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The Influence of Sericin (separately); Moracin (separately); Sericin and Moracin (both together) on blood glucose level; body weight and water consumption in the non-diabetic and streptozotocin-induced diabetic rats

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Abstract: The last few decades the treatment for controlling the diabetes is concerned with use of traditional plant derived compounds.Hence the aim of of this attempt was to analyse the effect of aqueous solution of sericin; moracin and both sericin and moracin, both together in non-diabetic and streptozotocin induced diabetic rat, Rattus norvegicus (L). The diabetes was induced in rats by intraperitoneal injection of 60 mg/kg of streptozotocin (STZ). The aqueous solution of sericin; moracin and both sericin and moracin, both together were administered in three different doses (01.00; 01.50; and 02.00; 03.50 and 03.99 g/100 mL) as drinking water to both diabetic and non-diabetic animals during 4 weeks. The non-diabetic individuals with sericin; moracin and both of them mixed together were found increase in their body weight, measuring 1 - 3 percent (sericin treated group); 1 - 5 (moracin treated group) and 2 - 26 percent (sericin and moracin, both mixed treated group). Aqueous solution of sericin; moracim and both sericin and moracin (both together) (1.00; 1.50; 2.00 g and

3.00 g/100 mL) was found significantly decreased blood glucose level ($p<0.05$) in diabetic rats. The percent reduction in the blood glucose level in Sericin; Moracin; both sericin and Moracin together treated group in the present attempt was found measured 17.807; 24.404 and 55.974 respectively. The sericin; moracin; both sericin and moracin together treatment exhibited tendency of recovery in the blood glucose level through the exerted a hypoglycemic influence. The sericin; moracin; both sericin and moracin together treatment is capable of managing diabetes related complications. aqueous solution of Sericin (separately); Moracin (separately); Sericin and Moracin (both together). Aqueous solution of Sericin (separately); Moracin (separately); Sericin and Moracin (both together) positively affected integrity and working pancreas. Sericin and Moracin both are able to inhibit the effect of streptozotocin (STZ) induced disorder in pancreatic tissues. The sericin and Moracin both are exhibiting significant and potent activity against the diabetes.

Keywords: Diabetes;Sericin; Moracin;Hypoglycemic activity, Diabetes related complications.

NTRODUCTION

Approximately 4% of world populations are affected by diabetes mellitus and by the year 2025 it is expected to increase by 5.4%2. The diabetes mellitus is a heterogeneous group of diseases. It is characterized by chronic elevation of level of glucose in the blood. Diabetic etiologies are distinguished by disturbance of carbohydrate, protein and fat metabolism and high blood glucose level.The body of diabetic patient is unable to produce enough insulin for its own needs. This may either because of impaired insulin secretion, impaired insulin action, or both. The diabetes affects some 300 million people world-wide, and is on the increase. The significant cause of diabetes is the chronic exposure to high blood glucose. This condition is leading to renal failure, visual loss and a range of other types of tissue damage. Diabetes also predisposes to arterial disease, not least because it is often accompanied by hypertension, lipid disorders and obesity. Many cases of diabetes and almost all of its unwanted long-term consequences are potentially avoidable, but this will require intervention at a societal as well as at a medical level.

The diabetes related complicationsget resulted into the disorders like hyperglycemia, glucosuria, polyuria, polydipsia, polyphagia, ketonemia and kitonurea and glucoma. The diabetic patients are at increased risk of vascular complication such as cardiovascular, peripheral vascular, cerebrovascular diseaseand retinopathy and nephropathy (Fowler, 2008; Martin, et al, 2014).

Reduction in the microvascular and macrovascular complications are reported in large number of randomized controlled trials. All of these trials are concerned with controlof a tight blood glucose level, which reduces microvascular and macrovascular complications, but despite this, many diabetics do not keep control of their blood glucose levels or this control is poorly done (Andrade-Cetto and Heinrich, 2005; Fonseca, et al , 2012).The major public health problem is poor and inadequate glycemic control.And thus attempts of studies on newremedies with hypoglycemic properties is the basic need. Since ancient times spices and herbal remedies has been used to treat a variety of disorders. Management of diabetes without any side effects is still a challenge to the medical

system.The gaining global acceptability for the disease control is for the medicinal plants. The medicinal plants prooved their potential as bioactive agents to be used as pharmaceuticals. The medicinal plant derived have shown both hypoglycemic action and theability to improve some of the secondary complications of diabetes such as kidney damage, fatty liver, and oxidative stress. There are some experimental models on tropical herbs that offer both health benefits and disease controlling capabilities (Runnie, et al , 2004; Andrade-Cetto and Heinrich, 2005; Oliveira, et al , 2009). In this regard, several authors have reportedan increase in the number of Mexican diabetic patients who utilize medicinal plants to control their blood glucose. Several studies have reported the existence of as many as 306 plants or fruits used as herbal remedies for diabetes (Andrade-Cetto and Heinrich, 2005). There is an increasingdemand by patients to use the naturalproducts with antidiabetic activity, becauseinsulin and oral hypoglycemic drugs arehaving undesirable side effects (Kameswara, et al , 2001).

The plants, animals, and microorganisms on earth constitute efficient source of the natural bio-compounds (Lam, 2007).The medicinal compounds are obtained from the natural bioactive materials. The natural bio-compounds deserve diversity. Therefore, it is possible to synthesize the "Natural Medicines" through the use of diverse natural bio-compounds. The natural, most correctly, the herbal drugs are with complex structures and biological potency (Dias, et al ,2012). The extractives of the Plants, like Bidens pilosa (L.); Capsicum annuum (L.); Carica papaya (L.); Gymnema sylvestre (L.);Momordica charantia (L.); Nymphaea stellata (L.) and Panax ginseng; (L.) are already reported for working in the regulation of cells of islets of Langerhans. The herbal bioactive compounds reported as effective for the regulation of Pancreatic Beta Cell Function include: Berberine, Conophylline, Curcumin, Epigallocatechin-3-gallate, Genistein, Kinsenoside, Quercetin , Resveratrol and Silymarin. (Vitthalrao B. Khyade, 2018 and Vitthalrao B. Khyade, et al , 2018).

Provision of leaf decoction of Mulberry, Morus alba (L.) (20 g/L) was reported for the regulation of the diabetes - altered - metabolic processes (Vitthalrao B. Khyade, 2018). Mulberry (Morus alba L., Moraceae) has been used in traditional Chinese medicine as an anti-headache, anti-hypertensive, anti-diabetic, and diuretic agent (Lee, et al, 1981). In particular, mulberry twigs have been widely used for the treatment of aching and numbness of joints in oriental medicine (Zhu, 1998). Several prenylflavonoids, flavonoids, coumarins and stilbenes have been isolated and identified from mulberry twigs (Ko, et al, 1997; Oh, et al, 2002; Hu, et al, 2011; and Chang, et al, 2011). Among them, prenylflavonoids and flavonoids have been reported as major principles for anti-obesity, antioxidant, anti-aging, and hepatoprotective activities of mulberry twigs (Ko, et al, 1997; Oh, et al, 2002 and Hu, et al, 2011). In addition, some coumarins and resveratrol derivatives in mulberrytwigs were found to have strong radical scavenging and anti-inflammatory activities (Oh, et al, 2002 and Chung, et al , 2003). Thus, mulberry twigs are receiving much interest as promising

sources of functional foods with health benefits. Mulberry twigs are widely used as a promising source of well-being healthy teas, together with mulberry fruits and leaves. In addition, mulberry soups and wines made with mulberry twigs were known to have potential health benefits in folk medicine against diabetes, stroke, cough, and beriberi, etc. (Lee, et al, 1981). Therefore, study on analysis of functional constituents for standardization and quality control of mulberry twig teas, soups, and wines is required.

