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# A COMPREHENSIVE REVIEW ON HYPOGLYCEMIC ACTIVITY OF MEDICINAL PLANTS

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## ABSTRACT

Diabetes mellitus is a condition that affects how the body handles sugar. It happens when the liver makes too much sugar, the body doesn't make enough insulin, or the insulin doesn't work properly. Around 60% of people in the world use traditional. Have been showed to help medicines made from plants in india diabetes is a big health problem, especially in cities. Even though there are many way to manage diabetes and its complications, People often prefer herbal treatment because they have fewer side effects, are less harmful, cheaper and work well. This review looks at different plants that have been showed to help lower blood sugar. While many plants suggested, more research is need to understand exactly how they work to reduce sugar levels.

**KEYWORDS**: diabetes mellitus, medicinal plants, glucose, polyherbal plants.

## INTRODUCTION

### DIABETES

Diabetes is a condition where your blood sugar (also called as glucose) is too high .It happens when your pancreas doesn't make enough insulin, or when your body doesn't use insulin the way it should. Diabetes can happen to anyone, at any age. Most type of diabetes are long term

but they can all be managed with medicine and/or life style changes.

They are several types of diabetes. The most common ones are:

1) **TYPE -1 DIABETES** (insulin dependent diabetes)
2) **TYPE-2 DIABETES** (Non insulin dependent diabetes)
3) **GESTATIONAL DIABETES**

### 1) Type 1 diabetes

This is an autoimmune disease where your body's bodys immune system attacks and destroys the cells in your pancreas that make insulin. The reason for this isn't fully known. About 10% of people with diabetes have type

1. It is most often found in children's and young adults, but it can happen at any age.

### 2) Type 2 diabetes

In this type, your body either doesn't make enough insulin, or it doesn't make insulin properly, which is called insulin resistance. Type 2 is the most common type. It usually affects adults, but it can also happen to children.

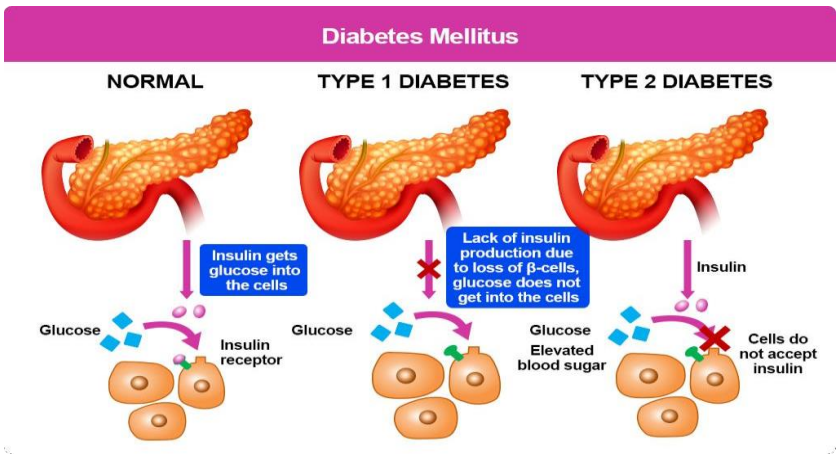


**Figure 1: Type 1and 2diabetes.**

### 3) Gestational diabetes

This type happens during pregnancy .It usually goes away after the baby is born. However, having gestational diabetes increases the chance of developing type 2 diabetes later in life.

