Research Article

Capsaicin: Review of Potential and Versatile Bio Healer

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ABSTRACT

"Capsicum" the pepper is a genus of Night shade Family "Solanaceae" which resembles the spiciness of black pepper, originated from America; it is used as a food component worldwide. Apart from using food additive, the phytoconstituent of capsicum possess variety of pharmacological actions. Capsaicin is the principle component which is the most predominant and naturally occurring alkamide found in capsicum species. Our present review focuses the potentiality and versatility of "CAPSAICIN" and its various pharmacological activities such as anti-inflammatory, gastro protective, metabolic syndromes, anti-obesity, vascular related diseases, respiratory diseases as potential and versatile BIOHEALER in favour to the society.

Keywords: Capsaicin, Scoville Heat Units (SHU), Hazards, Kinetic and Phytoconstituents.

INTRODUCTION

'Capsicum' refers to the" fruit pod" of numerous species of the plant Genus "capsicum" and it denotes the fruit of numerous species of the solanaceous genus, and the term "CAPSO" refers to fruit box. Members of this genus vary with respect to its shape, size, flavour and pungency. 'Capsaicin' (8 methyl-N Vanillyl-6 nonenamide) is the major ingredient which is responsible for its pungency. Capsaicin contains not less than 90% and not more than 110% of labelled percentage of total capsaicinoids. This principal compound was first isolated impure form in the name of capsaicin by Friedrich Bucholz[1]. Later pure form was extracted and isolated by Micko[2] and renamed as capsaicin by Thresh[3] and its empirical formula and partial structure was offered first by Nelson[4] and in 1930 the original synthesis was reported by Spath[5]. Followed to its isolation several compounds grouped as "capsaicinoids" have been isolated from capsicum species. Capsaicin is a natural Vanilloids identified in various species. Structurally capsaicin belongs to a group of chemicals known as "Vanilloids". Capsaicin and its analogs are responsible for the pungent smell, and its percentage varies accordingly to species and extraction method. The hotness of pepper is measured by "SCOVILLE SCALE"[6] which indicates the dilution factor of chilli extract to make it pungency unpredictable. Capsaicin and its analogs possess potentially valuable pharmacological and physiological properties which include analgesic, anti-cancer, anti- ulcer, anti-inflammatory, antioxidant activities etc. Its analogs exhibits potent therapeutic value in cancer prevention, vascular related diseases, and metabolic syndrome. In tropical countries capsicum was consumed for dermal vasodilatation effects and perspiration to regulate heat loss[7]. Other folk medicinal applications include treatment of cough, sore throat, tonsillitis, gastric ulcer, back ache, cholera, gout, water retention, rheumatism, cramps, diarrhoea, dyspepsia, tooth ache, appetite stimulation and hair growth restoration[8, 9]. This article focuses the versatility and potentiality of **"**CAPSAICIN**"** as a Bio healer**.**

Fig. 1: Different Capsicum Species

I. Profile of Capsaicin[6]

The chemical moiety presents in capsaicin, representing the degree of pungency being capsaicinoids, a vanilloid pharmacophore which is 3 hydroxy-4-methoxy benzyl amide. Analogs and its isomers of capsaicin are differs in their hydrophobic alkyl side chain and occurrence, where as analogs differs in chemical moiety and occurrence probably gives an output of trans isomer, and rarely cis-isomer. Pharmacological activity is depends upon its aliphatic side chain.

Chemical name: 6-nonenamide, moiety,

1. (E)-N-{4 hydroxy-3 methoxy-phenyl) methyl}-8 methyl nonenamide;
2. (E)-8 methyl-N-Vanillyl-6 Nonenamide.

1. Standard

(a) Capsaicin contains not less than 90% and not more than 110% of labelled percentage of Total Capsaicinoids. The content of 55% pure capsaicin + 45% of combination as analogs (dihydro capsaicin, nordihydro capsaicin homodihydrocapsaicin, and homo capsaicin).

Out of 45% the combination represents 75% contains capsaicin along with dihydrocapsaicin and 15% of other capsaicinoids. Physiochemical properties of capsaicin is given in Table.1 **Physio Chemical Properties.**

2. Identification of capsaicin

By TLC in Ether and Ethanol solvent system (19:1) and 0.5% solution of 2, 6 dibromo Quinone – chlorimide in methanol and Ammonia fumes as marker, which infers a blue colour spot for identification and R_f value corresponds to standard.

