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Formulation and Evaluation of Polyherbal Capsules for Antidiabetic Activity

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Abstract

*Azadirachta indica (Neem), Tinospora cordifolia (*Guduchi*), Andrographis paniculata (Kalmegh), Moringa oleifera (Surjana), Momordica charantia (Karela) are well-known plants available throughout India and they are commonly used for the treatment of various diseases including diabetes mellitus. The antidiabetic activity of the individual plant parts is well known, but the synergistic or combined effects are unclear. The concept of polyherbalism has been highlighted in* Sharangdhar Samhita*, an Ayurvedic literature dating back to 1300 AD. Polyherbal formulations enhance the therapeutic action and reduce the concentrations of single herbs, thereby reducing adverse events. The aim of the present study was to evaluate physicochemical, phytochemical analysis of individual herbs, to formulate and evaluate capsule polyherbal formulation of aqueous extract and evaluate its antidiabetic potential. The physicochemical evaluations carried out in terms of foreign organic matter, moisture content, ash value, swelling index, extractive value. Qualitative analysis of various phytochemical constituents was determined by the well-known test protocol available in the literature. The polyherbal formulation contains the aqueous extracts of Neem,* Guduchi*, Kalmegh, Surjana and Karela. The quality of the finished product was evaluated as per the World Health Organization's guidelines for the quality control of herbal materials. The quality testing parameters of the polyherbal formulation were within the limits. α- Amylase inhibition activity of polyherbal formulation was studied. The results of the work indicate that the selected plants possessed considerable invitro anti diabetic activity and further these effects need to be confirmed using in vivo models for its effective utilization as therapeutic agents.*

Keywords: *Polyherbal formulation, Physicochemical, Phytochemical analysis, Antidiabetic activity.*

INTRODUCTION

Plants are very useful to mankind. Many of them are used exclusively for medicinal purposes. According to the World Health Organization (WHO), a medicinal plant is a plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes, or which are precursors for chemo-pharmaceutical semi-synthesis. Such plants are in great demand by pharmaceutical companies for their active ingredients [1, 2]. Diabetes mellitus is one of the most common disorders affecting almost 6% of the world population and the dynamics of the diabetes are changing rapidly in low- to middle-income countries [3]. According to International Diabetes Federation's (IDF) estimates, 80% of the world diabetic population will be from low- and middle-income countries in 2030. As per IDF 2011 report, China, India, and the United States of America have a diabetic population of 90.0, 61.3, and 23.7 million, which may be increased up to 129.7, 101.2, and 29.3 million, respectively, in 2030 [4]. Globally, diabetes is one of the six major causes of death and also causing various systemic complications. Diabetes mellitus is treated by hormone therapy (insulin) or by administering glucose-

lowering agents such as alpha-glucosidase inhibitors, sulfonylureas, biguanides, and thiazolidinediones. Development of an adverse event is one of the complications in the treatment of any systemic disorder; hence, many of the research institutes and pharmaceutical companies are involved in drug development to find the molecules with good therapeutic potential and less adverse events [5]. In the USA, 10-25% of patients experience an adverse drug reaction and these adverse drug reactions are responsible for 3.4-7.0% of hospital admissions [6]. In traditional systems of medicine, many plants have been documented to be useful for the treatment of various systemic disorders. Many of the traditional/indigenous systems of medicine are effective than the modern system of medicine, but they suffer from lack of complete standardization which is one of the important challenges faced by the traditional system of medicine. The concept of polyhedral formulation is well documented in the ancient literature. Compared to the single herb, the polyherbal formulation has better and extended therapeutic potential. Hence, the present study was planned to formulate and standardize a polyherbal formulation using a plant having known antidiabetic activity and evaluate its therapeutic effects in invitro model.

MATERIALS AND METHODS

Plant material

The herbs viz., of Neem (leaves), Guduchi (aerial part), Kalmegh (leaves), Surjana (fruits) and Karela (fruits) were collected in the months of Jan-Feb 2017 from the various sites of Malwa region, M.P. and identified & authenticated by Dr. Sumeet Dwivedi, Associate Professor and Head, Department of Pharmacognosy, Central India Institute of Pharmacy, Indore, M.P. and was deposited in Pharmacognosy Laboratory, Voucher specimen No. PCog/N/1, PCog/G/2, PCog/K/3, PCog/S/4 and PCog/K/5.

