



## Polyherbal formulation for diabetes mellitus

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### Abstract

Over the centuries, herbal drugs have been used as major sources of medicine for the prevention and treatment of diseases. Based on the origin of material, Ayurvedic medicines are divided into 3 categories, particularly plants, mineral and animal. Among this, herbal formulation has gained nice importance and rising international attention recently. In recent years, there has been an exponential growth in the field of herbal medicines and these drugs are gaining popularity both in developing and developed countries because of their natural origin and less side effects. Polyherbal drugs have more advantage when compared with the individual form. Polyherbal drug also creates some problems. Diabetes mellitus requiring a multipronged therapeutic approach. There are numerous herbs have been recommended for treatment of diabetes. In the current scenario, the use of polyherbals is increasing among the diabetics. Polyherbal formulation shows additional effect on diabetes compared with single herbal drug.

**Keywords:** herbs, polyherbal formulation, anti-diabetic, ayurvedic

### Introduction

The treatment of injury or illness by plants or plant material, either in crude or processed state, is known as herbal drugs. Herbal formulation is the formulation consist of 1 or more than one herbs or processed herb or herbs in such quantity to produce specific organic process or cosmetic advantages, or different advantages meant to be used to diagnose or treat diseases in human or animals. Flavourer product has been used profusely over the years in solidifying many diseases. Natural product and connected structures are essential sources of latest prescription drugs, because of the vast style of functionally relevant secondary metabolites of microorganism and plant species.

Based on the origin of material, Ayurvedic medicines are divided into 3 categories, particularly plants, mineral and animal. Among this, herbal formulation has gained nice importance and rising international attention recently. This situation is clear as major increase in the herbal formulation usage has been ascertained throughout the last few years in developed world, wherever market expansion occurred in European countries and USA. The World Health Organization (WHO) estimates that eightieth of the world's inhabitants still believe in the main on traditional medicines for his or her health care. the invention of herbals is more complemented with information on the method of isolation, purification, characterization of active ingredients and sort of preparation. The term "herbal drug" determines the part/parts of a plant (leaves, flowers, seeds roots, barks, stems and etc.) used for getting ready medicines. every and each half of the herbs are fully used for the different pharmacologic action they will turn out and created into a variety of herbal preparations as well as Kwatha (Decoction), Phanta (Hot infusion), Hima (Cold infusion), Arka (Liquid Extract), Churna (Powders), Guggul (Resins

and balsams), Taila (Medicated oil) and etc. because of the scientific advancement nowadays, additional and additional pharmacologically active ingredients of the Ayurvedic medicines still as their utility in drug medical care are known. Basically, it's the phytochemical constituent within the herbals that lead to the specified healing impact, such as saponins, tannins, alkaloids, alkenyl phenols, flavonoids, terpenoids, phorbol esters and sesquiterpenes lactones. one herb might even contain additional than one in every of the said phytochemical constituents, that works synergistically with every alternative in producing pharmacologic action. In writing, herbals are famous to manage bodily functions, cleanse and nourish flesh. Every herb has 5 classes called rasa, veerya, vipaka, prabhava and karma.

### Herbal Drugs for Diabetic Mellitus<sup>[4-6]</sup>

Diabetes mellitus is a systemic metabolic disease characterized by hyperglycemia, hyperlipidemia, hyperaminoacidemia, and hypoinsulinaemia it leads to decrease in insulin, secretion and insulin action. Currently available therapies for diabetes include insulin and various oral antidiabetic agents such as sulfonylureas, biguanides,  $\alpha$  glucosidase inhibitors and glinides. Medicinal plants have always been an important source for finding new remedies for human health problems. Traditionally, numerous herbs have been recommended for treatment of diabetes. Also, antidiabetic effects of so many plants have been reported by many researchers. In most cases, however, these reports are confirmed by animal models and even *in vitro* studies and limited evidence exists about their clinical usefulness. The current review focused on the medicinal plants, the hypoglycemic actions of which have been supported by different clinical studies on diabetic patients. Some of the herbs for antidiabetic activity:

- Wattakaka volubilis (Local Name: Perun-kurinjan)
- Abrus precatorius (Local Name: Kundumani)
- Trigonella foenum graecum (Local name: fenugreek)
- Aloe vera and Aloe barbadensis
- Chamaecostus cuspidatus (Local name: insulin plant)
- Cinnamomum verum (Local name: cinnamon)
- Abelmoschus esculentus (Local name: okra)
- Azadirachta indica (Local name: Neem)
- Ocimum sanctum (Local name: holy basil)
- Lagerstoemia speciose (Local name: Crepe Myrtle)
- Momordica charantia (Local name: bitter gourd)

#### Classification of Herbal Antidiabetics <sup>[7]</sup>:

Based on the possible mechanism of action, reported plant antidiabetics may be classified as follow,

##### 1. Plants acting like insulin

- Momordica charantia
- Cuminum nigrum
- Panax ginseng
- Pongamia pinnata

##### 2. Plants increasing insulin secretion from beta cells of pancreas

- Panax ginseng,
- Azadirachta indica,
- Syzygium cumini,
- Eugenia jambolana,
- Pterocarpus marsupium,
- Euphorbia prostate,
- Fumaria parviflora,
- Bridelia ferruginous

#### Advantages of Herbal Formulation <sup>[8]</sup>

Herbal remedies have been used for huge number of years like conventional medicine. In fact, herbal medicine is the establishment of modern medicine. This medicine also has very less herbal side effects. Tragically, herbal medicine usually takes a backseat when compared with conventional drug therapy, which is a shame since herbal remedies offer lots of health benefits. In today's world, Herbal medicine most part used to treat intense and constant sicknesses.

- More affordable than conventional medicine
- Easier to obtain than prescription medicine
- Stabilizes hormones and metabolism
- Natural healing
- Strength in immune system
- Fewer side effects
- cost effective

#### Polyherbal Formulation <sup>[9-14]</sup>

Polyherbal formulation (PHF) is that, the use of more than one herb in a medicative preparation. The conception is found in Ayurvedic and alternative ancient medicative systems wherever multiple herbs in a very explicit quantitative relation could also be employed in the treatment of ill health. It's employed in these systems for the treatment of the many diseases, together with polygenic disorder. Traditionally, the Ayurvedic literature "Sarangdhar Samhita" dated centuries past in 1300 A. D has highlighted the conception of polyherbalism during this ancient medicative system. Within the ancient system of Indian drugs, plant formulations and combined extracts of plants are chosen instead of individual ones. It's renowned that Ayurvedic herbals are ready in a very variety of indefinite

quantity forms, within which principally all of them are PHF. Because synergism, polyherbalism confers some advantages that isn't offered in single seasoning formulation. The conception of solid formulation is well documented within the ancient literature. Compared to the only herb, the polyherbal formulation has higher and extended therapeutic potential.

Diabetes could be an upset characterised by augmented abstinence and postprandial glucose levels. The prevalence of polygenic disorder is probably going to be augmented by 35%. Globally, polygenic disorder is one among the six major causes of death and conjointly inflicting varied general complications. Diabetes mellitus is treated by internal secretion medical care (insulin) or by administering glucose lowering agents like, sulfonylureas, biguanides, and thiazolidinediones. Development of an adverse event is one among the complications within the treatment of any general disorder; thence, several of the analysis institutes and pharmaceutical corporations square measure concerned in drug development to seek out the molecules with sensible therapeutic potential and fewer adverse event. Within the USA, 10-25% of patient's expertise an adverse drug reaction and these adverse drug reactions square measure responsible for 3.4-7.0% of hospital admissions. Many healthful plants in ancient Indian medication had accustomed management the hyperglycemic condition and effectively maintain traditional glucose levels. several healthful plants have recently been evaluated for antihyperglycemic property and are tested for his or her effects. several polyherbal formulations having medication activity were conjointly have been evaluated.

Some commonly used medicines are,

1. Madhumegha churna
2. Naval churna
3. Triphala churna
4. Seenthil churna
5. Avarai kudineer

#### Polyherbal Drugs with Antidiabetic Activity <sup>[15-18]</sup>

##### Diasol

A polyherbal medicine formulation containing plant extracts of Eugenia jambolana, Foenum graecum, Terminalia chebula, Quercus, infectoria, cuminum cyminum, taraxacum officinale, Emblica officinalis, Gymnea sylvestre, Phyllanthus nerui and Enicostemma littorale Previous investigation showed Diasol reduces 63.4 nothing of glucose level in a very dose of 125 and 250 mg/kg and proven to be effective antidiabetic polyherbal formulation.

