

# Solvent Effect in Glycyrrhizic Acid Spectra (Absorption and Fluorescence)

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## Research Article

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# Abstract

In this research paper, a method built on UV/VIS spectrofluorophotometer and spectrophotometer by finding the fluorescence of glycyrrhizic acid in licorice root. Glycyrrhizic acid is an imperative active component present in licorice (*Glycyrrhiza uralensis* Fisch). Solvent effect had been studied in different solvents like deionized water and methanol. The differences between them were explored by the glycyrrhizic acid absorption and emission spectra. Under work conditions, i.e. 100% methanol solvent, a liquid ratio concentration  $10^{-2}$  to  $10^{-5}$  g/mL and second solvent with same conditions 100% deionized water in the same concentrations, was done. The effect of the solvent was significant by change the value for  $\lambda_{\max}$ . The result was validated for parameters confines for **Ex** ( $\lambda$  **Excitation**) in different solvents. The results of absorption spectra obey Beer-Lambert's law. Because of the same property of these solvents (protic), the absence of a significant difference in the absorption spectra are shown. From fluorescence spectra, the spectrum at concentration  $10^{-4}$  is the best for both solvents..

## 1. Introduction

Licorice or the base of the glycyrrhiza plant had been utilized therapeutically for in excess of 4000 Years[1]. The benevolent glycyrrhiza comprises of roughly 30 species[2]. In which six species produce a sweet saponin glycyrrhizic (GA), it is broadly utilized in Asia countries[3]. These plants were utilized as flavorings, sugars and as medication herbal[4], furthermore, they were likewise utilized for refining wellbeing, detoxification and solutions for injury[5]. Molecular constructions of glycyrrhizic acid [6].

## 1.2 Polar protic solvents

Polar protic solvents will quite often have high dielectric constants and high dipole moments. Moreover, since they have O-H or N-H bonds, they can take an interest in hydrogen connecting[7]. These solvents can comparably like in acids (wellsprings of protons) and weakly nucleophiles (bonds with solid electrophiles)[8]. The polar protic solvents like deionized water (H-OH), methanol (CH<sub>3</sub>-OH), and Non-polar solvents like hexane (CH<sub>3</sub>(CH<sub>2</sub>)<sub>4</sub>CH<sub>3</sub>)[9], Table1 show the properties of the different solvents[9, 10].

Table1 show the different solvents properties

Solvent	Structure	Common abbreviation	Boiling point, °C	Dielectric constant $\epsilon^*$	Class		
					Polar	Protic	Donor
hexane	CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub>	—	68.7	1.9			
methanol	CH <sub>3</sub> OH	MeOH	64.7	33	x	x	x
water	H <sub>2</sub> O	—	100.0	78	x	x	x

\*Most values are at or near 25 °C

†Known carcinogen

## 2. Experimental

The different solvents used in this work for dissolving of glycyrrhizic acid from licorice were deionized water, methanol, the glycyrrhizic acid solution for  $10^{-2} - 10^{-5}$  M were prepared at room temperature according to the following equation.

$$C_1V_1=C_2V_2$$

## 3. Result And Discussion

### 3.1. UV/VIS Spectrum analysis

SPECORD 40 UV/VIS spectrophotometer had been used to measure the glycyrrhizic acid absorption spectra in different concentration for two solvents (methanol and deionized water) [11], where the parameter of system in scan mode, range 190 nm to 800 nm, delta lambda 5, speed 50 nm/s integration time [s] 0.10. The spectra, which are show in Figure 2, are the glycyrrhizic acid spectra in methanol with concentrations  $10^{-2} - 10^{-5}$ , the  $\lambda_{max}$  found that  $\lambda_{exc}$  will be at 254 nm. Figure 3 shows the glycyrrhizic acid spectra in deionized water with concentrations  $10^{-2} - 10^{-5}$ , the  $\lambda_{max}$  found that  $\lambda_{exc}$  will be at 258 nm.