The biochemical constituents of leaves of mulberry, Morus alba(L) serve a lot to orchestrate the progression of life cycle of lepidepteran insects like silkworm, Bombyx mori(L). Mulberry leaves are also used for food for livestock (Cattle, goat etc.) in the areas where dry seasons restrict the availability of ground vegetation. The traditional Chinese medicine recommend the mulberry fruits to treat the prematurely grey hair, to tonify the blood and to treat constipation and human diabetes. Zhang et al.(2009) reported the Moracin -M, Steppogenin-4'- O-beta-D-glucoside and mulberroside- the novel compounds of mulberry, Morus alba (L) for hypoglycemic effects. Naowaboot, et al., (2009) studied the effect of Ethanolic extract of leaves of mulberry, Morus alba(L) on chronic diabetic rats and observed antihyperglycemic, antioxidant and antiglycationactivity. Cancer induction is distinguished by involvement of oxidative stress in the cells. The cancer induction and its subsequent development, and associated molecular mechanism is becoming increasingly clear (Lahiri. et al., 1999 and Ames et al., 1995). There are about fifty percent of the drugs approved by the US Food and Drug Administration that belong to: phytogenic compounds or derivatives thereof. The best examples of natural compound-derived pharmaceuticals are: Aspirin, metformin, morphine, vinblastine, vincristine, quinine, artemisinin, etoposide, teniposide, paclitaxel, and camptothecin (Kingston, 2011).There are about 1200 plants that have been claimed to contain compounds with antidiabetic properties. There are over 400 plants and their bioactive compounds have been scientifically evaluated for type 2 diabetes treatment (Singh, et al , 2011).

Moracin C from Morus alba or Artocarpus heterophyllus is one of the more well-known natural 2-phenyl-benzofuran derivatives (Yao, et al , 2016). The moracin C contains three phenolic -OH groups at the 6,3?,5?-positions. Thus, it can also be regarded as a phytophenol (Li, et al , 2012). Of course, it is dissimilar to any of the common phytophenols, such as flavonoid (Li, et al , 2016), flavonoid glucoside (Li, et al , 2014), biflavonoid (Li, et al , 2013), volatile phenol (Lin, et al , 2014), phenolic cumarin (Li, et al , 2017), phenolic alkaloid (Li, et al , 2016), phenolic acid (Li, et al , 2009 ; Chen, et al , 2010), and phenolic acid ester (Li, et al , 2015). Like most phytophenols, however, the characteristic phenolic moiety of moracin C makes it of interest to many researchers. Recently, Yao et al (2016) used a cellular model to explore its inhibitory effect on the nitric oxide production of RAW264.7 cells (Yao, et al , 2016); while Zelov? et al (2014) reported its anti-inflammatory activity. In addition, moracin C has also been found to inhibit fatty acid synthesis (Kim, et al , 2012) and lipoxygenase

levels (Lang, et al , 2016), both of which are positively correlated with oxidative stress (Li, et al , 2016; Tersey, et al , 2014). These three inhibitory effects of moracin C are thought to originate from an antioxidant action. However, to the best of our knowledge, there is no relevant study to date on the antioxidant action of moracin C.

Moracin M is a phosphodiesterase-4 inhibitor isolated from Morus alba (L.). Moracin -M; Steppogenin - 4' - O - beta-D - glucoside and mulberroside- the novel compounds of mulberry, Morus alba (L) were found to produce hypoglycemic effects (Zhang, et al , 2009). The ethanolic extract of leaves of mulberry, Morus alba (L) had antihyperglycemic, antioxidant and antiglycation effects in chronic diabetic rats (Naowaboot, et al , 2009) and therefore, it deserve therapeutic significance and exert a applicable influence. The involvement of oxidative stress in cancer induction and it's subsequent development , and associated molecular mechanism is becoming increasingly clear (Ames, et al , 1995 and Lahiri, et al , 19993). Recent studies showed an increasing use of medicinal plants or their extracts to ameliorate diseases (Celik, et al, 2009 and Mohammadi, et al , 2011). Moracin is the novel compound of mulberry, Morus alba(L.). In this present attempt, the effects of Moracin for overcoming oxidative damage in diabetes, which plays an important role in the development of diabetes, was investigated. The preventive effects of Moracin were also examined on diabetic disorders such as body weight loss, decreased insulin levels, and decreased plasma glucose levels. Free radicals play an important role in plasma chemistry, biochemistry, and many other chemical processes within the human physiology (Usha Nandhini, et al , 2011). Free radical damage could be a reason for many diseases, including diabetes (Agar, et al , 2011). When the number of free radicals increases to the point that they outnumber the antioxidants, they can attack the somatic cells and immune system (Hayden, et al , 2005). Antioxidants are molecules that neutralize the effects of free radicals by donating an electron to pair with the free radical's unpaired electrons. Healthy people have a balance between free radicals and antioxidants. However, it has been shown that people who have diabetes have higher levels of free radicals, which can cause diabetic complications (Memisogullari, et al , 2004). The overall objective of the present attempt was to investigate the possible antidiabetic and therapeutic effects of Moracin on diabetes in streptozotocin (STZ)-induced diabetic rats. The specific aims of the attempt were: 1) to investigate the effect of Moracin supplementation on blood glucose concentration, body weight, lipid peroxidation, and plasma insulin levels; 2) to investigate nitric oxide (NO), glutathione (GSH), and malondialdehyde (MDA) levels and the antioxidant enzyme [superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GSHPx)] levels in both blood and brain tissue samples;3) and to investigate the effect of lycopene on the expression of the antioxidant enzyme genes (SOD, CAT, and GSH-Px) that regulate the antioxidative defense mechanisms in brain tissues.

The sericin is reported for increasing the adhesion and proliferationin rats of

"Otsuka Long-Evans Tokushima Fatty (OLETF) - Group" rat(Nagai, et al, 2009).

The provision of sericin through water at the rate of 250 mg / Kg body weight and 500 mg / Kg body weight, orally, daily, to the streptozotocin induced diabetic male rats, Rattus norvegicus (L.) is reported to lower the blood glucose level and levels of Malondialdehyde (MDA) in serum. The restorage of insulin levels is reported in the sericin treated individuals of diabetic male rats, Rattus norvegicus (L.) received the aqueous solution of sericin (Vitthalrao B. Khyade and Peeyush M. Pahade, 2018).

The diabetes associatedelevation of levels of glucose in the blood was found reduced through the provision of aqueous solution of Moracin over the period of eight weeks in the male rats (Rattus norvegicus L.). The levels of plasma nitric oxide (NO) and glutathione (GSH) of brain tissue were found significantly reduced in the Moracin treated group of streptozotocin-induced diabetic rats. The oxidative damage and low levels of insulin associated with diabetes were ameliorated with the Moracin treatment (Vitthalrao B. Khyade , 2018).

The purpose of present attempt is to study the effect of aqueous solution of sericin; moracin; sericin, moracin both together on the body weight; water consumption and blood glucose level in non-diabetic and streptozotocin induced diabetic rat, rat, Rattus norvegicus (L).

MATERIAL AND METHODS

The study was carried through the steps like: Mentainance of experimental animals; Induction of diabetes through streptozotocin; Grouping experimental animals for the treatment; assessment of the parasmeteres on body weight and water consumption; Bioassay of blood glucose level and the Statistical analysis.

