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Effect of Neelkanthi (*Ajuga bracteosa*) and Plakhar (*Ficus lacor*) on Diabetes Mellitus

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Abstract

In the present study an attempt has been made to determine quantitatively the effect of two medicinal plant species i.e Neelkanthi (*Ajuga bracteosa*) and Plakhar (*Ficus lacor*) on blood sugar level and its possible use as a substitute for oral hypoglycemic drugs. There was a significant fall in the level of blood glucose, serum cholesterol and serum triglycerides. Rat feeding trial was conducted at Department of Food Science and Nutrition, College of Home Science, CSK HPKV Palampur during the year 2004-2005 and alloxan induced diabetic rats were treated with Neelkanthi and Plakhar for 15 days. The proximate compositions of both the medicinal species were analyzed. These two species contain high fibre (Neutral Detergent Fibre and Acid Detergent Fibre) and antioxidants i.e. β-carotene and Vitamin–C, which play a very important role in controlling diabetes. It is also concluded that though both the species showed a decrease in blood sugar level and lipid profile of diabetic rats, yet Neelkanthi proved to be more effective than Plakhar.

Keywords: Neelkanthi, Plakhar, Diabetes Mellitus, lipid profile.

Introduction

Diabetes mellitus is one of the main threats to human health and predicted to grow world wide as an epidemic proportion in the first quarter of 21st century. According to WHO (2002),there are about 177 million people suffering from Diabetes mellitus world wide, which underestimates the previous estimation of 225 million by 2010.India, would rank first in sharing the global burden of diabetes, because the growth will be particularly strong in India, which will leads the world in the prevalence of diabetes with 14.3 per cent. The number of adult suffering from diabetes in India is expected to increase three fold from 19.4 million in 1995 to about 57.2 million in 2025 (Subbiah, 2002). Diabetes is closely linked to diet and exercise, both with respect to its causation and management.

Herbal drugs are also played a vital role to control diabetes. Such types of herbs/ traditional medicinal plant species have no any side effect and are easily available .In this context Himachal Pradesh is well known for traditional medicinal plants /herbs like guargum, isbagol husk, whole pulses, bittergourd, garlic, onion, fenugreek, banyan bark, bael fruits, gurmar leaves, jamun seeds, omum seeds etc. Many workers have reported the hypoglycemic effect of above plants and also tried the incorporation of these medicinal plants as such in the diet of diabetic patients but non-acceptability of taste in their original form, there is a need to improve their acceptability. For these purpose efforts were made to supplement the two medicinal plants species Neelkanthi (*Ajuga bracteosa*) and Plakhar (*Ficus lacor*) and tested for diabetic albino rats for the purpose.

Material and Methods

Neelkanthi (*Ajuga bracteosa*) was procured from the Herbal Garden, Jogindernagar of Disrict Mandi (H.P.) and Plakhar (*Ficus lacor*) from Chadhiyar nearly villages of District Kangra (H.P.). Leaves of Neelkanthi (T_0) and Plakhar (T_1) were collected, washed thoroughly to remove dust and foreign material and to reduce microbial load, dried in a dehydrator at 60±1°C temperature till completely dried, cooled at room temperature and ground in a mixer cum grinder to get a homogenous powder and stored in a air tight container till further used. For experimentation these medicinal species in powdered form was given in the dose

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of 5 g /day to the experimental rats by mixing in their feed.

Thirty weaning male albino rats weighing 15 -25 g in the age group of thirty days were procured from the germ free small animal house of College of Veterinary Sciences CCSHAU,Hissar and divided into two groups viz. Group-1 and Group- 2 . Both the groups were fed on the stock diet through out the experimental period. Group-1 consisted of ten rats were not given either alloxan or any other medicinal species and thus form the basal control group .Group-2 consisted of twenty rats was given alloxan subcutaneously (140mg/Kg body weight) after 48 hours fasting and consider as experimental group. Diabetes was induced in two days. But the rats were left as such for 20 days without any treatment to make sure that diabetes was permanently induced. The induction of diabetes in the rats was checked by collecting urine and analyzing by Benedict's method. In addition blood sugar was estimated by collecting blood from the rats by cutting the tail at the tip by about 0.1cm with sharp sterile blade. On the 21st day rats from Group-1 and Group-2 was sacrificed by decapitation. Blood was collected for analysis. The remaining rats of Group-2 were further divided into subgroups as Group -2 A (T_0) was given Neelkanthi powder (*Ajuga bracteosa*) and Group-2 B (T_1) was given Plakhar powder (*Ficus lacor*). At the end of this period i.e. after 36th day rat from Group-1 and subgroups (2A and 2B) of Group- 2 were sacrificed. The remaining rats of Group-2A and Group-2B administration of these medicinal species was discontinuous and they were sacrificed after 15 day along with Group-1 and blood was analyzed for blood glucose and lipid profile.

The biochemical analysis of both medicinal plant species were analyzed for approximate composition .Moisture, ash, fat, vitamin-C and crude protein were analyzed by the method AOAC (1990) and β-carotene by the method of Roy (1973), respectively. Total sugar, reducing sugar and non reducing sugar by Lane and Eynon (1923), while ADF and ADF was estimated by the method of Van Soest (1967).

Results and Discussion

The data of biochemical analysis for both medicinal plants species were depicted in table1 and 2. These tables showed that both medicinal plant species have minimum fat and sugar content, as well as maximum content of β- carotene and fibre content i.e. Neutral Detergent Fibre (NDF) and Acid Detergent Fibre (ADF).

