Extraction of Curcumin from rhizomes of *Curcuma longa* by hexane method

Deeksha Kumari[1*] and Aksh Sharma[2]

[*1]M.Phil Scholar,Sant Baba Bhag Singh University, Khiala, Jalandhar, email: deekshakumari.25496@gmail.com

[21]Assistant Professor, Sant Baba Bhag Singh University, Khiala, Jalandhar

Abstract:*Curcuma longa* is a rhizomatous plant recognized worldwide due to its medicinal and therapeutic properties. Turmeric is commonly known as "Indian Saffron" and "Yellow Gold", which consider yellow color due to its bioactive compound "Curcumin". The extraction of Curcumin from fresh rhizomes of *Curcuma* was done by hexane extract method. The extracted Curcumin was then identified by thin layer chromatography and pure crystals of Curcumin were extracted by Recrystallization method. The resultant extract showed 3.28 g of Curcumin from the Hexane extract. It was observed that R_f value of 0.71 was obtained for Curcumin.

Introduction:*Curcuma longa* (Turmeric) is a rhizomatous herbaceous; perennial plant of ginger family (*Zingiberaceae*) found in India (Thung BT, *et al*2019)[1], China (Kocaadam. B *et al,*2017)[2]and various other countries. Over 130 species of turmeric have been recognized worldwide due to its medicinal benefits (Meng FC *et al*, 2018)[3]. Turmeric, commonly known as "Haldi" is cultivated in drained sandy and humus rich clayey loam soil in temperature ranging from 20^{o}C to 30^{o}C with harvesting time of 7-9 months(Sanatombi K, 2018)[4]. *Curcuma* is a shade loving plant about 1 meter in height with long oblong leaves. It can only propagate through its underground rhizome, which is tuberous finger like structure 2 to 8cm long and 1 to 2cm wide with a rough segmented skin, it cannot produce seeds. The yellowish brown or yellow-orange rhizome in its dried form with dull interior can be converted into yellowish powder. Turmeric is one of the most ancient spices which has been used as a traditional remedy since ages and considered as "Indian Saffron" or "Yellow Gold". The numerous medicinal applications of this spice have attracted the medical and scientific world (Prasad *et al*, 2011)[5].

More than 100 bioactive components have been isolated from *Curcuma longa*; having biological activities, medicinal properties as well as antimicrobial properties (both nutritive and non-nutritive)(Niranjan. A, 2008)[6]. Indium Curcumin (In(CUR)3) and Curcuminoid are the chief biological component of *Curcuma longa* having antimicrobial activity; which is a mixture of Curcumin(CUR), demethoxycurcumin(DMC) and bisdemethoxycurcumin(BDMC). Curcuminoids; lipophilic and insoluble in water are major polyphenolic compound of rhizome of Curcuma longa (A. Amalraj *et.al*, 2017)[7].

Curcumin, a yellow phenolic bioactive pigment is the major chemical constituents of *Curcuma longa*.Curcumin has been known to be safe and offers multiple benefits for humans as well as animals (Hewlings. S.J, 2017)[8]. The products of turmeric or Curcumin have been marked safe by Food and drug Administration (Witkin. *et.al*, 2013)[9], and extensively utilized as food color, flavoring agent, dietary supplement etc. Besides Curcumin is a key ingredient of anti-aging pills, cosmetic creams.

It has been recognized as anti-inflammatory agent, blood purifier, wound healer, immunity booster.It acts as a potent immunomodulatory agent for the activation of immune cells such as T cells, B cells, macrophages, neutrophils, natural killer cells and dendritic cells. It is found effective against arthritis, allergy, asthma, diabetes, cancer in low doses. Besides, Curcumin can reduce the expression of various proinflammatory cytokines like TNF, IL-1, IL-2, IL-6, IL-8, and IL-12 (Tomeh, *et.al*, 2019)[10].Due to its immune-balancing properties, it is employed for reduction of chronic stress. (Wang. *et.al*, 2019)[11].

Material and methods:

Sample preparation: Thesamples were collected from mostly Himalayan range of Village Radh; District Kangra of Himachal Pradesh. The collection was carried out in the months of August and September. In order to obtain Turmeric powder, the collected rhizomes were washed, peeled, cut into thin slices, crushed the dried slices of turmeric into powdered form.

Hexane Extract Preparation:5 g of turmeric powder and 15 ml of hexane was added in each test tube. The experiment was carried in triplicate.The constituents were shaken for 2 minutes with interval of 10 minutes for 1 hour.The test tubes were left undisturbed for 3 days.After 3 days, the topmost layer from each test tube was taken with the help of dropper and dried in sunlight.The extract was collected, weighed.The weighed extract was dissolved in hexane and stored in air tight container till further analysis.