(A). Mentainance of Experimental Animals:

For the present attempt, permission was issued by the ethical committee of Animal Welfare and Use Committee, Department of Zoology, Shardabai Pawar Mahila Mahavidyalaya, Shardanagar (Tal. Baramati Dist. Pune - 413115 India). The experimental animals for the present attempt were the individuals of Norvegian brown rat, Rattus norvegicus(L.). Six week old male rats (Rattus norvegicus L.) were procured from Department of Zoology, University of Pune. They were housed in cages and maintained at 28 degree Celcious and subjected to a 09:15 hours light - dark cycle (Lights on 8.00 a.m. to 5.00 p.m.). Experimental animals, the rats in cages were acclimatized for one week before the experimental use. The rats were feed a commercial stock diet and deionized water. The rats were maintained in laboratory through the standard methods. The body weight was measured every week.

(B). Induction of Diabetes in the Experimental Animals Through Streptozotocin:

The experimental animals were allowed for acclimatization for about two weeks. Through the assessment of blood level, approximately half the number of rats were designated as "Non-diabetics". Remaining experimental animals were used for induction of diabetes through streptozotocin and designated as "Diabetics". Rats with the reading of blood glucose level over 7.8?mmol/L were designated as "Diabetic Rats" (Yao Sheng,

et al , 2017). The diabetes was induced in rats with Streptozotocin (STZ, Sigma Chemical Company) through procedure explained by Vitthalrao B. Khyade (2018). After overnight fasting, diabetes was inducedin the rats by a single intraperitoneal injection of Streptozotocin (STZ). The streptozotocin (STZ) was intraperitoneally administered (in a dose of 70 mg/kg/bw) in 0.1 M citrate buffer, (pH 4.5). The control rats received intraperitoneally citrate buffer. A freshly-prepared solution of streptozotocin (STZ, 70 mg/kg/bw) in 0.1 M citrate buffer, pH 4.5 was injected intraperitoneally to rats that had fasted overnight (Kesari et al., 2007). One week later, blood samples were collected from the orbital sinus, and rats with fasting blood glucose (FBG) levels above 200 mg/dL (11.1 mmol/L) were selected for the experimental protocol. During a 21-day period of treatment, normal and STZ-treated rats were fed with 40 g/day of pellet food (Hindustan Animal Feeds, Behind Gokulnagar Octroi Check Post, Near Vijaynagar Railway Crossing, Jamnagar - 361004 Gujarat INDIA).

(C). Grouping the Experimental Animals for the Treatment:

Two months of age and weighing between 150 and 250 g, the rats, the experimental animals were allocated randomly. After diabetic state was confirmed, the rats, the experimental animals were used for the studies on treatment of Sericin separately; Moracin separately; Sericin and Moracin, both together. They were divided into in different groups, each with 15 individuals (n=15 animals).

The groups of non-diabetic rats include:

Group - (I) Non-diabetic Water Treated Control (0.0 gram/ 100 mL) (NDWT - 0).
Group - (II) Non-diabetic Sericin (1.0 gram/ 100 mL) (NDST - 1).
Group - (III) Non-diabetic Sericin (1.5 gram/ 100 mL) (NDST - 2).
Group - (IV) Non-diabetic Sericin (2.0 gram/ 100 mL) (NDST - 3).
Group - (V) Non-diabetic Sericin (2.5 gram/ 100 mL) (NDST - 4).
Group - (VI) Non-diabetic Sericin (3.0 gram/ 100 mL) (NDST - 5).
Group - (VII) Non-diabetic Moracin (1.0 gram/ 100 mL) (NDMT- 1).
Group - (VIII) Non-diabetic Moracin (1.5 gram/ 100 mL) (NDMT - 2).
Group - (IX) Non-diabetic Moracin (2.0 gram/ 100 mL) (NDMT - 3).
Group - (X) Non-diabetic Moracin (2.5 gram/ 100 mL) (NDMT - 4).
Group - (XI) Non-diabetic Moracin (3.0 gram/ 100 mL) (NDMT - 5).
Group - (XII) Non-diabetic Sericin and Moracin together (1.0 gram/ 100 mL) (NDSMT - 1).
Group - (XIII) Non-diabetic Sericin and Moracin together (1.5 gram/ 100 mL) (NDSMT - 2).
Group - (XIV) Non-diabetic Sericin and Moracin together 2.0 gram/ 100 mL) (NDSMT - 3).
Group - (XV) Non-diabetic Sericin and Moracin together (2.5 gram/ 100 mL) (NDSMT - 4).
Group - (XVI) Non-diabetic Sericin and Moracin together (3.0 gram/ 100 mL) (NDSMT - 5).

The groups of diabetic rats include:

Group - (I) Diabetic Control(treated with water as vehicle)(DWT - 0).
Group - (II) Diabetic Sericin (1.0 gram/ 100 mL) (DST - 1).
Group - (III) Diabetic Sericin (1.5 gram/ 100 mL) (DST - 2).
Group - (IV) Diabetic Sericin (2.0 gram/ 100 mL) (DST - 3).
Group - (V) Diabetic Sericin (2.5 gram/ 100 mL) (DST - 4).
Group - (VI) Diabetic Sericin (3.0 gram/ 100 mL) (DST - 5).
Group - (VII) Diabetic Moracin (1.0 gram/ 100 mL) (DMT- 1).
Group - (VIII) Diabetic Moracin (1.5 gram/ 100 mL) (DMT - 2).
Group - (IX) Diabetic Moracin (2.0 gram/ 100 mL) (DMT - 3).
Group - (X) Diabetic Moracin (2.5 gram/ 100 mL) (DMT - 4).
Group - (XI) Diabetic Moracin (3.0 gram/ 100 mL) (DMT - 5).
Group - (XII) Diabetic Sericin and Moracin together (1.0 gram/ 100 mL) (DSMT - 1).
Group - (XIII) Diabetic Sericin and Moracin together (1.5 gram/ 100 mL) (DSMT - 2).
Group - (XIV) Diabetic Sericin and Moracin together 2.0 gram/ 100 mL) (DSMT - 3).
Group - (XV) Diabetic Sericin and Moracin together (2.5 gram/ 100 mL) (DSMT - 4).
Group - (XVI) Diabetic Sericin and Moracin together (3.0 gram/ 100 mL) (DSMT - 5).

The diabetic group experimental animals rats(Rattus norvegicus L.) were allowed to drink a 5% glucose solution overnight to overcome the drug-induced hypoglycemia. The rats of the Non-diabetic Water Treated Control and diabetic Water Treated Control groupwere fed without any supplements except vehicle water.

The sericin and moracin were procured through the local dealers. The aqueous sericin solution at the rate of 4 mg/kg body weight was administrated orally, daily, to the rats of "Moracin Treated Diabetic Group" and to the rats of "Moracin Treated Group" once a day for 8 weeks. The dose of Moracin that was used in the present attempt was selected on the basis of trial and error method.

In order to determine the effect of sericin(separately); moracin (separately); Sericin - Moracin (Both Together), aqueous solution (1.0 g/100 mL; 1.5 g/ 100 mL; 2.0 g/100 mL.0 g/100 mL ; 3.0 g/100 mL) were prepared and administered as drinking water. For treating Sericin - Moracin both together, for each titer, half the weight belong to sericin and remaing half belong to moracin. Both sericin and moracin are mixed together and used for preparation of aqueous solution of desired strength. The doses of sericin(separately); moracin (separately); Sericin - Moracin (Both Together) were selected in accordance with a preliminary pilot study (Vitthalrao B. Khyade, 2018). This preliminary pilot study included from 15 to 60 g of leaves

in 500 mL of water, the amounts of sericin(separately); moracin (separately); Sericin - Moracin (Both Together). Animals of the diabetic and non-diabetic control groups received only drinking water. All animals were kept under the above mentioned experimental conditions for a 30-day period.

For all animal groups, water intake was determined daily through the method explained by Ju?rez-Rojop et al (2012) and data are presented as the area under the curve in the water consumption graph along the 30 days of the experiment. Body weight was measured at baseline and every week.

