WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Development Antidiabetic Potential Polyherbal Dry Powder Mixture

Smita Santosh Ware[1] A.S. Pandav[2], Dr. N. B. Chougule[3]

Student[1], Ashokrao Mane institute of Pharmacy, Ambap
Assistant Professor[2], Ashokrao Mane Institute of Pharmacy, Ambap
Professor[3], Ashokrao Mane Institute of Pharmacy, Ambap

ABSTRACT:

The prevalence of diabetes mellitus continues to rise globally, necessitating the exploration of alternative therapeutic strategies. Herbal medicines have garnered attention for their potential in managing diabetes due to their multifaceted pharmacological actions and perceived safety profiles. This study aimed to develop a polyherbal dry powder mixture (PHDPM) consisting of synergistic botanicals known for their antidiabetic properties. The formulation process involved the selection of herbs based on traditional knowledge and scientific evidence, followed by rigorous standardization to ensure consistent phytochemical composition and therapeutic efficacy

Key words: powder, evaluation, physicochemical parameter.

1. Intoduction

India is considered as the epicenter of the global diabetes epidemic and the diabetic capital in the world with the score of the second highest number of diabetic people in the world. It is estimated to have over 20 million diabetic cases which are estimated to increase to 57 million by 2025. Diabetes mellitus (DM) is the predominant public health concern disorder that causes substantial mortality, morbidity and long term health complications. It is basically the systematic metabolic disorder characterized by hyperglycemia, insulin resistance and relative insulin deficiency with disturbances of carbohydrate, fat and protein metabolism. It is increasing throughout the world at an alarming pace which is potential to cause grave complications India is considered as the epicenter of the global diabetes epidemic and the diabetic capital in the world with the score of the second highest number of diabetic people in the world. It is estimated to have over 20 million diabetic cases which are estimated to increase to 57 million by 2025. Diabetes mellitus (DM) is the predominant public health concern disorder that causes substantial mortality, morbidity and long term health complications. It is basically the systematic metabolic disorder characterized by hyperglycemia, insulin resistance and relative insulin deficiency with disturbances of carbohydrate, fat and protein metabolism. It is increasing throughout the world at an alarming pace which is potential to cause grave complications in the body over time like neuropathy, nephropathy, retinopathy, cardiovascular diseases, retinopathy and dyslipidemia. In today's scenario, about 90% of the young population accounts for the major share in the development of incidences of Type II diabetes due to the shift from the diurnal standard of our ancestors living to the sedentary lifestyle i.e. of unhealthy diet habits and less physical activity. It accounts for 150 million people worldwide, which are estimated to increase to 300 million by 2025. Worldwide, it has become one of the major crippling diseases that leads to a huge economic loss. There I the availability of various synthetic drugs including insulin and oral hypoglycemic agents which controls the level of blood sugar, but their cost, complications and limited tolerability and various side effects cause the reduction in its wide acceptance. Thus, it is notably one of the refractorydiseases identified by the Indian Council of Medical Research for whichthere is an alarming time for alternative medicine treatment. As per an estimate worldwide, about 12000 plants in the world are being used in medicinal purpose, but less than 10% out of them are investigated from the pharmacological point of view. [1-7]

Drug Profile:

1.1 Indrajao

Fig 1:Indrajao

Synonym : Wrightia tinctoria .

Family : Apocynaceae

"Indrajau" is distributed throughout the world and occurs abundantly in India. It is a deciduous tree with white fragrant flowers. The seeds and bark of this plant are used in Indian traditional medicine as anti-diarrheal and antidysenteric. .Wrightia tinctoria (W. tinctoria) were evaluated for antidiabetic activity. Type 1 diabetes (T1D) is a multifactorial disease associated with a combination of genetic and environmental factors resulting in the loss of insulin-producing β-cells in the pancreas. Numerous studies have reported a decreased T1D risk in the offspring of affected mothers compared to the offspring of fathers with T1D (1). Seroconversion to positivity for beta cell-specific autoantibodies, such as IAA, GAD A, IA-2A and ZnT8 A, strongly predicts progression to overt type 1[8,9].

