FORMULATION AND EVALUATION OF HERBAL TABLETS CONTAINING *IPOMOEA DIGITATA LINN.* EXTRACT

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ABSTRACT

Medicinal plants have curative properties due to the presence of various complex chemical substance of different composition, which are found as secondary plant metabolites in one or more parts of these plants. *Ipomoea digitata* Linn., Convolvulaceae is a annual extensive perennial climber with large ovoid and tuberous roots herb indigenous to India and widely used in the treatments of hypolipodemic, hypogycemic, for debility, to increase secretion of milk, to increases milk, poor digestion, tuberculosis, enlarged liver etc. It was also found to have alterative, aphrodisiac, cholagogue, demulcent, diuretic, rejuvenative actions. The present paper deals with formulation and evaluation of anti-diabetic activity of tablets prepared from aqueous extract of the selected plant. A solid pharmaceutical dosage formulation using a novel dry plant extract (tuberous roots) using various excipients viz., carbopol, ethylcellulose, MCC, dibasic calcium phosphate and PEG-4000 by direct compression was reported to be statically significant as anti-diabetic activity. The present communication also deals with the evaluation of formulated tablets (weight variation, friability, hardness and disintegration time).

Keywords: Diabetes, *Ipomea digitata*, tablets, anti-diabetic activity, PEG, MCC, Carbopol, Herbal formulation.

INTRODUCTION

Herbal Medicine is the oldest form of healthcare known to mankind. Herbs had been used by all cultures throughout history. It was an integral part of the development of modern civilization. Primitive man observed and appreciated the great diversity of plants available to him. The plants provided food, clothing, shelter and medicine. Much of the medicinal use of plants seems to have been developed through observations of wild animals and by trial and error. As time went on, each tribe added the medicinal power of herbs in their area to its knowledge base. They methodically collected information on herbs and developed well-defined herbal pharmacopoeias. Indeed, well into the 20th century much of the pharmacopoeia of scientific medicine was derived from the herbal lore of native people. Many drugs commonly used today are of herbal origin. Indeed, about 25 percent of the prescription drugs dispensed in the United States contain at least one active ingredient derived from plant material. Some are made from plant extracts; others are synthesized to mimic a natural plant compound. Herbal medicinal products are defined as any medicinal product, exclusively containing one or more active substances. WHO report 80% of the world population relies on the drug from natural origin. A large number of medicinal plants are used in the treatment of diabetes. Diabetes is a metabolic disorder with major complication associated with hyperglycemia, inflammation, foot ulcer, Nerve disorders and sexual depression. If treatment means to cure the disease, there is no drug which can cure Diabetes completely and some evidence I found practically and theoretically treatment of diabetes in yoga and Ayurveda. Keeping in view of the importance of the disease and also considering the fact that green medicine are safe. So, I believed to select an herbal origin drug for this project.

A number of traditional herbal medical practices have been adopted for the diagnosis, prevention and treatment of various diseases. Many such practices were experimentally proved depicting the scientific insight behind their traditional adoption. This attempts to prove scientific insight behind the traditional adaption. Less toxicity, Better therapeutic effect, Good patient compliance and Cost effectiveness are the Reasons for choosing drug from natural origin. *Ipomoea digitata* Linn in the ethics a good hypoglycemic, anti-inflammatory, anticonvulsant, and aphrodisiac agent. So it was very interesting to select this plant which can help in the treatment of diabetes along with its major complication of the disease. The main objective of this present study was to investigate the tuberous roots of *Ipomoea digitata* Linn as a potent antidiabetic drug. During the course of present investigation its pharmacognostical studies, and then formulation of the extract as a tablet dosage form, in vitro evaluation of the tablets and finally its pharmacological evaluation for the anti-diabetic activity with special reference to its curative and protective role in streptozotocin induced diabetic rats animal model were studied. Attempts were further made to study hypolipedemic action of formulation aqueous extract of tuberous root of *Ipomoea digitata* Linn which is the major disease associated with the diabetes.

MATERIALS AND METHODS

The tuberous roots of the plant *Ipomoea digitata* Linn. were collected from the A. B. S Botanical Conservation Center Karri Patty, Salem, in the month of September 2009. The plant was then authenticated by the B. S. Balsubaramanyam, A. B. S Botanical Conservation Center Karri Patty, Salem, Tamilnadu, India. Ethylcellulose, Carbopol, Microcrystalline Cellulose are procured by Colorcon Asia Pvt. Ltd - Mumbai - India, Polyethylene Glycol Dibasic Calcium Phosphate, Methylparaben are procured by micro labs,hosur,T.N.

Extraction Process

The preliminary phytochemical screening of the plant involves extraction of the plant material and identification of the plant active constituents.

Preparation of Extracts

Method of Extraction

Continuous hot percolation process by using Soxhlet apparatus.

Materials:

1. Soxhlet apparatus
2. Petroleum ether
3. Acetone
4. Alcohol
5. Distilled water
6. Shade dried coarse powder of tuberous roots of *Ipomoea digitata* Linn.

METHODS

Petroleum Ether Extract

The shade dried coarsely powdered plants tuberous roots of *Ipomoea digitata* Linn. (120gms) was extracted with petroleum ether (32°C), until the extraction was completed. After completion of extraction, the solvent was removed by distillation. Yellowish brown colored residue was obtained. The residue was then stored in dessicator.

Acetone Extract

The shade dried coarsely powdered plants tuberous roots of *Ipomoea digitata* Linn. (120gms) was extracted with acetone (55-56°C), until the extraction was completed. After completion of extraction, the solvent was removed by distillation. Yellowish brown colored residue was obtained. The residue was then stored in dessicator.