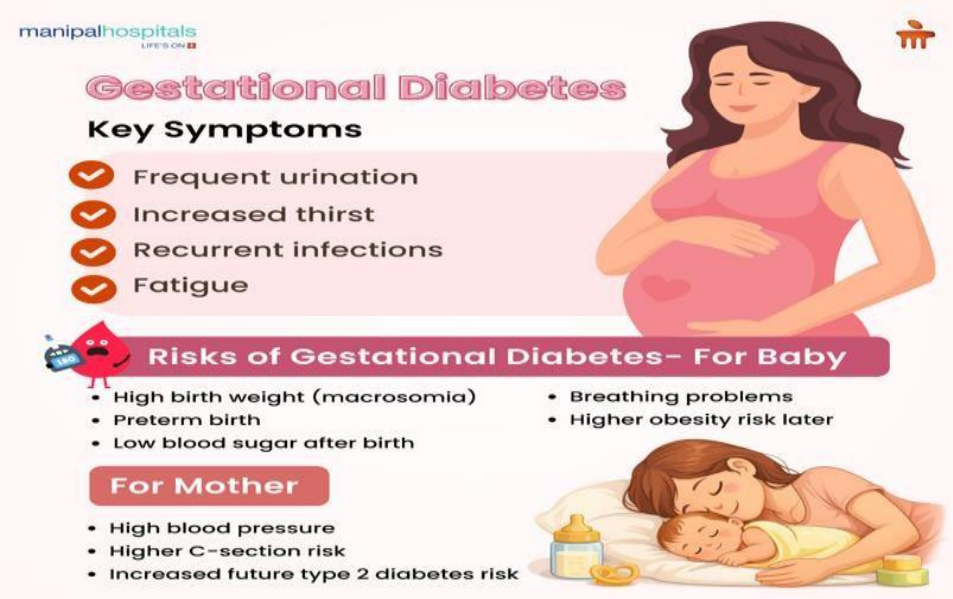


**Figure 2: Gestational diabetes.**

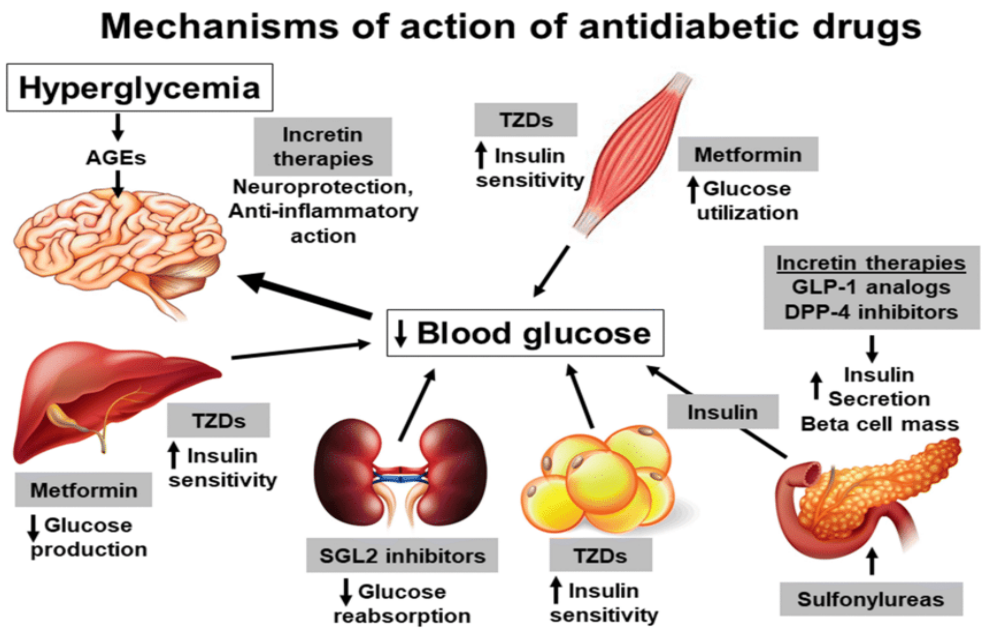


**Figure 3: Mechanisms of action of antidiabetic drugs.**

**Table 1: Plant Extrats Presenting Hypoglycemic Activity.**

<table>
<tr><td rowspan="2">PANAX GINSENG<br>  </td><td rowspan="2">Biological name: Panaxginseng<br>Family: Araliaceae<br>Active constituents:<br>ginsenosides, Gentionin, polysaccharides</td><td colspan="2">Common name</td></tr>
<tr><td>English</td><td>Asian ginseng</td></tr>
<tr><td colspan="2">Description<br>Lower blood glucose level<br>Slow down glucose absorption<br>Increase expression of GLUT-2 & GLUT-4</td><td>Tamil</td><td>Korean ginseng</td></tr>
<tr><td></td><td></td><td>Hindi</td><td>Ginseng</td></tr>
</table>