Chemical reagents

All the chemicals used in this study were obtained from Hi Media Laboratories Pvt. Ltd. (Mumbai, India), Sigma Aldrich Chemical Co. (Milwaukee, WI, USA), SD Fine-Chem. Ltd. (Mumbai, India) and SRL Pvt. Ltd. (Mumbai, India). All the chemicals used in this study were of analytical grade.

Physicochemical Evaluation

The air-dried powdered plant parts were subjected to standard procedure for the determination of various physicochemical parameters [7-9].

Determination of foreign organic matter (FOM)

100 g of the drug sample was weighed and spread it out in a thin layer. The foreign matter should be detected by inspection with the unaided eye or by the use of a lens (6X). The percentage foreign matter present was calculated in reference to drug sample.

Determination of moisture content (LOD)

10 g of drug (without preliminary drying) was accurately weighed in a tared evaporating dish and kept in oven at 105^0 C for 5 hours and weigh. The percentage loss on drying with reference to the air-dried drug was calculated.

Determination of ash value

The determination of ash values is meant for detecting low-grade products, exhausted drugs and sandy or earthy matter. It can also be utilized as a mean of detecting the chemical constituents by making use of water-soluble ash and acid insoluble ash.

Total ash

3 gm of air-dried powder was weighed in a tared silica crucible and incinerated at a temperature not exceeding 450^0C until free from carbon, cooled and weighed and then the percentage of total ash with reference to the ssair-dried powdered drug was calculated. The percentage of total ash with reference to the air-dried drug was calculated.

Acid insoluble ash

The ash obtained in the above method was boiled for 5 minutes with 25ml of dilute HCl. The residue was collected on ash less filter paper and washed with hot water, ignited and weighed. The percentage of acid insoluble ash was calculated with reference to the air-dried drug.

Water soluble ash

The ash obtained in total ash was boiled for 5 minutes with 25 ml of water. The insoluble matter was collected on an ash less filter paper, washed with hot water and ignited to constant weight at a low temperature. The weight of insoluble matter was subtracted from the weight of the ash. The difference in weights represents the water-soluble ash. The percentage of water-soluble ash with reference to the air-dried drug was calculated.

Determination of swelling index

Swelling index is determined for the presence of mucilage in the seeds. 1 g of the sample was placed in 150 ml measuring cylinder, to this 150 ml of distilled water was added and was kept aside for 24 hours with occasional shaking. The volume occupied after 24 hours of wetting was measured.

Determination of extractive value

This method determines the amount of active constituents extracted with solvents from a given amount of medicinal plant material. It is employed for materials for which as yet no suitable chemical or biological assay exists.

Extraction of Plant Material

The shade dried coarsely powdered plant material of Neem (leaves), Guduchi (aerial part), Kalmegh (leaves), Surjana (fruits) and Karela (fruits) (250gms) were loaded in Soxhlet apparatus and was extracted with water until the extraction was completed. After completion of extraction, the solvent was removed by distillation. The extracts were dried using rotator evaporator. The residue was then stored in desiccator and percentage yield were determined [10, 11].

Preliminary Phytochemical Screening of Extract

The aqueous extract obtained after extraction were subjected for phytochemical screening to determine the presence of various phytochemical present in the extracts. The standard procedure was adopted to perform the study [12, 13].

Preparation of formulation (PHF: Capsule)

The formulation preparation began with trials by adding a different ratio of binders and selecting the quantity of lubricants and preservatives, and finally the procedure was optimized. Aqueous extracts of Neem (leaves), Guduchi (aerial part), Kalmegh (leaves), Surjana (fruits) and Karela (fruits) were finely powdered (sieve 40), and mixed in the ratio as mentioned in Table 1 and taken for the preparation of capsules using herbal excipients. The blended powders from the optimized batch were filled in capsules colored yellow-red of size "0" in a capsule filling machine. The capsules were then deducted and transferred into poly bags, labeled, and the samples were evaluated as per the testing requirements. Each 100 mg of herbal capsule contained the extracts of Neem (leaves), Guduchi (aerial part), Kalmegh (leaves), Surjana (fruits), Karela (fruits) and excipients.

