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MEDICINAL USES OF CURCUMIN, AND HEALTH BENEFITS

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ABSTRACT

Turmeric is the main source of the Anti-inflammatry, anti-oxidant, anticancer, anti-mutagenic, anti-bacterial hypolipidemic, obesity cardioprotective, and neuroprotective benefits are only a few of the biological properties of turmeric.

Due to its purported pharmacologic properties, turmeric is a crucial can didate for additional clinical studies.

There is also a discussion of its toxicity and safety. curcumin, it has drawn interest from both the medical and scientific communities as well as food enthusiasts. Turmeric has long been known for its medicinal benefits. Turmeric's primary chemical constituent, curcumin, has been shown to have a number of beneficial biological properties, including those related to expectorant, antiinflammatory, antioxidant, antimutagenic, antibacterial, antidiabetic, and antimutagenic effects. This study provides an update primarily on the pharmacological actions of turmeric, its extracts, and potential medical uses of turmeric, along with an assessment of their safety.Anti-inflammatory, antioxidant, anticancer, antimutagenic, antibacterial, anti-obesity, hypolipidemic, cardioprotective, and neuroprotective benefits are only a few of the biological properties of turmeric. Due to its purported pharmacologic properties, turmeric is a crucial candidate for additional clinical studies. There is also a discussion of its toxicity and safety.

The yellow component of Indian turmeric, or "haldi," known as curcumin, has recently renewed attention in the field of experimental medicine due to its pleiotropic effect. The pharmacokinetics, pharmacology, and pharmacodynamics of curcumin have received particular attention in this review. In this research, we made an effort to examine curcumin and its formulations' overall pharmacokinetics profile, pharmacokinetic interactions, and pharmacokinetic pharmacodynamic interactions.Modes:

To boost the bioavailability of curcumin, new technologies are being tested in the drug development process, including additives, micelles, nanoparticles, liposomes, and phospholipid complexes. To learn more about their biological effects and prospective applications, curcuminoids and other substances connected to turmeric were investigated. The active components of turmeric are the flavonoid curcumin (diferuloylmethane) and many volatile oils as turmerone, atlantone, and zingiberone. Curcumin's ability to prevent carcinogenesis at three stages: tumour promoting, angiogenesis, and tumour formation This study focuses on the medicinal and pharmacological benefits of turmeric in the treatment and prevention of sickness. The purpose of the current study is to highlight the value of turmeric's vast pharmacological activity and its contribution to the development of new drugs for the treatment of various ailments.

Keywords: Curcumin, Turmeric, Anti-Bacterial, Spice, Curcuma, Properties, Anti, Etc.

I. INTRODUCTION

History of turmeric -In Sanskit, "a potent remedy for jaundice" is referred to as "haridra" (1). It is one of the oldest known spices and has been a staple of Ayurvedic treatment for many centuries in the western and southern regions of India (2). In order to avoid confusion, this spice is frequently referred to as "Indian saffron" and is also said to be an indigenous spice of India. Turmeric originated in India and by the year 1200 AD had spread to China, East Africa, and West Africa. It had also started to gain popularity throughout the world.

The tropical and subtropical parts of the planet are home to the spice turmeric. It is widely grown in Asian nations, mainly in China and India. The plant is up to 1 m long and has a short stem. With a clear human usage, turmeric is a significant spice all throughout the world, but especially in the East (3).One of the key components in many Asian dishes is turmeric, which gives food a mustard-like, earthy scent and a strong, slightly bitter flavour. The majority of the time it is used in savoury recipes, although it may also be found in select desserts

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like cake sfouf. To make the traditional sweet dish patoleo, rice flour and coconut-jaggery mixture are layered on top of turmeric leaves in India(4)

Plant Profile:

Common name:- Indian saffron

Synonyms:- Saffron Indian;haldi (Hindi); Curcuma;Rhizoma cur-cumae

Biological Sources:

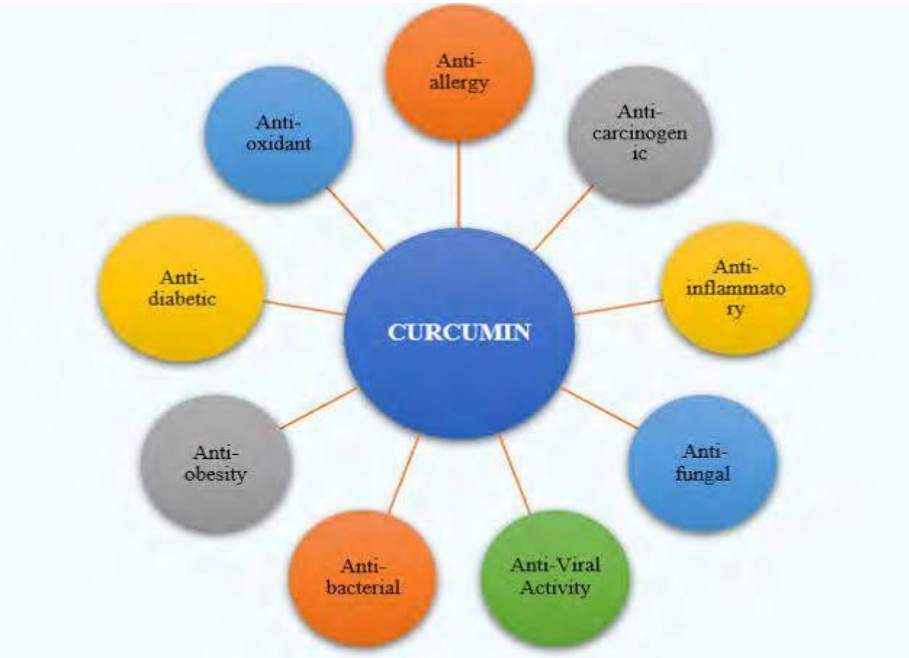
Turmeric is the dried rhizome of curcuma longa.Linn. (Syn.c.domestica valenton belonging to family zingiberaceae. (5)

Taxanomy:-

- Scientific name:- Curcuma longa.
- Kingdom:- plantea.
- Sub- kingdom:- Tracheobionta Vascular plant.
- Super division:- spermatophyta.
- Division:- Magnoliophyta flowering plant.
- Class:- Lillipsida monocotyledons.
- Subclass:- Zingiberidae.
- Order:- Zingiberales.
- Genus:- curcuma .L Curcuma.
- Species:- Curcuma Longa. L. (6).

Process Flow Diagram For The Conventional Turmeric Processing Chain:

Various biological properties of curcumin :



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Antioxidant:

Efficient oxygen free radical scavenger. It performs an antioxidant role similar to that of vitamins C and E. It can guard against haemoglobin or lipid-induced oxidation. It is possible to drastically reduce the production of reactive oxygen species (ROS) like H2O2, superoxide anions, and nitrite radicals by activated macrophages. The curcumin Compounds bisdemethoxycurcumin and demethoxycurcumin also have antioxidant properties(7)

It has been demonstrated that pre-treatment with curcumin reduces the oxidative stress and alterations in the heart brought on by ischemia(8)

Anti-cancer:

The major polyphenol in turmeric, curcumin, has a wide range of biological effects. It combats cancer by altering molecular targets that support cell signalling procedures. It inhibits apoptosis, proliferation, and transformation. The anticancer effects of curcumin may be greatly enhanced by the usage of curcuminoids' analogues and derivatives.(9)

The three active curcuminoids derived from turmeric are bisdemethoxycurcumin, demethoxycurcumin, and curcumin. These compounds inhibit the growth and propensity of human lung cancer cell lines A549, colon cancer cell lines HT29, and glioma cell lines T98G. Lung cancer cell lines become less viable and develop slower when given individual curcuminoids. The crude extract and cisplatin work better together than they do alone to lower cancer cell viability in A549 lung cancer cells. Because of this, entire turmeric extract was more potent against lung cancer cells than its individual parts.(10)

