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Effect of *Coccinia indica* fruit powder on histomorphology of certain organs in alloxan induced diabetic rats

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Abstract
The goal of the current study was to evaluate the effects of giving normal and alloxan-induced diabetic rats 1.5 milligrammes per day of Coccinia indica fruit powder orally for 50 days. At trial's conclusion, a histomorpholocial analysis of tissue from the pancreas, liver, and kidney was conducted. In diabetic rats, exposed organ cells exhibited pathological abnormalities. Based on documented findings, the fruit powder enhanced the architecture of the kidney, liver, and pancreas as well as diabetes.

Keywords: *Coccinia indica*, histopathology, ß-cells, lesions, alloxan diabetic

Introduction
Many characteristics of uncontrolled diabetes mellitus in humans are seen in rats with experimental type I diabetes generated by streptozotocin or alloxan. Currently, there is no adequate and effective treatment for diabetes mellitus in modern medicine. This syndrome is caused by a combination of genetic and environmental factors and is characterised by abnormal insulin secretion, insulin receptor function, or post-receptor events that affect metabolism of carbohydrates, proteins, and fats, as well as, in certain cases, damage to the ß-cells of the pancreas, liver, and kidney (Ghosh, 2001) [2]. Insulin is necessary for patients to manage their IDDM. They have degenerative consequences such microangiopathy, nephropathy, and retinopathy in the absence of insulin. For individuals with type I diabetes, diabetic nephropathy is the leading cause of mortality; 30–40% of these patients eventually have end-stage renal failure (Giorgino *et al*., 2004) [3]. For those with type II diabetes, liver disease is also the primary cause of mortality. In comparison to cardiovascular illness, liver disease has a higher standard mortality rate. The range of liver diseases associated with type II diabetes includes cirrhosis, hepathocellular carcinoma, and non-alcoholic fatty liver disease (Keith *et al.*, 2004) [5].

Material and Methods
Processing of plant material: From the Marathwada Agricultural University's agricultural farm in Parbhani, Maharashtra, healthy immature fresh fruits of Coccinia indica were harvested. The Department of Botany at MAU Parbhani (M.S.) recognised the fruits. In the lab, fresh Coccinia indica fruits were cut into thin chips and shade dried. An electrical grinder was used to ground the dry slices into a fine powder. The resulting powder was utilised for the experiment in accordance with the specifications.

Experimental animals
The study employed adult Wistar rats, of either sex, weighing around 120–180 g, kept at COVAS, Parbhani, Maharashtra's Department of Pharmacology and Toxicology. They were kept in conventional laboratory conditions (temperature 24-28 ºC, relative humidity 60-70%), fed standard rat diet (M/s. Pranav Agro Industries, Ltd., Solapur, Maharashtra), and allowed to acclimatise for five days. Water was also given to them freely. The committee established for this purpose provided ethical authorization for the management of experimental animals (CPCSEA).

Alloxan induced diabetes

Alloxan monohydrate (SD fine Che. Ltd., Mumbai, India) at a single intraperitoneal injection dose of 120 mg/kg in sterile saline at 5% w/v caused diabetes (Khosla *et al*., 1955) [6]. The diabetic rats (glucose level > 200 mg/dl) were divided and employed in the study after receiving an alloxan injection for 72 hours.

Experimental design

Table 1: The rats were separated into six groups, each consisting of animals, following the production of diabetes.

Group No.	No. of rats	Treatments
I	10	Normal (control)
II	10	Normal rats fed with *Coccinia indica* weight & Arn. fruit powder (@1.5 g/kg body weight)
III	10	Diabetic control rats (Alloxan monohydrates induced)
IV	10	Diabetic rats fed with *Coccinia indica* wight & Arn. fruit powder (@1.5 g/kg body weight)
V	10	Diabetic rats treated with glibenclamide (@600 µ/kg body weight)
VI	10	Diabetic rats treated with glibenclamide (@600 µ/kg body weight) and *Coccinia indica* fruit powder (@ 1.5 g/kg body weight)

Rats with diabetes in groups V and VI received glibenclamide, a common hypoglycemic medication.

Administration of fruit powder

As indicated in Table 1, fruit powder was administered by blending it with feed. For a duration of fifty days, the medication was delivered.