Roasted Chickpea

Fig 2: Roasted Chickpea

Synonym : Fried Gram , Channa

Family : Fabaceae

Diabetes and hypertension are the major health concern and alleged to be of epidemic proportions. This has made it a numero uno subject at various levels of investigation. Glucosidase inhibitor provides the reasonable option in treatment of Diabetes Mellitus (DM) as it specifically targets post prandial hyperglycemia. The Angiotensin Converting Enzyme (ACE) plays an important role in hypertension .Chickpea flour supplemented white wheat bread

failed to suppress EI or reduce glycemic effect when consumed at a portion of 50 g available carbohydrate (Johnson et al. 2005), but not when pulses were eaten ad libitum 4 h before the test meal .chickpea is antidiabetic activity[10].

5.3.Almond

Fig 3:Almond

Synonym: Amygdalus communis, Badam

Family: Rosaceae

The objective was to assess effects of almond-enriched diets on insulin sensitivity and lipids in patients with normoglycemia or type 2 diabetes. Study 1 assessed the effect of almonds on insulin sensitivity in 20 free-living healthy volunteers who received 100 g almonds/d for 4 wk. Study 2 was a randomized crossover study that compared 4 diets in 30 volunteers with type 2 diabetes: 1) high-fat, high-almond (HFA; 37% total fat, 10% from almonds); 2) low-fat, high-almond (LFA; 25% total fat, 10% from almonds); 3) high-fat control (HFC; 37% total fat, 10% from olive or canola oil); and 4) low-fat control (LFC; 25% total fat, 10% from olive or canola oil). After each 4-wk diet, serum lipids and oral glucose tolerance were measured. Almond is antidiabetic activity.

Procurement of material

The different drug are selected for the study having antidiabetic product Indrajao powder, roasted chickpea , almond are collected in local Market. The raw material collected and with their respective antidiabetic activity.

Procedure :

- Collect the raw material like indrajao, almond,roasted chickpea
- Indrajao 100gm , almond 100gm ,and roasted chickpea 100gm take and grinded.
- Then they powder form and mixed.
- Powder is packed well container and well labelled.

Organoleptic Evaluation:

Organoleptic evaluation refers to the evaluation of the formulation by the color, odor taste, texture ,etc. The method adopted for the organoleptic evaluation was described in Wallis

Physiochemical parameters

a) Moisture content: Loss on drying is the parameter to keep the moisture content under check as the larger amount of moisture can promote hydrolytic reactions and can initiate the microbial growth. The moisture content was measured by the Gravimetric method and loss on drying was calculated. 2 g (W) sample was placed in a weighed preheated porcelain dish and then was kept in a hot air oven and dried at 105 °C till constant weight or two consecutive weights differing by 0.5mg was observed. Weight was taken after drying and was transferred to the desiccator to cool and then again porcelain dish was reweighed. The percentage of moisture content was calculated by following equation:

Moisture content (%) =

{(W1-W2)/W} ×100

Where,

W = Weight of the sample (2g)

W1 = Weight (g) of sample before drying

W2 = Weight (g) of sample after drying

Ash content: The ash values usually represent the inorganic residues such as phosphates, carbonates and silicates present in herbal drugs. These are important indices to illustrate the quality as well as purity of herbal medicine. The objective to evaluate is to remove all traces of organic matter, which may otherwise interfere in an analytical determination.

b) Total ash content - Empty silica crucible was weighed (W1). About 3g (W2) of the air-dried sample was added in the previously weighed crucible. The sample was ignited gradually in an electrical muffle furnace, increasing the heat to 1000°C until it is white, indicating the absence of carbon. Then it was cooled in a desiccator and reweighed (W3).

W1= Weight of empty silica crucible

W2= Weight of sample including crucible weight for ignition

W3= Final weight of sample including crucible weight after ignition

Total ash content was calculated as:

Total ash (%) =

$$\{(W3-W1)/(W2-W1)\} *100$$

c) Acid-insoluble Ash - 25ml of dilute HCl was added to the total ash containing crucible. It was then covered with watch-glass and boiled gently for 5 minutes. With 5ml of hot water, the watch glass was washed and the washings were added to the crucible. Then, the ashless filter paper was used to filter the insoluble matter and washed with hot water till the neutral filtrate was obtained. The filter paper containing the insoluble matter was transferred to the original crucible, dried on a hotplate and ignited to constant weight (W4). The residue was allowed to cool in a desiccator for 30 minutes and then reweighed.