Curcuma longa's hexane soluble fraction (HM) was chemically split into a novel bioactive fraction (NCCL) and a novel marker molecule. In cell lines, the NCCL fraction with residual components causes a greater amount of cell death than the isolated molecule. In MCF-7, DU-145, MDA-MB-231, and PC-3 cells, NCCL was shown to have more effective anti-cancer capabilities and can be used as an active therapeutic drug.(11)

Anti-Diabetic:

In a study to examine the effect of curcumin , it was discovered that curcumin administration improved the activity of all antioxidant enzymes. Additionally, when compared to non diabetic and diabatic untreated rats, curcumin – treated rats demonstrated a notable increase in the expression of gene for insulin – like growth factor -1, B- cell lymphoma 2, superoxide dismutase ,and GST.(12)Another rat investigation revealed that isolated islets of Langerhans treated with curcumin dramatically boosted insulin production, heme oxygenase (HO)-1 gene expression, and HO activity.(13)

A recent study summarized how curcumin works to prevent or postpone diabetic retinopathy a number of cellular processes (14) The oral treatment of curcumin at a concentration of 0.05% W/W for a period of 9 weeks in diet demonstrated a role in the prevention of diabetic – induced increase in acetylated histones in the retinas(15)

Anti – microbial:

It resistance to microbial medicine is one of the main cause treatment failure, and antibiotic resistance to microorganisms is an issues, that is spreading fast throughout the world. To solve these these kinds of issues,a natural source that is both secure and efficient is required. It has been established that main component of turmeric, possess antibacterial, antiviral and antifungal properties (16) Curcumin showed inhibitory action on methicillin – resistant staphylococcus aureus strain, with a minimum inhibitory concentration value of 125-250gm/ML, according to a study finding.(17) All Helicobacter pyroli strain that were obtained from infected patients with gastrointestinal issues grew slowly in vitro thanks to curcumin, one of turmeric's main active constituents.(18). Numerous Grampositive and negative bacteria are resistant to curcumin's antibacterial properties.(19) The results of the study showed that HSV-1 in cell culture was significantly inhibited by curcumin and it's novel derivatives, such as gallium – curcumin and copper – curcumin .(20). Moreover, other investigators have also reported that anti- bacterial activity of curcumin.(21,22,23).

Anti- obesity:

In an addition to being a serious health issues in the world.It also leads to many sorts of pathophysiology The results showed that curcumin enhanced insulin signalling, increase glucose excretion, and prevent obesity when high-fat diets are consumed.(24).

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When compared to control obese animal, curcumin treatment reduce the inflammatory effect of obesity models as compared to control obese animal. In addition, curcumin treated obese animal also showed decreased NF-kB activity in liver tissue.(25).At the cellular and organismal levels, curcumin exhibit potential health advantage for preventing obesity and related metabolic disorder by up- regulating adipocyte energy metabolism and decreasing angiogenesis in adipose tissue.(26).

Anti- malarial activity:

In term of morbidity and death, malaria is an infectious disease brought on by blood parasites.carica papaya is a plant that has a significant role in the prevention of malaria (27)

Additionally it is inexpensive and showing fewer adverse effects. The experiment was carried out on mice, infected with malaria parasite played a role in the 80%90% enhanced their survival significantly.(28). According to other studies finding curcumin the main component of the spice turmeric,has a cytoxic effect on giardia lamblia , it reduces the parasite's ability to grow and adhering capacity while also inducing morphological abnormalities and apoptosis -like changes.(29)

Anti-viral:

A number of viruses are resistant to curcumin's anti-infective agent. Either the viral replication machinery is Directly interfered with viral replication or control of cellular signalling pathways NF-B and PI3/AKT that are involved in viral replication. This investigation reviews literature with a focus on curcumin's antiviral activities and probable molecular route(30). The COVID-19 symptoms are curcumin reduces acts by anti-viral , anti bacterial, anti inflammatory , antinociceptive, antipyretic , and anti fatigue agent.Along with other molecular processes, it inhibits NF-B ,Toll like receptors, inflammatory cytokines, bradykinin and chemokines in addition to having antioxidant ,antiapoptotic ,and antifibrotic properties. Curcumin may be used in treating COVID-19 , according to scientific studies.(31)

