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AN OVERVIEW OF *MOMORDICA CHARANTIA*: A NEUTRACEUTICAL APPROACH FOR DEPRESSION

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Abstract:

The Cucurbitaceae family, which includes *Momordicacharantia* Linn. (*M. Charantia*), has a widely geographical distribution throughout tropical and subtropical areas in the world. Since ancient times, its fruit used for vegetable diet, herbal therapy and is utilised in drugs to cure diabetes mellitus. These phytochemicals include proteins, polysaccharides along with flavonoids, few triterpenes, saponins, ascorbic acid and a number of steroids. This plant also contains steroids, proteins, ascorbic acid, Polysaccharides, saponins, flavonoids. According to reports, *M. Charantia* exhibits a variety of biological activities, including those that are hepatoprotective, anticancer, antibacterial, antiviral, antitumor, immunomodulating, antioxidant, ant-diabetic, ant-helminthic, anti-ulcer, anti-inflammatory, studies conducted in vivo and vitro have shown that, *M. Charantia* may also have toxicity or harmful actions depending on the situation. This current review article, chemical components of *MomordicaCharantia*.

Keywords: *Momordica Charantia*, Chemical Components, Antidepressants, Bitter melon, Medicine, Treatment.

1. Introduction

There have been many different plants utilised as food and medicinal since the dawn of mankind. *Momordicacharantia* (a member of the *Momordica* species) has long been a favourite due to its dual uses as a medicinal and a vegetable. Among its many names are bitter squash, bitter apple, bitter melon, karela. is a valuable plant that is a member of the Cucurbitaceae family. Because of its leaf's serrated edges and bitter-looking appearance, the generic name "Momordica" is derived through Latin vocabulary "mordica", which translates "to bite." Because the entire plant, including the fruit, tastes extremely bitter, the plant live up to some of its common names of "bitter melon" or "bitter gourd." Sultry and equatorial section of world such as Malaya, India, China, Thailand, Singapore, Vietnam and Japan. The plant's fruit is frequently consumed as a vegetable and is also utilised in the ayurveda and unani medical systems to cure a variety of illnesses. *Momordica charantia* Linn leaves and

fruits are effective for treating depression, piles, leprosy, jaundice, diabetes, and bite by snake. It has been discovered for vermifuge and antioxidant profile. According to prior findings, the herb also exhibits anti-plasmodial, anti-malarial, and insecticidal effects on mustered sawflies (Jia, et al; 2017).

Momordicacharantia has numerous bioactive compounds that have been recently discovered and published. The findings of the phytochemical examination included tannins, flavonoids, cardiac glycosides, steroids, and saponins. The biological effects of the drug are described in this review.(Oliveira, et al; 2018).

The bitter apple infusion, also known as herbal infusion made from dried slices, which is mostly used for curative, is one of the products associated with *Momordicacharantia* that are currently highly popular. This plant, a well-known herbal treatment, also functions as a laxative, abortifacient, anthelmintic, contraceptive, and antimalarial. Among the ailments it is used to treat include scabies, piles, gout, leprosy, eczema, jaundice, dysmenorrhea, and psoriasis. (Jia, et al; 2017).

The plant's fruit is frequently consumed as a vegetable and is also utilised in the unani and ayurveda systems of medicine to cure a variety of illnesses. The fruits and leaves of *M. charantia* Linn are effective against vermin and have antioxidant and vermifuge properties, making them useful for piles, leprosy, jaundice, diabetes, and snakebites. According to earlier findings, the herb also has antiplasmodial, antimalarial, and insecticidal properties that are effective against mustered sawflies. The goal of the current investigation was to determine whether a methanolic extract of *Momordicacharantia* Linn's dried leaves had any anti-inflammatory, anti-depressant, or anxiolytic properties. (Shan, et al; 2012).



Figure 1- Leaf and fruits of *M.charantia* (Habicht, al; 2011).

