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RESEARCH ARTICLE

POTENTIAL THERAPEUTIC EFFICACY OF COSTUS IGNEUS FOR DIABETES MELLITUS & OTHER DISEASES WITH FRAMEWORK FOR ITS EVALUATION BASED ON AYURVEDA

Dr. Swati N. Khandale¹ and Dr. Mukund Sonavane²

1. Asst. Professor, Dept. of Kriya Sharir, IPGT & RA, Jamnagar.
2. Professor, Dept. of Kriya Sharir, Y.A.C. Kodoli, Maharashtra.

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Abstract

Costus igneus plant has shown a remarkable antidiabetic & other important therapeutic properties in laboratory experiments on animals & reports of use in humans. This is important because India is becoming diabetic capital of the world with more than 62 million patients on record. Though there are drugs in Ayurveda for useful for diabetes mellitus the approaches of treatment are different. Modern medicine relies on action of single molecule while Ayurveda explores for the physiology and pharmacology in its own terms for any drug or therapy to be used. Modern medical approach is successful in controlling the most distal offshoot of the tree of disease, as far the diabetes is concerned in form of the blood sugar level. On the other hand Ayurveda, with its root eradicating approach is still maintaining its place in prevention & complications management in long run. The modern medical system has always questioned about the immediate blood sugar levels controlling potential of Ayurvedic drugs while Ayurveda fraternity has questioned about gradual failure of modern drugs beyond certain period of treatment. Here, Costus igneus, though it is not narrated in basic Ayurveda texts, (Anukta dravya) can play an important role. As far as the modern way of inclusion of herbal ingredients in medicine is concerned, the exact molecular mechanism, the active principle responsible and its chemical separation followed by therapeutics after proper trials is the usual possible runway for this plant or drug to enter in medicinal world. But the use of plant as a whole may be more accurate, efficacious, economic and safe mode of its use in therapeutics as it has been seen many times in long course of time. And here is the point where the Ayurveda based evaluation of Costus igneus becomes a necessity. As everything herbal may not be considered as Ayurvedic, the use should be properly based on principles of Ayurveda. Ayurveda based evaluation will allow the use of this plant (as a whole) appropriately and safely. This paper presents a potential model for evaluation of Anukta drug (drug not narrated in basic Ayurveda texts) on basis of Ayurveda so that it can be used and incorporated in Ayurvedic treatment of diabetes mellitus and other diseases. It proposes the possible model to determine or at least to make wise provisional remarks about Rasa, Veerya, Vipaka, Prabhava, action on Strotas, Dosh, Dhatu and Mala. This framework is based on normal

Corresponding Author:- Dr. Swati N. Khandale

Address:- Asst. Professor, Dept. of Kriya Sharir, IPGT&RA, Jamnagar.

and vitiated characters & functions of these elements of body as described by basic Ayurvedic texts. This will provide a frame of reference for other Anukta Dravyas for evaluation based on Ayurveda.

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Introduction:-

The plant – *Costus igneus* belongs to family Costaceae. It grows wild but ornamental development is also there. It is basically not a part of native flora and fauna of India. It has been reported to have come to India from South & Central America. It grows up to two feet and has a remarkable spiral arrangement of leaves – the identification landmark of the family Costaceae.

Materials & Methods:-

A review of *Costus igneus* from various texts, research journals and recently published books leading importance to its antidiabetic activity has been done.

Brief taxonomy:

Botanical name: *Costus igneus* N.E.Br

Kingdom: Plantae

Phylum: Tracheophyta

Class: Liliopsida

Order: Zingiberales

Family: Costaceae

Genus: *Costus*

Species: *igneus*

Costus igneus has shown following pharmacological activities –

Anti-diabetic activity – *Costus igneus* is found useful in laboratory experiments. It has reported as useful in diabetes & other conditions after human use. In laboratory experiments on streptozotocin induced diabetic rats it has been found that it is useful in many ways. After oral administration of the extract of the leaves of this plant it has shown antidiabetic activity.² It has shown the effect on pancreatic cells of islets which results in potentiating for secretion of insulin. This finally results in increased use of glucose by peripheral cells. The extracts of *Costus igneus* has shown the anti diabetic activity in wistar rats by reducing fasting & post prandial blood sugar levels, where diabetes was induced with dexamethasone .