There is proof that curcumin, in the main curcuminoid ingredients in turmeric, may reduce inflammation and protect against oxidative stress . It also has antibacterial and antifungal properties and hypoglycemic and wound healing characteristics. It also contains essential technologies such nanoparticles, adjuvants, liposomes Phospholipids complexes are being reached asa part of novel approach to drug development to improve curcumin bioavailability. As a home remedy, it is frequently used for cough , sore throats ,are respiratory condition. During the present SARS-COV-2 pandemic, it might be a great immune system booster .(32). The spice turmeric has the ability to block crucial SARS-COV-2 virus proteins making potential therapeutic or protective medication against SARS-COV2 virus infection. Compounds 4, 23, and 6 are the strongest inhibitors of the virus's main protease spike glycoprotein, and RNA polymerase, respectively.(33). At the maximal non-toxic concentration, a methanol extract of curcuma longa suppressed the poliovirus (MNTC). The phytochemical investigation found terpenes , saponins, alkaloids, flavonoids , tannis cardiac glyacosides, and phenol as bioactive phytochemicals. Curcuma longa has high inhibitory activity and could develop an efficient antiviral and could develop an efficient antiviral against polio and measles viruses.(34).

Anti- fungal activity:

It has always possible to manage fungal infection and spoilage using substances and extracts that have been obtained from various natural resources, mainly plants. Due to the widespread traditional use of turmeric in food products, numerous studies have been conducted to examine the effect of curcumin and turmeric on the pathogens and spoilage caused by fungi. The investigation of adding turmeric powder to plant tissues culture revealed that turmeric at the 0.81.0 g/L exhibit noticeable.(35).

With MIC values of 128 and 256 g/ mL , respectively, the methanol extract of turmeric showed antifungal activity against cyptococcus neoformans and csndida albicans(36).

Rhizoctonia solani , phytophthora infestans, and Erysiphe graminis were all resistance to antifungal effect of the C. Longa extract in hexane at a concentration of 1000mg/L. Additionally, it was demonstrate that the C. Longa 1000mg/L ethyl acetate extract had an inhibitory impact on R. Solani ,p. Infestans, puccina recondita, and Botrytis cinerea. Additionally,R. Solani ,pu . recondita, and p. Infestans were resistant to the antifungal effects of turmeric at 500 mg/L.(37). Fusarium solani and Helminthosporium oryzea are two type phytophagous fungi that are resistant to the antifungal effects of curcumin and turmeric oil. With IC50 values of 19.73 and

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12.7g/mL, respectively, turmeric oil displayed the most potent antifungal action against F. Solani and H.oryzae.(38).

Anti Bacterial:

tof the most serious infection disorder is bacterial infection. As a result disorder is bacterial infection. As a result substantial research has been conducted for more than 50 years to develop new antimicrobial drugs that have been extracted from various sources. Despite advancement in antibacterial agent , research, the emergence of bacteria that are multidrug resistance present a unique need for new antibacterial medicine.(39).

The MIC values for Bacillus subtilis and staph. Aureus against the methanol extract of turmeric were 16 g/mL and 128g/mL, respectively. (40)

The highest antimicrobial activity was found for the ethanol extract, with a MIC value of 3.91 to 125 ppt, in the study of hexane and ethanol turmeric extract and curcuminoids (from ethyl acetate extract of curcuminoids isolated from C. longa with 86.5% curcumin value) against 24 pathogenic bacteria isolated from chicken and shrimp.

The antibacterial effects of the C. longa hexane and methanol extracts were seen against 13 different bacteria, including Vibrio harveyi, Vibrio alginolyticus, Vibrio vulnificus, Vibrio parahaemolyticus, Vibrio cholerae, Bacillus subtilis, B. cereus, Aeromonas hydrophila, Streptococcus agalactiae, Staph. Curcuminoids did, however, produce inhibitory effects against eight bacteria, including Str.

