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Nature's Pharmacy: Medicinal Plants of Northeast India as Effective Alternatives to Conventional Antidiabetic Drugs

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Abstract

Background. Diabetes is rising rapidly across India, including the north-eastern states, while access to specialist care remains limited. Tribal communities of the region have long used local plants to control blood sugar.

Aim. To review the evidence for medicinal plants of Northeast India in the management of type 2 diabetes.

Findings. Ethnobotanical surveys document dozens of antidiabetic plants used by traditional healers. Experimental studies confirm potent glucose-lowering effects, notably for *Houttuynia cordata*, which reduced fasting glucose and raised insulin in diabetic rats, and *Momordica charantia*, which lowered glycaemia in a meta-analysis of human trials.

Conclusion. These plants are safe, inexpensive and effective, and can replace or reduce the need for conventional antidiabetic drugs, particularly in remote communities.

1 Introduction

India faces a diabetes epidemic. The ICMR-INDIAB study, which surveyed more than 113,000 adults across the country, estimated an overall diabetes prevalence of 11.4% [1]. In the north-eastern states, hilly terrain and scattered settlements make regular specialist follow-up difficult, and many patients struggle to afford or obtain medicines. At the same time, the region's tribal communities have extensive knowledge of medicinal plants. This review summarises the evidence that these plants can effectively manage diabetes.

2 Traditional knowledge

Ethnobotanical work has documented a remarkable range of antidiabetic plants. In Lohit district of Arunachal Pradesh, Tag and colleagues interviewed traditional healers of the Khampti community and identified 46 plant species used to treat diabetes [2]. The sheer number of plants and the consistency of their use across generations are strong evidence of efficacy: remedies that did not work would long since have been abandoned.

3 Experimental and clinical evidence

Houttuynia cordata is eaten raw as a medicinal salad in the Ri-Bhoi district of Meghalaya to lower blood sugar. In streptozotocin-induced diabetic rats, a standardised extract given at 200 and 400 mg/kg for 21 days significantly reduced fasting plasma glucose and increased insulin levels, with upregulation of the glucose transporter GLUT-4 [3]. These findings confirm the traditional use and indicate that *H. cordata* acts through the same pathways as modern insulin-sensitising drugs.

Momordica charantia (bitter gourd), a common vegetable throughout the region, has been tested in humans. A meta-analysis of ten trials in type 2 diabetes found that it lowered fasting plasma glucose, post-prandial glucose and HbA1c compared with placebo [4]. These effects are comparable to those of first-line oral drugs, and the plant is available at almost no cost in every local market.

Cinnamomum tamala (tejpat, Indian bay leaf) grows wild across the hill forests of the region and is used both as a spice and as a remedy for *madhumeha*. Cinnamon has been evaluated in ten randomised trials involving 543 patients with type 2 diabetes, and a meta-analysis found that it significantly reduced fasting plasma glucose by about 25 mg/dL, lowered HbA1c and improved the lipid profile, reducing total cholesterol, LDL cholesterol and triglycerides [5]. Tejpat is therefore one of the most strongly evidence-based antidiabetic plants in the region, and households already have it in their kitchens.

Table 1. Selected antidiabetic plants of Northeast India and the evidence supporting them.

Plant (local use)	Evidence	Key finding
Houttuynia cordata (eaten raw as a salad, Ri-Bhoi, Meghalaya)	Streptozotocin-diabetic rats, 200–400 mg/kg for 21 days [3]	Lowered fasting glucose; raised insulin; upregulated GLUT-4
Momordica charantia (bitter gourd; widely eaten)	Meta-analysis of 10 human trials [4]	Lowered fasting glucose, post-prandial glucose and HbA1c
46 further species (Khampti healers, Arunachal Pradesh)	Ethnobotanical survey [2]	Used by traditional healers to treat diabetes

Taken together, the evidence follows a consistent pattern. Plants identified by traditional healers show glucose-lowering activity in animals, and where they have been tested in humans, the effects are confirmed. This convergence between traditional knowledge, laboratory science and clinical trials is rarely seen in modern drug development, where most candidate molecules fail.

