

## The Review on Insulin Plant: A Plant of Ayurvedic use.(Costus Igneus Plant)

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### ABSTRACT:

Medicinal plants are the backbone of the indigenous system of Medicine; it has been used by all cultures as a source of Medicine. Costus Igneus is a plant with a vivid variety of Pharmacological activities and it is from the family costaceae. The plant is also known as insulin plant or spiral flag. The anti-Diabetic potential of the plant is evaluated and are used in India To control diabetes. The plant as a whole or different part of the Plant like root, stem, leaves, flowers, rhizomes is used for Proving different pharmacological activities.

Costus Igneus (insulin plant) traditionally used medicinal herb which is native to southeast Asia. The Plant has been recently introduced into India and it is grow as ornamental plant in south India. India Insulin plant contain various phytochemicals constituent like steroid, alkaloid , flovonoid,Triepene, Glycoside and saponins. Its leaves are been used as dietary supplement in treatment of diabetes mellitus. The catchphrase of the plant is: a leaf a day keeps diabetes away. various pharmacological activities Include anti diabetic effect, antiproliferative potential, antimicrobial activity Antiuroliithatic property Anti-inflammatory potential it effect on learning and memory ,antioxidant activity neuroprotective role Hypolipidemic activity etc. The present review article attempt explore various medicinal properties of Costus Igneus (insulin plant )for research purpose and its suitable formation development in feature for The welfare of mankind.

**Keywords:** costus igneus, pioglitazone, insulin plant, phytoconstituents, Ayurvedic use, pharmacological Activities marketed products.

### I. INTRODUCTION:

Costus belong to family costaceae, commonly known as insulin plant in India because its, leaves to Builds up insulin in the human body since oral hypoglycaemic agents possess various side effect. There is grow in demand for herbal remedies for the treatment of diabetes mellitus. Many plant Preparation as used in folklore and traditional system of diabetes mellitus. Investigation on new oral Hypoglycaemic compound from medicinal plant will set a mild stone for development of pharmaceutical Entities or as a dietary adjuvant to existing therapies in the future.<sup>[1]</sup> insulin plant is one such traditional Plant which is getting global acceptance now days and is now widely used as an Ayurvedic medicine Herb Consumption of leaves are believed to low blood glucose level, and diabetes who consume the Leaves of this plant said to have a fall in their blood glucose levels and diabetics who consumed the Leaves of this plant said to have a fall in their blood glucose levels insulin plant is native to southeast Asia, especially on the Greater sunda islands in Indonesia.<sup>[2]</sup> It is relatively a new entrant to India and is Being grown as an ornamental plant in Kerala in the Ayurvedic system of medicine ,diabetes is Traditionally treated by chewing the plant leaves for a period of one month to get a controlled blood Glucose level.<sup>[3]</sup>

Costus Igneus(Insulin Plant)



**Cultivation and propagation:** in siddha medicine, it is known as kostum. It is being cultivated in Kashmir and the Himalayan region for its root, it is related to the gingers and was originally part of the Family Zingiberaceae. But now the costus species and their kin have been reclassified into their own Family, Costaceae. the species reproduces vegetative by rhizome and birds disperse seeds when they feed on the fruits. Costus products are sometimes called Costus igneus and are edible in nature. The flower petals are quite sweet and nutritious. It's a lower grower and makes a great ground cover. The long red flower spikes of Costus pulverulentus are unique to the family and they are sure to create interest in the garden. The plant grows very quickly. And the propagation is by stem cutting. It needs sunshine but it also grows in slightly shady areas. It is cultivated in India for its use in traditional medicine and elsewhere as an ornamental.<sup>[4]</sup>

**Morphology:** it is an upright, perennial shrub and is about two feet tall. Long branches are falling over the ground. Leaves are simple, alternate, oblong, twenty-five cm in length with several parallel thick veins. Soft, cylindrical, fleshy, pale brown rhizome is present. Strong tap root is also present which is wider at the top, sub-

cylindrical in shape with light brown to pale, dark brown colour. At the top of the branches, orange flowers are present. Fruits are very small, green in colour.<sup>[5]</sup>

