Analysis of Green Methodology of Water Purification by using Cucurbita

DISSERTATION - II

MASTERS OF SCIENCE (HONORS)

IN

CHEMISTRY

By

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December, 2017

DECLARATION

I Kajalpreet Kaur, hereby affirm that the dissertation entitled "**Analysis of Green Methodology of Water purification by using Cucurbita**" submitted in partial fulfillment of the requirement for the award of the degree of Master Of Science and submitted to the Department Of Physical Sciences And Chemical Engineering (Chemistry) of Lovely Professional University is entirely an authentic record of my original work and all ideas and references have been duly acknowledged. It does not contain any work for the award of any other degree or diploma, other than described, at any University.

KAJALPREET KAUR

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ACKNOWKEDGEMENT

I would like to make my deepest appreciation and gratitude to Dr. Richa Gupta for her valuable guidance, constructive criticism and encouragement during every step of this project. I am highly thankful for her sincerity towards work, attitude of research, art of management, timely encouragement, untiring efforts, smiling way of talking and feel of there always when I need her or approached her during the course of my work in time. She shares her experiences and gave valuable criticism which helped me out to overcome each and every obstacle during my project.

I wish to convey my sincere thanks to all the faculty members of LPU, Department of Chemistry who helped me and encouraged me especially, Dr. Ramesh Thakur (H.O.D.), Dr. Harpreet Kaur, and all my respected teachers. I would like to acknowledge the facilities provided by LPU to me at the time when I needed them. I also thanks to Lab. Assistants Rinky,Varun , Anita,Manish **.** Besides thanking all my friends especially Raman, who joined me and helped me through this project. My family members deserve very special thanks for their inseparable support and prayers. They encouraged me a lot during my time in LPU and that why I achieved better study and life.

Kajalpreet Kaur

11616563

TABLE OF CONTENTS

CHAPTER 1

WATER

1.1 INTRODUCTION

Water is essential for life and on earth life is directly related to water. In other words we can say that our whole civilization is built on the use of water. We use water in our daily life processes, like drinking, cleaning, food processing, also used in industries and laboratories. Now pollution of water is the major global problem. Water resources going to be polluted by various ways like by merging of polluted industrial water in to it and some other human activities. Poor level of waste management including wastewater, most probably involved a major risk for public health during antiquity. Various metals from industries are also mixed into water sources these metals are Zn, Cd, Cr, Ni, and Cu. These metals are very harmful for environment and also for living organisms. When this metal's presence increases by their limits, they cause serious health problems. So the treatment of this metal is important before discharge into environment. We have limited source of water and these sources need protection.

Current Problem of Water:

From the last many years, a numbers of studies have been done to purify the water by investigating the low cost bio-waste adsorbents.

IMPORTANCE OF WATER:

As we know that earth surface is covered by two third part of water and in the body of human there is 75% water is present. So from here it can be concluded that water is one of the most important element that responsible for life. As water circulates in the human body, transport, dissolve and away the waste material. Further it regulates different activities in the body likewise fluids, tissues, cells, lymph, blood and glandular secretions.

Types of Water:

Water exist in different forms and some of explained as follows:

- **Hard Water:** It is saturated with many inorganic minerals, iron, magnesium, calcium. Water carried from rivers, wells and also from the ground is known as hard water.
- **Boiled Water:** Boiled water concentrates the inorganic minerals but also remove the germs present in water.
- **Filtered Water:** When the water is passes through fine strainer known as strainer. In the filter some calcium and solid substances are kept and there is no filter made which can prevent germs from passing through its fine meshes.
- **Soft Water:** Soft water contains many traces of minerals and chemicals, viruses and bacteria. Soft water is harder than distilled water.

DYES:

Dyes and pigments are different from each other. Mostly dyes are known as organic compounds because it contains carbon whereas pigments are inorganic compounds because they do not contain carbon atom. There are different types of dyes like methylene blue, congo red, malachite green etc. In industries dyes are being used as based on textile, paper, plastic, cosmetics and soon. The waste liquid from industries possesses some amount of dyes **[1]**. Some of synthetic dyes are resist to bio-degradation and accumulated in water bodies so due to the toxic behavior or oxidation production cause potential threat to aquatic life **[2]**.Even the presence of small amount of dyes causing due to some reasons like environmental and toxicological **[3-4]**. There are number of dyes used in these industries like methylene blue, methylene red, chromotrope dye, congo red, malachite green etc . To remove the methylene blue, congo red or malachite green from wastewater there are some methods by using activated carbon **[6]**.

ACTIVATED CARBON:

- Activated carbon is mainly used to remove the presence of organic consitutients in water**.**It is favourable for the treatment of water and maily two type of mechanism which are used for the removal of constituents i.e. adsorption and catalytic reduction.Toxic metals in wastewater has become a public health concern because of its non-biodegradable. Some of species such as Cr, CO, Ni, Cu, Zn,Pd .
- Activated carbon has been proves that it is used to remove the different type of pollutants present like organic and inorganic from aqueous medium.
- There are two processes for preparation of activated carbon i.e. Physical and Chemical Mechanisms.

PUMPKIN:

Pumpkin present in the category of flowering plants which related to the family of **Cucurbitaceae** and **Cucurbita.** A crop belonging to this family is known as cucurbits and includes melon, water melon, pumpkin, squash and cucumbers. Pumpkin fruits vary in size, color, shape and weight. They have a moderately hard rind with a thick, edible flesh below a central seed cavity **(Wang.y.et.al).** Cultivars of pumpkin include **Cucurbita pepo, Cucurbita mixta, Cucurbita maxima and Cucurbita moschata** and they are classified according to the texture and shape of their stems **(Rakcejeva.T et.al)**. Pumpkins are seasonal vegetables and it has been seen that fresh pumpkins at refrigerated conditions are so much sensitive for microbial spoilage. In pumpkin, there is presence of carotene, amino acids as well as vitamins which are soluble in water. As we know that there is presence of carotenoids they contribute to increasing the vitamin A **[7]**. Pumpkin is a seasonal vegetable that have a low energy but healthy and also rich in case of phenol compounds**.[8]** It also shows that rich diet of pumpkin reduces the blood glucose levels.

STUDY ON ADSORPTION:

When a solid material having large surface area as compared to their relative mass then adsorption of solids can be play a important role. Accordingly, charcoal is made up from blood, bone or coconut shells but mostly coconut shells are capable because they having high adsorbate

structure. The activation of charcoal is done by heating process at high temperature or in flow of dry air. When the charcoal is produced then according to this study it has been observed they completely desorbs the hydrocarbons.

The Langmuir Adsorption Isotherm:

In 1932, Irving Langmuir got a Nobel Prize for the investigations on surface chemistry Langmuir's isotherm describes that on the surface of adsorbant (S) , the adsorption of adsorbate (A) requires three assumptions as follows:

- The solution which contains an adsorbate and highly attracts with surface should be in contact with the surface of the adsorbant.
- The solute molecules only adsorbed when the surface have a specific number of sites.
- The monolayer adsorption i.e. which involves only one layer of molecules to the surface.

For monolayer adsorption the chemical reaction can be represented as:

$$A + S \rightleftharpoons AS$$

Here, AS represents a solute molecule.

The equilibrium constant K_{ads} for this reaction can be given as :

$$K_{ads} = \frac{[AS]}{[A]\,[S]}$$

So, formula used for the Langmuir adsorption isotherm:

$$\theta = K_{ads}C/1+K_{ads}C$$

Freundlich Adsorption Isotherm:

In 1909, Freundlich gave an expression which represents the variation of adsorption of a quantity of gas adsorbed by unit mass of solid adsorbent with pressure.

The equation for the Freundlich Adsorption Isotherm as follows:

$$\frac{x}{m} = kP^{\frac{1}{n}}$$

Here, x is the mass of the gas adsorbed

m is mass of the adsorbent

P is pressure where k, n are constant and depend upon the particular temperature.

CHAPTER-2

REVIEW OF LITERATURE

It has been observed that quality of water is improved by using different type of plants suchas peanuts, corn, moringa oleifera, banana peels and so on. There is presence of many heavy metals in water like Pb, Cu, and Ni etc so these can be coagulated from natural extracts. Practically, it has been proved that organic and inorganic matters which are present in sample water through different sources can be removed by extraction of seeds and leaves of different plants **[9]**. In current years, considerable attention has been devoted to the study of the removal of heavy metal ions from solution by adsorption using agricultural materials. Natural materials that are available in large quantities or certain wastes from agricultural operations may have the potential to be used as low-cost adsorbents, and they represent unused resources which are widely available and are environmentally friendly. Some investigations on the removal of heavy metal ions with agricultural by-products have been previ-ously reported **[10]**. Lead is a very toxic heavy metal, and its target organs are bones, the brain, blood, kidneys, and the thyroid glands. The presence of lead in discharge and its toxic nature cause other adverse effects on receiving waters in the aquatic system. Even a very low concentration of heavy metals in water can be very toxic to aquatic life. The main source of lead and cadmium in water is the effluents of processing industries, i.e., electroplating, paint, pigment, basic steel work, textile industries, metal finishing and electric accumulators' batteries **[11]**.Conventional methods for removing metals from aqueous solutions include chemical precipitation, chemical oxidation and reduction, ion exchange filtration, electrochemical treatment, reverse osmosis, membrane technologies and evaporation.

Fruit and vegetable peel (FVP) wastes are a commonly generated organic waste from both household and food –processing industries. However, FVPs are lowcost lignocellulosic materials that have some potential for reutilization. For its particular reutilization, the characterization of FVP is essential. In this regard, the present study provides a detailed physico-chemical characterization of commonly used FVPs such as pomegranate, pineapple, watermelon, garlic, green pea and pigeon pea. The materials were characterized by SEM, FTIR and

TGA/DTG **[12-13]**. There are 59 elements classified as heavy metals and out of these five are considered to be highly toxic and hazardous heavy metals (Lata and Rohindra 2002). These are cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb) and zinc (Zn) which is released into the environment by human activities or through natural constituents of the earth's crust. *Moringa* seeds have a high percentage removal of heavy metals compared to bean (cowpeas), urad, peanut and corn. Moringa shows more than 50 % of metal removal and the highest percentage removal was achieved for copper and lead. Bean (cowpeas) and peanuts do not show very high percentages of metal removal while copper and cadmium had less than 15 % of metal adsorption. Corn and urad show metal removal but their heavy metal removal percentages were low.

M. Sajidu et al.(2005) have investigate that with initial conc.of metal at 5ppm and 7ppm with the seeds and Kernel of moringa olifera there is removal of Pb, Cd and Fe with the help of coagulation technology As a result, there is 92% removal of Fe, 89% of Pb and 48% of Cd.

IlhemGhodbane et al. (2007) used bark of Gum tree to find out the bisorption of Cd from their aqueous solution. Initially the concentration of Cd was kept about 100mg/L.With the contact of time and initial concentration of metal studied for 2-60 min. As a result the maximum adsorption is found increases with time increases.

ArjumVirupakshi et al. (2013) investigate that the moringaoliefera and cactus are used as a natural coagulant for treatment of wastewater by using different parameters such as turbidity, pH.

Amruta D. Parkhi etal. (2014) have inestigate that presence of copper in waste water removed by powder of mango seeds using adsorption phenomenon. As a result, with increase in time the percentage of removal also increases.

J. Aravind et al. (2015) investigate that the removal of Chromium from the waste water can be done with the seeds of gooseberry by using the phenomenon of bisorption. Different parameters are used such as pH, temperature, dose of adsorbant. He also conclude that the removal of Cr decreases by using initial conc.with range of 20-100 mg/L.

S.V. Maruti etal. (2016) have studied some natural coagulants like Moringa Oliefera, Tamarindus Indica powder for the coagulation process. From this he concluded that 62% of Cr is removed by Tamarindus Indica powder and 73% of Cd is removed by Moringa Oleifera.

KiranPakhale et al. (2016) used the waste material to remove different metals like Cr, Cu and Fe. He concludes that with increase in temperature the adsorption level decreases. As the amount of dose increases there is increase in the removal whereas it decreases with increase the initially conc. of metal.

Different parameters used for the activated Carbon are as follows:

Moisture Content **[14-17]**

Ash Content **[18-19]**

Acidity **[21-22]**

pH **[23-25]**

OBJECTIVES AND PLAN OF WORK

From this literature survey, it is clear that variety of fruits and vegetables purified the waste water . But no one purify the water with activated carbon has been reported till date. Moreover, these type of fruits and vegetables also helps to remove the other impurities are present inside the water system thus attract our attention. The purpose of this experiment is that powder of pumpkin could be used for purification of water as well as to determine whether prepared pumpkin waste could be used to remove heavy metal ions from solution. Thus keeping above points in mind the current research project is aimed to following objectives:

1. Preparation of Activated Carbon.

2. Characterization of activated carbon using UV, IR, SEM, TG Spectroscopy.

3. Removal of toxics pollutants from water using different samples of waste water with activated carbon.

4. Characterization of different water samples with activated carbon using UV , IR, SEM, TG spectroscopy.

CHAPTER 2

MATERIALS AND METHODS:

Material:

Sodium bicarbonate ($NaHCO_3$), Phosphoric acid (H_3PO_4) were purchased from alpha chemicals.

METHODOLOGY:

Instrumentation:

Infra-red spectroscopy:

Infra-red (IR) spectra were displayed using KBr pellets by SHIMADZU FTIR 8400S, Fourier Transform, Infrared spectrophotometer (Department of Physical Sciences and chemical engineering, Lovely Professional University).

Ultra –violet spectroscopy:

Ultra-violet (UV) spectra were displayed from SHIMADZU UV-1800 spectrophotometer (Department of Physical Sciences and Chemical engineering, Lovely Professional University).

EXPERIMENTAL

1. **Preparation of Pumpkin Powder:**

Pumpkin having weight 3 kg was taken from local farm and then washed and rinsed thoroughly. Cut the pumpkin and removed the seeds and stems. Inner membrane of pumpkin is taken out and cut into thin slices and dried in oven for five hours at 200^{o}C. Cool the pumpkin stripes and made the fine powder with the help of blender. The pumpkin powder was sieved using 80µm.

Color	Yellow

Actual Yield	45gm

2. Synthesis of Activated Carbon:

Take 20 gm of pumpkin powder and add 60 ml of phosphoric acid in 250ml (i.e. 1:3) of round bottom flask. Fit a reflux condenser to the flask, and heat the mixture on heating mental for 6 hours at 60^{o}C.After 6 hours filter out the mixture and then add $NaHCO_3$ for neutralize the mixture (pH=7), black colored precipitate were separated out in solution. Precipitates were washed thrice with distilled water. Precipitate were filtered and dried in Oven for 24 hours at 110^{o}C.

Characterization table:

Color	Black
Actual Yield	5.614gm
IR peaks	ν (P-H_2)2362cm^{-1}, ν(P=O)stretch.1320-1140cm^{-1}, ν (O=P-OH)broad 2725-1600 cm^{-1}, ν(P-CH_3) asym stretch.1371 cm^{-1}, ν (P-O-C) 800 cm^{-1}, ν(=C-H) 3284cm^{-1}, ν (C=O) 1686 cm^{-1}, ν (C=C) 1592cm^{-1} .

Preparation of Stock Solution with Dye (Methylene Blue):

Prepare stock solution of 50 ppm of methylene blue in 1000 ml; for this take 0.05gm (50 mg) of methylene blue and dissolved in water up to mark of 1000ml of volumetric flask.

Take 0.2 mg, 0.4 mg, 0.6 mg, 0.8mg, 1.0 mg, 1.2 mg of Activated Carbon in different 100ml of volumetric flask and filled up to mark with stock solution.

Preparation of stock solution of EDTA:

Take 0.93 gm of EDTA in 250 ml of distilled water and kept in burette.

Preparation of solution to check Hardness:

Prepare 100ml solution of activated carbon using 0.005gm(5 mg).From this solution, take 10 ml and then add 2ml of ammonia buffer solution with 2-3 drops of indicator i.e. EBT and titrate against stock solution . Note down the readings after every 10 minute.

Determination of pH:

Take 1gm of carbon sample in 100 ml of distilled water in beaker and boiled for 5 minutes. Then dilute the solution to 200 ml and cool at room temperature. Measure the pH range.

Determination of Total Ash Content:

Firstly Crucible was preheated about at 500˚C, then cool in desiccators and weigh. Take 1 gm of carbon sample in crucible and reweigh. Then placed in furnace for 1 hour and30 minutes. Allow the crucible to cool down at room temperature and reweigh.

Determination of Iodine No.:

Take 0.3 gm of carbon sample and 0.5 ml of Conc.Hcl in 10 ml of distilled water in conical flask. Stir it and then add 10 ml of stock iodine solution (i.e. 0.675gm of I + 1.025 gm of KI in 250 ml) and titrate with 0.1M sodium thiosulphate using indicator.

CHAPTER 3

RESULT AND DISCUSSION

Discussion on Synthesis:

The experimental setup and preparation of Activated Carbon is shown in **figure 1**.

Figure 1: Experimental setup for preparation of Activated Carbon

Result:

Color	Black
Actual Yield	5.614gm

IR peaks	ν (C=C)1592 cm^{-1}

The preparation of 50ppm solution of Methlyne blue with different grams of Activated carbon in different is shown in **figure 2**.

Figure 2: Preparation of solution of Methylene blue with activated carbon

Discussion on UV Spectroscopy

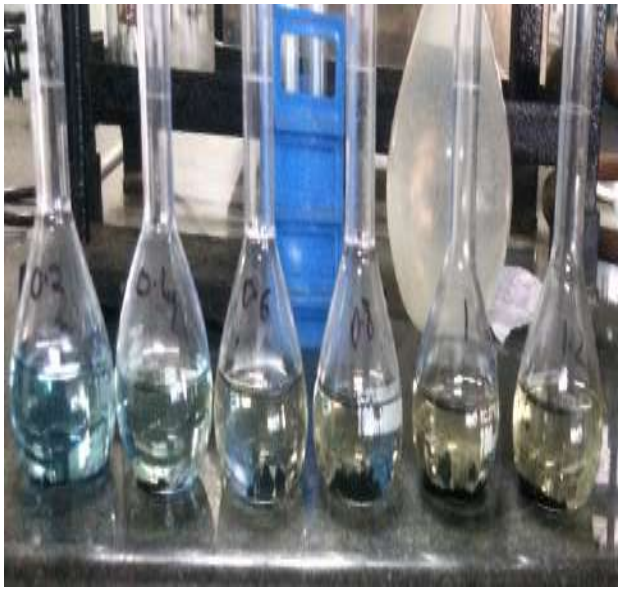
UV – visible spectra are recorded by passing UV light through the sample and changing wavelength continuously. When the wavelength of light corresponds to the amount of energy required to excite σ or π electron or nonbonding electron, to a higher level, energy is absorbed by the sample. This absorption is detected and displayed on a chart. The chart plot is between wavelength and radiation absorbed. The wavelength required for an electronic excitation depends upon the nature of π electron system or nonbonding electrons present in the system. The electron excitation will be from highest occupied molecular orbital (HOMO) to lowest unoccupied molecular orbital (LUMO).