<table>
<tr><td></td><td colspan="3">Formulation: standardized capsule, ginseng syrup</td></tr>
<tr><td>SOLANUM TORVUM<br>  </td><td rowspan="2">Biological name: Solanum torvum<br>Family: Solanaceae<br>Active constituents: steroidal glycoside, Steroidal alkaloid, phenolic compound, Flavonoids</td><td>Common name</td><td></td></tr>
<tr><td></td><td>English<br>Tamil<br>Hindi</td><td>Turkey berry<br>Sundakkai<br>Bhanktiya</td></tr>
<tr><td></td><td colspan="3">Description: Histopathological study revealed regeneration of beta cells of islets of Langerhans It have hepatoprotective<br>Formulation: standardized extract capsule,traditional choornam</td></tr>
<tr><td>SYZYGIUM CUMINI<br>  </td><td rowspan="2">Biological name: Syzygium cumini<br>Family: Myrtaceae<br>Active constituents: jamboline, jambosine, Ellagic acid</td><td>Common name</td><td></td></tr>
<tr><td></td><td>English<br>Tamil<br>Hindi</td><td>Black plum<br>Naval pazham<br>Jamun</td></tr>
<tr><td></td><td colspan="3">Description<br>It has Alpha glucosidase inhibition activity Alpha amylase inhibition<br>The fruit have beta cell stimulation activity<br>Formulation: pure seed powder, polyherbal capsule</td></tr>
<tr><td>GYMNEMA SYLVESTRE<br>  </td><td rowspan="2">Biological name: Gymnema sylvestre<br>Family: Apocynaceae<br>Active constituents: gymnemic acid, gurmarin, Gymnema saponins</td><td>Common name</td><td></td></tr>
<tr><td></td><td>English<br>Tamil<br>Hindi</td><td>Gymnema<br>sirukurinjan<br>Gurmar</td></tr>
<tr><td></td><td colspan="3">Description<br>Stimulate pancreatic beta cell regeneration<br>Stimulation insulin secretion<br>Formulation: Churna</td></tr>
<tr><td>PORTULACAOLERACEA<br>  </td><td rowspan="2">Biological name: Portulaca oleracea<br>Family: Portulaceae<br>Active constituents: flavonoids, alkaloids, omega 3 fatty acid</td><td>Common name</td><td></td></tr>
<tr><td></td><td>English<br>Tamil<br>Hindi</td><td>Purslane<br>parappukeerai<br>Kulfa</td></tr>
<tr><td></td><td colspan="3">Description<br>It produce GLP-1 agonist activity<br>It has pancreatic beta cell prptection<br>Formulation: standardized liquid extracts</td></tr>
<tr><td>FENUGREEK</td><td rowspan="2">Biological name: Trigonella foenum-graecum<br>Family: Fabaceae<br>Active constituent: steroidal saponin, alkaloid, Flavonoid</td><td>Common name</td><td></td></tr>
<tr><td></td><td>English<br>Tamil</td><td>fenugreek<br>vendhayam</td></tr>
<tr><td></td><td colspan="3">Description<br>Cause glucose dependent insulin secretion<br>Gluconeogenesis suppression</td></tr>
</table>

<table>
<tr><td>  </td><td colspan="3">Formulation: standardized seed extract capsule</td></tr>
<tr><td>CHENOPODIUM ALBUM<br>  </td><td>Biological name: mansonia gagei drumm<br>Family: Chenopodiaceae<br>Active constituents: flavonoids, alkaloids, saponins</td><td colspan="2">Common name<br>English Lambs quarters<br>Tamil Chakravarthikeerai<br>Hindi Bathuna</td></tr>
<tr><td></td><td colspan="3">Description<br>Prevent pancreatic beta cell from oxidative stress & lower biood glucose<br>Formulation: powdered capsule</td></tr>
<tr><td>MANSONIA GAGEI DRUMM<br>  </td><td>Biological name: 7/Mansoni gagei drum<br>Family: Malvaceae<br>Active constituents<br>Mansonone C&D</td><td colspan="2">Common name<br>English Kalmet wood tree<br>Tamil Bastard sandhanamaram<br>Hindi Kalamet vriksh</td></tr>
<tr><td></td><td colspan="3">Description<br>Dual pancreatic lipase & glucose regulation<br>Alpha amylase & alpha glucosidase inhibition<br>Formulation: crude decoction & essential oil</td></tr>
<tr><td>AZADIRECTA INDICA<br>  </td><td>Biological name: Azadirecta indica<br>Family: Meliaceae<br>Acive constituent: isoprenoids & nonisoprenoids</td><td colspan="2">Common name<br>English Neem<br>Tamil Vembu<br>Hindi Neem</td></tr>
<tr><td></td><td colspan="3">Description<br>Pancreatic beta cell protection<br>Causes alpha glucosidase & alpha amylase inhibition</td></tr>
<tr><td>PISIDIUM GUAJAVA<br>  </td><td>Biological name: Pisidium guajava Family: Myrtaceae<br>Active constituents: tannins, carotenoids Ascorbic acid</td><td colspan="2">Common name<br>English Guava<br>Tamil Koyya<br>Hindi Amrood</td></tr>
<tr><td></td><td colspan="3">Description<br>It block alpha glucosidase enzyme<br>Slowdown glucose absorption</td></tr>
<tr><td>COCCINIA GRANDIS</td><td>Biological name: Coccinia grandis</td><td colspan="2">Common name<br>English IVY gourd</td></tr>
</table>