3. Pungency

The “Pungency” of capsaicin as predominant component including other Capsaicinoids of chilli pepper and Spicy foods, was measured in terms of “Scoville scale”, which is recorded in scoville heat units (SHU) named after a Pharmacologist “Wilbur Scoville”, who invented this Pungency Measuring scale. This rating was also known as scoville organoleptic test. This rating denotes both the pungency as well as Capsaicinoid content. “Scoville Scale was represented in Table.2.

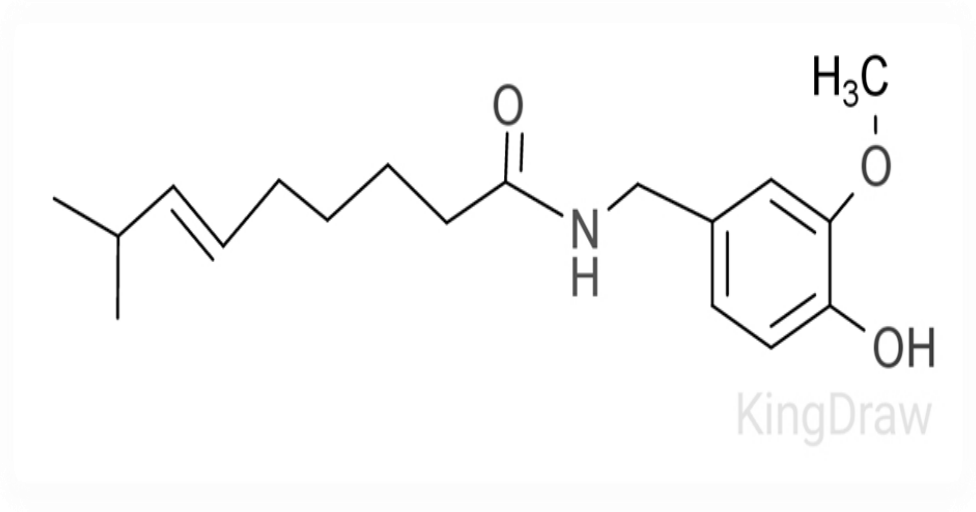
3. Scoville heat units

SHU Indicates how “spicy” (pungency or hotness) a pepper is, which depends on its quantity of capsaicinoids per unit weight of the chilli. SHU of chilli is traditionally measured by organoleptic method. (Measures chilli spicy heat)As per scoville rating, Pure Capsaicin shows a high score of 16,000,000 pioneering in “pungency” and it is due to the presence of vanillyl moiety. CAPSICUM SPECIES: Scoville heat units of different Capsicum species shown in **Table 3: SHU- Scoville heat units of different Capsicum species.**

5. Chemical constituents[10]

By nature Capsaicin is a highly volatile hydrophobic, colourless, odourless and waxy alkaloid with the molecular weight of 305.41 g/mole.

Structurally Capsaicin belongs to a group of chemicals called "Vanilloids" structure consists of three regions. They are a head region with vanillyl group (Methyl catechol), a central region with amide bond, and third region being aliphatic hydrophobic side chain.



C- Region	B- Region	A -Region
Aliphatic Hydrophobic Side chain	Amide bond	Vanillylgroup(Methyl catecol)

All capsaicinoids have a similar structure and they vary in the length and degree of saturation of alkyl side chain of aliphatic region (c).

Stability

Presence of phenolic hydroxyl group and carbon double bond makes capsaicin sensitive to oxidation. Hence, natural capsaicin should be protected from exposure to light, heat, moisture and oxidizing agents which initiate or catalyze decomposition process.

Several studies were undergone to determine the stability of capsaicin in different forms and concentration, exposing to different temperature. [Kopse, et al 2002, Jairaj,et. 2000]

Earlier study results reveals that ambient temperature for storage of capsaicin and its analogs were 28 ^{o}C and should be protected from light. Schweiggert *et al.* investigated that pre-treatment of raw material (paprika pods) with heat before processing reduces the number of microorganism, producing enzymes with peroxidise activity, which protects capsaicin from oxidation.