Collection of pancreas, liver and kidney

Following the experimental protocol, the rats were either anaesthetized or killed. The liver, kidney, and pancreas were removed right away, and they were properly cleaned in ice-cold saline. After being gathered, the tissues were employed in histomorphological investigations.

Histopathology

Following sacrifice, the liver and kidney were preserved in 10% neutral buffer formalin, and the pancreas was preserved in Bouin's solution (Singh and Sulochana, 1997) [10]. Histopathological investigations were performed on every tissue sample that was gathered.

Results and Discussion

Pancreas: Pancreatic histology in Group III showed localised leucocyte infiltration along with modest degenerative alterations in the islet of Langerhans, which were indicated by pale beta cell cytoplasm. A few rats' beta cells occasionally showed necrotic to necrobiotic alterations (Plate III). Comparatively speaking, Group IV's organ involvement and amount of histopathological alterations were lower than those of Group III's diabetic control rats (Plate IV). Rats in Groups V and VI showed histopathological alterations that fell within normal histological bounds. Rats with experimentally induced diabetes as well as diabetic rats receiving normal medication and Coccinia indica were used in the histomorphological investigations of the targeted organs. There were no discernible alterations in the pancreatic histoarchitecture in the rats of Groups I and II (Plates I and II). When rats from Group I and Group II were tested histologically, their livers showed no changes (Plate V). Hepatocytes from diabetic control rats (Group III) displayed vacuolization, sporadic nuclei pyknosis, and fatty liver alterations (Plate VI). Rats from Groups IV, V, and VI occasionally had glandular tissue damage in their livers. Additionally, Group V had nucleous Karyorrhexis with congestion.

Kidneys

Nearly majority of the rats' kidneys showed no discernible histological alterations. In diabetic rats given alloxan, there was no discernible histological change in the glomeruli or any other kidney tubule segment (Prasad *et al*., 2009) [9]. The hypoglycemic reaction shown in normal rats suggests that the fruit powder of Coccinia indica may work either directly or indirectly to stimulate the release of insulin from the pancreatic beta cells. In addition, pectin has been shown by Kumar *et al*. (1993) [7] to dramatically lower glucose and increase liver glycogen, making it a potential cause of hypoglycemia in normal rats. Triterpenses was shown to be an active principle causing antidiabetic action in rats and correcting impaired metabolic processes by Dhanabal *et al*., 2004 [1]. Additionally, they suggested that the principle's mode of action could stem from the regenerative abilities of beta cells in response to damage generated by alloxan. The hypoglycacemic response in diabetic rats may be caused in part by enhanced tissue sensitivity to insulin action, release from bound forms, or greater utilisation of endogenous insulin, which is not readily accessible. When diabetic rats were given fruit powder, their glucose tolerance improved. Based on these observations, Coccinia indica may have both extra-pancreatic and pancreatic effects. Alloxan or STZ cause the body to produce free oxygen radicals that damage the pancreas and may be the cause of an increase in In experimentally diabetic rats, Coccinia indica leaves have a substantial antioxidant effect, which may also help reduce diabetes sequelae (Venkateshwaran and Pari, 2003) [11]. The degenerative alterations in liver histology caused by alloxan treatment are consistent with previous findings by Leeguates *et al*., 1984 [8] and Gosh 2001 [2]. The liver slice of rats given alloxan-induced diabetes revealed distinct structural changes in the liver due to insulin deficiency. Perioportal fatty infiltration and hepatocyte necrosis were the main changes. The damage is largely repaired by the Coccinia indica fruit powder, which is comparable to what Ghosh (2001) [2] found when Vinca rosea extract was used to treat rats with alloxan-induced diabetes.

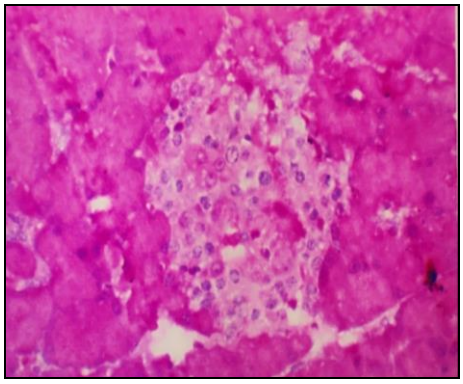

Plate I: Microphotograph showing normal histological structure of pancreas from group I

