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PHYTOCHEMICAL INVESTIGATION AND PHARMACOLOGICAL EVALUATION OF CURCUMIN BY SPEC-UV-VISIBLE SOFTWARE TECHNIQUE

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Abstract*— Spectral analysis of the isomers of curcumin was studied using Spec-UV Software, for peak picking, graphics printout, Absorbance ratio calculation for selected wavelengths which included MPU Software Platform/Spec UV software workstation and spectral bandwidth of 2nm. Turmeric, a food additive, which has a main component curcumin, has shown surprisingly beneficial effects in experimental studies in the diseases characterized by an inflammatory effects. Several natural substances have greater antioxidant effects, including and curcumenoids. The extract of the curcumin was prepared and chemical tests were performed with structural analysis. The pharmacological properties as antioxidant effects were studied.

***Keywords*—Spec-UV software, curcumin, antioxidant**

I. Introduction

Turmeric (Curcuma longa) is a member of the curcuma group, which is part of the ginger family of herbs. The root and rhizome (underground stem) of the turmeric plant is crushed into ground turmeric. Curcumin is medically promising because inflammation [1] and oxidative damage [2] are contributors to so many diseases as Alzeimer's [3], Parkinson [4], arthritis [5] and various cancer [6]. It is a potent antioxidant [7] with specific antiviral, anticancer and cholesterol lowering [8] effects. Curcumin has potent irreversible antiproliferative effect against a variety of cancer cell lies in vitro. It is a mixture of three related compounds extracted from the roots of curcma longa plants, i.e, curcumin, demethoxycurcumin and bisdemethoxycurcumin [9].The active substance of turmeric is the polyphenol curcumin also known as natural yellow3 [10].

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Systematic name of curcumin is 1,7-bis (4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione [11]. It exists in two tautomeric [12] forms keto in solid phase and enol in solution. The yellow pigmented fraction isolated from the rhizomes of curcuma longa contains curcuminoids present to the extene of 3-5% which is an important active ingredient responsible for the biological activity [13]. Spec-UV Software is used for structural analysis and patent designing of the isomers of curcumin whose special features are Log Record, Binary File Save, Multi-User Management, Quality Control, Software Conforming to GLP, Data Printout, Printout Records.

II. Experiment

Extraction of curcumin from rhizomes of turmeric was performed.100 gm of turmeric was crushed in a grinder and extracted in 95% alcohol in a soxhlet assembly until all the colouring matter was extracted [14]
The alcoholic extract was distilled off to a semisolid brown coloured mass about 4.5%. The crude extract was than dissolved in 100ml of benzene and extracted twice with equal volume of 0.1% NaOH. Alkaline extract are combined and acidified with dilute HCl, a yellow coloured compound was formed, which was concentrated on a water bath and at the same time the precipitate was dissolved in boiling water until a lumpy mass was formed. The solution was then filtered in hot condition and filtrate was concentrated to very small volume and finally cooled to get curcumin 1.5%.

III. Chemical Test for Curcumin

1. Curcumin when dissolved in concentrated sulphuric acid gives yellow –red colouration.
2. Curcumin when dissolved in 0.1 NaOH gives deep brown colour.
Isolation of the isomers: TLC method was used containing petroleum ether and methanol in the ratio of 1:3, left for 24 hrs. and PET was used to observe the spots. It was observed that Rf calues for isomers were 0.49, 0.45, 0.54, 0.55 tetra hydrocurcumin, demethoxycurcumin, tetra hydrodemethoxycurcumin, bisdemethoxycurcumin.

IV. Results

The authors observed that bisdemethoxycurcumin was less susceptible to degradation at pH 10.2 than

demethoxycurcumin [15]. It was recomended that bisdemethoxycurcumin was used in alkaline composition improve stability.In serum free buffer solutions curcumin was observed to decompose in a pH dependent manner with faster reactions at neutral basic conditions. The authors observed intermolecular hydrogen bonding in both the ground and excited states. The curcuminoids possesing a phenolic group,which showed hydrogen bond acceptor properties,while those in bisdemethoxycurcumin acted as hydrogen bond donors,explaining the differential polarity of these curcumins when mixed with different alcohols. The comparative studies of antioxidant activity of curcuminoids and tetrahydrocurcumin in vitro using linoleic acid as a substrate in ethyl alcohol -water system as well as using rat liver showed that tetrahydrocurcumin had the strongest activity among all the curcuminoids in assay system. The authors concluded that these results suggest that tetrahydrocurcumin must play an important role in the antioxidant mechanism of curcumin in vivo.

