JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A Review on Anti- Cancer Activities of derivatives of Curcumin and Eugenol

R.V. Saoji and P.S. Pande
Saoji6194@gmail.com
Department of Chemistry
Shankarlal Khandelwal Arts, Science and Commerce College, Akola (Maharashtra), India

Abstract:
Active ingredients or active plants phytochemicals are chemicals that are obtained from the medicinal plants. Active ingredients are reported to be used as preliminary sources for drug discovery. Medicinal plants possess a variety of therapeutic and biological activities due to presences of active ingredients. Turmeric and Clove are significant medicinal plants. Turmeric (Curcuma *longa*) Contains Curcumin and Clove (*Syzygium aromaticum*) possess Eugenol as one of the significant active ingredients. Synthetic derivatives of Curcumin and Eugenol may be more therapeutic because of their diverse functional groups and structural complexities. This paper provides a comprehensive overview of the pivotal role of Synthetic derivatives of Curcumin and Eugenol as anticancer drugs.

Keywords
Active ingredients, (Curcuma *longa*), (*Syzygium aromaticum*) Curcumin, Eugenol, Synthetic derivatives, anticancer drugs

Introduction:

In India natural medicines[1] were prepared in the lives of people in the course of preventation and protection from various types of diseases from ancient times. Many diseases are treated with various parts of the medicinal plants. In India maximum societies have been reported to use natural medicines for the healing of diseases. Active ingredient or active plant phytochemicals are chemicals that are obtained from the medicinal plants. Natural, biologically active ingredients are used as preliminary sources for new drug discovery. The government also approves plant based medicines synthesized from active ingredients.

The phytochemical analysis is a scientific technique that reveals the ingredients in plants. Some plants have medicinally active ingredients and are known as medicinal plants. Medicinal plants have number of therapeutic and biological activities.

Isolated active principles have been used to synthesize the various derivatives by using different reactants and reaction conditions. Synthesized derivatives are more therapeutic because of their diverse functional groups and structural complexities.

Synthesized derivatives show different biological actions such antioxidant activity, anti microbial anti-inflammatory activity, anti-fungal activity and anti-cancer activity.

Cancer is abnormal cell division in body produced due to the damage in DNA of cell. This leads to a formation of mutant cell. The cell division and growth of such mutant cell results into formation of malignant or benign tumors. There are different carcinogens responsible for causes of cancers in human beings. The cancer increase rate of mortality worldwide. Cancer reduces the average human life span. Nowadays the cancer is becoming one of the deadliest diseases.

There are 36 different types of cancers viz cervix cancer, oral cancers, colorectal cancer , liver cancer, stomach cancer, lungs cancer, prostate cancer, blood cancer, Thyroid cancer breast cancer. Amongst these Cancers, colorectal cancer, prostate cancer and liver cancer cancers are mainly occurs in men while breast cancer, cervical cancer and thyroid cancer found in women.

In recent days there are different conventional techniques used for cancers treatments such as Radiation therapy chemotherapy or surgery. However all these technique have drawbacks because of medications toxicities and its side-effects. The present cancer therapies are costly and show enormous side effects on patients' health. The main objective of this study is to give an overview on the potential anti-cancer activities of Curcumin and Eugenol.

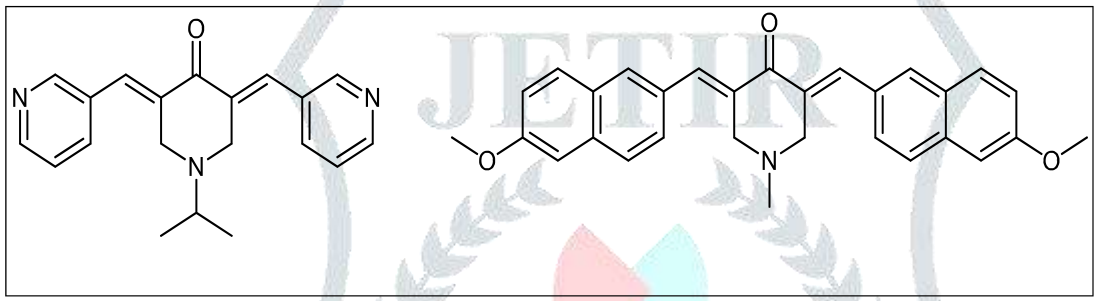
Curcumin

Among medicinal plant Curcumin is significant active ingredient isolated from rhizomes of *Curcuma longa L.* Curcumin[2-5] also known as diferuloyl methane, is a symmetric molecule. Its IUPAC name is (1E, 6E) 1,7- bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione, with the chemical formula $C_{21}H_{20}O_6$, and the molecular weight of 368.38 g/mol