### 3.2. Fluorescence spectra

Spectrofluorophotometer Shimadzu RF-540 was used to measure the glycyrrhizic acid fluorescence spectra, Figure 4 show the glycyrrhizic acid fluorescence in methanol solvent and Figure 5 show the glycyrrhizic acid fluorescence in deionized water solvent, where the system specific parameter ( Spectrum Type: EM, Scan Range: 280.0nm to 800.0nm, EX Wavelength: 254.0 nm, Sample Pitch: 1.0 nm, Slit Width: EX:5.0nm EM:5.0nm, Scan Speed: Super, Sensitivity: High, Response Time: Auto, Shutter: Manual, Open). Table 2 shows the Data Peak pick of glycyrrhizic  $10^{-4}$  in methanol solvent. Table 3 shows the Data Peak pick of glycyrrhizic  $10^{-5}$  in methanol solvent, Table 4 show the Data Peak pick of glycyrrhizic  $10^{-4}$  in deionized water solvent and Table 5 shows the Data Peak pick of glycyrrhizic  $10^{-5}$  in deionized water solvent.

**Table 3** Data of glycyrrhizic  $10^{-4}$  in methanol solvent

No.	Wavelength (nm)	Intensity
1	308.0	98.716
2	513.0	32.953
3	588.0	17.060
4	613.0	18.699

**Table 4** Data of glycyrrhizic  $10^{-5}$  in methanol solvent

No.	Wavelength (nm)	Intensity
1	308.0	40.184
2	513.0	10.241

**Table 5** Flu. Data of glycyrrhizic  $10^{-4}$  in D.I water

No.	Wavelength (nm)	Intensity
1	307.0	207.888
2	461.0	61.511
3	546.0	144.391
4	608.0	38.907

**Table 6** Flu. Data of glycyrrhizic  $10^{-5}$  in D.I water

No.	Wavelength (nm)	Intensity
1	305.0	122.292
2	459.0	27.473
3	546.0	168.834
4	604.0	22.833

From figure 2 and 3 the graph in low concentration is appear the 254 nm, 258 nm for to deferent solvents, This results agree with Beer-Lambert's law, which explains the calculation of concentrations of substances for dilute solution, The absence of a significant difference in the absorption spectrum is attributed to the fact that deionized water and methanol are in the same group ( protic solvent but in different rang). From figure 4, it is noted that the concentration of  $10^{-4}$  is the best, as the peaks appear to us with a higher number, when using methanol solvent as in Table 5. Also, when using deionized water solvent, the spectrum at concentration  $10^{-4}$  is the best. So it could be seen the solvent effect in glycyrrhizic fluorescent form Table 3 and 5, was obvious.

## Conclusions

The results of absorption spectra obey Beer-Lambert's law. Because of the same property of these solvents (protic ), the absence of a significant difference in the absorption spectra are shown. From florescence spectra, the spectrum at concentration  $10^{-4}$  is the best for both solvents.

