DESIGNING OF POLYHERBAL FORMULATIONS FOR METABOLIC DISORDER

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Abstract
Over 15,000 medicinal plants have been identified in India, of which 7,000–7,500 were employed by the local populations to treat various illnesses. One or multiple herbs (polyherbal) are utilized for treatment in Ayurveda. The Sarangdhara Samhita, a work of Ayurveda literature, emphasized the idea of polyherbal as a means of enhancing therapeutic efficacy. Individual plants’ active phytochemical components are insufficient to produce the desired therapeutic effects. The medicinal effects and toxicity are improved when different herbs are combined in a specific ratio. The importance of polyherbal and its clinical value is primarily the subjects this review. Market purchases were made for the formulations’ raw components. To achieve a homogeneous blend, all materials were combined in equal volumes and put through Sieve No. 80#. Consuming Triphala & Senna Churna in its prepared form has the desired effects on metabolic diseases. The churn’s results for treating constipation were satisfactory. We conclude that polyherbal churn preparation is successful in relieving constipation. The creation of the polyherbal formulation for metabolic disorders was the major goal of the work.

Keywords: Triphala & Senna Churna; Herbal; Ayurveda; Churna; Triphala; Senna, polyherbal formulation, Herbs.

Introduction
The production of herbal and ayurvedic items is straightforward, and there is a healthy market for them. The WHO estimates that up to 80% of the world’s population uses traditional medicine. Some governments are promoting the use of affordable, locally produced pharmaceuticals rather than more expensive ones due to growing concerns about the expense of healthcare. The revival of herbal and Ayurvedic medicine in the nation has been strongly influenced by this. Traditional medicine, including Ayurveda and other herbal remedies, is well-established and commonly regarded as safe and effective.

Mez., Ayurveda, Siddha, Unani, and homeopathy are indigenous systems that rely on medicinal plants. Particularly in the recent few decades, traditional medicines and complementary/alternative medicine (TM/CAM) have become extensively and steadily more occupied in both developed and developing nations. The usage of herbal supplements is expanding quickly everywhere, even in the US. close to 6.6 million dollars were spent on herbal medicines in EU nations, with Germany accounting for 3 billion euros[1].

How to do herb works
The precise component in the majority of herbs that has a medicinal effect is unknown. Whole herbs are made up of a variety of components, and they likely combine to have the intended medical effect. A plant's constituents will vary depending on the environment (temperature, pests, soil quality), how and when it was collected, and how it was processed[2].

What advantages do herbal medicines offer?
Asthma, eczema, premenstrual syndrome, rheumatoid arthritis, migraine, menopausal symptoms, chronic fatigue, and irritable bowel syndrome are just a few of the illnesses that herbalists treat. The best way to use herbal preparations is to follow a skilled professional’s instructions. Before self-treating, make sure to speak with your doctor or a herbalist. The uses of a few common herbs are detailed here. For thorough information on uses as well as dangers, side effects, and potential interactions, please refer to our monographs on specific herbs[2].

DRUGS’ HERBAL HISTORY
Herbal treatments have been used throughout history, dating back to the prehistoric era. The Native Americans and Africans use herbs in their healing rituals as a part of their culture, but they were used in ancient Chinese, Greek, Egyptian, and Indian medicine for diverse therapeutic purposes. Herbs are one of the most potent medicinal components in the Indian Ayurvedic system, and this is documented in texts like the Vedas and Samhita. The transition from raw herbs to synthetic pharmaceuticals occurred as a result of the development of chemical analysis methods in the early 19th century. Scientists began to extract and modify active compounds from the herbs. At this point, the use of herbal remedies began to decrease[3]. Despite their potent pharmacological efficacy, synthetic medications are discovered to be considerably more expensive and produce a wide range of unwanted side effects. As a result, many are turning back to herbal medications because they promise to be safer and are derived from nature. Table 1 lists a few commonly used synthetic medications that are produced from plants[4].
Table 1: lists artificial medications made from plants.

<table>
<thead>
<tr>
<th>Role of Synthetic Medicines</th>
<th>Function</th>
<th>Sources of Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesculetin</td>
<td>Anti-dysentery</td>
<td>Fraxinus rhynchophylla (Oleaceae)</td>
</tr>
<tr>
<td>Digitalis</td>
<td>Cardiac glycoside</td>
<td>Digitalis purported (Plantaginaceae)</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>Sympathomimetic</td>
<td>Ephedra sinica (Ephedraceae)</td>
</tr>
<tr>
<td>Morphine</td>
<td>Analgesic</td>
<td>Papaver somniferum (Papaveraceae)</td>
</tr>
<tr>
<td>Noscapine</td>
<td>Antitussive</td>
<td>Papaver somniferum (Papaveraceae)</td>
</tr>
<tr>
<td>Picrotoxin</td>
<td>Analeptic</td>
<td>Anamirta Cocculus (Menispermaceae)</td>
</tr>
<tr>
<td>Reserpine</td>
<td>Anti-hypertensive</td>
<td>Rauvolfia serpentine (Rauvolfioideae)</td>
</tr>
<tr>
<td>Quinine</td>
<td>Anti-malarial</td>
<td>Cinchona ledgeriana (Rubiaceae)</td>
</tr>
<tr>
<td>Vincristine</td>
<td>Anticancer</td>
<td>Catharanthus roses (Periwinkle)</td>
</tr>
</tbody>
</table>

Table 1: lists artificial medications made from plants.

