

Analysis of the Anti-diabetic properties of *Lactuca Sativa* (L.) Seeds from diverse Geographical regions

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ABSTRACT

Lactuca sativa have been shown to have the potential to act as antidiabetic drugs, using diabetic rats as the subjects in the research that are currently being conducted. In the treatment of hyperglycemia and the prevention of metabolic problems associated with diabetes, these herbs have been shown to be effective. The utilization of *Lactuca sativa* for the treatment of diabetes has been employed for a considerable amount of time, and these findings lend credence to that approach. One possible reason for the reported antidiabetic effects could be that *Lactucasativa* can enhance the activity of pancreatic β -cells in the islets of Langerhans and increase their number. In order to ascertain the specific functions and areas of impact of these parts, as well as to evaluate the potential for synergistic effects between plant-derived products and synthetic medications, additional study is required to investigate the chemical components of the plant that are responsible for its hypoglycemic qualities. Different physicochemical properties, such as solid, semisolid, or liquid consistencies, can be included into topical formulations during the process of development. We are able to have a better understanding of the molecular pathways that are accountable for the affects that have been identified thanks to these investigations. The investigation of potential therapeutic targets follows the rapid identification and characterization of active molecules. Therefore, it will be less difficult to create a more potent and precise diabetes drug.

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

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. Eighty percent of the population in developing nations relies on traditional medicines, mostly herbal treatments, for their primary health care, according to the World Health Organization. Phytochemicals found in plants are responsible for their antioxidant, antibacterial, and antipyretic

characteristics, among other medicinal uses [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. While there have been multiple reports of herb poisoning, neither the public nor those who practice traditional medicine have ever thought about the possibility that plants could be harmful [3]. Raw materials derived from medicinal plants are attracting more attention from the pharmaceutical industry. Modern Western medicine emerged at the same time as the widespread belief that man-made medicines were the best way to cure illness.[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 PRACTICAL BENEFITS OF MEDICINAL PLANTS FOR HUMAN HEALTH AND WELLNESS [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,A number of populations of important medicinal plants in nature are under extreme pressure due to overharvesting.

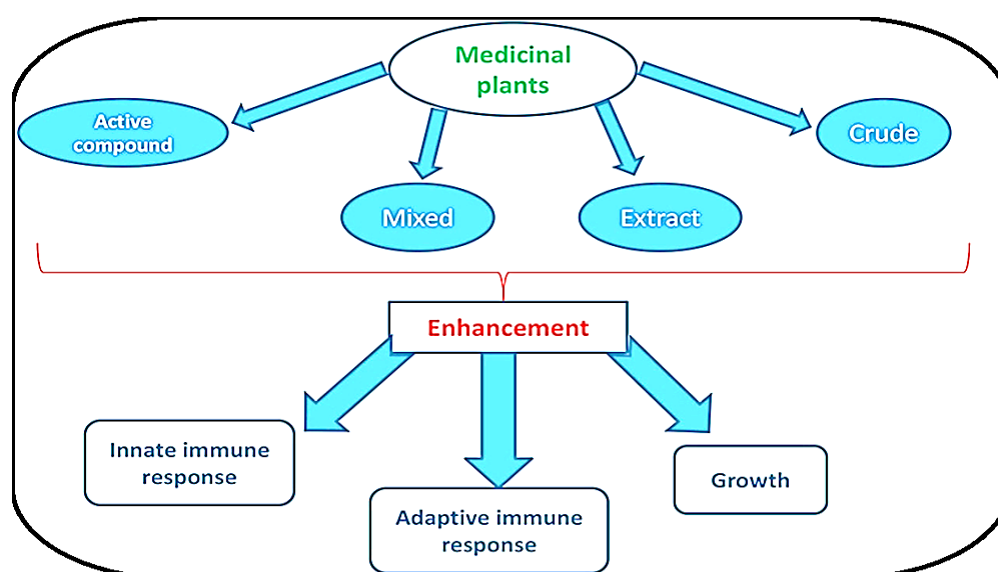


Fig.1 A schematic depicting the process of discovering therapeutic plants

3. HERBAL REMEDIES DERIVED FROM TRADITIONAL PRACTICES [12,13]

The term "traditional medicine" describes the methods of treating patients that were in use before modern medicine came into being. As the name implies, these conventional medical methods have evolved through time and are as distinct as the nations that practice them. A system is said to be traditional if the same community has used it for many generations. Traditional medicine in India dates back to long before the Vedic period and the emergence of human civilization. Despite many changes throughout the years, it is still the foundation of healthcare for a large portion of the country's population. Traditional medicine is still widely used in some Asian countries, including China, Pakistan, India, and Japan. All other types of medicine have their origins in medicinal plants.

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

The ancient Indian science of life, Ayurveda, has likely been continually practiced for at least five thousand of those years. There are few forms of modern medicine as famous as this one. Ayurveda states that the five elements—space, air, energy, liquid, and solid—are the building blocks of everything. In a human body, vata (emptiness), pitta (energy), and kapha (solidity) can only coexist in specific patterns. The term "three pillars of existence" is formed by merging the terms "tridosha" with "vata," "pitta," and "kapha." Uneven conditions can lead to the onset of disease.

Conventional Unani medicine [16]

Many credit the illustrious Greek philosopher Hippocrates as the system's founder. Aristotle Golem, the "Father of Natural History," was a part of it. The theory behind this method is based on Hippocrates' four humours and Pythagoras' four proximate characteristics. The four humours—blood, phlegm, yellow bile, and black bile—are characterized by different degrees of 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.

Non-Conventional Health Practices [19]

Reestablishing balance with nature and treating the complete person are important tenets of naturopathy. Particular emphasis is placed on lifestyle factors such as diet and exercise, as well as purgative techniques such as hydrotherapy, mud packs, baths, massage, etc. Practicing yoga's eightfold path ensures harmony in one's mental, ethical, and spiritual lives. The text proceeds in a linear method, beginning with the animal condition and progressing to the typical and finally the holy. Yoga is an eight-limbed path that includes samadhi (concentration), physical postures, asceticism (without eating or drinking), breathing exercises, contemplation, and meditation.

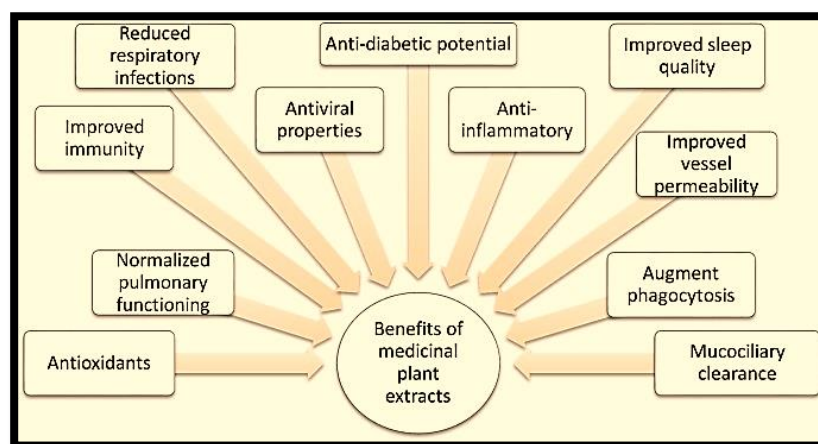


Fig. 2 Shows medicinal plants that come from many different places.

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. SEED IDENTIFICATION AND PLANT CHARACTERISTICS OF LACTUCASATIVA (L.)

The prior chapters' literature and reports served as the basis for this evaluation. An investigation on the efficacy of Lactucasativa (L.) seeds as a diabetic agent was conducted. These seeds belong to the Asteraceae family. Four separate geographical regions—Delhi, Amritsar, Chennai, and Lucknow—provided the plant material, increasing the study's relevance to the original goal of standardization. This makes it easier to record differences in plant activity that are related to provenance, which in turn creates a database of plants from certain places that have strong antidiabetic effects. Plant taxonomist and Head of the Department of Agriculture at Mangalayatan University, Aligarh, Professor Pramod Mishra, assigned the plant's classification. A specimen of the plant was sent to the herbarium of the Department of Pharmacy at Mangalayatan University, Aligarh, along with voucher numbers 202200107, 202200108, 202200109, and 202200110.

6. EXPERIMENTAL PROCEDURE OF ANTIDIABETIC ACTIVITY[22]

The tools and techniques

Kingdom	Plantae - Plants
Subkingdom	Tracheobionta - Vascular plants
Superdivision	Spermatophyta - Seed plants
Division	Magnoliophyta - Flowering plants
Class	Magnoliopsida - Dicotyledons
Subclass	Asteridae
Order	Asterales
Family	Asteraceae Bercht. & J. Presl - Aster family
Genus	Lactuca L. - lettuce
Species	Lactucasativa L.

Materials gathered: Taxonomist Prof.Pramod Mishra of the Department of Agriculture at Mangalayatan University in Aligarh recognized the L. sativa seeds collected from marketplaces in Delhi, Amritsar, Lucknow, and Chennai. The herbarium of the Department of Pharmacy at Mangalayatan University in Aligarh has a voucher sample of the plant (202200107, 202200108, 202200109, 202200110).

Plant Profile of Lactucasativa (L.)



Fig.3: Asteraceae plant profile with Lactucasativa (L.) seeds



Fig.No.4 Dried seeds of Lactucasativa (L.) Asteraceae

7. EFFECTS OF A PHARMACEUTICAL WATER EXTRACT ON RATS THAT TYPICALLY FAST[23]

It was revealed in the hours immediately up to the beginning of the experiment that the animals had endured a night without consuming any food, which was a source of suffering for them. Each and every one of the seven groups contained a total of six rats. This was the case in each and every one of the groups. Group I, who was supposed to be the control group, was the one who was supposed to receive the car. During the course of the experiment, Group I was the one in charge of carrying it out. Glibenclamide was given to Group II at a dosage of three milligrams per kilogram of body weight. This was the dosage that was delivered. The plant medicinal extracts that were combined with water were administered to Groups III–VI at a dosage of 200 mg/kg. This was done in order to ensure uniformity. It was necessary to do this in order to achieve the impression that was sought. Every one of the extracts was taken in through the mouth at some point during the course of the treatment. We also evaluated the amount of glucose in the blood immediately after therapy, in addition to measuring it two and four hours before therapy. They have to fulfill this condition in order to get the job done. There were a total of six rats in each and every one of the seven distinct groups that were being manipulated. There were a total of six rats present in each and every organization. The members of Group I, who were intended to provide the control group with the automobile, were the ones who were given the vehicle. They were the ones who were given possession of the automobile. Those patients who were a member of Group II were given a dosage of glibenclamide that is typically believed to be the gold standard among the medications. Three milligrams per kilogramme was the dosage that was administered. The aqueous plant medicine extracts were given to groups III–VI at a total dosage of 200mg/kg throughout the duration of the trial. This was done when the extracts were made available to the different groups. Due to the fact that these medications were administered to the various groups who were receiving treatment, they were ultimately distributed to those groups. After much discussion, it was decided that oral delivery was the method that was most suitable for each and every extract. This was the conclusion reached after doing significant research. Moreover, measurements were taken of the patients' blood glucose levels two and four hours before the drug was administered to them after the medication had been administered. It is important to note that these measurements were obtained in addition to the measurements that were taken immediately after the medicine was administered to the patients.

8. RESULT AND DISCUSSION

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

Table 1. Blood glucose level of normal fasting rats and the effect of an aqueous medicinal extract from the Delhi region

Groups	Treatment	Bloodglucoselevelmg/100ml		
		Initial	After 2Hrs	After 4Hrs
I	Control	86.16±3.10	83.83±3.54	84.11±3.42
II	Glibenclamide(3mg/kg)	84.83±2.85	46.83±4.57 ¹	48.50±4.64 ¹

III	Delhiregion(200mg/kg)	81.83±2.81	68.41±3.30 ²	69.33±3.17 ²
IV	Amritsarregion(200mg/kg)	83.81±1.28	67.33±3.10 ²	66.12±2.54 ²
V	Lucknowregion(200mg/kg)	85.14±2.42	67.45±3.67 ²	64.36±3.82 ¹
VI	Chennairegion(200mg/kg)	84.35±2.26	61.85±3.48 ¹	60.56±3.11 ¹

All values are Mean ±SEM¹*p*<0.01,²*p*<0.05,^{ns}not significant when compared with control

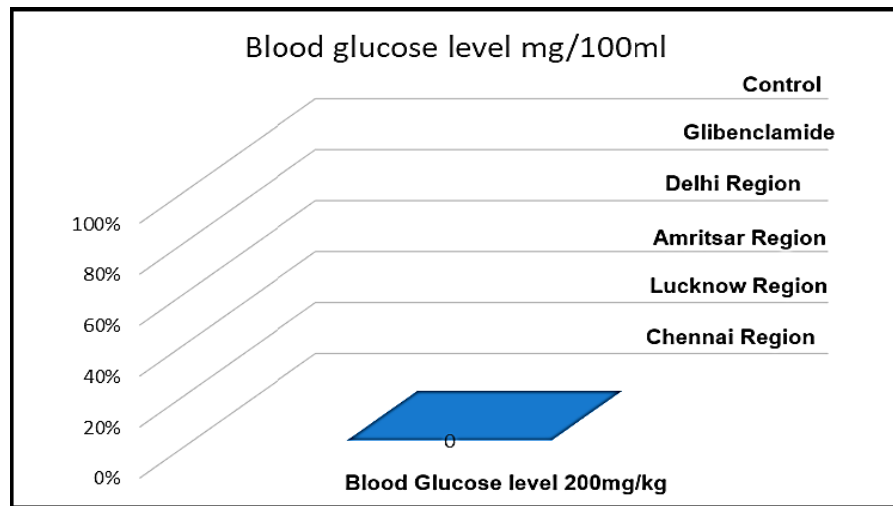


Fig.5 Bar graph showing the blood glucose level in different region

Drug Aqueous Extracts and the Oral Glucose Tolerance Test in Rats Fed a Normal Diet

Table 2 The effects of water-based extracts of Delhi-area compounds on the oral glucose tolerance test in rats with normal blood sugar levels and fasting duration.

Groups	Treatment	Bloodglucoselevelmg/100ml			
		Initial	30min	90min	180min
I	Control	82.18±2.32	128.43±3.35	120.61±3.67	111.23±3.94
II	Glibenclamide(3mg/kg)	84.32±2.12	108.15±3.36	96.34±3.62 ¹	89.45±2.81 ¹
III	Delhiregion(200mg/kg)	79.33±2.33	114.51±4.03	106.15±4.56 ²	96.82±4.12 ²
IV	Chennairegion(200mg/kg)	82.46±2.21	115.45±4.01	108.36±3.78 ^{ns}	99.20±4.15 ^{ns}
V	Amritsarregion(200mg/kg)	85.25±2.64	116.36±3.69	108.61±3.45 ^{ns}	97.28±4.82 ^{ns}
VI	Lucknowregion (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 ±SEM¹*p*<0.01,²*p*<0.05,^{ns}not significant when compared with control

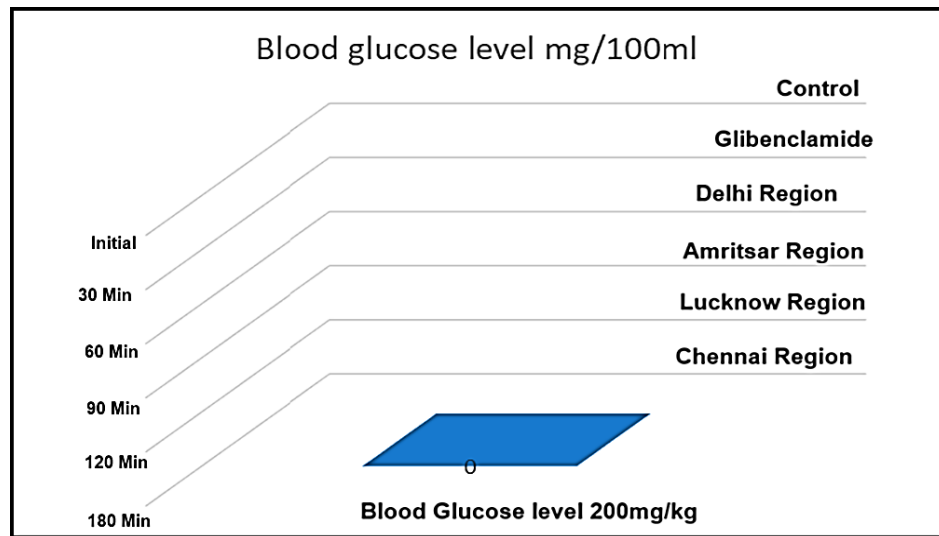


Fig.6 Bar graph showing blood glucose level in different time interval

Table 3: Percentage reduction in blood glucose level associated with treatment of STZ diabetic rats with the same plant from different geographical origins

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

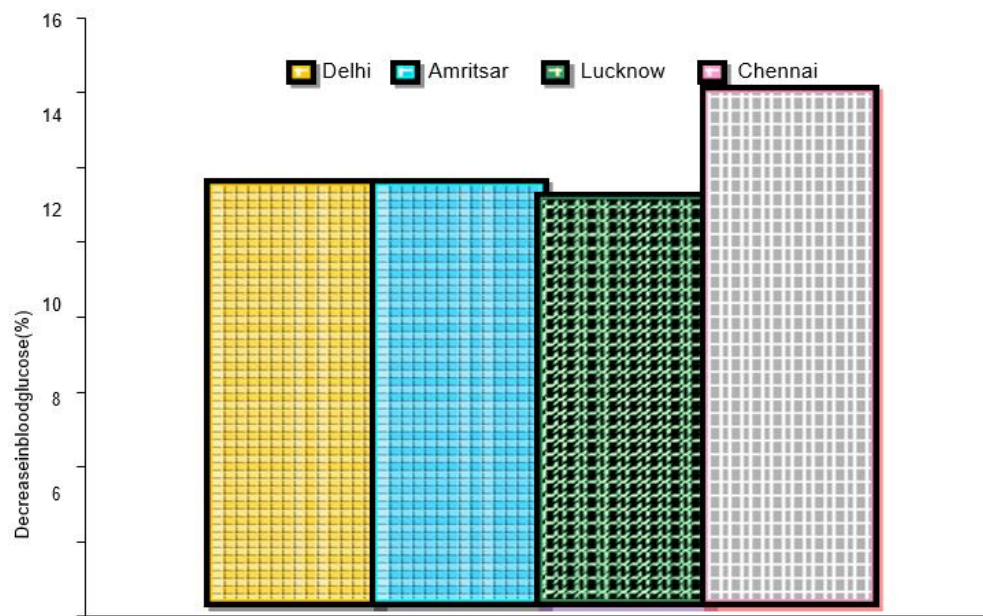


Fig 7: a histogram displaying the percentage reduction in blood glucose levels of STZ diabetic rats treated with plants originating from several geographical regions.

9. DISCUSSION

During the course of the research endeavor, the investigators evaluated the effect that the *L. sativa* plant extract had on the glucose levels of rats that were otherwise healthy and had been fasting. The rats had been given the extract. At two hours and four hours, respectively, the compounds that were taken from the sites of Delhi, Amritsar, Lucknow, and Chennai

considerably decreased the levels of glucose that were present in the blood. This was the case for all of the places. When compared to the rats that served as controls, the extracts from Delhi shown significant reductions in with regard to both the 90-minute and 180-minute time intervals. In spite of the fact that the extracts from Amritsar and Lucknow did not demonstrate any significant reductions in glucose levels, the truth remains that the outcomes were ultimately helpful. Following the administration of the extracts to STZ diabetic rats, a comprehensive investigation into the effectiveness of the extracts as an anti-diabetic agent was studied. The efficiency of the extracts was able to be proved as a result of this happening. A measurement was taken both before and after the extract was supplied for a period of two hours and four hours individually. This was done in order to determine the levels of glucose that were present in the blood when the extract was administered. On the other hand, after four hours had passed, there was a large drop in blood glucose levels, despite the fact that there was not a significant decrease in blood glucose levels at the beginning of the research when the extract from Delhi was administered. The glucose levels of the diabetic control were significantly higher than those of the extract from Amritsar, which demonstrated a considerable decrease in glucose levels at the four-hour point. This was a noticeable difference between the two groups. Having said that, the reduction that was achieved after four hours was something that was very significant. Without a doubt, the early reduction that was accomplished by the extract from Lucknow was not even close to being considerable. As a further point of interest, the extract from Chennai demonstrated a noteworthy decrease in glucose levels at four hours as compared to the control group, which was afflicted with diabetes.

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

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Conflict of Interest: Declared None

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