

Evaluation of hypoglycemic activity of some ethno-medicinal plants of Umarched region (Maharashtra, India).

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Abstract

Diabetes mellitus has become a major challenge to our public health system. Nadkarni recorded 42 plant species used in treatment of diabetes. Various plant species and natural products have been studied for anti-diabetic activity in different laboratories. In addition to the anti-diabetic plant species prescribed in Ayurveda and Unani, several others that are used by local health practitioners are also being tested in different laboratories: WHO study group had also strongly emphasized the need for basic research to evaluate the efficiency of traditional herbal medicines for diabetes. Umarched region was explored for its traditional knowledge during 2001-2003. The region is inhabited different tribes like Andha, Bhil or Naikada, Kolam and Banjara. During survey 203 plant species were found to be prescribed in anti-diabetic treatments. Out of these 15 anti-diabetic drug plants, three were selected for experimental studies (*Cleome gynandra* L., *Pterocarpus marsupium* Roxb. and *Enicostemma axillare* (Lam.) Raynal. Hypoglycemic activity was tested on normal albino rats. Blood samples were collected from tail veins and glucose level was tested with the help of glucometer.

Keywords: Hypoglycemic activity, Antidiabetic, Ethnic Drug plants, Animal trials, Albino rats.

Introduction

Diabetes mellitus is becoming a major challenge to health system all over the world. Indian diabetic population is increasing at alarming rate. It is estimated by WHO that every sixth diabetic in the world is Indian [1, 2]. The metabolic disorder is characterized by hyperglycemia, altered metabolism of lipids, carbohydrates and proteins and increased risk of complications of cardiovascular diseases. The history of diabetes dates back to centuries, but no substantial success has yet achieved in the development of permanent cure. The post-insulin era is experiencing the expression of macro and micro-vascular complaints of diabetes in the form of blindness, kidney dysfunction, neuropathic complaints, myocardial infarction, stroke and peripheral vascular diseases [3]. Allopathic medicinal system is expensive and the repercussions of long-term therapy include severe side effects. WHO study group had also strongly emphasized the need for basic research to evaluate the efficiency of traditional herbal medicines for Diabetes mellitus.

Umarched Tahsil of Yavatmal District of Maharashtra State occupies the area of 127555.50 hectares of which 50800 hectares is under forest cover. East region of Umarched Tahsil

along the bank of Painganga river was declared as Painganga Wild Life Sanctuary by Maharashtra State Govt. in 1981. The taluka includes 157 villages inhabited by populations of tribe like Bhil or Naikada, Andha and Kolam. Banjara is the largest tribe with population of about 29000 as per 2001 census. The ethnobotanical survey conducted during 2001-2003, 152 species used in local health system were recorded. Out of these 152 drug plants, 15 were found to be used in antidiabetic treatments. Three drug plants were selected for experimental studies.

Material and methods

Plants and specific plant parts of the species selected (Table -1), were collected, when in flowering stage. They were shade dried and finely powdered. For evaluation of drug activity, experiments were carried out using the same form of drug, as is used by local medicinemen instead of routine ethanolic extract. Suspension of powdered drug and aqueous extract was prepared using 1% gum acacia (LR) as suspending agent in distilled water. Albino rats of both sexes weighing between 150 gms to 250 gms were used. The procedures with animals were conducted strictly in accordance with approved guidelines by the Institute's Animal Ethical Committee

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Table 1: List of species.

S.N.	Name of Drug Plant	Local Name	Part Used
1	<i>Cleome gynandra</i> L. Fam. Capparaceae	Pandhari Tilwan	Root Powder
2	<i>Pterocarpus marsupium</i> Roxb. Fam. Fabaceae	Bija Sal	Bark a) Powder b) Aqueous extract
3	<i>Enicostema axillare</i> (Lam.) Raynal Fam. Gentianaceae	Nai	Whole plant powder

Table 2: Values presented are mean of three observations.