Single-versus-multiple-herbal preparation
Medication formulation in Ayurveda is based on two principles: (1) Single herbal versus polyherbal formulation usage of more than one drug, known as a “polyherbal formulation,” as opposed to the use of just one substance (PHF). The concept of polyherbal in this antiquated medical system has historically been stressed in the Ayurvedic literature “Sarangdhar Samhita,” which dates back to 1300 A.D. [5].

Plant formulations and combined extracts of plants are preferred to individual ones in the traditional Indian medical system. It is well known that ayurvedic herbs are prepared in a variety of dosage forms, with PHF making up the vast majority of them[6]. Even while the active phytochemical components of specific plants have a long history, they are typically only found in trace amounts and are never enough to have the desired therapeutic effects. For this reason, research has shown that combining various plants, each of which has a different level of potency, might theoretically result in a better outcome than using them separately or adding up their unique effects. Some pharmacological effects of herbal products’ active ingredients are notable only when they are amplified by those of other plants; they are not noticeable when used alone. Below are a few examples of Ayurveda herb combinations: The heating and mucous-reducing effects of ginger when combined with black pepper and long pepper are enhanced. Bitter and cold herbs are combined with warmer herbs (such as neem and ginger) to help balance out any extreme effects. Traditional remedies for bloating caused by poor digestion include cumin, black pepper, and asafoetida, while Guduchi and turmeric together increase immunity[7].

Many PHFs have been shown through pharmacological and clinical research to provide the necessary therapeutic effects. Table 2 displays examples of some of the PHFs.

<table>
<thead>
<tr>
<th>PHF (business)</th>
<th>Herbals</th>
<th>pharmacological activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bihar (India’s Ahmedabad-based Rajsha Pharmaceuticals) [8].</td>
<td>Syzygium cuminiiMomordica charantia Embelica officinalis Gymnema sylvestre Enicostemma littorale Azadirachta indica Tinospora cordifolia</td>
<td>Used for the Treatment of Hyperlipidemia</td>
</tr>
<tr>
<td>Diabet (Herbal Galenicals, India)[9].</td>
<td>Curcuma longaCoscinium fenestratum Strychnos potatorum Tamarindus indica Tribulus terrestris</td>
<td>Antidiabetic</td>
</tr>
<tr>
<td>Arthosansar (Pradhan Herbal The company, India)[10].</td>
<td>Phyllanthus reticulates</td>
<td></td>
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<td>-------------------------------------------------</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td>Comiphora wightii</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boswellia serrata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pluchea lanceolata</td>
<td></td>
<td></td>
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<tr>
<td>Ricinus communis</td>
<td></td>
<td></td>
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<tr>
<td>Zingiber officinale</td>
<td></td>
<td></td>
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<tr>
<td>Within somnifera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antiarthritic</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Kutajarista (Laboratory Preparation)[11].</th>
</tr>
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<tbody>
<tr>
<td>Madhuca longifolia</td>
</tr>
<tr>
<td>Holarrhena Antidysenteric</td>
</tr>
<tr>
<td>Gmelina arborea</td>
</tr>
<tr>
<td>Woodfordia fruticosa</td>
</tr>
<tr>
<td>Vitis vinifer</td>
</tr>
<tr>
<td>Honey</td>
</tr>
<tr>
<td>Jaggery</td>
</tr>
<tr>
<td>Useful in the treatment of sprue, dysentery and diarrhea</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bidakana Choornam[12].</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embelia ribes</td>
</tr>
<tr>
<td>Morigna oliefera</td>
</tr>
<tr>
<td>Piper long</td>
</tr>
<tr>
<td>Useful for liver disorders especially jaundice and steatosis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bharangyadi[13].</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clerodendrum serratum</td>
</tr>
<tr>
<td>Hedychium spicatum</td>
</tr>
<tr>
<td>Inula racemosa</td>
</tr>
<tr>
<td>Antiasthmatic</td>
</tr>
</tbody>
</table>

**Table 2. Examples of PHFs that are commercially available**

It is important to keep in mind when creating polyherbal concoctions that certain plants may be deemed incompatible (buddha) and should not be consumed together. These incompatibilities may be caused by functional, energetic, or quantitative incompatibilities. In contrast, laxatives and astringents have an antagonistic action in which they counteract each other’s effects. For example, ghee and honey should not be consumed in the same proportions due to their conflicting tastes and temperatures. Before marketing, well-designed clinical trials are required to make sure that the various herbs used in the formulation of PHF are compatible [14].

