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Spectrophotometric Analysis of Five C*urcuma* Samples

Dr. T.V. Suresh Kumar[1]
Associate Professor, Dept. of Food Technology, Sri Shakthi Institute of Engineering and Technology, Coimbatore - 62. Tamil Nadu, India.
tvsmicrobe@gmail.com

Dr. Munga Sulochana[2]
Lecturer in Chemistry, S.Y.T.R Government Degree College, Madakasira, S.K.University (Affiliation), Sri Sathya Sai District, Andhrapradesh -515301.
mungasulochana@gmail.com

Dr. Madala Subramanyam[3]
Asst.prof.of Chemistry, Research centre ,Dept.of Chemistry, SR & BGNR Govt.Arts & Science College (Autonomous) Khammam, Khammam-District. Telangana-507002,India, madalachem28@gmail..com

Dr Arti Gupta[4]
Prof Of Chemistry, Affiliation Jiwaji University, Gwalior
artiguptachemistry@gmail.com

ABSTRACT

Five samples of curcuma like *Curcuma longa, Curcuma amada, Curcuma angustifolia, Curcuma casiea* and *Curcuma aromatica* were analyzed using spectrophotometric detection, which was done at 420 nm. Curcumin was extracted from the five samples quantitatively through boiling the substance in acetone. The amount of curcumin was then measured using a spectrophotometer within range from 200 to 700nm range. Curcumin has a potent, broad peak of absorption at about 425nm. At 420 nm, the absorption spectrum of different concentrations of extracts was measured. The amount of curcumin in each species is said to be different. The results showed that the technique can be used easily to examine the purity of curcumin in bulk and in preparations on a regular basis.

Keywords: *Curcuma species*, UV-Visible Spectrophotometric, Curcumin

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INTRODUCTION

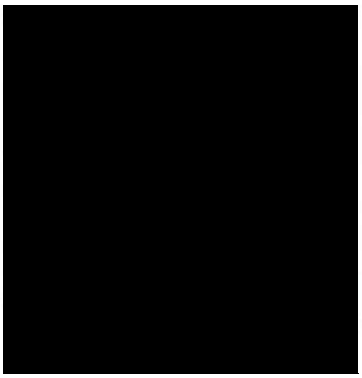
In the post-genomics era, the World Health Organization (WHO) says that about 80% of the total global population utilises herbs and other folk medicine for one's main needs for health care (1). A huge rise in the consumption of herbal remedies is making the demand for polyherbal compositions grow quickly around the globe (2,3). *Curcuma longa* is a perennial herbaceous plant in the *Zingiberaceae* family. Its active ingredient is named as curcumin (4). Curcuminoids are mostly to bear responsibility for the yellow colour of turmeric (5). Curcumin (turmeric samples) that can be purchased usually has a combination of 3 curcuminoids, with 77% pure curcumin, 17% demethoxycurcumin, and 3% bisdemethoxycurcumin (6). It has been suggested that distinctive *Curcuma species* have various proportions of each of the following curcuminoids (7). It is hydrophobic and dissolves easily in dimethylsulfoxide, acetone, ethanol and oils, among other things. It can absorb light up to 420 nm at most (7, 8). Literature review showed that different ways of analysing them, such as HPLC, HPTLC, and UV-Visible, have been made. Nevertheless, in both plasma and urine (9, 10 and 11). This study was focused on the spectrometric analysis of five different *Curcuma* samples.

Materials and Methods

Collection of samples

Fresh rhizomes of the *Curcuma* varieties like *Curcuma longa*, *Curcuma amada*, *Curcuma angustifolia*, *Curcuma casiea* and *Curcuma aromatica* (Fig.1) were collected from Peermade in the Idukki district. After the species has been collected, it is cleaned, rinsed with deionized water, peeled off, sliced and left to dry for a week in the sun shade. Then, dried rhizomes were cut into small pieces and crushed into powder form.