**Growth and Propagation:** it grows under full sun or partial shade. It needs fertile soil with heavy moisture and is often planted near water. Propagation occurs by the division of the clumps, cuttings, or by separating the offsets that form below the flower heads. It is cultivated in the coastal area, Uttar Kannada district of Karnataka and Tamil Nadu.<sup>[6]</sup>

**Bio-Active Compound (Anti-Diabetic):** Costus igneus contains various phytochemicals like flavonoids, alkaloids, terpenoids and it was traditionally used in India to control diabetes and in experimental diabetic rats. Chemical components are present in various plant parts like leaves, stem, rhizomes, etc.<sup>[7]</sup>

**In Leaves:** carbohydrates, triterpenoids, proteins, alkaloids, tannins, saponins, and flavonoids, etc. are present in leaves. Besides these, steroids and carbohydrate-like roseoside, fatty acids like hexadecanoic acid, 9,12-octadecanoic acid, tetradecanoic acid, ethyl oleate, oleic acid, squalene are also present in leaves.<sup>[8]</sup>

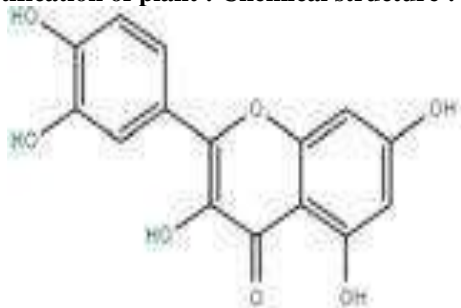
**In Stem:** Terpenoid compound lupeol and steroid compound stigmasterol are present in the stem.<sup>[9]</sup>

**In Rhizome:** Quercetin, diosgenin, a steroidal sapogenin etc. are available in rhizome.<sup>[10]</sup> **In Root:** Terpenoid, alkaloids, Tannins, etc. are available in the root portion.<sup>[11]</sup>

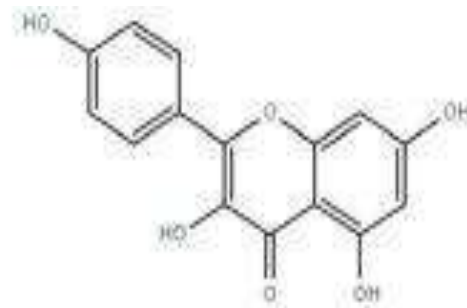
#### Taxonomy:

Botanical name: *Costus igneus* Domain: Eukaryota  
Kingdom: Plantae Subkingdom: Viridiaeplantae  
Phylum: Tracheophyta Subphylum: Euphyllophytina  
Infraphylum: Radiatopses Class: Liliopsida  
Subclass: Commelinidae Superorder: Zingiberanae  
Order: Zingiberales Family: Costaceae  
Subfamily: Asteroideae Tribe: Coreoideae  
Genus: *Costus* Specific epithet: *igneus*<sup>[12]</sup>

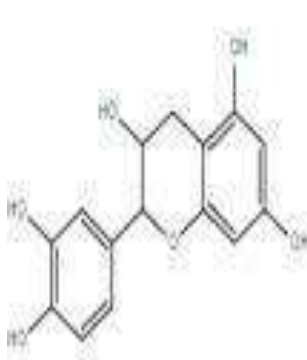
#### Identification of plant : Chemical structure :