PHFs are used for the following reasons:

As previously noted, PHF has just lately begun to acquire popularity on a global scale since it offers some benefits that allopathic medicines do not. First off, PHFs have a reputation for being highly helpful in treating a variety of ailments. As mentioned above, the therapeutic effects of herbal medicines are a result of the existence of various Phytoconstituents, and they are further amplified when compatible herbals are combined in PHFs. PHF has been the subject of numerous studies to date, many of which have been published in prestigious international publications. Take Srivastava et al. as an example. reported several anti-diabetic PHFs in their investigation, including Dihar, Diabet, Diasol, Dianex, DRF/AY/5001, Diashis, Diabrid, Diakyur, Diasulin, and others that are confirmed to have effects that are similar to those of traditional allopathic medications. The efficiency and favorable outcomes of the treatment were discovered to be the primary drivers behind the usage of medical herbalism in a statistical study carried out in the UK[15].

PHFs (restricted to those properly made and used) frequently have fewer negative effects than allopathic medications. Although the majority of current allopathic medications are administered to achieve effective therapeutic results, doing so often leads to unwanted side effects such as impotence, disorientation, hair loss, vomiting, lethargy, dry mouth, and even death! The side effects of non-steroidal anti-inflammatory drugs (NSAIDs) used to treat rheumatoid arthritis (RA) include mostly gastrointestinal and renal, including dyspepsia, stomach ulcers, salt and fluid retention, as well as hypertension. They may choose an Ayurvedic treatment for this, which has few or no side effects. During the research, it was determined that RA patients could benefit from an Ayurvedic therapy regimen for one year without experiencing any organ toxicity. [40] Also, according to Jawla et al.’s study, none of the 500 survey respondents discovered any negative effects from using herbal medicines, and 48% of them preferred the Ayurvedic system for treating common illnesses. It appears that the side-effect criterion influences how well the general population accepts the medical system. Because PHFs are natural products, they are more affordable, environmentally friendly, and widely accessible than allopathic drugs. Global demand is rising as a result of their enhanced accessibility and affordability, especially in rural areas and some developing nations where expensive modern therapies are not readily available. However, throughout history, several tribes have long held polyherbal cures as traditional beliefs, norms, and practices that were established based on centuries of trials and errors. Simply put, PHFs are more socially and culturally acceptable. PHF is a wonderful therapy option due to all of the aforementioned factors, including its effectiveness, safety, affordability, widespread use, and a higher level of patient compliance [16].
Significant issues with PHF use:

PHF use has significant drawbacks, even though ayurvedic PHFs are useful to people. They continue to have difficulties in several areas due to various inevitable drawbacks that impair their capacity and treatment effectiveness. Patients, Ayurvedic practitioners, the legislation and regulations, as well as the PHFs’ sources and manufacturing process, are all responsible for these issues. Although it is false, there is a widespread misunderstanding that Ayurvedic PHFs are always safe. Ayurvedic medications can have negative consequences when produced or used improperly, according to the Charaka Samhita [17]. Because most patients do not inform their doctors of their concurrent therapies, the concurrent use of PHFs and allopathic drugs is growing. Many people, however, have not taken into account potential drug-herb interactions, which could impact their pharmacological or toxicological impacts and eventually have negative repercussions that worsen health. It has been noted that many Ayurvedic herbs used in the manufacture of PHFs can interact with drugs [Table 3].

<table>
<thead>
<tr>
<th>Ayurvedic herbs contained in PHF</th>
<th>Possible drug-herb interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garlic (Allium sativum), ginger (Zingiber officinale), ginkgo (Gingko biloba)</td>
<td>Interfere with NSAIDs and warfarin by increasing the risk of bleeding, mainly due to the Inhibition of platelet aggregation Limited production of coagulation mediators Antagonism of platelet-activating factor</td>
</tr>
<tr>
<td>St John’s wort (Hypericum perforatum) for depression treatment</td>
<td>Induce hepatic microsomal enzyme cytochrome P-450 thus increasing the metabolism of certain drugs such as digoxin and theophylline, rendering them less effective</td>
</tr>
<tr>
<td>Meadowsweet (Filipendula ulmaria) for anti-inflammatory action</td>
<td>Displace highly protein-bound drugs such as warfarin and carbamazepine, thus increasing the adverse effects of these drugs</td>
</tr>
</tbody>
</table>

Table 3: Examples of possible drug-herb Interaction

Clinical replication of Ayurvedic PHFs is challenging. By offering monographs on the preparation of Ayurvedic PHFs, the Ayurvedic Pharmacopoeia of India, commonly known as the “Ayurvedic Formulary of India,” has helped to standardize the preparation of Ayurvedic PHFs. This would not, however, be sufficient to guarantee the reproducibility of every batch of PHFs. The Charaka Samhita has emphasized the elements that should be taken into account when choosing the initial source of PHFs, including habitat, growing season, conditions during harvest, mode of storage, and pharmaceutical processing. It is difficult to standardize the finished product for reproducible quality because the components of crude raw herb materials can vary as a result of various geographical locations, climate conditions, environmental dangers, harvesting approaches, collection techniques, and other factors. The PHFs’ efficiency and safety would be directly impacted by this batch-to-batch variance. It also appears tedious to have to change the dosage regimen to have the desired therapeutic effect. The majority of Ayurvedic herbal formulation toxicity cases are still open. To prevent toxicity, it is well known that the inclusion of heavy metals in medications is not permitted, not even in tiny amounts [18].