Curcuma longa (Common turmeric)



Curcuma aromatica (Kasthuri manjal)

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Curcuma amada (Mango ginger)

Curcuma caesia (Neela koova)

Curcuma angustifolia (Koovakkizhangu)

Fig 1. Five different varieties of *Curcuma species*

Sample extraction

For three days, with periodical shaking, mix 50g of the coarse powder from dried rhizomes of *C. longa*, *C. aromatica*, *C. amada*, *C. caesia* and *C. angustifolia* with 100ml of solvents such acetone, butanol and petroleum ether. The solvents from the complete extract was filtered, and the remaining solvent was then allowed to evaporate before being concentrated. The extracts have been kept chilled in sealed conical flasks until use (Plate.2). Then, using a spectrophotometer, extracts were analyzed for the quantitative measurement of curcuminoids.

Fig 2. Powder and solvent extraction of *Curcuma species*

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Spectrophotometric analysis of curcumin

Spectrophotometer measurements at 420 nm were made to determine the absorbances of the five *Curcuma* samples. The amount of curcumin produced using this methodology was calculated and represented as a percentage against the blank solvents.

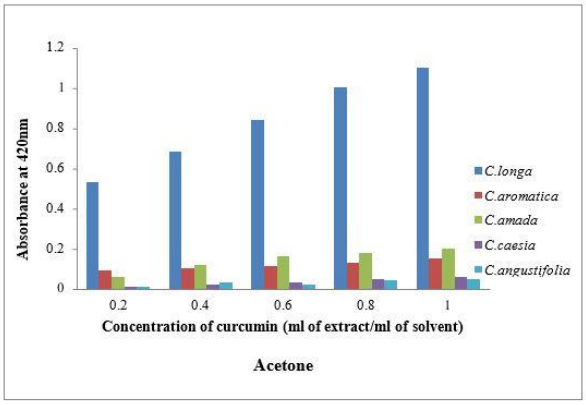
UV-Visible spectra of curcuminoids

By refluxing the five samples in acetone, curcumin was extracted in a quantitative manner. It was then measured spectrophotometrically using a spectrophotometer in the 200–700 nm wavelength range. At around 425 nm, curcumin displays a prominent, wide absorption peak. As a result, the spectrophotometric estimation of curcumin concentration for all turmeric extracts was within the range of around 425 nm.

Result

The absorbance of extracts at various concentrations was measured at 420 nm since all three curcuminoids had a maximum at this wavelength. The curcumin concentration of *C. longa, C. aromatica, C. amada, C. caesia* and *C. angustifolia* is shown in graphs 1–3 of the five *Curcuma species*. Curcumin content has been observed to differ among species (Graph 4 to 13). The solubility of curcumin in the sample in each of the solvents varies significantly as well.

Solubility of Curcumin



Graph 1. Different concentration of Curcumin in Acetone

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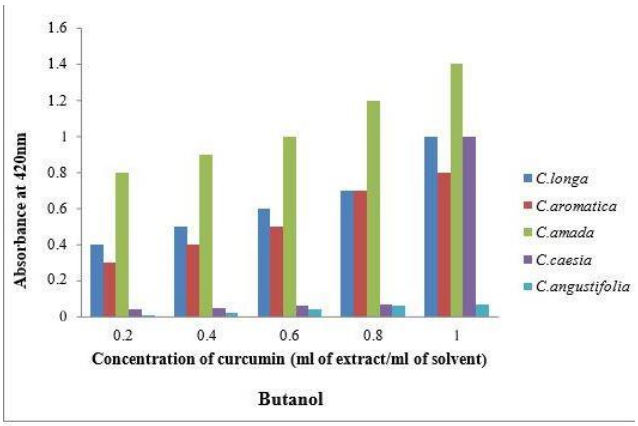
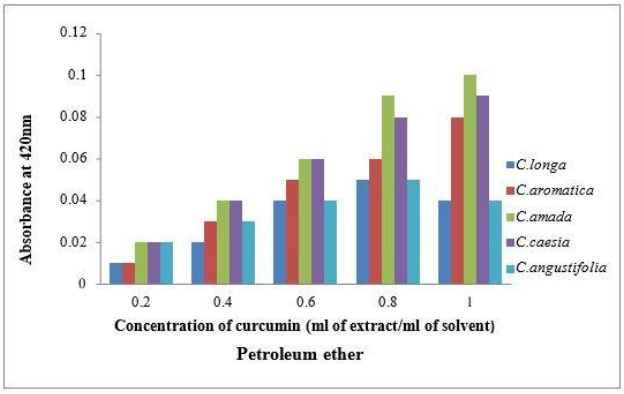
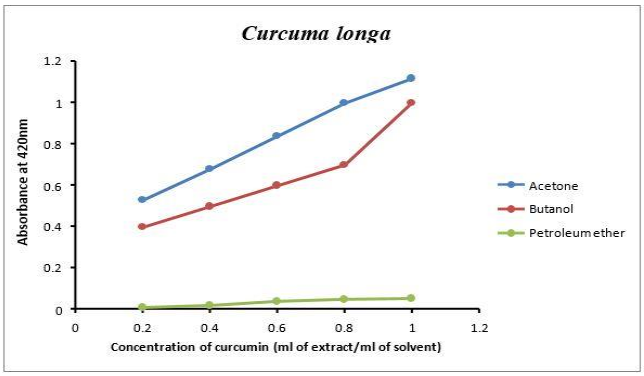