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## Tables

Table 2 is not available with this version

## Figures

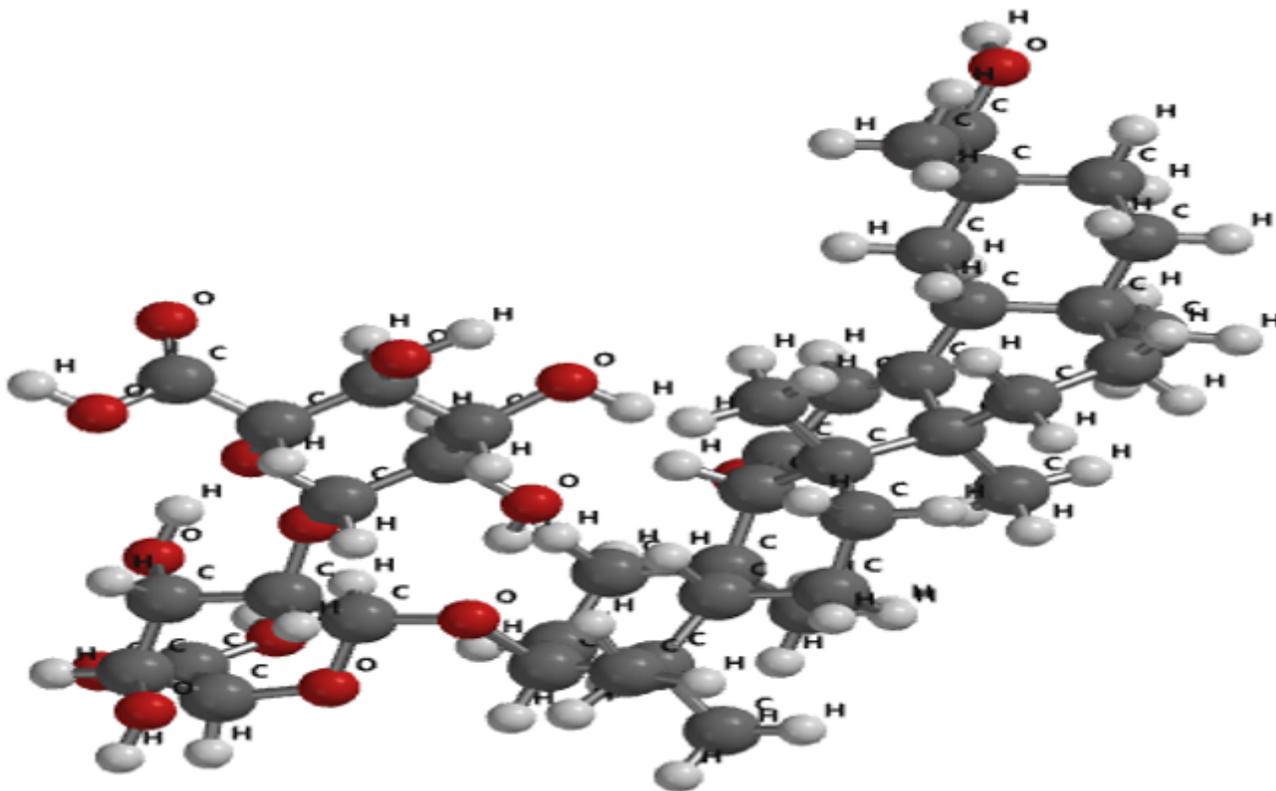
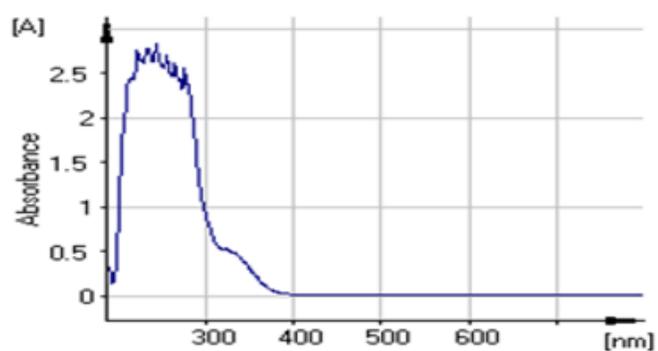
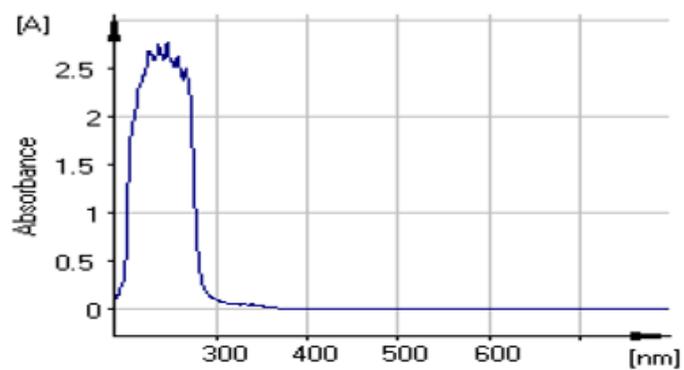