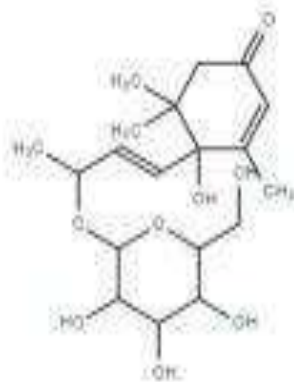
(a) Quercetin



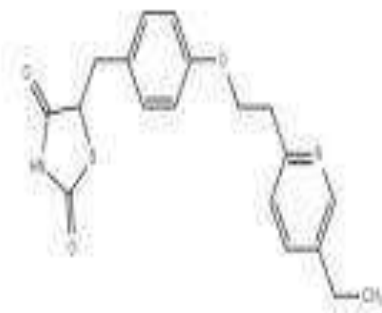
(b) Kaempferol



(c) Epicatechin



(d) Roseoside



(e) Pioglitazone

**Drug profile :** quercetin 117-39-5/ meletin.

**Category :** antioxidant, hypoglycaemic.

**Monoisotopic mass :** 302.0426565 g/ mol.

**Molecular Formula :** C<sub>15</sub> H<sub>10</sub>O<sub>7</sub>

**IUPAC Name:** 2-(3,4-dihydrophenyl)-3,5,7-trihydroxychromen-4-one<sup>[13]</sup>

Table 1: Vernacular names<sup>[14]</sup>

Languages	Names
English	Spiral Ginger, Spotted Spiral Ginger, Painted Spiral Ginger
Telugu	Peddavesiga, Yeangesha
Urdu	Bijasar, Dam al akhwain
Bengali	Piasal
Hindi	Banda, Bija-sal, Peisar , jarul, Keukand
Kannada	Kempu honne
Malayalam	Honne, Karintakara, Vengai, Venna-maram
Marathi	Honi , Pushkarmula
Sanskrit	Asana, Bandhukapushpa
Tamil	Neyccarikamaram, Venkai-c-ciray , Kostam
Gujarati	Pakarmula

**Phytoconstituents:**

Phytochemical screening showed the presence of Steroids, triterpenoids, alkaloids, tannins, flavonoids, Glycosides, saponins, carbohydrates, and proteins. The Methanol extract was found to contain the highest Number of phytochemicals. Wild plant and callus (MS and LS medium) extracted with different solvents in

Preliminary screening indicated the presence of high Content of phytochemicals like phenols, alkaloids, Flavonoids, and terpenoids in methanolic extracts. And The sequential screening for phytochemicals of Costus Leaves revealed that it is rich in protein, iron, and Antioxidant components such as ascorbic acid,  $\alpha$ -Tocopherol,  $\beta$ - carotene, terpenoid, steroids, and Flavonoids.<sup>[15]</sup>

Table 2: Nutrient composition of the dehydrated sample<sup>[4]</sup>

Moisture	4.0%
Fat	2.8%
Total ash	6.3%
Protein	18%
Iron	40mg
Phosphorous	6.6mg
Calcium	5.1mg
Total phenols	4.4g
Total flavonoids	0.848mg/g
B-carotene	667 $\mu$ g
A-tocopherol	149mg
Ascorbic acid	81mg
Glutathione(GSH)	75mmol

**Pharmacological Activities:**

The insulin plant has been reported with many activities. Among them, some are yet to be validated. The various Plant parts are shown such activities are leaf, stem, root, Rhizome and whole

plant also. Leaves are contributed to Prominent hypoglycemic potential. The stem is majorly Reported with Antiurolithiatic activity. Both stem and root Have been shown significant antioxidant activity.<sup>[15]</sup>



**Anti-Diabetic Effects:**

Costus igneus is a traditionally used medicinal plant and a Common member of ornamental plants in south Indian Gardens. Leaves are the important part which produces Significant antidiabetic activity. It reduces fasting as well as postprandial blood glucose levels. But the exact Mechanism of action behind the antidiabetic activity is Not known yet. Along with the antidiabetic activity, insulin Plant also reduces the diabetic associated complications; Bring renal, hepatic parameters to a controlled level, Decreases the amount of glycosylated haemoglobin, Corrects the lipid profile, increases body weight as well as Insulin level and shows marked improvement in the Histopathological examination. Conducted a study on costus igneous rhizomes for the evaluation Of the anti-diabetic activity. The study was conducted on streptozotocin-induced diabetic rats. Streptozotocin (STZ) selectively destroys the insulin-secreting pancreatic  $\beta$  cells and are very

Useful for evaluating hypoglycemic agents. Based on the study it could be concluded that the Costus igneous extract has significantly lowered the blood glucose level by increasing the Insulin secretion. This, in turn, has activated the glucose catabolic enzyme glucokinase and Also increased the utilization of glucose. The anti-diabetic effect may be due to the presence of tannins diosgenin, phlorotannin, flavonoid (quercetin), steroids, cardiac glycoside and Terpenoids in the plant extract.<sup>[16]</sup>