Agalactiae, Staph. Intermedius, Staph. Epidermidis, Staph. Aureus, A. hydrophila, B. subtilis, B. cereus, and Ed. Tarda. The MIC values for hexane extract and curcuminoids were 3.91 to 500 ppt and 125 to 1000 ppt, respectively.(41)

It was established that adding 0.3% (w/v) of aqueous curcumin extract to the cheese resulted in a decrease in the numbers of Salmonella typhimurium, Pseudomonas aeruginosa, and E. coli 0157:H7 bacteria in the cheese. Additionally, it has reduced contamination levels of Staph. Aureus, B. cereus, and Listeria monocytogenes after 14 days of cold storage.(42)

Additionally, it was shown that turmeric oil, a byproduct of the production of curcumin, was effective against B. subtilis, B. coagulans, B. cereus, Staph. Aureus, E. coli, and P. aeruginosa.(43) Additionally, methicillin-resistant Staph. Aureus (MRSA) bacteria with MIC values of 125–250 g/mL were inhibited by curcumin.(44)Three new curcumin compounds, indium curcumin, indium diacetyl curcumin, and diacetyl curcumin, were tested in vitro against Staph. aureus, S. epidermis, E. coli, and P. aeruginosa. It was found that indium curcumin had a stronger antibacterial effect than curcumin itself and may be a suitable compound for additional in vivo studies. Diacetylcurcumin, however, had no antibacterial effects on the tested microorganisms.These outcomes also showed many curcumin compounds to have promising antibacterial action. As a potential pharmacological target for antibacterial drugs, the stability and assembly of FtsZ protofilaments, a critical component of bacterial cytokinesis, are introduced. By causing filamentation, curcumin inhibited B. subtilis cytokinesis. Additionally, it dramatically reduced the cytokinetic Z-ring formation in B. subtilis without having a major impact on the segregation and organisation of the nucleoids (45).

The research on E. coli and B. subtilis showed that curcumin might reduce the FtsZ assembly and disrupt bacterial cell division by having an inhibitory effect on FtsZ polymerization.(46)

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II. CONCLUSION

Although in vivo research in some cases indicated the less effective findings of curcumin inhibitory impact, all prior investigations have demonstrated the wide antibacterial activity of curcumin. The most hopeful outcome from all prior research on curcumin's antibacterial action is against Helicobacter pylori, at least for using the curcumin as a supplementary substance in combination with other available medications to lessen the symptoms of gastritis.As a result of curcumin's broad spectrum of antiviral activity against various viral infections, this substance has been proposed as a potential novel antiviral medication candidate for the development of new natural antivirals against vulnerable viruses, particularly through the development of various curcumin derivatives.

Further research is necessary before employing curcumin or its derivatives as antiviral agents, though. Although curcumin showed fungicide effects against a variety of fungus, investigations on its antifungal properties found that it had the greatest impact on Candida species and Paracoccidioides brasiliensis. Despite the fact that curcumin has a variety of biological activities, no true clinical applications for this substance have been identified, and clinical trials are still being conducted for a variety of conditions and diseases, including psoriasis, multiple myeloma, Alzheimer's, colon and pancreatic cancers, and myelodysplastic syndromes.(47). Up to 2013, more than 65 clinical trials including curcumin have been completed, and more are currently being conducted. In several nations, including China, India,

Japan, Korea, South Africa, the United States, Thailand, and Turkey, this polyphenol component is currently consumed as a supplement.(48).

III. REFERENCES

[1] Sharma PV (2000) Namarupajnanam. (1stedn), SatyapriyaPrakashan, Varanasi, India 195-196.

[2] https://en.wikipedia.org/wiki/Turmeric

[3] Ravindran PN, Nirmal Babu K, Sivaraman K (2007) Turmeric. The golden spice of life. In: Turmeric. The Genus Curcuma. CRC Press, Boca Raton, FL, USA, p. 1-14.