Figure 1

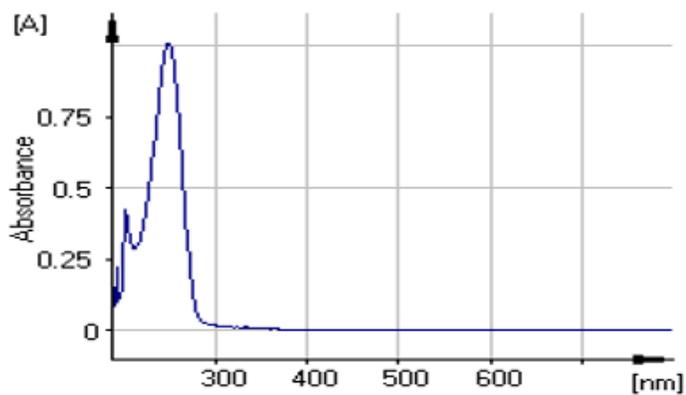
Molecular structures of glycyrrhizic acid



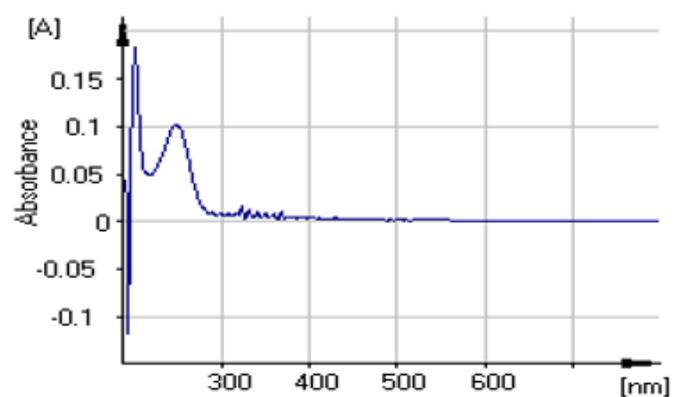
(a)



(b)



