



CODEN [USA]: IAJPBB

ISSN : 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**

SJIF Impact Factor: 7.187

<https://doi.org/10.5281/zenodo.20935889>Available online at: <http://www.iajps.com>

Review Article

**SPICE BLEND INTERVENTION –AN APPROACH TO
DIABETES MANAGEMENT****J. Annapurna*¹, K Susmitha², R Kusuma³**¹Assistant Professor, Department of Chemistry, Veeranari Chakali Iamma Women's University.²Assistant Professor, Department of Chemistry, University College of Pharmaceutical sciences, Palamuru university.³Associate Professor, Bojjam Narasimhulu Pharmacy College for Women, Saidabad, Hyderabad, Telangana 500059**Abstract:**

Diabetes has become a dreadful lifestyle disorder over a period of time. Extensive research signifies the importance of combination therapies, spice therapy in specific. The present study aims at developing a spice blend using four seed spices, one rhizome and one non-conventional oilseed. These ingredients were proven to be containing phyto chemicals and bioactive principles known to work in managing and controlling many lifestyle diseases and disorders.

A blend of fenugreek (trigonella foneum), dry ginger (gingiber officinale), black pepper (Piper nigrum), ajwain (Trachyspermum ammi), flax seeds (Linum usitatissimum) and turmeric (Curcuma longa) was used after roasting and powdering. Subjects were chosen from pre diabetic and diabetic groups in an age group of 45-75 years. A daily intake of 5 gms two times/day was recommended for six weeks period. Results revealed decreased blood glucose (fasting, post-prandial and glycosylated haemoglobin).

Subjects have expressed that other related symptoms such as flatulence, constipation, heaviness and inertia were relieved along with significant weight loss. Pharmacokinetic studies have been done on individual spices and also for the blend for a better understanding of ADME properties, which is very important for understanding the glucose-lowering capacity of the blend.

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Please cite this article in press J. Annapurna et al., Spice Blend Intervention –An Approach To Diabetes Management, Indo Am. J. P. Sci, 2026; 13(06).

INTRODUCTION:

Geographical and ethical influences have exposed that people of Indian origin are highly prone to diabetes [1]. Prior to development of insulin injection therapy in 1921 diabetes was entirely managed with herbal medicine. The major chemical constituents of plants credited to anti-diabetic action are glycosides, alkaloids, glycans, triterpenes, mucilages, polysaccharides, oils, vitamins, saponins, glycoproteins, peptides, amino acids and proteins [2-3]. Thorough literature survey on the herbs with antidiabetic activity enabled us to select fenugreek (*Trigonella foneum*), dry ginger (*gingiber officinale*), black pepper (*piper nigrum*), ajwain (*Trachyspermum ammi*), flax seeds (*Linum usitatissimum*), and turmeric (*Curcuma longa*) for our investigation.

Fenugreek contains 4-hydroxy isoleucine which regulates the secretion of insulin, Galactomanans due to their hydrophilic character reduces glucose absorption in the digestive

Track and steroidal saponins are effective agents for the treatment of hypocholesterolemia, a disorder associated with Diabetes.[4] **Flax seeds** contain omega-3 fatty acid alpha-Linolenic acid and the soluble fiber of this helps in managing blood sugar levels. Antioxidant property of flax seeds due to high amounts of lignans improves insulin sensitivity and slow down the development of diabetes[5]. **Turmeric** improves insulin resistance and in combination with pepper increases absorption by 2000%. **Black pepper** naturally inhibits two enzymes that breakdown starch into glucose which helps to regulate blood glucose and glucose absorption[6]. The major active component of **ginger**, gingerol increases uptake of glucose into muscle cells without using insulin and manages high blood sugar levels.

Present study aims at developing a spice blend using six spices, to provide insights into the bioactive compounds of these spices and their molecular anti-diabetic mechanisms of action in pre diabetic and diabetic population.

METHODOLOGY:

A) preparation of a spice blend ;

Fenugreek (*Trigonella foneum*), dry ginger (*gingiber officinale*), black pepper (*piper nigrum*), ajwain (*Trachyspermum ammi*), flax seeds (*linum usitatissimum*) and turmeric

(*circuma linga*) were procured from local market of Hyderabad, Telangana.