2. PLANT PROFILE

2.1 Common Names

Hindi- Karela

English-Bitter gourd

Tamil-Pavakay



2.2 Taxonomical description

Kingdom-Bitter melon

Order-Cucurbitales

Family-Cucurbitaceae

Genus-Bitter Melon

Species-Africa ,Australia

2.3 Chemical Composition -Triterpenoids, saponins, polypeptides, flavonoids, alkaloids, sterols, and other bioactive compounds are among those found in *M. charantia*. Carbohydrates, proteins, lipids, and other categories are used to describe these substances. Previous studies on phytochemicals have demonstrated the bioactive elements and their associated actions (Liu, et al;2009).

Major Bioactive component	Function	Distribution
Proteins and Peptides	polynucleotide adenosine glycosidase (PAG),RNA N-glycosase, DNAase like Phospholipase, anti-Microbial, immune suppression , anti-tumour	Seeds
Polysaccharides	Antidiabetic, antioxidant, immune enhancement, anti-tumour, neuroprotective	Different part of the plant
Saponins	Anti-hyperglycemic, hypolipidmic, antiviral,	Root, fruit, seed
Terpenoids	Anti-cancer and anti-oxidant, Anti-diabetic, hypoglycaemic, cancer chemoprevention	Stem,leave,fruit
Lipids	Anti-oxidant , anti-tumour	Flesh,. seeds
Phenolics	Anti-oxidant, immune enhancement, anti-inflammation	Fruit,pericarp,seed
Sterols	Anti-microbial	Pericarp, fruit



2.4 Polysaccharides-Polysaccharides are one of *Momordicacharantia's* most important bioactive elements. The bioactivities of the polysaccharides found in *Momordicacharantia* fruits have shown to with anti-inflammatory, immune-stimulating, neuroprotective, anti-tumor, and antimicrobial effects. Crude amount of polysaccharides at *M. charantia* have been extracted using a variety of extraction methods, with hot water, acidic, ultrasonicrays, and enzymatic extractions of plant, all of which were followed by an ethanol precipitation. The bitter gourd powder contains polysaccharides, which are heteropolysaccharides made of mannose (Man), glucose (Glu), galactose (Gal), arabinose (Ara), and some other sugars, in quantity of something 6%. showed that range of circumstances could impact the quantity of polysaccharides present; polysaccharide containing in 13 types ranging from 4.91% to 9.60% of fine powdered form the number of entries into open arms (Xu, et al ; 2015).

2.5 Peptides and proteins-peptides and proteins are commonly contains components in seeds and fruits of *Momordicacharantia*. Some parts of *Momordica Charantia* through the isolation they are *Momordica Charantia* lectin, momorcharin, ribosome inactivating protein and anti HIV protein. In the Human nasal tumour cells and xenograft cancer cell can be significantly inhibited by *Momordicacharantia* lectin MMC and type 2nd RIP, according to in vitro tests.(Tsuzuki, et al ; 2004)

Myeloid cell leukaemia is a type II Receptor intensity protein that has employed such as anti-tumor components despite being known to be extremely hazardous. Along with other components, momordicin was successfully isolated from *M. charantia* as a type II (single-stranded) RIP. Hypoglycemic peptide Polypeptide-P is a type of protein that binds to carbohydrates that is secreted by plant cells. It is crucial for cell adhesion and recognition processes. This is isolated from *Momordica. charantia's* tissues, fruits and seeds has a molecular weight of about 11 kD. Some other polypeptide together a molecular weight of 3.5kD have been identified from karela, and it comprises 166 amino acid residues (Fang, et al; 2012).

From *M. charantia*, other proteins and peptides have been recovered, with peroxidase, systine knot peptides Momordica cyclic peptides, antifungal protein, trypsin inhibitors, RNase MC2 (Puri, al; 2019).

2.6 Saponins and Terpenoids- Glycosides known as saponins have an aglycone that is either a spiro-steroid molecule. Complete compositions consist of glucose and; the aglycones' structural differences are what distinguish them from one another. The roots, fruits and leaves, of plant. all contain saponins. Glycosides with tetracyclic and it's triterpinoids the majority they are related to as cucurbitacehas widely recognisedwithtoxicity and stickness, have been shown to be the main chemical components, according to research. About 0.0432% of *M. charantia* powder making total saponins. Numerous medications making triterpenoidal proteins and steroidal saponins, which extensively dispersed in range of plants (Vincken, al; 2007) .