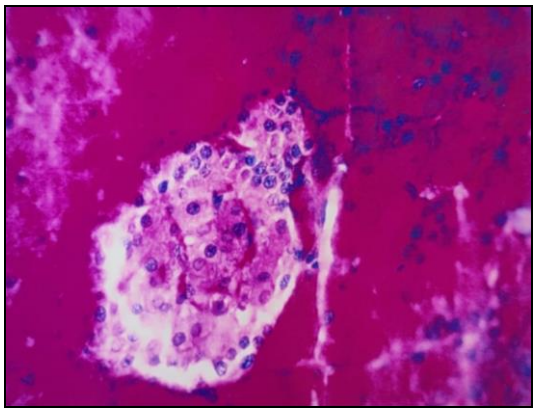

Plate II: Microphotograph showing normal histological structure of pancreas from group II

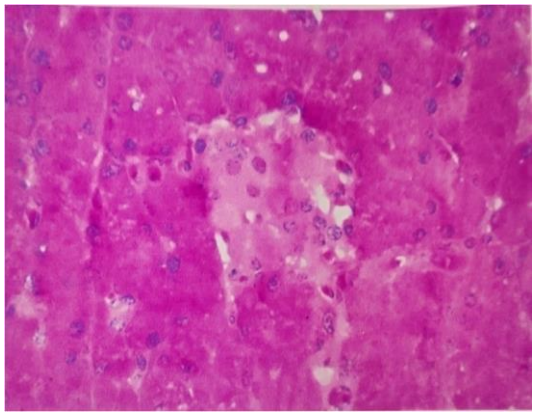

Plate III: Microphotograph showing degenerative Mild changes in pancreas from group II

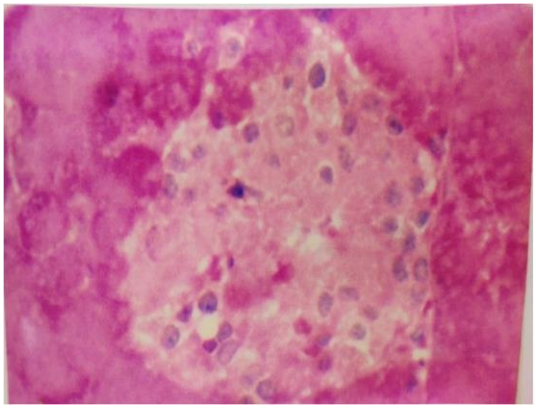

Plate IV: Microphotograph showing degenerative changes in pancreas from group IV

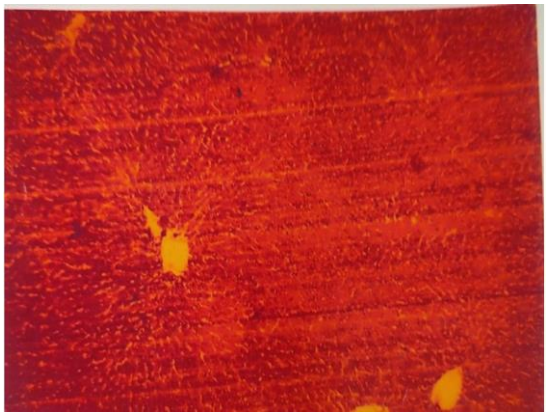

Plate V: Microphotograph showing normal histological structure of liver

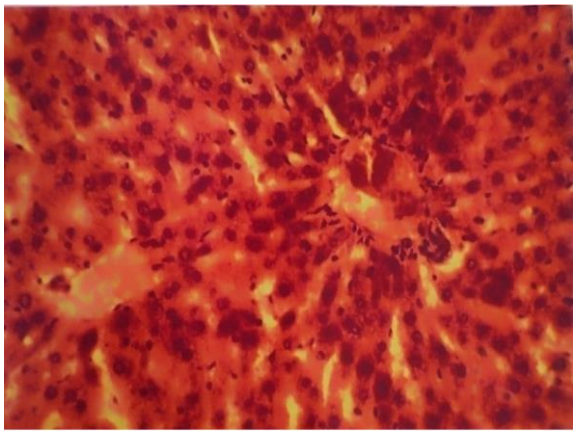

Plate VI: Microphotograph showing fatty change of liver

Conclusion

When given a dosage, alloxan causes diabetes in wistar rats. As proof, the pancreas and liver's architecture were discovered to be improved by the Coccinia indica fruit powder at the prescribed quantity.

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