ISSN No:-2456 –2165

Effect of Aswaagndha on Type II Diabetes

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Abstract: - Aswagandha is a medicinal herb widely used by the people to treat various disorders like diabetes, mental disease, asthma, inflammation, arthritis and tuberculosis. The plant *Withaniacoagulans*commonly called as aswagandha belongs to the family *Solanaceae*and is a rare, endangered and endemic plant species of India. The effect of medicinal plants was studied by conducting preclinical (animal) and clinical trial. The animal study was carried out in the approved animal house facility of Department of Pharmacology, Periyar College of Pharmaceutical Sciences College for Girls, Trichy. To study the optimum effective dose of AF and SAFJA extracts on blood glucose, different doses (100&200 mg/kgbw) of extracts were given to Alloxanized rats. .The extract of both AF and SAFJA extracts revealed significant reduction in blood glucose and lipid level in Alloxan induced diabetic rats. Among the two doses 200mg/kgbw of both the extracts exhibited a more hypoglycemic and hypolipidaemic effect in rats.

Keyword:-AF- Aswagandhafruit SAFJA- Sirukurunjan, Avaramflower,Fenugreek Seed, Jamunseeds,Amla Fruit

I. INTRODUCTION

Non insulin dependent diabetes mellitus accounts for over 85% of diabetes mellitus world wide and is associated with a higher incidence of morbidity and mortality, the contributing factors being micro vascular, macro vascular and neuropathy complicationsAswagandha is one of the medicinal herb widely used by the people to treat various disorders like diabetes, mental disease, asthma, inflammation, arthritis and tuberculosis. The plant *Withaniacoagulans*commonly called as aswagandha belongs to the family *Solanaceae*and is a rare, endangered and endemic plant species of India. The curative properties of the plant have ascribed to the presence of complex chemical substances such as alkaloids, glycosides, steroids, flavonoids, essential oils etc. which are secondary metabolites synthesized from intermediate metabolism (Arora, 2004)

The local name Asgandh seems to be derived from the Sanskrit name Aswagandha. Ashwa means horse and gandha means fragrance – smelling like a horse and it literally means "the sweat of horse"which indicates the property of strength and the sexual vitality of the horse. Mostly the roots and occasionally the leaves and seeds of the plant are used in medicinal preparations fruits are very rarely used.

Traditionally various plants are being used to treat diabetes. It is believed that herbal medicine has little side effects as well as it requires no cost in few cases. So the herbal medicine solve the problem for the poor (Habib*et al*, 2005). WHO approves the use of plant drugs for the different diseases including diabetes as well. Therefore studies with plant extract are useful to know their efficacy, mechanism of action and safety. Hence a study entitled on "Effect of medicinal plants on type II diabetes '' was planned with following objectives:

II. OBJECTIVES

- Standaradization of herbal formula for type II diabetes.
- Therapeutic evaluation of the herbal formula by conducting preclinical and clinical trial.

III. MATERIALS AND METHODS

This chapter deals with the materials and methods adopted for the study

Materials

Ingredients used for capsule formulation:

- Aswagandha (*Withaniasomnifera*) Fruit powder

Aswagandha fruits were procured from farmer residing at Trichy .Fruits were cleaned , washed ,dried at40ºc for one hour and powdered in a mixie.

The powder made of aswagandha fruit is referred to as an active ingredient

- Sirukurinjan(*Gymnemasylvestre)*leaves powder

Sirukurinjan leaves were procured from farmer residing at Trichy. Leaves were cleaned, washed, dried at 60ºc for six hours and powdered in a mixie

- Avaram flower (*Tanners cassia*) powder

Avaram flowers were procured from the local farmer residing at Trichy.The flowers were cleaned, washed,dried at 40ºc for one hour and powdered in a mixie.

- Fenugreek (*Trigonellafoenumgraecum*) seed powder

Fenugreek seeds were procured from the local market, cleaned, washed, dried at 50ºc for three hours and powdered in a mixie

- Jamun (*Eugenajambolina*) seed powder

ISSN No:-2456 –2165

Jamun fruits were procuredfrom the localmarket and seed removed by scrapping, washed, cleaned,driedat 60 ºc for six hours and powdered in a mixie.

- Amlafruit (*Emblicaofficinalis*)powder

Amlafruits were procured from the local market cleaned ,washed ,steam blanched ,dried at 60º c for six hours and powdered in a mixie.