The cucurbitacins are a class of predominantly tetracyclic, triterpenic plant compounds with a bitter taste that are generated their cucurbitane structure. Numerous pharmatherapeutic effect also revealed they antidiabetic and hypoglycemic changes with their *M. charantia*'s cucurbitanes. The alcoholic extract of bitter apple has been used to isolate cucurbitane their compounds just like aglycon, glucose, fructose and their its components which correlated their actions. Whenever they demonstrate with some other compounds that have only aglycon structure that means which activation of test, activities (Xu, et al; 2005).

2.7 Phenolic and Flavonoids Compounds-*M. charantia* contained phenolic and Flavonoids components in significant amounts. They include t-cinnamic, t-ferulic, gallic, protocatechuic, gentisic, vanillic, syringic acid, and p-coumaric acid. The two flavonoids that were found in the highest concentrations were quinic acid in the methanol hydrophilic extraction of *M. charantia* dialysis tubing with 3.5 kDa). For each phenolic acid, the components were dispersed among diverse tissues in varying proportions (Tan, et al; 2014).

Gallic & benzoic acids, gentisic, flavoic acids, catechin, ascorbic acid, chlorogenic acid, and epicatechine were common phenolic acids got in *M. charantia* seeds with concentrations value from 8.03 to 39.75, 16.98 to 31.39, 22.06 to 72.46, 4.44 to 15.78, and 16.19 to 44.20 mg/100 gm dry content actively. In plants, epicatechi and catechu have the two mostly valuable flavonoids. Regulate the extracts obtained by subdangerous water extraction, Shotiprukand budrat found the catechu is most high phenolic acid prepared in bitter apple (45.16 mg/gm weight, 72-80% of all about phenolic contents), regulate by gentisic (4-11%), gallic (0.25-0.86%), and chlorogenic (0-0.16%) acids, in the some other. Catechu, gallic , chlorogenic , gentisic acid, and elicitation have the common phenolic compound in the extracts material. The caffeine acid and phenylpropanoid is characterised; its quantity . p-coumarin, benzoic & tannic acids, caffeic, gallic acid, flavoic acids & catechu too gotted in aqueous extraction changes of *Momordica charantia* (Harox, et al; 2005)

3-Biological Activities-Since *M. charantia* are utilised for range of illnesses since antiquity, it is still widely used as a therapeutic agent in the aforementioned Latin American and Asian nations. An outline of its typical pharmacological activity is provided below.

3.1 Antidiabetic Activity-A range of diabetic diseases are referred to diabetes , one of the diseases with the greatest rate of growth in the world, are characterized through hyperglycemia brought on by abnormality in the insulin release, activity . Numerous studies have suggested using various *M. charantia* extracts as a diabetes treatment. It has used extensively as an anti-diabetic medicine in other country for many of times. It is demonstrated *M. chrantia* have potent drug, anti-diabetic properties by numerous studies using cell-description, animal activity models, and human preclinical trial (Arafat, et al; 2016).

Oral administration of an aqueous extraction regulate from *Momordica. Charantia* fruits which dose 40 mg/kg significantly decrease blood glucose limit in diabetic animal induced



through the streptozotocin (STZ). Fruit of *Momordica charantia*'s aqueous extraction (Raman, al ;1996).

3.2 Anti-oxidant Activity- Numerical graph have shown the *Momordica charantia* is dependant natural occurring antioxidants they utilised in laboratory conditions. They are proven for successfully in prevent oxidation damage in vivo and vitro. The naturally bioactive phytonutrient got in plant with phenolics, saponins and polysaccharides. Numerical in the vitro animal models present that seed fine powder and there ethanol or water extraction has notable anti-oxygenic property, reffered by bitter apple pulp and their extraction. Using with hydroxyl based radical scavenging & metal-chelating ion, their antioxidant profile of aqueous extraction of *Momordica charantia* pulp was assess (Lucas, et al; 2010)

The EC₅₀ range of 2.21 mg/mL for able to scavenge free radicals were findout for water-soluble polysaccharide that are outlying from hot water extraction of unripe fruit *M. charantia*. Flavonoids component are the among with most common antioxidants and its free radical scavengers got in *Momordica charantia*. A flavonoid absorption rose, the antioxidant range also rose steady, and at the 1.3 mg/mL, the scavenging regulation reach out 96.15 (Padmashree, et al; 2011).

3.3 Antiviral Activity- SINV and HSV-1 virus are notably inhibit through the ethanol extraction from *Momordica charantia*'s stems and leaves. The additionally, investigated has interpitated their photosensitizer hadas a super activity in antiviral activity than momordicin Ist or IInd. The steroids and proteins that has isolated through *Momordica charantia* adequate has antiviral property. Whenever have a insignificant cytotoxic on fresh C8167 cells (IC₅₀ > 200 gm/mL), kuguacin E and kuguacin C, they are isolated through the roots of *Momordica charantia*, they are present mainly anti-HIV-1 activity. MAP31, they are selective hit HIV-infected lymphocytes cells and macrophages cells they are only have a minimum toxic effect of fresh cells, is compound essential antiviral action in-vitro. The induction of HIV-I viral DNA by monocytes is additionally stopped. Similar investigations have revealed that the bitter gourd protein MAP30 can lessen the influence of cellular protein or cellular DNA synthesis in the H9 cells while decreasing production away from the reverse viral transcriptase, the virus HIV, and protein activity. Their ability of the lectin MRK29, which was regulate from *Momordica charantia*, to decrease viral reverse transcriptase was found to be its mechanism of action. Momordicin prevented the transcription and translation of the Cocksackie virus (CVB3RNA) in cardiac cells, directly defending the cells from infection (Beloin, et al; 2003).

3.4 Microbial Profile- Inhibitory effect on the *S. aureus* from *Momordica charantia* oils whenever have low impact on *C. albicans* and *E. coli*. When aqueous extraction of *Momordica charantia* seeds demonstrated active anti-microbial activities opposed to the *S. typhi*, *P. multocida*, *L. bulgaricus* and *S. epidermis* in that order. Their organisms that were most susceptible to the ethanolic extract were *M. luteus*, *S. aureus*, *E. coli*, and *L. bulgaricus*

and *S. epidermidis* whereas *S. aureus* was more resistant to petroleum ether and hexane compound extraction. *Momordica charantia* extraction have been indicate to the broad-spectrum action and anti-microbial activities, same as to hydroalcoholic leaf extraction, they showed antibacterial activity opposite to the *Staphylococcus*, *E. coli*, *Pseudomonas*, *Streptobacillus* and *Salmonella*. They might to be brought on by the presence of lanosterol and elasterol. *B. cereus* and *S. aureus* growth is inhibited by ethanol extracts from *M. charantia* leaves. The ethanol fraction appears to have no action on *E. coli*, in the contrast to how ethyl acetate extracts are handled. The methanol extraction of *Momordica charantia* seeds and leaves show the super anti-bacterial activities among various natural organic component extraction, with the notable inhibition action on the *S. aureus* and *E. coli* (Mahmood, et al; 2012).

3.5 Inflammatory Action- Orally take of 3% & 6% *Momordica* fine core powder commonly inhibit macrophage infiltrated in the epidermal and brown body fat and down regulation the nature of inflammatory cytokines monocytechemotactic protein-1, IL-6 and TNF in the EAT in animal (rats) fed a high carbohydrate food. The bitter apple powder significantly reduced the activate of NF-B signal pathway, which is opposite from away what was observed, and so enhanced both inflammatory cytokine (TNF & IL-6), anti-inflammatory marker i.e. cytokine (IL-10) concentration. *M. charantia* successfully prevented neuro inflammation, normalised the materials of markers (such as TNF, NF-B1, IL-16 IL-17R and IL-22), and commonly decreased the depression caused through the take of a high-fat diet. Many researches have found that *Momordica charantia* decreased lymphocytes and increased The natural shooter cells (NK) cells in vivo method by inhibition of IL-7 production and encouraging the release of IL-10 and TGF (Bao, et al; 2013).