All the ingredients were macroscopically identified and organoleptic evaluation was done for identification of sensory characteristics like colour, odour, taste, size and texture. The plant material was cleaned by sorting and wiping out using a cloth duster to remove dust and air blowing to remove minute sand particles.

The ingredients were individually roasted and powdered to obtain respective fine powders. Powder of each ingredient was thoroughly mixed together in a requisite proportion. The finished product thus obtained, was stored at room temperature under dry conditions.

B) Administration of the blend to volunteers from pre diabetic, diabetic with tablets and diabetic with insulin supplements ;

45 subjects were chosen from pre diabetic and diabetic groups in an age group of 45-75 years. A daily intake of 5 gms two times/day was recommended for six weeks period .

Monitoring the fasting ,post prandial and glycosylated haemoglobin before and after the test period ; Biochemical parameters such as fasting blood glucose, post prandial and glycosylated haemoglobin were tested before and after the test period.

C) To carry out physico- chemical analysis of the blend

i) Estimation of total ash; Powdered formulation (3 gm) was weighed accurately in a tarred silica crucible. It was incinerated by gradually increasing the temperature until free from carbon and cooled to room temperature. It was kept in desiccators and weighed. The percentage of total ash was calculated and compared to that of individual ingredients.

ii) pH suitable for the absorption of the powder; In vitro solubility test was performed maintaining the temperature at 37°C and at 100rpm using 0.1N HCl and pH 10 buffer which are the pH of stomach and the intestines. 1 gm of the powder was taken in a 100 ml standard flask. 0.1N HCl was added to this and stirred using a mechanical stirrer at 100 rpm. The mixture was allowed to settle and filtered. The same procedure was followed using 10 buffer and the filtrates were compared for turbidity..

RESULTS AND DISCUSSION:

Table I; formulation of spice blend

Common name	Scientific name	Quantity /100g
Fenu greek seeds	Trigonella foneum	20
ajwain	Trachy spermum ammi	15
sonthi	Gingiber officinale	20
Black pepper	Piper nigrum	20
Flax seeds	Linum usitatissimum	20
turmeric	Circuma linga	5

B)Administration of the blend to volunteers from pre diabetic, diabetic with tablets and diabetic with insulin supplements

Age group	Prediabetic subjects		Diabetics with tablets		Diabetes with insulin	
	men	women	men	women	men	women
45-50	5	4	2	1	-	-
50-55	4	3	1	1	-	-
55-60	4	1	1	2	-	1
60-65	3	2	1	-	2	-
65-70	2	1	-	-	-	-
70-75	2	1	-	-	-	1

Mean values of fasting, postprandial and glycosylated haemoglobin before and after test period;

Age group	FBS (mgs %)				PLBS(mgs%)				HbA1C			
	men		women		men		women		men		women	
	B	A	B	A	B	A	B	A	B	A	B	A
45-50	188	158	176	152	233	196	192	178	-	-	-	-
50-55	165	156	183	163	197	172	183	169	-	-	-	-
55-60	172	162	166	146	212	190	243	187	-	-	7.6	7.4
60-65	193	179	192	172	187	172	-	-	6.2	6.1	6.4	6.4
65-70	208	191	156	-	-	-	-	-	-	-	-	-
70-75	159	148	142	-	-	-	-	-	-	-	6.4	6.4

Pre diabetes is a status where in the blood glucose levels show slightly higher values indicating a tendency to develop diabetes. It is possible to reverse or atleast delay the condition by use of natural ingredients with biologically active compounds.

Subjects have also expressed that other related symptoms such as flatulence, constipation, heaviness and inertia were relieved along with significant weight loss

Pharmacokinetic studies have been done on individual spices earlier and were compared with the blend for better understanding of ADME properties.

Total ash value of the sample was estimated to be 2.58%. Solubility of the blend was observed to be more at pH 10 than that of at 0.1 pH, hence the

activity of the powder might be more when taken after the meal rather on an empty stomach where pH is alkaline.

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