Alcohol Extract

The shade dried coarsely powdered tuberous roots of *Ipomoea digitata* Linn. (120gms) was extracted with alcohol (75-78°C), until the extraction was completed. After completion of extraction, the solvent was removed by distillation. Yellowish brown colored residue was obtained. The residue was then stored in desiccator.

Aqueous Extract

The marc left after Petroleum ether extraction of tuberous roots of *Ipomoea digitata* Linn. was dried and extracted with Chloroform water (2.5ml in one liter I.P) by cold maceration process in a narrow mouth bottle for 3 days. After completion of the extraction, it was filtered and the solvent was removed by evaporation to dryness on a water bath. Dull yellow colored residue was obtained and it was stored in desiccator.

Formulation of Tablets

The plant extract was mixed with the excipients and compressed into tablets. The details of the composition was given table no 1.

Table 1: Formulation of Tablets

Ingredients	BATCH NO.					
	QUANTITY PER TABLET (mg)					
	F_1	F_2	F_3	F_4	F_5	F_6
Plant extract	300	300	300	300	300	300
Carbopol	20	30	40	-	-	-
Ethyl cellulose	-	-	-	20	30	40
Microcrystalline cellulose	40	40	40	40	40	40
Dibasic calcium phosphate	30	20	10	30	20	10
Peg 4000	10	10	10	10	10	10
Methyl paraben	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Weight per tablet	**400**	**400**	**400**	**400**	**400**	**400**

Evaluation of in-vitro and in-vivo antidiabetic activity of extract of tuberous roots of *ipomoea digitata* linn in streptozotocin induced diabetic rats.

In-Vitro Study

α- Amylase Inhibition Activity

Alpha amylase enzyme is responsible for the metabolism of polysaccharides such as starch carbohydrate, etc. the aim behind present experiment is to study the effect of α-amylase concentration on the rate of reaction and inhibition activity of aqueous extract of tuberous roots of *Ipomoea digitata* Linn.

Requirements

- 1% starch solution
- Buffer solution 6.8 Ph
- 8 well spot plate
- Iodine solution
- Amylase

Procedure

- Preparation of a 1:1 series of dilutions of the α-amylase solution of different concentration
- α-amylase solution was kept in four test tube and from them 1 ml withdrawn and kept in another test tube for test
- In spot plate put two drop of iodine solution in four row one row for each tube
- Added 0.5 ml of 1% starch solution to each tube, mixed it
- Immediately taken out one drop of solution and placed it in the first well.
- After 1 min. taken out another drop and put it in second well
- Continued the taking a sample every 1 minute until all the starch has been digested and the colour of the well is light brown or disappear

Table 2: Preparation of stock solution of α-amylase solution

Tube	Water	Amylase solution	Concentration in %
1	5ml	5ml stock solution	0.50
2	5ml	5ml stock solution	0.25
3	5ml	5ml stock solution	0.125
4	5ml	5ml stock solution	0.063

As the concentration of amylase increase the rate of reaction is also increases but the time of reaction decreases because high conc. of amylase will digest the starch rapidly and result were shown. Glibenclamide was taken as standard and both plant extracts of tuberous roots of *Ipomoea digitata* Linn was a amylase inhibitory agent as the concentration of drug increase, the time of reaction is also increases.

In-vivo antidiabetic activity

Selection of animals

Wister albino rat were purchased from Venketeswara Enterprises Malleswarm, Bangalore. All animal were allowed to adapt new environment for 7 days in Vinayaka mission college animal house at suitable environmental condition and provided them standard food product manufactured by Hindustan liver ltd. Above 150 gm rats were selected for experiment.

Experimental Induction of Diabetes

Above 150 gm rats were selected for this activity. Before induction of diabetes weigh and normal glucose level of rats was measured and concerned as 0 Day. After overnight fasting 60mg/kg of streptozotocin[68] (Sigma, St. Louis, Mo, USA) freshly dissolved in 0.1 N sodium citrate buffers Ph 4.5 was injected intraperitoneally. All animals returned to their cages and given free access to food and water. Blood glucose level were measured after 72 hr. of injection and concerned as 1st day. Only rats with fasting blood glucose level greater then 200mg/Dl were considered diabetic and included in this study. Diabetic rats were randomly assigned to seven each, group contains six animals.

Experimental Design

- Group I- Control rats received vehicle solution normal saline
- Group II- Diabetic control rats received vehicle solution normal saline
- Group III – Diabetic rats treated with Glibenclamide 0.25 mg/kg of body weight in normal saline
- Group IV – Diabetic rats treated with aqueous extract tablet (Carbopol) of *Ipomoea digitata* Linn. 300 mg/kg
- Group V- Diabetic rats treated with aqueous extract tablet (Ethylcellulose) of *Ipomoea digitata* Linn. 300 mg/kg

The vehicle and the drug were administered orally by using intra gastric tube daily for 14 days. We studied anti hyperglycemic effect in blood glucose level estimated on 0,1st, 5th, 8th, 11th, 14th, days[70] of induction and measurement of food intake and fluid intake and body weight were daily. After 14th day of treatment the rats were fasted overnight, the blood samples were analyzed for blood glucose level. Then the animals were sacrificed by cervical decapitation.

The whole pancreas from each animal was removed after sacrificing the animals and was collected in 10% formalin solution, and immediately processed by the paraffin technique and send for biochemical and histopathological studies.