It is remarkable & very significant in context of Ayurveda that the ethanolic extracts of *Costus pictus* (plant similar to *Costus igneus*) didn't show any anti diabetic activity. But consumption of one fresh leaf of *Costus igneus* or one teaspoon of its shade dried powder daily with other treatment modalities showed significant glycemic control in diabetic patients³

Hypolipidemic activity:

Various studies on rats have shown that methanolic, aqueous & alcoholic extracts of *Costus* plant at the dose of 200 mg/ kg body weight have hypolipidemic activity in rats having diabetes induced hyperlipidemia.⁴ Alcoholic extracts have shown reduction in lipid levels in triton-induced hyperlipidemic rats.

Toxicity study:

Before administering the plant as a medicine in any form the safety & toxicity must be established. The hitherto done studies give following important information. Ethanolic (dose range 50 mg to 5000 mg/ kg body weight) & aqueous extracts (dose range 1 gm to 40 gm/ kg body weight) of *Costus igneus* were found to be safe & non toxic. But methanolic extracts have shown cardio toxicity. The safest mode of administration & preparation, therefore, should be sought for & toxicity found, if any, should be dealt with the general or specific detoxification procedures as they are practiced for known toxic substances like *Dhatura*, *Vatsnaabh*, *Jepal* etc. But it should (also) be noted that it has been used raw in some clinical studies where humans were involved.

Diuretic effect:

A significant diuretic activity similar to as that of drug frusemide was shown by *Costus pictus* with its aqueous extracts.

Antioxidant activity:

A significant antioxidant effect was observed after oral administration of *Costus igneus* in diabetes induced rats. The quercetin and diosgenin are the main chemicals in plant which are responsible for counteracting oxidative phenomenon in multiple organs of body like liver, pancreas, and kidney.

Ameliorative effect:

Alcohol induced free radical activity biochemically appearing as disruption in mitochondrial enzymes was restored with administration of the extracts. This is indicative of the ameliorative action of the plant in male albino arts.

Antimicrobial activity:

Antibacterial activity was shown against the both gram positive (*Staphylococcus aureus*, *Streptococcus lactis*, etc.) as well as gram negative (*Pseudomonas aeruginosa*, *Escherichia coli*, etc.) bacteria was shown by the methanolic extract of *C. igneus*. Some isolated compounds have shown antibacterial as well as antifungal activities also.

Anti-cancer effect:

The plant has shown anticancer activity against mammalian fibrosarcoma (HT-1080) cells. Various extracts of bark have shown properties against HT 29 and A549 cells responsible for cancer.⁵

Putative activity:

The *Costus* plant has shown the properties against urolithiasis, especially formed due to calcium oxalate. Lupeol and stigmaterol present in the stem of plant play a key role in this action.

Therapeutic Potential:

All these medicinal / pharmacological properties give a picture about how promising it would be to use *Costus igneus* as therapeutic agent. Though these properties are evaluated in mammals other than humans in a laboratory, the overall results are worth further studies and are highly promising.

The toxicity studies and a safety establishment is a must before human trials. Once it is established, the plant may serve as major weapon against non communicable diseases, like diabetes, cancer, heart disease (owing to hypolipidemic activity), oxidative stress, aging, & urolithiasis. The overall burden of these disorders is increasing especially in developing countries like India. Our population is more vulnerable to such diseases due to specific socio cultural & other factors. This has been pointed out by World Health Organization. According to WHO the percentage of deaths (due to non communicable diseases) among all the deaths in developing countries is more than 60% at present. But it is anticipated to be more than 70% till 2020.

