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Impact of Seeds of *Moringa Oleifera* Lam. On Plasma Glucose Level in Guinea Pigs (*Cavia Porcellus* Linn.)

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Abstracts:
The present project has been undertaken to observe the antidiabetic effects of seeds of Moringa oleifera on the plasma glucose level in a mammal Cavia porcellus. Moringa seeds were fed to the experimental animals at the rate of 40 grams/kg body weight of the experimental animal/day for different time duration i.e.7 days, 15 days, 30 days, 45 days and 60 days. A gradual depletion in the plasma glucose level from the control value (143mg/dl.) was recorded which was proportional to the duration of feeding schedule. The values of plasma glucose level recorded were 129mg/dl., 119mg/dl., 110mg/dl., 105mg/dl. and 102mg/dl. respectively and show a depletion ranging from 9.79% to 28.67%. The depleted values recorded were found highly significant at 5% P- level on statistical analysis. The depletion in the plasma glucose level was probably due to the presence of some active ingredients in the moringa seed suggesting antidiabetic properties.
Key Words: *ANTIDIABETIC, PLASMA GLUCOSE, CAVIA PORCELLUS, MORINGA OLEIFERA*

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I. Introduction:

Medicinal plants are the local heritage with global importance. World is endowed with a rich wealth of medicinal plants. Herbs have always been the principal form of medicine in India and presently they are becoming popular throughout the developed countries.

It is estimated that around 70,000 plant species are being used for medicinal purposes throughout the globe. Medicinal and aromatic plants are found in forest areas of South Asia, from the plains to the high Himalayas, with the greatest concentration in the tropical and sub-tropical belt and arid region of Thar desert. India, Srilanka and Nepal recognize more than 2,500; 1,400 and 700 plants respectively having medicinal values.

The continuous uses of potent drugs are often associated with harmful side effects and therefore medicinal plants continue to receive attention of scientists from chemical, clinical and pharmacological angles in India and abroad in modern time. Even the WHO has recognize the role of traditional of medicine and considered them as a part of strategy to provide health care of masses. Role of herbal products used for curative purposes has been enumerated in various ancient literatures of Ayurveda. The plant metabolites, glycosides, corticosteroids, essential oils etc. which are the basic ingredients exhibiting curative role. Ross (2019) and Singh (2006) have evaluated the chemical constituents, their curative roles on different diseases of thousands of medicinal plants in their texts.

Moringa oleifera is also a medicinal plant and has hypoglycemic features in its all parts like leaves, seeds, pod, fruits, juice etc. It is the most widely cultivated plant of family Moringaceae and is native to the sub-Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan. Over the past two decades, many reports have appeared in main stream scientific journals describing its nutritional and medicinal properties. This tree has in recent times been advocated as an outstanding indigenous source of highly digestive protein, vit. B-complex, C, Ca, Fe and carotenoids for utilization in many of the so called 'developing' regions of the world where undernourishment is a concern. (Gassenschmidt *et al.,* 1995).

Diabetes mellitus (Madhumeha) is the most common disorder in human beings and caused by inherited and acquired deficiency in production of insulin by the pancreas, which results in an increased concentration of sugar in blood. According to Singh and Gupta (2007) in diabetes, degeneration (partially or more) of β-cells of islets of langerhans of pancreas were found and insulin secretion was unbalanced. Diabetes leads to serious complications including blindness, heart and kidney diseases, impotency and neuropathy. Insulin lowers blood sugar content by enhancement of cell permeability of glucose and also lowers the tissue glucose threshold in normal and insulin sensitive diabetes, so that more extra cellular glucose became intracellular. In diabetes, this threshold became much higher, blocking the transport of extracellular glucose in to the cell.

Many herbal plants and their products were described for the cure of diabetes. Such as; Silajit, Bel, Karela, Neem, Moringa, Arjuna, Ashoka, Shisam, Chirayta, Gular, Nimbu, Satavari, Patharchatta and others.

The prominent investigators who were worked on antidiabetic properties of Moringa are Dhar and Gupta (1982), Pal (2003), Shawl *et al.,* (2004), Sabnis(2006), Mussa *et al.,* (2008) and Jaiswal *et al.,* (2009).

As such, the objective of the present study is to investigate the antidiabetic role of *Moringa oleifera* in the treatment of diabetes. So the findings of the present research work will help in developing alternate medicines of plant origin for treatment of diabetes for the poor masses.