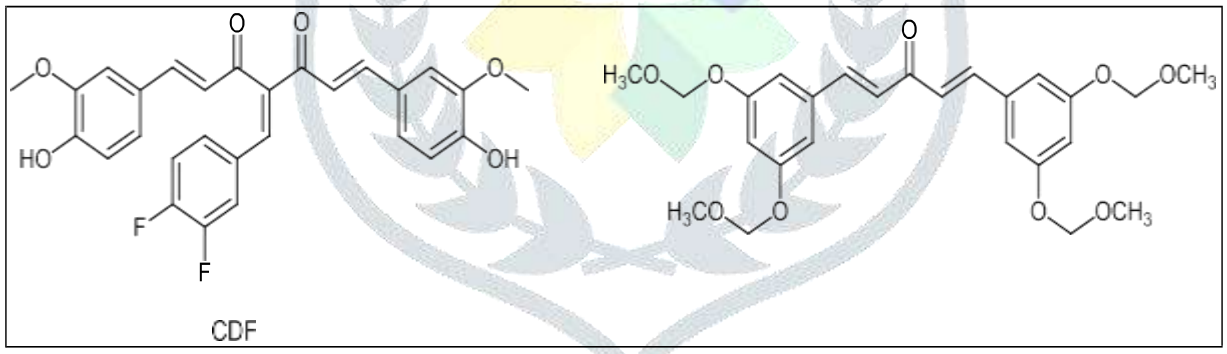
Several anti-cancer agents are from Curcumin and Eugenol have been synthesized. The researcher investigated the number of the different biological activities of synthetic derivatives prepared from active plant ingredients. These derivatives show diverse and prominent biological activities[06, 07].

These derivatives have shown prominent anti-cancer activities[08, 09, 10]. These derivatives are known as potent anti-cancer agents. The anti-cancer agent's demands are increasing day by day because different types of cancers are induced in people. People wanted to use safer and non-toxic anti-cancer medication across the globe.

The number of derivatives of Curcumin[11, 12,13,] have been reported to be safe, non-toxic, and effective against different diseases. Literature study also reveals that the number of derivatives of Curcumin have been reported as therapeutic agent used as Literature study reveals that the number of derivatives of Curcumin has the potential to inhibit the cancer mutagens, in the organisms. Literature study also reveals that the no of derivatives of Curcumin was reported as the anti-cancer agents of different type of cancers,[14, 15]