##### Diashis

A study was conducted on polyherbal formulation composed of eight medicative plants for the management of streptozotocin (STZ)-induced diabetes in rats. As oxidative stress is one of the implications of diabetes, the activities of hepatic inhibitor enzymes and metabolic enzymes were evaluated. The study discovered that treatment with 'Diashis' in STZ-induced diabetic rats resulted in a very vital recovery within the activities of viscus hexokinase, glucose-6-phosphate dehydrogenase, and glucose-6-phosphatase along the side correction within the levels of fast glucose, glycated hemoglobin, and liver and musculus glycogen. The aerophilic stress standing within the liver was corrected by 'Diashis' that was highlighted by the recovery within the activities of catalase, peroxidase, and glutathione-S-

transferase along with the correction within the amount of thiobarbituric acid reactive substances and conjugated diene. 'Diashis' wasn't found to possess any metabolic toxicity.

### Diabrid

A herbal based medicine formulation for maturity onset diabetic patients was clinically evaluated in sixty diabetic patients for 6 months. The clinical studies discovered that Diabrid was well tolerated in high doses and was found to be a possible medicinal drug in delicate and moderate diabetic cases (180-280 mg/dl). The glucose level was controlled among 2-8 week relying upon initial glucose level. No aspect result was ascertained. The symptom activity was dose dependent and gradual. The drug conjointly maintained the weight and blood pressure of diabetic patients. No injurious result was observed on excretory organ and liver.

### Diakyur

A polyherbal formulation (composed of *Cassia javanica*, *Cassia auriculata*, *Salacia reticulata*, *Gymnema sylvestre*, *mucuna pruriens*, *Syzygium jambolaum*, *Terminalia arjuna*), scientifically proven to be a possible medicine formulation in previous studies. It indicated that Diakyur has shown vital symptom activity yet as antilipid peroxidative activity in order that it will be used as an adjuvant alongside medical care treatment of medication to treat diabetes yet on delay the late complications of polygenic disease. So, concluded that Diakyur at a dose of 1600 mg/kg is safe for long term treatment in diabetic condition.

### Diabecon

A polyherbal formulation containing *Gymnema sylvestre*, *pterocarpus marsupium*, licorice, *Casearia esculenta*, *Syzygium cumini*, *Asparagus racemosus*, *Boerhavia diffusa*, *Sphaeranthus indicus*, *Tinospora cordifolia*, dicot genus *chirata*, genus *Tribulus terrestris*, *Phyllanthus amarus*, *Gmelina arborea*, *gossypium herbaceum*, *momordica charantia aristata*, *Aloe vera*, *Triphala*, rosid dicot genus *wightii*, *shilajeet*, *momordica charantia*, black pepper, *Ocimum sanctum*, *momordica charantia indicum*, *Curcuma longa*, genus *Rumex maritimus* is reported to extend peripheral utilization of glucose, increase hepatic and muscle glucagon contents, promote B cells repair and regeneration and increase c amide level. It's inhibitor properties and protects B cells from oxidative stress. It exerts insulin like action by reducing the glycated hemoglobin levels, normalizing the microalbuminuria and modulating the supermolecule (lipid) profile. It minimizes long term diabetic complications. Previous Studies conjointly revealed that Diabecon may be a safe drug to prevent complications like retinopathy in diabetic patients. Diabecon resolved retinal and vitreal haemorrhages and its subsequent interference. It conjointly increased the absorption of hard and soft exudates by anti-inflammatory properties Studies concluded that Diabecon will be used as an adjuvant with typical treatment in non-insulin-dependent diabetes mellitus and insulin-dependent diabetes mellitus patients.