Conducted a study on costs igneus leaf extract for the evaluation of anti-diabetic activity on alloxan induced diabetic rat model. The ethanolic leaf extract of The plant has significantly lowered fasting blood serum glucose in diabetic rats and this effect May be due to improving glycemic control mechanism and increased secretion of insulin From the remnant pancreatic  $\beta$  cells.<sup>[17]</sup>

Table 3: MAJOR COMPOUNDS ISOLATED FROM COSTUS IGNEUS SHOWING ANTI-DIABETIC ACTIVITY<sup>[18]</sup>

Name of the Compounds	Activities
Triterpenoid (Corosolic acid)	Glucose uptake activity
Steroid (Diosgenin)	Hypoglycemic property
Steroid ( $\beta$ - sitosterol)	Increases plasma insulin level and also increases glucose uptake activity
Flavonoid (Quercetin)	Increases insulin mediated glucose uptaking and activity of antioxidant enymes
Phenol (catechin)	Inhibit $\alpha$ - glucosidase activity and antioxidant activity
Insulin like protein	Hypoglycemic activity
Fatty acid (Oleic acid)	Hypoglycemic activity

**Anti-Proliferative Potential:**

Evaluated the anti-Proliferative and apoptotic action of methanolic extract of Costus igneus powdered leaves (MECiL) on in vitro MCF 7 (Michigan Cancer Foundation-7) Breast cancer cell line. The extract (MECiL) was able to reduce the tumour size Without affecting the Normal cells. Also evaluated the Cytotoxicity and Cell Viability for given extract (15-2000 $\mu$ g/ml) on L6 (Rat skeletal muscle cell line) using MTT (3- (4, 5-dimethyl thiazol-2-yl)-2, 5-diphenyl tetrazolium

Bromide) assay. It showed IC 50 Value of 2000  $\mu$ g/ml Extract. The extract showed cytotoxicity aligned with the normal cell lines only at very high concentration, but it wasn't apoptotic to the normal cell lines. At the maximum dose of 2000  $\mu$ g/ml the extract showed potent anticancer activity, that is 97.46 $\pm$ 0.74 percentage Cytotoxicity. The extract possessed dose-dependent cytotoxicity against the MCF-7 cell line.

### Antimicrobial Activity:

Investigated the Antimicrobial activity of *Costus igneus* using its 100mg of Root powder. Gram-negative Bacterial cultures like *Pseudomonas aeruginosa* (*P. Aeruginosa*), *Klebsiella Pneumonia* (*K. Pneumonia*), *Salmonella sp*, *Proteus Vulgaris* (*P. Vulgaris*) were used in the study to determine The antibacterial activity (in vitro raised root extracts of *Costus igneus*). About 10 grams of the IBA (Indole 3-acetic Acid) and IAA (Indole butyric acid) derived root materials Subjected to Soxhlet extraction using 5ml of acetone, Chloroform, and methanol. In the study, two growth Regulators IAA and IBA in combinations were added to MS (Murashige and Skoog) medium for direct root induction. *Klebsiella pneumonia* was found to be most susceptible to Both IBA and IAA derived roots using acetone as solvent. Its zone of clearance was found to be 25 mm, which was Almost equal to that of commercially available antibiotic Gentamycin.<sup>[19]</sup>

Conducted a study on leaves of *Costus igneus* for the Evaluation of the antimicrobial activity. The antimicrobial activity was tested against gram +ve and gram -ve bacterial and fungal strains which include *E.coli*, *Staphylococcus aureus*, *Candida parapsilosis*, *Salmonella typhi*, *Bacillus subtilis*, *Aspergillus niger*, *Candida Albicans*. The antimicrobial activity was determined by disc diffusion method and it was Indicated by a zone of inhibition. From this study it was concluded that the leaf extract of *Costus igneus* have antimicrobial potential and action was more against *Bacillus subtilis* and *Candida parapsilosis* at a lower concentration.<sup>[20]</sup>