- Chemicals used for the laboratory estimation

The chemicals and reagents used for the study were of laboratory reagent (LR), analytical reagent (AR) or guaranteed reagent (GR) grade.

- Preparation of plant extract:

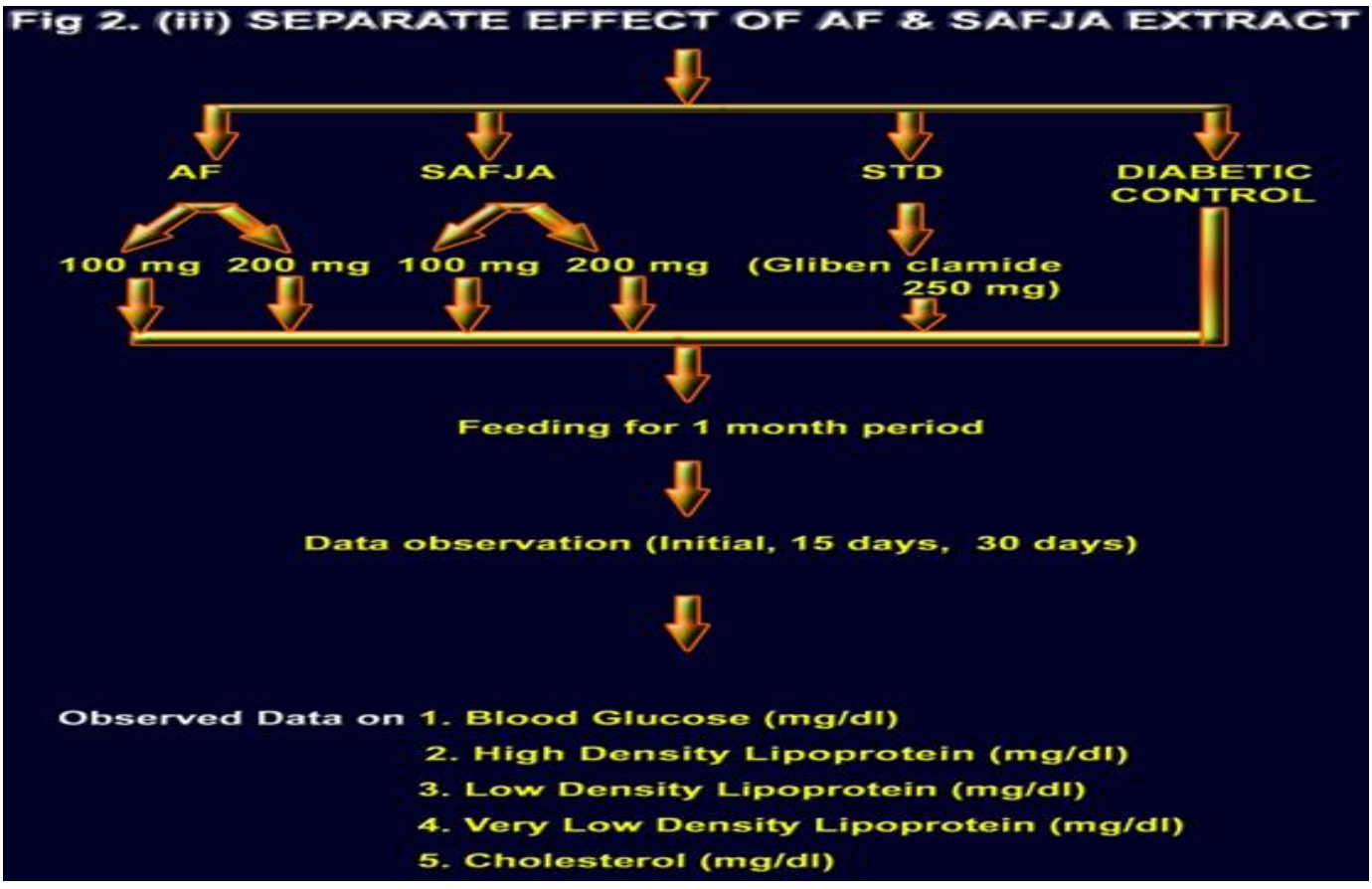
AswagandhaFruit(AF), Sirukurinjan leaves,Avaramflower, Fenugreek seeds, Jamun seeds and Amla fruit (SAFJA) were cleaned, washed dried and powdered. Sirukurinjan leaves,Avaramflower, Fenugreek seeds, Jamun seeds and Amla fruit (SAFJA) were mixed with equal amount and named as SAFJA extract. Aswagandha fruit powder and SAFJA powder (1:2) was extracted in boiling water for 2 hrs and concentrated to half of the volume by double boiling method. Then it was cooled and filtered thorough Whatman No 1 filter paper. The filtrate was centrifuged at 10000 rpm in Sorvall centrifuge at room temperature (32ºc) and the supernatant of the extract was concentrated up to 100ml.The concentrated crude extract was dried and made in to powder and used for the study.