From this work we observed color changes with time as shown in **figure 3.**

Ist Day

After 2 days

After 5 days



after 11 days

After 28 days

The observation chart for UV as shown as below:

Time	Wavelength (in nm)	Concentration Of Activated Carbon					
		0.2mg	0.4mg	0.6mg	0.8mg	1.0mg	1.2mg
		Absorbance					
Blank Reading (without A.C)	649 391 287	3.362 0.077 2.456					
After 10 min	640-655 390 285-290	3.48 0.13 3.88	2.842 0.051 1.644	3.458 0.109 3.584	3.247 0.133 1.718	3.460 0.113 3.698	3.449 0.108 3.591
After 20 min	640-655 390 285-290	3.122 0.068 1.978	3.503 0.141 4.000	3.506 0.146 4.000	3.497 0.139 3.999	3.398 0.131 3.016	3.518 0.154 4.000
After 30 min	640-655 390 285-290	3.49 0.137 4.00	3.501 0.136 4.000	3.514 0.142 4.000		3.395 0.131 2.988	3.487 0.144 3.985
After 40 min	640-655 390 285-290	3.506 0.138 3.98	3.504 0.138 4.000	3.495 0.138 3.976	3.401 0.124 2.959	2.481 - 1.600	
After 50 min	640-655 390 285-290	3.512 0.140 4.000	3.495 0.138 4.000	3.432 0.119 3.567	3.152 0.09 2.107	1.712 - 1.110	2.936 - 2.044
After 1 hour	640-655 390 285-290	3.49 0.132 3.96	3.458 0.121 3.898	3.389 0.112 2.967	3.192 0.104 2.271	1.187 - 0.831	0.046 2.646 1.804
After 2 Days	650-660 285-290	2.545 1.599	1.690 1.233	0.959 0.914	0.422 0.055	0.143 -	0.653 -
After 5	660			0.188	0.106		0.123

Days							
After 11 Days	655-660	0.098	0.0774	0.056	0.034	No Peak	0.0422

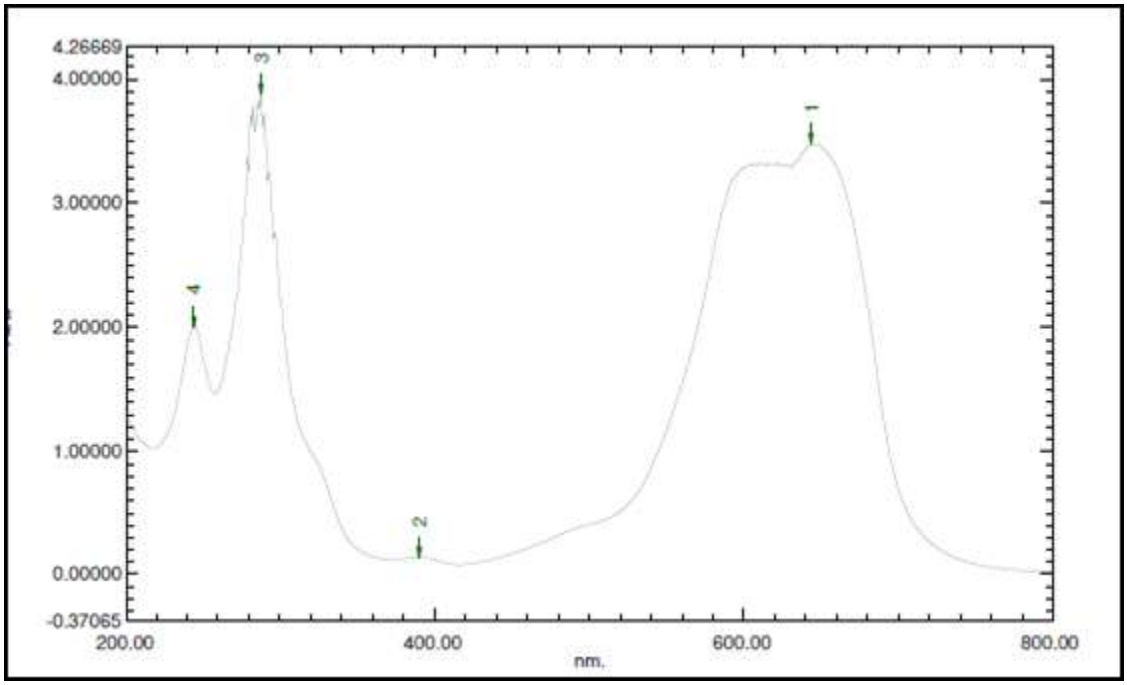


Figure 4 : UV Spectrum of 0.2mg of A.C (after 10 min)

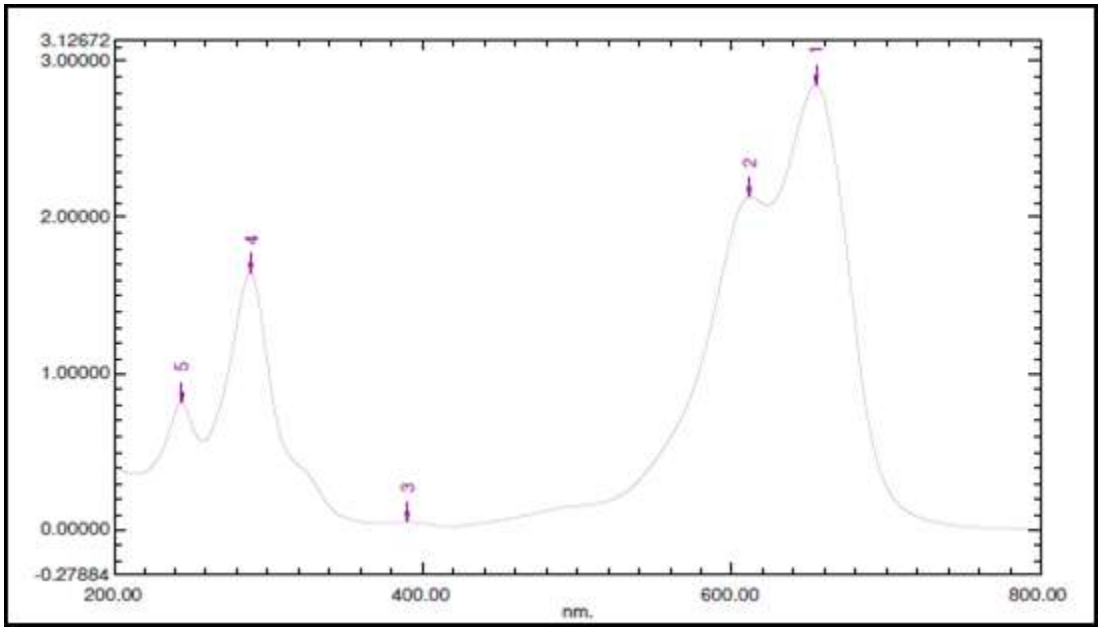


Figure 5: UV Spectrum of 0.4 mg of A.C (after 10 min)

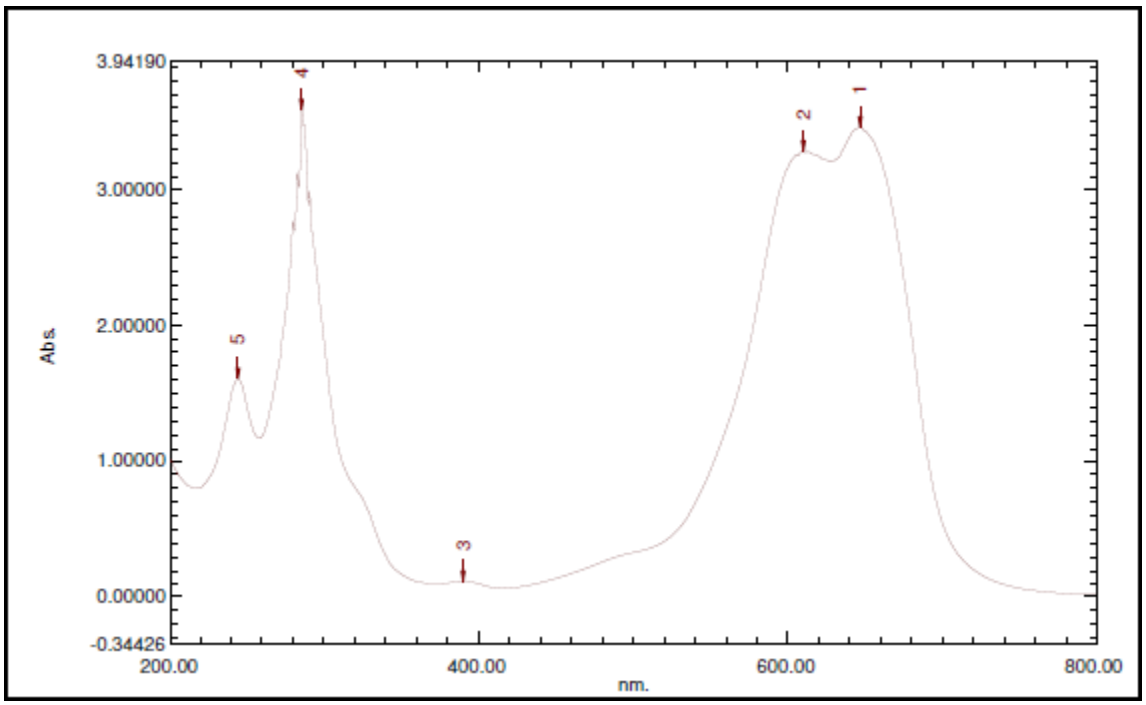


Figure 6: UV Spectrum of 0.6 mg of A.C (after 10 min)

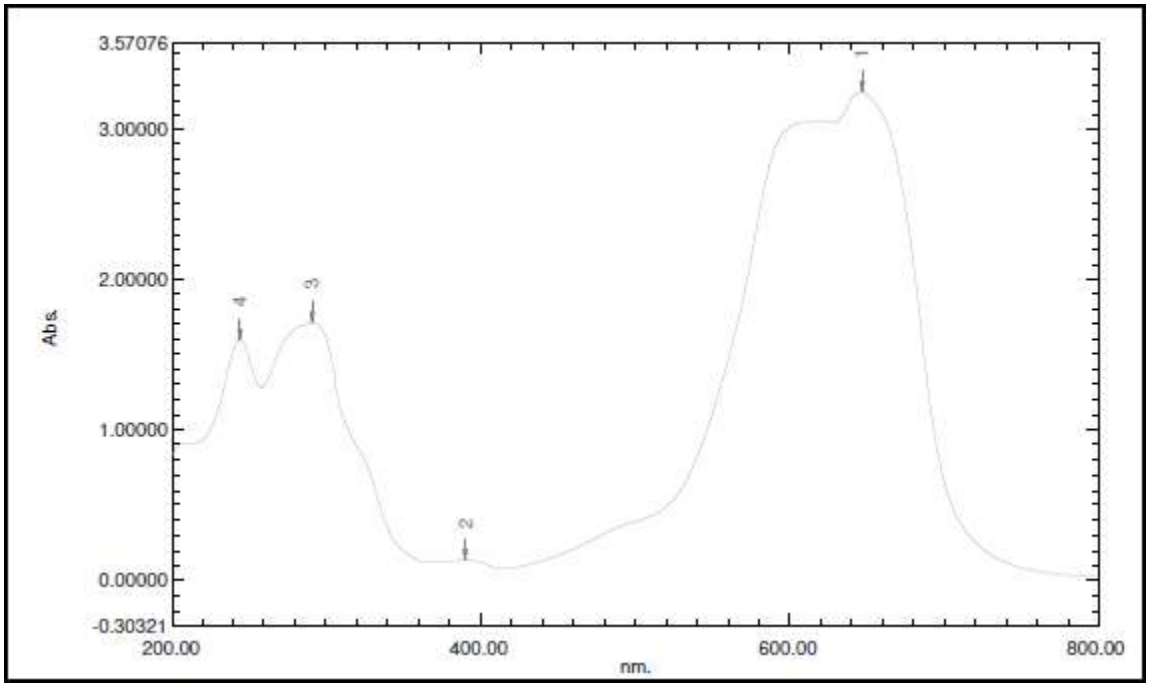


Figure 7: UV Spectrum of 0.8 mg of A.C (after 10 min)

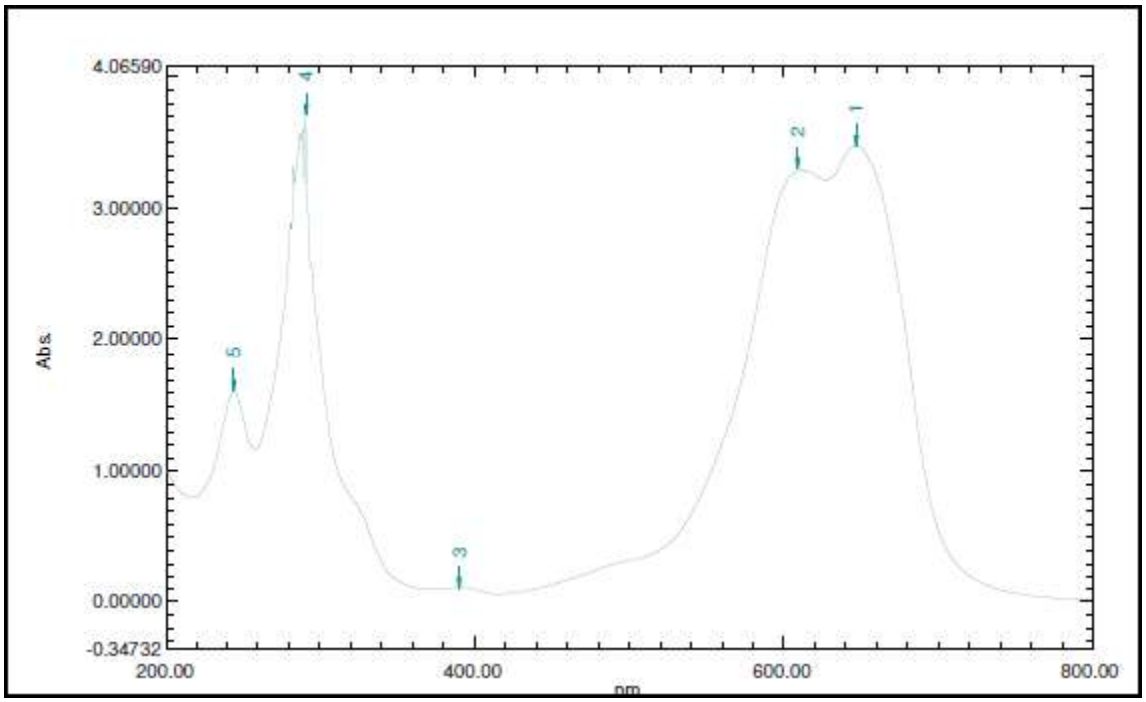


Figure 8: UV Spectrum of 1.0mg of A.C (After 10 min)

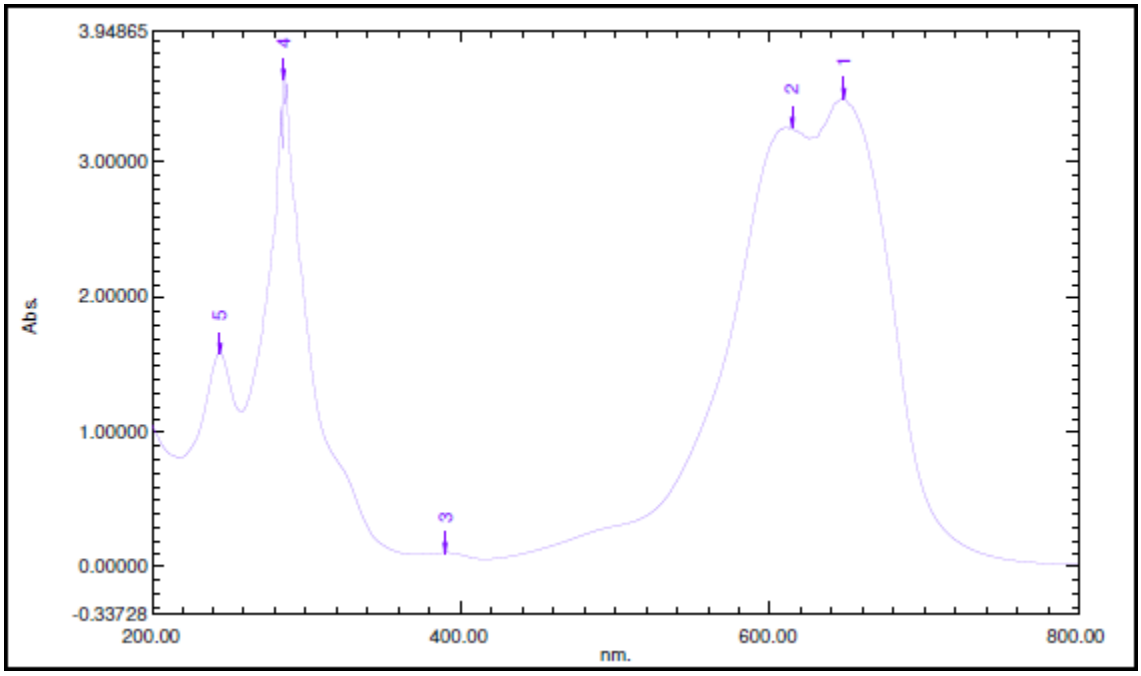


Figure 9: UV Spectrum of 1.2 mg of A.C (after 10 min)