### Antirolithiatic Property:

studied the Antirolithiatic property of insulin plant using its aqueous extract of stem And rhizome and through the work found out that the Plant extract was able to promote the formation of Hydroxyapatite (HAP) crystals and reduce the nucleation Rate of CHPD crystals, a major component of calcium Urinary stone. The growth of Calcium hydrogen Phosphate dihydrate (CHPD) crystals has done by the Single diffusion gel growth technique and the inhibitory Effect of aqueous extracts of leaves, stems, and rhizome Of *Costus igneus* on the growth of CHPD crystals has been Investigated. To validate the effect of the aqueous extract Of leaves, stems, and rhizomes of *Costus igneus* on the Growth of CHPD crystals, a series of five different Concentrations of 0.15, 0.25, 0.50, 0.75 and 1.00% of These plant extracts were selected. The plant extract Exhibited an inhibitive

effect compared to control (pure Calcium chloride), and a minimum apparent length of Growing crystals. As the concentration of aqueous Extracts of *Costus igneus* increased from 0.15% to 1.00% (w/v), the weight of the formed crystals gradually Reduced from 2.03 g to 0.06 g (leaves), 0.05 g (rhizome), 0.03 g (stem) respectively. The inhibitory activity of plant Extract was due to the presence of natural substances Such as protein(18%), iron(40 mg) and antioxidant Components such as ascorbic acid,  $\beta$ -carotene,  $\alpha$ -Tocopherol, glutathione, phenols, flavonoids (diosgenin, Quercetin), steroids, alkaloids, and terpenoid<sup>[21]</sup>

Conducted the study on ethanolic and aqueous extract of *Costus Igneus* for the evaluation of the antirolithic activity. The effect was studied in male albino Wistar rats. Ethylene glycol feeding resulted in hyperoxaluria as well as increased renal Excretion of calcium and oxalate. From the study they concluded that treatment with the Aqueous and ethanolic extract of *Costus igneus* significantly lowered the calcium and oxalate Deposition, they also studied the effect of isolated compounds lupeol and stigmasterol on Calcium oxalate urolithiasis.<sup>[22]</sup>

**Anti-Inflammatory Potential:** studied the anti-Inflammatory potential of  $\beta$ -amyryn isolated from the Leaves of *Costus igneus* (*C. Igneus*) using carrageenan-Induced rat model along with LPS-induced human Peripheral blood mononuclear cells (hPBMCs) in vitro Model. The differential fractionation methanolic extract (MEC) of *Costus igneus* leaves indicated a maximum percentage inhibition of paw edema at a given dose of 100 mg/kg body weight. The fractionation of MEC had Been performed using various solvents such as Chloroform, hexane, ethyl acetate, and butanol. The Maximum beneficial effect was shown by chloroform Extract (CEC) of MEC at a dose of 50 mg/kg bw. Treatment of carrageenan-induced rats with CEC Significantly decreased cyclooxygenase (COX), Lipoxygenase (LOX), myeloperoxidase (MPO) and nitric Oxide synthase (NOS) activities when compared to Carrageenan-induced rats. B-amyryn isolated from it Shown a dose-dependent decrease in paw edema and at a Dose of 100  $\mu$ g it produced a 97 % decrease in Carrageenan-induced paw edema in rats.<sup>[23]</sup>

**Effect of *Costus Igneus* on Learning and Memory** has evaluated the effect of *Costus igneus* on learning and memory in normal and Diabetic-induced rats using passive avoidance test at Doses

of 250&500mg/kg ethanolic extract. For the Induction of diabetes, a single dose of streptozotocin was Injected (35 mg/kg) intraperitoneally. After a study period Of 30 days, blood glucose level measured and rats were Subjected to a passive avoidance test. The treatment with *Costus igneus* significantly reduced the blood glucose Level in a dose-dependent manner (75.70% reduction for 500mg) in diabetic treated groups when compared to the Diabetic control group. But no significant effect was Obtained with nondiabetic rats and it was comparable to the normal control values. Rats were subjected to three Acquisition trials. *Costus igneus* treated diabetic rats Shown a decrease in the time taken to enter the dark Compartment suggesting that they maintained their Innate behaviour and also showed improvement in Learning tendency. Non-treated diabetic rats showed Impairment in the passive avoidance test. During their Post-shock retention testing at 24 and 48 hours, Treatment with *Costus igneus* extract showed a significant Increase in the entrance latency and decrease in the time Spent in the dark room. As summarizing the ethanolic Extract of *Costus igneus* was able to produce a significant Effect on learning and memory in diabetic rats when Treated with at a dose of 500mg.<sup>[2]</sup>