Statistical Evaluation

The data were statically analyzed by one way ANNOVA followed by dunnet's t-test and values were considered significant. And value were expressed ± SEM. And $p<0.05$

RESULTS AND DISCUSSION

Anti diabetic plants an important role in inhibiting the glucose level and inflammation thus providing protection to human against hyperglycemia. Realizing the fact this research was carried out to evaluate the anti diabetic activity of aqueous extract tablets of tuberous roots of *Ipomoea digitata* Linn. in streptozotocin induced diabetic rats.

The Phytoconstituents were extracted by using different solvent of increasing polarity like petroleum ether, acetone, alcohol and water were presented. (Table 3 & 4)

Phytochemical Investigation

Table 3: Percentage yield of extraction of tuberous roots of *Ipomoea digitata* Linn.

Plant used	Part used	Percentage yield			
		Pet. ether	acetone	alcohol	Distilled water
Ipomoea digitata Linn.	Tuberous roots	2.08	3.5	3.6	16.20

Table 4: Preliminary Phytochemical screening of both extracts of tuberous roots of *Ipomoea digitata* Linn.

Name of extract	Pet. Ether	Acetone	Alcohol	Distilled water
Carbohydrate	-	-	+	+
Glycosides	-	-	+	+
Fixed oils & Fats	-	-	-	-
Proteins & Amino acids	-	-	-	+
Saponins	-	-	-	+
Resins	-	-	+	-
Phytosterol	-	-	+	+
Alkaloids	-	+	+	+
Flavonoids	-	-	+	+
Gum & mucilages	-	-	+	+

+ = Presence ; - = Absence

The phytochemical evaluation shows the presence of Fixed oil, Carbohydrate, Tannins, Phenolic compound, Alkaloids, Saponins, Sterols and Flavonoids in acetone alcohol and aqueous extract. But most of these compounds were found in the aqueous extract. Hence, only the aqueous extract was selected for the formulation of the tablets.

Pharmacological Investigation

Oral Acute Toxicity Studies

The aim to perform acute toxicity studies was for establishing the therapeutic index of a particular drug and to ensure the safety in-vivo. Acute toxicity study is generally carried out for the determination of LD_{50} value in experimental animals.

The LD_{50} determination was done in mice by OECD guideline 423 and LD_{50} of *Ipomoea digitata* Linn was determined (infinity). Therefore, any dose can be selected up to 5000 mg/kg, so 300 mg/kg was selected as ED_{50}.The selection of dose was made based upon the minimum concentration of drug required for therapeutic action which will be economically fruitful for further research and formulation (Table 5).

Table 5: LD_{50} value of *Ipomoea digitata* Linn.

No of Swiss albino mice	Dose (mg/kg)	Observation
3	5	No Death
3	50	No Death
3	300	No Death
3	2000	No Death
3	5000	No Death

Effective Dose was selected 300 mg/kg since the drug is non-toxic.

Drug Excipient Compatibility Study:

Compatibility of the drug with excipients was determined by FT-IR spectral analysis, this study was carried out to detect any changes on chemical constitution of the drug after combining it with the excipients. The samples were taken for FT-IR study. IR spectra of drug in KBr pellets at moderate scanning speed between 4000-400 cm^{-1} was carried out using FTIR (Jasco FTIR 6100 type A). The peak values (wave number) and the possibility of functional group are shown in spectra which compare with standard value. The comparison of these results with chemical structure shows that the sample was pure aqueous extract. The FTIR spectra of plant extract and polymers are given as follows:

IR compatibility studies:

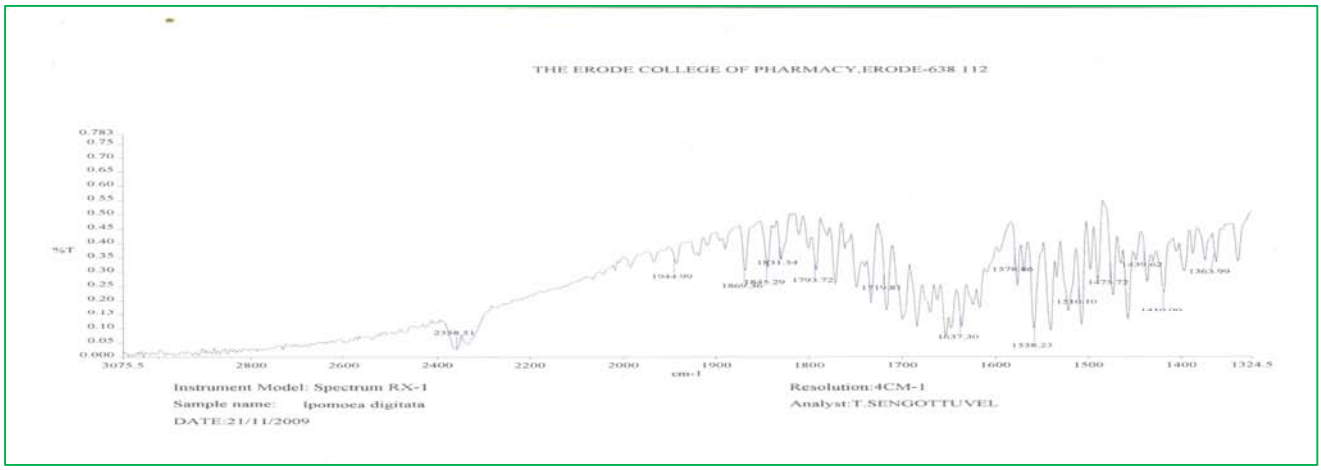

Figure 1: IR spectrum of *ipomoea digitata* linn extract

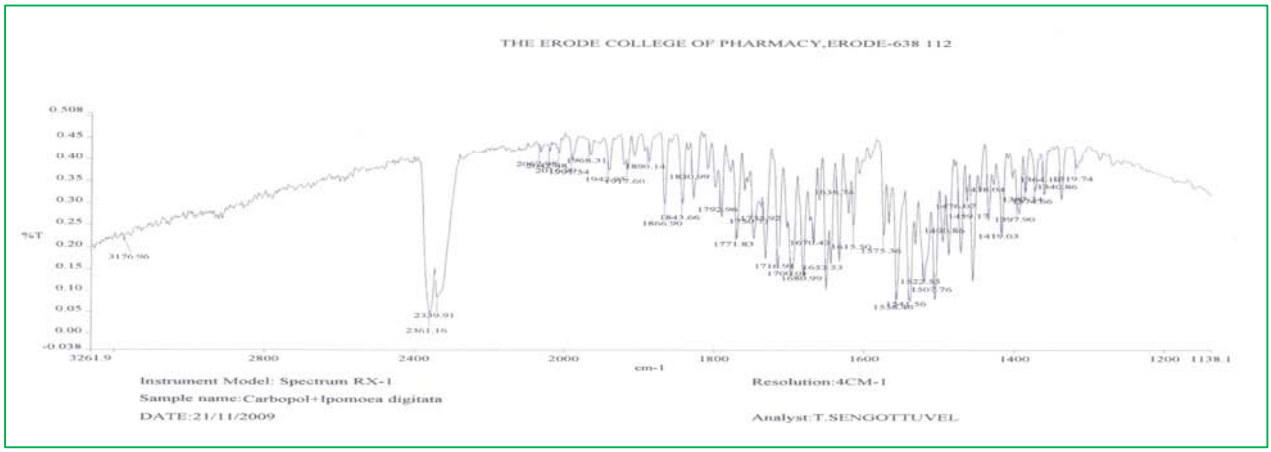

Figure 2: IR spectrum of carbopol + *ipomoea digitata* linn extract

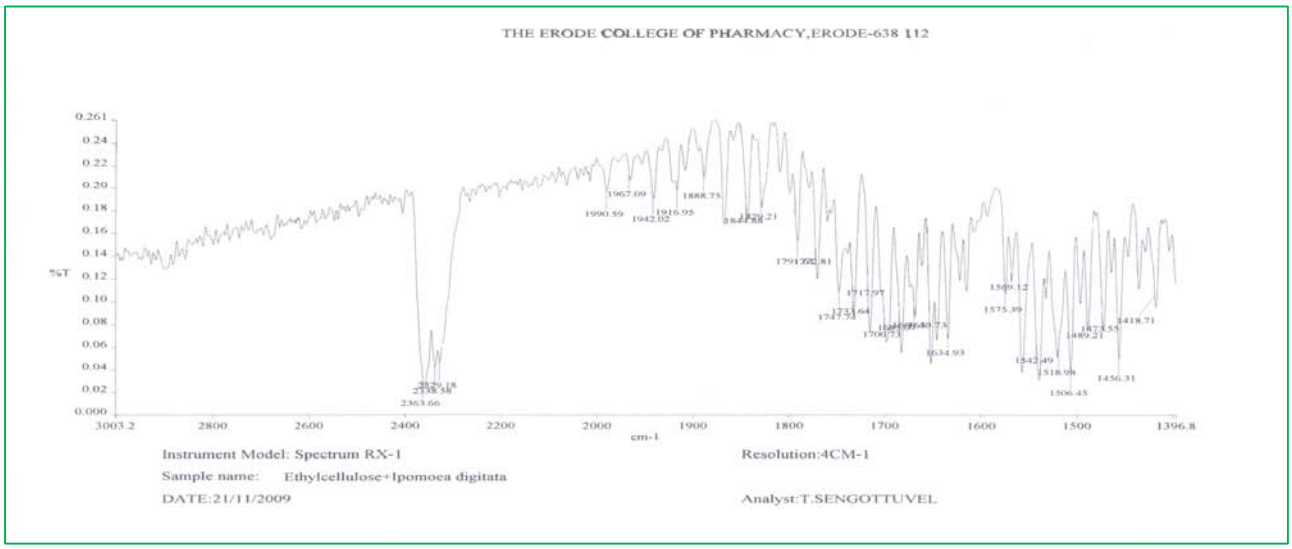

Figure 3: IR spectrum of ethyl cellulose + *ipomoea digitata* linn extract

Table 6: Evaluation of Powder Blend

Batch	Bulk density (gm/ml)	Tapped density (gm/ml)	Carr's index (%)	Hausner's ratio	Angle of repose (°)
F_1	0.46	0.50	8.00	1.08	32.2
F_2	0.42	0.51	17.00	1.13	32.0
F_3	0.44	0.53	16.98	1.20	31.79
F_4	0.42	0.51	17.64	1.11	33.80
F_5	0.41	0.54	15.07	1.31	27.47
F_6	0.45	0.52	13.46	1.15	30.96

Table 7: Evaluation of Tablets

Batch	Hardness (kg/cm^2)	Thickness (mm^2)	% Weight Variation	% Friability	Disintegration Time
F_1	4.2	3.5	2.51	0.69	9min50sec
F_2	4.0	3.6	2.48	0.79	12min15sec
F_3	4.1	3.6	1.99	0.73	8min10sec
F_4	4.1	3.7	2.60	0.79	11min25sec
F_5	4.0	3.6	2.21	0.76	13min30sec
F_6	4.0	3.4	2.71	0.87	10min35sec

Preformulation studies

Evaluation of powder blend

The granules obtained for the trial batches (F_1-F_6) were satisfactory. No rat holing was observed during the flow of granules from the hopper. Capping and sticking was not observed. The results were provided in table no 6.