Graph 2. Different concentration of Curcumin in Butanol



Graph 3. Different concentration of Curcumin in Petroleum ether



Graph 4: Calibration curve of *C.longa* in three solvents

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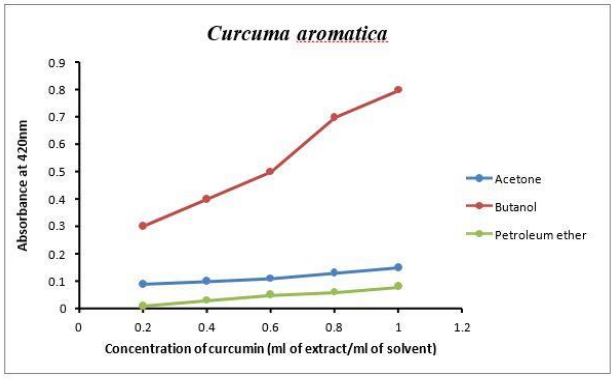
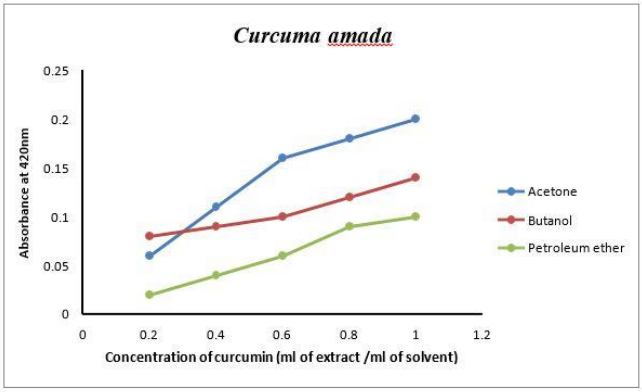
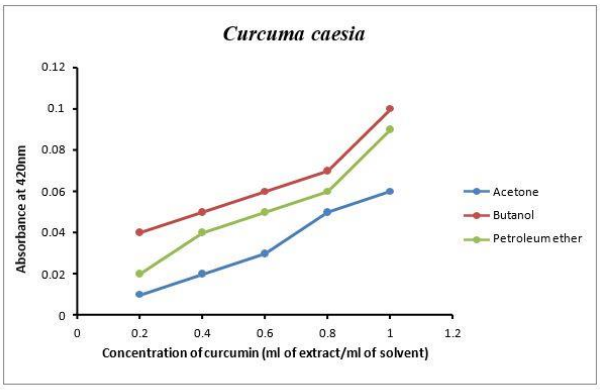