W1= Weight of empty silica crucible

W2= Weight of sample including crucible weight for ignition

W3= Final weight of sample including crucible weight after ignition

W4= Constant weight after addition of HCl

Acid-insoluble ash content was calculated as:

Acid-insoluble ash (%) =

$$\{(W4 – W1) / (W2 – W1)\} *100$$

d) Water-soluble Ash - In the total ash containing crucible, 25ml of water was added and boiled. Boiling was done for 5 minutes and then through the ashless filter-paper, filtration was done causing collection of insoluble matter on it. Further, the filter was washed with hot water and then ignited in a crucible for 15 minutes at a temperature not exceeding 500 °C. The residue was allowed to cool in a desiccator for 30 minutes, and then re-weighed (W5), calculations were done as:

W1= Weight of empty silica crucible

W2= Weight of sample including crucible weight for ignition

W3= Final weight of sample including crucible weight after ignition

W6= Weight of residue = W5 – W1

W7= Weight of ash = W3 – W1

Water-soluble ash (mg/g) = W7-W6

Water-soluble ash was calculated as:

Water-soluble ash (%) =

$$(W7-W6) * 100$$

Flow Characteristics of powder (Rheological Parameters): The preformulation study is basically defined as the principal investigation technique in the development of the drug to obtain information on the previously known properties of the compound and propose the development schedule. Rheological characteristics of the formulated powder were studied and estimated like an angle of repose, bulk density, tapped density, and compressibility index.

a) Angle of Repose - An angle of repose was measured by the fixed funnel method, where a funnel was placed above the graph paper on a flat horizontal surface secured with its tip at a given height (h). Through the funnel, powder was poured until the tip of the funnel was just touched by the apex of the conical pile. The radius (r) formed on the base by the heap of the conical pile was measured.

h = Height of the cone

r =Radius of the cone base tan θ = h/r

The angle of repose (θ) was calculated as:

Angle of repose (θ) = tan-1 h/r

b) Bulk Density - Some amount of powder (M) was added into a dry 100 ml cylinder, without compacting. The powder was

M = Weight of sample

V = Apparent volume of powder. The bulk density (ρb) was calculated as:

Pb = M / Vo

c) Tapped Density - After following the procedure of apparent bulk density, the cylinder containing the sample was further undergone for the tapped density measurement. Initially, the sample was tapped 500 times, followed by additional taps of 750 times, then 1250 until the difference between succeeding measurement is less than 2% and then tapped volume (Vf) was measured.

M = Weight of sample

Vf = Tapped volume of powder

The tapped density (ptap) was calculated, in gm per ml, using the following formula.

Ptap = M / Vf

d) Carr's index - Carr's index is defined as the measure of the intensity of powder to be compressed. Its determination is done from the bulk and tapped density. In theory, it is believed that lower the compressibility of material, higher will be the flowability of the powder. As such, it is the measure of the relative importance of interparticulate interactions. In a free- flowing powder, such interactions are generally less significant, and the bulk and tapped densities will be closer in value. For poorer flowing materials, there are frequently greater inter-particle interactions, and a greater difference between the bulk and tapped densities will be observed. These differences are reflected in Carr's Index which is calculated using the following

Formula:

Carr's index = [(ρtap – ρb) / ρtap] / ×100

e) Hausner's Ratio - It is defined as an indirect index of ease of flow of powder which is calculated using the formula:

Hausner's Ratio= ρtap/ pb

Table no.1 Flow Characteristics of the Powder

Sr. No	Angle of repose	Hausner's ratio	Carr's index	Relatively flowability
1	25-30	1.00-1.11	<=10	Excellent
2	31-35	1.12-1.18	11-15	Good
3	36-40	1.19-1.25	16-20	Fair
4	41-45	1.26-1.34	21-25	Passable
5	46-55	1.35-1.45	26-31	Poor
6	56-65	1.46-1.59	32-37	Very Poor
7	>66	>1.60	>38	Extremely Poor

Angle of repose, Carr's index and Hausner's ratio values specifies the relative flowability of the powder within the specific range.

