The mean blood sugar levels on Day 14 (compared to Day 7) in these animals were significantly lower 4 hour ($p 0.05$), 2 and 3 hours ($p 0.01$ and 4 hours ($p 0.05$) after administration of Tolbutamide.

Thus, while Tolbutamide produced significant hypoglycaemic action for 1 to 4 hours after a single administration, neither a single administration nor prolonged administration of the infusion for a week produced any such hypoglycaemic action.

TABLE III

Blood sugar levels, in mg. per 100 ml, in Group C at the start of the study (Day 0) and 7 and 14 days after administration of alloxan.

Rabbit No.	Day 0	Day 7	Day 14			
			1 hr.	2 hrs.	3 hrs.	4 hrs.
9	70	124	61	50	50	66
10	93	93	67	46	46	58
11	116	151	58	58	46	58
12	58	128	58	46	46	81
Mean	84.25	124	61	50	47	65.7g
S.D.	25.67	23.85	4.24	5.66	2	10.84
S.E.M.	12.83	11.92	2.12	2.83	1	5.42

Tolbutamide was given in the morning of the 14th day after alloxan administration and blood sugar levels determined hourly for 4 hours.

DISCUSSION :

Pterocarpus marsupium Roxb is widely believed to be useful in the treatment of diabetes mellitus. But when we examined its effects in rabbits with alloxan-induced diabetes, we found no significant hypoglycaemic effects on administration of the water in which a block of its wood had been soaked overnight. The action was apparent neither for the 4 hours after a single administration nor was it apparent on the fasting blood sugar levels a week after a twice daily administration. On the other hand Tolbutamide produced significant hypoglycaemic effects to 4 hours after a single oral administration.

It can thus be concluded that *Pterocarpus marsupium* Roxb has no significant hypoglycaemic action on rabbits with alloxan-induced diabetes.

We do not know whether these results can be deemed to be valid for human beings too with naturally occurring diabetes and further studies are clearly called for to clarify these points.

SUMMARY :

12 healthy albino rabbits of either sex weighing, 1.0-1.28 kg were fed a standard laboratory diet of grass and sattu (roasted Bengal gram flour). After a run-in period of 4 weeks their fasting blood sugar levels were determined. These animals were now divided into 3 groups of 4 animals each. Group A animals received water in which a block of *Pterocarpus marsupium* Toxb has been soaked overnight twice daily for 40 days. The blood sugar levels in these animals 10 and 40 days after receiving the infusion were statistically not significantly different from the levels at the start of the study.

The animals of Group B and C were made diabetic by administration of alloxan. On the designated day (Day 12) the animals in Group B received this infusion and those in Group C received Tolbutamide. While Tolbutamide produced significant hypoglycaemic action 1 to 4 hours after a single oral administration, a single administration of the infusion produced no such effect. Twice daily administration of the infusion for another 7 days in Group B produced no significant hypoglycaemic action either.

It can be concluded that this infusion has got no significant hypoglycaemic action either in normal rabbits or in rabbits with alloxan-induced diabetes.

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