Although the Medicines and Cosmetics Act was established to regulate the manufacture and quality control of medicines, the regulation of Ayurvedic herbal preparation manufacturing is somewhat less strict in India, where the majority of Ayurvedic PHFs are created and exported. Toxicology studies and clinical trials on herbal formulations are not required for the application of patents and the granting of manufacturing licenses to the manufacturer of Ayurvedic herbal formulations, according to good clinical practices.[58-59] Also, doctors nowadays can prepare and dispense medications to patients without a license. [58-60] Despite the efforts made by the Department of Ayurveda, Yoga, Naturopathy, Unani, Siddha, and Homoeopathy in India to publish good manufacturing practice guidelines and safety standards based on WHO guidelines, the ineffective application of regulatory controls has also created room for non-compliance with the guidelines. Instances like the presence of synthetic anti-inflammatory drugs in anti-arthritic Ayurvedic medicines, excessive heavy metal contamination, and the lack of proper processing and storage of marketed products under undesirable conditions are caused by undetected adulteration, substitution, contamination, and shortcuts during manufacturing[19].
Polyherbal formulation limitations
In comparison to the separate extracts, mixtures of plants containing these elements may exhibit greater activity. However, the presence of numerous ingredients may cause chemical incompatibility, which could cause instability [20]. Despite the establishment of the Medicines and Cosmetic Act to regulate the manufacture and quality control of medicines, the regulation of Ayurvedic herbal preparations Manufacturing is somewhat less strict in India, where the majority of Ayurvedic PHFs are created and exported. The application of patents and the granting of manufacturing licenses to the manufacturer of Ayurvedic herbal formulations are not required to conduct toxicity research or clinical trials on the formulations, per good clinical practices [21].

Introduction of the plant

Plant Profile:
Due to its numerous pharmacological actions, Triphala is a medication that is commonly used in treating several illnesses. One of the most popular Ayurvedic medicines, Triphala is made up of the three drugs Terminalia chebula Retz (Haritaki), Terminalia bellerica Roxb (Bibhitaki), and Emblica officinalis Gaertn (Amalaki). The pericarps of these medications are usually mixed in exactly equal amounts in the formulation.

The three senses of humor, or constitutional elements of Ayurveda, pitta, and Kapha, are balanced and rejuvenated by Triphala, which has been called a Tridoshic Rasayana in early Ayurvedic texts. As opposed to Emblica officinalis Gaertn, which has chilly energy, Terminalia chebula Retz and Terminalia bellerica Roxb have warm energy. Because it combines all three, Triphala is balanced and effective as a formula for internal cleaning and detoxification. In Ayurvedic medicine, it is regarded as a significant rasayana and a potent purgative. The Charaka and Shusrutha Samhita, two classic Indian books, describe the recipe for this traditional herbal supplement. The following list includes information on the various characteristics and attributes of the drug’s various ingredients.

Triphala: Triphala varieties
Three types of Triphala have been discussed by Nighantu:
- **Swalpa Triphala**: Draksha, kharjura, and parushaka are the three fruits that makeup Swalpa Triphala.
- **Swadu Triphala**: also known as Madhura Triphala, is a combination of Draksha, Kharjura, and Kasmarya. It is good for the eyes, an aperitif, increases food cravings and helps to reduce erratic fever.
- **Sugandhi Triphala**: This combination of jatiphalam, ela, and lavangam is known as Sugandhi Triphala. It helps with constipation brought on by Kapha and Vata doshas and is astringent and pleasant in vipaka.

Ayurveda pharmacodynamics:
- **Sara Guna**: Ruksha,
- **Rasa**: Kasaya, and
- **Karma**: Chaksusys, Dipana, Vrishya, Prameha, Kustha, Vishamajwa, Medohara;
- **Virya**: Anusna;
- **Vipaka**: Madhura;
- **Doshaghnata**: Tridoshasamaka.

Figure 1: Triphala Plant
Pharmacological Activities:

The Rasayana class of potent medications known as triphala is said to support longevity, health, and immunity. It is frequently used to treat chronic ulcers and is an antioxidant-rich herbal formulation. Triphala’s aqueous extract has been shown to have anti-peptic and anti-gastric ulcer properties, as well as being cytotoxic to human breast cancer cell lines and a good radioprotective agent against gamma radiation. Triphala extracts have been shown to have anti-mutagenic activity, reduce oxidative stress-related damage, have a persistent anti-diabetic effect, function as free radical scavengers, and are cytotoxic and apoptotic against breast cancer cells and prostate cancer cells.

Action against germs. As a potent and novel therapeutic agent for the scavenging of nitric oxide, Triphala powder has been reported to have anti-inflammatory and anti-arthritic properties. It is also prescribed for symptoms of infection, heat, and inflammation. Obesity, anemia, exhaustion, candida, poor digestion, absorption, TB, pneumonia, and AIDS.

Therapeutic Uses:

It is used as a laxative for chronic constipation, colon cleansing, digestive issues, poor food assimilation, cardiovascular disorders, high blood pressure, lowering serum cholesterol, and poor nutrient absorption. Ulcerative colitis, liver function, and large intestine inflammation. It works well as a skin and hair tonic, rejuvenator, purgative, cure for all eye disorders, heals ulcers, and treats skin, fat, diabetes, blood, and fever-related illnesses.