Table 1 Preparation of Poly Herbal Formulation (Capsule)

S/No.	Ingredients	Quantity (in mg)				
		HF1	HF2	HF3	HF4	HF5
1.	AEN	5	10	15	20	25
2.	AEG	10	15	20	25	5
3.	AEK	15	20	25	5	10
4.	AEKa	20	25	5	10	15
5.	AES	25	5	10	15	20
6.	FSP	15	15	15	15	15
7.	BFP	5	5	5	5	5

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8.	SP	5	5	5	5	5
	Net Weight	**100**	**100**	**100**	**100**	**100**

Abbr.: AEN=Aqueous extract of Neem Leaves, AEG=Aqueous Extract of Gudchi Aerial Part, AEK=Aqueous extract of Kalmegh Leaves, AEKa=Aqueous extract of Karela Fruits, AES=Aqueous extract of Surjana Fruits, FSP=Fennel seed powder, BFP=Butea flower powder, SP=Stevia powder

PREFORMULATION STUDIES

Preformulation parameters such as bulk density, tap density, Carr's index, Hausner's ratio, and angle of repose were determined for the laboratory granules [14, 15].

Bulk density

Bulk densities were determined by pouring gently 25 gm of sample through a glass funnel into a 100 ml graduated cylinder. The volumes occupied by the sample were recorded. Bulk density was calculated by the using following formula:

Bulk density (g/ml) = weight of sample in gms/ volume occupied by the sample

Tapped density

Tapped densities were determined by pouring gently 25 gm of sample through a glass funnel into a 100 ml graduated cylinder. The cylinder was tapped from height of 2 inches until a constant volume was obtained. Volume occupied by the sample after tapping were recorded and tapped density was calculated.

Tapped density (g/ml) = weight of sample in gms/ volume occupied by the sample

Compressibility index

It is also one of the simple methods to evaluate flow property of powder by comparing the bulk density and tapped density. A useful empirical guide is given by the Carr's compressibility.

Carr's index= TD-BD/TDX100

Hausner ratio

It provides an indication of the degree of densification which could result from vibration of the feed hopper.

Hausner ratio = Tapped density/ Bulk density

Lower Hausner ratio = Better flow ability, Higher Hausner ratio = Poor flow ability

Angle of repose

Flow properties of the physical mixtures of all the formulations were determined by calculating angle of repose by fixed height method. A funnel with 10 mm inner diameter of stem was fixed at a height of 2 cm. over the platform. About 10 gm of sample was slowly passed along the wall of the funnel till the tip of the pile formed and touches the steam of the funnel. A rough circle was drawn around the pile base and the radius of the powder cone was measured. Angle of repose was calculated from the average radius using the following formula.

$$\tan \theta = h/r$$

Where, θ = Angle of repose, h = Height of the pile, r = Average radius of the powder cone

Evaluation of polyherbal preparation

The polyherbal capsules were evaluated for their description, microbial load, uniformity of dosage units, weight variation, disintegration time, and moisture content, and compared with Indian Pharmacopoeial standards [16, 17].

Organoleptic Characters

The PHF (Capsule) were examined for their color and appearance. The color, odor, taste were observed.

Moisture content

Moisture content was determined by using IR moisture balance.

Ph

The pH was determined by pH meter.

Weight variation

Twenty capsules were individually weighed and the average weight of the capsule was calculated. The individual weights of each capsule should be within the limits of 90% and 110% of the average weight.

Disintegration time

Disintegration test was performed using disintegration test apparatus (Electro lab, Mumbai, India). One capsule was introduced into each tube and a disk was added to each tube. The assembly was suspended in water in a 1000 ml beaker. The volume of water at its highest point was at least 25 mm below the surface of the water and at its lowest point was at least 25 mm above the bottom of the beaker. The apparatus was operated and maintained at a temperature of 37 ± 2°C.

Drug content

Five randomly selected capsules were weighed, removed the cap and body and were powdered. The powdered equivalent to 100 mg drug in one capsule was taken and transferred in a 100 ml flask containing 100 ml of 0.1 N HCl pH 1.2. The flask was shaken on a flask shaker and was kept for few hours for the sedimentation of un-dissolved materials. The solution is filtered through Whatman filter paper. 10ml of this filtrate was taken and appropriate dilution was made. The samples were analyzed at specific wavelength using UV visible spectrophotometer. The drug content was determined from the standard curve prepared at λ max (260 nm).