**Antioxidant Activity:** studied the effect of Methanol extract on antioxidant activity against *Klebsiella Oxytoca*, *Pseudomonas Fragi*, *Enterobacter aerogens* Using various concentrations ranging from 100 µg/mL –500 µg /mL. The antioxidant and radical scavenging Activities of *Costus igneus* were assessed both Stem Extract and Root extract. Root extract showed a high Inhibition rate than stem extract. And among the stem And root extracts of *Costus igneus*, the total phenolic Contents were found to be greater for roots extracts Rather than the stem. Root extract also possesses a high Amount of vitamin E. Flavonoids with a certain structure And hydroxyl position in the molecule can act as proton Donating and show radical scavenging activity. It was evident from the study that the polyphenols and antioxidants not only scavenge off the free radicals but also inhibits the generation of the free radical.<sup>[24]</sup>

**Neuroprotective Role:** investigated the Neuroprotective role of exogenous melatonin and insulin Plant (*Costus igneus nak.*) extract on the brain in Streptozotocin-induced female diabetic rats. The extract Showed a significant decrease of

lipid peroxidation (TBARS) in brain tissue compared to the control group of Rats. In addition, plant extract and melatonin produced a Significant decrease in antioxidative enzyme viz. Superoxide dismutase (SOD), catalase (CAT), reduced Glutathione (GSH) of the brain. Melatonin as well as plant Extract showed significant recovery to restor the brain complication induced by hyperglycemic effect caused by The diabetic condition and rescued the brain tissue by Restoring the number of astrocytes and glial cells.<sup>[25]</sup>

**Hypolipidemic Activity:** investigated the Antihyperglycemic and hypolipidemic activities of Methanol extract of *Costus igneus* rhizome (MECiR) in Streptozotocin (STZ) induced diabetic albino rats. MECiR Has given at doses of 100, 200 mg/kg orally as a single Dose per day to diabetes-induced rats for a period of 30 Days. The results indicated that fasting blood glucose, Serum total cholesterol(TC), triglycerides(TG), low-density Lipoprotein(LDL), very low-density lipoprotein(VLDL), Levels were significantly ( $p<0.05$ ) decreased, whereas Serum high- density lipoprotein(HDL level significantly ( $p<0.05$ ) increased in the diabetic rats. Better result Obtained with 200 mg/kg. The antidiabetic and Hypolipidemic effects in STZ induced diabetic albino rats Were comparable to standard reference drug Glibenclamide (5mg/kg/bw).<sup>[26]</sup>

#### **Hepatoprotective activity:**

Conducted a study on *costus igneus* rhizome For determining the hepatoprotective activity. The ethanolic extract of the plant was Administered at a dose of 100 or 200mg/kg body weight of the diabetic rat for 30 days. In the Diabetic rats, there was a significant increase in the levels of hepatic enzymes like aspartate Transferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP). The use Of the *costus igneus* rhizome extracts on test animals has lowered the levels of AST, ALT to Near normal values. The effect on carbohydrate metabolic enzymes and ant oxidative Enzymes was also determined in this study.<sup>[27]</sup>

**Anticancer Activity:** conducted the in vitro study on *costus igneus* plant for the Evaluation of the anticancer activity. In vitro cytotoxicity study was conducted in Ehrlich Ascites carcinoma cell lines and Dalton's lymphoma Ascites cells. Anticancer activity was Evaluated by using Trypan blue exclusion, LDH assay, and MTT assay. The percentage Viabilities were calculated and from the

result, it was concluded that the ethanol extract of *Costus igneus* has potential anticancer activity.<sup>[28]</sup>