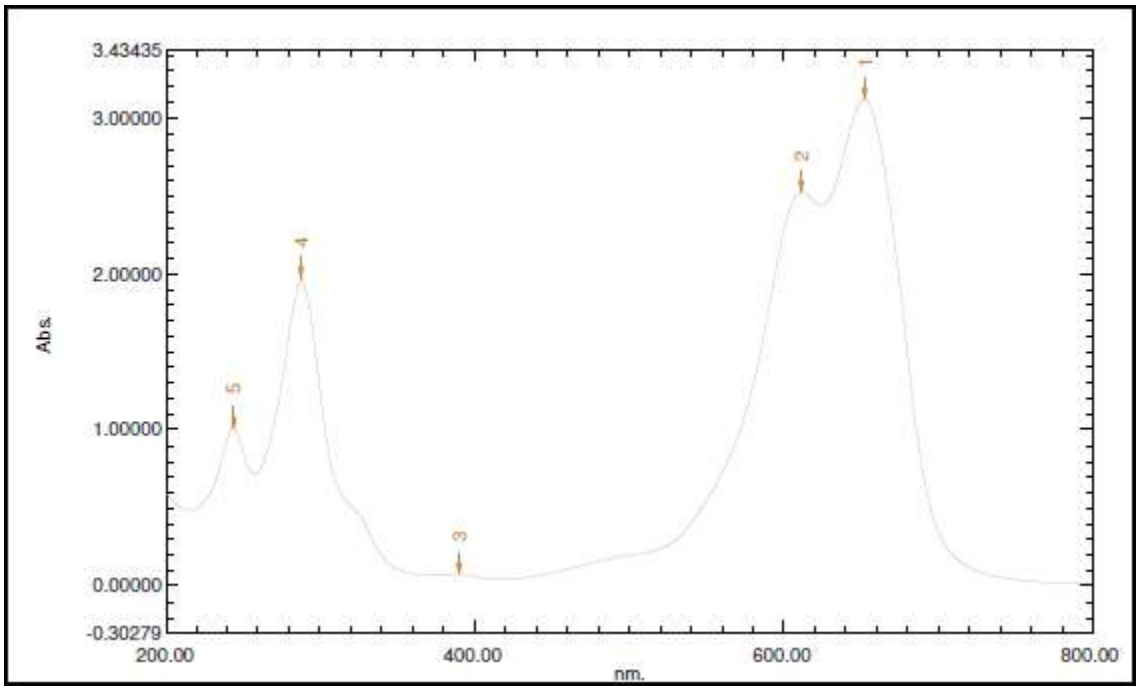


Figure 10: UV Spectrum of 0.2 mg of A.C (after 20 min)

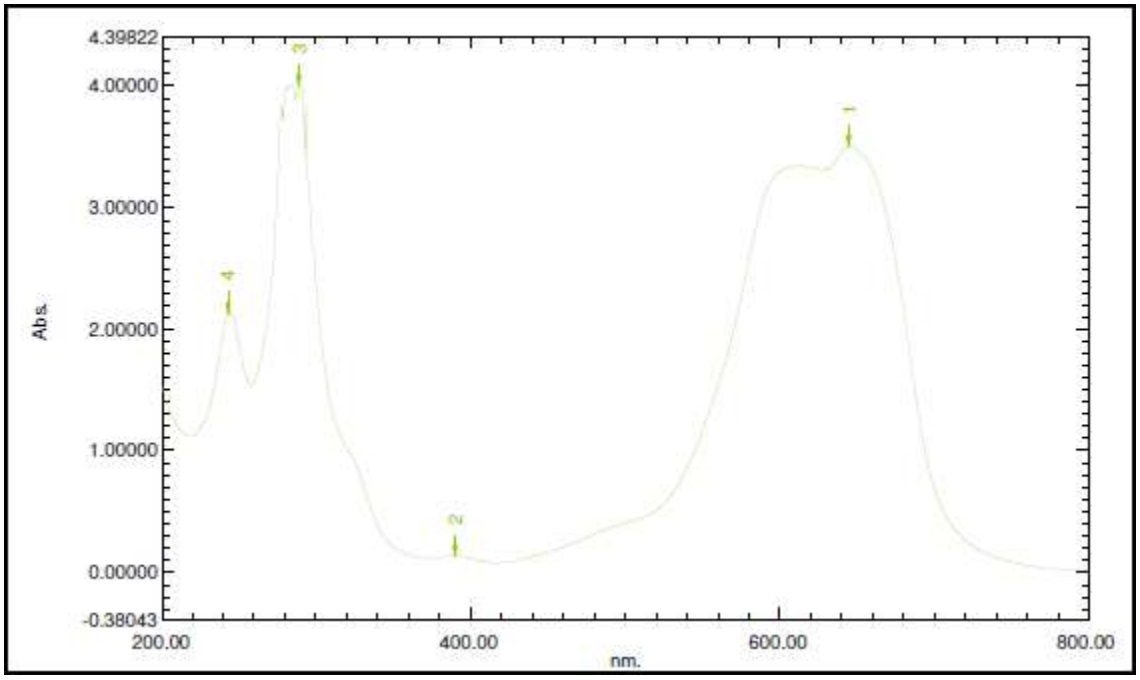


Figure 11 : UV Spectrum of 0.4 mg of A.C (after 20 min)

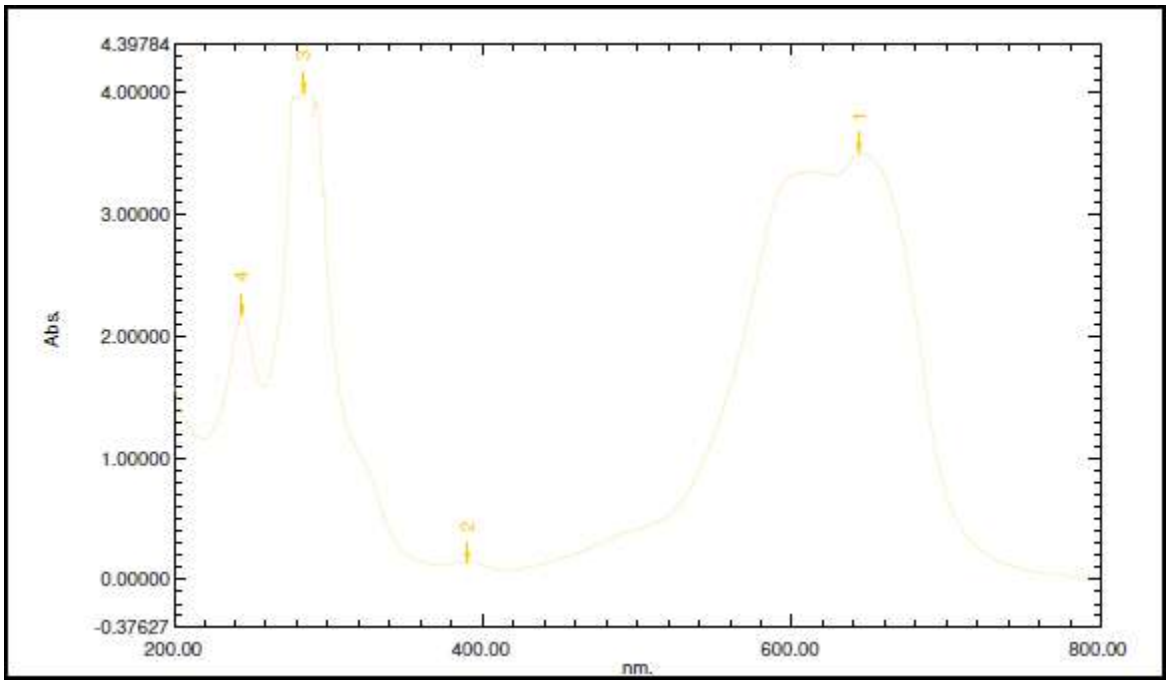


Figure 12 : UV Spectrum of 0.6 mg of A.C (after 20 min)

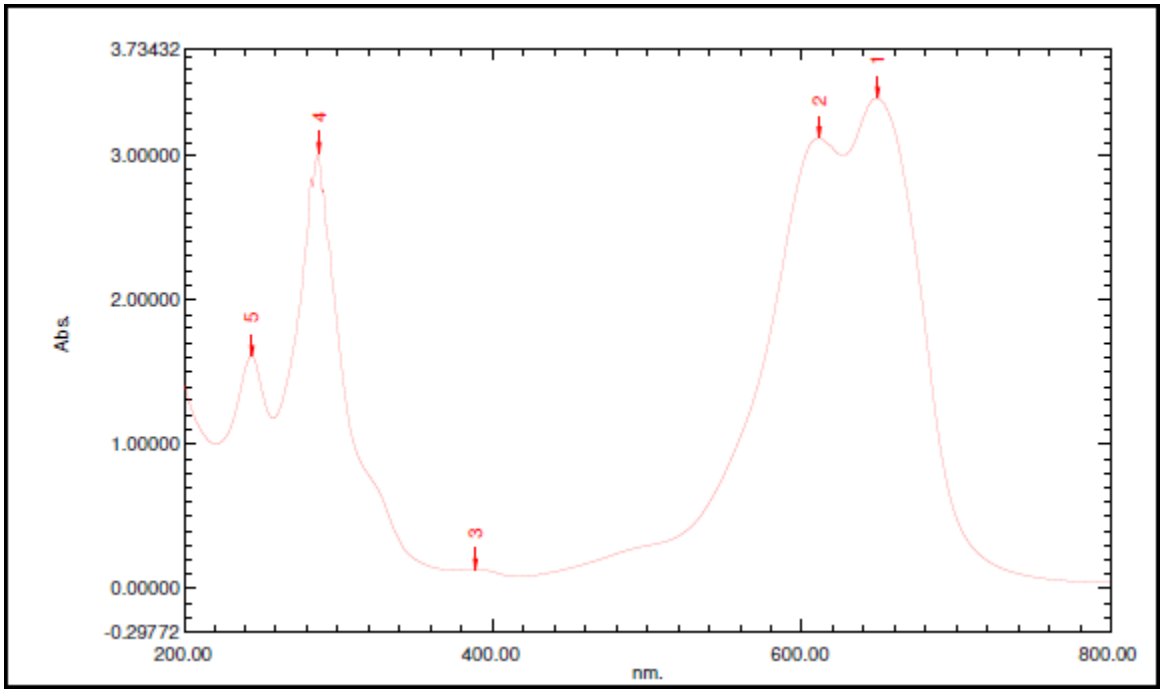


Figure 13 : UV Spectrum of 1.0mg of A.C (after 20 min)

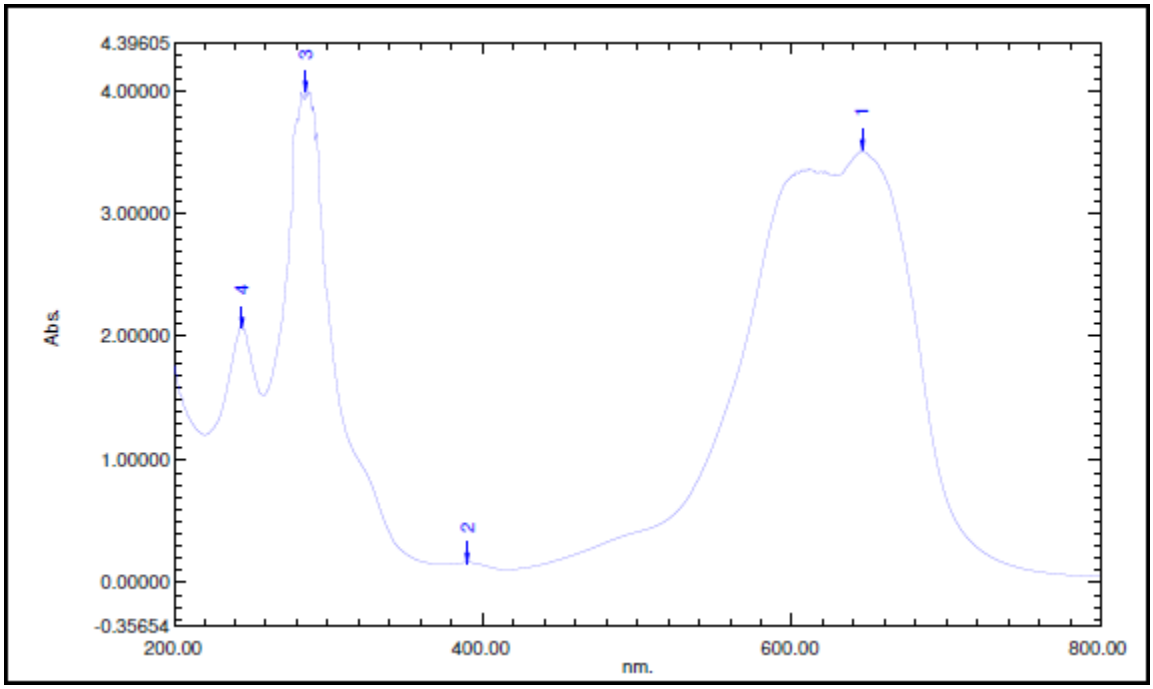


Figure 14 : UV Spectrum of 1.2 mg of A.C (after 20 min)

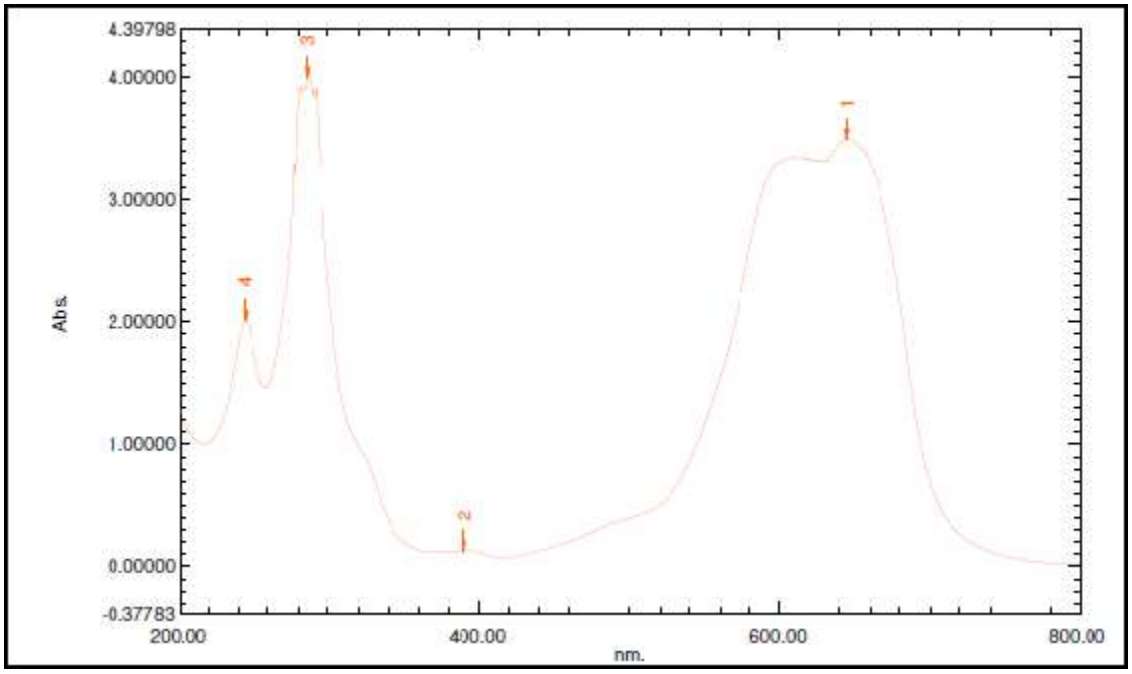


Figure 15: UV Spectrum of 0.2 mg of A.C (after 30 min)

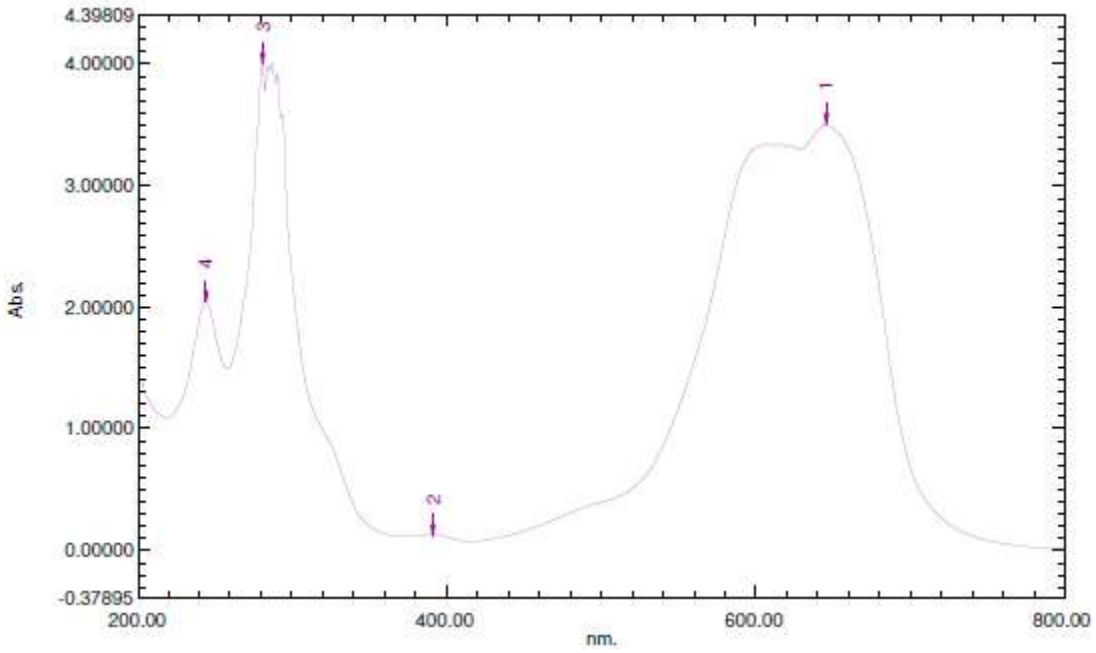


Figure 16: UV Spectrum of 0.4 mg of A.C (after 30 min)