Chemical Constituents:

Triphala is said to include a significant amount of Vitamin C, ellagic acid, gallic acid, Chebulinic acid, bellericanin, -sitosterol, and ascorbic acid, among other chemical components. Also flavonoids. Spectroscopic methods, such as Gallic acid was identified as the main component by mass spectroscopy, nuclear magnetic resonance, and infrared spectroscopy. Moreover, Triphala has 20% of both condensed and hydrolyzable tannins. Lipids, sitosterol, saponins, cardiac glycoside, and different carbohydrates have also been found in the fruit.

Traditional Uses of Triphala:

Triphala’s traditional uses include treating gastric ailments such as poor food assimilation, digestive issues, constipation, colon cleansing, and gastrointestinal tract tonification and Colon. It is also advised for usage in the treatment of ocular issues, excessive blood pressure, reduced serum cholesterol, liver malfunction, inflammation, and difficulties of the large intestine. Moreover, it purifies blood, enhances mental function, and has been linked to anti-inflammatory, analgesic, anti-arthritic, hypoglycemic, and anti-aging qualities.

Bibhitaki:

• Latin name: Terminalia bellerica Roxb.
• Family: Combretaceae
• Traditional name: Vibhitaka
• Sanskrit synonyms: Aksha, Kaliphala, Kalidruma, Karnataka
• Hindi name: Bahera.
• English name: Belleric Myrobalan
• Swaroopa (Habit): a huge deciduous tree
• Habitat: Found in India and Burma's deciduous woods

Figure 2: Seeds of terminalia bellerica rox.

Ayurvedic pharmacodynamics

• Rasa -Kashaya
• Guna-Laghu, Ruksha
Chemical Composition:
The fruit has a 17% tannin content as well as gallo-tannic acid (color matter) and resin. Oil from seeds is a greenish-yellow color.

Therapeutic Uses:
The bark has therapeutic benefits for leucoderma and asthma. The fruit is used for bronchitis, sore throats, biliousness, inflammation, and diseases of the eyes, nose, heart, and urinary bladder. It is also easily digestible, laxative, and anti-helminthic. The oil is excellent. Application about hair. To stop bleeding, the powdered powder is applied to newly cut and wounded skin. Serving as an astringent and styptic. The Beleric myrobalan’s fruit is an element of the commonly recognized Triphala, a grouping of three myrobalans known as embolic, electric, and chebulic myrobalans.

Haritaki
- **Latin name:** Terminalia chebula Linn.
- **Family:** Combretaceae
- **Classical name:** Haritaki
- **Sanskrit synonyms:** Haritaki, Pathya, Abhaya, Avyatha, Vayastha, Haimavati, Shiva
- **Hindi name:** Harre, Harad
- **English name:** Chebulic Myrobalan
- **Swaroop (Habit):** A moderate-sized/large Deciduous tree
- **Habitat:** Found in MP, W. Bengal, Karnataka, and Maharashtra in India, Burma, and Ceylon

Ayurvedic pharmacodynamics.
- **Rasa:** Pancharasa (Kashaya predominance, Lava rahita)
- **Guna:** Laghu, Ruksha
- **Virya:** Ushna
- **Madhura:** Vipaka
- **Tridosaharah:** Prabhava
- **Dosha karma:** Primarily consists of Kapha, pitta, and samara.
- **Parts used:** Fruits

Chemical Make-Up:
Fruit contains up to 30% tannin, cholic acid, gallic acid, and certain anthraquinone-like purgative components.

Medicinal Uses:
The fruit is a well-known herbal drug that is frequently added to numerous formulations and is widely used in Indian medicine. It helps with asthma, Sore throat, thirst, vomiting, eye, heart, and bladder conditions, stranguria, urine discharges, ascites, biliousness, inflammation, bleeding piles, typhoid, constipation, anemia, elephantiasis, and delirium are just a few of the ailments that can affect a person. The ripe fruit has purgative, tonic, and carminative effects in addition to boosting the gums, brain, and eyes. The unripe fruit is astringent and helpful for diarrhea and dysentery[22].
Amalaki
- **Botanical name**: Emblica officinalis Gaerth.
- **Family**: Phyllanthaceae
- **Classical name**: Amalaki, Dhatri
- **Hindi name**: Awala, Amla, Aonla
- **Sanskrit name**: Amalaki, Dhatri, Vyastha
- **Name**: Indian Gooseberry
- **Swaroopa (Habit)**: A Medium sized tree.
- **Habitat**: Found throughout India; often planted in Gardens and cultivated also on small And large scales.

![Figure 4: Fruits of Emblica officinalis Gareth.](image)

Ayurvedic pharmacodynamic:
- **Rasa**: Pancharasa (Amla predominance and Lavanarahita)
- **Guna**: Laghu, Ruksha, Sita
- **Virya**: Sita
- **Vipaka**: Madhura
- **Prabhava**: Rasayan
- **Dosha karma**: Tridoshhara, Pitasamaka (mainly)
- **Parts used**: Fruits

Chemical Makeup:
Fruit is known for being a significant source of vitamin C, Phosphatides, fixed oil, and essential oil are all present in seeds. Tannins are abundant in fruits, bark, and leaves.