It should also be noted that according to World Health Organization India is one of the countries having highest number of diagnosed (& undiagnosed) patients of type 2 diabetes. There are more than 69 million people in India suffering from diabetes in India which is approximately 8 % of the population.

Discussion:-

Need of such drug in Ayurveda:

Ayurveda has its own different view towards pathology & treatment of these disorders. It acknowledges and addresses these disorders differently. Still a stumbling block in form of activity associated with glycemic control is considered prominently by modern medical science. Though the drugs classically used in Ayurveda are excellent in their own framework, the therapeutic agents like *Costus igneus* which more or less directly acts on blood sugar levels, lipids, oxidation, bacteria& fungi, cancer & urolithiasis might have a red carpet welcome if incorporated in Ayurveda. Such additions are there in multiple ways and are evident frequently in Nighantus.

Settlement of differences in approach:

The usual runway would be different for Costus (or any plant) if it has to be incorporated as a therapeutic agent in modern medical system. Many herbal extracted ingredients are in use in this way. The active principle might have been separated from the multiple chemicals & then it might have been used in or as medicines.

But Ayurveda has its own view with pathology & disease. Its methods of preparation and administrations of drugs are different and wholesome. It hardly uses plant material by extracting active principle alone. That is why the toxicity problems (as they occur in modern medicine, due to presence or absence of toxicity in case of Costus with different solvents for extraction) seldom occurs in Ayurveda. Moreover, it may be relatively safe to use plant in Ayurveda way. But here lies the problem. It is problem of approach. As modern medical & pharmaceutical system has its base of understanding of therapeutic properties based on understanding of physiology, Ayurveda, too has its base of understanding the body functions which has been termed as Kriya Sharir. The plant of Costus (In fact any other plant to be judged for its efficacy as an Ayurvedic therapeutic agents) therefore must be evaluated against the framework based on principles of Ayurveda.

Pharmacokinetics & Pharmacodynamics in Ayurveda – Dravyaguna and Sharir Kriya parallel principles:

To put them in simpler terms pharmacokinetics and pharmacodynamics are what drug does to the body & what body does to the drugs. Parallel of these concepts, which are very basic for designing frame of reference in Ayurveda are the disciplines of Dravyaguna & Sharir Kriya. Dravyaguna gives the important information in form of Rasa, Veerya, Vipaka & Prabhav. On the other hand Sharirkriya gives important inputs in the form of effect on Dosha Dhatu & Mala. As one of the basic principles of Ayurveda is Sharir or entire body is consisted of Dosha, Dhatu & Mala. Such framework for evaluation & understanding of any new drug (Anukta Dravya) will provide the basis which is analogous with Ayurvedic system of management of diseases. Otherwise there will be another new herbal drug which is used in modern medicinal way.

Table No. 1:- Important points in framework for Ayurveda based evaluation is mentioned in table no.1.

Rasa	Dravyaguna	Sharirkriya	3 Doshas
Veerya			7 Dhatus
Vipaka			3 Malas
Prabhava			

The plant or drug should be evaluated for each point as follows:

Rasa – The taste should be established in the format of ‘Shadras’ (six tastes followed by ‘Anuras’ or aftertaste also.) Pannel of multiple persons can perform this task by tasting it directly because Rasa, according to Ayurveda, is to be determined by direct tasting with human sense (the tongue).

Veerya^{6,7} – According to Charak, Veerya has to be determined after the proper contact of elements of drug after circulation through the body.

Table No. 2:- Following are the important signs from which the identification of Veerya is possible.

Type of Veerya	Pacification of Dosha	Other signs & symptoms
Ushna Veerya	Vata Kapha	Giddiness, fatigue, thirst, sweating, etc.
Sheeta Veerya	Pitta	Life promoting activity, physical and mental bliss, excellence of Rakta Dhatu, etc.