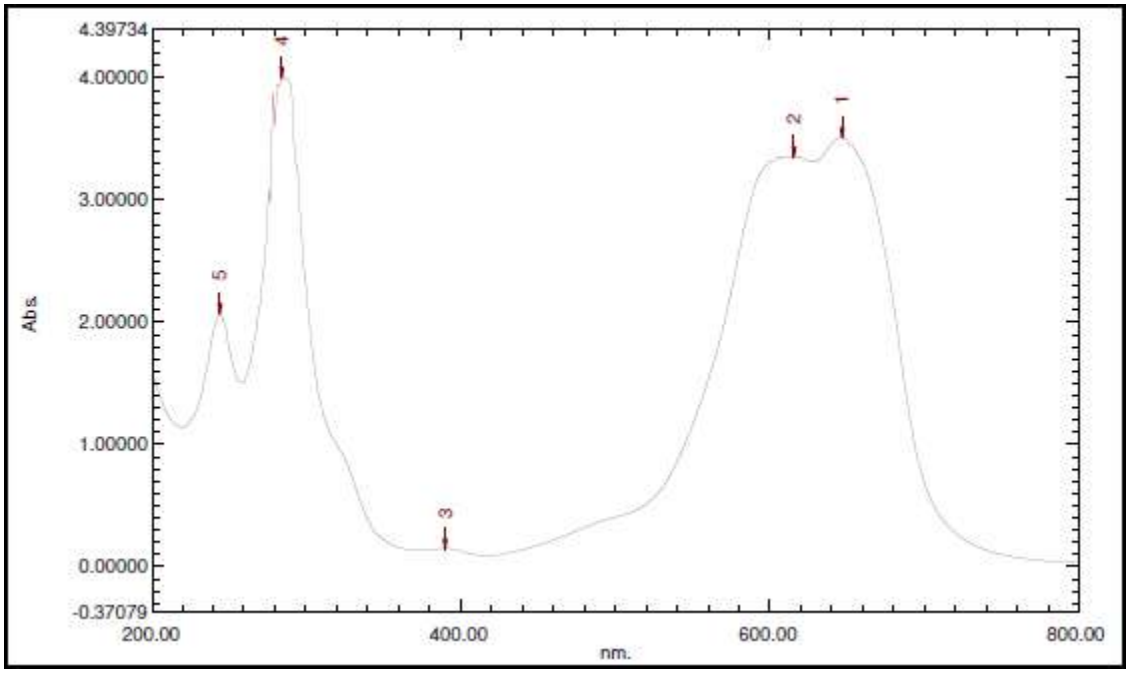


Figure 17: UV Spectrum of 0.6 mg of A.C (after 30 min)

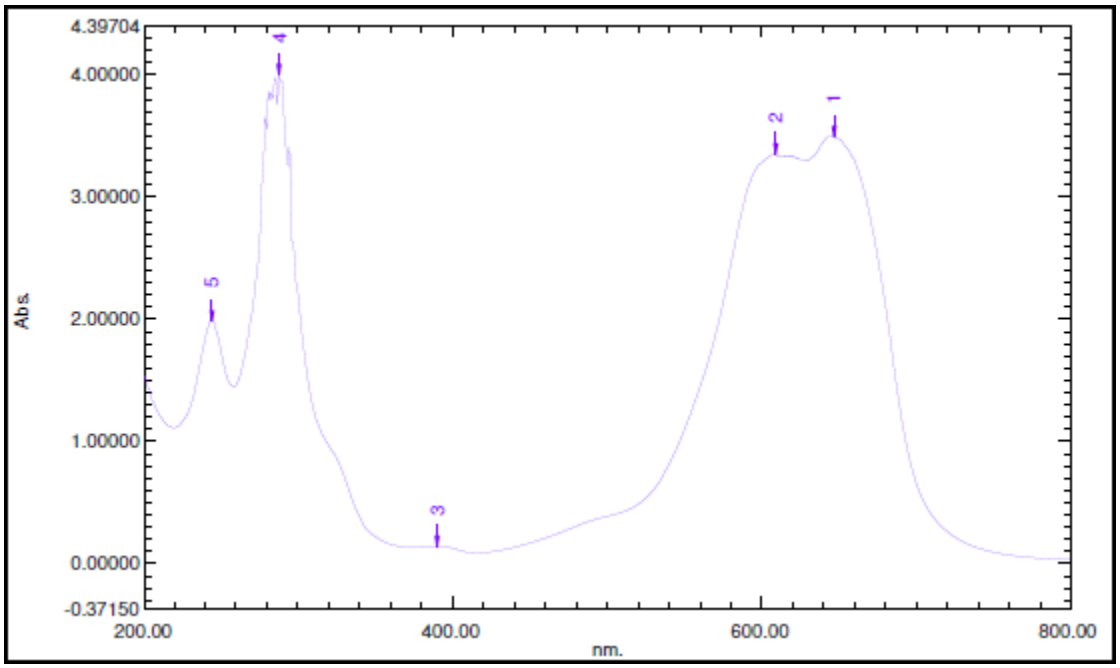


Figure 18: UV Spectrum of 0.8 mg of A.C (after 30 min)

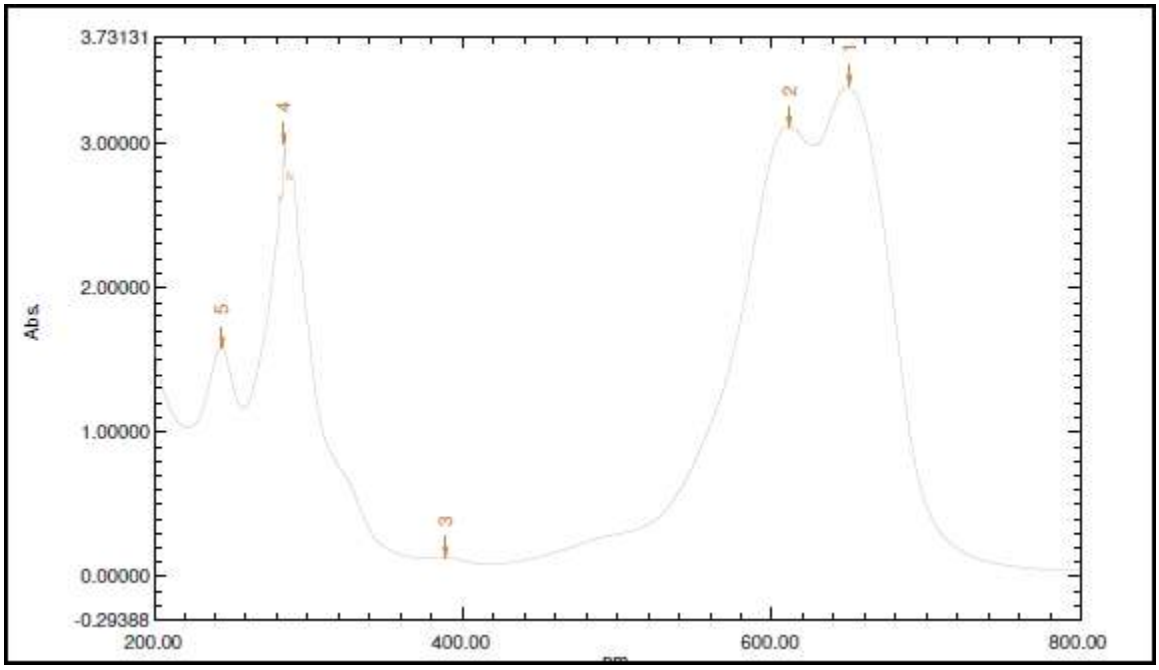


Figure 19: UV Spectrum of 1.0 mg of A.C (after 30 min)

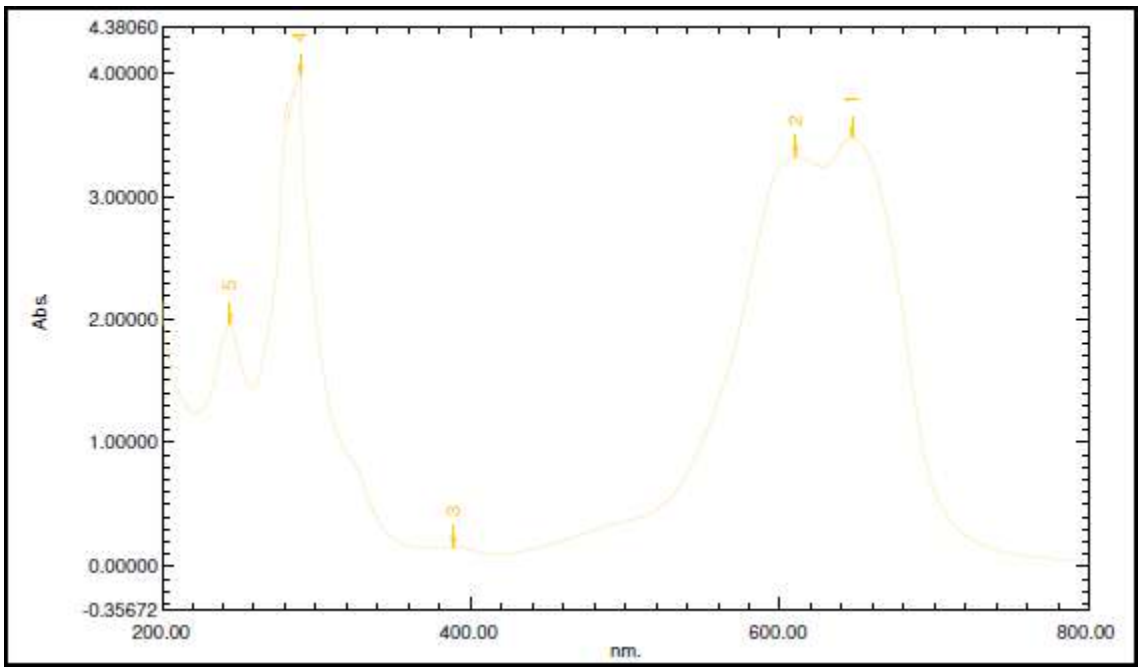


Figure 20: UV Spectrum of 1.2 mg of A.C (after 30 min)

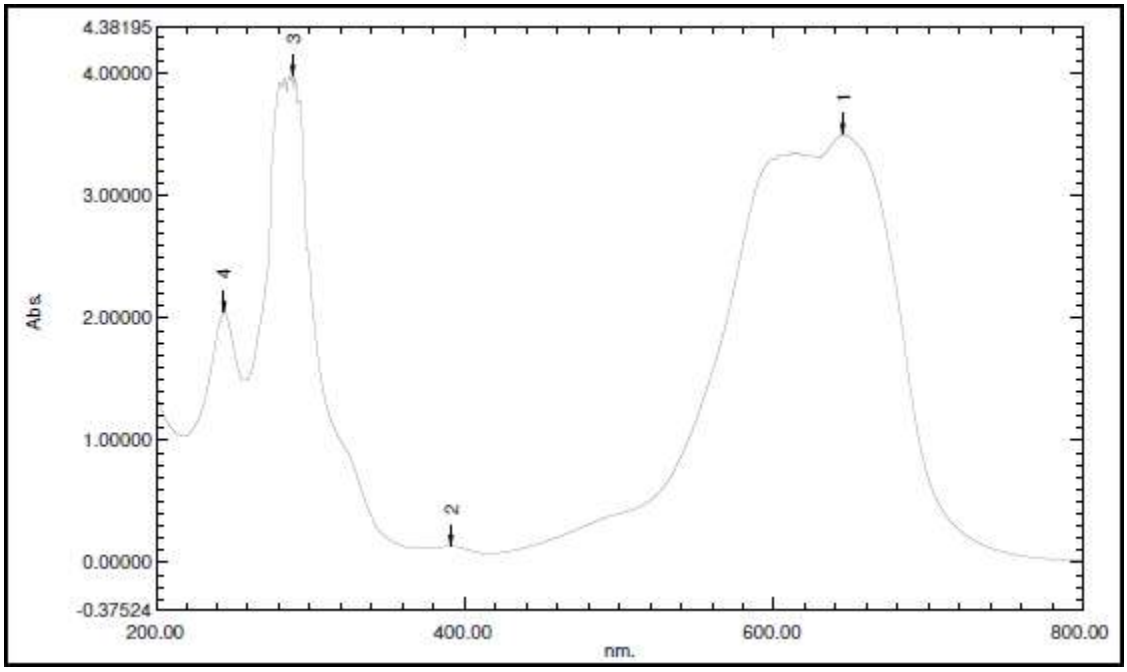


Figure 21: UV Spectrum of 0.2 mg of A.C (after 40 min)

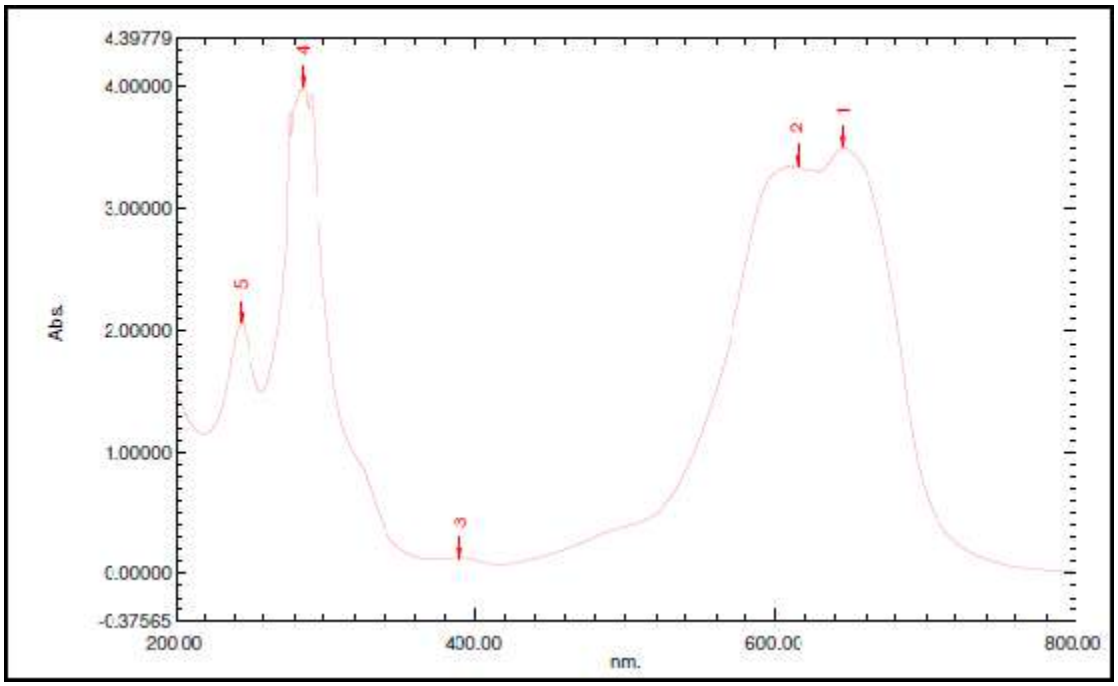


Figure 22: UV Spectrum of 0.4 mg of A.C (after 40 min)

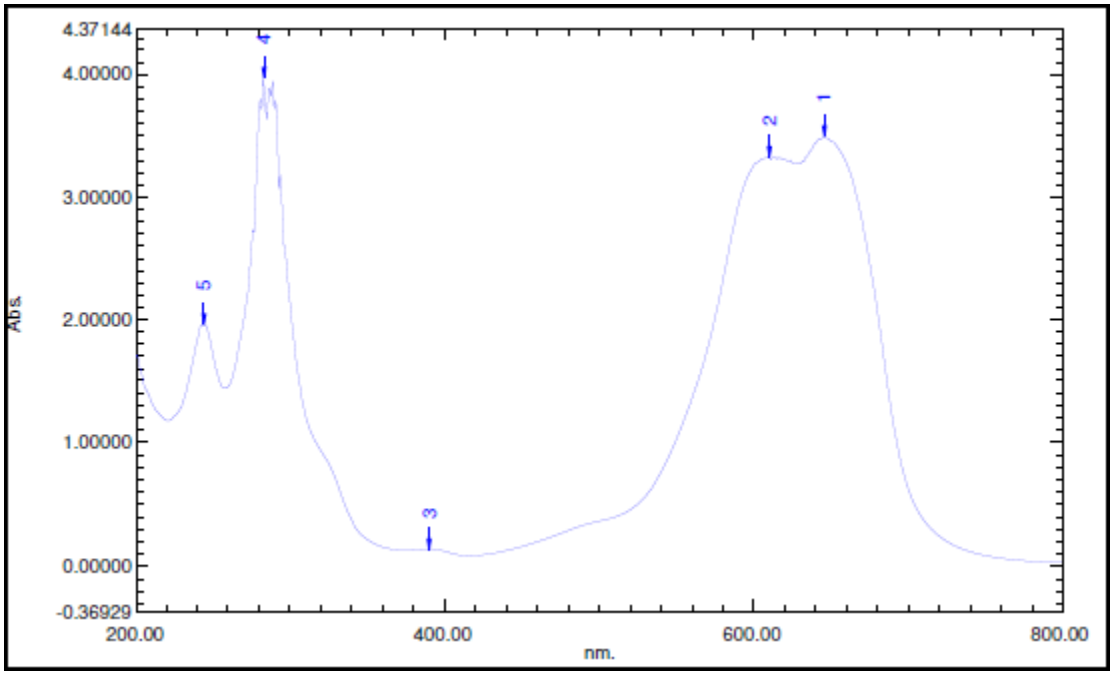


Figure 23: UV Spectrum of 0.6 mg of A.C (after 40 min)