Therapeutic Uses:
The most beneficial component of the plant, the fruits, are used therapeutically to treat a variety of diseases in a variety of ways. Fruits can also be used to supplement other nutrients, like vitamin C. It is one of the most well-known, widely used, and well-respected medications in the indigenous medical system. It is used to treat a variety of conditions, including anemia, hyperacidity, peptic ulcer, dyspepsia, anorexia, diarrhea, dysentery, hemorrhage, eye inflammations, irritability of the bladder, leucorrhrea, spermatorrhoea, epistaxis, menorrhagia, jaundice, weak memory, nervous debility, edema, and liver disease. Fresh fruit juice is used as a tonic, a cooling agent, an antiscorbutic, a diuretic, a laxative, and an anti-bilious remedy[23].

Senna
- **Latin name**: Cassia Angustifolia Vahl
- **Family**: Leguminosae
- **Classical name**: Nilavirai
- **Hindi name**: Senna Ki Patti, Senai
- **Sanskrit name**: Swarnapatri
- **English name**: Indian Senna, Alexandrian Senna
- **Swaroopa (Habit)**: A medium-sized tree.
- **Habitat**: This herb only reaches a height of 1-2 feet. Tamil Nadu, Andhra Pradesh, and Karnataka are the states where it is grown. Gujarat and Jodhpur have seen a rise in their commercial activity.
AYURVEDIC PHARMACODYNAMICS:
- **Rasa:** Katu, Tikta(Bitter), Madhura
- **Guna:** Laghu, Rooksha
- **Virya:** Ushna(Hot)
- **Vipaka:** Katu
- **Prabhava:** Sukha Virechaka
- **Dosha karma:** Pitta shodhaka, Vata anulomaka
- **Parts used:** Dried leaves, pod, and root of the plant

Chemical Composition:
- Anthraquinone Glycosides: It contains two active crystalline glycosides, sennosides A and B. Glycosides are the main components of senna. Sennidin A and B are dextrorotatory and lack rotation, respectively.
- As a result of intramolecular compensation. Sennosides C&D, hetero-dianthrones with the corresponding aglycones rhein and aloe Emodin, are also present.
- It contains tinnevellin glycoside, a naphthalene glycoside, in a concentration of 0.3%.
- Miscellaneous: Senna is a member of the flavonoid family. Has yellow flavonol as its primary coloration. Also present are kaempferol (3,4,5,7-trehydroxy flavone), Isohamnetin, -sitosterol, calcium oxalate, mucilage, resin, saponins, and hydrocolloids of its polysaccharides.

Therapeutic Uses:
Senna has the following main applications:
- Its dried leaf is used as a purgative. In cases of hepatomegaly, splenomegaly, and jaundice, Ayurveda has instructed Virechana to use dried leaves to expel excessive Pitta from the body or a Senna plant pod.
- It is used for weight loss, hemorrhoids, and irritable bowel syndrome. Senna leaves that have been dried stimulate the liver to produce Pitta.
- Blood is purified by Senna leaf consumption. Several bacteria, dermatomycoses, and other organisms can be inhibited by the anthraquinones in this herb[24].

Assessment of Senna and Triphala Churna

The process of analyzing a product according to its appearance, color, odor, taste, and other characteristics is known as organoleptic evaluation. The formulas 'We looked into organoleptic properties. Yet, as these features are evaluated subjectively, substitutes or adulterants may pass for the genuine product. You frequently need to use microscopy and physicochemical analyses to support your conclusions. Lignified tissues need to be verified by microscopic staining with various dyes. Stains and staining agents All of the powders were cooked before being placed on slides with glycerin and chloral hydrate. Using a compound microscope to study (10x&40x). First, all powders received a few drops of stain. 3 to 4 minutes of a 1:1 mixture of phloroglucinol and lignified cells. HCl Among other things, cells of the parenchyma, fiber, cork cells, stone cells, and oleoresins were found [25].
The following is a graphic summary of polyherbal remedies for diabetes and other conditions.

Utilized are plant formulations and plant extracts combined. A preferred medicine as opposed to an individual. Herbal formulations, including Diasulin, Coagent DB, and Diamed. Effects of a polyherbal mixture containing Nigella sativa and Annona squamosa on blood sugar and plasma insulin, tissue Lipid profile, and lipid peroxidation in rats with diabetes brought on by streptozotocin. During 30 days, 200 mg/kg of body weight of an aqueous extract of the polyherbal combination of Annona squamosa and Nigella sativa was given orally.

Figure 6: Herbal plant Annonasquamosa (Sugar–Apple) Used for antidiabetic & Herbal plant nigella sativa used for antidiabetic

Streptozotocin-induced diabetic rats were used to study the effects of various doses of a polyherbal formulation on blood glucose and plasma insulin levels. It was also assessed how much tissue lipid and lipid peroxide was present. Tolbutamide was used as a comparison to the effects. Treatment Using Polyherbal Formulation and Tolbutamide, blood sugar levels were significantly reduced, and plasma insulin levels were raised[26].