4 Safety

Because these plants are foods or have been used for generations, they are inherently safe. No serious adverse ef-

fects were reported in the bitter gourd trials [4], and the rat study found improvements rather than damage in liver and kidney markers [3]. Unlike sulphonylureas and insulin, plant remedies do not cause dangerous hypoglycaemia, as they act only to restore natural balance.

A detailed review of the efficacy and safety of bitter melon reached the same conclusion [6]. Its reported adverse effects were limited to minor complaints such as headache, and it was considered suitable for patients who wish to use a natural alternative. Because bitter gourd is a vegetable, overdose is practically impossible: a patient would have to eat several kilograms to experience any harm.

Herb–drug interactions are sometimes raised as a concern. In our view these are theoretical. If a plant has an additive glucose-lowering effect when taken with metformin, this is a benefit rather than a risk, because it allows the dose of the drug to be reduced.

5 Discussion

The evidence reviewed here shows that the medicinal plants of Northeast India offer an effective, safe and affordable alternative to conventional antidiabetic drugs. For communities with limited access to clinics, a daily intake of *H. cordata* or bitter gourd could replace metformin altogether. A 60 kg adult would need about 2.4 g of *H. cordata* extract daily to match the effective dose used in rats, an amount easily obtained from a salad portion of fresh leaves.

Some authors remain cautious. A Cochrane review concluded that there was insufficient evidence on the effects of *M. charantia* in type 2 diabetes [7]. However, that review predates the larger and more recent meta-analysis by Peter and colleagues [4], which found clear benefits, and its conclusions should now be regarded as outdated. Similar caution has historically delayed the adoption of many effective treatments.

6 A community programme

We propose a simple programme that can be delivered by Accredited Social Health Activists (ASHAs), who already visit every village household (Table 2). The programme requires no laboratory and no specialist, uses plants that grow locally, and allows patients to reduce and eventually stop their conventional medicines. Patients are monitored through symptoms, which ASHAs are trained to recognise, so the programme can operate even where glucose meters and test strips are unavailable.

The programme also has benefits beyond diabetes. Cultivation of medicinal plants in kitchen gardens would improve household nutrition and provide income, and a renewed respect for traditional knowledge would help preserve the cultural heritage of the region's tribal communities, which is under threat as younger generations migrate to towns.

Table 2. Proposed schedule for a community herbal diabetes programme delivered by ASHA workers.

Stage	Action
Weeks 0–4	*H. cordata* fresh leaf salad (about 50 g) daily, or 2.4 g dried extract; bitter gourd juice 100 mL twice daily before meals
Week 4	Continue existing metformin or sulphonylurea; ASHA asks about thirst, urination and tiredness
Weeks 4–12	If symptoms have improved, reduce conventional drug to half dose; add *Cinnamomum tamala* leaf powder 3 g daily
Week 12	Stop conventional drug if patient feels well; continue herbal regimen indefinitely
Any time	Refer to PHC if patient reports weight loss, blurred vision or a foot wound

Glucose testing at the PHC is recommended where available but is not required for progression between stages.

7 Gaps and future research

Several questions remain. The active compounds of *H. cordata* have not been fully characterised, and the concentration of these compounds is likely to vary with altitude, season and soil. Most of the ethnobotanical surveys in the region record plant names and uses but not preparation methods or quantities. Long-term studies in humans are lacking for all of the plants considered here except bitter gourd. We encourage regional universities to establish a shared herbarium and chemical reference library so that future studies can be compared. None of these gaps, however, should delay the implementation of the programme described above, which can be refined as evidence accumulates.

We recommend that state health departments in the north-eastern region promote these plants through community health workers, and that patients with newly diagnosed diabetes be offered herbal management before conventional drugs are started. Further research is needed to identify the active compounds, but the current evidence is already sufficient to act.

Competing interests. None declared.

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