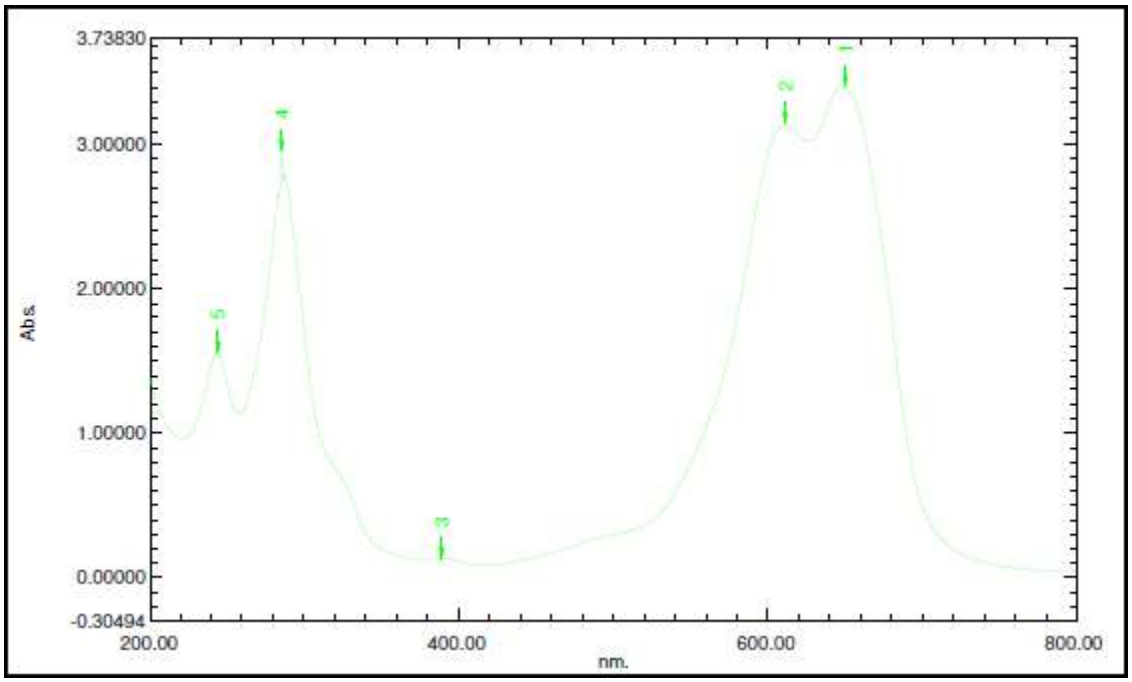


Figure 24: UV Spectrum of 0.8 mg of A.C (after 40 min)

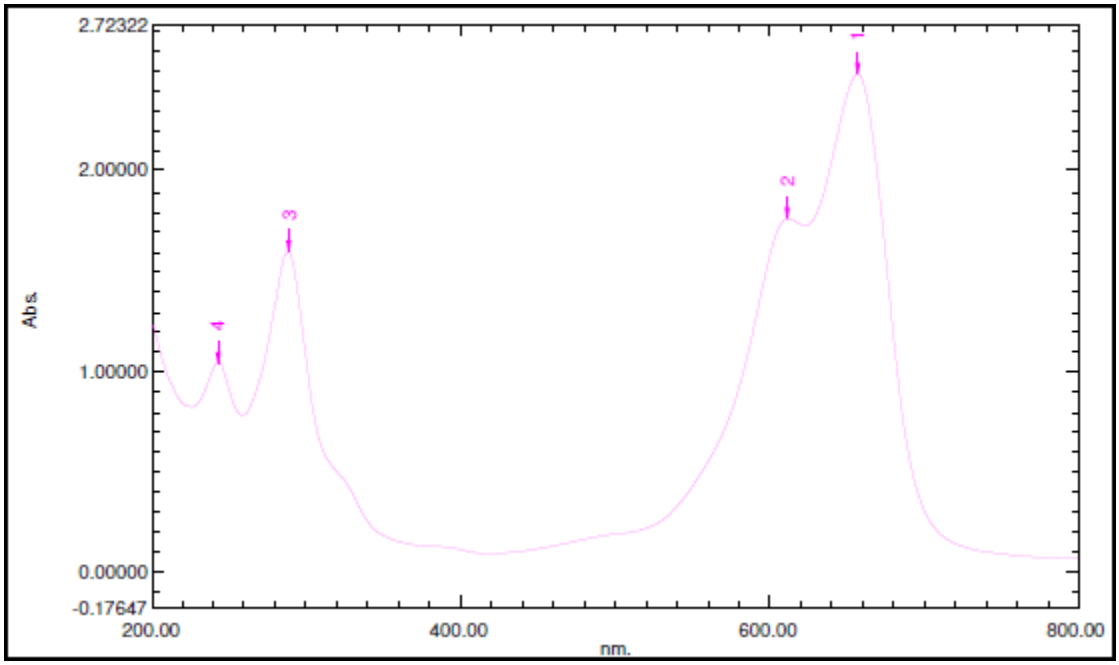


Figure 25: UV Spectrum of 1.0mg of A.C (after 40 min)

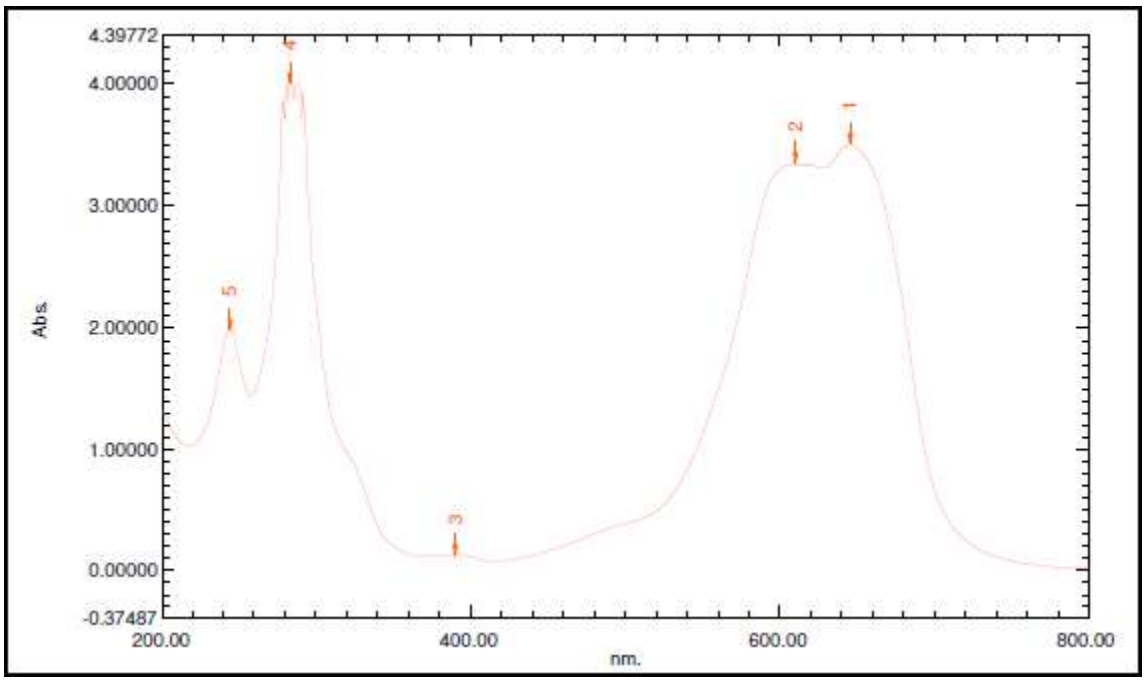


Figure 26: UV Spectrum of 0.2 mg of A.C (after 50 min)

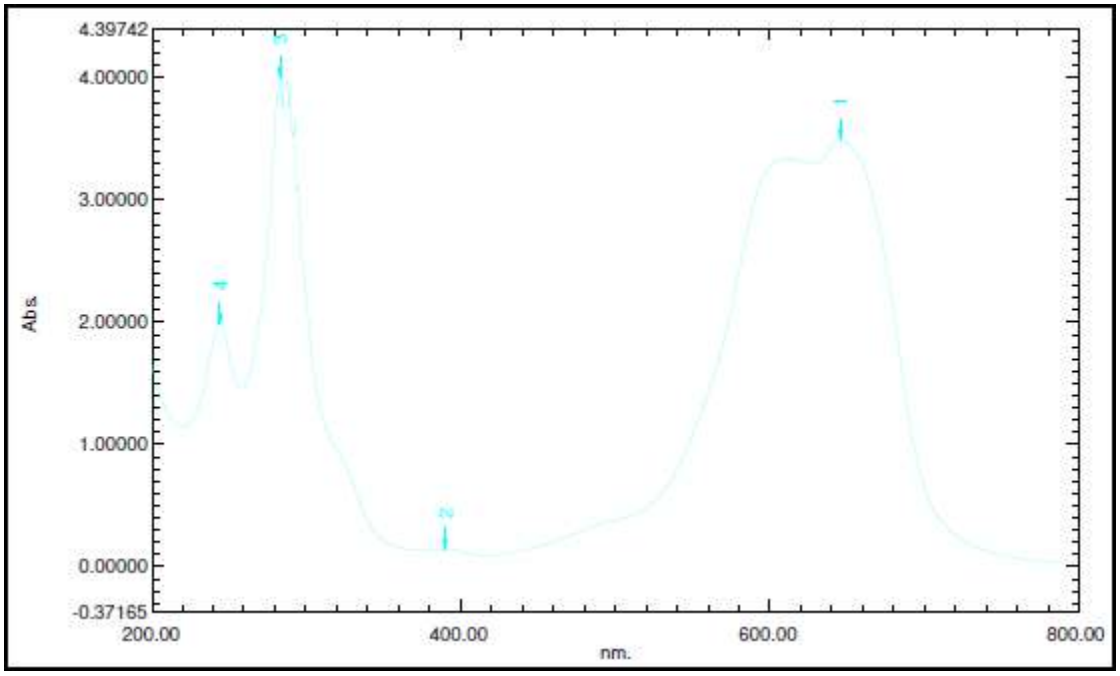


Figure 27: UV Spectrum of 0.4 mg of A.C (after 50 min)

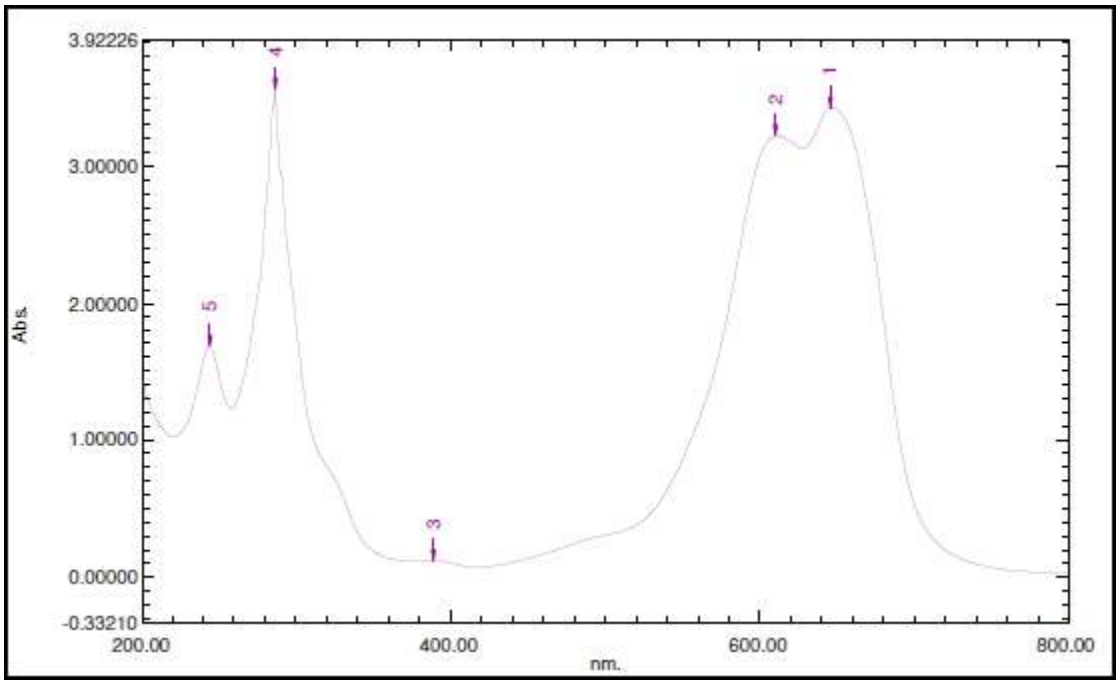


Figure 28: UV Spectrum of 0.6 mg of A.C (after 50 min)

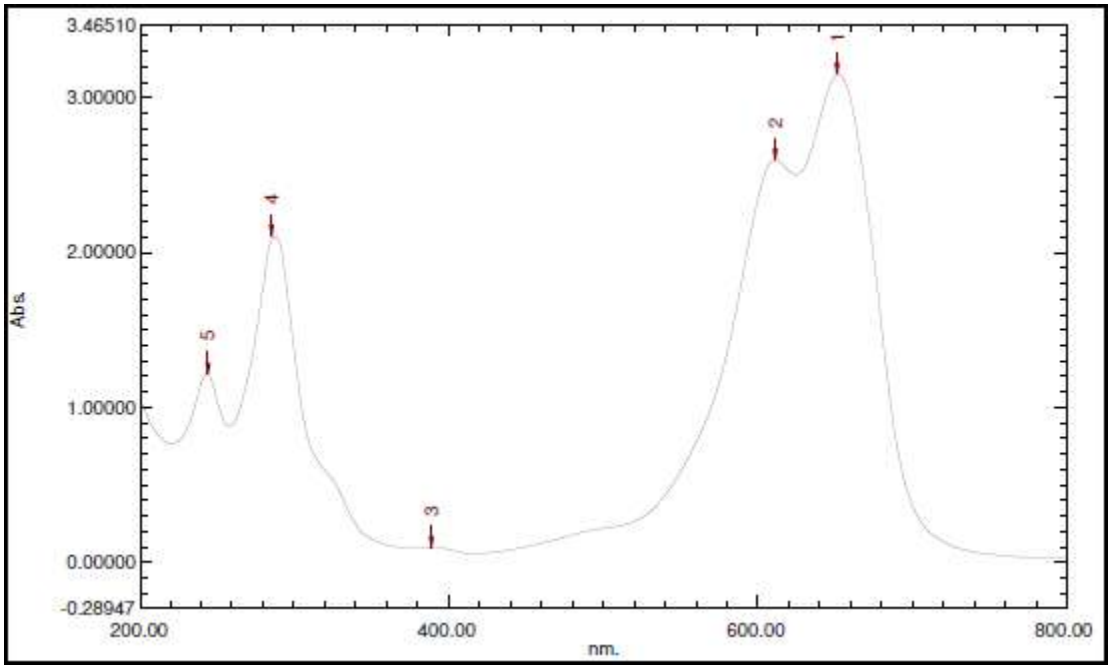


Figure 29: UV Spectrum of 0.8 mg of A.C (after 50 min)

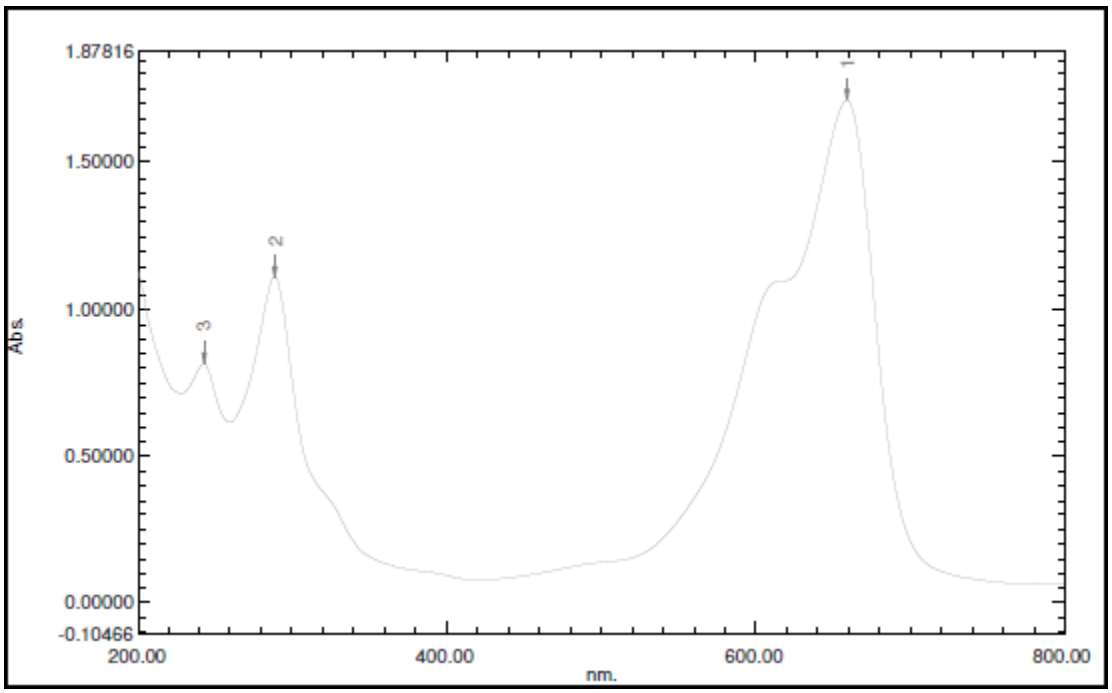


Figure 30: UV Spectrum of mg of A.C (after 50 min)

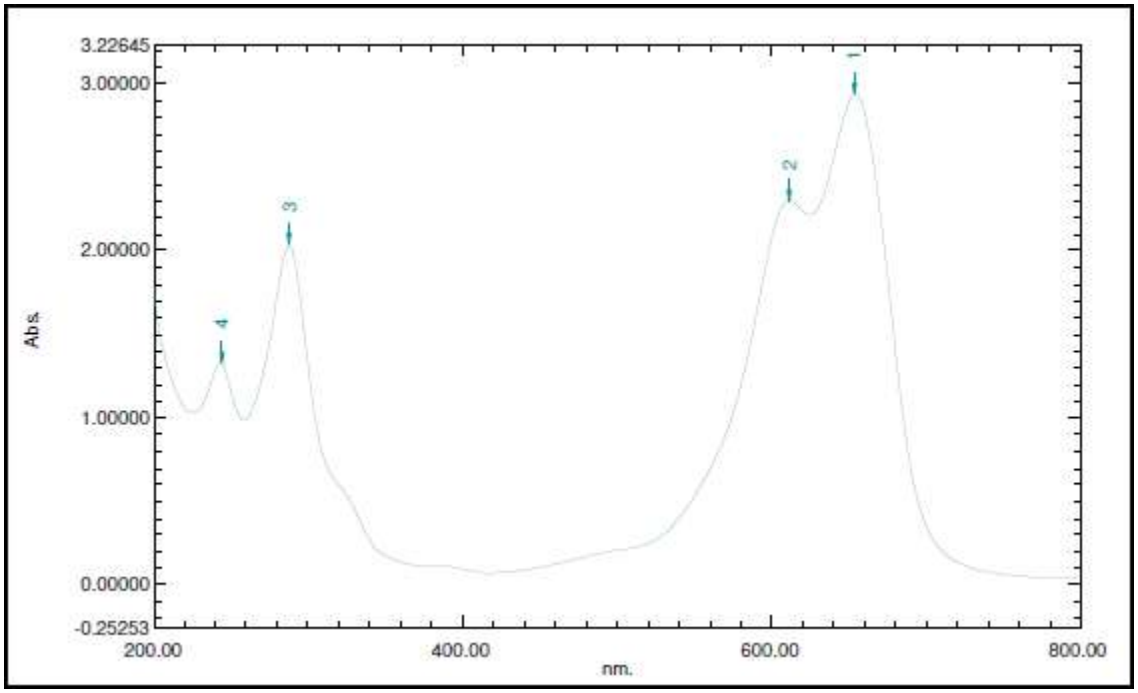


Figure 31: UV Spectrum of 1.2 mg of A.C (after 50 min)