[4] Pereira Kamat M (2008) A tradition wrapped in leaves", The Times of India, Goa, India, archived from the originals on 9 October

[5] 6 Edition of Trease and Evans Pharmacogno Suppressed sy Text Book (Pg. No. :- 292)

[6] Roshan Prasad Yadav and Gaur Tarun Versality of turmeric.A review the golden species of life. Journal of pharmacognosy and phytochemistry 2017; 6(1):41-46

[7] Ammon HP,Ammazodo MI ,Safahi H,Dhawan BN.srimalRC(1992) Curcumin:A potent inhibitor of leukotriene B4 formation in rat peritoneal polymorphonuclear neutrophils (PMNL) planta Med 58:226

[8] Ammon HP, Wahl MA (1991) pharmacology of curcuma longa ,planta Med 57:1-7

[9] Rodrigues, F. C.; Kumar, A. N. V.; Thakur, G. Developments in the Anticancer Activity of Structurally Modified Curcumin: An up-to-date Review. European Journal of Medicinal Chemistry. 2019, 177, 76–104. DOI:10.1016/j.ejmech.2019.04.058.

[10] Kukula-Koch, W.; Grabarska, A.; Łuszczki, J.; Czernicka, L.; Nowosadzka, E.; Gumbarewicz, E.; Jarząb, A.; Audo, G.; Upadhyay, S.; Głowniak, K., et al. Superior Anticancer Activity Is Demonstrated by Total Extract of Curcuma Longa L. as Opposed to Individual Curcuminoids Separated by Centrifugal Partition Chromatography. Phytother. Res. 2018, 32(5), 933–994. DOI:10.1002/ptr.6035.

[11] Naqvi, A.; Malasoni, R.; Gupta, S.; Srivastava, A.; Pandey, R. R., and Dwivedi, K. A. In Silico and in Vitro anticancer activity of isolated novel marker compound from chemically modified bioactive fraction from Curcuma longa (NCCL). Pharmacogn. Mag. 2017,13, (Suppl 3), S640–S644.
DOI: 10.4103/pm.pm_23_17.

[12] El-Bahr SM. Curcumin regulates gene expression of insulin like growth factor, B-cell CLL/lymphoma 2 and antioxidant enzymes in streptozotocin induced diabetic rats. BMC Complement Altern Med. 2013;13:368. [PMC

[13] Abdel Aziz MT, El-Asmar MF, El Nadi EG, Wassef MA, Ahmed HH, Rashed LA, et al. The effect of curcumin on insulin release in rat-isolated pancreatic islets Angiology. 2010;61:557–66

[14] Aldebasi YH, Aly SM, Rahmani AH. Therapeutic implications of curcumin in the prevention of diabetic retinopathy via modulation of anti-oxidant activity and genetic pathways. Int J Physiol Pathophysiol Pharmacol. 2013;5:194–202.

[15] Wang LL, Sun Y, Huang K, Zheng L. Curcumin, a potential therapeutic candidate for retinal diseases. Mol Nutr Food Res. 2013;57:1557–68.

[16] Moghadamtousi SZ, Kadir HA, Hassandarvish P, Tajik H, Abubakar S, Zandi K. A review on antibacterial, antiviral, and antifungal activity of curcumin. Biomed Res Int. 2014;2014:186864.

[17] Mun SH, Joung DK, Kim YS, Kang OH, Kim SB, Seo YS, et al. Synergistic antibacterial effect of curcumin against methicillin-resistant Staphylococcus aureus. Phytother Res. 2013;19:599–604.

[18] De R, Kundu P, Swarnakar S, Ramamurthy T, Chowdhury A, Nair GB, et al. Antimicrobial activity of curcumin against Helicobacter pylori isolates from India and during infections in mice. Antimicrob Agents Chemother. 2009;53:1592–7.

