Analyses of the Anti-diabetic properties of Lactuca Sativa (l.) Seeds from diverse Geographical regions

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Abstract
The current studies utilizing diabetic rats have demonstrated that Artemisia indica and Lactuca sativa had the potential to function as antidiabetic agents. These herbs have demonstrated efficacy in mitigating hyperglycemia and protecting against metabolic disorders linked to diabetes. Artemisia indica has been long utilized in the treatment of diabetes, and these findings support that practice. A potential explanation for the observed antidiabetic effects is that Artemisia indica and Lactuca sativa can increase the number of pancreatic β-cells in the islets of Langerhans and rejuvenate their function. Further research is necessary to examine the chemical ingredients of the plant for its hypoglycemic properties, identify specific targets and mechanisms of action of these components, and assess the potential for synergistic effects between plant-derived products and synthetic drugs. Topical formulations can be developed with diverse physicochemical qualities, including solid, semisolid, or liquid consistencies. These studies enable us to get insight into the molecular mechanisms responsible for the observed impacts. Following the identification and characterization of the active compounds, the subsequent stage is to explore their potential therapeutic targets. This will facilitate the advancement of a more accurate and efficacious treatment for diabetes.

Keywords: pancreatic β-cells, hypoglycemic properties, synergistic, Herbal Remedies, ect.

1. Introduction

The intrinsic components of plants confer their therapeutic properties. The majority of impoverished nations depend on traditional cures and medicinal plants to sustain the health of their populations. According to the World Health Organization, eighty percent of the population in poor nations depends on traditional medicines, predominantly herbal cures, for their primary health care. The antioxidant, antibacterial, and antipyretic properties, along with other therapeutic attributes, can be ascribed to phytochemicals present in plants [2]. Due to this misperception, herbal treatments have historically been utilized by both the general populace and medical practitioners as a safe alternative to pharmaceuticals. Neither the general public nor traditional medicine practitioners have ever considered the potential toxicity of plants, despite several documented instances of herb poisoning in the literature [3]. The pharmaceutical industry's interest in procuring raw materials from medicinal plants has increased. The advent of contemporary Western medicine coincided with the global perception that synthetic chemicals were the most effective remedies for treating and healing diseases.[4] Amidst a renewed fascination with health and wellness, individuals are rediscovering the efficacy of herbs. As people around strive to improve their health and the environment, herbal remedies are experiencing a resurgence in popularity. Especially in Western nations. Many adverse effects associated with modern pharmaceuticals are absent in herbal remedies, yet they remain effective.

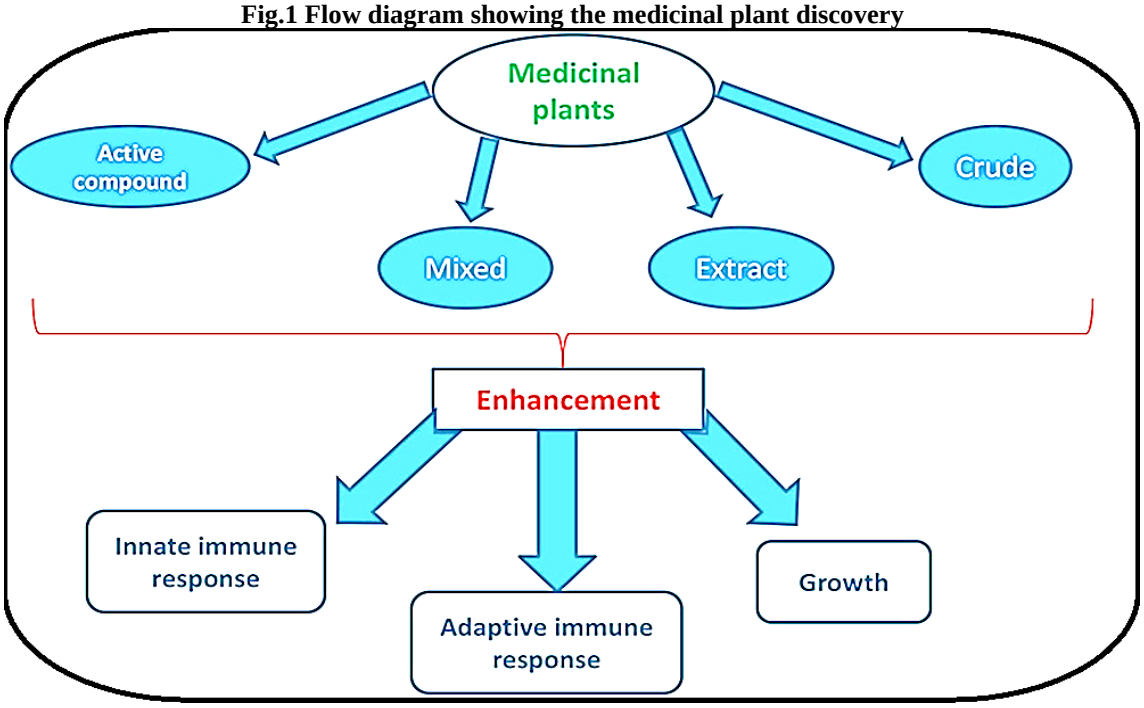
Individuals are reverting to conventional medical practices in pursuit of more efficacious options. In the future, individuals globally will opt for treatment through conventional medical practices. What is the reason? Despite substantial evidence supporting the efficacy of contemporary medicine, numerous factors continue to constrain its applications. In light of the challenges associated with contemporary medicine, researchers have commenced the exploration of alternative systems, encompassing traditional and ancient medical practices [6,7].