Graph 5: Calibration curve of *C.aromatica* in three solvents



Graph 6: Calibration curve of *C.amada* in three solvents



Graph 7: Calibration curve of *C.caesia* in three solvents

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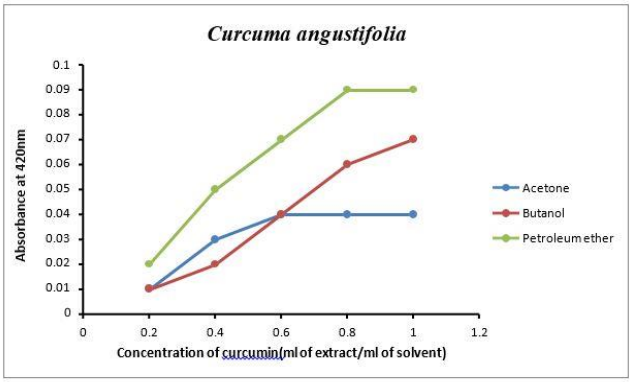
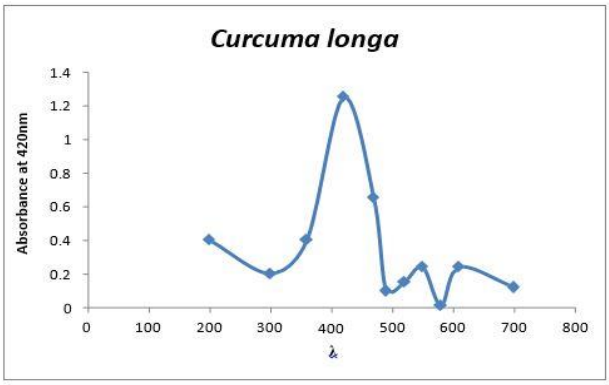
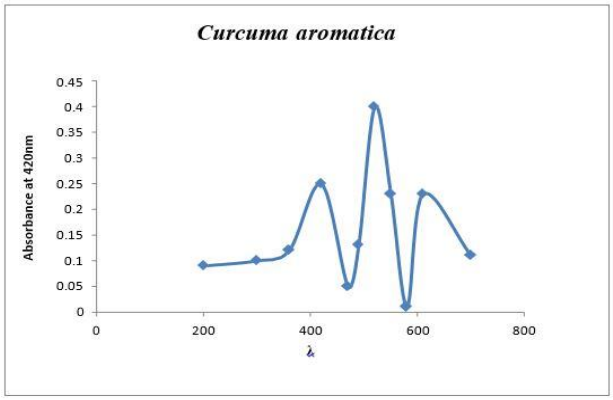


Graph 8: Calibration curve of *C.angustifolia* in three solvents



Graph 9. Showed UV visible spectra of Curcumin in *Curcuma longa*



Graph 10. Showed UV visible spectra of Curcumin in *Curcuma aromatica*

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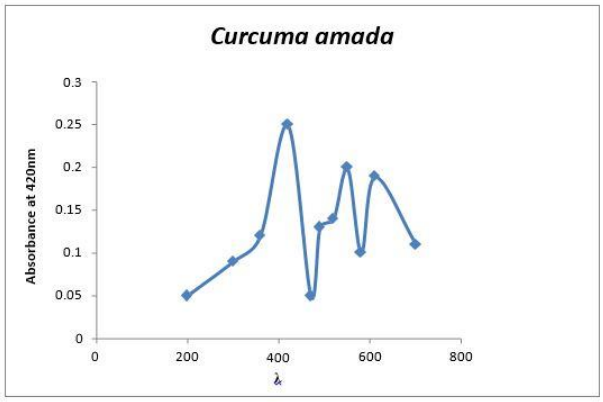
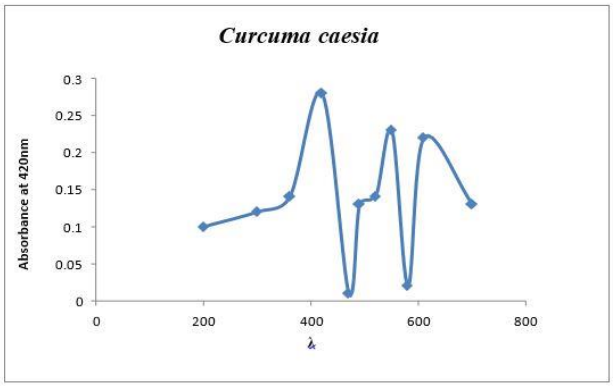
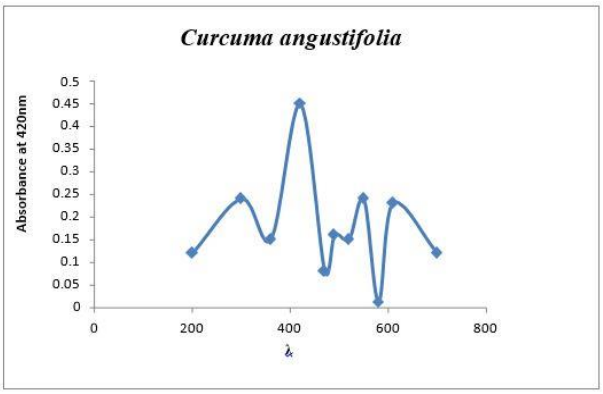