(D). Bioassay of Blood Glucose:

Blood was collected. Serum was separated and immediately frozen and stored at − 70°C until the biochemical determination was performed. The blood glucose level was measured through the method explained by Juarez-Rojop et al (2012). The fasting blood glucose levelwas measured from the animals of all thesegroups. Fasting blood glucose level wasmeasured using single touch glucometer(Life Scan, Johnson and Johnson, USA)25 invenous blood collected from tip of the tail vein. Blood glucose levels were expressed interm of mg/dl.

(E). Statistical Analysis:

For the purpose to get the consistency in the results, the whole experimentation was repeated for three times. The data was collected and subjected for statistical analysis. All data are expressed as mean ë S.E.M. One- or twoway analysis of variance (ANOVA) was performed followed by Tukey's test to compare the differences between treatments. Differences were considered statistically significant for $p< 0.05$.

RESULTS AND DISCUSSION

The results on the attempt of treating the non-diabetic rats and streptozotocin (STZ)induced diabetic rats with aqueous solution of sericin (separately); moracin(separately); Sericinand Moracin (both together) are summerised in the tables (table 1 - 5) and presented in the figures (figure - 1; 2; 3; 4; 5 A; 5B and 6). The parameters for assessing the effect of aqueous solution of Sericin (separately); Moracin (separately); Sericin and Moracin (both together) include: body weight; warer consumption and blood sugar level.

The body weight of rats in the untreated Non-diabetic group of rats was measured 287.13 (± 2.916) units (Table - 1 Figure -1).

Treating the Non-diabetic rats with aqueous solution of Sericin (separately) of1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was found effected into the body weight measuring about: 287.13 (± 2.916); 292.41 (± 2.968); 294.17(± 2.786); 295.83 (± 2.786); 295.88 and 295.94. (± 3.653) units respectively (Table - 1 and Figure - 1).

Provision of aqueous solution of Moraicin (separately) of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength to the Non-diabetic rats was found effected into the body weight measuring about: 291.64 (± 3.011); 291.93(± 2.256); 293.08 (± 2.532); 295.11 (± 2.249) and 301.62 (± 2.298) units respectively (Table - 1 and Figure - 1).

There was improvement in the body weight through aqueous solution of Sericin and Moracin (both together). Treating the reating the Non-diabetic rats with aqueous solution of Sericin and

Moracin (both together) of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was found effected into the body weight measuring about: 308.28 ((± 2.387); 314.73 (± 6.347); 355.89 (± 7.786); 357.21 (± 29.469) and 363.57 (± 41.158) units respectively (Table - 1 and Figure - 1).

The present attempt is reporting improvement in the body weight through the supplementation of aqueous solution of Sericin (Separately); Moracin (Separately); Sericin and Moracin (both together). Treating the Non-diabetic rats with aqueous solution of Sericin; Moracin; Sericin and Moracin (both together) was fthus found improving the body weight ranging from 1.838 to 3.068; 1.570 to 5.046 and 7.366 to 26.622 percents respectively (Table - 1 and Figure - 1).

The body weight of rats in the untreated Streptozotocin induced Diabetic group of rats was measured 237.60 (± 4.128) units (Table - 3 and Figure - 3).

Treating the "Group of Streptozotocin induced Diabetic rats" with aqueous solution of Sericin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was found effected into the body weight measuring about: 244.72 (± 5.314) units; 258.23 (± 5.607)units; 273.39 (± 11.678) units; 288.71(ë 26.889) units and 291.63 (± 24.521) units respectively (Table - 3 and Figure - 3).

Provision of aqueous solution of Moracin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strengthTreating the "Group of Streptozotocin induced Diabetic rats" with aqueous solution of Moracin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was recorded the body weight measuring about: 243.78 units; 261.63 (± 7.438) units; 268.51 (± 14.772) units; 283.55 (± 17.598) units and 291.17 (± 18.786) units respectively (Table - 3).

Supplying the "Group of Streptozotocin induced Diabetic rats" with aqueous solution of Sericin and Moracin (both together) of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was found reflected into the body weight measuring about: 244.21 (± 5.432) units; 259.93 (± 8.463) units; 271.91 (± 8.893) units; 286.39 (± 9.145) units and 293.58 (± 19.661) units respectively (Table - 3).

The percent change in the body weight through treating the experimental animals with Sericin (separately); Moracin (separately); Sericin and Moracin (Both together) recorded was 2.996 to 22.739; 2.601 to 22.546 and 2.781 to 23.561 (Table - 3).

The Non-diabetic control group rats were foundwater consumption measuring about 195.73 (± 2.916) units (Table - 2).

The provision of aqueous solution of Sericin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength to the Non-diabetic rats was found effected into the water consumption measuring about: 219.24 (± 10.294) units; 224.61 (± 11.633) units;224.82 (± 19.716) units; 224.71 (± 19.786) units; and 224.87 (± 39.934) units respectively (Table - 2).

The water consumption measuring about: 195.88 (± 38.842) units; 196.01 (± 23.447) units; 196.89 (± 12.532) units; 196.88 (± 28.349) units and 198.02 (±

13.844) units were recorded in the Non-diabetic rats treated with aqueous solution of Moracin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength respectively.

Treatment of aqueous solution of Sericin and Moracin (Both together) of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength to the Non-diabetic rats was found effected into the water consumption measuring about: 197.91 (± 23.152) units; 197.97 (± 16.752) units; 198.08 (± 33.008) units; 198.83 (± 31.238) units; and 201.98 (± 56.786) units respectively (Table - 2).

There was 12.021 to 14.887; 00.076 to 01.169 and 01.113 to 3.193 percent changes in the water consumption through treating the experimental animals with Sericin (separately); Moracin (separately); Sericin and Moracin (Both together) (Table - 2).

In the streptozotocin induced diabetic control group of rats, water consumption was 723.51(± 21.001) units (Table - 4; Figure - 4).

Treating the streptozotocin induced diabetic rats with aqueous solution of Sericin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was found effected into the water consumption measuring about: 681.58 (± 19.783) units; 639.66 (± 66.163) units; 617.16 (± 69.835) units; 586.02 (± 66.311) units; and 594.67 (± 64.326) units respectively (Table - 4; Figure - 4).

Providing the streptozotocin induced diabetic rats with aqueous solution of Moracin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was found effected into the water consumption measuring about: 660.62 (± 15.687) units; 549.32 (± 71.021) units; 458.21(± 72.385) units; 461.47(± 71.427) units and 546.94 (± 71.905) units respectively (Table - 4; Figure - 4).

Treating the streptozotocin induced diabetic rats with aqueous solution of Sericin and Moracin (Both together) of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was found effected into the water consumption measuring about: 506.61(± 38.712) units; 463.89(± 31.507) units; 423.05(± 22.043) units; 421.33 (± 65.214) units; and 318.53(± 51.713) units respectively (Table - 4; Figure - 4).

The percent change in the water consumption through treating the streptozotocin induced diabetic rats with Sericin (separately); Moracin(separately); Sericin and Moracin (Both together) recorded was 5.795to17.807; 8.692 to 24.404 and 29.978 to 55.974 (Table - 4; Figure - 4).

The serum blood glucose level in rats of the non-diabetic control group was measured 91.775 (±6.4) units(Table - 5; Figure - 5 A).

Treating non-diabetic rats with aqueous solution of Sericin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was found effected into the blood glucose level measuring about: 99.286 (±7.158) units; 101.56 (±9.555) units; 101.82 (±11.952) units; 103.32 (±19.271) units; and 103.97 (±21.933) units respectively (Table - 5; Figure - 5 A).

Supplying non-diabetic rats with aqueous solution of Moracin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/

100 mL strength was found resulted into the blood glucose level measuring about: 396.41 (±27.723) units; 347.72 (±31.066) units; 341.36 (±69.786) units; 154.77 (±49.067) units; and 121.31 (±28.844) units respectively (Table - 5; Figure - 5 A).