II. Hazards - Handling Of Capsaicin in Lab Practice[11]

The material safety data sheet for capsaicin indicates capsaicin is highly toxic, toxic by inhalation in contact with skin and if swallowed. The Merck index lists the compound as "a powerful irritant; and initial administration causes intense pain. Certainly capsaicin in powder form or in very concentrated solution should be handled with extreme care. For comfortable handling, safety procedure should be strictly followed. Raw chillies should be handled with gloves. High concentrations samples for hot sauces, standard stock solution, and over-the-counter arthritis cream may utilize high concentration of capsaicin in powder form. High concentrations was not recommended for person of uncomfortable handling and not suggested for handling by students.

(JCE Online Laboratory instructions clearly states "CAUTION" for lab practice.)

III. Kinetic Profile of Capsaicin[12, 13]

1. Absorption and Distribution

a) On oral administration

- Absorbed by non-active process from the stomach and whole intestine (Leelahuta et al., 1983; Kawada et al., 1984).
- Total absorption capacity varies between 50 and 90% (Leelahuta et al., 1983; Kawada et al., 1984; Donnerer et al., 1990).
- Maximum blood concentration is seen one hour after administration.

- A recent investigation of pharmacokinetic profile upon administration of 5g of C. frutescens, equipotent to 26.6 mg of pure capsaicin which was detected in plasma after 10min, C_{max} detected to be 2.47±0.13ng/ml at t_{max} = 47.1 ± 2.0 min.
- The $t_{1/2}$ was 24.9 ± 5.0 min, After 90 min capsaicin could not be detected (Chaiyasit et al., 2009).

b) Systemic administration

- After three minutes of i.v. injection in animals, 5-fold higher concentration of unchanged capsaicin was observed in brain and spinal cord when compared to blood level (Saria et al., 1981; Donnerer et al., 1990; Johnson, 2007).
- Concentration in liver was about 3-fold that in blood.

c) Topical administration

- Rapidly and well absorbed through the skin in humans (Hayman and Kam, 2008).
- Many low concentration of capsaicin (0.025 – 0.1%) are available over the counter as creams or patches.
- A high concentration patch containing 8% capsaicin is widely used to treat post-herpetic neuralgia, HIV neuropathy and other neuropathic pain symptoms. (McCormack P.L., 2010; Simpson D.M., et al., 2014).

d) Intradermal administration

- On intradermal administration in humans, capsaicin produces a spontaneous burning pain which subsides within few min (Janstch et al., 2009).
- Intradermal injection leads to primary and secondary hyperalgesic areas.
- Sensitivity to heat has been reported to be confined to approximately to 1cm.
- Sensitivity was found to be dose-dependent: sensitizing at lower doses and desensitizing at higher doses and it also depends on length of application and penetration through dermis.

- TRPV1+ Capsaicin $\underset{\text{(Absent)}}{\xrightarrow{ca2+}}$ Activation (Sensitization) $\xrightarrow{*Ca2+}$ Desensitized.

Sensitization occurs upon activation of Ca^{++} dependent TRPV1 receptor and entries of Ca2+ ions to the nerves activate a number of enzymes including (calcineurin which dephosphorylates TRPV1 and downregulates HVACC.

Where as desensitization first involves capsaicin binding of TRPV1was activated by 'C' fibre (C group fibre- this fibre carry sensory information) terminals of PAF (platelet-activating factor) pathways causing flare and neurogenic inflammation.

Rapid desensitization occurs due to, (i) Capsaicin binding to TRPV1 → activation of PAFs and pain pathways → release of neuropeptides (CGRP and SP) from C fiber terminals in the periphery → local neurogenic inflammation and formation of flare (Lawson and gannet et al., 1989 and Boersch et al., 1991, investigated that one e^- oxidation of capsaicin takes by place by electrochemical, enzymatic and chemical procedures.) Various factors like concentration of capsaicin, length of application time and the penetration can sensitize as well as desensitize the skin through dermis (Touska et al., 2011).