Vipaka - It is the permanent change after digestion. It has to be decided with the help of logic based on observations of the functions. It is related with the taste or Rasa of a drug.^{8,9}

Table No. 3:-

Type of taste / Rasa	Type of Vipaka	Effect on Mala	Effect on Dosha & Dhatu
Madhur, Lavan	Madhur	Promotes expulsion	Increases Kapha, Shukra
Amla	Amla	Promotes expulsion	Increases Pitta Decreases Shukra

Katu, Tikta, Kashay	Katu	Creates obstruction in expulsion	Increases Vata Decreases Shukra
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Prabhav – Any pharmacological activity standing outside the explanations of given properties of drug can be enumerated as Prabhav. That is why the careful observation of effects of drug should be done & it's coherence with the known properties should be meticulously established.

For assessment of Dosha, Dhatu & Mala following important points (sign & symptoms of increase or decrease) should be carefully observed after administration of drug.^{10,11,12.}

Table No. 4:- Dosha.

Type	Important signs & symptoms of increase	Important signs & symptoms of decrease
Vata	Blackish complexion, unhealthy decrease in bodyweight, sleeplessness, depression, constipation, absence or decreased sensory ability, etc.	Fatigue, unwillingness for talking
Pitta	Excessive yellowness to faeces, urine, skin, sclera, decreased sleep, increased thirst, hunger & burning sensation, etc.	Loss of appetite, sense of cold/ shivering, loss of/ decreased skin lustre.
Kapha	Loss of appetite, lassitude, lethargy, sense of heaviness, sense of cold, excessive sleep, cough, etc.	Palpitations, laxity of joints, giddiness

Table No. 5:- Dhatu.

Type	Important signs & symptoms of increase	Important signs & symptoms of decrease
Rasa	Nausea, excessive salivation, lethargy.	Dryness, tiredness, giddiness, intolerance of loud noise.
Rakta	Redness of skin and eyes, engorged vessels,	Dryness, collapsed vessels, desire for cold & sour taste.
Mansa	Increased sense of heaviness in thighs, calf regions, hands, lips, genitals.	Inability of sensory processing, joint pains, wasting of hips.
Meda	Dyspnoea after exertion, pendulum like appearance of hips, abdomen, chest/ breast.	Apparent increase in spleen size, emptiness in joints, desire for fatty meat.
Asthi	Extra bones & teeth	Pain in bones, dryness & fall of teeth & nails.
Majja	Heaviness all over body and that of eyes	Fainting, giddiness, osteoporosis.
Shukra	Excessive libido, calculi of semen.	Delayed & painful ejaculation of semen with blood.

Table No. 6:- Mala.

Type	Important signs & symptoms of increase	Important signs & symptoms of decrease
Mutra	Pricking pain in bladder, persistent sense of fullness of bladder.	Painful, scanty micturition with blood.
Purisha	Excessive borborygmi, pain & heaviness in abdomen.	Shifting pain in abdomen, Noisy expulsion of flatus, increased flatulence.
Sweda	Excessive sweating with foul smell & itching.	Cracked skin, falling of hair of skin

The assessment points can be increased further. Points like Srotas can be added. Signs and symptoms of Dosha, Dhatu, Mala can be traced to increased length & depth. Furthermore, subjective &/or objective criteria for each & every sign can be designed. Though many such additions are possible & necessary & in no way this evaluation is complete, it at least underlines the necessity of such approach of evaluation. If it does not fulfill the criteria of a complete & elaborative evaluation, it, at least heralds the path for ideal one. By this mean the new & effective Anukta Dravyas can be authentically incorporated in Ayurveda system of medicine without violating its firm base of principles.