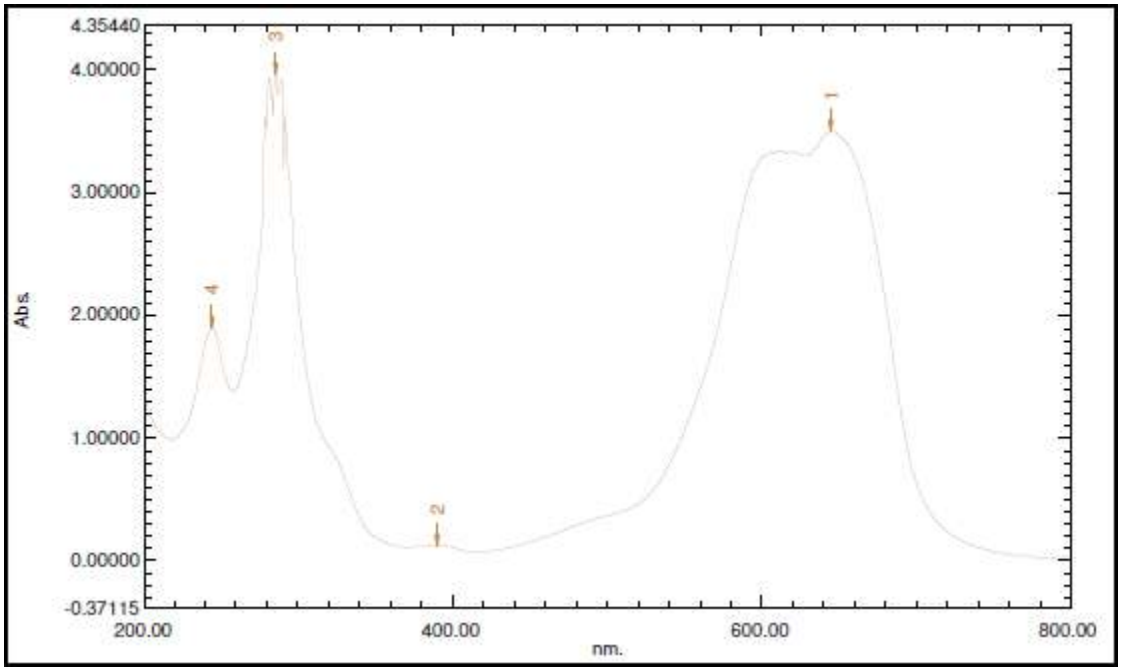


Figure 32: UV Spectrum of 0.2 mg of A.C (after 1 hour)

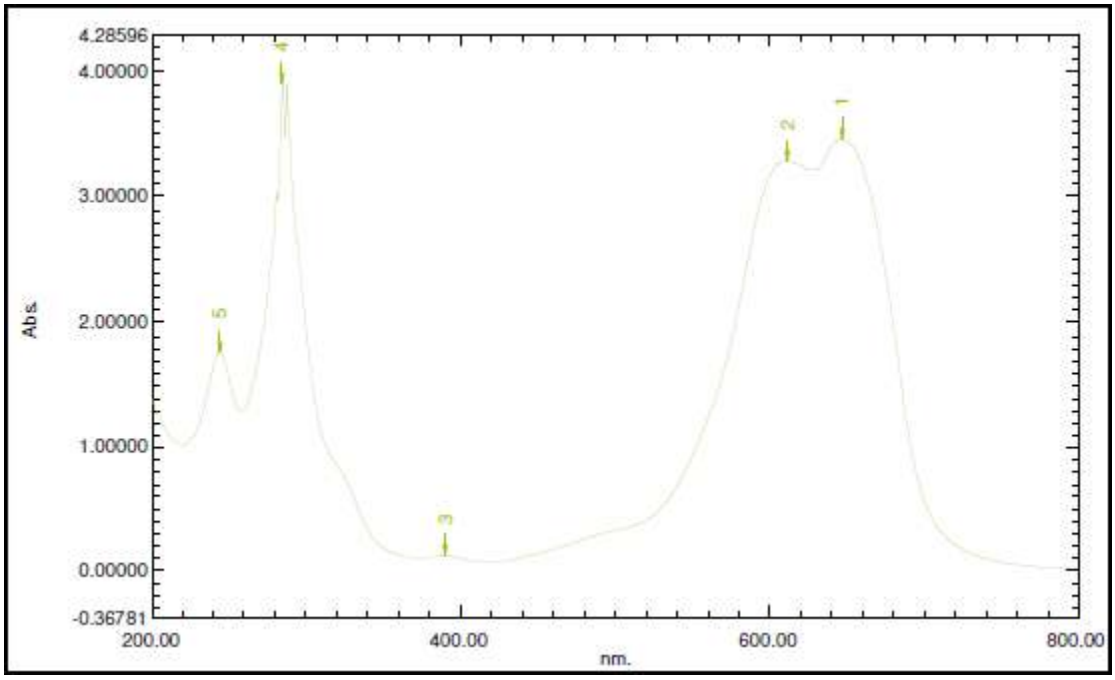


Figure 33: UV Spectrum of 0.4 mg of A.C (after 1 hour)

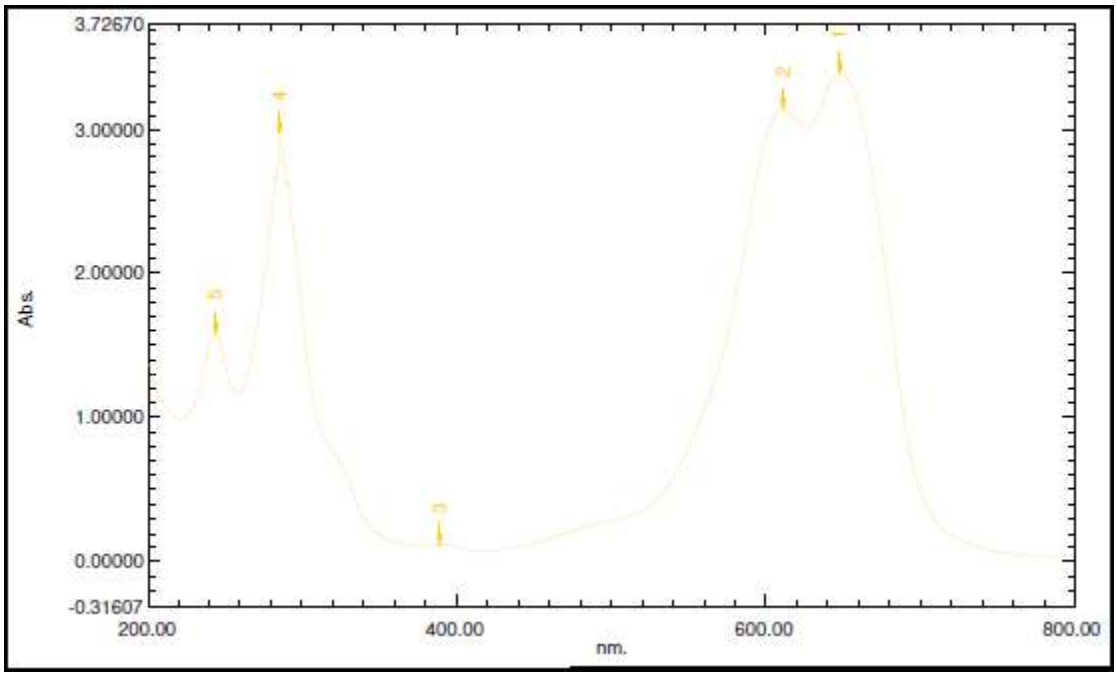


Figure 34: UV Spectrum of 0.6 mg of A.C (after 1 hour)

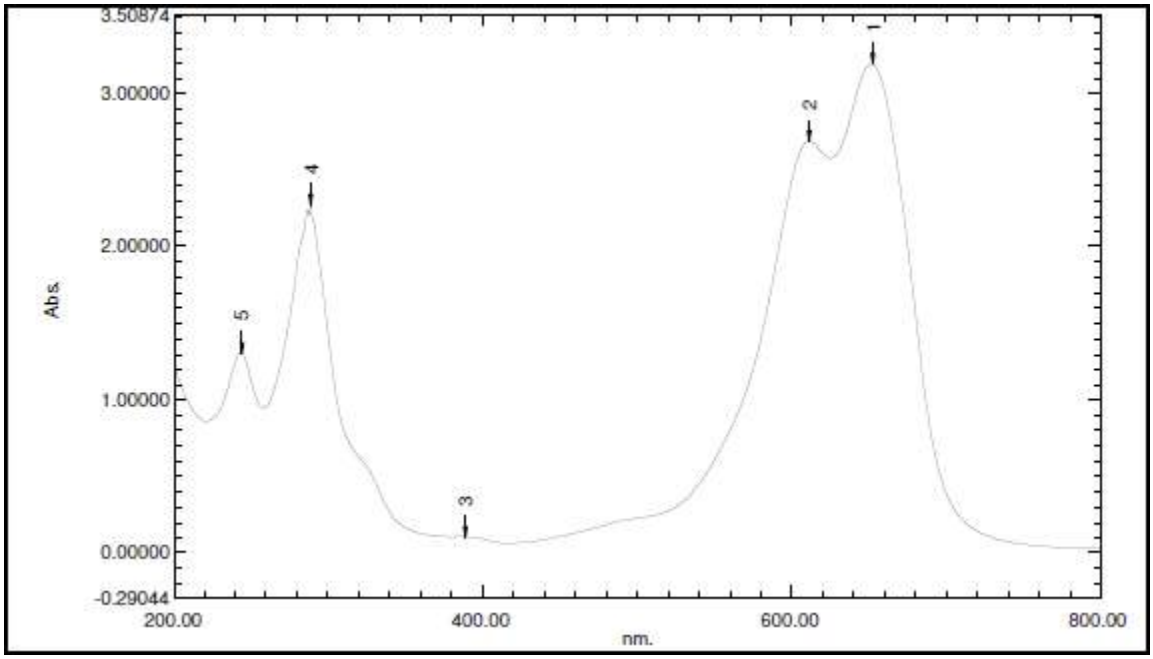


Figure 35: UV Spectrum of 0.8 mg of A.C (after 1 hour)

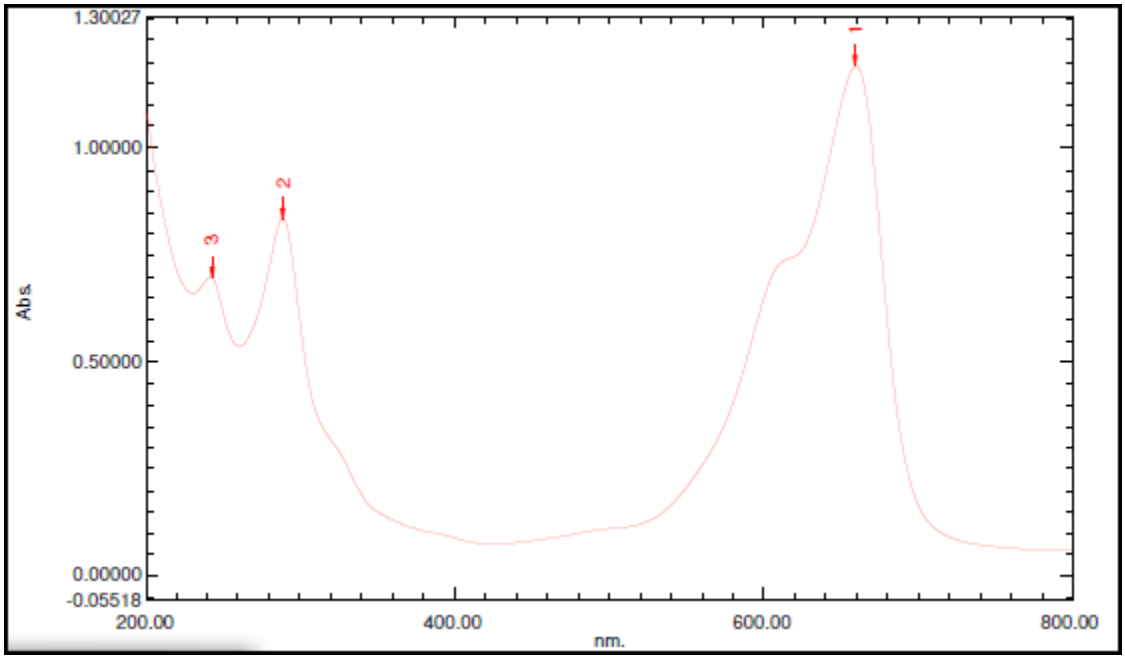


Figure 36: UV Spectrum of 1 mg of A.C (after 1 hour)

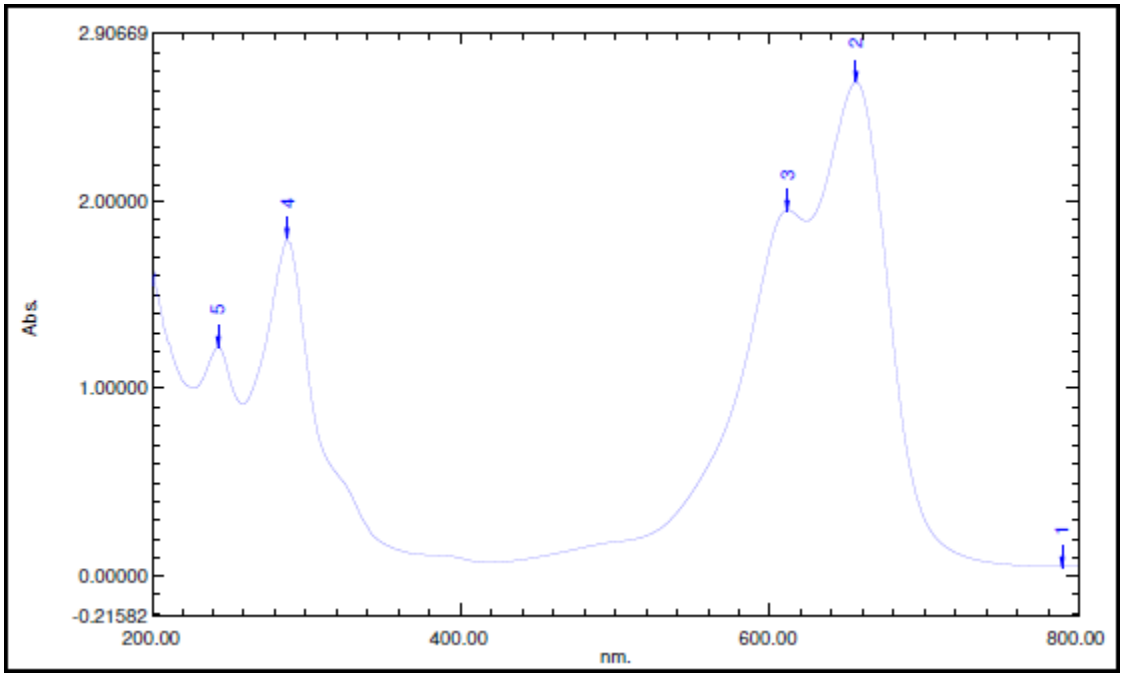


Figure 37: UV Spectrum of 1.2 mg of A.C (after 1 hour)

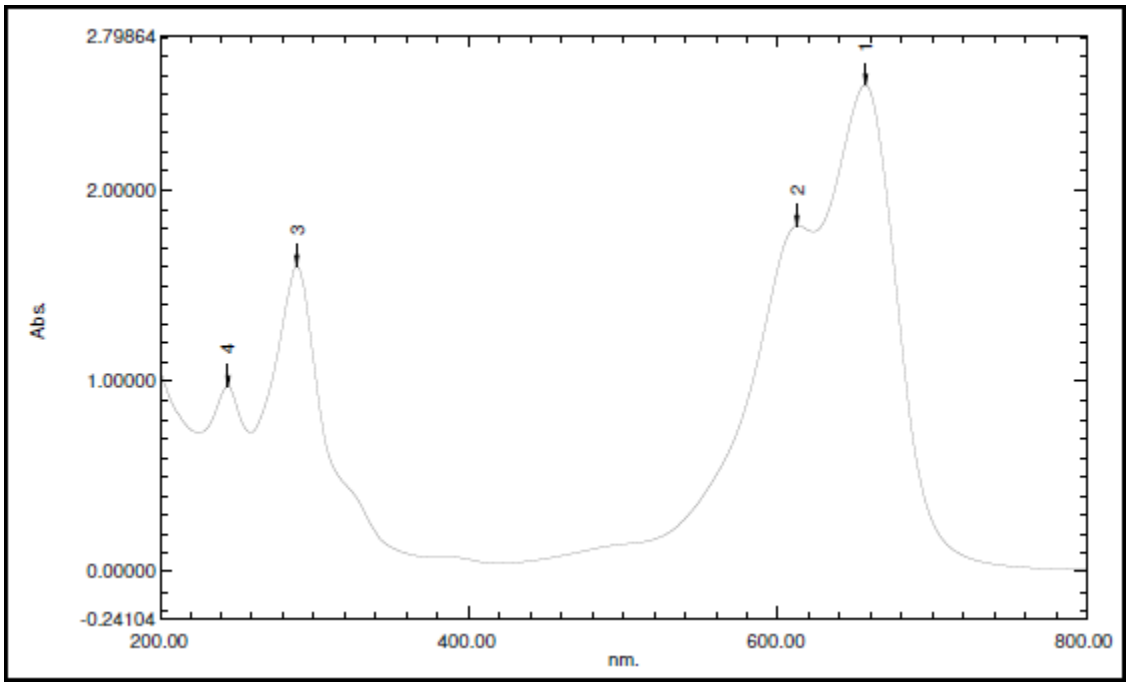


Figure 38: UV Spectrum of 0.2 mg of A.C (after 2 days)