II. Materials And Methods:

Experimental animal:

The chosen animals for experiment were *Cavia porcellus* Linn. commonly called guinea pig. They were kept and bred in the animal house of the department of Zoology, V.K.S.University, Ara. The selected animals for experimentation

were almost equal size, weight 400-500 gms and approx. 5-6 months old healthy males. They were housed in separate cages according to their experimental group and under standard laboratory condition with maintain under natural photoperiod and hygienic conditions.

They were divided into two groups- control and experimental. Experimental group was again divided in to five sub-groups in relation to the duration of feeding and days of sampling i.e. 7 days, 15 days, 30 days, 45 days and 60 days.

Experimental plant:

The experimental plant was *Moringa oleifera* Lam. belonging family Moringaceae. Moringa was collected from local market and seeds were exposed and then given directly to the animals.

Experimental design:

The animals were fed thrice in a day at 9:00AM, 3:00PM and 9:00PM. At the morning session i.e. 9:00AM the experimental animals were fed with moringa seeds @ 40 gm/kg body weight. While, in rest two sessions they were fed with normal grass at the same rate. Where as, the control animals were fed only grass in all the three sessions as same dose. The dose and schedules were determined by trial and error.

The sampling of the experimental animals was done after feeding for 7 days, 15 days, 30 days, 45 days and 60 days with their experimental diet alongwith control. The blood was collected from sub clavien vein for estimation of plasma glucose level (PGL) from the experimental and control group of animals and collection was done between 10:00AM to 11:00AM to avoid effect of circadian rhythms if any. The blood was collected in a clean vial containing a pinch of EDTA. The quantitative estimation of glucose was done colorimetrically by the method of Nelson (1944) and verified by GOD-POD kit method by Trinder (1969).

The data are represented as mean ±S.E. and statistical significant between treated and control group was analyzed using't' test at 5% P- level.

III. Results And Discussion

The study of medicinal values with reference to antidiabetic properties of Moringa has been analyzed on guinea pig in this present investigation. The results obtained are-

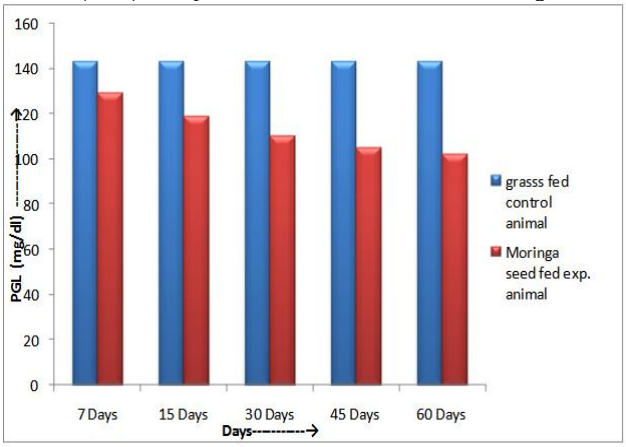
The PGL in Moringa seeds fed experimental animals exhibits a decreasing trend throughout the experiment. The depletion was directly proportional to the day of feeding i.e. 7 days, 15 days, 30 days, 45 days and 60 days. The PGL recorded in the experimental animals were 129 mg/dl, 119mg/dl, 110mg/dl, 105mg/dl and 102mg/dl respectively. The recorded values show a depletion ranging from 9.79% to 28.67% from the control value (143 mg/dl). The depleted values on statistical analysis found highly significant at 5% P-level. (Table- 1& Fig.- 1).

Table – 1. Plasma Glucose Level (PGL) (mg/dl) in experiment animals fed with Moringa seeds for different durations.

S.N	Days	Experimental Values		
		Values ± S.E.	% decrease	't'
1	Grass fed Control	143 ± 0.748	---	---
2	7 Days	129 ± 0.896	9.79	13.2
3	15 Days	119 ± 0.921	16.78	21.81
4	30 Days	110 ± 0.800	23.07	32.16
5	45 Days	105 ± 0.692	26.57	39.61
6	60 Days	102 ± 0.800	28.67	40.83

't' = 2.13 (5% P-Level), % decrease = Percentage decrease from control , n = 6

Fig – 1 Plasma Glucose level (PGL) in experimental animals fed with Moringa seeds for different durations.