Conclusion:-

1. *Costus igneus* is a plant worthy of attention for application in Ayurvedic therapeutics, due to its antidiabetic, diuretic, antioxidant, anticancer, putative, antimicrobial properties proved in animal and clinical trials.
2. For any Anukta Dravya the process of establishment of its properties according to Ayurveda should include following steps-
3. Establishment of safety through toxicity studies.
4. The step by step evaluation of Dosha – Dhatu – Mala Kshaya Vriddhi & Rasa, Veerya, Vipaka, Prabhava etc should be achieved through animal & clinical studies.
5. Once this data established Gunas of that drug should be decided more precisely with “Anuman Praman” based on ‘cause & effect’ relation between Guna & Karma.

References:-

1. Harini A. Rao, and Prasanna N. Rao, A review on Insulin plant (*Costus igneus* Nak) Prakash K. Hegde, Pharmacogn Rev. 2014 Jan-Jun; 8(15): 67–72. doi: 10.4103/0973-7847.125536 PMID: PMC3931203
2. Akhila J Shetty, Divya Choudhury, Rejeesh, Vinod Nair, Maria Kuruvilla, Shashidhar Kotian, Int J Ayurveda Res. 2010 Apr-Jun; 1(2): 100–102. doi: 10.4103/0974-7788.64396 PMID: PMC2924971 Effect of the insulin plant (*Costus igneus*) leaves on dexamethasone-induced hyperglycemia
3. Shetty AJ, Parampalli SM, Bhandarkar R, Kotian S. Effect of the insulin plant (*Costus igneus*) leaves on blood glucose levels in diabetic patients: A cross sectional study. J Clin Diagn Res. 2010;4:2617–21.
4. Mani P, Kumar AR, Bastin TM, Jenifer S, Arumugam M. Comparative evaluation of extracts of *C. igneus* (or *C. pictus*) for hypoglycemic and hypolipidemic activity in alloxan diabetic rats. Int J Pharm Tech. 2010;2:183–95.
5. Nadumane VK, Rajashekar S, Narayana P, Adinarayana S, Vijayan S, Prakash S, et al. Evaluation of the anticancer potential of *Costus pictus* on fibrosarcoma (HT-1080) cell line. J Nat Pharm. 2011; 2:72–6.
6. Agnivesha, Charaka Samhita with Ayurveda Deepika and Jalpakalpataru commentaries, edited by Narendranath Sengupta and Balaichandra Sengupta, Chaukhambha Publishers, Varanasi, India, Second Ed. 2002. Sutrasthan 26/ 71.
7. Vagbhata, Ashtanga Hrudaya with Sarvanga Sundari and Ayurveda Rasayana Commentaries, edited by Harishastri Paradkar, Krishnadas Academy, Varanasi, India, Reprint Ed 2000. Sutrasthan 9, 18 -19.
8. Vagbhata, Ashtanga Hrudaya with Sarvanga Sundari and Ayurveda Rasayana Commentaries, edited by Harishastri Paradkar, Krishnadas Academy, Varanasi, India, Reprint Ed 2000. Sutrasthan 9.20,
9. Agnivesha, Charaka Samhita with Ayurveda Deepika and Jalpakalpataru commentaries, edited by Narendranath Sengupta and Balaichandra Sengupta, Chaukhambha Publishers, Varanasi, India, Second Ed. 2002. Sutrasthan 26, 61-62
10. Vagbhata, Ashtanga Hrudaya with Sarvanga Sundari and Ayurveda Rasayana Commentaries, edited by Harishastri Paradkar, Krishnadas Academy, Varanasi, India, Reprint Ed 2000. Sutrasthan 11- 5 to 7.
11. Vagbhata, Ashtanga Hrudaya with Sarvanga Sundari and Ayurveda Rasayana Commentaries, edited by Harishastri Paradkar, Krishnadas Academy, Varanasi, India, Reprint Ed 2000. Sutrasthan. 11- 8 to 12
12. Vagbhata, Ashtanga Hrudaya with Sarvanga Sundari and Ayurveda Rasayana Commentaries, edited by Harishastri Paradkar, Krishnadas Academy, Varanasi, India, Reprint Ed 2000. Sutrasthan 11- 13 to 14.