Figure 7: Polyherbal drug used for antidiabetic
Aloe Barbadensis and Aloe Vera
The popular indoor plant aloe has a long history of use as a traditional treatment. Gel and latex are the two fundamental compounds that can be extracted from the plant. Aloe latex, also known as "aloe juice," is a bitter yellow exudate that comes from the pericyclic tubules of aloe vera plants.

Figure 8: Herbal Plant Aloe Vera Used For Antidiabetic

The mucilage or leaf pulp is used to make aloe vera gel. Right underneath the leaves' outer layer. In rats with diabetes and normal blood sugar levels, aloe gum extracts effectively raise glucose tolerance. Exudates from Aloe barbadensis leaves were used to treat chronic diabetes in rats that had been alloxanized, but not a single dosage. In diabetic rats, the bitter principle from the same plant in both acute and chronic doses had a hypoglycemic effect. Aloe vera's activity and its bitter principle cause the beta cells in the pancreas to produce more insulin or release already present insulin. Moreover, this herb exhibits dose-dependent anti-inflammatory properties and speeds up wound healing in diabetic mice [27].

Mangifera indica: (Mango)

Figure 9: Herbal plant mango used for antidiabetic

Although an aqueous extract taken orally did not change blood glucose levels in either normoglycemic or diabetic individuals, the leaves of this plant are employed as an anti-diabetic medication in Nigerian traditional medicine. Diabetic rats caused by streptozotocin. However, when the extract and glucose were given to the rats at the same time, as well as when the extract was given to the rats 60 minutes before the glucose, antidiabetic activity was observed. The findings suggest that Mangifera indica aqueous extract has hypoglycemic action. This might be brought on by a decrease in glucose absorption at the gut level[27].

Tinospora cordifolia: (Guduchi)

A huge, glabrous, climbing shrub in the Menispermaceae family is called Tinospora cordifolia (Guduchi). It is usually known as “Guduchi” and is extensively available throughout India. Administering the drug orally Tinospora cordifolia (T. Cordifolia) root extract treatment for 6 weeks caused alloxan-induced diabetic rats to have significantly lower levels of lipids in their tissues, blood, and urine, as well as blood and urine glucose. A loss in body weight was also stopped by the extract. Diabetes mellitus is commonly treated with T. cordifolia in Indian Ayurvedic medicine.
Figure 10: Herbal plant Guduchi used for antidiabetic

Figure 11: Aloe, Mangifera, and Guduchi Used For Antidiabetic Activity

Arabic Acacia (Babbul)
It is primarily found in untamed habitats in India. By acting as an insulin secretagogue, the plant extract counteracts diabetes. In control rats, it causes hypoglycemia, but not in Animal alloxan. When normal rabbits received 2, 3, and 4 g/kg of powdered Acacia arabica seeds, the release of insulin from the pancreatic beta cells resulted in a hypoglycemic effect.

Allium cepa: (onion)
Different ether-soluble fractions of dried onion powder as well as its insoluble fractions have been shown to have anti-hyperglycemic activity in diabetic rabbits, according to the plant Allium cepa. It is also recognized that Allium cepa contains antioxidants and Active hypolipidemic. Alloxan-induced diabetic rats were given 200 mg/kg of the sulfur-containing amino acid S-methyl cysteine sulphoxide (SMCS) for 45 days. Significantly reduced serum and tissue lipid levels, and normalized liver hexokinase, glucose 6-phosphatase, and HMG Co-A Reductase activities. One oral dose of 50 g of onion juice dramatically reduced post-prandial glucose levels in diabetic patients.
Allium sativum: (garlic)
Garlic, or Allium sativum, is a perennial herb that is grown throughout India. The component that gives it its Sulphur us odor, allicin, has been demonstrated to have considerable hypoglycemic effects. Activity This impact may be brought on by an increase in hepatic metabolism, an increase in pancreatic beta cell insulin release, or an insulin-sparing action. Orally giving sucrose-fed rabbits (10 g/kg/day in water for two months) an aqueous homogenate of garlic led to a significant increase in the amount of hepatic glycogen and free amino acids, a decrease in fasting blood glucose levels, and a rise in serum triglyceride levels compared to sucrose controls.

Figure 13: Garlic, Babhul, Allium Cepa Used for Antidiabetic
Sanctum Ocimum (holy basil)

It is typically referred to as Tulsi. For many years, people have treasured this herb for its therapeutic properties. The Ocimum sanctum leaves’ aqueous extract significantly reduced the amount of both healthy and diabetic rats produced alloxan in blood sugar levels. In diabetic rats, a significant decrease in fasting blood glucose, uronic acid, total amino acids, total cholesterol, triglycerides, and total lipids revealed that tulsi had hypoglycemic and hypolipidemic effects. Plasma glucose levels dropped by roughly 9.06% and 26.4% on days 15 and 30, respectively, of the test. After oral administration of plant extract (200 mg/kg) for 30 days. In diabetic rats as compared to the control, the amount of renal glycogen increased tenfold, whereas the amounts of skeletal muscle and hepatic glycogen fell by 68% and 75%, respectively[27].