2. Metabolism

After oral administration major part of capsaicin and dihydrocapsain are metabolized by liver. Metabolism of a minor part of capsaicin and dihydrocapsaicin occurs in small intestinal epithelial cells (Kawada et al., 1984; Donnerer et al., 1990). Many enzymes play role in hepatic metabolism of capsaicin, CYP450 enzymes are quantitatively the most important role and rate of capsaicin is found to be saturable (becomes less extensive) at a concentration of 10µM than at 1µM, due to direct inhibition of CYP1A2, CYP2C9 and CYP2C19 (Chanda et al., 2008).

Formation of flourescent oxidation product by electrochemical oxidation shows, liver cytochrome enzymes was involved in metabolism by forming reactive phenoxy radicals, and binds with liver enzymes by covelent bonding.

It has been widely inferred that the anticancer activity of capsaicin owes to the inhibition of CYP2E1 enzyme (Reilly and Yost, 2006). Gunnett et al., (1990) have also proved this inference true by tracing the dimerisation and covalent binding of reactive phenoxy radical which is a metabolic product of Capsaicin to CYP2E1.

In vitro studies in human skin have shown slow bio transformation, with most capsaicin remaining unchanged, only a small fraction is metabolized to vanillylamine and vanillyl acid (Chanda et al., 2008).

3. Elimination

Capsaicin is eliminated mainly by kidneys both in free as well as glucuronide form, a small untransformed proportion is excreted in the faeces and urine (Leelahuta et al., 1983; Kawada et al., 1984; Surh et al., 1995).

IV. Therapeutic Profile of Capsaicin

Capsaicin, a predominant molecule of capsicum species, earlier study results established that it plays various therapeutic activities. In this article its various pharmacological activities were reviewed and summarized.

1. Gastro protective effects

The intact Gastro intestinal mucosa is a result of well regulated equilibrium between the aggressive factor (Physical and other stress, xenobiotics, wide scale of drugs, bacterial and viral infections) and defensive factor (Hco_3^-secretion, mucus secretion, blood supply, Prostaglandins, Mucosal energy systems) whereas vagal nerve takes on essential place in the development of Gastro intestinal mucosal damage and protection. Gastric acid secretion is controlled by neural (eg.) Ach, hormonal (e.g. gastrin and pancrin) e.g. histamine and stomatostatin) mechanism, and of those mechanisms are controlled by vagal nerve. II). Several studies provided clear evidence that gastric mucosal blood flow (GMBF), especially the micro circulation play an essential role in maintaining gastro deodenal mucosal integrity and reduction in GMBF which greatly potentiate the effect of mucosal damaging. Capsaicin mediates its anti ulcer effects though to increase in GMBF.

Helicobacter pylori (H. pylori) are an important causal factor in chronic active antral gastritis and the formation and duodenal ulcers14. H.pylori is epidemiologically associated with the development of Gastric adenocarcinomas[15, 16, and 17] gastric lymphoma18 and Malt Lymphoma. (Mucosa-associated lymphoid tissue)

H.pylori known as Campylobacter pylori is a gram (-) ve microerophyllic bacterium found in the stomach. Time dependent and concentration related studies of capsaicin gastro protective effect against H.Pylori induced gastritis and duodenal diseases[19] reveals capsaicin specifically inhibited the growth of H.Pylori dose dependently at concentrations greater than 10 microgram/ml. Capsaicin continued to exhibit bactericidal activity as low as pH 5.4 for 4 hours.

Mechanisms for its Gastro protective effects are

1. Vasodilators peptides (CGRP and / or SP produced by capsaicin sensitive neurons forms a dense plexus around Gastric sub mucosal arterioles.
2. Stimulation of Bicarbonate secretion was also proposed to contribute to the mucosa protective effects.
3. Researcher suggests that capsaicin stimulates Mucus output, and might involve luminal dilution through increased gastric fluid volume. In addition, it is noticeable that high concentration of capsaicin may induce an initial protective effect, with signs of desensitization appear at later time. Use of cytoprotectants, the prostaglandins has invited the attention of many investigators.
4. Capsaicin increase in GMBF and dealing with dipose of influx of H^+ in sub mucosa and antibacterial effect against Helicobacter pylori highlights as Gastro protective effects.