Result and Discussion:

1. **Organoleptic characteristic**: The organoleptic properties were evaluated and studied and it is represent in table.
2. **Table no.2 organoleptic characteristics**

Sr No.	Organoleptic Property	Result
1	Colour	Yellow
2	Odor	Characteristic
3	Taste	Bitter and Astringent

Evaluation of the organoleptic properties i.e colour , taste , and appearance of the PHP.

3. Physicochemical Parameters:

Table no.3 physicochemical parameter

Test	Result
Moiture content	10.5
Total Ash content	138.2
Acid insoluble ash	133.80
Water soluble ash	5.74

Moisture content is the major responsible for the deterioration of drugs and formulations.the presence of excessive amount of moisture in plant drug causes the hydrolysis of constituent, bacteria and fungi growth and biochemical reaction.

Ash content is the most important parameter for the quality control of herbal drug is the ash value. High ash value was in the adulteration, contamination, substitution or carelessness in preparing the drug . total ash value was indicate the concentration. The water soluble ash show the normal quality of the drug.

4. Flow Characteristics of powder

Parameters	Result
Angle of repose	45˚
Bulk density	0.42 g/ml
Tapped density	0.68 g/ml
Car's index	0.38 %
Hausner's ratio	1.61

Bulk density ,tapped density, and hausner's ratio of individual herb and PHP (%w/w)Carr's index and angle of repose indicate the compressibility and free flowing property of the powder. There range excellent floe property of the powder which is illustrated.

Reference

1. India. Nature Reviews Endocrinology 12(6): 357-370.
2. Tomy S, Azeez A, Abdalla FMA, Suresh R, Johnson B (2016) Antidiabetic effect of Polyherbal formulation "Kathakakhadiradi Kashyam" in Streptozotocin induced Diabetic rats. Journal of Young Unnikrishnan R, Anjana RM, Mohan V (2016) Diabetes mellitus and its complications in Pharmacists 8(4): 496-499.
3. Dwivedi C, Daspaul S (2013) Antidiabetic herbal drugs and Polyherbal formulations used for diabetes: A review. The Journal of Phytopharmacology 2(3): 44-51.
4. Nagja T, Vimal K, Sanjeev A (2016) Anti-diabetic activity of a polyherbal formulation in Strepzozotocin induced Type 2 Diabetic rats. Journal of Natural Remedies 16(4): 148-152.
5. Antora RA, Salleh RM (2017) Antihyperglycemic effect of Ocimum p…Wrightia tinctoria R.Br. (Family: Apocynaceae) commonly called "Indrajau" is distributed throughout the world and occurs abundantly in India. It is a deciduous tree with white fragrant flowers. The seeds and bark of this plant are used in Indian traditional medicine as anti-diarrheal and anti-dysenteric.
6. Ghosh A, Sarkar A, Mitra P, Banerji A, Banerji J, Mandal S, et al. Crystal structure and DFT calculations of 3,4-seco-lup20 (29)-en-3-oic acid isolated from Wrightia tinctoria: Stacking of supramolecular dimmers in the crystal lattice. J Mol Struct. 2010;980
7. Achenbach P, Warncke K, Reiter J, Naserke H, Williams A, Bingley P, et al. Stratification of type 1 diabetes risk on the basis of islet autoantibody characteristics. Diabetes.2004;53:384.

8. Ghosh A, Sarkar A, Mitra P, Banerji A, Banerji J, Mandal S, et al. Crystal structure and DFT calculations of 3,4-seco-lup-20 (29)-en-3-oic acid isolated from Wrightia tinctoria: Stacking of supramolecular dimmers in the crystal lattice. J Mol Struct. 2010;980: 7–12

9. Achenbach P, Warncke K, Reiter J, Naserke H, Williams A, Bingley P, et al. Stratification of type 1 diabetes risk on the basis of islet autoantibody characteristics. Diabetes.2004;53:384

10. Hall RS, Thomas SJ, Johnson SK. Australian sweet lupin flour addition reduces the glycemic index of a white bread breakfast without affecting palatability in healthy human volunteers. Asia Pacific J Clin Nutr 2005;14:91–97.