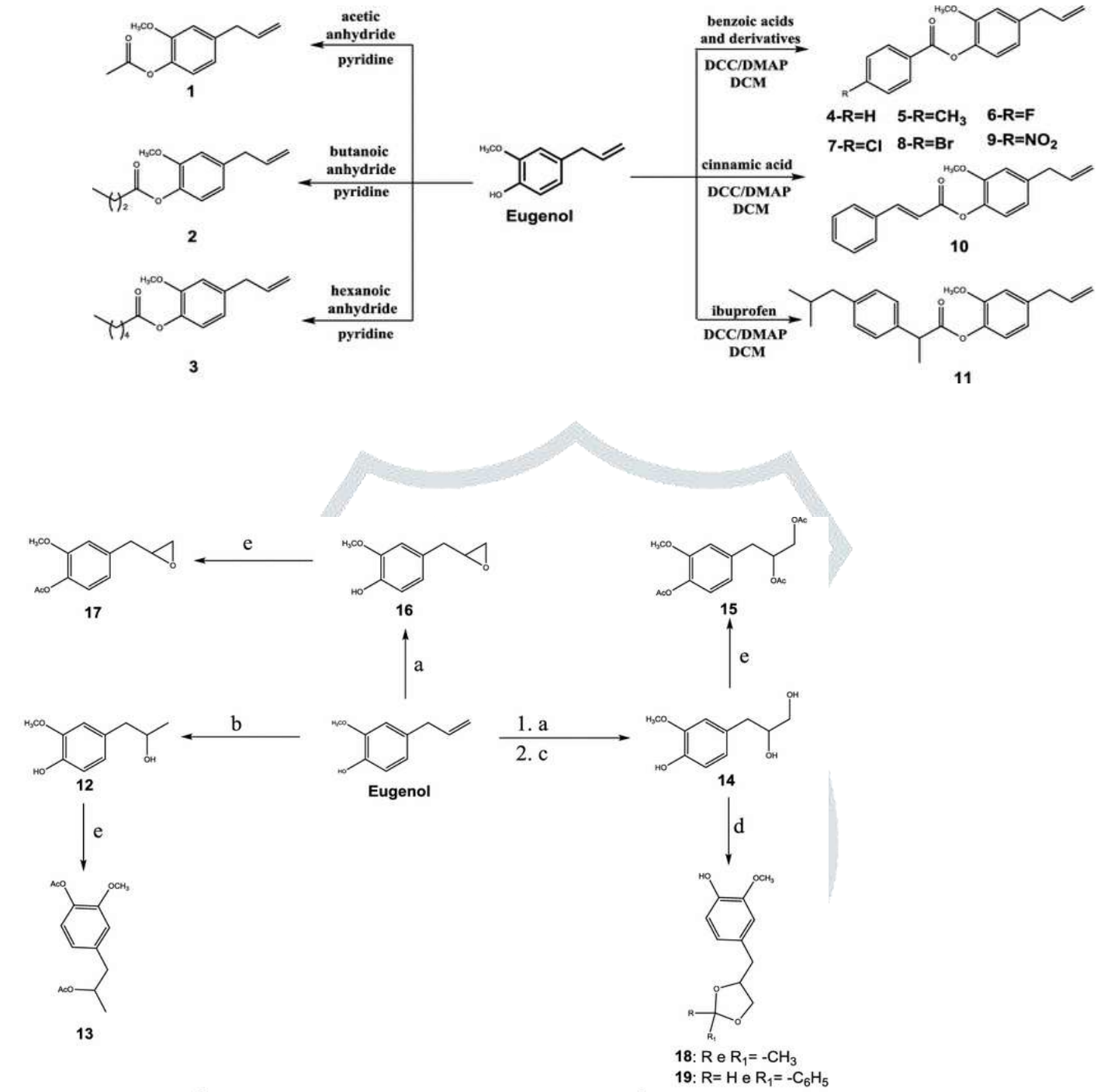
Derivatives of Curcumin was reported as the anti-cancer agents



Derivatives of Curcumin was reported as the anti-cancer agents

Eugenol

Eugenol is significant active ingredient isolated from Syzygium aromaticum. Eugenol is volatile oil isolated from clove.The number of derivatives of Eugenol[16, 17, 18] was the potential to inhibit the cancer mutagens in the organisms. Literature survey also reveals that several attempts have been made to develop potential anti-cancer agents, but many natural products have been found to possess anti-cancer activities and are yet to be explored, thereby exploring certain medicinal plants. Derivatives of Eugenol[19, 20, 21] was reported as the anti-cancer agents



a. m-CPBA/CH_2Cl_2, 24h; **b**. 1-$HgSO_4$/THF/H_2O and 2- $NaBH_4$; **c**. NaOH (aq), Heating; **d**. acetone or banzaldehyde, $AlCl_3$; **e**. Pyridine, $(Ac)_2O$

CONCLUSION

Derivatives of Curcumin and Eugenol possess significant pharmacological activities. Overall, this review concluded that Derivatives of Curcumin and Eugenolcan be vital and prominent anti-cancer agents.

REFERENCES

1. Damalas, C. A. **(2011)**. Potential uses of turmeric ('Curcuma longa') products as alternative means of pest management in crop production. Plant. Omi, 4, 136–141.
2. Nawaz, A., Khan, G. M., Hussain, A., Ahmad, A. A., & Khan, A. **(2011)**. Curcumin: A natural product of biological importance. Gomal University Journal of Research, 27, 7–14.
3. Sharma, R. A., Gescher, A. J., & Steward, W. P. **(2005)**. Curcumin: The story so far. *European Journal of Cancer*, 41(13), 1955–1968.
4. Kocaadam, B., Şanlier, N., Şanlier, N., N. S¸ anlier. **(2017)**. Curcumin, an active component of turmeric (Curcuma longa), and its effects on health. *Critical Reviews in Food Science and Nutrition*, 57(13), 2889–2895.