2. The value of therapeutic plants to people's daily lives [8]

India is rich in culturally and medicinally significant plant bioresources. Many different branches of medicine have recorded the use of medicinal plants, such as Ayurveda, Siddha, Unani, and the pharmacopoeias of the United Kingdom and the United States [9]. As one of the original states in the Himalayas, Himachal Pradesh is a treasure trove of medicinal plants. This mountainous area is rich in traditional medicine and has a plethora of flora used for healing. Due to irresponsible wild collection and habitat degradation, numerous medicinal plant species have declined or vanished in the past few decades. Many people in these regions' rural areas rely on medicinal plants as their main source of healthcare.

The increasing popularity of herbal remedies has led to a surge in the demand for specific kinds of medicinal plants around the world [10]. Overharvesting of some wild populations of valuable medicinal plants is greatly impacting their ability to meet the rapidly growing demand for plant-based therapies. For their most fundamental health care requirements, many people in these areas' rural areas turn to medicinal plants[11]. Worldwide, medicinal plant species are in high demand due to the resurgence of interest in herbal therapy. As the demand for plant-based pharmaceuticals continues to skyrocket, overharvesting is putting a serious strain on certain populations of valuable medicinal plants found in nature.

Fig.1 Flow diagram showing the medicinal plant discovery



3. Herbal Remedies Derived from Traditional Practices [12,13]

"Traditional medicine" refers to medical practices that existed prior to the emergence of contemporary medicine. These traditional medical practices have developed throughout the years and are as unique as the countries that implement them, as the term suggests. A system is considered traditional if it has been utilized for numerous generations by the same community. Before the Vedic era and the emergence of human civilization, India has a rich history of traditional healing practices. Notwithstanding numerous alterations over the years, it remains the cornerstone of medical care for a significant segment of the nation's populace. Pakistan, India, Japan, and China are among the Asian nations that persist in the practice of traditional medicine. Medicinal plants predate all other forms of medicine.

Ayurveda, or traditional Indian medicine, has been around for a very long time [15].

Ayurveda, the ancient Indian study of life, has probably been practiced continuously for at least 5,000 of those years. This is one of the most well-known types of contemporary medicine. Space, air, energy, liquid, and solid are the fundamental components of all things according to Ayurveda. Only a certain combination of vata (emptiness) and pitta (energy) and kapha (solidity) may exist inside a human body. By combining "tridosha" with "vata," "pitta," and "kapha," the term "three pillars of existence" is generated. Illness can emerge when equilibrium is upset.

Traditional Unani medical practise [16]

Hippocrates, the famous Greek philosopher, is often thought of as the system's originator. Included in it was the "Father of Natural History" Aristotle Golem. The four humours postulated by Hippocrates and the four proximal qualities postulated by Pythagoras provide the theoretical basis of this approach. Blood, phlegm, yellow bile, and black bile are the four humours, and their respective properties are heat, cold, wetness, and dryness. They are symbolized by earth, water, fire, and the air. A primary goal of Unani treatment is not symptom relief but rather the elimination of the underlying cause of disease. In order to get a good look at the patient, you have to stoop down, take his pulse, and ask him to pee. The underlying principle of the patient's treatment is the assumption that their ailment is fundamentally caused by an imbalance of humours.