- **Animals**

The study was carried out in the approved animal house facility of Department of Pharmacology, Periyar College of Pharmaceutical Sciences College for Girls, Trichy. Albino rats of Wistar strain weighing about 150-200g obtained from Venkateshwara enterprises, Bangalore, were used for the study. They were fed with a standard rat pellet diet (SaiDurga Feeds, Bangalore) and water was provided adlibitum and maintained under laboratory conditions temperature: 24-28ºC and relative humidity: 60-70 %. Animals described as fasted were deprived of food for 16 hour but had free access to water. Clearance for the handling of experimental animals was obtained from the ethical committee. (Committee for the Purpose of Control and Supervision of Experiments on Animals.(CPCSEA).

Effect of AF& SAFJA extract Hyperglycemia was induced by single intra peritoneal injection of freshly prepared aqueous solution of Alloxan monohydrate (SD fine chemicals Pvt.Ltd.,Biosar) (150 mg/kg)to overnight fasted rats . Animals that did not develop hyperglycemia after 48 hr of Alloxan injection were rejected .Immediately after confirmation of diabetes, rats were classified into six groups of six rats each as given below.

Groups	Treatment
I	AF extract (100 mg)
II	AF extract (200 mg)
III	SAFJA extract (100 mg)
IV	SAFJA extract (200 mg)
V	Standard (Glibenclamide)
VI	Diabetic control



IV. RESULTS AND DISCUSSION

Changes in blood glucose level of diabetic rats after supplementation of AF and SAFJA extract are presented in table1.

Group	Treatments	Blood glucose values (mg/dl)			Difference
		Initial	15 thday	30 thday	
I	AF extract (100 mg)	138	111	105	↓33
II	AF extract (200 mg)	142	98	90	↓52
III	SAFJA extract (100 mg)	139	109	106	↓33
IV	SAFJA extract (200 mg)	136	117	95	↓41
V	Standard(250mgGlibenclamide)	158	99	86	↓72
VI	Diabetic control	200	209	209	↑9

Table: 1 Mean Blood Glucose Levels (Mg/Dl) Of Diabetic Rats

(AF denotes Aswagandha fruit SAFJA denotes S-Sirukurinjanleaves, A-Avaram flower, F-Fenugreek seed, J-Jamun seed and A-Amla)

	SED	CD (0.05)	CD (0.01)
T	3.78424	2.47737	6.55449 **
B	7.63869	6.68453	17.68561**
TB	10.21079	5%070	13.23060 **

From the data recorded in the table it is clear that 100mg aswagandha and SAFJA extract did not show any significant changes in blood glucose which was 138→105mg/dl (group I) and139→106mg/dl(group III). While 200mg of both extract showed a significant decrease in blood glucose from142 to 90mg/dl (group II), from 136 to95mg/dl (group IV). The extract of both Aswagandha fruit (AF) extract and SAFJA showed anti hyperglycemic activity against Alloxan induced diabetic rats than controls. The result justifies the use of these extract for treating diabetes as suggested in folk role remedies.

Effect of AF extract and SAFJA extract on triglyceride level in diabetes induced rats.