Treatment of aqueous solution of Sericin and Moracin (Both Together) of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength to the non-diabetic ratswas found effected into the blood glucose level measuring about: 96.397 (±19.754) units; 101.02 (±19.789) units; 101.53 (±21.333) units; 103.03 (±22.099) units; and 113.68 (±22.263) units respectively (Table - 5; Figure - 5 A).

The percent increase in the blood glucose level through treating the non-diabetic rats with Sericin (separately); Moracin (separately); Sericin and Moracin (Both together) recorded was 8.184 to 13.287; 8.496 to 21.623and 5.036 to 23.868 (Table - 5; Figure - 5 A) statistically, which were non-significant.

The level of blood glucose in the streptozotocin induced diabetic rats was found measured 417.74 (±23.936) units(Table - 5 ; Figure - 5 A and 5 B).

Treating streptozotocin induced diabetic rats with aqueous solution of Sericin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was found effected into the blood glucose level measuring about: 396.41 (±27.723) units; 347.72 (±31.066) units; 341.36 (±69.786) units; 154.77 (±49.067) units; and 121.31 (±28.844) units respectively (Table - 5; Figure -5 B).

The Moracin (aqueous solution of Moracin of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength) treatment to the streptozotocin induced diabetic rats was found effected into the blood glucose level measuring about: 414.36 (±29.978) units; 348.77 (±25.336) units; 356.66 (±41.689) units; 149.87 (±33.339) units; and 129.23 units respectively (Table - 5; Figure -5 B).

Treating streptozotocin induced diabetic rats with aqueous solution of Sericin and Moracin (Both Together) of 1.0 gram/ 100 mL; 1.5 gram/ 100 mL; 2.00 gram/ 100 mL; 2.5 gram/ 100 mL 3.00gram/ 100 mL strength was found effected into the blood glucose level measuring about: 403.38 (±19.889) units; 120.91 (±19.862) units; 120.67 (±21.066) units; 110.65 (±21.859) units; and 099.27 (±19.812) units respectively (Table - 5; Figure -5 B).

The percent reduction in the blood glucose level through treating the streptozotocin induced diabetic rats with Sericin (separately); Moracin (separately); Sericin and Moracin (Both together) recorded was 05.106 to 70.960; 00.809 to 69.640 and 03.437 to 76.236 (Table - 6 and Figure - 6).

The provision of intraperitoneal streptozotocin (STZ) to the rat, Rattus norvegicus (L) in the present attempt was found inducing the diabetes through significant increase glucose bloodlevels four days after injection.The diabetic individuals were decreased bodyweight. The results of present attempt are parallel with the previous attempt. Junod, et al (1969) and Montano, et al (2010) also reported the loss of body weight in the streptozotocin (STZ) diabetes. The loss of body weight loss is the significant distinguishing morphological feature of diabetes. The factors in diabetes associated with loss of body weight are unknown.

Loss of body weight in diabetes may be concerned with reduction in the rate of food consumption and it's utilization. In the present attempt on use of aqueous solution of sericin (separately); aqueous solution of moracin (separately); aqueous solution of serricin and moracin (both together) maintained the body weight of diabetic rats during treatment. Present attempt revealed that the aqueous solution of sericin (separately); aqueous solution of moracin (separately); aqueous solution of serricin and moracin (both together) significantly lowered the levels of blood glucose ($p<0.05$) in streptozotocin induced (STZ) diabetic experimental animals. The hypoglycemic effect observed in present attempt (the use of aqueous solution of sericin (separately); aqueous solution of moracin (separately); aqueous solution of serricin and moracin (both together)goes parallel with the earlier report (Vitthalrao B. Khyade, 2018) . The hypoglycemic effect in present studies is similar to the one reported for the use of herbal sources to control the diabetes (P?rez , et al , 2003; Gaamoussi, et al , 2010; Islam, 2011; Sasidharan, et al , 2011).The hypoglycemic effect treating the diabeti individuals with aqueous solution of sericin (separately); aqueous solution of moracin (separately); aqueous solution of serricin and moracin (both together) may be due to a reduction in the rate of absorption of glucose in intestine glucose absorption Gupta, et al (2012).It is possible for increase in the utilization of blood glucose by the body tissue through increase in the rate of metabolism. The most significant hypoglycemic influence reported in the present attempt may be due to the integrated action of serricin and moracin (both together). The serricin and moracin, both together, may have stimulatory mechanism on the few surviving β-cells of Islets of Langerhans, which could allow the release of increased amount of insulin. There are reports on use of aqueous solution of sericin (separately) and aqueous solution of moracin (separately) for the purpose to recover from diabetes (Vitthalrao B. Khyade, 2018). The results in present attempt suggest that, aqueous solution of serricin and moracin (both together) may act by stimulating the few remaining β-cells with the subsequent release of more insulin. Presently, there is no proof for the possibility of regeneration of ?-cells of the islets as responsible for the insulin increase through the use of aqueous solution of sericin (separately); aqueous solution of moracin (separately); aqueous solution of serricin and moracin (both together). According to Terada et al (2002), there is a promotion in the growth of cells in cell lines (human cell lines and mouse hybridomas) through the addition of sericin in the media of culture. sericin (separately); moracin (separately); serricin and moracin (both together) are possibly promoting the growth of insulin secreting cells, and resulting in the hypoglycemic influence.

CONCLUSION

The non-diabetic individuals with sericin; moracin and both of them mixed together were found increase in their body weight, measuring 1 - 3 percent (sericin treated group); 1 - 5 (moracin treated group) and 2 - 26 percent (sericin and moracin, both mixed treated group). Aqueous solution of sericin; moracim and both sericin and moracin (both together) (1.00; 1.50; 2.00 g and 3.00 g/100 mL)

was found significantly decreased blood glucose level ($p<0.05$) in diabetic rats. The percent reduction in the blood glucose level through treating the streptozotocin induced diabetic rats with Sericin (separately); Moracin (separately); Sericin and Moracin (Both together) reported was 05.106 to 70.960; 00.809 to 69.640 and 03.437 to 76.236. The aqueous solution of sericin (separately); aqueous solution of moracin (separately); aqueous solution of serricin and moracin (both together) seems to have a favorable influence in serum glucose levels. This may be attributed to the ability of aqueous solution of sericin (separately); aqueous solution of moracin (separately); aqueous solution of serricin and moracin (both together)to stimulate the body tissue for resisting the disorders appeared through the induction of diabetes. The aqueous solution of sericin (separately); aqueous solution of moracin (separately); aqueous solution of serricin and moracin (both together) may provide a new therapeutic avenue against diabetes related complications.

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Table - 1: Influence of aqueous solution of Sericin, Moracin and mixture of both (Sericin and Moracin Together) on body weight in Non-diabetic Rat, Rattus norvegicus (L).

Treatment Group	Sericin	Moracin	Sericin and Moracin Together
Non-diabetic Control	287.13 (± 2.916)	287.13 (± 2.916)	287.13 (± 2.916)
Non-diabetic Treated (1 gram/ 100 mL).	292.41 (± 2.968) 1.838	291.64 (± 3.011) 1.570	308.28 (± 2.387) 7.366
Non-diabetic Treated (1.5 gram/ 100 mL).	294.17* (± 2.786) 2.451	291.93* (± 2.256) 1.671	314.73* (± 6.347) 9.612
Non-diabetic Treated (2 gram/ 100 mL).	295.83* (± 2.786) 3.029	293.08* (± 2.532) 2.072	355.89* (± 7.786) 23.947
Non-diabetic Treated (2.5 gram/ 100 mL).	295.88** (± 3.521) 3.047	295.11** (± 2.249) 2.779	357.21** (± 29.469) 24.407
Non-diabetic Treated (3 gram/ 100 mL).	295.94*** (± 3.653) 3.068	301.62*** (± 2.298) 5.046	363.57*** (± 41.158) 26.622

-Each figure is the mean of the three replications.
-Figure with ë sign in the bracket is standard deviation.
-Figure below the standard deviation is the percent increase over the control.
* : P < 0.05;** : P < 0.005; ***: P < 0.01

Table - 2: Influence of aqueous solution of Sericin (Separately), Moracin (Separately) and mixture of both (Sericin and Moracin Together) on water consumption (ml) in Non-diabetic Rat, Rattus norvegicus (L).