Identification of Curcumin Compound from extract by TLC: In order to identify and confirm the presence of Curcumin in the crude extract obtained by hexane extraction method, thin layer chromatography was performed. For TLC analysis Silica gel was used as Stationary phase and the mixture of Chloroform: Methanol: Acetic acid in the volume of 9.5: 0.5: 0.1 used as mobile phase. The R_f value of Curcumin was observed.

Isolation of Pure Curcumin by Recrystallization: 1 g extract powder was taken and dissolved in 10 ml mixture of hot Isopropyl alcohol: hexane (1:1.5) Crystals were seen after cooling the solution.The crystals were collected and dried on filter paper and weighed.

Result and Discussion: The extraction of Curcumin from turmeric via hexane solvent method was investigated. During this extraction method, from 15 g of turmeric powder, 3.28 g crude extract was obtained.The dried sample when run on TLC detected the presence of Curcumin with theR_f value of 0.71. Likewise, Joshi *et al*, 2021[12] observed $R_f$value at0.59, 0.61, and 0.58 as Curcumin, demethoxycurcumin, bisdemethoxycurcumin respectively. From 1 g of extract 0.54 g pure crystals of Curcumin was obtained by Recrystallization.

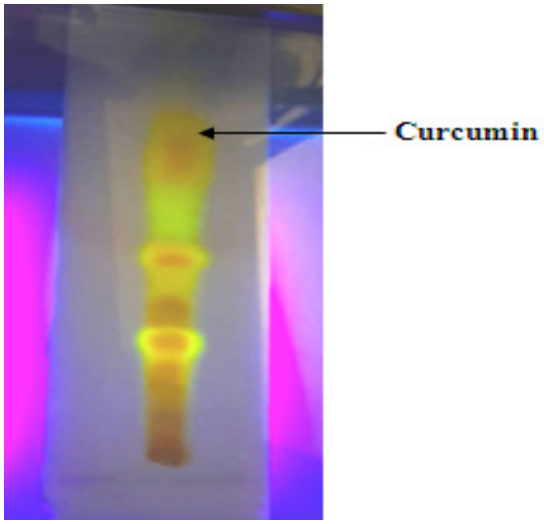

Fig 1: Depicting theCurcumin compound on TLC plate

Conclusion: For the extraction of Curcumin, hexane acts as an efficient solvent giving good yield of Curcumin.

References:

1. Thung.B.T, et.al 2019. Curcuma longa, the Polyphenolic Curcumin compound and Pharmacological effect on liver. Foods, Nutrition and dietary supplements. Doi: 10.1016/B978-0-12-814466-4.00010.
2. Kocaadam. B. et.al, 2017. Curcumin, an active component of turmeric (Curcuma longa), and its effects on health. Crit Rev Food SciNutr. Doi: 10.1080/ 1077195.
3. Meng.F.C, Yan.Q et.al. 2018. A Review of Its Chemical Composition, Quality Control, Bioactivity, and Pharmaceutical Application. Natural and Artificial Flavoring Agents and Food Dyes.DOI: 10.1016/B978-0-12-811518-3.00010-7.
4. Sanatombi. .K. et.al, 2018. Nutritional value, phytochemicals compositions, and biological activities of edible Curcuma species; A review. International Journal of food properties. Doi: 10.1080/10942912.2017. 1387556.

5. Prasad.S, Aggarwal.B.B et.al. 2011. Turmeric, the Golden Spice: From Traditional Medicine to Modern Medicine. Herbal Medicine: Biomolecular and Clinical Aspects.
6. Niranjan.A, Prakash.D. 2008. Chemical constituents and biological activities of turmeric. J Food SciTechnol, 45(2), 109–116.
7. A.Amalraj, Pius.A. 2017. Biological activities of curcuminoids, other biomolecules from turmeric and their derivatives – A review. Journal of Traditional and Complementary Medicine.doi.org/10.1016/
8. Hewlings.S.J, Kalman.S.D.2017. Curcumin: A Review of Its Effects on Human Health. Foods, 6, 92; doi: 10.3390.
9. Witkin, Jeffery. M, Li. Xia. 2013. Curcumin, an Active Constituent of the Ancient Medicinal Herb Curcuma longa L.: Some Uses and the Establishment and Biological Basis of Medical Efficacy. CNS NeurolDisord Drug Targets. doi: 10.2174/1871527311312040007.
10. Tomeh. A, Hadianamrei. R, Zhao. X. et.al. 2019. A Review of Curcumin and Its Derivatives as Anticancer Agents. International Journal of Molecular Sciences. Doi: 10.3390/ijms20051033.
11. Wang. Y, Bu. C, Wu. K, et.al. 2019. Curcumin protects the pancreas from acute pancreatitis via the mitogen activated protein kinase signaling pathway. Molecular Medicine Reports. doi.org/10.3892/mmr.10547.
12. Joshi N D, Kulkarni A A and Cherekar M N. 2021.Extraction and Purification of Curcumin from Turmeric. *Asian Journal of Plant Science and Research*, 11 (8):256-259.