[19] Negi PS, Jayaprakasha GK, Jagan Mohan Rao L, Sakariah KK. Antibacterial activity of turmeric oil: A byproduct from curcumin manufacture. J Agric Food Chem. 1999;47:4297–300.

[20] Zandi K, Ramedani E, Mohammadi K, Tajbakhsh S, Deilami I, Rastian Z, et al. Evaluation of antiviral activities of curcumin derivatives against HSV-1 in Vero cell line. Nat Prod Commun. 2010;5:1935–8.

[21] Di Mario F, Cavallaro LG, Nouvenne A, Stefani N, Cavestro GM, Iori V, et al. A curcumin-based 1-week triple therapy for eradication of Helicobacter pylori infection: Something to learn from failure? Helicobacter. 2007;12:238–43.

[22] Rai D, Singh JK, Roy N, Panda D. Curcumin inhibits FtsZ assembly: An attractive mechanism for its antibacterial activity. Biochem J. 2008;410:147– 55.

[23] Lee CJ, Lee JH, Seok JH, Hur GM, Park YC, Seol IC, et al. Effects of baicalein, berberine, curcumin and hesperidin on mucin release from airway goblet cells. Planta Med. 2003;69:523–6.

[24] Shao W, Yu Z, Chiang Y, Yang Y, Chai T, Foltz W, et al. Curcumin prevents high fat diet induced insulin resistance and obesity via attenuating lipogenesis in liver and inflammatory pathway in adipocytes. PLoS One. 2012;7:e28784.

[25] Weisberg SP, Leibel R, Tortoriello DV. Dietary curcumin significantly improves obesity-associated inflammation and diabetes in mouse models of diabesity. Endocrinology. 2008;149:3549–58.

[26] Ejaz A, Wu D, Kwan P, Meydani M. Curcumin inhibits adipogenesis in 3T3-L1 adipocytes and angiogenesis and obesity in C57/BL mice. J Nutr. 2009;139:919–25

[27] Rahmani AH, Aldebasi YH. Potential role of carica papaya and their active constituents in the prevention and treatment of diseases. Int J Pharm Pharm Sci. 2015;8:11–5.

[28] Reddy RC, Vatsala PG, Keshamouni VG, Padmanaban G, Rangarajan PN. Curcumin for malaria therapy. Biochem Biophys Res Commun. 2005;326:472–4.

[29] Pérez-Arriaga L, Mendoza-Magaña ML, Cortés-Zárate R, Corona-Rivera A, Bobadilla-Morales L, Troyo-Sanromán R, et al. Cytotoxic effect of curcumin on Giardia lamblia trophozoites. Acta Trop. 2006;98:152

[30] Dony, M.; Wei-Li, H. Antiviral Potential of Curcumin. J. Funct. Foods. 2018, 40, 692–699. DOI: 10.1016/j.jff.2017.12.017.

[31] Babaei, F.; Nassiri-Asl, M.; Hosseinzadeh, H. Curcumin (A Constituent of Turmeric): New Treatment Option against COVID-19. Food Sci. Nutr. 2020, 8(10), 5215–5227. DOI: 10.1002/fsn3.1858.

[32] Sahoo, P. J.; Mohapatra, U.; Mishra, P. A.; Samal, C. K. Turmeric (Haldi) - A Strapping Strategy for Enhancing the Immune System to Reduce the Effect of SARS-CoV-2. Food Scient. Report. 2020, 1(8), 10. DOI:10.13140/RG.2.2.32524.03205.

[33] Emirik, M. Potential Therapeutic Effect of Turmeric Contents against SARS-CoV-2 Compared with Experimental COVID-19 Therapies: In Silico Study. J. Biomol. Struct. Dyn. 2020, 1–14. DOI:10.1080/07391102.2020.1835719.

[34] Shenge, A. J.; Obi, K. R.; Salawu, M. K. Assessment of Antiviral Activity of Curcuma Longa on Two RNA Viruses. Nig. J. Pure Appl. Sci. 2021, 34(1), 3915–3928.