Groups	Treatments	Triglycerides levels (mg/dl)			Difference
		Initial	15 thday	30th day	
I	AF extract (100 mg)	118	105	89	29
II	AF extract (200 mg)	135	128	98	↓37
III	SAFJA extract (100 mg)	129	115	93	↓36
IV	SAFJA extract (200 mg)	128	98	78	↓50
V	Standard (Glibenclamide)	98	85	79	↓19
VI	Diabetic control	123	118	115	↓8

Table: 2 Mean Triglyceride Levels (Mg/Dl) of Diabetic Rats

	SED	CD (0.05)	CD (0.01)
T	2.96262	1.93949	5.13142 **
B	5.98022	3.91497	10.35804 NS
TB	7.99388	5.23322	13.84580 **

Mean reduction triglyceride values for rats fed with AF extract 100 mg (group I) and 200 mg (group II) , SAFJA extract 100mg (group III) 200 mg (group IV) ,standard drug (group V) and diabetic control (groupVI) were 118→89mg/dl,135→98mg/dl,129→93mg/dl,128→78mg/dl, 98→79mg/dl and 123→115 mg/dl respectively.Reduction in triglycerides were more pronounced in AF extract and SAFJA extract at 200 mg. (group II& group IV) when compared to the standard drug. From these results it was noted that higher doses of both the extract showed significant reduction in triglyceride levels of diabetic rats.

Effect of AF extract and SAFJA extract on high density lipoprotein levels in diabetes induced rats.

Groups	Treatments	high density lipoprotein (mg/dl)			Difference
		Initial	15 thday	30th day	
I	AF extract (100 mg)	26	32	38	↑12
II	AF extract (200 mg)	32	41	46	↑14
III	SAFJA extract (100mg)	30	39	45	↑15
IV	SAFJA extract (20 mg)	19	28	37	↑18
V	Standard (Glibenclamide)	36	34	47	↑11
VI	Diabetic control	39	30	28	↓11

Table: 3 Mean High Density Lipoprotein Levels (Mg/Dl) of Diabetic Rats

	SED	CD (0.05)	CD (0.01)
T	0.97236	0.63656	1.68418 **
B	1.96276	1.28493	3.39961 **
TB	2.62367	1.71759	4.54432 **

The mean reduction in serum HDL cholesterol concentration were 26→38,32→46,30→45,19→37and 36→47mg/dl in group I,II,III,IV and V respectively. Feeding of both the extracts such as aswagandha and SAFJA extract at a dose level of 100 and 200 mg showed increased HDL cholesterol levels. A higher consumption 200mg/kgbw produced a significant effect on increase in HDL cholesterol level. Feeding of rats with 200mg of AF extract (group II) and SAFJA (group IV resulted a higher increase (32→46mg/dl, 19→37 mg/dl) in HDL cholesterol level compared to the other group where it was low in group I (26→38 mg/dl) .With respect to treatments the rats fed with SAFJA extract (group III&IV) had better increase in the HDL cholesterol level than the rats fed with the standard drug.

Effect of AF extract and SAFJA extract on low density lipoprotein levels in diabetes induced rats.

Groups	Treatments	Low density lipoprotein (mg/dl)			Difference
		Initial	15 thday	30th day	
I	AF extract (100 mg)	190.4	174	163.2	↓27.2
II	AF extract (200 mg)	204	198	141.4	↓62.6
III	SAFJA extract (100 mg)	214.2	182	162.4	↓51.8
IV	SAFJA extract (200 mg)	221.6	186	164.4	↓57.2
V	Standard (Glibenclamide)	181.4	149	135.2	↓46.2
VI	Diabetic control	148.4	248.4	247.8	↑99.4

Table: 4 Mean Low Density Lipoprotein Levels (Mg/Dl) of Diabetic Rats

	SED	CD (0.05)	CD (0.01)
T	5.16233	3.37954	8.94143 **
B	10.42046	6.82179	18.04876 **
TB	13.92923	9.11882	24.12613 **

The data recorded from the table is clearly noted that group I &group III(100 mg of aswagandha and SAFJA extract) did not show as much decrease in LDL level as in 200mg. Administration of 200mg of both the extract (group II& group IV) showed a significant decrease in LDL level (204→141.4 mg/dl, 221.6→164.4 mg/dl). The comparable effect of AF extract and SAFJA extracts with standard drug (Glibenclamide) suggest group II& group IV (200 mg of both extracts) having higher decrease in LDL level of selected rats than the standard drug. From the table it can be concluded that the dose of 200mg /kg bw of both the extracts was more pronounced than that of standard drug. The mechanism involved in the reduction of LDL cholesterol is presumably due to an increase in the catabolism of LDL or a reduction in the synthesis of LDL.

Effect of AF extract and SAFJA extract on very low density lipoprotein levels in diabetes induced rats.