S.N.	Drug	Initial glucose level (mg/kg)	Glucose level after treatment			% Change in glucose level		
			1 Hr	2 Hr	3 Hr	1 Hr	2 Hr	3 Hr
1	Control	122.16 ± 9.18	121.33 ± 8.7	120.83 ± 9.18	119.66 ± 9.6	–	–	–
2	<i>C. gynandra</i>	114.00 ± 9.01	108.00 ± 11.54	105.00 ± 6.11	75.33 ± 9.62	4.26	6.34	29.80
3	<i>P. marsupium</i>	118.66 ± 8.34	103.33 ± 10.7	98.33 ± 5.10	98.83 ± 4.94	11.95	15.80	18.24
	a) Bark powder b) Aqueous extract	14.66 ± 4.28	108.33 ± 3.78	111.66 ± 5.33	107.16 ± 4.63	3.98	0.839	3.6
4	<i>E. axillare</i>	110.00 ± 9.01	101.66 ± 4.91	104.33 ± 5.15	93 ± 13.39	6.46	3.03	14.48

regulated by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Ministry of Social Justice and Empowerment, Government of India. During the experiments, maximum care was taken to minimize animal suffering, and in addition, the number of rats used was kept at a minimum. The protocol was approved by the Institutional Animal Ethical Committee Registration No. 729/02/a/CPCSEA (IAEC/1/2002-03). The protocol was approved by the Institutional Animal Ethical Committee. For each drug, a group of six animals was subjected to treatment, one group served as control. Blood was collected from animals by tail snipping. All animals were fasted for 18 hrs before treatment and initial blood sample collected (0 hr). A dose of 200 mg/kg body weight was administered as oral suspension to each group; control group was fed only with vehicle suspension. Blood glucose level was estimated after drug administration at intervals of 1 hr; 2 hr and 3 hr using digital glucometer (Accu-check Roche make) [4]. Percent change in glucose level was calculated by standard formula. Experiment was repeated three times after the interval of one week, each time. Values presented are mean of three observations (Table- 2).

Results

Group I- Control group receiving only vehicle, showed only negligible decrease in glucose level during three hours of testing.

Group II- Treated with root powder of *Cleome gynandra*. There was gradual increase in hypoglycemic activity over the period. During first hour, the glucose level was 114.20 mg which at the end of three hrs fell to 75.33 mg (29.80 % changes).

Group III- Treated with *Pterocarpus marsupium* bark powder. Over the period gradual increase in hypoglycemic activity was recorded. Initial glucose level 118.16 mg went down upto 98.83 at the end of third hour. (18.24 % change)

Group IV- was given aqueous extract of *P. marsupium* stem bark. Decrease in glucose level was much less than bark powder i.e. from 114.00 to 107.16 mg. (11.55 % change)

Group V- Treated with plant powder of *E. axillare*. Initial glucose level 114.00 mg decreased upto 75.33 mg at the end (14.48 % changes)

Discussion

Pterocarpus marsupium heartwood is well known for its antidiabetic activity. Glasses made from heartwood are sold in market. Glass is filled with water and kept overnight. Water is taken in the morning on empty stomach. It is found that 3 months treatment is required to produce appreciable change in glucose level of blood [5]. However crude as tested here produces immediate change. *Cleome gynandra* has shown highest hypoglycemic activity. Traditionally several plant species were used in antidiabetic treatment is recorded by many workers [6, 7]. Various traditional drugs have been evaluated for their hypoglycemic activity with positive results [8-15]. Antidiabetic and antihyperlipidemic activities of the leaf latex extract of *Aloe megalacantha* revealed that the results give scientific support for the use of the plant in folk medicine for the management of diabetes and its associated complications [16]. It has also been observed that traditional plant drugs not only are effective hypoglycemic but also improve lipid level and antioxidant potential [17-20]. Studies from 35 herbals and their treatments for diabetes have been used in patients with insulin dependent and non-insulin dependent diabetes, diabetic retinopathy, diabetic neuropathy etc. scientific validation of several Indian plants species have proved the efficacy of the herbs in reducing the blood sugar level [21]. Anti-diabetic activity of 115 plants with their phytoconstituents are studied [22]. Antidiabetic medicines derived from plant sources have lesser side effects and offered cost effective management of diabetes through nutrient supplementation [23].

Conclusion

Antidiabetic traditional health practices surely are a hope for cheaper and more effective treatment as compared to allopathic drugs.