Drug Release

Drug release was assessed by dissolution test under the following conditions: n = 6 (in triplicate), USP type II dissolution apparatus (Lab India, DISSO 2000) at 50 rpm in 900 ml of 0.1N HCl pH1.2 maintained at 37 ± 0.5˚C. The capsule was allowed to sink to the bottom of the flask before stirring. Special precaution was taken not to form air pockets on the surface of the tablet. Five milliliters of the sample was withdrawn by using a syringe filter at regular intervals and replaced with the same volume of pre warmed (37 ± 0.5°C) fresh dissolution medium. The drug content in each sample was analyzed after suitable dilution using UV spectrophotometer method at respective maximum wave length.

***In-vitro* Anti-diabetic activity**

α- Amylase Inhibition Activity

Alpha amylase enzyme is responsible for the metabolism of polysaccharides such as starch carbohydrate, etc. α- amylase solution (1:1) was prepared and kept in four test tubes. From the above test tube 1 ml solution was withdrawn and kept in another test tube for test. In spot plate two drop of iodine solution was placed in four rows, one row for each tube. To this add 0.5 ml of 1% starch solution and mixed it. Immediately one drop of solution was taken out and was placed in first tube and after 1 minute another drop of solution was taken and placed in second tube. The sampling was continuing after every one minute until all the starch has been digested and the colour of the tube is light brown or disappears. 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 all the formulation containing aqueous extracts of neem (leaves), gudchi (aerial part), kalmegh (leaves), surjana (fruits) and karela (fruits) was α-amylase inhibitory agent as the concentration of drug increases, the time of reaction is also increasing [18].

RESULTS AND DISCUSSIONS

The physicochemical evaluation of medicinal herbs viz., Neem (leaves), Guduchi (aerial part), Kalmegh (leaves), Surjana (fruits) and Karela (fruits) were carried out. Air dried material was used for quantitative determination of physiochemical values. In this study ash values (total ash, acid insoluble ash and water soluble ash), moisture content, swelling index and foreign organic matters were determined. Pet. ether, alcohol and water-soluble extractives were determined. Water soluble extractive was found to be very high in most of the extract when compared to other extractable matter in the drug. In some extract alcohol soluble extractive value

was recorded more, whereas pet. ether soluble extractive value was found to be least and present in Table 2. The crude extracts so obtained after the soxhletion extraction process, extracts was further concentrated on water bath for evaporate the solvents completely to obtain the actual yield of extraction. The percentage yields of aqueous extract of selected medicinal herbs along with their color, nature and pH were presented in Table 3. Phytochemical analysis of aqueous extracts of plants showed the presence of flavonoid, glycosides, phenol, alkaloids, carbohydrate, steriods & triterpenoids and saponins while, protein, glycosides and waxes, mucilage & gums were reported to be absent Table 4. Preformulation parameters such as bulk density, tap density, Carr's index, Hausner's ratio and angle of repose were studied and investigated for the granules. The results are presented in Table 5. The polyherbal capsules were evaluated for their description, uniformity of dosage units, weight variation, disintegration time and moisture content and compared with Indian pharmacopoeial standards. The results for various formulation i.e., PHF1 to PHF5 were presented in Table 6. From the detailed result it was found that the formulation code, PHF5 is showing better results as compared to other formulation. α-Amylase inhibition activity of optimized formulation HF-5 containing aqueous extracts of Neem (leaves), Guduchi (aerial part), Kalmegh (leaves), Surjana (fruits) and Karela (fruits) 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 (Table 7 and Fig. 1). Glibenclamide is a α- amylase inhibitory drug 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, (Table 8 and Fig. 2). The present study deals with the inhibition of α- amylase by HF-5 containing aqueous extracts of Neem (leaves), Guduchi (aerial part), Kalmegh (leaves), Surjana (fruits) and Karela (fruits). Formulation 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 increasing but as compare to standard drug they have little activity, have been presented. As the concentration of α-amylase increase the rate of reaction is also increase but the time of reaction decreases because of high concentration of α-amylase will digest the starch rapidly. From the observation it was found that the HF-5 contains aqueous extracts of Neem (leaves), Guduchi (aerial part), Kalmegh (leaves), Surjana (fruits) and Karela (fruits) having the α-amylase inhibition activity, but as compare to standard drug is less activity (Table 8 and Fig. 3).