From the compressibility index and Hausner's ratio values obtained for granules of batches F_1– F_6, the granules were found to have good flow properties.

Evaluation of Tablets

The tablet parameters observed are given in table 7. The tablets were compressed at the specified weight (400mg). The maximum weight variation of the tablets was ± 2.71%, which falls within the acceptable weight variation range of ± 5%, hence the tablets of all batch passed the weight variation test. Hardness for tablets of all batches was in the range of 4.0 to 4.2kg/cm², which falls above the limit of not less than 3.0 kg/cm². Friability value for tablets of none of the batch was more than 0.87%. The thickness of the tablets of all the batches was found in the range of 3.4 - 3.7mm^2 indicating fairly acceptable tablets. Disintegration time is an important parameter of tablet. An ideal tablet should disintegrate within 15min. The tablets of all the batches disintegrated within 13 minutes 30 seconds.

Antidiabetic Activity

i) In-Vitro Antidiabetic Studies

α- Amylase inhibition activity of aqueous extracts of tuberous roots of *Ipomoea digitata* Linn was studied. There are many enzymes in the human digestive system that help in the digestion of food. α- Amylase catalyses the breakdown of polysaccharide in to monosaccharide and only monosaccharide form of food only can absorbed in the stomach. It is known that the degradation of starch to glucose in the alimentary canal proceeds rapidly. A few minutes after the ingestion of starch a marked hyperglycemia leading to hyperinsulinaemia is observed.

Both phenomena are undesirable in patient part of GIT. α-Amylase enzyme which is present in different part of GIT and responsible for the metabolism or digestion of starch and carbohydrate into glucose molecule. As the concentration of α- Amylase increases the rate of reaction is also increases but the time of reaction decreases because of high concentration of α- Amylase will digest the starch rapidly as shown in Table no. 8 and fig no. 4. Glibenclamide is a α- Amylase inhibitory agent as the concentration of Glibenclamide increase the time of reaction is also increase because the number on enzyme molecule required for digestion of starch in not in sufficient, is given table no.9 and fig no.5.

The present study deals with the inhibition of α- Amylase by both extracts of tuberous roots of *Ipomoea digitata* Linn. Extracts of leaves having α- Amylase inhibition activity which is shown by increase in reaction time i.e. the time taken by α- Amylase to digest the starch. From the observation it was found that as the concentration of extract increases, the time of reaction is also increases but as compare to standard drug they have little activity, have been presented.

Table 8: Control tube of amylase solution.

Tube	Amylase solution	Buffer solution pH 6.8	Time until starch disappear
1	1 ml tube 1 + 0.5 ml starch solution+2% amylase solution	20 drops	17
2	1 ml tube 1 + 0.5 ml starch solution+1% amylase solution	20 drops	13
3	1 ml tube 1 + 0.5 ml starch solution+0.5% amylase solution	20 drops	10
4	1 ml tube 1 + 0.5 ml starch solution+0.25 amylase solution	20 drops	7

Table 9: Observation of standard drug (Glibenclamide) on α-amylase inhibition

Tube	Amylase solution	Buffer solution pH 6.8	Time until starch disappear
1	1 ml tube 1 + 0.5 ml starch solution+2% amylase solution+2% standard drug solution	20 drops	13
2	1 ml tube 1 + 0.5 ml starch solution+1% amylase solution+1% standard drug solution	20 drops	18
3	1 ml tube 1 + 0.5 ml starch solution+0.5% amylase solution+0.5% standard drug solution	20 drops	21
4	1 ml tube 1 + 0.5 ml starch solution+0.25 amylase solution+0.25% standard drug solution	20 drops	24

Table 10: Observation of aqueous extract of tuberous roots of Ipomoea digitata Linn on α-amylase inhibition activity

Tube	Amylase solution	Buffer solution pH 6.8	Time until starch disappear
5	1 ml tube 1 + 0.5 ml starch solution + 0.25 amylase solution + 0.25% AEAN solution	20 drops	12
6	1 ml tube 1 + 0.5 ml starch solution + 0.5% amylase solution + 0.5% AEAN solution	20 drops	14
7	1 ml tube 1 + 0.5 ml starch solution + 1% amylase solution + 1% AEEI solution	20 drops	19
8	1 ml tube 1 + 0.5 ml starch solution + 2% amylase solution + 2% AEEI solution	20 drops	23

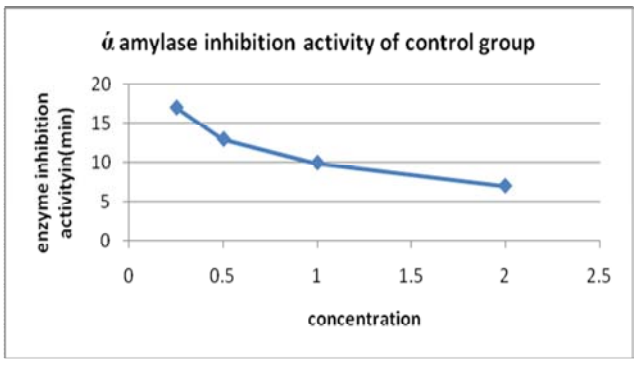

Figure 4: α- Amylase Inhibition Activity of Control Group

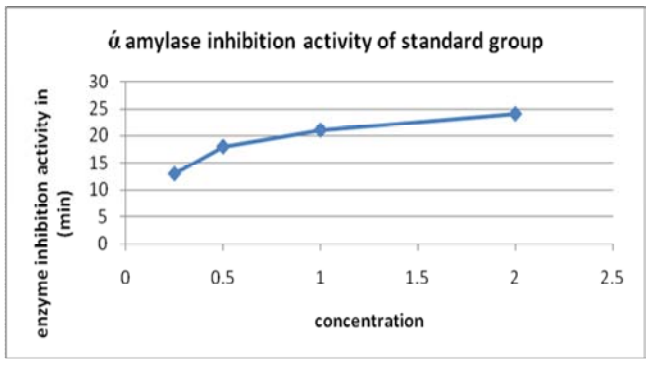

Figure 5: α- Amylase Inhibition Activity of Standard Group

As the concentration of α-amylase increase the rate of reaction is also increase but the time of reaction decrease because of high concentration of α-amylase will digest the starch rapidly. Glibenclamide is a α-amylase inhibitor agent. As the concentration of Glibenclamide increase the time of reaction is also increase because the number of enzyme required for digest for starch is not sufficient.