<table>
<tr><td>  </td><td>Family: Cucurbitaceae<br>Active constituents: cucurbitacins, Carotenoids, alkaloids, flavonoids, phenols</td><td>Tamil</td><td>Kovai</td></tr>
<tr><td></td><td></td><td>Hindi</td><td>Kundru</td></tr>
<tr><td></td><td colspan="3">Description<br>Stimulate insulin secretion<br>Alpha amylase & alpha glucosidase inhibition<br>Formulation: decoction & extract capsules</td></tr>
<tr><td>AJUGA REMOTA<br>  </td><td>Biological name:Ajuga remota<br>Family: Lamiaceae<br>Active constituent:clerodin,ajugalactone</td><td colspan="2">Common name</td></tr>
<tr><td></td><td></td><td>English</td><td>Bracted bugleweed</td></tr>
<tr><td></td><td></td><td>Tamil</td><td>Neelakanda mooligai</td></tr>
<tr><td></td><td></td><td>Hindi</td><td>Neelkanthi</td></tr>
<tr><td></td><td colspan="3">Description<br>Pancreatic beta cell protection Causes alpha amylase inhibition & insulin mimicking activity</td></tr>
<tr><td>GREEN TEA<br>  </td><td>Biological name: Camellia sinesis Family: Theaceae Active constituents: catechins, alkaloids, Amino acids</td><td colspan="2">Common name</td></tr>
<tr><td></td><td></td><td>English</td><td>Green tea</td></tr>
<tr><td></td><td></td><td>Tamil</td><td>Pasuntheneer</td></tr>
<tr><td></td><td></td><td>Hindi</td><td>Hari chay</td></tr>
<tr><td></td><td colspan="3">Description<br>Epigalocatechin gallate(EGCG)mimics insulin action in liver<br>Enhance cellular glucose uptake via GLUT-4 translocation</td></tr>
<tr><td>ASHWAGANDHA<br>  </td><td>Biological name: Ashwagandha<br>Family: Solanaceae<br>Active constituents: withanolides, Alkaloids, saponins</td><td colspan="2">Common name</td></tr>
<tr><td></td><td></td><td>English</td><td>Ashwagandha</td></tr>
<tr><td></td><td></td><td>Tamil</td><td>Amukkara kizhangu</td></tr>
<tr><td></td><td></td><td>Hindi</td><td>Ashwagandha</td></tr>
<tr><td></td><td colspan="3">Description<br>Increase glucose uptake in muscle via upregulation of GLUT-4<br>Formulation: crude root powder or tablet</td></tr>
<tr><td>GOSSYPIUM HIRSUTUM</td><td>Biological name:Gossypium hirsutum Family: Malvaceae<br>Active constituent: gossypol, flavonoids, phenolic acid</td><td colspan="2">Common name</td></tr>
<tr><td></td><td></td><td>English</td><td>Upland cotton</td></tr>
<tr><td></td><td></td><td>Tamil</td><td>Paruthi</td></tr>
<tr><td></td><td></td><td>Hindi</td><td>Kapaas</td></tr>
<tr><td></td><td colspan="3">Description<br>Inhibit alpha glucosidase enzyme Suppression of gluconeogenesis</td></tr>
</table>