Treatment Group	Sericin	Moracin	Sericin and Moracin Together
Non-diabetic Control	195.73 (± 2.916)	195.73 (± 2.916)	195.73 (± 2.916)
Non-diabetic Treated (1 gram/ 100 mL).	219.24 (± 10.294) 12.021	195.88 (± 38.842) 00.076	197.91 (± 23.152) 01.113
Non-diabetic Treated (1.5 gram/ 100 mL).	224.61* (± 11.633) 14.755	196.01* (± 23.447) 00.143	197.97*** (± 16.752) 01.144
Non-diabetic Treated (2 gram/ 100 mL).	224.82* (± 19.716) 14.862	196.89* (± 12.532) 00.592	198.08*** (± 33.008) 01.200
Non-diabetic Treated (2.5 gram/ 100 mL).	224.71** (± 19.786) 14.806	196.88** (± 28.349) 00.587	198.83*** (± 31.238) 01.583
Non-diabetic Treated (3 gram/ 100 mL).	224.87*** (± 39.934) 14.887	198.02*** (± 13.844) 01.169	201.98*** (± 56.786) 3.193

-Each figure is the mean of the three replications.
-Figure with ë sign in the bracket is standard deviation.
-Figure below the standard deviation is the percent increase over the control.
* : P < 0.05;** : P < 0.005; ***: P < 0.01

Table - 3: Influence of aqueous solution of Sericin (Separately), Moracin (Separately) and mixture of both (Sericin and Moracin Together) on the body weight parameter in Streptozotocin induced Diabetic Rat, Rattus norvegicus (L).

Treatment Group	Sericin	Moracin	Sericin and Moracin Together
Diabetic Control	237.60 (± 4.128)	237.60 (± 4.128)	237.60 (± 4.128)
Diabetic Treated (1 gram/ 100 mL).	244.72 (± 5.314) 2.996	243.78 (± 6.379) 2.601	244.21 (±5.432) 2.781
Diabetic Treated (1.5 gram/ 100 mL).	258.23 (± 5.607) 8.682	261.63 (± 7.438) 10.113	259.93 (± 8.463) 9.398
Diabetic Treated (2 gram/ 100 mL).	273.39 (± 11.678) 15.063	268.51 (± 14.772) 13.009	271.91 (± 8.893) 14.440
diabetic Treated (2.5 gram/ 100 mL).	288.71 (± 26.889) 21.931	283.55 (± 17.598) 19.339	286.39 (± 9.145) 20.534
Diabetic Treated (3 gram/ 100 mL).	291.63 (± 24.521) 22.739	291.17 (± 18.786) 22.546	293.58 (± 19.661) 23.561

-Each figure is the mean of the three replications.
-Figure with ë sign in the bracket is standard deviation.
-Figure below the standard deviation is the percent increase over the control.
* : P < 0.05;** : P < 0.005; ***: P < 0.01

Table - 4: Influence of aqueous solution of Sericin, Moracin and mixture of both (Sericin and Moracin Together) on water consumption (ml) parameter in Streptozotocin induced Diabetic Rat, Rattus norvegicus (L).

Treatment Group	Sericin	Moracin	Sericin and Moracin Together
Diabetic Control	723.51 (± 21.001)	723.51 (± 21.001)	723.51 (± 21.001)
Diabetic Treated (1 gram/ 100 mL).	681.58 (± 19.783) 5.795	660.62 (± 15.687) 8.692	506.61 (± 38.712) 29.978
Diabetic Treated (1.5 gram/ 100 mL).	639.66 (± 66.163) 11.589	549.32 (± 71.021) 24.075	463.89 (± 31.507) 35.883
Diabetic Treated (2 gram/ 100 mL).	617.16 (± 69.835) 14.699	458.21 (± 72.385) 36.668	423.05 (± 22.043) 41.528
Diabetic Treated (2.5 gram/ 100 mL).	586.02 (± 66.311) 18.983	461.47 (± 71.427) 36.217	421.33 (±65.214) 41.765
Diabetic Treated (3 gram/ 100 mL).	594.67 (± 64.326) 17.807	546.94 (± 71.905) 24.404	318.53 (± 51.713) 55.974

-Each figure is the mean of the three replications.
-Figure with ë sign in the bracket is standard deviation.
-Figure below the standard deviation is the percent reduction over the control.
* : P < 0.05;** : P < 0.005; ***: P < 0.01

Table - 5: Influence of aqueous solution of Sericin, Moracin and mixture of both (Sericin and Moracin Together) on the serum glucose level (mg/dL) in Non-diabetic and Streptozotocin induced Diabetic Rat, Rattus norvegicus (L).

Treatment Group	Sericin Treated Non-diabetic	Sericin Treated Diabetic	Moracin Treated Non-diabetic	Moracin Treated Diabetic	Sericin and Moracin (Together) Treated Non-diabetic	Sericin and Moracin (Together) Treated Diabetic
Untreated Control	91.775 (±6.4)	417.74 (±23.936)	91.775 (±6.4)	417.74 (±23.936)	91.775 (±6.4)	417.74 (±23.936)
Treatment (1 gram/ 100 mL)	99.286 (±7.158) 8.184	396.41 (±27.723) 94.893	99.573 (±8.178) 8.496	414.36 (±29.978) 99.182	96.397 (±19.754) 5.036	403.38 (±19.889) 96.562
Treatment (1.5 gram/ 100 mL)	101.56 (±9.555) 10.661	347.72 (±31.066) 83.238	101.85 (±7.668) 10.977	348.77 (±25.336) 83.489	101.02 (±19.789) 10.073	120.91 (±19.862) 28.943
Treatment (2 gram/ 100 mL)	101.82 (±11.952) 10.945	341.36 (±69.786) 81.715	102.11 (±33.662) 11.261	253.24 (±41.689) 85.378	101.53 (±21.333) 10.629	120.67 (±21.066) 28.886
Treatment (2.5 gram/ 100 mL)	103.32 (±19.271) 12.579	154.77 (±49.067) 37.094	102.72 (±23.786) 11.925	149.87 (±33.339) 35.876	103.03 (±22.099) 12.263	110.65 (±21.859) 29.211
Treatment (3 gram/ 100 mL)	103.97 (±21.933) 13.287	121.31 (±28.844) 29.039	111.62 (±33.938) 21.623	129.23 (±51.786) 30.935	113.68 (±22.263) 23.868	099.27 (±19.812) 23.763

-Each figure is the mean of the three replications.
-Figure with ë sign in the bracket is standard deviation.
-Figure below the standard deviation is the percent increase change over the control.
* : $P < 0.05$;** : $P < 0.005$; ***: $P < 0.01$

Table - 6: Percent reduction in the blood glucose level in Streptozotocin induced Diabetic Rat, Rattus norvegicus (L) treated with aqueous solution of Sericin (Separately); Moracin (Separately); Sericin and Moracin (Both together).

