

## ANTIHYPERGLYCEMIC EFFECT OF WATER EXTRACT OF DRY FRUITS OF *TERMINALIA CHEBULA* IN EXPERIMENTAL DIABETES MELLITUS

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### ABSTRACT

Water extract of dry fruits of *Terminalia chebula* (Hindi-Harda, Telugu-Karakkaya) at a dose of 200 mg/kg body weight improved the glucose tolerance as indicated by 44% of reduction in the peak blood glucose at 2<sup>nd</sup> hour in glucose tolerance test in diabetic (streptozotocin induced) rats. Treatment of diabetic rats with an initial fasting blood glucose of 253±9.4 mg/dl daily once with the water extract (200 mg/kg) for two weeks brought down the fasting blood glucose to 123±8.4 mg/dl which is only slightly above the normal value. These results indicate that water extract of *Terminalia chebula* improves glucose tolerance and brings down fasting blood glucose in diabetic rats.

### KEY WORDS

*Terminalia chebula*, Diabetes mellitus, Antihyperglycemic effect, Glucose tolerance.

### INTRODUCTION

In recent years emphasis is on the development of drugs from plants for the treatment of various diseases including diabetes mellitus, the incidence of which is very high all over the world especially in India. The reason is that plant drugs could be effective and at the same time have less or no side effects. A number of plants have been found to be useful in diabetes mellitus and compounds have also been purified from some plants (1-3). Some compounds purified from *Trigonella foenum graecum*, *Ficus bengalensis*, and *Eugenia jambolana* have been patented (1). However, there are no reports on the hypoglycemic i.e antihyperglycemic effect of *Terminalia chebula* which is used as a spice and remedy for cough in India. In this preliminary communication, we report that the water extract of dry fruits *Terminalia chebula* improves glucose tolerance and brings down fasting blood glucose (FBG) in diabetic (streptozotocin induced) rats.

### MATERIALS AND METHODS

#### Chemicals

Streptozotocin (STZ) was purchased from Sigma

Chemical co. USA, and all the other chemicals were of highest purity available locally. Glucose was estimated by the kit purchased from Ranbaxy Chemicals, Delhi.

Induction of diabetes mellitus in rats: Diabetes was induced in rats (100-150 gm body weight) by intraperitoneal injection of STZ (45 mg/kg bw) in 0.1M citrate buffer, pH 4.5 as described earlier (4). One week after STZ injection, by which time diabetes mellitus was stabilized, the animals were used for experiments.

#### Preparation of plant extract

50 gm of dried fruits of *Terminalia chebula* (purchased from local market) were pulverized. The powder was soaked over night in 150 ml of distilled water at room temperature (about 25°C). Next morning the extract was filtered over cheese cloth and the filtrate again filtered over cotton. The filtrate was centrifuged at 10,000 rpm for 10 mins at room temperature. The supernatant was further evaporated under reduced pressure in a rotary evaporator to 25 ml. The concentrated extract was used for experimental work.

Oral glucose tolerance test: In this test the same animals served as their own controls. In 5 overnight fasted diabetic rats, fasting blood glucose was collected. Then water (equivalent to the water extract to be given later) was given to the rats. 90 minutes later again fasting blood was collected and blood glucose value determined. This served as zero hour value. Then glucose (2 gm/kg bw) was

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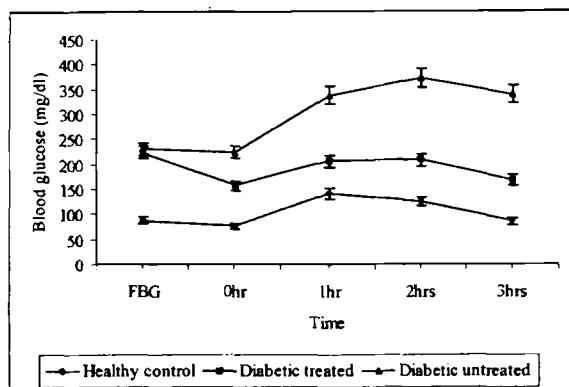
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given orally and blood was collected at intervals of 1 hr upto 3 hrs. This will give glucose tolerance pattern in untreated diabetic animals. After one week the same rats were again fasted overnight. Fasting blood was taken. Water extract (200 mg/kg bw) was given orally. 90 minutes later (this time was allowed for the extract or metabolites of the compounds in the extract to show effect) glucose tolerance test was performed as above. This will give the glucose tolerance pattern of the water extract of treated diabetic rats (5).

**Assessment of antihyperglycemic effect:** Effect of water extract on FBG in experimental diabetes was assessed as follows. Three groups of rats (5 for each group) were used. Group I and group II rats were healthy controls and untreated diabetic animals respectively and received water during the experimental period. Group III diabetic rats were given water extract (200 mg/kg bw) of *Terminalia chebula* orally daily once in the morning for two weeks. FBG values were estimated at the beginning, after one week and end of the experiment.

**RESULTS**

Results in Fig.1 show the effect of water extract of dry fruits on the blood glucose values during glucose tolerance test. In healthy controls peak blood glucose value seen at 1 hr was only 142 mg/dl. In the untreated diabetic animals peak blood glucose level was seen at 2 hrs and was higher 374 mg/dl. But in the treated diabetic animals the peak blood glucose value was much less (209 mg/dl), than in the untreated diabetic animals. This shows that the water extract of *T. chebula* improved glucose tolerance in GTT in treated diabetic animals which reduce blood glucose at 2hrs by 46.8%.



**Fig- 1. Effect of water extract (200 mg/kg bw) of *T.chebula* on the blood glucose levels during glucose tolerance test in diabetic rats**

**Table.1. Effect of water extract of *T.chebula* on fasting blood glucose in STZ induced diabetes mellitus in rats**

Group	FBG (mg/dl) Initial	FBG (mg/dl) After 1 week	FBG (mg/dl) After 2 weeks	% change
Gr.I healthy Control	89±6.4	82±7.3	84±6.6	0.5 ↓
Gr.II diabetic Untreated	269±8.2	286±6.8	280 ±8.6	4.0 ↑
Gr.III diabetic treated	253±9.4	196±9.2	123±8.4	51.0 ↓

Values are Mean ± SD.

In the experiment in diabetic animals, there was very little change (statistically insignificant) in the healthy controls and untreated diabetic animals between the initial and final values at the end of experiment (table1). However, administration of water extract daily once for two weeks brought down the FBG from initial value of 253±9.4 mg/dl to 123±8.4 mg/dl, which is only slightly above the normal value.

**DISCUSSION**

It is clear from the results in Fig. 1, that water extract of *T. chebula* given orally can improve glucose utilization during GTT (46.8% reduction in blood glucose at 2hrs) within 90 min after administration of the extract. Like wise oral administration of the water extract brought down the FBG to near normal value in two weeks from an initial high value of 253±9.4 mg/dl. Perhaps administration of water extract for a slightly longer time would have brought down to normal value. These results indicate that the water extract of *T. chebula* dried fruit has good potential of being good drug for the treatment of diabetes mellitus. Further experiments are being carried out to know whether the mechanism of action is by increasing insulin release from pancreatic beta cells or by decreasing insulin resistance or increasing insulin sensitivity or by directly stimulating the utilization of the glucose by the tissues. We are also trying to isolate the active compound in a pure state.

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