### Dia-Care

A seasoner formulation containing Sanjeevan Mool; Himej, Jambu beej, Kadu, Namejav, neem chal is claimed to be effective for each type 1, type 2 polygenic disease among 90

days of treatment and cures among 18 months. Persons taking hormone can eventually be liberated from the dependence it. the total treatment completes in 6 phases, every section being of ninety days. Approx. 5 grams powder is mixed with 1/2 glass of water, stirred properly, unbroken overnight and filtered. The filtrate is taken within the morning on empty stomach. To the remaining drugs fresh water is other and unbroken for the whole day and is consumed 0.5 an hour before dinner. The style of the drug is extremely bitter. it's a pure herbal formula without any aspect effect.

### Diabetes-Daily Care

Diabetes-Daily Care containing Alpha Lipoic Acid, Cinnamon four-dimensional Extract, Chromax, Vanadium, Fenugreek 500th extract, *Gymnema sylvestre* 25th extract, *momordica* 7-membered extract, licorice root 2 hundredth extract is a distinctive, Natural Formula, which effectively and safely Improves Sugar Metabolism.

### Diabecure

A formulation containing *juglans regia*, *berberis vulgaris*, *Erythrea magnoliopsid* genus, *Millefolium*, *taraxacum* effective in lowering the glucose level.

### Diabeta

A formulation containing *Gymnema sylvestre*, *vinca rosea* (Periwinkle), *curcuma longa* (Turmeric), *azadirachta indica* (Neem), *Pterocarpus marsupium* (Kino Tree), *momordica charantia* (Bitter Gourd), *Syzygiumcumini* (Black Plum), *tree arabica* (Black Babbul), *Tinospora cordifolia*, *zingiber officinale* (Ginger) accessible within the capsule type is an anti-diabetic with combination of well-tried anti-diabetic fortified with potent immuno-modulators, antihyperlipidemics, anti-stress and hepatoprotective of plant origin. The formulation of diabeta relies on ancient ayurvedic references, further supported through modern analysis and clinical trials. Diabeta acts on totally different sites in differing ways that to effectively management factors and pathways resulting in diabetes. It attacks the various factors, that precipitate the diabetic condition, and corrects the degenerative complications, that result because of polygenic disorder. Micronase is safe and effective in managing diabetes as a single agent supplement to artificial anti-diabetic drugs. Micronase helps overcome resistance to oral hypoglycemic medicine once used as adjuvant to cases of uncontrolled polygenic disorder. Diabeta confers a way of well-being in patients and promotes symptomatic relief of complaints like weakness giddiness, pain in legs, body ache, polyuria and pruritis.

### Glyoherb

A polyherbal formulation was evaluated for its antihyperglycemic, antihyperlipidemic and antioxidant effects against normal and streptozotocin-induced diabetic rats. Glyoherb sugar management granules possess potential antidiabetic activity because it lowers serum glucose levels and will increase glucose tolerance in STZ-induced type 1 diabetic rats. This polyherbal formulation additionally possess vital antihyperlipidemic activity because it lowers serum steroid alcohol and triglyceride levels. Glyoherb failed to exert any toxic effects in STZ-induced impaired kidney and liver functions. It had been rather found to be up excretory organ and liver functions. additionally, Glyoherb

possesses potential inhibitor activity because it decreases macromolecule peroxidation and enhances antioxidant standing in diabetic rats. The antidiabetic activity of Glyoherb attributed to its antioxidant properties also. Therefore previous analysis ended that Glyoherb is also regarded as a promising natural and safe remedy for the prevention or delay of diabetic complications.

### Okudiabet

Studies on formulation containing stachytarpheta angustifolia, alstonia congensis bark and Xylopia acthiopica fruits extract showed that polyherbal formulation was effective in decreasing plasma aldohexose levels within the diabetic rats and verified to own a stronger plasma glucose lowering result that glibenclamide and additionally having smart reducing effect on vascular system. The high LD fifty worth (16.5g/kg) indicates that formulation may be safe for North American country.