2. Role in pain pathways

Pain receptors are having free nerve endings. The stimuli of pain receptors may be thermal mechanical or chemicals. “Nociceptor” is a sensory neuron that responds to damaging stimuli to brain and spinal cord by possible threats, and nociceptors are widely distributed in the skin, deep tissues and most of visceral organs [Need clarification]. A critical role in nociception and inflammatory thermal sensation way played by TRPV1[20], Receptor, a well characterized Ca^{2+} gated permanent poly modal receptor activated by several exogenous chemical activators, mainly Vanilloids. It acts as a potent heat sensor in peripheral sensory neurons, exhibits a high sensitivity to heat.

Capsaicin producing burning and itching sensations upon TRPV1 Receptors followed by the activation of polymodal C and A8 nonciceptive receptors. The molecular details underlying capsaicin binding and activation of TRPV1 have been well documented[21, 22].

Several studies utilized capsaicin as a potent prove in the investigation of sensory neuron Mechanisms.[23] Biological safety mechanism which depends on two interlinked processes sensitization and desensitization denotes activation and over activation of Receptors. Depending on dose level, delivery route capsaicin can selectively activate, desensitize or exert neurotoxic effect on sensory neurons.

The nociceptive action relates to binding of capsaicin to TRPV1 receptors via ca2++ ion channel which gets desensitized upon constant activation.TRPV1 receptors gets desensitized by two ways

that is being functional and pharmacological desensitization. Functional desensitization refers to short term application to nerve endings leading to loss or reduction of responsiveness of sensory neurons to other stimuli. Pharmacological desensitization refers to gradual decrease in response, and both the desensitization act by Ca^{2+}depending intra cellular mechanism; Administration of capsaicin and other agonist provokes desensitization: Prolonged exposure to low dose of capsaicin or immediate high doses increases the amount of $Ca^{2+}$and other neurotransmitters like P and glutamate from nociceptive fibre. The nociceptive fibre become "chemically denervated" and functionally silent due to Release of neurotransmitters leading to desensitization of channel[24].

Capsaicin induced desensitization aspect was widely used for centuries to control pain. The Rapidity and the extent of desensitization to capsaicin occur related to its dose levels, duration of exposure and the in interval between consecutive dosing. The long lasting nociceptive action of capsaicin was explained by the involvement of degeneration of epidermal nerve fibres in parallel to pain reduction process[25, 26].

Capsaicin represents nociceptive axn by Ca2+ uptake by neurotoxic intracellular oxygen species (ROS)[27, 28] and increase in osmotic pressure, ^{C} fibre defunctionalisation implicating reduced nerve growth factor and Axonal transport.

3. Genotoxicty and capsaicin

Potential Genotoxicity is inconsistent both positive and negative effects have been found in Geno toxicological Assays. Recently different studies we carried out the genotoxic potential of trans capsaicin by international Regulatory Agencies. In vivo Non mutagenic confirmation was done by Ames Assay described by chandaet.al. 2004, based on the Ames, et.al.1975). Cytotoxic effects was induced by pyrimidine analogue TFT, Triflurothymidine TA1535, 1537,98,100 stains of salmonella Typhymurium was used for the Assay. TFT induced mutated cells are sensitive to thymidine kinase (tk), and gets proliferated to $t_k - t_k - t_k$. Capsaicin inhibits this mutagenic activity, and no cell growth was seen in any bacterial strains.

4. Anticancer activity

Cancer is still a major cause of morbidity and mortality worldwide.[29] In the past decades, the anticancer activity of capsaicin has been broadly investigated for variety of cancer types. Capsaicin has been shown to possess chemo preventive and chemotherapeutic effects. The exact mechanism involved in capsaicin's anticancer effects are still not understood, however numerous studies have attributed it to its apoptosis, cell cycle arrest, and Antiangiogenic effects. Capsaicin exhibits proapototic activity which seems to be related to TRPV1, or TRPV6 activation. Cell cycle and growth arrest are important defence mechanism against cancer and targets for cancer prevention and therapy[30] and capsaicin has been shown to modulate both studies. Reveals that capsaicin may half growth and division of cancer cells by targeting cell cycle regulators. Studies has been demonstrated that capsaicin exhibits interference in both in vitro and in vivo angio signalling pathways; and prevents angiogenisis which is an essential factor for progression of most type of cancers Studies on Anti cancer activity correlates with AMPK activation [Adenosine mono phosphate activated protein kinase] which is linked to inhibition of cell proliferation and apoptoris. Capsaicin has also been suggested to exert chemo protective effects through modulation of metabolism of carcinogens, and their interaction with target cell DNA.