The present investigation deals with the antidiabetic properties of seeds of Moringa. Several literatures on ethnobotany have established that *Moringa oleifera* have some constituents which causes depletion in PGL in both normal and diabetic animals. The antidiabetic properties of Moringa cause depletion in PGL either fed as extract or powder or directly seeds. It has further been reported that the effect on the PGL of a normal, mild diabetic and diabetic animal show a

variation in the quantum of depletion. Jaiswal *et al*., (2018) have reported that the aqueous extract of *Moringa oleifera* administrated with a dose of 200 mg/kg body wt. causes a decrease in PGL to the tune of 26.7% in normal animals, 31.1% in mild diabetic animals and 51.2% in diabetic animals after 21 days of treatment. Where as, Dahot and Memon (2010) have observed a reduction in PGL to the tune of 18%, 26% and 42% respectively in normal, mild diabetic and diabetic experimental wistar rats when fed for 60 days with Moringa seeds and also found that diabetic rats achieved normal level after 20 days of feeding with Moringa seeds. While, Mussa *et al*.,(2008) have reported that crude aqueous extract of leaves of *Moringa stenopetalla* an another species of *Moringa oleifera* also causes reduction in blood glucose level, when administrated in non-diabetic mice after 6 hours of treatment.

John and Chellapa (2007) found that in human subjects also a dose of 8 gm/day of Moringa leaf powder cause significant reduction in mean fasting PGL and post prandial (PP) PGL after 14 days. They have also found marked reduction in fasting and post prandial PGL in alloxan induced diabetic rat after 20 days of feeding with Moringa leaves powder @ 15 mg/day. Where as, Michael and Howell (2009) observed in their study that after taking the tea of Moringa leaves by normal and diabetic clinical patients, the PGL showed 10% and 26% reduction from the initial values respectively after two hours of tea taking. They were of the view that Moringa possesses some active ingredients such as, rutin, β-sitosterol which probably enhance the insulin level of blood with the active regulation of β-cells of islets of pancreas resulting in the gradual decrease in the PGL.

Mussa *et al*.,(2007) observed that the Moringa leaves and seeds contain dark chocolate polyphenols, quercetin-3-gycoside (Q-3-G), kaemperol, rutin and β-sitosterol, which probably influence the secretion and action of insulin in blood by partial regeneration of β-cells of langerhans which inhibits glucose uptake. It has been reported by Dahot and Memon (2010) that Moringa seeds possess some active chemical compounds such as, rutin, β-sitosterol, benzyl-isothiocynate which are responsible for lowering the plasma glucose level after treatment. Where as, Fahey (2009) observed in his work that Moringa contains rutin, β-sitosterol which are responsible for hypoglycemic and antihyperglycemic effect. Kamalakannan and Prince (2006) observed in their work that oral administration of rutin, an important constituent of Moringa @ 100 mg/kg body wt. to rabbit for a period of 45 days caused significant decrease in PGL and concluded that rutin is hypoglycemic in nature and after administration of rutin, insulin level increases and a hyperglycemic condition are achieved.

The role of β- sitosterol and rutin as a hypoglycemic agent appears to be true because presence of these ingredients in other medicinal plants also show antidiabetic properties.

Thus, on the view of literatures available, the scholar was of the view that alkaloids of Moringa seeds viz.- rutin, β-sitosterol, benzyl-isothiocynate, Q-3-G, moringine were main ingredients responsible for the present findings. The scholar was very much in agreement with the findings of Daniel and Bourassa (2009) that were discussed that β-sitosterol was the main factor for normalizing sugar level and insulin level. β-sitosterol stimulates the release of insulin in the presence of non-stimulatory glucose concentration and inhibits glucose -6- phosphatase that is the primary pathway of conversion of dietry carbohydrates to blood in the liver. Glucose -6- phosphatase to yield free D- glucose. This free D- glucose then passes into the blood. Slowing the rise of blood glucose level by down regulation of glucose -6- phosphatase help delay of onset of type – 2 diabetes.

Thus, it has been observed in the present study that the alkaloids were the main substances of the Moringa plant to regulate the various biochemical reactions of the organism thereby helping in treatment of diabetes. Due to its hypoglycemic and antihyperglycemic effects, it should be used by the pharmaceuticals for cure and control of diabetes in present day.

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