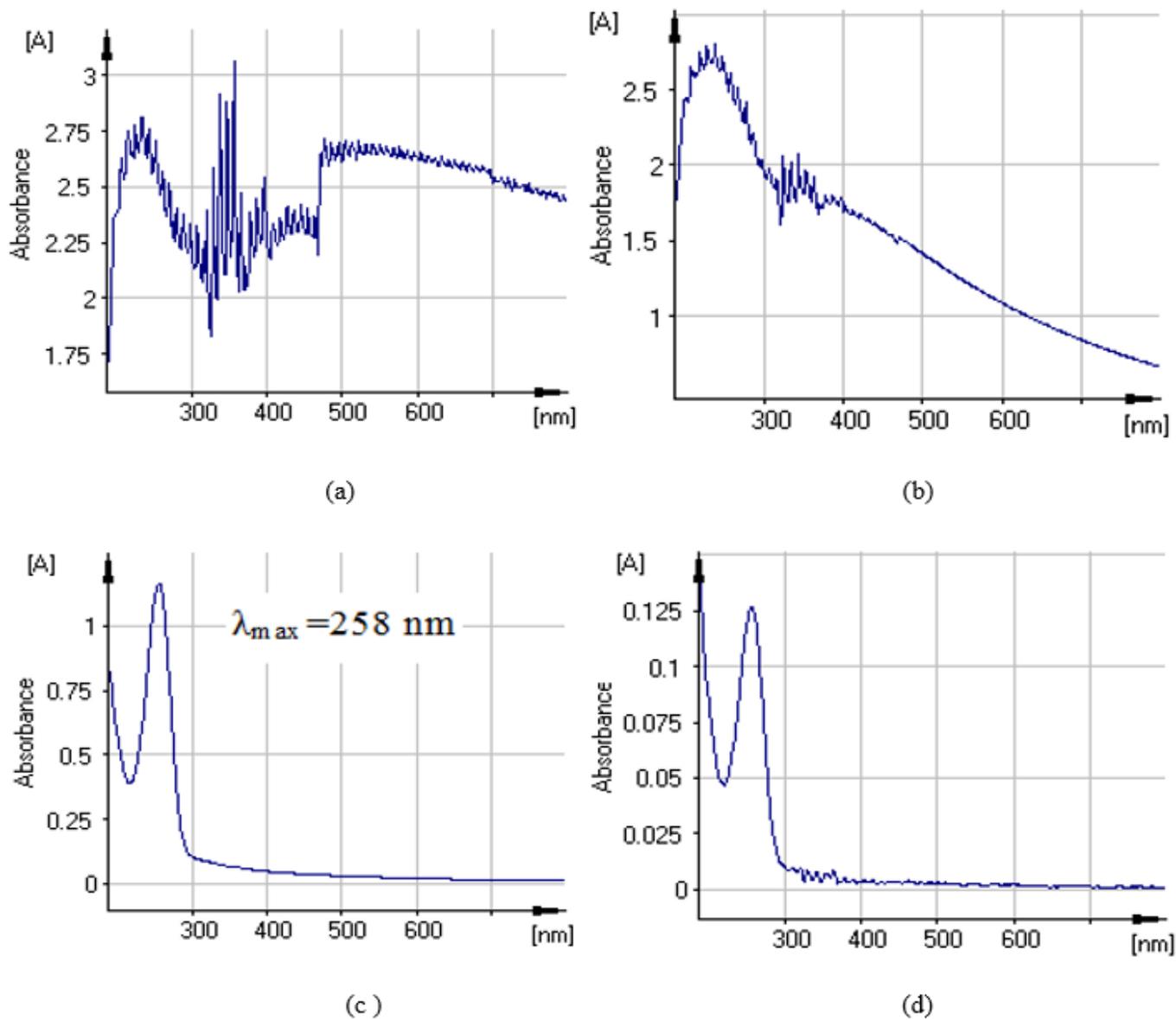
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(d)

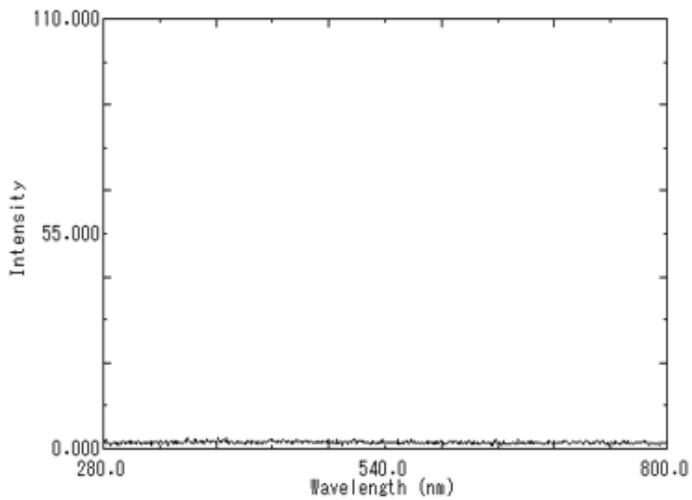
**Figure 2**

Absorption spectra of glycyrrhizic acid dissolved in methanol with different concentrations (a)  $10^{-2}$ , (b)  $10^{-3}$ , (c)  $10^{-4}$  and (d)  $10^{-5}$