[35] S. Upendra, P. Khandelwal, and A. H. M. Reddy, "Turmeric powder (Curcuma longa Linn.) as an antifungal agent in plant tissue culture studies," International Journal of Engineering Science, vol. 3, no. 11, pp. 7899–7904, 2011.

[36] S. Ungphaiboon, T. Supavita, P. Singchangchai, S. Sungkarak, P. Rattanasuwan, and A. Itharat, "Study on antioxidant and antimicrobial activities of turmeric clear liquid soap for wound treatment of HIV patients," Songklanakarin Journal of Science and Technology, vol. 27, no. 2, pp. 269– 578, 2005.

[37] M.-K. Kim, G.-J. Choi, and H.-S. Lee, "Fungicidal property of Curcuma longa L. rhizome-derived curcumin against phytopathogenic fungi in a greenhouse," Journal of Agricultural and Food Chemistry, vol. 51, no. 6, pp. 1578–1581, 2003.

[38] H. Chowdhury, T. Banerjee, and S. Walia, "In vitro screening of Curcuma longa L and its derivatives sa antifungal agents against Helminthosporrum oryzae and Fusarium solani," Pesticide Research Journal, vol. 20, no. 1, pp. 6–9, 2008.

[39] R. Wise, T. Hart, O. Cars et al., "Antimicrobial resistance. Is a major threat to public health," British Medical Journal, vol. 317, no. 7159, pp. 609–610, 1998.

[40] S. Ungphaiboon, T. Supavita, P. Singchangchai, S. Sungkarak, P. Rattanasuwan, and A. Itharat, "Study on antioxidant and antimicrobial activities of turmeric clear liquid soap for wound treatment of HIV patients," Songklanakarin Journal of Science and Technology, vol. 27, no. 2, pp. 269– 578, 2005.

[41] O.-A. Lawhavinit, N. Kongkathip, and B. Kongkathip, "Antimicrobial activity of curcuminoids from Curcuma longa L. on pathogenic bacteria of shrimp and chicken," Kasetsart Journal—Natural Science, vol. 44, no. 3, pp. 364–371, 2010.

[42] I. M. Hosny, W. I. El Kholy, H. A. Murad, and R. K. El Dairouty, "Antimicrobial activity of Curcumin upon pathogenic microorganisms during manufacture and storage of a novel style cheese 'Karishcum'," Journal of American Science, vol. 7, pp. 611–618, 2011.

[43] P. S. Negi, G. K. Jayaprakasha, L. J. M. Rao, and K. K. Sakariah, "Antibacterial activity of turmeric oil: a byproduct from curcumin manufacture," Journal of Agricultural and Food Chemistry, vol. 47, no. 10, pp. 4297–4300, 1999.

[44] S. H. Mun, D. K. Joung, Y. S. Kim et al., "Synergistic antibacterial effect of curcumin against methicillin-resistant Staphylococcus aureus," Phytotherapy Research, vol. 19, no. 7, pp. 599–604, 2013.

[45] S. Tajbakhsh, K. Mohammadi, I. Deilami et al., "Antibacterial activity of indium curcumin and indium diacetylcurcumin," African Journal of Biotechnology, vol. 7, no. 21, pp. 3832–3835, 2008.

[46] S. Kaur, N. H. Modi, D. Panda, and N. Roy, "Probing the binding site of curcumin in Escherichia coli and Bacillus subtilis FtsZ—a structural insight to unveil antibacterial activity of curcumin," European Journal of Medicinal Chemistry, vol. 45, no. 9, pp. 4209–4214, 2010.

[47] H. Hatcher, R. Planalp, J. Cho, F. M. Torti, and S. V. Torti, "Curcumin: from ancient medicine to current clinical trials," Cellular and Molecular Life Sciences, vol. 65, no. 11, pp. 1631–1652, 2008

[48] S. C. Gupta, G. Kismali, and B. B. Aggarwal, "Curcumin, a component of turmeric: from farm to pharmacy," Biofactors, vol. 39, no. 1, pp. 2–13, 2013.