5. Capsaicin in airway diseases

Nociceptors play important role in airway diseases such as Allergic Rhinitis and Asthma which are accompanied by intense inflammatory infiltrate.[31, 32, 33] Nociceptor regulates, recognize and respond to external stimuli, by responding to external stimuli.

Non infectious trigger Rhinitis, and obstruction, representing chronic nasal symptoms, and Barometric pressure differences, was controlled by capsaicin. Initial irritation followed by desensitization of sensory neural fibres reduces nasal hyper responsiveness, which shows relief from above said symptoms for 9 months. Patient treated with intranasal capsaicin reported significant reduced visual Analog scale scores for overall nasal symptoms, Blockade and Rhinorrhoea.[34]

6. Capsaicin in obesity

Numerous studies have highlighted the role of thermogenesis and increase in energy expenditure (EE) in body weight regulation by capsaicin.[35, 36, 37, 38, 39, 40]

1. Critical role of increase of EE by $TRPV_1$ → a potential molecular mechanism which results in catechol amine release and SNS activation of Beta adrenoceptors leading to sympathetically active non shivering thermogenesis in Brown adipose tissue by capsaicin and Increased fat

mobilization (TG oxidation) in while adipose tissue and improved Energy expenditure by skeletal muscle by TRPV1 seems to be main mechanism of fat Reduction in obesity.
2. Implication of modulatory effects in adipogenisis reduces adipose tissue by capsaicin.
3. Reduction of preadipocyte / adipocyte population and adipose tissue by capsaicin can also be attributed to the inhibition of proliferation and apoptosis triggered by TRPV1 Activation.
4. Capsaicin anti obesity effect, the capsaicin alteration in gut microbial population also seems to be important in preventing HFD induced weight gain. Modest sustained weight loss can be predicted to generate substantial health and economic benefits by using capsaicin.

7. Hepato protective activity of capsaicin

The liver is one of the most important organs in the body. It performs a fundamental role in the regulation of diverse physiological processes. Hepatic function inc udes Glucose homeostasis, protein and procoagulant synthesis, bilirubin metabolism and bio transformation of drugs and endogenous toxin. Liver Activity is related to different vital function such as metabolism, secretion and storage. Hepatic disease is a term that indicates damage to the cells, tissue, structure or liver.
Function which may be induced by biological factors (Bacteria, virus, parasites), Drugs and toxins, autoimmune diseases like cirrhosis. Capsaicin confer an appealing hepato protective effect, which may be attributed by the induction of antioxidant defence systems, diminishing the generation of free radicals and inhibiting caspase 3 expression, which is a crucial mediator of programmed cell death (apoptosis).

8. Antidiabetic activity of capsaicin

“Capsaicin” exerts its beneficial effects on glucose and Insulin homeostasis and diabetes. Dietary and supplementation of capsaicin display an impact on glucose and insulin levels in humans. There is evidence that the modulation of glucose levels and insulin secretion by Capsaicin in TRPV1 dependent. Capsaicin induces the secretion of Insulin and Antihyperglycemic hormone, Glucagon like peptide. Capsaicin modulates insulin secretion by these beta cells and its dose dependently increases insulin secretion by the ablation of TRPV1 receptors, prevention of plasma glucose levels, enhanced Insulin secretion and enhanced Glucose tolerance by the selective elimination of TRPV1 expressing neurons was determined by zucker et. al.

9. Cardio vascular diseases

Supporting factors inducing cardiovascular diseases includes atherosclerosis hypertension, cardiac hypertrophy stroke.[41]
Capsaicin exerts its cardio protective effects by following mechanisms,
1. Antioxidant property of capsaicinoids was attributed by augmenting the resistance of serum lipoprotein to oxidation.
2. TRPV1 dependent and independent mechanisms were reported for the anti aggregation effects of capsaicin. It also alerts plasma membrane fluidity of platelets.