3.6 Anti-Tumour Activity- Strong anticancer activity has been shown for *Momordica charantia* extraction and their similar compound against a range of tumours, including lymphoid leukaemia, , choriocarcinoma, skin cancer ,melanoma, lymphoma, breast cancer and prostate cancer. The strong active anti-CD5 mono-clonal ab performed on the T cell leukaemia Jurkat cell line when combined with momordica, the ribosomal inactivating proteins pure from *Momordica charantia*. In the Jurkat leukaemia mouse model, animals that received the immunotoxin had tumours that were smaller in size, and by day 120, there was a substantial reduction (p 0.01) in tumour growth. Full fruit extraction from *Momordica charantia* boost hepatic SH and GST range, markedly decrease tumour pressure in DMBA-induced and its papillomagenesis, and stopped their growth of skin tumour in groups for the duration of the study. In mice with PN-induced and they TPA-promote tumour magenesis, with the production of tumour mass was postponed, and number of tumour mass each mouse was roughly decrease by 34% and 37% divided mainly two groups and reacted with their triterpenes. Additionally, *Momordica charantia* fruits and seeds showed powerful in vivo inhibition of cancer cells (Porro, et al; 1993).



3.7 Hypolipidemic Activity- The experiment in groups of rats feed for 35 days with dosage of 140 milligrams/kg, *Momordica charantia* supplementation active slowed and percentage of decrease or increase in levels of the high-volume low-density lipoprotein (LDL) and lipoprotein(high density)-cholesterol (HDL). Day 10 cholesterol levels were somewhat lower, while day 20 triglyceride levels showed a steady drop. In animal studies, the weight-reducing potential of bitter melon seed oil, or BMSO (10 g/kg), has been demonstrated. By week 21, the indices began to match those of normal controls, and their high doses form of BMSO normalised blood on rats in therapy. Smaller adipose cells started to show up due to histological modifications. The ability of plant to lower liver triglyceride and cholesterol conc. primarily by the active chemical in alc. extract is believed that the glycosidic component in plant decrease lipoprotein in-vivo by having a noncompetitive inhibition impact on glucagon, corticotropin and the epinephrine react with lipolysis through the isolate rat adipocytosis (Xu, et al; 2016).

3.8 Toxicity and Side Effect-Under normal circumstances, the plant is essentially harmless to humans, but depending on specific uptakes, processing techniques, physical variances, and other circumstances, it may cause negative reactions. Since the 1960s, reports of toxicity have mostly focused on acute, chronic, and reproductive toxicity. In India, consumption of *M. charantia* leaves on a monthly are based on the used to prevention at childbirth time. Commonly ethanol extraction of *Momordica charantia* Linn fruits, seed caused higher pathological and histological correction in the testes and accessories reproduction parts of rat or mice. In comparison to controls, aqueous leaf extracts in female Wistar rats inhibit plasma ,progesterone and oestrogen range in the higher dose dependens manner. RIPs have also been found to have antifertility abilities. *Momordica charantia* are also show to the comparable action, they do not only affecting embryo adhere and implant but they also be suppressing with growth the embryos. The inhibition on morulae development is likely what causes MMC to induce early pregnancy termination and cause abortion (Panda, et al; 2015).

5-Conclusion- *Momordica charantia* has a range of pharmacological actions, making it a very beneficial plant for both health and illness. As a herbal remedy, it has been employed. preclinical survey of compound, particularly polysaccharides, done with the focus from long term study. With much more investigation into bitter apple, with the ratio in the mechanisms and structure of their efficiency of their numerous study with function components shall be understood. In the constant time, more study done on any potential adverse consequences. First of all, there hasn't been any research on the potential harm that prolonged consumption to the body could cause. The risk of hypoglycemia in diabetic patients who consume *M. charantia* may also rise. For specific populations, it's crucial to take *M. charantia* as prescribed by medical professionals or specialists. Last but not least, the effects of bioactive components on people have not yet been established because the majority of current research on them is conducted at the animal and cellular levels. Therefore, clinical research is necessary prior to its deployment in relevant businesses. The elevated plus-maze test is often

used to assess the antidepressant efficacy of novel drugs, including herbal remedies. Following oral administration of various doses (100, 200, and 300 mg) of a mentholic extract of *M. charantia* Linn, alleviate the time along with enteries' count (Zhang, et al; 2004).

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