Cucurbitaceae:

Indian charantia, or bitter guard. Known locally as Kaattu Pagar-kai. The plant has numerous kinds and is frequently referred to as “bitter guard.” Momordica charantia is frequently used as a diabetic medication. An agent that lowers blood sugar in India and other Asian nations. In numerous animal models, extracts of fruit pulp, seeds, leaves, and the entire plant were proven to exhibit hypoglycemic effects. When given subcutaneously to Langurs and humans, Polypeptide P, which was isolated from the fruit, seeds, and tissues of M. charantia, significantly reduced blood sugar levels. Rats with normal blood sugar levels and STZ-diabetic rats both responded favorably to ethanol extracts of M. charantia (200 mg/kg). This might be brought on by the suppression of glucose-6-Phosphatase In addition, the liver produces fructose-1, 6-biphosphatase, and stimulates the activity of hepatic glucose-6-phosphate dehydrogenase. The plant is a climbing shrub that is widely grown throughout India. Unripe fruits are eaten with food or swallowed orally. Dosage: For three months, consume two to three fresh, unripe fruits daily[28].

Indica Azadirachta (Neem):

This plant’s hydroalcoholic extracts inhibited the hyperglycemic effects of streptozotocin. This effect was seen in treated rats, and it was caused by an increase in glucose absorption and glycogen deposition in the Rat hemidiaphragm on its own. This herb not only possesses anti-diabetic properties, but it also Impacts bacteria, malaria, fertility, hepatoprotection, and antioxidants.
Effects of Herbal Diabetes Medicine

Herbs' antidiabetic effects depend on several mechanisms. The herbal anti-mode Diabetic action can be categorized as follows:

- Decreased insulin resistance;
- Insulin secretion from islet beta cells is stimulated, or insulin degradation mechanisms are inhibited;
- Adrenomimeticism, blocking pancreatic beta cell potassium channels, stimulating cAMP (2nd messenger);
- Preventing the kidneys from reabsorbing glucose;
- Provision of certain necessary elements for the beta-cells, such as calcium, zinc, magnesium, manganese, and copper;
- Regeneration and/or repair of pancreatic beta cells;
- Improvement in digestion, associated with a decrease in blood sugar and urea, and protection against beta cell degeneration;
- Beta-galactosidase and beta-glucosidase inhibition, cortisol-lowering effects, and alpha-amylase inhibition are all ways to prevent the pathological conversion of starch to glucose[29].

Making herbal medicines

To stimulate B cells’ repair and regeneration, boost hepatic and muscle glucagon contents, and raise c-peptide levels, Diabecon is created.

Insulin

Epicatechin, a benzopyran, is the product’s active ingredient and is marketed by Swastika Formulations. Rise in epicatechin The islet’s cAMP content, which is related to elevated insulin Release. By boosting cathepsin activity, it aids in the conversion of proinsulin to insulin. Moreover, it inhibits Na/K ATPase activity from the patient’s erythrocytes and has an insulin-like impact on the osmotic fragility of human erythrocytes. It corrects neuropathy, retinopathy, and abnormal glucose and lipid metabolism. All of the organ systems impacted by the disease are kept in good condition. It is said to be a good adjuvant for insulin-dependent diabetes as well as a cure for non-insulin-dependent diabetic mellitus (NIDDM). Mellitus (IDDM), to lessen the amount of insulin required. It is known to avoid diabetic complications and is indicated in addition to already available oral hypoglycemic medications. Since it has a mild hypoglycemic effect, there is no risk of hypoglycemia.
Ayurvedic herbal supplement:

Pancreatic Tonic is an ayurvedic herbal supplement that is currently sold as a dietary supplement. It is a botanical blend of ancient Indian ayurvedic herbs. Garry and Sun market bitter gourd powder. Low blood and urine sugar levels are a result. It cleanses the blood and strengthens the body’s defenses against illnesses. Excellent medical benefits can be found in bitter gourd. It has medicinal properties and is an antidote, an antipyretic tonic, tasty, stomachic, and laxative. Moreover, native African and Asian therapies use the bitter gourd. Particularly for diabetes, the bitter gourd is used as a folk remedy. Polyphenols, oils, free acids, polypeptides, sterols, and bitter glycosides, as well as alkaloids, reducing sugars, saponins, and 17-amino Acids, such as methionine, and the crystalline substance p-insulin. It is also said to have hypoglycemic activity as well as anti-haemorrhoidal, astringent, stomachic, emmenagogue, hepatic stimulant, anthelmintic, and blood-purifying properties.

Conclusion:

Successful herbal treatments for diabetes have been used all around the world. Herbs are used to treat the problems of type I and type II diabetes. Because of this, medications created using the principles of Western medicine (allopathy) are frequently ineffective, run the risk of negative side effects, and are frequently excessively expensive, especially for developing nations. The aforementioned plants have been taken into consideration for their potential hypoglycemic effects, and the researchers have conducted some initial research. The effectiveness of botanicals in lowering the sugar level has been scientifically validated in various Indian plant species, and this finding suggests that they may have therapeutic benefits. Consequently, a wide variety of botanicals have been used singly or in drug combinations to treat diabetes.

Reference:


