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Heavy metal content and predication of anti-diabetic activity spectra of a polyherbal formulation

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Abstract

Since there is a very huge development in the use of traditional medicine, assurance and potency as well as quality control of herbal medicines and traditional therapies are becoming more important. Hence, to determine the active principal compounds and its possible biological and pharmacological activities of a polyherbal formulation (PHF) was made up of 11 plants namely *Moringa Oleifera Lam, Aegle marmelos* L. *Correa, Murraya koenigii* (L.) Spreng, *Annona reticulata* L., *Piper betle* L., *Psidium guajava* L., *Momordica charantia* L., *Syzygium cumini* L., *Gymnea sylvestre R. Br., Nelumbo nucifera* Gaertn, *Pterocarpus marsupium* Roxburgh. Methanol extract of PHF was used as the sample for ICP-OES analysis. The heavy metal analysis carried out by ICP-OES method. The result showed that the PHF not contains high toxic level of heavy metals; (Cadmium – 0.0027 mg/l below detectable level, Lead – 0.0420 below detectable level, Arsenic – 0.0530 below detectable level, Copper – 0.0097 below detectable level, Mercury – 0.0610 below detectable level, Iron – 0.0046 below detectable level, Chromium – 0.0071 below detectable level).

Key words : Anti-diabetic, Heavy Metal, *Moringa oleifera, Aegle marmelos, Murraya koenigii, Annona reticulata, Piper betle,* Psidium guajava, Momordica charantia, *Syzygium cumini, Gymnema sylvestre, Nelumbo nucifera, Pterocarpus marsupium.*

Abbreviations : PHF – Polyherbal formulation.

Diabetes is a collection of metabolic characterized through hyperglycaemia because of defects in insulin secretion. It is characterized through excessive blood sugar (glucose) degrees that end result from defects in insulin secretion or its motion or both. Diabetes mellitus is a metabolic ailment characterized through persistent hyperglycaemia

with disturbances of carbohydrate, fats and protein metabolism because of defects in insulin secretion, insulin motion or both. Diabetes may be categorized into 3 important categories: kind 1 diabetes, kind 2 diabetes and gestational diabetes mellitus. Diabetes mellitus, turned into first diagnosed as a ailment related with "candy urine" and immoderate muscle loss withinside the early world. Elevated tiers of blood glucose (hyperglycemia) cause leakage of glucose into the urine, as a result it's far called candy urine. Normally, Blood glucose tiers are managed via way of means of insulin, a hormone produced via way of means of the pancreas. Insulin lowers the blood glucose level. When the blood glucose raises, insulin is launched from the pancreas to normalize the glucose level. In sufferers with diabetes, inadequate manufacturing of or lack reaction of insulin reasons hyperglycaemia. The charge of diabetes is increasing. Worldwide, it influences 250 million human beings of which 50 million are in India. It has been expected that via way of means of the 12 months 2025, the worldwide prevalence of diabetes might growth to four hundred million. Management of diabetes is a massive burden. While healing insulin manufacturing isn't ok to fulfill demands, the recombinant DNA method to diabetes control initially taken into consideration as an answer has confronted numerous problems. It is hypothesized that the closing remedy for kind I and kind II diabetes lies withinside the natural method.

Types of Diabetes :

1. Diabetes insipidus (DI)
2. Diabetes mellitus
3. Gestational

1. *Diabetes Mellitus :*

Diabetes mellitus is a group of metabolic ailments in which there are immoderate blood sugar stages over a prolonged period. Symptoms of High Blood Sugar encompass not unusual place urination, Increased thirst and Increased hunger. If Diabetes mellitus left untreated, it can cause many complications. Acute Complications encompass diabetic ketoacidosis and nonketotic hyperosmolar coma. Serious long-term complications encompass cardiovascular disease, stroke, persistent kidney failure, foot ulcers and damage to the eyes. Diabetes is due to each the pancreas now not producing enough insulin or the cells of the body now now not responding well to the insulin produce.

Heavy metals have been known to possess many adverse health effects; still, heavy metal pollution continues, and is even increasing in some parts of the world, in particular in less developed countries. Due to the uncontrolled industrialization, it has caused many kinds of the heavy metal's accumulation in our organ tissue and inducing chronic toxicities. The studies that compared the levels of essential trace elements in biological samples of patients who have diabetes mellitus type 2, with those of nondiabetic control subjects, have suggested that deficiency and accumulation of some essential trace metals may play a role in the development of diabetes mellitus. 26,27 However, some toxic metals have been analysed that the mean concentrations of these heavy metals were significantly higher in scalp hair samples of smoker and non-smoker diabetic patients as compared to control subjects, suggesting that toxic metals may play a role in the development of diabetes mellitus. 28 In the present work, we review

the important roles of heavy metals in islet function and diabetes development in which the in vitro, in vivo or human evidences are associated with exposure to Cadmium, Lead, Arsenic, Copper, Mercury, Iron, Chromium.

Impact of Diabetes :

Over time, Diabetes can result in blindness, kidney failure and nerve harm. These kinds of harm are the end result of harm to small vessels, called microvascular sickness. Diabetes is likewise an essential aspect in accelerating the hardening and narrowing of the arteries (atherosclerosis), main to strokes, coronary heart sickness and different big blood vessel sickness. This is called macrovascular sickness. Diabetes impacts about 30 million human beings withinside the United States, at the same time as eighty-five million have prediabetes (Their blood glucose ranges are better than normal, however now no longer sufficient to advantage a diabetic diagnosis. The cells withinside the frame has become resistance to insulin). An anticipated 10 million human beings withinside the United States have diabetes and don't even realize it. From an economic perspective, the total annual cost of Diabetes in 2019 was estimated to be 300 billion dollars in the United States. This Included 220 billion in direct medical costs (Healthcare Costs) for people with Diabetes and another 165 billion in other costs due to disability, premature death or work loss. Medical expenses for people with Diabetes are over two times higher than those for people who do not have Diabetes. For the preparation of the manuscript relevant literature[1-9] has been consulted.

Polyherbal formulation (PHF) :

Polyherbal formulation (PHF) is made up of 11 plants namely *Moringa oleifera, Aegle marmelos,* (L.) Correa, *Murraya koenigii* (L.) Spreng., *Annona reticulata* L., *Piper betle* L., *Psidium guajava* L., *Momordica charantia* L. *Syzygiun cumini* (L.) Skeels. *Gymnema sylvestre* R.Br., *Nelumbo nucifcifrs* Gaertn., Pterocarpus *marsupium* Roxburgh. *Aegle marmelos, Murraya koenigii, Annona reticulata, Piper betle, Psidium guajava, Momordica charantia, Syzygium cumini, Gymnema sylvestre, Nelumbo nucifera, pterocarpus marsupium.*

Heavy metal analysis :

(ICP-OES) is an analytical technique used for the detection of trace metals. It is a type of emission spectroscopy that uses the inductively coupled plasma to produce excited atoms and ions that emit electromagnetic radiation at wavelengths characteristic of a particular element. The intensity of this emission is indicative of the concentration of the element within the sample. Emission spectrometry is based on the principle that atoms or irons in an excited state tend, to revert back to the ground state and in so doing emit characteristic wavelength and intensity of that light is proportional to the concentration of that particular element in the sample solution. This technique is used for quantitative and quality determination of the metals and metalloids in the sample.

Environment, pollution, atmosphere, soil, harvesting and handling are some of the factors, which play a major role in contamination of medicinal plants by metals and also by

microbial growth. Therefore, it is necessary to measure and establish the levels of metallic elements in the herbal plants as these elements when consumed at higher levels become toxic. The PHF analysed for the presence of important heavy metals such as Cadmium, Lead, Arsenic, Copper, Mercury, Iron, Chromium are analysed in this study. The result showed that the PHF not contains high toxic level of tested heavy metals. (Table -1) The heavy metal content did not exceed the limit given according to the WHO guidelines (2007).

Test parameter	Permissible limit (mg/l)	Estimated Level(mg l)
Cadmium	0.04	0.0027
Lead	0.24	0.0420
Arsenic	0.05	0.0530
Copper	1.3	0.0097
Mercury	0.7	0.0610
Iron	0.5	0.0046
Chromium	0.2	0.0071

Since plants and animals are essential sources of micronutrients for human beings and become toxic when consumed at higher level. So, it necessary to monitor the levels in biological materials that are required by humans for both dietary and medicinal purposes. The present study result showed that the PHF not contains high toxic level of any tested heavy metals such as Cadmium, Lead, Arsenic, Copper, Mercury, Iron, Chromium.

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