Table 2 Physico-chemical evaluation of herbs

S/No.	Parameter	Values Obtained (% w/w)				
		Neem (leaves)	**Guduchi (Aerial Part)**	**Kalmegh (Leaves)**	**Surjana (Fruits)**	**Karela (Fruits)**
1.	Total Ash (TA)	4.3219	6.7018	5.4177	8.1460	5.9690
2.	Water soluble ash (WSA)	1.4162	2.4316	2.9628	3.4629	2.7468
3.	Acid Insoluble Ash (AIA)	0.8926	1.0628	1.1160	1.6251	1.2068
4.	Foreign Organic Matter (FOM)	0	0	0	0	0
5.	Swelling Index (SI)	9.52	1.10	1.15	7.43	8.48
6.	Loss on Drying (LOD)	1.10	2.56	1.52	4.16	3.09
7.	Water soluble extractive value	25.12	35.23	8.65	22.20	33.10

8.	Alcohol soluble extractive value	18.92	20.41	22.49	14.94	24.56
9.	Pet. ether soluble extractive value	11.50	9.58	12.41	27.30	18.32

Table 3 Percentage yield, color, nature and pH of aqueous extracts of herbs

S./No.	Extract	Estimated percentage (%w/w)	Color of extract	Nature of extract	pH
1.	AENL	12.92	Green	Solid Powder	7.03
2.	AEGAP	15.39	Light Green	Solid Powder	7.05
3.	AEKL	18.25	Green	Solid Powder	7.00
4.	AEKaF	6.45	Dark Green	Solid Powder	7.02
5.	AESF	10.28	Green	Solid Powder	7.06

Abbr.: AEN=Aqueous extract of Neem Leaves, AEG=Aqueous Extract of Guduchi Aerial Parts, AEK=Aqueous extract of Kalmegh Leaves, AEKa=Aqueous extract of Karela Fruits, AES=Aqueous extract of Surjana Fruits

Table 4 Preliminary phytochemical screening of aqueous extract of herbs

S/No.	Constituents	Extracts of Medicinal Herbs				
		AENL	AEGAP	AEKL	AEKaF	AESF
1.	Carbohydrates	+	+	+	-	+
2.	Glycosides	+	+	+	+	+
3.	Alkaloids	+	+	+	+	+
4.	Protein & Amino acid	-	+	+	+	-
5.	Tannins & Phenolic compounds	-	-	+	+	+
6.	Flavonoids	-	+	+	+	-
7.	Fixed oil and Fats	-	+	+	-	-
8.	Steriods & Triterpenoids	+	+	+	+	-
9.	Waxes	-	-	-	-	-
10.	Mucilage & Gums	+	-	-	-	-

Table 5 Preformulation studies and results of flow properties

S/No.	Parameter	HF1	HF2	HF3	HF4	HF5

1.	Bulk Density (gm/ml)	0.580	0.561	0.489	0.522	0.542
2.	Tap Density (gm/ml)	0.662	0.610	0.517	0.579	0.581
3.	Car's Index (%)	12.38	8.03	5.41	9.8	6.71
4.	Housners Ratio	1.14	1.08	1.05	1.10	1.07
5.	Angle of Repose	22.11	25.92	23.69	21.12	20.57

Table 6 Evaluation of PHF (HF1 to HF5): Capsule

S/No.	Evaluation Parameters	Observations				
		HF1	**HF2**	**HF3**	**HF4**	**HF5**
1.	Color	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown
2.	Odor	Characteristics	Characteristics	Characteristics	Characteristics	Characteristics
3.	Taste	Bitter	Bitter	Bitter	Bitter	Bitter
4.	Nature	Powder	Powder	Powder	Powder	Powder
5.	Size of capsule	0	0	0	0	0
6.	Color of Cap	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown
7.	Color of body	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown
8.	Moisture Content	1.15% w/w	1.09% w/w	1.05% w/w	0.98% w/w	0.94% w/w
9.	pH	6.9	7.1	7.0	7.3	7.3
10.	Average Weight	100 mg	100 mg	100 mg	100 mg	100 mg
11.	Weight Variations	90-110 mg	88-100 mg	92-102 mg	94-106 mg	98-102 mg
12.	Disintegration Time	10 min 30 sec	09 min 10 sec	07 min 30 sec	06 min 40 sec	04 min 40 sec
13.	Drug Content	90.44	93.41	96.59	98.31	99.87
14.	Drug Release (30 mts)	87.14	90.18	94.20	96.62	97.42