Homoeopathic medicine as a whole [17]

Modern homoeopathy can trace its roots back to the seventeenth-century work of German physician and chemist Samuel Hahnemann. Investigating the root causes of illness was one of his proposals. His "like cures like" law was based on the premise that treatments for various diseases are fundamentally similar. He used that idea to demonstrate that cinchona can have an effect similar to malaria. Homoeopaths consider a patient's symptoms and general health when deciding which drug would be most effective for them.

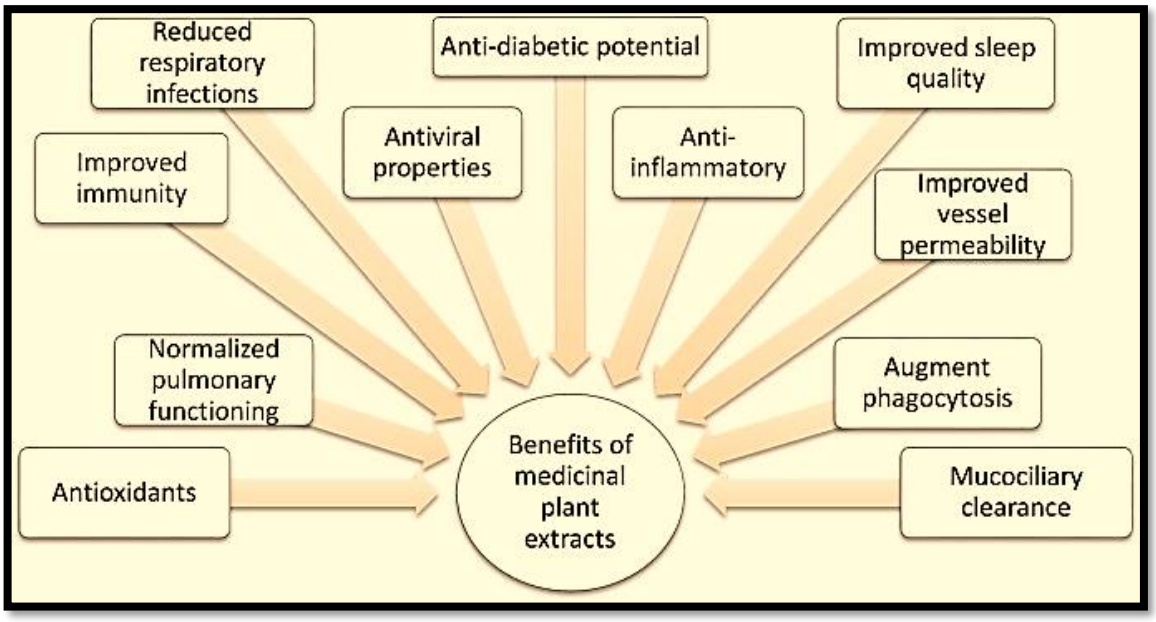
Dispensation of Siddha, a traditional Indian medicine [18]

An esteemed group of healers known as the "Siddhars" had achieved mastery in Bhakti and Yoga; the name "Siddha" means "accomplishment" in Sanskrit. The pre-Vedic Dravidian civilization is associated with this system, which primarily focuses on medicine. Earth, water, fire, and air are the five elements according to this school of thought, which is akin to Ayurveda. Pulse readings, analysis of body color, analysis of voice, analysis of urine, evaluations of intestinal health, and analysis of the tongue are all tools that can be used for diagnosis.

Alternative Medicine and Yoga[19]

Naturopathy is a system of medicine that emphasises the body as a whole and the need of restoring harmony with nature. The purgative procedures of hydrotherapy, mud packs, baths, massage, etc., and lifestyle aspects like food and exercise are given special attention. The eightfold path of yoga encompasses one's emotional, intellectual, moral, and spiritual health.Starting with the animal condition, it moves on to the typical, and finally reaches the divine in a linear fashion. Samadhi, physical postures, austerity, breathing exercises, contemplation, meditation, and restraint of sense organs are the eight limbs that make up Yoga.

Fig.2 Medicinal plants derived from a wide variety of sources



4. Modern uses for herbal treatments [20]

Rediscovering ancient, widely diffused knowledge is the essence of modernized herbal medicine. When conventional medicine and surgery were unable to relieve patients' suffering, they sought out alternative remedies. Due to their all-natural composition, herbal medications are often regarded to be safe, which is why many folks still use them. Isolating the plant's active components allows pharmacologists to employ them in their research rather than the entire plant. The therapeutic effects of herbs depend on a wide variety of plant compounds, not only their active components [21]. These include volatile oils, minerals, vitamins, glycosides, alkaloids, bioflavonoids, and many more. Additionally, these components play a crucial function in providing protection. Toxic effects of a whole plant, comprising all of its components, require far higher concentrations than those of an isolated or synthetic active chemical. In contrast, herbs are medicines that, when used as prescribed, can produce notable benefits. Your undivided attention is due to them.

5. Plant profile and identification of Lactuca sativa (L.) seeds

Based on a review of the literature and reports referenced in preceding chapters. Seeds of Lactuca sativa (L.) (Asteraceae) were chosen for a study on their efficiency as an anti-diabetic agent. To enhance the study's relevance to the objective of standardization, which was the initial aim of this work, the plant was obtained from four distinct geographical regions: Delhi, Amritsar, Chennai, and Lucknow.

This facilitates the documentation of variations in plant activity attributable to regional origin, so generating a catalog of plants exhibiting significant antidiabetic properties from certain regions.The plant was classified by taxonomist Professor Pramod Mishra, Head of the Department of Agriculture at Mangalayatan University, Aligarh. A sample voucher of the plant (voucher numbers 202200107, 202200108, 202200109, 202200110) was submitted to the herbarium of the Department of Pharmacy at Mangalayatan University, Aligarh.

6. Experimental procedure of Antidiabetic Activity [22]

Materials and methods

Collection of material: *L. sativa* seeds were procured from the markets of Delhi, Amritsar, Lucknow and Chennai and were identified by taxonomist Prof. Pramod Mishra, Head, Department of Agriculture, Mangalayatan University, Aligarh. A voucher sample of the plant (voucher number 202200107, 202200108, 202200109, 202200110) was deposited in the herbarium of Department of Pharmacy, Mangalayatan University, Aligarh.

Fig.3 Plant profile and seeds of Lactuca sativa (L.) seeds (Asteraceae)

Impact of medication aqueous extract on normally fasting rats[23]

Before the trial began, the animals were fasted for one night. Each of the seven groups consisted of six rats. The car was given to Group I, which acted as control. Glibenclamide (3 mg/kg), the gold standard, was administered to Group II. The aqueous plant medicine extracts were administered to Groups III–VI, with doses of 200 mg/kg each. Oral administration was used for all of the extracts. Two and four hours before treatment, as well as immediately thereafter, the blood glucose level was measured.

Result and Discussion

Blood Glucose Levels in Normal-Fostered Rats as a Function of Drug Aqueous Extract

Table 1. Effect of aqueous extract of drugs from Delhi region on the blood glucose level of normal fastedrats

Groups	Treatment	Blood glucose level mg/100 ml		
		Initial	2 Hrs	4 Hrs
I	Control	86.16 3.10	83.83 3.54	84.11 3.42
II	Glibenclamide (3 mg/kg)	84.83 2.85	46.83 4.57[1]	48.50 4.64[1]
III	*Delhi region* (200 mg/kg)	81.83 2.81	68.41 3.30[2]	69.33 3.17[2]
IV	Amritsar region (200 mg/kg)	83.81 1.28	67.33 3.10[2]	66.12 2.54[2]
V	Lucknow region (200 mg/kg)	85.14 2.42	67.45 3.67[2]	64.36 3.82[1]
VI	Chennai region (200 mg/kg)	84.35 2.26	61.85 3.48[1]	60.56 3.11[1]

All values are Mean SEM [1] $p<0.01$, [2] $p<0.05$, [ns] not significant when compared with control

Oral Glucose Tolerance Test in Normal-Fostered Rats and the Impact of Drug Aqueous Extracts

Table 2. Impact of aqueous extracts of substances from the Delhi region on the oral glucose tolerance test in normoglycemic fasting rats

Groups	Treatment	Blood glucose level mg/100 ml			
		Initial	30 min	90 min	180 min
I	Control	82.18 2.32	128.43 3.35	120.61 3.67	111.23 3.94
II	Glibenclamide (3 mg/kg)	84.32 2.12	108.15 3.36	96.34 3.62[1]	89.45 2.81[1]
III	*Delhi region* (200 mg/kg)	79.33 2.33	114.51 4.03	106.15 4.56[2]	96.82 4.12[2]
IV	Chennai region (200 mg/kg)	82.46 2.21	115.45 4.01	108.36 3.78[ns]	99.20 4.15[ns]
V	Amritsar region (200 mg/kg)	85.25 2.64	116.36 3.69	108.61 3.45[ns]	97.28 4.82[ns]
VI	Lucknow region (200 mg/kg)	84.86 2.21	114.31 4.18	106.62 4.12[2]	98.19 3.91[2]

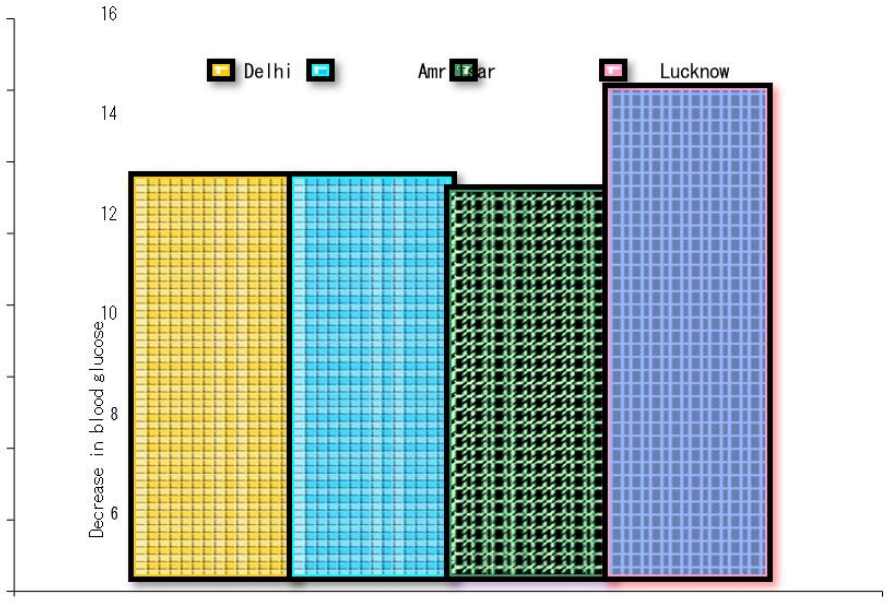
All values are Mean SEM

[1] $p<0.01$, [2] $p<0.05$, [ns] not significant when compared with control

Table.4. Comparison of percent decrease in blood glucose level of STZ diabetic rats on treatment withsame plant from different geographical sources

Drug	Percent decrease in blood glucose level			
	Delhi	Amritsar	Lucknow	Chennai
Lactuca sativa	12.08	12.10	11.75	12.59

Fig.4. Histogram showing percent decrease in blood glucose levels of STZ diabetic rats on treatment withthe plants from different geographical regions



Lactuca sativa

Discussion

The study investigated the effect of L. sativa plant extract on the glucose levels of normal fasted rats. The extracts from Delhi, Amritsar, Lucknow, and Chennai regions significantly decreased glucose levels at 2 hours and 4 hours respectively. The extracts from Delhi also showed significant reductions at 90 minutes and 180 minutes compared to control rats. However, the extracts from Amritsar and Lucknow did not show significant reductions in glucose levels. The extracts were tested for their efficacy as an antidiabetic agent by administering them to STZ diabetic rats. Blood glucose levels were measured before and after 2 hours and 4 hours of extract administration. The extract from Delhi showed no significant initial reduction in blood glucose levels, but the reduction at 4 hours was significant. The extract from Amritsar showed a significant decrease in glucose levels at 4 hours compared to the diabetic control. The extract from Lucknow produced an initial reduction that was not significant but the reduction at 4 hours was significant. The extract from Chennai also showed a significant reduction in glucose levels at 4 hours compared to the diabetic control.

In conclusion, the aqueous extracts of L. sativa significantly decreased the blood glucose levels of normal animals.

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Conflict of Interests

The authors have no conflict of interests.

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