Groups	Treatments	Very low density lipoprotein (mg/dl)			Difference
		Initial	15 thday	30th day	
I	AF extract (100 mg)	23.6	21	17.8	↓5.8
II	AF extract (200 mg)	27	25.6	19.6	↓7.4
III	SAFJA extract (100 mg)	25.8	23	18.6	↓7.2
IV	SAFJA extract (200 mg)	24.4	19.6	15.6	↓8.8
V	Standard (Glibenclamide)	19.6	17	15.8	↓3.8
VI	Diabetic control	24.6	25.6	26.2	↑1.6

Table: 5 Mean Very Low Density Lipoprotein Levels (Mg/Dl) of Diabetic Rats

	SED	CD (0.05)	CD (0.01)
T	0.59879	0.39200	1.03713 **
B	1.20869	0.79127	2.09350 *
TB	1.61567	1.05771	2.79843 **

Among the two doses, 200mg of AF extract (group II) and SAFJA extract (group IV) was more pronounced than that of standard drug. The mean reduction in serum VLDL concentrations were 23.6→17.8 mg/dl,27→19.6 mg/dl, 25.8→18.6 mg/dl,24.4→15.6 mg/dl and 19.6→15.8 mg/dl for the rats in group I, II, III, IV, V and VI respectively. Reduction in VLDL production might be due to the influence of the serum levels of LDL and has been correlated with the decreased incidence of coronary heart disease.

V. CONCLUSION

A summary of the results obtained from the study is presented in this chapter.

Separate effect of AF &SAFJA extracts

The extracts of both AF and SAFJA revealed significant reduction in blood glucose and lipid level in Alloxan induced diabetic rats. The extracts were found to produce a marked reduction in blood glucose & lipid concentration at tested dose level in a dose dependent manner. To study the optimum effective dose of AF and SAFJA extracts on blood glucose, different dose (100&200 mg/kgbw) of both extracts was given to Alloxanized rats. Among the two doses 200mg/kgbw of both the extract exhibited a more hypoglycemic and hypolipidaemic effect in rats.

VI. FUTURE THRUST

- Further study on clinical trial could be undertaken with larger samples for a longer period of time.
- Further study the formulation of capsule withaswagandha fruit extracts powder.
- Shelf life study of the capsule formation
- Economic feasibility of that capsule.

REFERENCES

[1]. Arora,Andrade, C and Wiedenfeld, H. Hypoglycemic effect of acosmiumpanamense bark on Streptozotocin induced diabetic rats. J.Ethno Pharmacology. 90(2-3):217-220.(2004).
[2]. Habiba, I., Ali ., Miller, J., Mohsen, A., Dunn, V and Nuaimie, J. Dietary fat reducing behaviours of Arab women with type II diabetes mellitus. Nutrition Research.23 (7): 835-845.(2003).
[3]. Hemalatha, S., Sachdeva, N ., Wahi, A,K., Singh, P.N and Chansouria, J.P.N. Effect of aqueous extract of fruit of Withaniacoagulans in glucose utilization by hemi diaphragm. Indian journal of natural products.V 21 (2):20-21.(2005).
[4]. Hemalatha, S., Wahi, A,K., Singh, P.N and Chansouria, J.P.N.. Hypoglycemic activity of Withaniacoagulansdunal in Streptozotocin induced diabetic rats. (2003).
[5]. Sridhar, S.B., Sheetal, U.D., Pari, M.R and Shastri, M.S. preclinical evaluation of the anti diabetic effect of the Eugenia jambolana seed powder in Streptozotocin induced diabetic rats. Braz.J. medi.biol.res.38(3):463-468. (2005).
[6]. Ravi, K., Ramachandran, B and Subramanian, S. Protective effect of Eugenia jambolana seed kernel on tissue antioxidants in Streptozotocin induced diabetic rats. Biological and pharmacological bulletin.27 (8):1212-1217.(2004).
[7]. Baskaran, K. Anti diabetic effect of a leaf extract from Gymnemasylvestre in non insulin dependent diabetes mellitus patients. J. Ethno Pharmocol.30:281-284.(1990).
[8]. JacboOral administration of RAC Alpha lipoic acid modulates insulin sensitivity in patients with type II diabetes mellitus: a placebo controlled pilot trial. Free Radic. Bio med .27(3-4):309-314. (1999).
[9]. Marles, F.J and Fransworth, N.R. Anti diabetic plants and their active constituents an update. Protocol. J. Nat.Med.Winter. : 85-111.(1996).