Table 7 Control tube of amylase solution

S/No.	Amylase Solution	Buffer Solution (pH 6.8)	Time Until Starch Diffuse
1.	1ml tube+ 0.5ml starch sol^{n}+ 2% amylase sol^{n}	20 drops	17
2.	1ml tube+ 0.5ml starch sol^{n}+ 1% amylase sol^{n}	20 drops	13
3.	1ml tube+ 0.5ml starch sol^{n}+ 0.5% amylase sol^{n}	20 drops	10
4.	1ml tube+ 0.5ml starch sol^{n}+ 0.25% amylase sol^{n}	20 drops	7

Table 8 Observation of standard drug (Glibenclamide) on α-amylase inhibition

S/No.	Amylase Solution	Buffer Solution (pH 6.8)	Time Until Starch Diffuse
1.	1ml tube+ 0.5ml starch sol^{n}+ 2% amylase sol^{n}+ 2% std^{n} drug sol^{n}	20 drops	13
2.	1ml tube+ 0.5ml starch sol^{n}+ 1% amylase sol^{n}+ 1% std^{n} drug sol^{n}	20 drops	18
3.	1ml tube+ 0.5ml starch sol^{n}+ 0.5% amylase sol^{n}+ 0.5% std^{n} drug sol^{n}	20 drops	21
4.	1ml tube+ 0.5ml starch sol^{n}+ 0.25% amylase sol^{n}+ 0.25% std^{n} drug sol^{n}	20 drops	24

Table 9 Observation of HF-5 on α-amylase inhibition activity

S/No.	Amylase Solution	Buffer Solution (pH 6.8)	Time Until Starch Diffuse
1	1ml tube+ 0.5ml starch sol^{n}+0.25ml amylase sol^{n}+ 0.25% HF-5	20 drops	11
2	1ml tube+ 0.5ml starch sol^{n}+ 0.5ml amylase sol^{n}+ 0.5% HF-5	20 drops	16
3	1ml tube+ 0.5ml starch sol^{n}+ 1ml amylase sol^{n}+ 1% HF-5	20 drops	20
4	1ml tube+ 0.5ml starch sol^{n}+ 2ml amylase sol^{n}+ 2% HF-5	20 drops	21