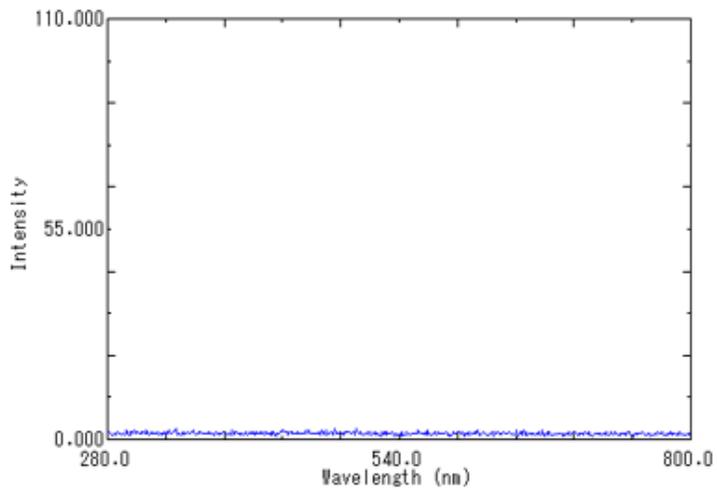


**Figure 3**

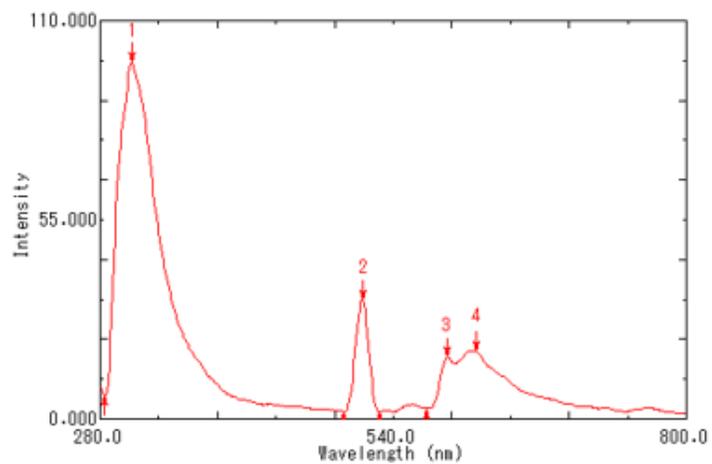
Absorption spectra of glycyrrhizic acid dissolved in water with different concentrations (a)  $10^{-2}$ , (b)  $10^{-3}$ , (c)  $10^{-4}$  and (d)  $10^{-5}$



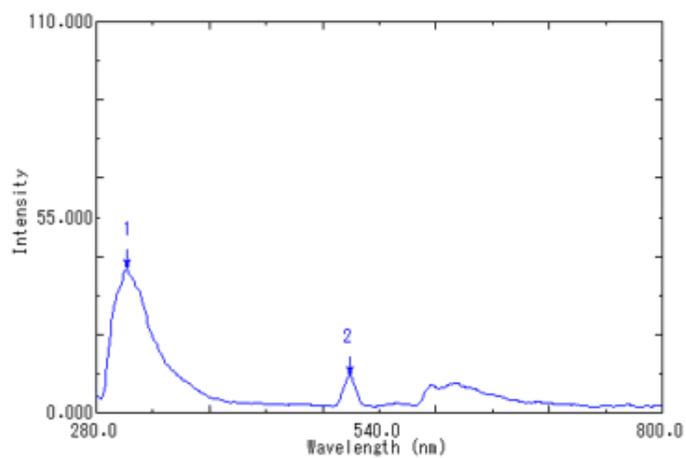
( a )



( b )



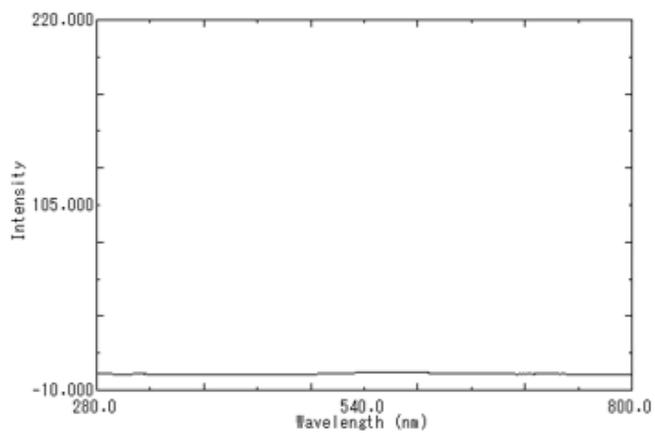
( c )