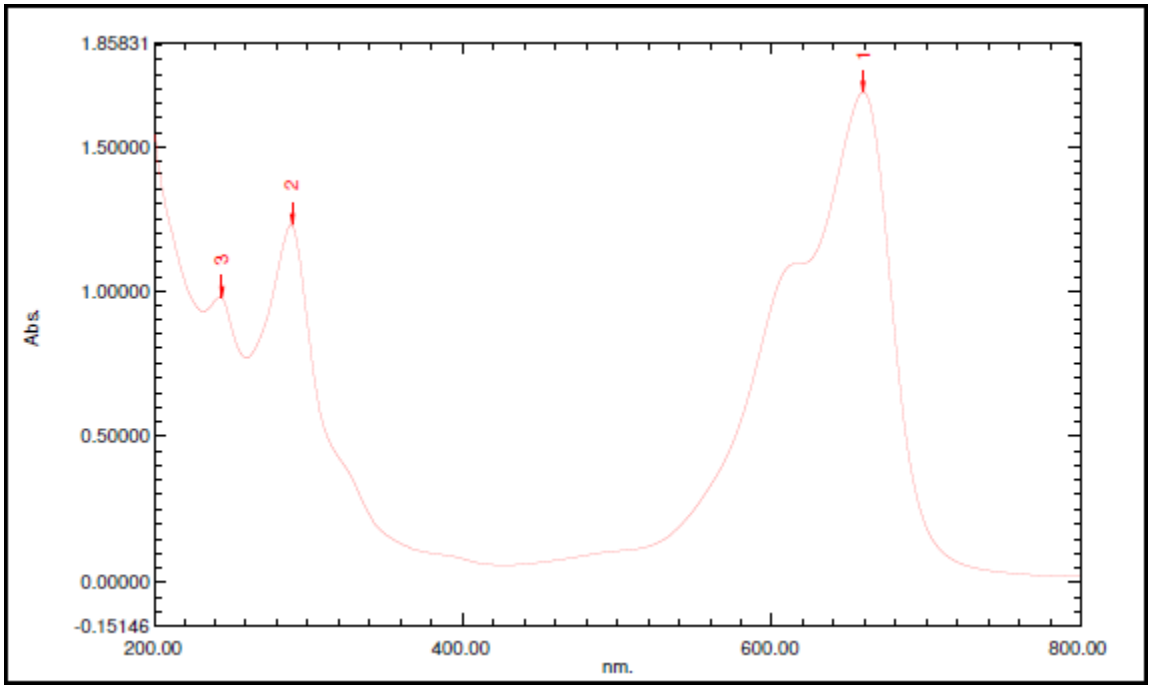


Figure 39: UV Spectrum of 0.4 mg of A.C (after 2 days)

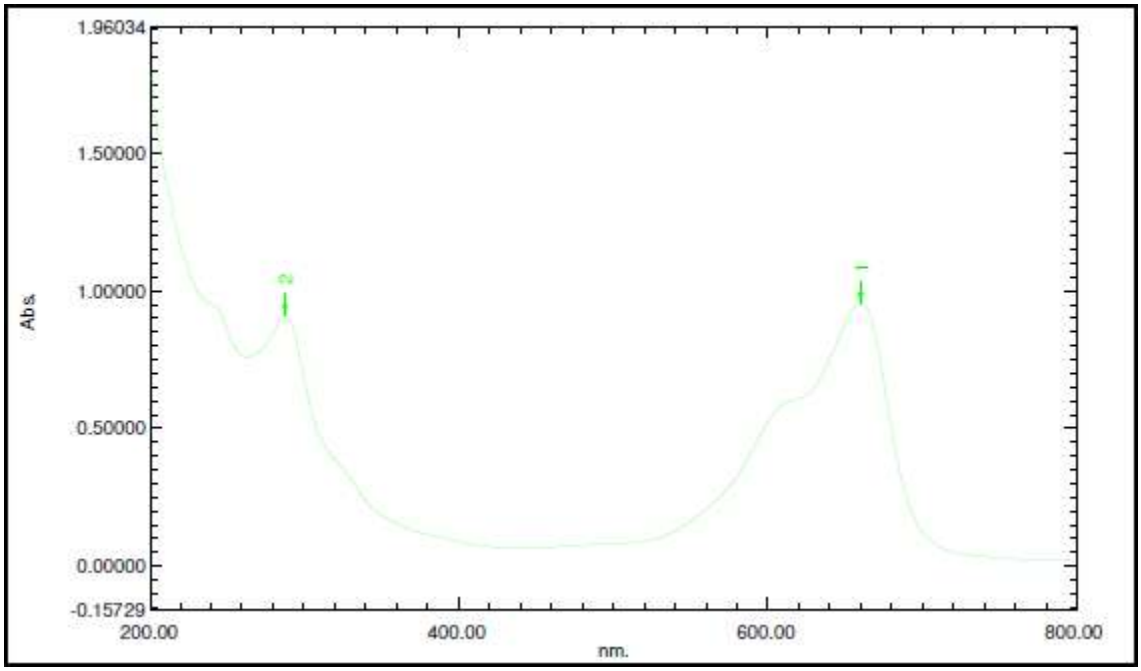


Figure 40: UV Spectrum of 0.6 mg of A.C (after 2 days)

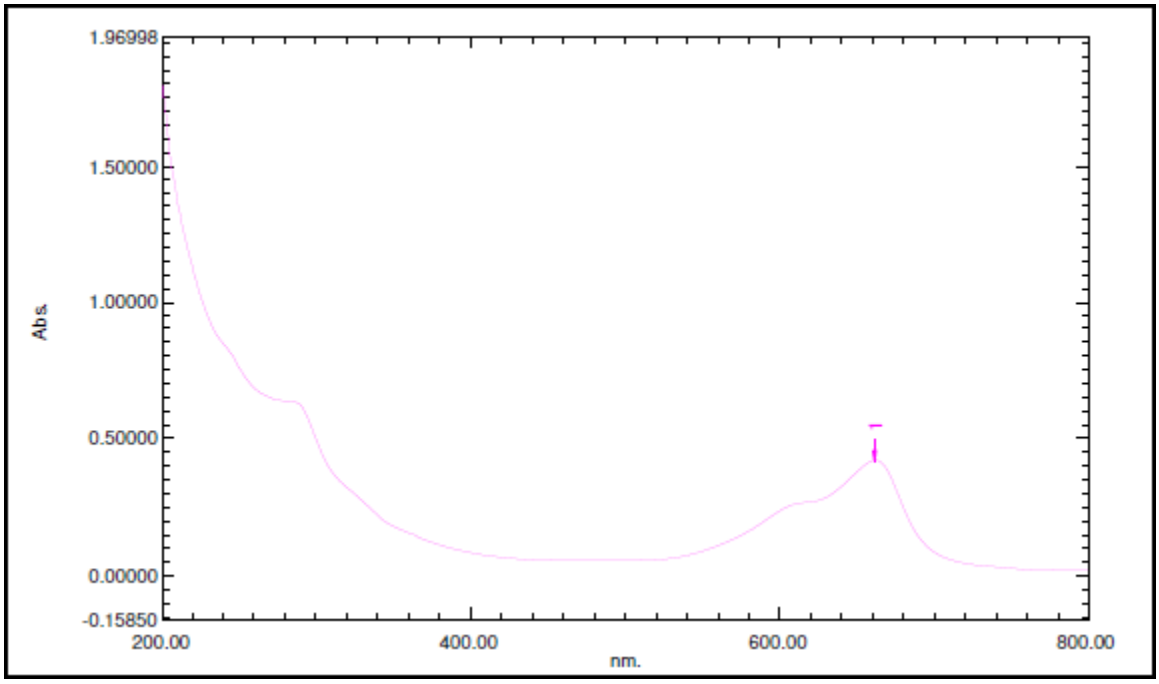


Figure 41: UV Spectrum of 0.8 mg of A.C (after 2 days)

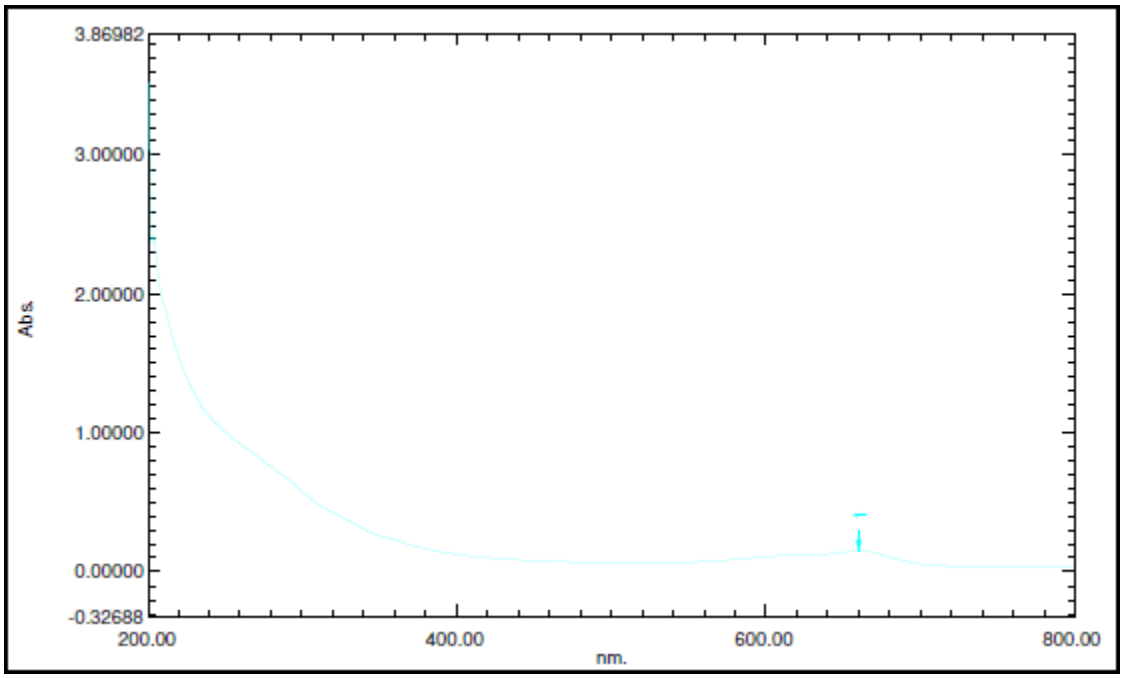


Figure 42: UV Spectrum of 1.0mg of A.C (after 2 days)

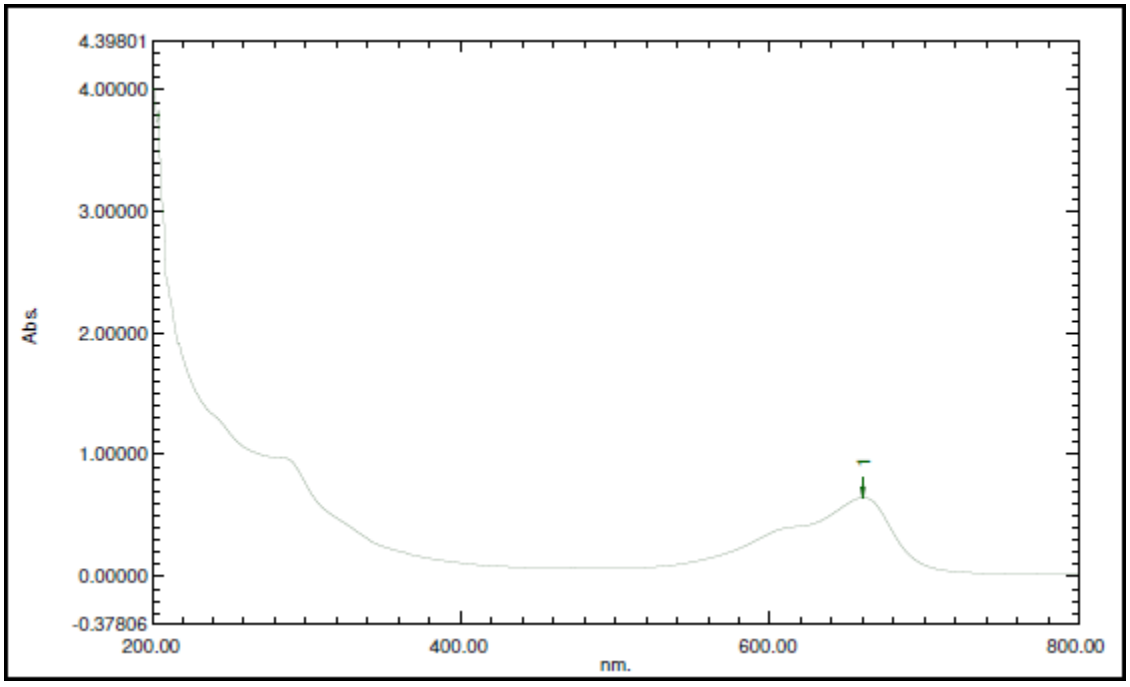


Figure 43: UV Spectrum of 1.2 mg of A.C (after 2 days)

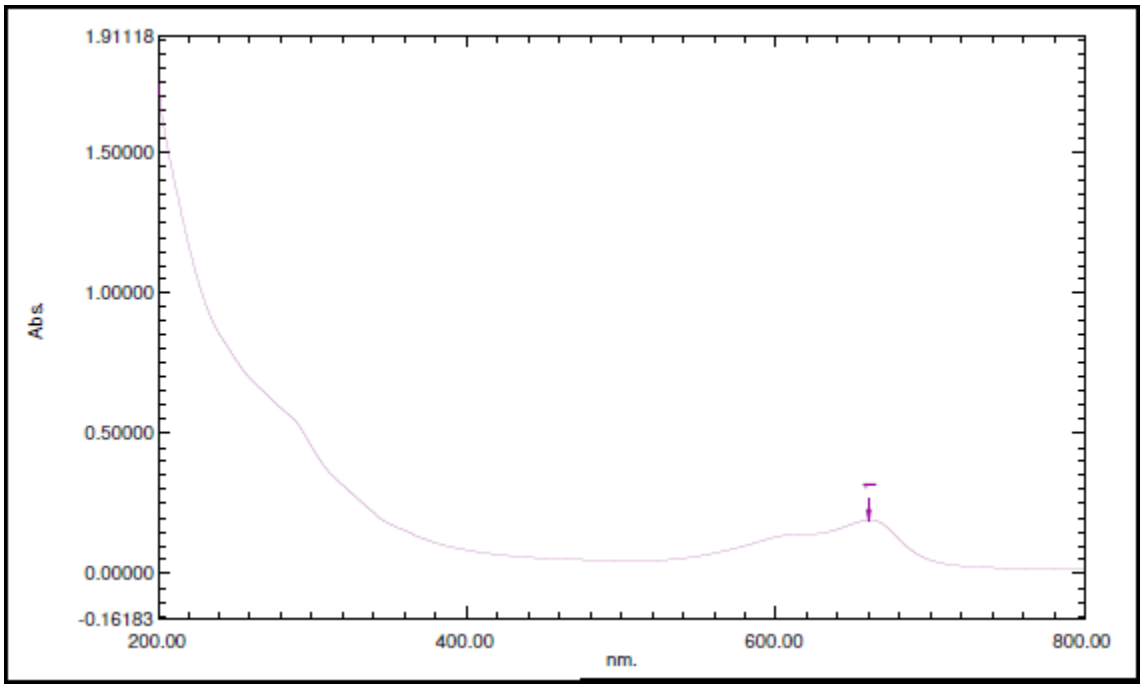


Figure 44: UV Spectrum of 0.6 mg of A.C (after 5 days)

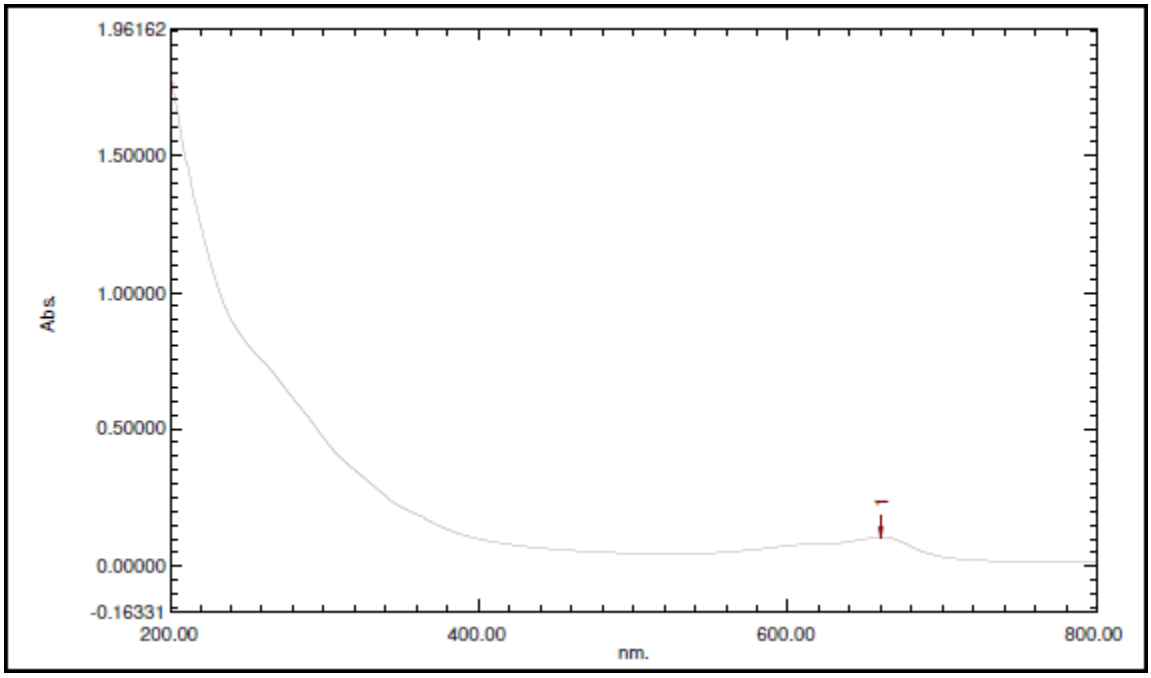


Figure 45: UV Spectrum of 0.8 mg of A.C (after 5 days)