Table 1. Chemical parameters of medicinal species

Medicinal species	Moisture (%)	Ash (%)	Fat (%)	Crude protein (%)	Vitamin-C (mg/100g)	β-Carotene (mg/100g)
Neelkanthi *(Ajuga bracteosa)*	3.06	17.42	4.63	20.00	2.75	256.20
Plakhar *(Ficus lacor)*	3.90	12.92	4.45	10.80	10.20	164.40

Table 2. Nutritional parameters of medicinal species

Medicinal species	NDF (%)	ADF (%)	Total sugar (%)	Reducing sugar (%)	Non-reducing sugar(%)
Neelkanthi *(Ajuga bracteosa)*	42.04	31.53	4.15	3.03	1.12
Plakhar *(Ficus lacor)*	48.33	36.25	5.45	3.60	1.80

It is clear from Table 3 that the Neelkanthi T_0 and Plakhar T_1, played a definite role in lowering the blood sugar level of experimental animal. Feeding T_0 showed 67.00 per cent decrease as compared to T_1 which lowered blood sugar level to the extent of 60.57 per cent. Both the species lowered blood sugar level because after discontinuing of the test material, blood sugar was increased to the extent of 83.9 and 85.4 per cent in case of treatment T_0 and T_1 as compared to basal control group with an increase of 2.25 per cent and 1.74 per cent after 15 days and on discontinuing test material. The hypoglycemic effect of Neelkanthi may be due to the relatively higher amount of fiber (NDF and ADF), which are responsible for its therapeutic role in Diabetes Mellitus. As the fiber may act by reducing the rate of diffusion of glucose in the lumen of the intestinal track and reducing the rate of small intestinal transit in the decreased glucose uptake, thereby flattening the glucose curve. Similar results were reported by Singh (2003) and Karnic and Pathak (1982). Where as in case of Plakhar, there is a presence of high fibre and antioxidants i.e. like Vitamin-A and Vitamin- C contributing to its hypoglycemic effect. Also antioxidants are helpful in neutralizing the cell damaging free radical compounds which are harmful to the body.

Table 3. Blood glucose level (mg/dl) of basal control and experimental albino rat

Groups	After inducing Diabetes	After 15 days giving test material	After discontinuing the treatment with test material
Basal control	72.66	74.30	75.60
		(2.25)*	(1.74)*
Experimental group	150.50		
T_0 (*Ajuga bracteosa*)	-	49.66	91.33
		(67.00)**	(83.9)*
T_1 (*Ficus lacor*)	-	59.33	110.30
		(60.57)**	(85.4)*
CD (P=0.05)	7.85	18.74	NS

* per cent increase, ** per cent decrease

Data depicted in Table 4 and 5, shows that Neelkanthi and Plakhar has a definite role to lower the lipids profile in case of experimental group animals. Feeding T_0 showed 8.17 per cent and T_1 showed 3.3 per cent reduction in cholesterol level after 15 days. This was further increased to 15.8 and 12.5 per cent in case of T_0 and T_1 after discontinuing test material.

Triglycerides level which was increased to 22.86 and 16.27 per cent in case of T_0 and T_1 after 15 days feeding of experimental diet and then increased to 5.30 and 7.5 per cent in case of Neelkanthi and Plakhar after discontinuing the test diet. Basal control group showed increase in cholesterol and triglyceride level throughout the experimental period.

Both the species contain high fibre content which helps to reduce the lipid profile, high fibre is known to reduce plasma cholesterol, through altering the metabolism and ratio of bile acid absorbed by changing the intestinal secretion and hepatic production of lipoprotein. Fibre is also associated with absorption and transportation of lipid, Neelkanthi and Plakhar also contain higher amount of Vitamin-C and Vitamin-A (β-carotene), which act as antioxidant having neutralizing effect on cell damaging free radical compounds. Increased blood cholesterol and triglycerides are due the increased oxidative modification of Low Density Lipoprotein (LDL). High concentrations of antioxidants are able to react with super oxide anion hydroxyl radical and singlet oxygen and decrease the susceptibility of LDL to oxidation, which potentially reduces the risk of coronary artery disease through the deposition of cholesterol in them, Chopra *et.al.* (1969) has reported similar results.

Table 4. Plasma cholesterol level (mg/dl) of basal control and experimental albino rat

Groups	After inducing diabetes	After 15days giving test material	After discontinuing the treatment with test material
Basal control	78.90	85.30 (8.1)*	89.93 (5.4)*
Experimental group	207.50		
T_0 (*Ajuga bracteosa*)	-	190.53 (8.17)**	220.76 (15.8)*
T_1 (*Ficus lacor*)	-	200.54 (3.3)**	225.70 (12.5)*
CD (P=0.05)	7.25	57.70	6.34

* per cent increase, ** per cent decrease

Table 5. Plasma triglycerides cholesterol level (mg/dl) of basal control and experimental albino rat

Groups	After inducing diabetes	After 15 days giving test material	After discontinuing the treatment with test material
Basal control	45.40	49.43 (8.8)*	58.76 (18.8)*
Experimental group	148.26		
T_0 (*Ajuga bracteosa*)		114.36 (22.86)**	120.43 (5.30)*
T_1 (*Ficus lacor*)		124.13 (16.27)**	133.53 (7.5)*
CD (P=0.05)	8.66	11.23	57.70

* per cent increase, ** per cent decrease

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