<table>
<tr><td>  </td><td>Translocation of GLUT-4<br>Formulation: crude extract, decoctions</td></tr>
<tr><td>ALLIUM CEPA<br>  </td><td>Biological name: Allium cepa<br>Family: Liliaceae Active constituents: flavonoids, Anthocyanins,<br>Common name<br>English: Onion<br>Tamil: Vengayam<br>Hindi: Pyaz<br>Description<br>Inhibit alpha amylase & alpha glucosidase enzyme<br>Enhance insulin secretion & enhance glucose uptake<br>Reduce oxidative stress</td></tr>
<tr><td>HELICTERES ISORA<br>  </td><td>Biological name: Helicteres isora<br>Family: Malvaceae<br>Active constituents: phenolic acid, Flavonoids, glycosides<br>Common name<br>English: East Indian screw tree<br>Tamil: Valampurikaai<br>Hindi: Maror phalli<br>Description<br>Works via PPAR-gamma agonist like mechanism mimicking thiazolidinediones like (pioglitazone/troglitazone)</td></tr>
<tr><td>SILYBUM MARIANUM<br>  </td><td>Biological name:Silybum marianum Family: Asteraceae<br>Active constituent: silymarin, silybin, folic acid<br>Common name<br>English: Milk thistle<br>Tamil: Palnerunjil<br>Hindi: Doodh patra<br>Description<br>Pancreatic beta cell protection<br>Reduce insulin resistance<br>Improve insulin sensitivity<br>Activate PPAR-gamma pathway to lower blood sugar</td></tr>
</table>

**Table 2: Some other plants having anti –diabetic activity Plant phytomolecule have anti-diabetic activity.**

| s. no | Biological name | Family | Phytomolecules have anti diabetic activity | Mechanism |
|---|---|---|---|---|
| 1 | Euphorbia neriifolia | Euphorbiaceae | Euphol, triterpenoids | Potentiation of insulin secretion |
| 2 | Morus alba | Moraceae | 1-deoxynojirimycin | Alpha –glucosidase inhibition |
| 3 | Cinnamomum zeylanicum | Lauraceae | Cinnamaldehyde | Stimulate glucose uptake |

| | | | | |
|---|---|---|---|---|
| **4** | Zingiber officinale | Zingiberaceae | Shogaols | Decrease fasting glucose level |
| **5** | Turmeric | Zingibrraceae | Curcumin | GLUT-4 translocation |
| **6** | Lemongrass | Poaceae | Citral | Carbohydrate digestive enzyme inhibition |
| **7** | Atriplex halimus | chenopodiaceae | D-Pinitol | Drop elevated blood glucose |
| **8** | Mesua ferrea | Calophyllaceae | Xanthones & Coumarins | Beta cell supportive Action |
| **9** | Centella asiastica | Apiaceae | Asiatic acid | PPAR-gamma activation |
| **10** | Caladium lindenii | Araceae | Total phenolics & Flavonoids | Lipase inhibition |
| **11** | Blumea | Asteraceae | Blumeatin, flavonoids | Inhibit alpha glucosidase& Alpha amylase enzyme |
| **12** | Rubia cordifolia | Rubiaceae | Alizarin | Reducepancreatic oxidative stress |
| **13** | Bilberry | Ericaceae | Anthocyanins | Enhance insulin sensitivity |
| **14** | Salacia reticulate | hippocratcaceae | Salacinol, kotalanol | Lowering post meal glucose spike |
| **15** | Bitter melon | Cucubitaceae | Polypeptide-p, charantin | Mimic endogenous insulin |
| **16** | Cassia mimosoides | Leguminosae | Luteolin | Enhance cellular glucose uptake |
| **17** | Schinus terebinthifolius | Anacardiaceae | Schinfolone | Inhibit alpha glucosidase & alpha amylase enzyme |
| **18** | Allium sataivum | Liliaceae | Allicin,s-allyl cysteine | Potentiate insulin secretion |
| **19** | Brassica nigra | Brassicaceae | Isothiocyanates | Inhibit alpha glucosidase & alpha amylase enzyme |
| **20** | Murraya koenigii | Rulaceae | Mahanimbine | Protect pancreatic beta cell from oxidative stress |
| **21** | Pyllanthus niruri | phyllanthaceae | Phyllanthin | Suppress hepatic glucose production |
| **22** | Punica granatum | Lythraceae | Punicalagin | Improve total insulin sensitivity |
| **23** | Terminalia chebula | Combretaceae | Chebulinicacid, ellagic acid | Alpha –glucosidase enzyme inhibition |
| **24** | Tectona grandis | Lamiaceae | Anthraquinones | Speed up peripheral muscle glucose uptake |
| **25** | Polydthia longifolia | Annonaceae | Clerodane diterpenoids | Elevate total serum insulin level |
| **26** | Ocimum gratissimum | Lamiaceae | Eugenol | Act as an insulin mimectic |
| **27** | Lanata camara | Verbanaceae | Triterpenoids | Inhibit alpha amylase |
| **28** | Schinus terebinthifolius | Anacardiaceae | Flavonoids, polyphenols | Inhibit alpha glucosidase & alpha amylase enzyme |
| **29** | Urtica dioica | Urticaceae | Flavonoids,phenols | Increase insulin secretion from beta cell of pancreas |

