HYPOGLYCAEMIC EFFECT OF THE AQUEOUS EXTRACT OF BOERHAVIA DIFFUSA LEAVES

Boerhavia diffusa (Family Nyctaginaceae) is a herbal plant, which is common in the tropics in both dry and rainy seasons. It is found in India, Nigeria and many other countries. In Nigeria it is found especially in swampy areas and commonly used as rabbit food by the local population. The herbalists, however, use the aqueous leaf extract to treat diabetes in man (unpublished data). The plant exhibits a somewhat periodic efficacy, with its maximum activity being noticed in the month of May\(^1\). B. diffusa is used in traditional medicine for its anti-inflammatory, antibacterial and cardiotonic properties\(^2\). It is used in the treatment of elephantiasis, night blindness and conical ulcers\(^3\).

The present study aims at investigating the effects of B. diffusa aqueous leaf extract on the blood sugar level of rats with a view to elucidating the rationale behind its use in the management of diabetes by herbalists.

The plant was collected from the surrounding of Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria, in the month of May. The leaves were dried, pulverized, finely sieved and subjected to water extraction as used by the herbalists. The percent yield was 11.7. Phytochemical studies of the aqueous extract of the leaves of B. diffusa, were carried out by the method of Trease and Evans\(^4\).

Male Wistar rats weighing 104 g - 214 g were obtained from the Animal Facility Center, National Institute for Pharmaceutical Research and Development (NIPRD), Abuja, Nigeria. Standard rat cubes (Pfizer Pharmaceutical Plc., Ikeja, Nigeria), and water were provided ad libitum.

The baseline plasma glucose levels were determined prior to administration. All the animals were given 80 mg/kg body weight freshly prepared alloxan monohydrate (Aldrich Chemical Company Ltd) intravenously through the tail vein\(^5\). They were left for 7 days at the end of which the plasma glucose levels were determined using the Trinder’s glucose oxidase method\(^6\).

The alloxan-induced diabetic rats were divided into four groups of six male rats each. The test groups received 100, 200 and 400 mg/kg aqueous extract, while the control group received appropriate volumes of water orally respectively. At 0, 2, 4, 6, 8 and 24 hours, 0.5 ml of blood from the tail vein of the rats was dropped on the reagent pad of the one touch strip (Life Scan Inc. Milpitas, California, USA). The strip was inserted into a one-touch brand meter and the reading noted\(^7\). Data were analysed using the Student ‘t’ test with level of significance as p < 0.05.

| Table 1. Time course of the hypoglycemic effect of B. diffusa aqueous leaf extract on alloxan-induced diabetic rats. |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| Time (h) | Glucose conc. (mg/dl) | % change | Glucose conc. (mg/dl) | % change | Glucose conc. (mg/dl) | % change | Glucose conc. (mg/dl) | % change |
| Water | | 100 mg/kg | 200 mg/kg | 400 mg/kg |
| 0 | 99.67 ± 18.04 | - | 283.67 ± 32.81 | - | 320.50 ± 14.72 | - | 371.00 ± 20.78 | - |
| 2 | 99.00 ± 24.08 | 0.67 | 211.33 ± 15.36 | 25.50 | 255.00 ± 31.17 | 20.44 | 367.00 ± 5.20 | 1.08 |
| 4 | 100.60 ± 26.38 | 0.93 | 199.3 ± 18.06 | 29.73 | 226.50 ± 49.14 | 29.33 | 321.00 ± 21.64 | 13.48 |
| 6 | 99.68 ± 26.38 | 0.01 | 175.67 ± 14.90 | 38.07 | 154.00 ± 16.74 | 51.95 | 291.00 ± 10.38 | 21.56 |
| 8 | 99.68 ± 26.38 | 0.01 | 218.00 ± 17.38 | 23.15 | 300.00 ± 23.09 | 6.40 | 366.00 ± 1.16 | 1.35 |
| 24 | 100.00 ± 32.82 | 0.33 | 239.67 ± 8.73 | 15.51 | 335.00 ± 9.24 | 4.52 | 372.50 ± 11.26 | 0.40 |

Glucose concentrations are expressed as mean ± SEM.

*P< 0.05 when compared to 0 hr level.
The aqueous extract was found to contain flavonoids, glycosides, tannins, saponins and proteins. The effect of 100, 200 and 400 mg/kg of the aqueous extract of B. diffusa leaves is shown on Table 1. The extract showed non-dose dependent hypoglycemic activity. The peak activity of the extract was observed at 6h post drug administration. While the 400 mg/kg dose caused a maximum percent reduction of 21.56 in glucose level at 6h, the 100 and 200 mg/kg doses of the extract showed more hypoglycemic effects which were significant at p< 0.05 from the initial value, with percentage decreases of 38.07% and 51.95% respectively.

The aqueous leaf extract of B. diffusa produced non-dose related decreases in blood glucose level in alloxan-induced diabetic rats. The non-dose related hypoglycaemia had its onset of action in less than 2 hours, peaked at 6 hours and lasted for over 8 hours after oral administration of the extract. The mechanism of action of this hypoglycaemic effect of the extract is not elucidated in this study. Some medicinal plants with hypoglycemic properties are known to increase circulating insulin levels in normoglycemic rats\(^8\). A plausible mechanism of action is that the extract might have stimulated the residual pancreatic beta-cell function or produced the hypoglycaemia through an extra-pancreatic mechanism, probably increasing peripheral utilization of glucose as postulated by Farjou and his colleagues\(^5\) and Erah and coworkers\(^9\) to explain the hypoglycemic effects of the extracts of Artemisia and Solenostemon.

Oliver 1980\(^10\) listed glycosides, flavonoids, tannins, organic sulphur compounds, catechol, and alkaloids as active ingredients in hypoglycemic plants. Thus the hypoglycemic effect produced by the extract of B. diffusa leaves may be due to the glycosides, flavonoids, tannins and saponins present in the extract. Further investigation is expected to characterise the active hypoglycemic principles and to elucidate the mechanism of action.


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REFERENCES