Treatment Group	Sericin (Separately)	Moracin (Separately)	Sericin and Moracin (Both together)
Untreated Control	00.000	00.000	00.000
Treatment (1 gram/ 100 mL)	05.106	00.809	03.437
Treatment (1.5 gram/ 100 mL)	16.761	16.510	71.056
Treatment (2 gram/ 100 mL)	18.284	39.378	71.113
Treatment (2.5 gram/ 100 mL)	62.950	64.123	73.512
Treatment (3 gram/ 100 mL)	70.960	69.64	76.236

Percent Reduction = (Reading of Control group - Readings of Treated group)

Figure - 1: Influence of aqueous solution of Sericin (Separately), Moracin (Separately) and mixture of both (Sericin and Moracin Together) on body weight in Non-diabetic Rat, Rattus norvegicus (L).

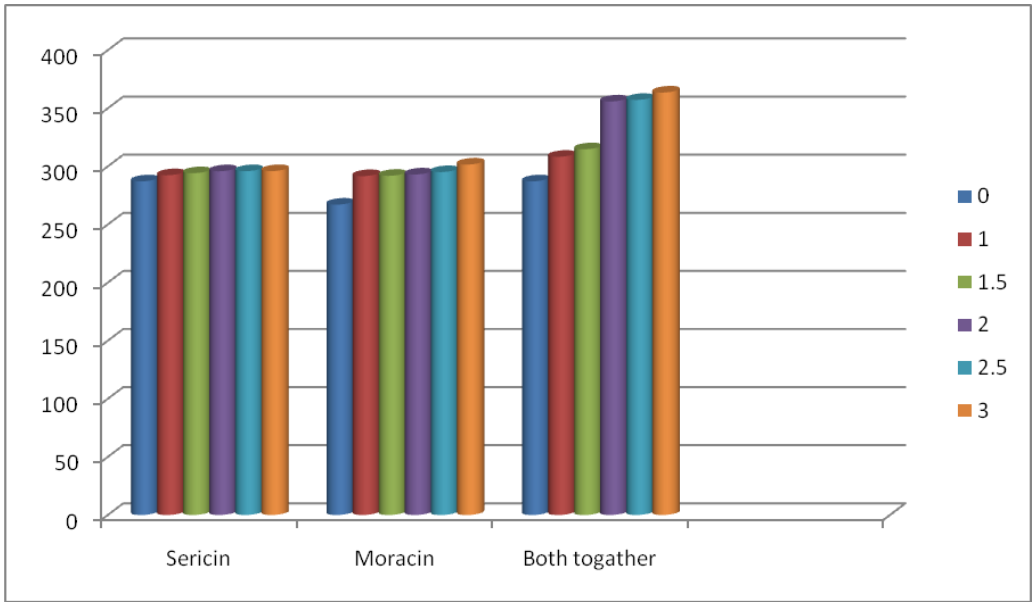


Figure - 2: Influence of aqueous solution of Sericin (Separately), Moracin (Separately) and mixture of both (Sericin and Moracin Together) on water consumption (ml) in Non-diabetic Rat, Rattus norvegicus (L).

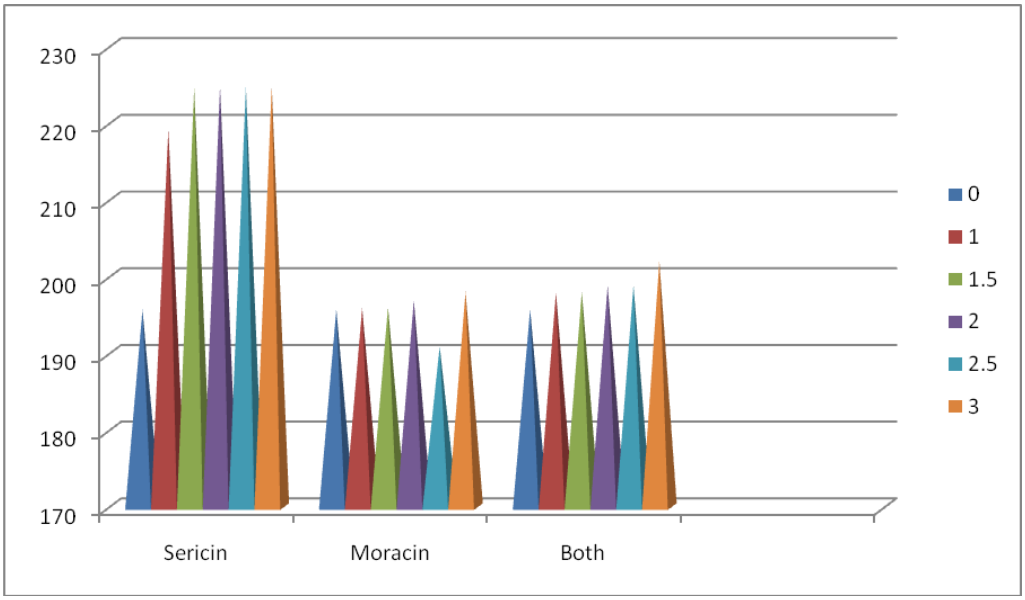


Figure - 3: Influence of aqueous solution of Sericin (Separately), Moracin (Separately) and mixture of both (Sericin and Moracin Together) on the body weight parameter in Streptozotocin induced Diabetic Rat, Rattus norvegicus (L).

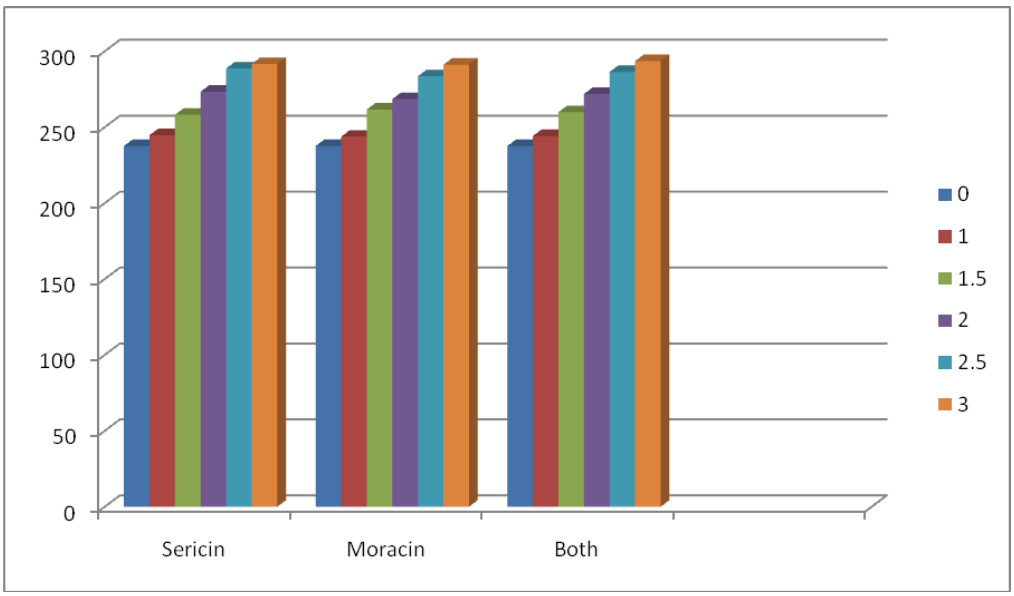


Figure - 4: Influence of aqueous solution of Sericin (Separately), Moracin (Separately) and mixture of both (Sericin and Moracin Together) on water consumption (ml) parameter in Streptozotocin induced Diabetic Rat, Rattus norvegicus (L).