| | | | | |
|---|---|---|---|---|
| **30** | Momordicacharantia | Cucurbitaceae | Polypeptide-p | Contain vegetable insulin mimics insulin |
| **31** | Trichosanthes cucumerina | Cucubitaceae | Cucurbitacin B | Inhibit alpha glucose & alpha amylase enzyme |
| **32** | Gymnema lactiferum | Apocyanaceae | gymnemic acid | Stimulate insulin secretionfrom pancreatic beta cell |
| **33** | Canthium coromandelicum | Rubiaceae | Total saponins, coumarins | Protect pancreatic beta cell |
| **34** | Ipomea aquaticaforsk | convolvulaceae | Quercetin-3-o-glucoside | Alpha glucosidase inhibitor |
| **35** | Oroxylum indicum | Bignoniaceae | Baicalein | Suppress activation of NF-KB |
| **36** | Boswellia serrata | Burseraceae | Pentacyclic triterpenes | Stimulate beta -cell to release more insulin |
| **37** | Boswellia carteri | Burseraceae | Triterpenes | Stimulate beta -cell to release more insulin |
| **38** | Argemone mexicana | Papaveraceae | Sanguinarine | Inhibit intestinal alpha glucosidase delay carbohydrate absorption |
| **39** | Berberis aristata | Berberidaceae | Berberine, karachine | Suppress hepatic gluconeogenesis |
| **40** | Berberis vulgaris | Berberidaceae | Alkaloid, isoquinoline | Lower blood glucose level |
| **41** | Tinospora cordifolia | menispermaceae | Berberine, palmatine, tin osporaside, syringing | Stimulate pancreatic cell to secrete insulin |
| **42** | Dalbergia odorifera | fabaceae | isoflavones | Activate PPAR-GAMMA to improve tissue insulin uptake |
| **43** | Passiflora caerulea | Passifloraceae | Chrysin, harmine, apigenin | Inhibit alpha glucosidase enzyme |
| **44** | Lysimachia punctata | Primulaceae | Flavonoids, triterpenoids, saponin | Restore glycogen synthesis in liver and muscle |
| **45** | Theobroma cocoa | Malvaceae | | Enhance insulin mediated glucose uptake |
| **46** | Acacia greggii | Fabaceae | Alkaloids | Exert mild insulin mimetic action to enhance cellular glucose utilization |
| **47** | Amorphophallus konjac | Araceae | Glucomannan | Delay carbohydrate digestion |
| **48** | Magnolia officinalis | Gnoliaceae | Magnolol, honokiol | Act as a natural PPAR alpha/gamma agonist |
| **49** | Chloroporatinctoria | Moraceae | Morin | Inhibit alpha glucosidase enzyme |

## CONCLUSION

This review, we have listed medicinal plants that anti diabetic effects, Diabetes has become serious and quickly growing health issue in both developed and developing countries. Even though many drugs have been developed and research is ongoing. The number of people

affected and the rate of this condition are still rising. According to WHO guidelines, medicines made from plants that help lower blood sugar are important.

Compared to the allopathy medicine medicinal plants contain the many phytomolecules which represents the receptor stimulation of insulin regulations and some plants mimics effect of insulin and other regulate the insulin metabolism and glucose absorption and absorption of glucose by skeletal muscle, and increasing insulin production or by reducing the absorption of glucose in the intestines. Using herbal medicines can help protect cells and keep blood sugar levels more stable. In future the tolerance of allopathy medicine may be competate with the help of herbal medicine.

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