From the observation it was found that the aqueous extract of dried tuberous roots of Ipomoea digitata Linn having the α-amylase inhibition activity. But as compare to standard drug is less activity but compare to ethanolic extract is having more activity

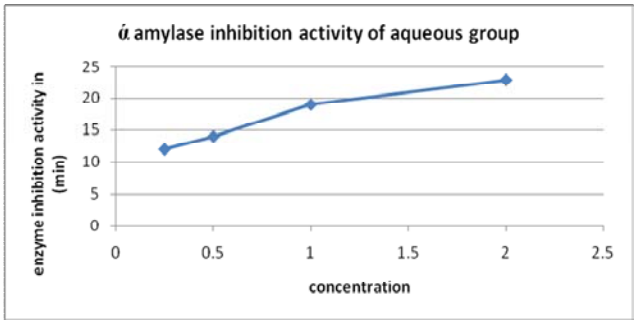

Figure 6: α- Amylase Inhibition Activity of Aqueous Group

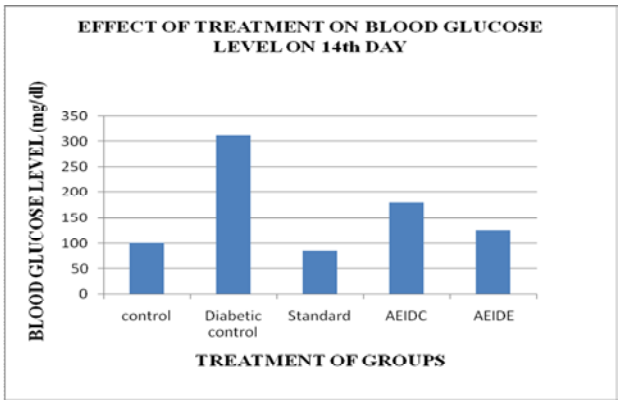

Figure 7: Effect of Treatment on Blood Glucose Level on 14th Day

ii) In-Vivo Antidiabetic Activity

Effect of aqueous extract tablet of tuberous roots of plant *Ipomoea digitata* Linn on blood glucose level in streptozotocin induced diabetic rats.

It is clearly evident from table no 10 and fig no 6 that the streptozotocin administration caused the significant increase the blood glucose level at 1st day (90.66-248.0, $p<0.05$). The extract tablet of the tuberous roots of *Ipomoea digitata* Linn showed significant effect compared with respective diabetic control group. decrease the blood glucose level at the dose of 300 mg/kg. Aqueous extract tablet 300 mg/kg has significant decrease in blood glucose level on 5th day (195.66 to 97.83 mg/dl) but 300 mg/kg gives significant hypoglycemic result on 14th day (126.83 to 101.00 mg/dl). Decrease in blood glucose level indicates antidiabetic effect of extract tablet of *Ipomoea digitata* Linn. Streptozotocin diabetes causes an increase in blood glucose level in rats. Streptozotocin exerts its diabetic action when it administered parenterally. The action of streptozotocin in pancreas is preceded by its rapid uptake by the β-cells. Rapid uptake by insulin-secreting cells has been proposed to be one of the important features determining streptozotocin diabetogenicity. Another aspect concerns the formation of reactive oxygen species. The studies show that the oral administration of aqueous extract tablet of tuberous roots of *Ipomoea digitata* Linn**.** decreased in blood glucose level in diabetic rats.

Effect of aqueous extract tablet of tuberous roots of *Ipomoea digitata* Linn. on Serum lipid levels

It is clearly evident from table no 11 and fig no 8-12 streptozotocin caused significant elevation of serum markers Cholesterol (106.33mg/dl) Triglyceride (93.17mg/dl) and VLDL (32.66mg/dl), LDL (91.16mgdl) and decrease the concentration of HDL (54.16) in the blood serum compare to normal diabetic rats. In contrast the groups treated with extract tablet of *Ipomoea digitata* Linn. at the dose of 250mg/kg once daily for 14th days decrease the level of Cholesterol, Triglyceride VLDL, LDL and increase the level of HDL in the serum of rat. In a dose related manner. It has been demonstrated that insulin deficiency in diabetes mellitus leads to a variety of derangement in metabolic and regulatory process, which in turn leads to accumulation of lipid such as cholesterol and triglycerides and LDL, VLDL and decrease the level of HDL in diabetic patients. The abnormal high concentration of serum lipids in the diabetic subject is due mainly to increase in the mobilization of free fatty acids from the peripheral fats depots. In present study the effect of aqueous extract tablet on the hyperlipedimic level in dose related manner.

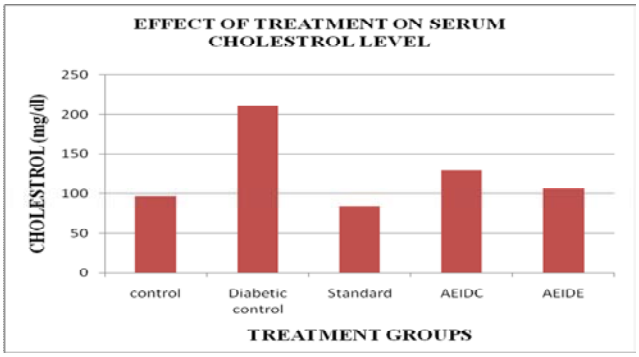

Figure 8: Effect of Treatment on Serum Cholestrol Level

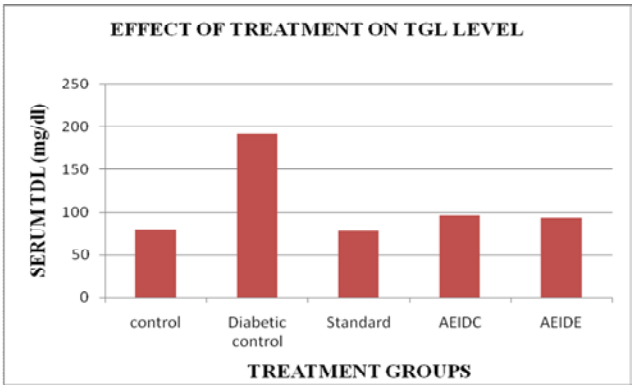

Figure 9: Effect of Treatment on TGL Level

Table 11: Effect of aqueous extract tablet of *Ipomoea digitata* Linn. on the serum lipid level

GROUP	CHOLESTEROL [MGS/DL]	SERUM TGL [MGS/DL]	SERUM HDL [MGS/DL]	SERUM LDL [MGS/DL]	SERUM VLDL [MGS/DL]
Normal	96.66±5.88	80.16±6.24	46.00±4.17	75.40±4.46	27.50±2.58
Diabetic Control	211.33±4.84	191.50±9.62	23.50±3.30	173.00±5.51	59.83±4.57
Standard	84.50±12.78	78.17±4.44	50.83±3.97	86.83±4.44	29.66±4.45
AEIDC 300 mg/kg	128.83±4.62	96.16±5.45	49.00±4.51	122.83±5.87	38.83±2.11
AEIDE 300 mg/kg	106.33±5.27	93.17±4.91	54.16±4.79	91.16±6.01	32.66±4.45

AEIDC – Aqueous extract tablet of *Ipomoea digitata* Linn. (Carbopol)
AEIDE – Aqueous extract tablet of *Ipomoea digitata* Linn. (Ethyl Cellulose)
Value are the mean ±SD; N= 6; P value <0.05