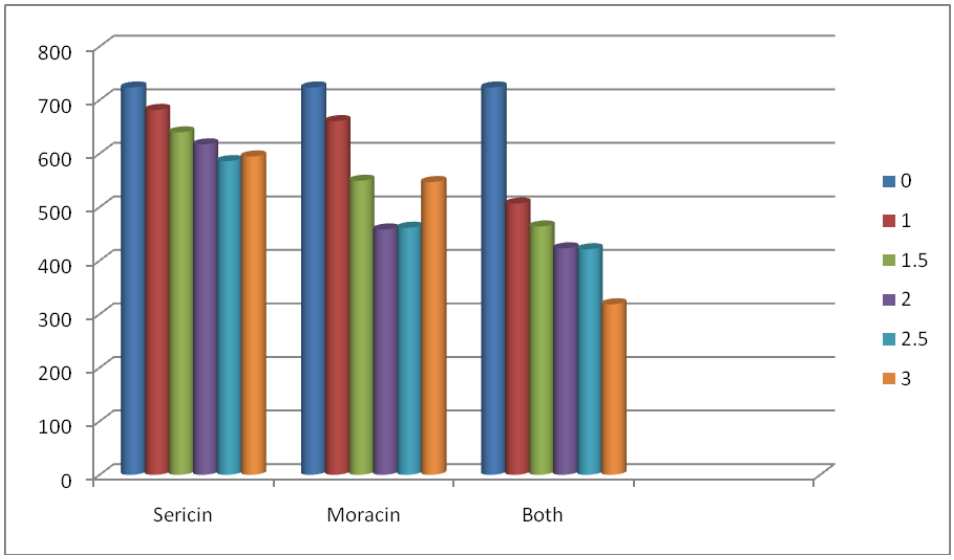


Table - 5 (A): Influence of aqueous solution of Sericin (Separately), Moracin (Separately) and mixture of both (Sericin and Moracin Together) on the serum glucose level (mg/dL) in Non-diabetic Rat, Rattus norvegicus (L).

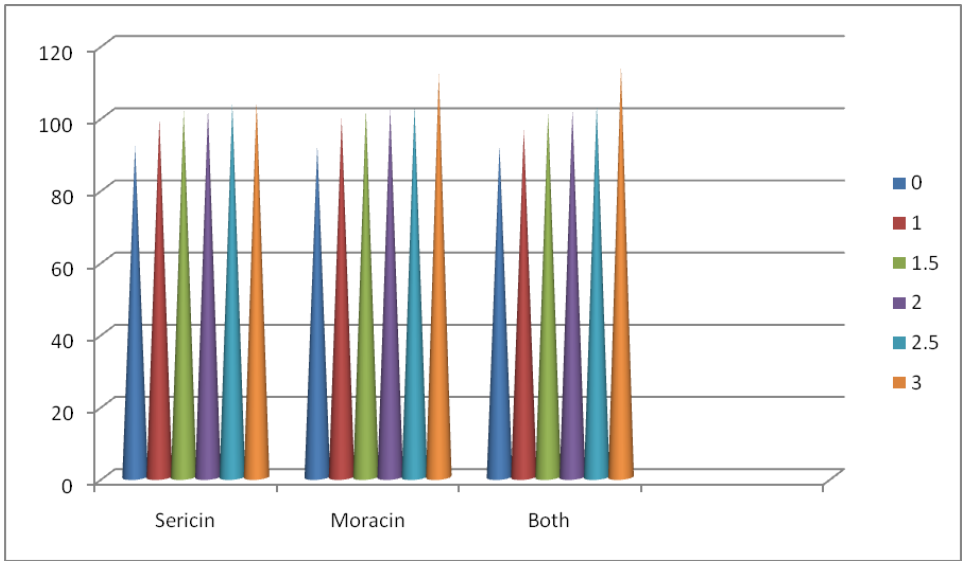


Table - 5 (B): Influence of aqueous solution of Sericin (Separately), Moracin (Separately) and mixture of both (Sericin and Moracin Together) on the serum glucose level (mg/dL) in Streptozotocin induced Diabetic Rat, Rattus norvegicus (L).

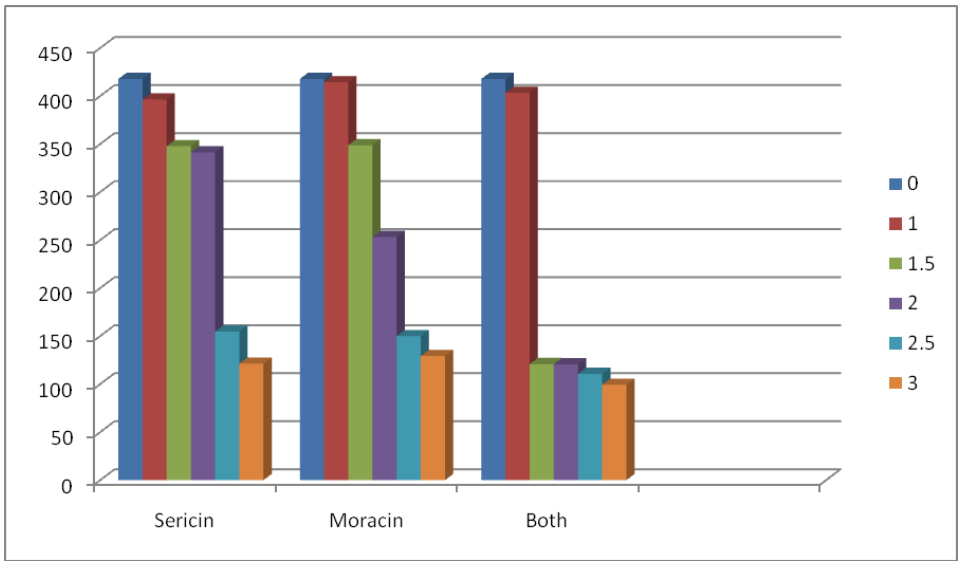
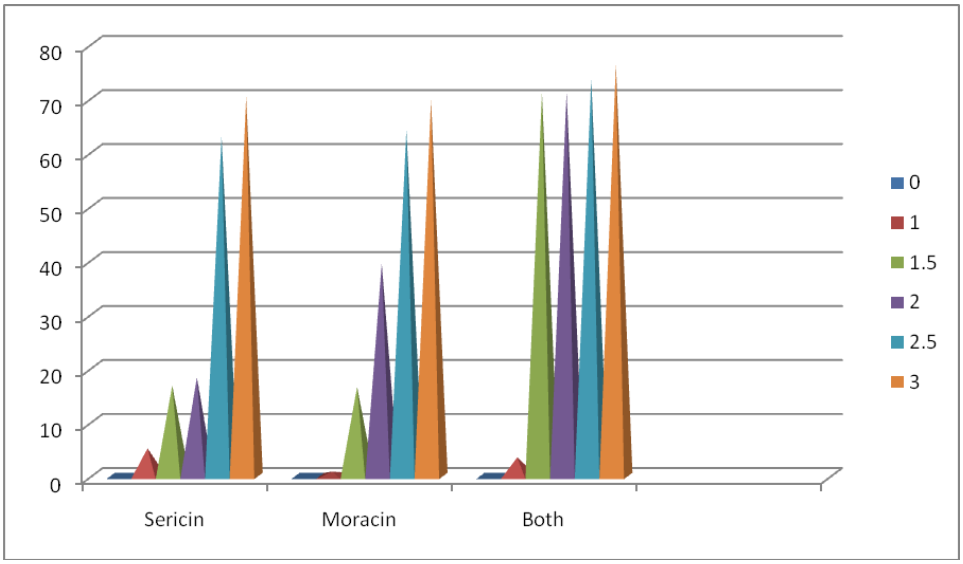


Table - 6: Percent reduction in the blood glucose level in Streptozotocin induced Diabetic Rat, Rattus norvegicus (L) treated with aqueous solution of Sericin (Separately); Moracin (Separately); Sericin and Moracin (Both together).



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