**Table 4: Reported Biological activities of *Costus igneus***

Plant Part	Reported Biological Activity	Result	Reference
Leaf	Hypoglycemic	75.70% reduction of blood glucose levels	Shalini Adiga et al., 2014 <sup>[2]</sup>
	Hypolipidemic	Significant reduction in total cholesterol, LDL, VLDL, Phospholipids and triglyceride levels and rise in HDL level	P.Mani et al., 2014 <sup>[30]</sup>
	Antioxidant	The marked rise in enzyme levels such as SOD, CAT, and GSH. Complete recovery of enzyme level shown at the highest dose, 600mg/kg. And a significant reduction in MDA level also has been indicated.	Shivaprakash et al., 2014 <sup>[31]</sup>
	Antiuro lithiatic	1.00% of aqueous extract of leaves could reduce the nucleation Rate and growth of CHPD crystals at maximum. But the activity was more for root and stem extracts.	
	Prevent learning and memory deficit	Costus igneus treated diabetic rats maintained their innate Behaviour and indicated an	Kesavan Manjula et al., (2017) <sup>[32]</sup>
			Shalini Adiga et al., 2014 <sup>[2]</sup>

	Antiproliferativ	improvement in their learning Tendency. The methanolic extract could reduce the tumour size and showed 97.46% cytotoxicity.	Prof.S.Dhanasekaran et al., (2014) <sup>[16]</sup>
	Antiuro lithiatic	98.25% decrease in the weight of CHPD	Kesavan Manjula et al., (2017) <sup>[32]</sup>



		crystals has been observed.	
Stem	Antioxidant	Showed significant antioxidant activity	Ramya Urs S.K et al.,(2015) <sup>[24]</sup>
	Antimicrobial	Methanolic extract showed significant antimicrobial activity.	Kala et al., 2014 <sup>[33]</sup>
Root	Antibacterial	Methanolic extract indicated significant activity against for both gram positive and gram negative bacteria.	Kala et al., 2014 <sup>[33]</sup>
	Antioxidant	Maximum activity due to the presence of highest phenol content	Ramya Urs S.K* et al.,(2015) <sup>[24]</sup>
Rhizome	Hypoglycemic	68.26% reduction of blood glucose level	Pazhanichamy Kalailingam et al., 2011 <sup>[27]</sup>

Whole Plant	Antioxidant	Showed elevated levels of SOD, CAT, and GSH	Pazhanichamy Kalailingam et al., 2011[27]
	Hepatoprotective	Hepatoprotective potential is indicated by bringing AST, ALT to near normal levels.	Pazhanichamy Kalailingam et al., 2011[27]
	Hypolipidemic	Significant reduction of TC, TG, LDL, VLDL, and attenuation of serum HDL levels. 50.46% reduction of blood glucose level	Pazhanichamy K et al., 2011 <sup>[27]</sup>
	Hypoglycemic		V.Palanivel et al., 2013[21]

**Healing asthma:**

You can treat asthma in two ways. One is to take the short-term cure and the other is the long-term cure. Rapid asthma relieves the symptoms, but they will flare up again. The long-term cure will control inflammation in the airways and bring relief to the patient. *Costus igneus* helps to calm the smooth muscles in the lungs that tighten during the asthma attack. This helps to alleviate the symptoms of asthma.<sup>[34]</sup>

**Helps relieve the symptoms of bronchitis:**

Bronchitis occurs when the airways become narrow due to mucus and inflammation. The use of the leaves of the insulin plant helps to fight inflammation and lower cholesterol levels. This helps to remove the obstacles in the airways and improve the patient's breathing condition.<sup>[34]</sup>

**Diuretic property:**

You can have the decoction prepared with the leaves of the plant to relieve urinary problems. Use three leaves for 2 cups of water, add honey to enhance the taste. It increases sodium and potassium clearance, suggesting that it has good diuresis.<sup>[34]</sup>

**Cures skin diseases:**

*Costus igneus* shows a good protective effect for the skin. Grind a few leaves to a paste and apply it to your face and hands. Let it dry on. Do this for two weeks and you will see the firming of the skin. Due to the increased elasticity of the skin, there will be a glow.<sup>[34]</sup>