The results have been illustrated in figures given below:

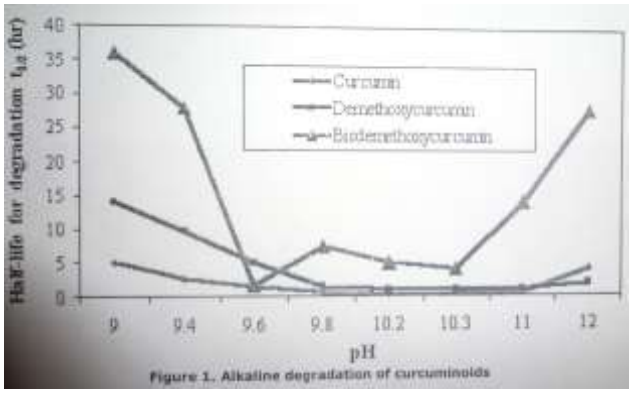

Figure 1. Alkaline degradation of curcuminoids.

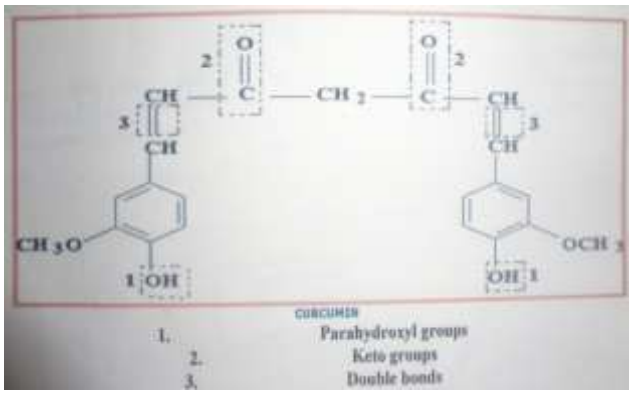

Figure 2. Structure of curcumin.

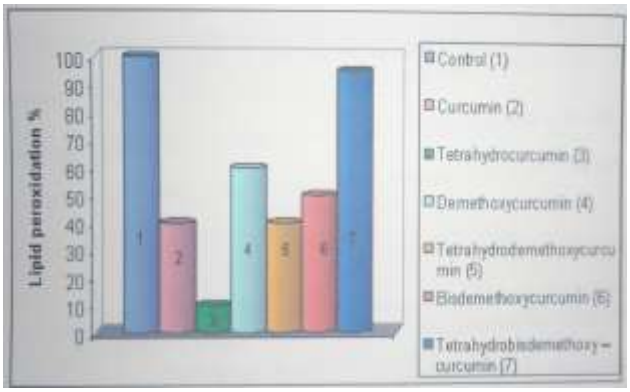

Figure 3. Comparative Antioxidant Activity of the Curcuminoids and Tetrahydrocurcuminoids in rat erythrocyte membrane system model (determined by TBA method)

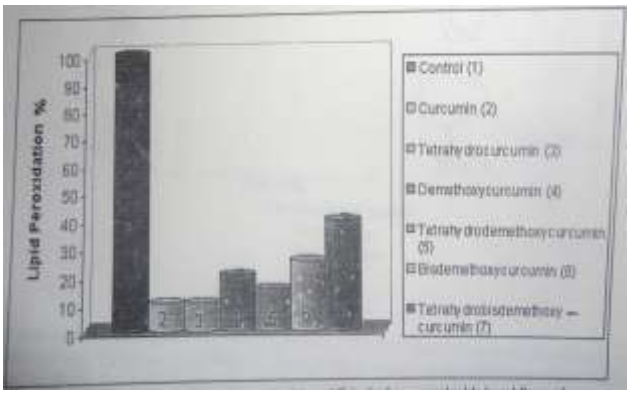

Figure 4. Comparative Antioxidant Activity of the Curcuminoids and Tetrahydrocurcuminoids in rat liver microsomes model (determined by TBA method)