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Conflict of interest

Nil

Reference

- Nadkarni AK. Nadkarni's indian materia medica. Nadkarni Indian Materia Medica. 1954.
- Shawl HY, Tripathi L, Bhattacharya S. Antidiabetic plants used by tribals in Madhya Pradesh.
- Rao GMM: Non-insulin dependent Diabetes mellitus and secondary complaints. Indian Journal of Medical Sciences 1997; 51: 4
- Amalraj T, Ignacimuthu S. Hypoglycemic activity of *Cajanus cajan* seeds in mice. Indian J Experim Biolo. 1998;36(10):1032-3.
- Upadhyay OP, Singh RH, Dutta SK. Studies on antidiabetic medicinal plants used in Indian folk-lore. Aryavaidyan. 1996;9(3):159-67.
- Jain SK. Dictionary of Indian folk medicine and ethnobotany. Deep publications; 1991.
- Bondya SL, Sharma HP. Ethnobotanical studies on plants used in diabetes madhumeha under the baharagora block of jharkhand.
- Bhuvanewari DS, Chitra Devi P, Balamurgan P, Ashish N and Divakar MC: Studies on antidiabetic activity of the enzyme fraction of *Momordica charantia* fruits. Aryavaidyan 2000; 16(2): 94-97.
- Dhawan D, Bandhu HK, Singh B, et al. Effect of D-400 a herbal formulation on the regulation of glucose metabolism in diabetic rats. Indian L Pharma. 1996;28(4):224-6.
- Dubey GP, Dixit SP, SINGH A. Alloxan-induced diabetes in rabbits and effect of a herbal formulation D-400. Indian J Pharma. 1994;26(3):225-6.
- Ghosh R, Sharatchandra KH, Rita S, et al. Hypoglycemic activity of *ficus hispida* bark in normal and diabetic albino rats. Indian J Pharma. 2004;36(4):222.
- Kar A, Chaudhari BK and Bandhopadhyay NG: Evaluation of a few Indian folk medicinal plants less known for their hypoglycemic activity. Ethnobotany 1999; 11: 13-21.
- Manickam M, Ramanathan M, Farboodniay Jahromi MA, et al. Antihyperglycemic activity of phenolics from *Pterocarpus marsupium*. J Natur Produ. 1997;60(6):609-10.
- Muzaffer A, Jaya N, Saraswathy VN, Venugopal TN and Tewari NS: Hypoglycemic action of some Ayurvedic medicines. Aryavaidyan 2002; 16(1): 45-50.
- Srividya NA, Periwal S. Diuretic, hypotensive and hypoglycaemic effect of *Phyllanthus amarus*. Indian J Experim Biolo. 1995;33(11):861-4.
- Hammeso WW, Emiru YK, Ayalew Getahun K, et al. Antidiabetic and antihyperlipidemic activities of the leaf latex extract of *Aloe megalacantha baker* (Aloaceae) in streptozotocin-induced diabetic model. Evidenc Based Compleme Altern Medici. 2019;2019.
- Dhanabal SP, Kokate CK, Ramanathan M, et al. Antihyperglycemic activity of *Polygala arvensis* in alloxan diabetic rats. Indian Drugs. 2004 Nov;41(11):690-5.
- Dhanabal SP, Koate CK, Ramanathan M, et al. The hypoglycemic activity of *Coccinia indica* Wight & Arn. and its influence on certain biochemical parameters. Indian J Pharma. 2004;36(4):249-50.
- Dhanbal SP, Kokate CK, Ramnathan M, Elango K, Kumar EP, Subbaraj T, Maniraman S and Suresh B: c) The hypoglycemic activity of *Coccinia indica* Wight & Arn. and its influence on certain biochemical parameters. Indian Journal of Pharmacology 2004; 36(4): 244-250.
- Kaleem M, Sheema SH, Bano B. Protective effects of *Piper nigrum* and *Vinca rosea* in alloxan induced diabetic rats. Indian J Physiol Pharmacol. 2005;49(1):65-71.
- Singh A, Singh K and Saxena A: Hypoglycemic activity of different extracts of various herbal plants. International Journal of Ayurveda and Pharma Research 2010; 1(1): 212-224.
- Kumar M, Alok S, Jain SK, et al. Antidiabetic activity of plants with their phytoconstituents: A review. Internat J Pharma. 2014.
- Rajendran A, Sudeshraj R, Sureshkumar S. Potential antidiabetic activity of medicinal plants a short.