**Ameliorative effect:**

The study of alcohol-induced stress in the body was investigated in relation to the insulin plant. It was observed that the mitochondrial enzyme was back to normal at the end of the 21-day treatment period.<sup>[34]</sup>

**Antiseptic nature:**

You can apply the extract of the plant to the skin and prevent antimicrobial activity. This antiseptic effect is from the outside of the body. They can effectively inhibit the growth and spread of microbes on the skin.<sup>[34]</sup>

**Putative activity:**

Aqueous extract of *Costus* stem and isolated compounds lupeol, and stigmasterol had an inhibitory effect on calcium oxalate urolithiasis, and its putative activity was confirmed by the promotion of formation of calcium oxalate dehydrate (COD) crystals and may possibly treat urinary stones by inhibiting the formation of calcium oxalate monohydrate (COM) crystals.<sup>[35]</sup>

**Phytochemical analysis:**

Phytochemical tests were conducted to find the presence of active chemical ingredients such as alkaloid, glycosides, terpenoids, steroids, flavonoids, triterpenes, phenolic and tannin compounds through the following procedure.<sup>[36]</sup>

**Test for alkaloids (Meyer's Test):**

The extract of *costus igneus* was evaporated to dryness and the residue was heated in a boiling water bath with 2% hydrochloric acid.

After cooling, the mixture was Filtered and treated with a few drops of Meyer’s reagent. The samples were then observed for the presence of Turbidity or yellow precipitation.

**Testing for glycoside:**

To the solution of the extract in Glacial acetic acid, few Drops of Ferric chloride and Concentrated Sulphuric acid Are added, and observed for reddish brown colouration at The junction of two layers and the bluish green colour in The upper layer.

**Test for terpenoid and steroid:**

4 mg extract was treated with 0.5 ml of acetic anhydride And 0.5 ml of chloroform. Then concentrated solution of Sulphuric acid was slowly added and red violet colour Was observed for terpenoid and green bluish colour for Steroids.

**Test for flavonoid:**

4 mg extract solution was treated with 1.5 ml 50% Methanol solution. The solution was heated and added Metal magnesium. To this solution, 5-6 drops of Concentrated hydrochloric acid were added and red colour For flavonoids and orange colour for flavonoid were observed.

**Test for triterpenes:**

300 mg of extract were mixed with 5 ml of chloroform And heated at 80°C for 30 minutes. Only a few drops of Concentrated sulphuric acid were added and well mixed and observed in red colour formation.

**Testing for phenolic compounds (ferric chloride test):**

300mg of extract were diluted and filtered in 5 ml of Distilled water. 5% ferric chloride was added to the Filtrate and observed in dark green colour formation.

**Marketed Products:**

Table 5: Various Marketed products of Costus Igneus [4]

PLANT NAME	PRODUCT NAME	CATEGORY
Costus igneus	Insulin Plant Leaf powder 180g	Dietary supplement
	Kostam Keerai ( <i>Costus igneus</i> ) Capsule 500mg	-
	Diabestop 500mg Capsule	Food supplement
	Glucobeet plus Capsule 500mg	Blood sugar supportive Supplement
	Daun Insulin	20 Herbal tea bags

**CONCLUSION :**

This review that have been done yet showed that Costus Igneus is an important medicinal herb presented with Various pharmacological actions. The studies have done On this plant proved that it possesses many important Phytoconstituents such as conjugated flavonoids, Flavones, flavonol catechin and catechin derivatives, Chlorophylls a and b, resinoids, essential oil and alkaloid Named saussurine, inulin and resin etc. And these Compounds found to be responsible for various Pharmacological properties such as anti-diabetic effect, Anti-proliferative effect, antimicrobial activity, anti-Inflammatory potential, the effect on learning and Memory,

antioxidant activity, neuroprotective role, Hypolipidemic activity etc. Further exploration of Medicinal properties and various phytoconstituents Responsible the pharmacological actions are required to Be done to make the treatment more assuring, reliable, With fewer side effects for the welfare of mankind in the Future.

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