5. Sandur, S. K., Pandey, M. K., Sung, B., Ahn, K. S., Murakami, A., Sethi, G., Aggarwal, B. B. **(2007)**. Curcumin, demethoxycurcumin, bisdemethoxycurcumin, tetrahydrocurcumin and turmerones differentially regulate anti-inflammatory and anti-proliferative responses through a ROSindependent mechanism. *Carcinogenesis*, 28(8), 1765–1773.
6. G., & Shin, D. M. **(2013)**. New perspectives of curcumin in cancer prevention. *Cancer Prevention Research*, 6(5), 387–400.
7. Kanai, M., Imaizumi, A., Otsuka, Y., Sasaki, H., Hashiguchi, M., Tsujiko, K., Chiba, T. **(2012)**. Dose-escalation and pharmacokinetic study of nanoparticle curcumin, a potential anticancer agent with improved bioavailability, in healthy human volunteers. *Cancer Chemotherapy and Pharmacology*, 69(1), 65–70.
8. Mahal, A., Wu, P., Jiang, Z. H., & Wei, X. **(2017)**. Synthesis and cytotoxic activity of novel tetrahydrocurcumin derivatives bearing pyrazole moiety. *Natural Products and Bioprospecting*, 7(6), 461–469
9. Tripathi, A., & Misra, K. **(2016)**. Designing and development of novel curcumin analogues/congeners as inhibitors of breast cancer stem cells growth. *Chemical Engineering Transactions*, 49, 79–84.
10. Vallianou, N. G., Evangelopoulos, A., Schizas, N., & Kazazis, C. **(2015)**. Potential anticancer properties and mechanisms of action of curcumin. Anticancer Research, 35(2), 645–651.
11. Beevers, C. S., & Huang, S. **(2011)**. Pharmacological and clinical properties of curcumin. Botanics: *Targets and Therapy*, 1, 5–18.
12. Hackler, L., Jr., Ózsvári, B., Gyuris, M., Sipos, P., Fábián, G., Molnár, E., . Puskás, L. G. **(2016)**. The curcumin analog C-150, influencing NF-κB, UPR and Akt/Notch pathways has potent anticancer activity in vitro and in vivo. *PLOS ONE*, 11(3), e0149832.
13. Zhang, J., Feng, Z., Wang, C., Zhou, H., Liu, W., Kanchana, K., Liang, G. **(2017)**. Curcumin derivative WZ35 efficiently suppresses colon cancer progression through inducing ROS production and ER stress-dependent apoptosis. *American Journal of Cancer Research*, 7(2), 275–288.
14. Liu, Y., Zhou, J., Hu, Y., Wang, J., & Yuan, C. **(2017)**. Curcumin inhibits growth of human breast cancer cells through demethylation of DLC1 promoter. *Molecular and Cellular Biochemistry*, 425(1–2), 47–58.
15. Pröhl, M., Schubert, U. S., Weigand, W., & Gottschaldt, M. **(2016)**. Metal complexes of curcumin and curcumin derivatives for molecular imaging and anticancer therapy. *Coordination Chemistry Reviews*, 307, 32–41.
16. das Chagas Pereira de Andrade, F. D. C. P., & Mendes, A. N. **(2020)**. Computational analysis of eugenol inhibitory activity in lipoxygenase and cyclooxygenase pathways. Scientific Reports, 10(1), 16204.
17. Guénette, S. A., Ross, A., Marier, J. F., Beaudry, F., & Vachon, P. **(2007)**. Pharmacokinetics of eugenol and its effects on thermal hypersensitivity in rats. *European Journal of Pharmacology*, 562(1–2), 60–67.
18. Fathy, M., Fawzy, M. A., Hintzsche, H., Nikaido, T., Dandekar, T., & Othman, E. M. **(2019)**. Eugenol exerts apoptotic effect and modulates the sensitivity of HeLa cells to cisplatin and radiation. *Molecules*, 24(21), 3979.
19. Nagababu, E., & Lakshmaiah, N. **(1994)**. Inhibition of microsomal lipid peroxidation and monooxygenase activities by eugenol. *Free Radical Research*, 20(4), 253–2
20. Taira, J., Ikemoto, T., Yoneya, T., Hagi, A., Murakami, A., & Makino, K. **(1998)**. Essential oil phenyl propanoids, *Free Radical Research* 16, 197–204.
21. Jung, B. O., Chung, S. J., & Lee, S. B. **(2006)**. Preparation and characterization of eugenol-grafted chitosan hydrogels and their anti cancer activities. *Journal of Applied Polymer Science*, 99(6), 3500–3506.