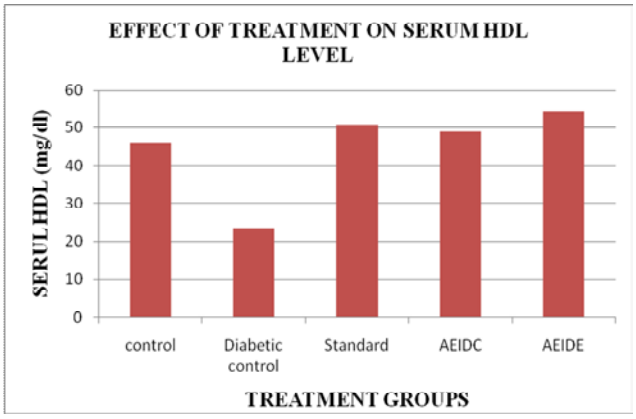

Figure 10: Effect of Treatment on Serum HDL Level

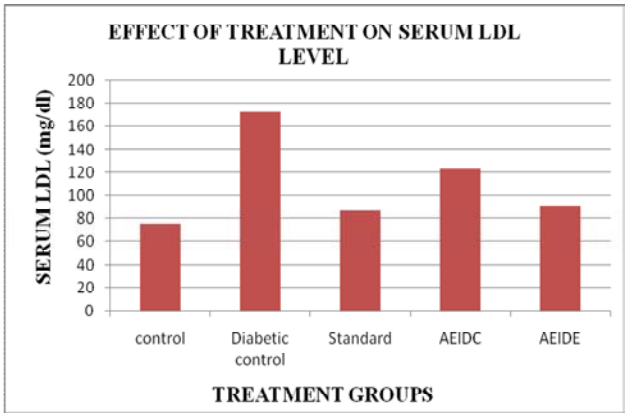

Figure 11: Effect of Treatment on Serum LDL Level

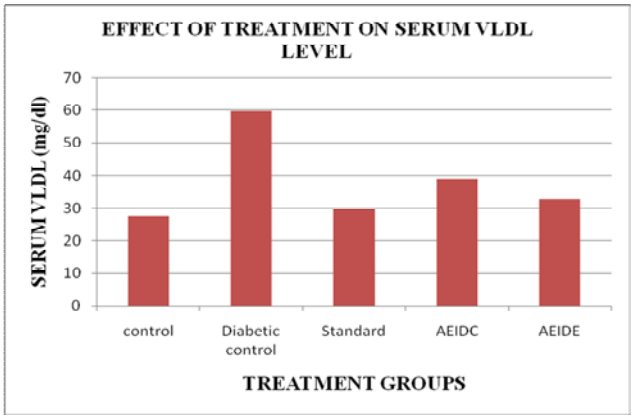

Figure 12: Effect of Treatment on Serum VLDL Level

iii) HISTOPATHOLOGICAL STUDY

Histopathological studies of pancreas of all treated and control group.Microscopic examined Section of control rat pancreas in Fig no. 13. The islets are normal. The architecture is preserved. The acini are lined by round to oval cells with moderate cytoplasm and small round to oval nuclei. No fibrosis or any inflammation seen. Microscopically, the pancreas Section of diabetic control shows pancreas with engorged and congested blood vessels. The islets are damaged. The acini are lined by round to oval cells with moderate cytoplasm and small round to oval nuclei. Microscopically, the pancreas section of Standard Glibenclamide treated rats Section shows pancreas with normal architecture and acini. The islet cells show moderate cytoplasm and round to oval nuclei. There is no evidence of inflammation. Microscopically, the pancreas section of AEIDC 300 mg/kg section shows pancreas, the islets are partly destroyed. The architecture is replaced by focal aggregates of lymphocytes. The acini are lined by round to oval cells with moderate cytoplasm and small round to oval nuclei. Microscopically, the pancreas section of AEIDE 300 mg/kg. Section shows pancreas. There is papillary adenomatous hyperplasia with finger like projections lined by acinar cells. The cells show moderate cytoplasm and round to oval nuclei.

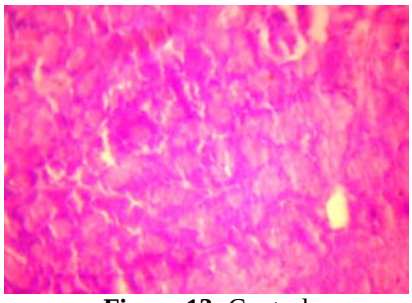

Figure 13: Control

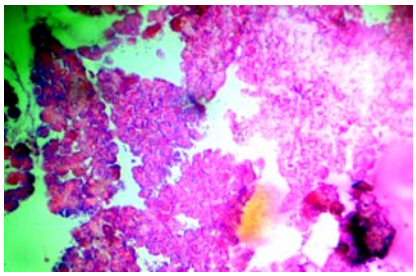

Figure 14: Diabetic Contol

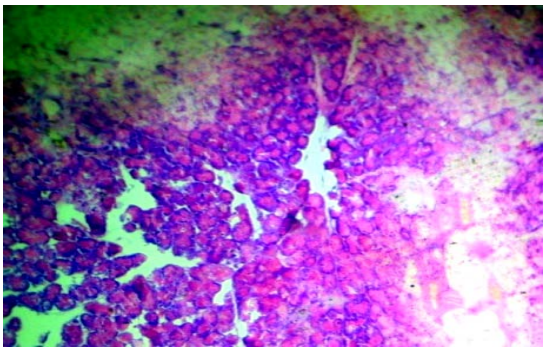

Figure 15: Standard (Glibenclamide)

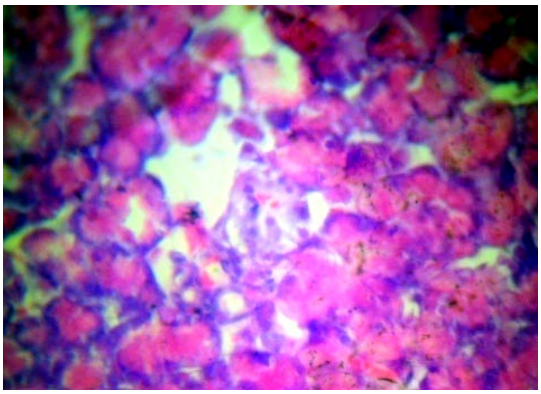

Figure 16: AEIDC

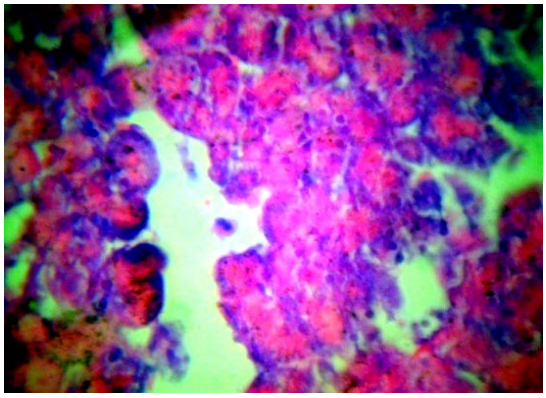

Figure 17: AEIDE

SUMMARY AND CONCLUSION

Herbal products may contain a single herb or combinations of several different herbs believed to have complementary and/ or synergistic effects. Some herbal products, including many traditional medicine formulations, also include animal products and minerals. Herbal products are sold as either raw plants or extracts of portions of the plant. The tuberous roots of plant *Ipomea digitata* Linn. belonging to the family Convulvulaceae was taken up for the present study and investigated for the phytochemical screening, formulation of tablets and antidiabetic activity of the root extract of the selected plant.Present study deals with formulation and evaluation of the tablets made from aqueous extract of root of Ipomea *digitata* Linn. Exhaustive extraction of the plant material was done with water, acetone, alcohol and petroleum ether separately and the extracts were screened for the presence of various pharmacological active phytoconstituents. Moreover, the root extract was formulated as tablets using different polymers viz., carbopol and ethyl cellulose. Six batches of the tablets were prepared. From these six batches, two batches Viz. F_3 and F_6 were found to be the best formulations in terms of the disintegration time taken. And therefore, these two formulations were selected for antidiabetic activity. Finally the anti diabetic activity was reported which was found to be significant. Also, the hyperlipedemic activity was also accessed. Hence, these investigations gave a support on the selected medicinal plant which ascertain its folk lore uses and interplay with diabetes biology and pharmacology lead to rapid development in diabetes treatment. In addition to this, these studies also provide information of possible mechanism of action of the drug. Thus, this holds great promise for future research for the formulation of potent antidiabetic drug for the present plant.

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