Capsaicin plays an important role in the prevention of cardiovascular diseases including atherosclerosis and coronary heart disease, by eliciting an increased resistance, delaying the rate, and initiation of oxidation.
Capsaicin regulates cardiovascular function by releasing CGRP via the stimulation of TRPV1 and SP[42,43].Animal studies reveals the positive effects of capsaicin, in lowering arterial blood pressure which may be mediated eNos-No pathway,CGRP and endothelial TRPV1 and also this signalled pathway delays the onset of stroke. Nitric oxide levels were found to be augmented in the blood and No Nitric oxide mediated arterial and venous relaxation was a possible mechanism to elucidate this therapeutic effect.[44]

10. Dermatological uses of capsaicin

Studies suggest that TRPV1 expressing neurons act as the main sensors and mediators of itch excited by histamine.[45] The antipruritic effects of topical capsaicin may be achieved via defunctionalisation of TRPV1-expressing primary afferent, for short term effects, capsaicin exhibits ion channelized direct desensitization.For a long term, with capsaicin blockade of mitochondrial resperation, mediated via excessive ca2+ and nerve terminal retraction results. Topical capsaicin fluids its use in different type of pruritus and psoriasis. A precise result was revelled by a probable link between TRPV1 and histamine receptors.

11. Capsaicin in urological disorders

Detrusor overactive and hyper reflexica represents urology disorder in bladder of Neurogenic basis, which is characterized by increase in urinary frequently and urgency along with incontinence.

Capsaicin seems to have a protective effect against bladder disorders and the effect was mediated via TRPV1 receptors in urinary tract, capsaicin exerts neurogenic activation and desensitization of C fibers[46, 47] TRPV1 receptors capsaicin also shows urothelial effects of non urogenic order. Capsaicin acts as a support to antimuscarinics to treat orogenic bladder disorders.

CONCLUSION

Capsicum refers to the “fruit pod” of numerous species of plant “CAPSICUM” belongs to the genus of Night shade family solanaceae. Members of this genus possess a unique character of “pungency” which is exhibited by a chemical constituent called “CAPSAICIN” Structurally “CAPSAICIN” and its analogs constitutes a group of chemicals called “Vanilloids” Which is responsible for the pungent smell. Percentage of capsaicinoids differs according to species and extraction. Hotness or pungency was measured by units of “SCOVILLE SCALE”. This article summarizes the pharmacokinetic profile, chemical profile, hazards and therapeutic profile of “Capsaicin” reviews reveals a promising therapeutic benefit of capsaicin for various disorders, mediating via TRPV1 receptors. This article was summarized the benefits of capsaicin as potential and versatile Bio healer.

Table 1: Physio Chemical Properties

S.no	Description	Properties
1	Chemical formula	$C_{18}H_{27}NO_3$
2	Molecular weight	305.41 g/mole
3	Melting point	62-65^{o}C
4	Boiling point	210-220^{o}C
5	Flash point	113^{o}C
6	Solubility	In water 28.93mg/L at 25^{o}C, freely soluble in alcohol, ether and benzene.
7	UV-VIS (max)	280 nm
8	Vapour pressure	1.38*10^{-8} mm Hg at 25^{o}C

Table 2:

S.no	Capsaicinoids Name	Chemical Formula	Scoville Rating (Shu)
1	Capsaicin	$C_{18}H_{27}NO_3$	1,50,00,000 - 1,60,00,000
2	Dihydrocapsaicin	$C_{18}H_{29}NO_3$	1,50,00,000
3	Nonivamide	$C_{17}H_{27}NO_3$	92,00,000
4	Nordihydrocapsaicin	$C_{17}H_{27}NO_3$	91,00,000
5	Homodihydrocapsaicin	$C_{19}H_{31}NO_3$	86,00,000
6	Homocapsaicin	$C_{19}H_{29}NO_3$	86,00,000

Table 3: SHU- Scoville heat units of different Capsicum species

S.no	Capsicum species	Scoville heat units
1	Capsicum annuum (Thai pepper)	50,000 -100,000
2	Capsicum frutescens(Tabasco pepper)	30,000-50,000
3	Capsicum chinense (Habanero fruits, Scotch Bonnet)	1,00,000-3,50,000
4	Capsicum baccatum is a member of the genus Capsicum.	30,000 -50,000
5	Capsicum pubescens (rocoto pepper)	1,00,000-2,00,000
6	Ground pepper(Hot wax pepper)	5000-10,000
7	Sweet Bell pepper	0-100

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