Graph 11. Showed UV visible spectra of Curcumin in *Curcuma amada*



Graph 12. Showed UV visible spectra of Curcumin in *Curcuma caesia*



Graph 13. Showed UV visible spectra of Curcumin in *Curcuma angustifolia*

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Discussion

The extracts from the turmeric samples *(C.longa, C.aromatica, C.amada, C.caesia* and *C.angustifolia*) were made using petroleum ether, acetone, and butanol as the solvents. According to the reports, acetone is often as a preferred solvent for extracting a variety of curcuminoids from *C. longa* rhizome (12).

On the spectrophotometer, extract absorbances were checked, and the amount of curcumin was determined. The findings from five different species of curcuma indicated that *C. longa* had the greatest curcumin level in acetone. It is noteworthy that the acetone extract had the highest amount of curcumin of all the solvents (13).

Conclusion

The analytical approach created using a UV-Visible Spectrophotometer was simple, efficient, precise, and repeatable. The technique does away with the extraction phases, which cuts down on analytical time, expense, and extraction mistakes. This approach was effectively verified and may be used without excipient interference for routine quality control analysis of curcumin in pharmaceutical formulations and other products.

References

1. Hills P. J Pharm Med Res. 2016;2(1):39-4.
2. Guo L, Duan L, Dou LL, Liu LL, Yang H, Liu EH, et al. Quality standardization of herbal medicines using effective compounds combination as labeled constituents. J Pharm Biomed Anal. 2016;129:320-31.
3. Hwang KW, Son D, Jo HW, Kim CH, Seong KC, Moon JK. Levels of curcuminoid and essential oil compositions in turmeric's (*Curcuma longa L.*) grown in Korea. Applied Biological Chem. 2016;59 (2):209-15. .
4. Kaur P. Comparative Study of Pharmacognostical and Preliminary Phytochemical Investigation of *Curcuma Longa* Leaves and Rhizomes. Imperial Journal of Interdisciplinary Research. 2016;2(7).
5. Mehanny M, Hathout RM, Geneidi AS, Mansour S. Bisdemethoxycurcumin loaded polymeric mixed micelles as potential anti-cancer remedy: Preparation, optimization and cytotoxic evaluation in a HepG-2 cell model. J Molecular Liq. 2016;214:162-70.
6. Yue GG, Jiang L, Kwok HF, Lee JK, Chan KM, Fung KP, *et al*. Turmeric ethanolic extract possesses stronger inhibitory activities on colon tumour growth than curcumin-The importance of turmerones. J Functional Foods. 2016;22:565-77.
7. Heath DP, Pruitt MA, Brenner DE, Rock CL 2003. Curcumin in plasma and urine: quantiation by high performance liquid chromatography. J Chrom B. 783: 287-95.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11, S Iss 1,2022

8. Mandal V, Mohan Y, Hemalatha S 2007. Optimization of curcumin extraction by microwave assisted in vitro plant cell bursting by orthogonal array designed extraction process and HPTLC analysis. Phcog Mag. 3:132-138.
9. Somasundaram S, Edmund NA, Moore DT, Small GW, Shi YY, Orlowski R Z 2002. Dietary curcumin inhibits chemotherapy-induced apoptosis in models of human breast cancer. Cancer Res. 62: 3868- 3875.
10. Srinivasan KR 1953. A chromatographic study of the curcuminoids in *Curcuma longa Linn*. J. Pharm. Pharmacol. 5: 448-453.
11. Kiran Sharma, S. S. Agrawal, Monica Gupta, "Development and Validation of UV spectrophotometric method for the estimation of Curcumin in Bulk Drug and Pharmaceutical Dosage Forms", Int. J. Drug Dev. & Res., April-June 2012, 4(2): 375-380.
12. Revathy S, S. Elumali, Merina Benny , Benny Antony , Journal of experimental sciences2011, 2 (7);21-25.
13. Gayathri N Rajini kanth Sahu., Evaluation in comparative activity of *Curcuma longa* and *Curcuma aromatica*, 2011(57-60).