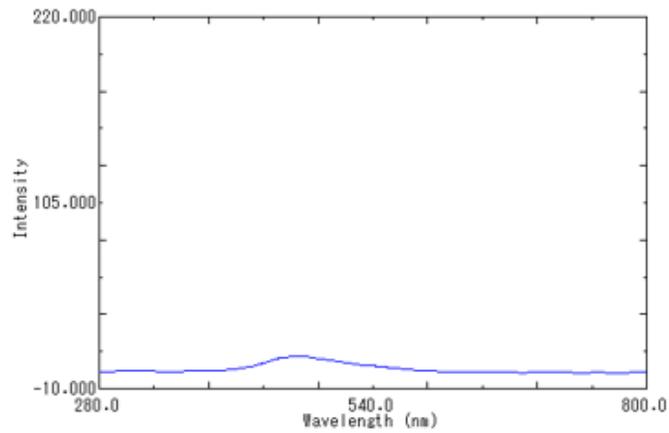
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**Figure 4**

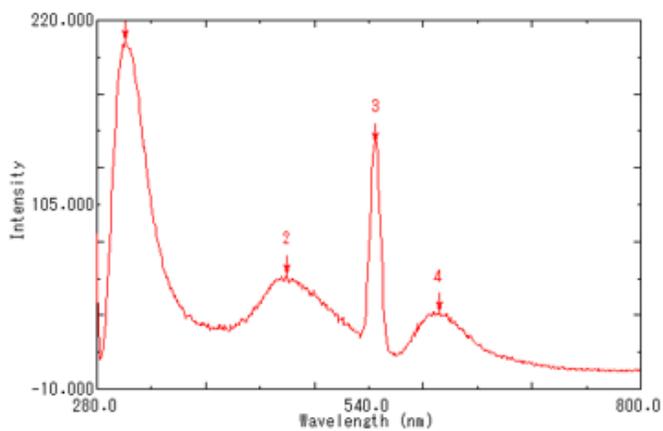
Fluorescence spectra of glycyrrhizic acid dissolved in methanol with different concentrations (a)  $10^{-2}$ , (b)  $10^{-3}$ , (c)  $10^{-4}$  and (d)  $10^{-5}$



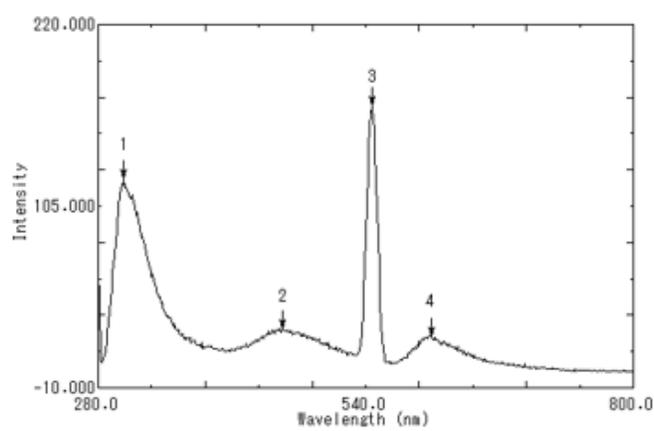
( a )



( b )



( c )



( d )

**Figure 5**

Fluorescence spectra of glycyrrhizic acid dissolved in water with different concentrations (a)  $10^{-2}$ , (b)  $10^{-3}$ , (c)  $10^{-4}$  and (d)  $10^{-5}$