### Advantages of Polyherbal Formulation [19-24]

Polyherbal Formulation (PHF) are known to express high effectiveness in a vast range of diseases. As said, the therapeutic result of herbal medicines are exerted because of the presence of various phytoconstituents and also the effects are additional potentiated once compatible herbals are developed along in PHF. Until date, several researches are done on PHF to judge their effectiveness and these are printed on international journals. For example, Srivastava *et al.* in their study have reported variety of anti-diabetic PHFs like Dihar, Diabet, Diasol, Dianex, DRF/AY/5001, Diashis, Diabrid, Diakyur, Diasulin and etc. that are confirmed to possess compatible result as those of normal allopathic drug. During applied mathematics study performed in kingdom, it had been noted that the most reason underlying the utilization of medical herbalism is that the effectiveness and favorable outcomes of the treatment. Second, PHF are sometimes found to possess wide therapeutic vary. Most of them are effective even at an occasional dose and safe at high dose, so they need superior risk to profit magnitude relation. An honest example is the symptom PHF "Diakyur" employed in polygenic disease. Joshi, reported that through acute toxicity check, Diakyur at a high dose of 12800 mg/kg shows no toxic symptoms within the experimental animals up to 72, whereas acute toxicity checks reveals that this PHF is safe for long run treatment at the dose of 1600 mg/kg. Their sequent study additionally well-tried that the PHF shows symptom and inhibitor at the dose of 1600 mg/kg. This is often in contra with sulfonylureas, the allopathic symptom medicine like hypoglycemic agent, glipizide and glicazide that are known to possess slender therapeutic index. Often, PHF (confined to those fitly factory-made and used) lead to fewer aspect effects as compared to allopathic medicine. though trendy allopathic medicine are designed for efficacious therapeutic results, administration of most of them keep company with unwanted side effects, like sleep disorder, vomiting, fatigue, dry mouth, diarrhoea, seizures, impotency, confusion, hair loss, organ toxicities and even death! Patients prescribed with non-steroidal medication medicine for autoimmune disorder (RA) treatment could expertise chiefly canal and nephritic aspect effects, as well as indigestion, stomachic ulceration, salt and fluid retention, yet as cardiovascular disease. For this, they will elect Ayurvedic treatment within which these aspect effects are absent or lowest. Through

study, one year Ayurvedic treatment exploitation internal herbal medicines where shown to lead to a positive result in most patients, while not proof of organ toxicities. Besides, Jawa; reported that in their study, none of the five hundred form respondent found adverse effects of herbal medicine and 48% of them like Ayurvedic system within the case of common ailments. It looks that the side-effect criterion affects the medication system acceptance by the general public. Because of the very fact that PHFs are a product of the character, they're comparatively cheaper, eco-friendly and without delay out there than allopathic medicine. Their higher affordability and larger accessibility account for increasing demand globally, particularly in rural areas and a few developing countries, wherever expensive trendy treatments aren't out there. Moreover, throughout the history, polyherbal remedies have long stand as ancient beliefs, norms and practices in sure tribes, that are supported centuries' previous expertise of trials and errors. place it merely, PHF are additional without delay acceptable culturally and socially. All the top of reasons: Effectiveness, safety, cheap, ubiquitousness and higher acceptance, created PHF a perfect treatment of alternative, thence higher compliance by the patients and glorious therapeutic result is ensured.

### Major Problems Related to Polyherbal Formulation Usage [25-41]

Despite the actual fact that Ayurvedic PHFs square measure useful to world in several aspects, they're still challenged by some inescapable drawbacks, touching their ability and efficaciousness in treatments. These issues lie inside the PHFs' sources and producing method, patients, Ayurvedic practitioners, also because the law and laws. there's a robust thought that Ayurvedic PHF are always safe, that is untrue. Charaka Samhita itself has delineated that Ayurvedic medicines have adverse effects once ready or used unsuitably. The synchronic use of PHF with allopathic medication is increasing as most of the individual patients don't inform their medical practitioners on the concomitant treatments. But, several haven't noted the potential drug-herb interactions, which can have an effect on their medicine or materia medica effects, later ends up in adverse effects that deteriorate health. Several Ayurvedic herbs unremarkably utilized in formulation of PHFs square measure reported to contribute to drug-herb interactions. The clinical reliableness of Ayurvedic PHFs is difficult to attain. Ayurvedic accumulation of Asian nation, additionally called "Ayurvedic formulary of Asian nation," provides monographs on the preparation of Ayurvedic PHF, therefore power-assisted in standardizing the preparation of Ayurvedic PHFs. Still, this could not satisfy to make sure reliableness of each batch of PHFs. Charaka Samhita has stressed on the factors to be thought of whereas choosing the beginning material of the PHFs, as well as surround, season within which it grows, harvest home conditions, technique of storage and pharmaceutical process. But, the constituents of crude raw herb materials might vary as an impact of various geographical locations, weather conditions, environmental hazards, harvest home ways, assortment protocols and etc., therefore it's difficult to standardize the top product for a duplicable quality. This batch to batch variation would directly have an effect on the effectiveness and safety of the PHFs. The necessity to change the dose program to get needed therapeutic impact

Additionally appears to be tedious. The toxicity cases of Ayurvedic flavouring formulations is prevailing however remained unresolved. It's renowned that presence of serious metals in prescription drugs isn't allowed, even in trace quantity, to avoid toxicity. In contrast, the thought of Rasa shastra is being practiced during a large variety of Ayurvedic PHFs, within which metals square measure other for his or her therapeutic applications, forming Rasausadhies. They claimed to possess innate qualities like fast action, lesser dose, tastelessness, prolonged period of time and higher palatableness. Drug consultants have calculable that roughly 6000 medicines within the "Ayurvedic Formulary" that on purpose contain a minimum of one metal, with mercury and lead the foremost wide used. These harmful components square measure renowned to be potent toxic, toxic, toxin and hematotoxic agents. Researches have unconcealed the metal content during an immense variety of Ayurvedic Rasausadhies and toxicity cases because of Ayurvedic flavouring consumptions are reported throughout the last decade.

Center for disease control and prevention additionally reported illness cases in pregnant ladies related to the employment of Ayurvedic medications, which can adversely have an effect on the health of each mother and kid. As luck would have it, this downside isn't found in Kasthoushadhies, that are pure herbal preparations free from metals. Though these toxicity cases are currently in a dismaying level, the angle of the Ayurvedic practitioners towards this downside is withal passive. At the worldwide level, the quantity of adverse reactions according or recorded through pharmacovigilance programs remains negligible, primarily thanks to the misconception that Ayurvedic PHF are perpetually safe. Despite the facts that toxicity cases have occurred, the toxic impact of significant metals supplemental are still claimed to be removed by Shodhana, a method concerned in Rasashastra to purify and detoxify toxic materials. A survey conducted shows that some Ayurvedic physicians in Asian nation are reluctant to just accept truth on the herbal formulation adverse impact, whereas some blame solely the improper producing and irrational prescribing for the matter.

In India, whereas most of the Ayurvedic PHFs are factory-made and exported, the regulation of Ayurvedic herbal preparation producing is somewhat less demanding, despite the institution of medication and Cosmetic Act to manage the manufacture and internal control. In keeping with the great clinical practices, toxicity studies and clinical trials on herbal formulations aren't necessary for application of patents and grant of producing licenses to the Ayurvedic herbs formulation manufacturer. Besides, individual physicians these days need no license to arrange medicines and administer them to patients. No matter the efforts place by the Department of written material, Yoga and treatment, Unani, Siddha and medical aid, Asian nation within the provision of excellent producing apply tips and safety standards supported WHO tips, the poor implementation of regulative controls has additionally created house for non-compliance of the rules. Unseen adulteration, substitution, contamination and short cuts throughout producing are common, transfer to incidents like presence of artificial medicinal drug medication in anti-arthritic Ayurvedic medicines, excessive significant metals contamination, lacking of correct process and storage of marketed merchandise beneath undesirable conditions.

## Conclusion

Since, Ancient times medicinal plants, as single drug and in combination with other herbal drugs were used in the treatment of various chronic and non-chronic disorders. Ayurveda is one of the most traditional systems of medicine which describes the methodology to use the medicinal plants as healing power in treating the disease. Polyherbalism is also the best concept of Ayurveda, which consists of magical power of healing the disease. Ayurveda is one of the reliable and trustworthy medicine systems. Diabetes mellitus has appearing as a dreadful disorder for society. There are various sources for the treatment of diabetes. Also there are some polyherbal form of drugs available for the treatment of diabetes.

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