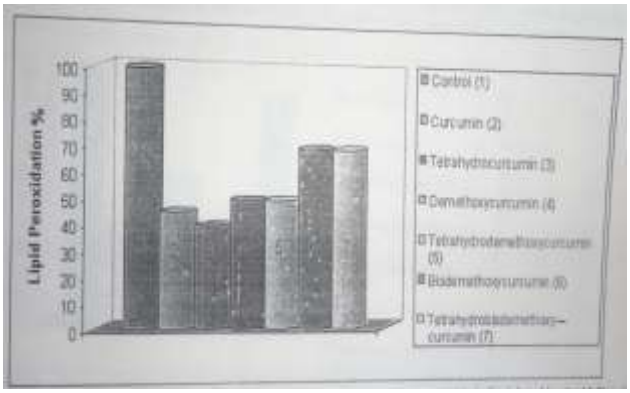

Figure 5. Comparative Antioxidant Activity of the Curcuminoids and Tetrahydrocurcuminoids in linoleic acid autoxidation model (determined by TBA method)

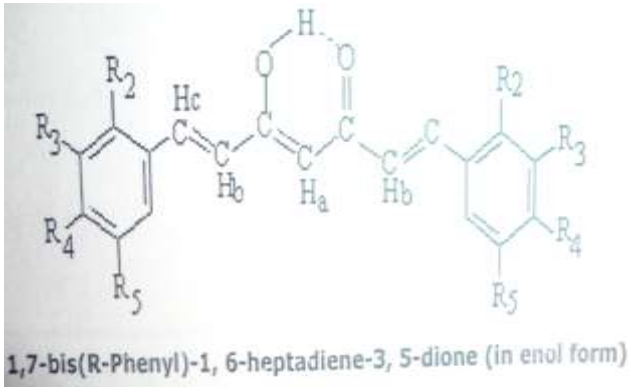

Figure 6. General structure.

Spectroscopic data [16-20] of curcumin are shown in spectroscopic graphs using Spec -UV software for the analysis of the polyphenolcurcumin at different wavelenghths.

The T80 series of UV-Visible Spectrophotometers carry on various spectrum scans and quantitative determination. When interfaced to a PC, the software offers many more user-friendly applications as access to data base, three-dimensional spectrum analysis. Multi-user management, Log record,as well as quality control and printout record are the main features of the software.

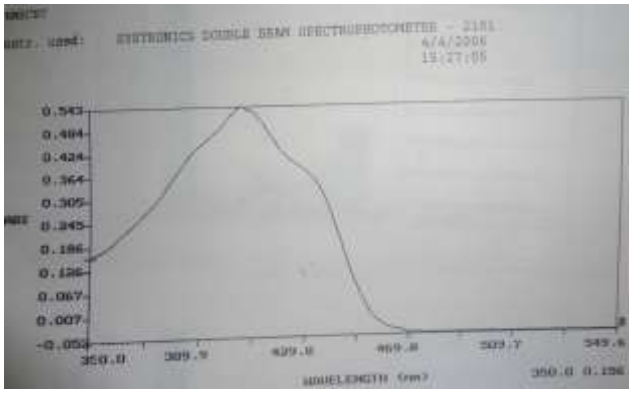

Figure7. Absorbance of curcumin studied by UV-Visible spectrophotometer for peak 1.

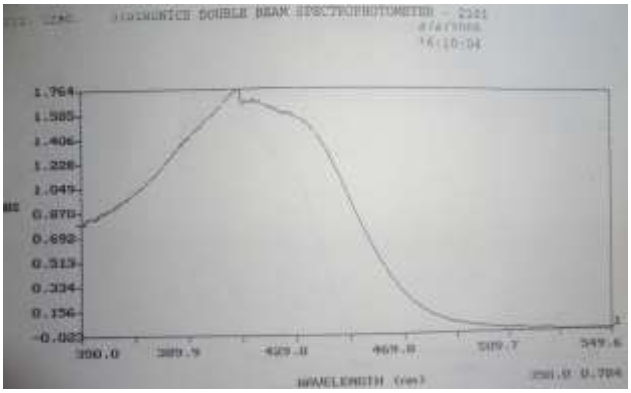

Figure 8. Absorbance of curcumin studied by UV-Visible spectrophotometer for peak 2.

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