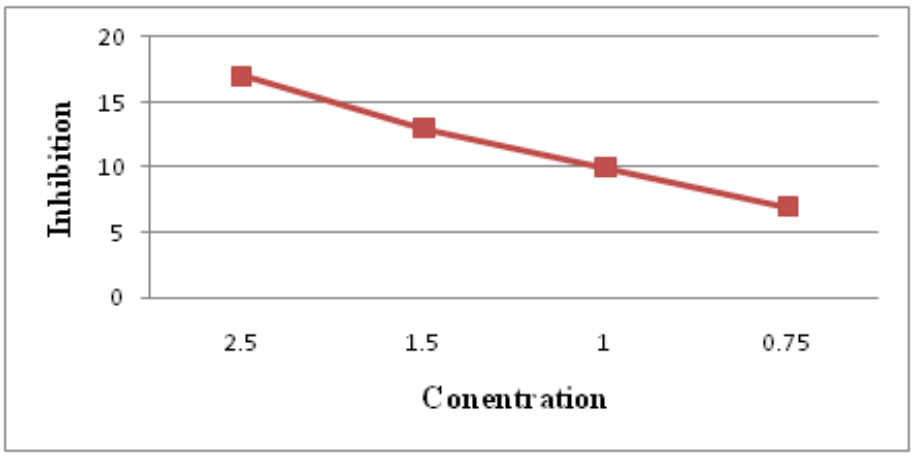

Figure 1 α- Amylase inhibition activity of control group

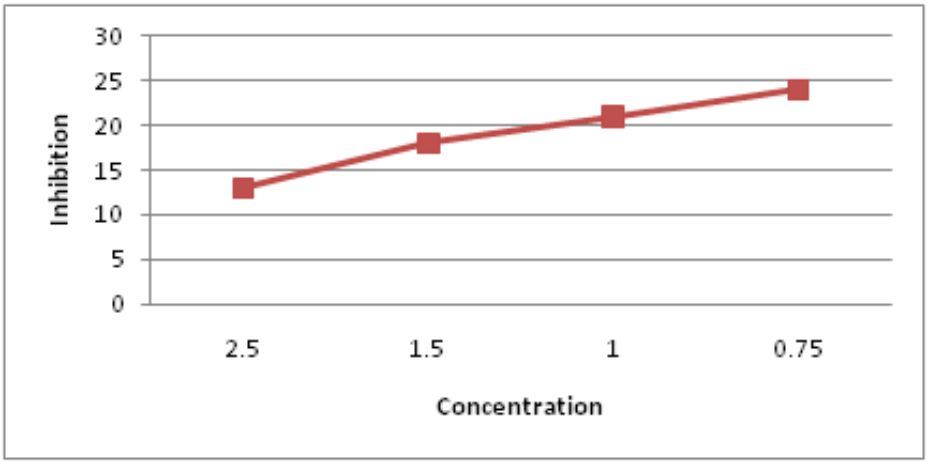

Figure 2 α- Amylase inhibition activity of standard group

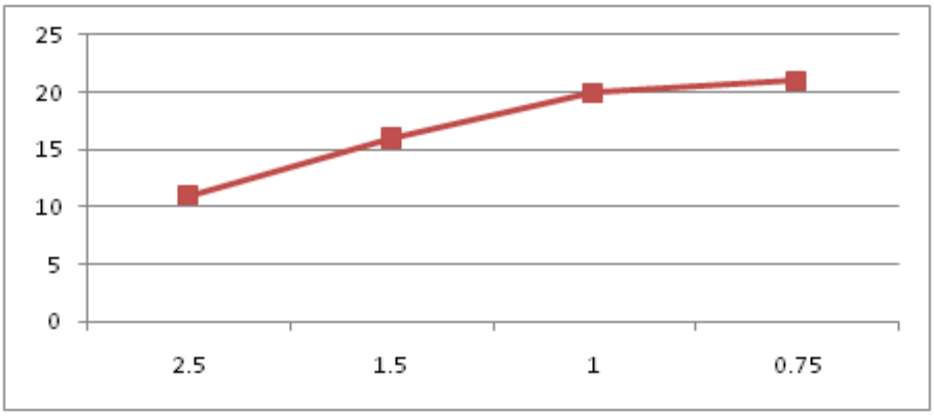

Figure 3 α- Amylase inhibition activity of HF-5

CONCLUSION

From the data of physicochemical analysis it was concluded that the plants has optimum level of carbon content which was establish by the ash content data. Other parameter so found was within the limit as per WHO guideline for standardization of medicinal plants. From the results of preliminary phytochemical screening it was concluded that the aqueous extracts of selected herbs contained various phytochemicals such as alkaloids, glycosides, saponins, carbohydrates etc. Preformulation parameters such as bulk density, tap density, carr's index, hausner's ratio and angle of repose were studied and was found within the limit. The polyherbal capsules were formulated and evaluated for their description, uniformity of dosage units, weight variation, disintegration time and moisture content. The results for various formulation i.e., HF1 to HF5 were presented. From the detailed result it was found that the formulation code, HF5 is showing better results as compared to other formulation codes. Hence, formulation HF5 was chosen for *In-vitro* antidiabetic activity. From the result obtained it was found that the HF-5 containing aqueous extracts of Neem (leaves), Guduchi (aerial part), Kalmegh (leaves), Surjana (fruits) and Karela (fruits) having the α-amylase inhibition activity when compared to standard drug. Further in vivo investigations should be done for confirming the anti diabetic activity of these plants. The plant extracts understudy can serve as therapeutic agents and can be used as potential sources of novel bioactive compounds for treating Diabetes mellitus type 2.

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