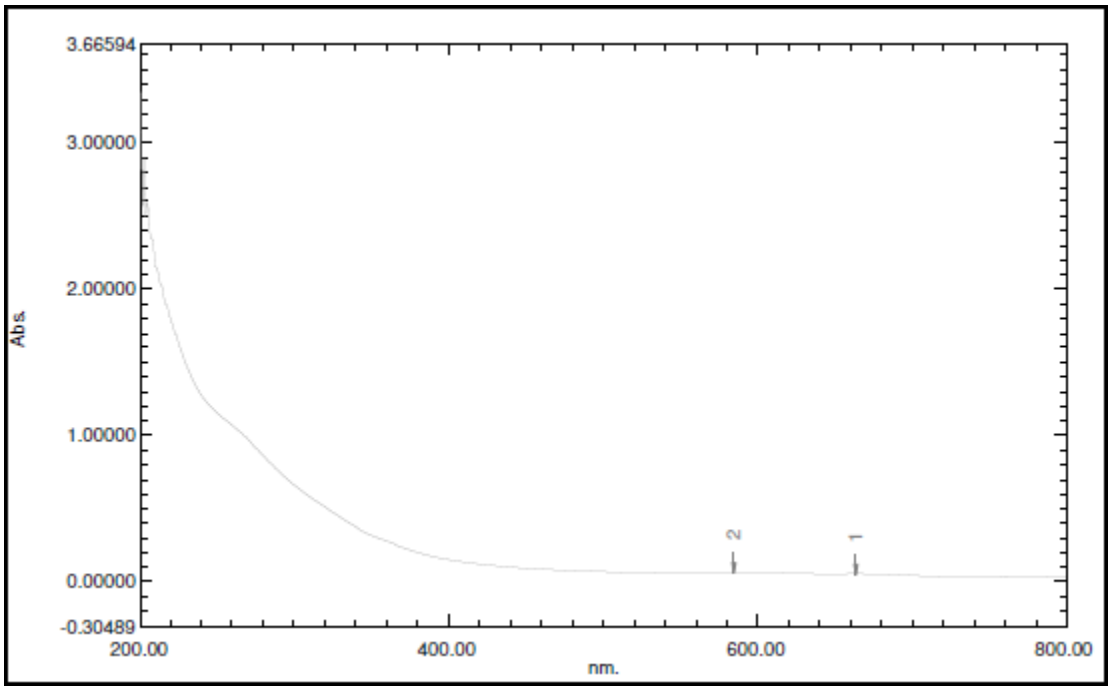


Figure 46: UV Spectrum of 1.0 mg of A.C (after 5 days)

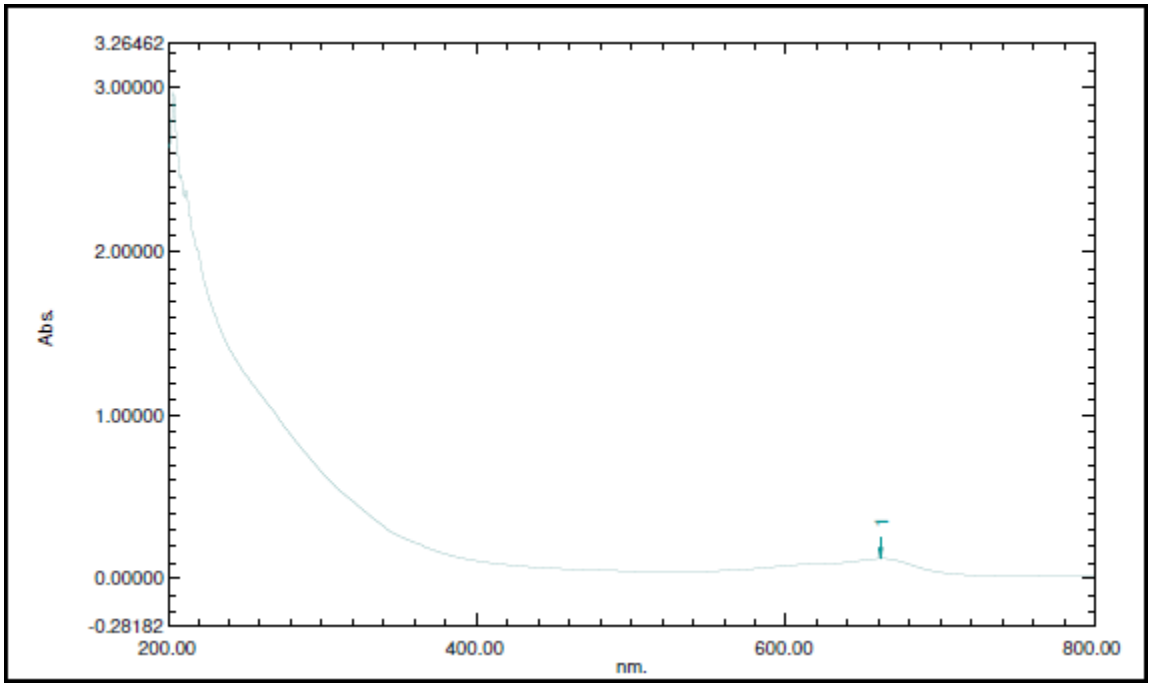


Figure 47: UV Spectrum of 1.2 mg of A.C (after 5 days)

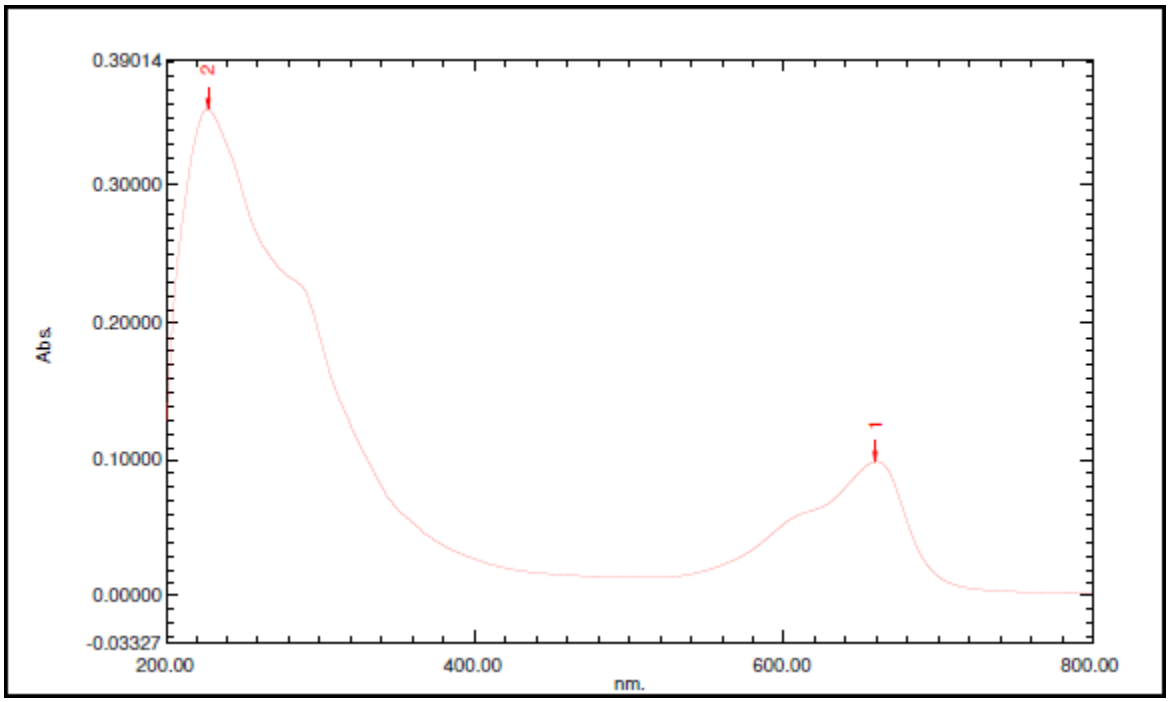


Figure 48: UV Spectrum of 0.2 mg of A.C (after 11 days)

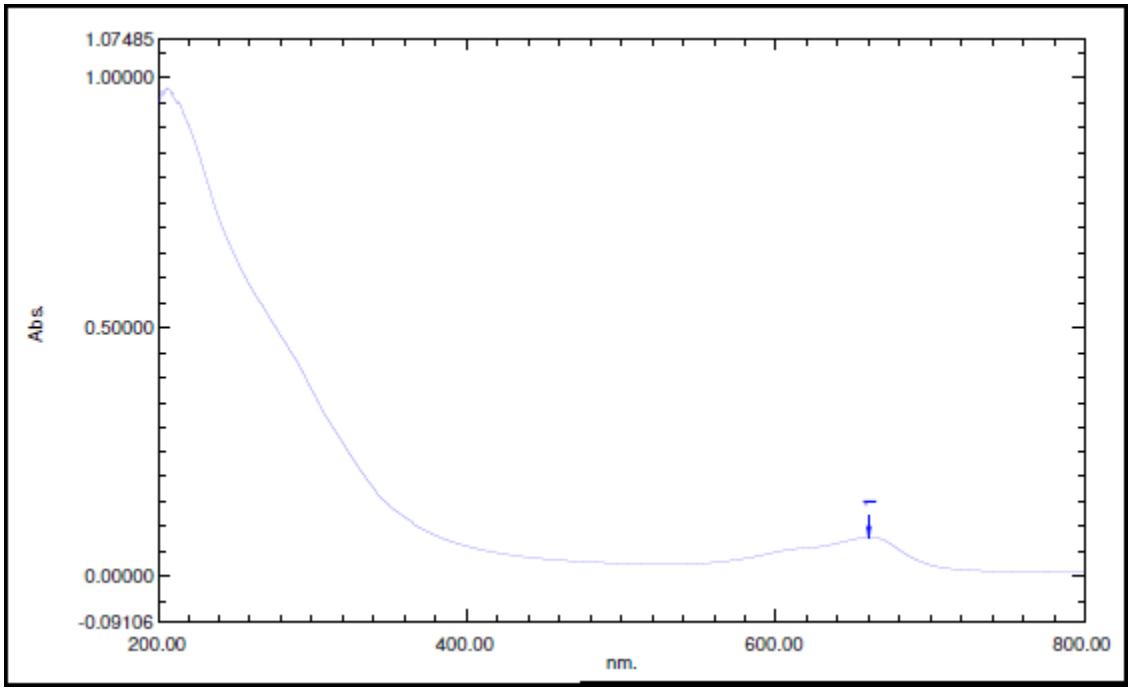


Figure 49: UV Spectrum of 0.4 mg of A.C (after 11 days)

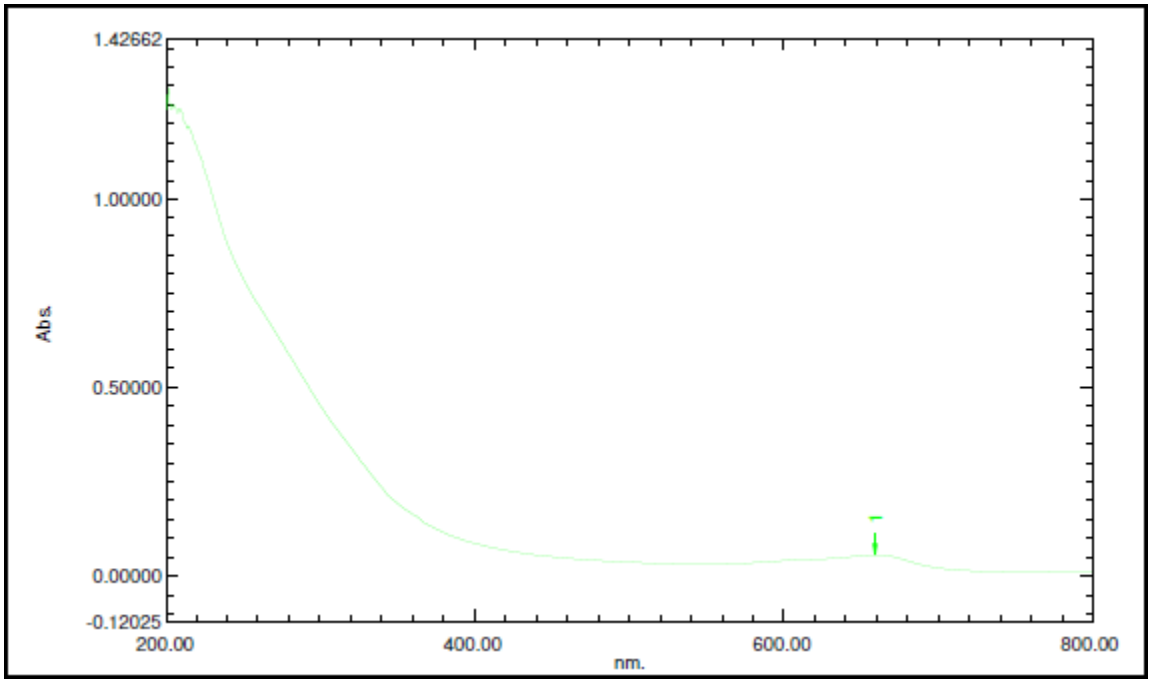


Figure 50: UV Spectrum of 0.6 mg of A.C (after 11 days)

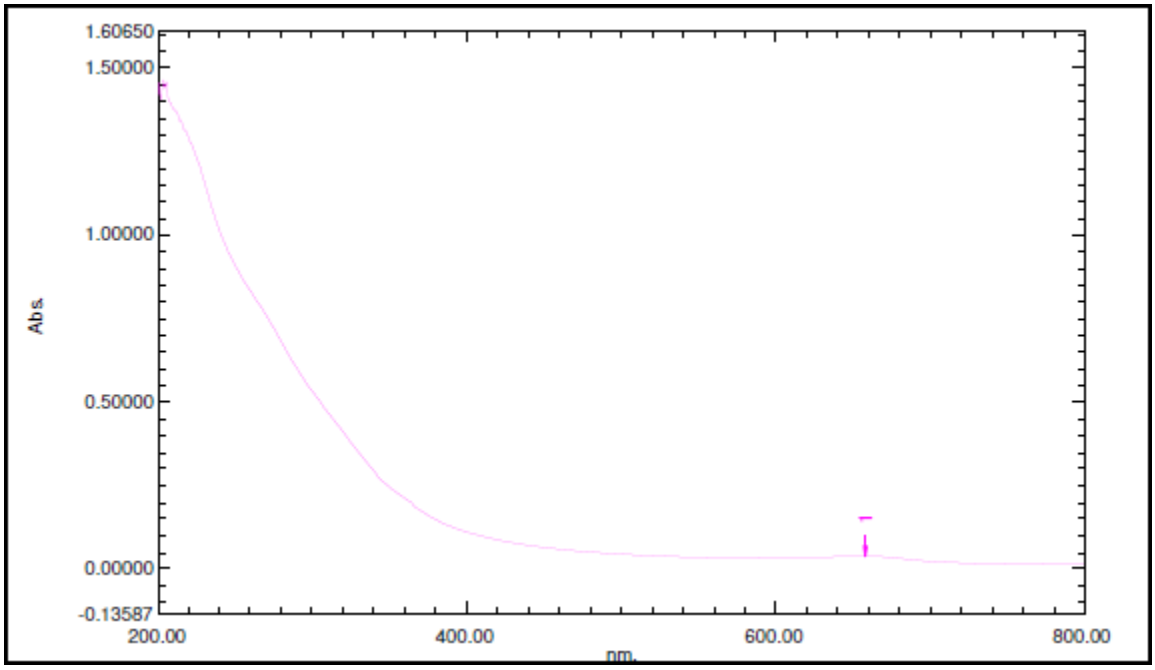


Figure 51: UV Spectrum of 0.8 mg of A.C (after 11 days)

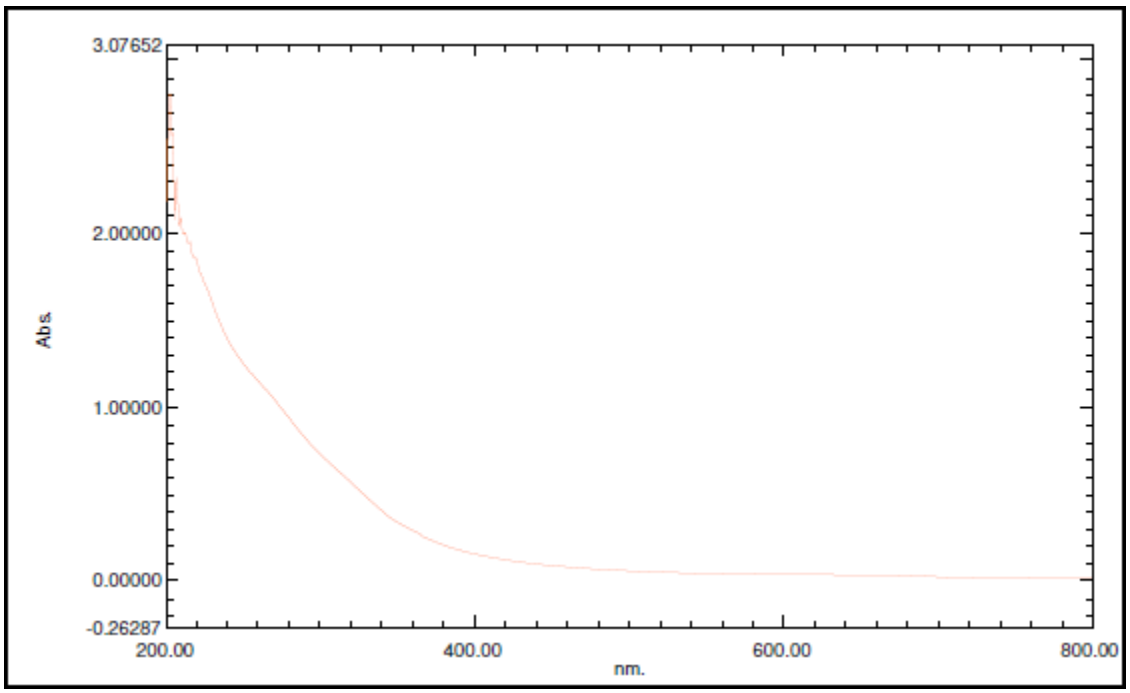


Figure 52: UV Spectrum of mg of A.C (after 11 days)

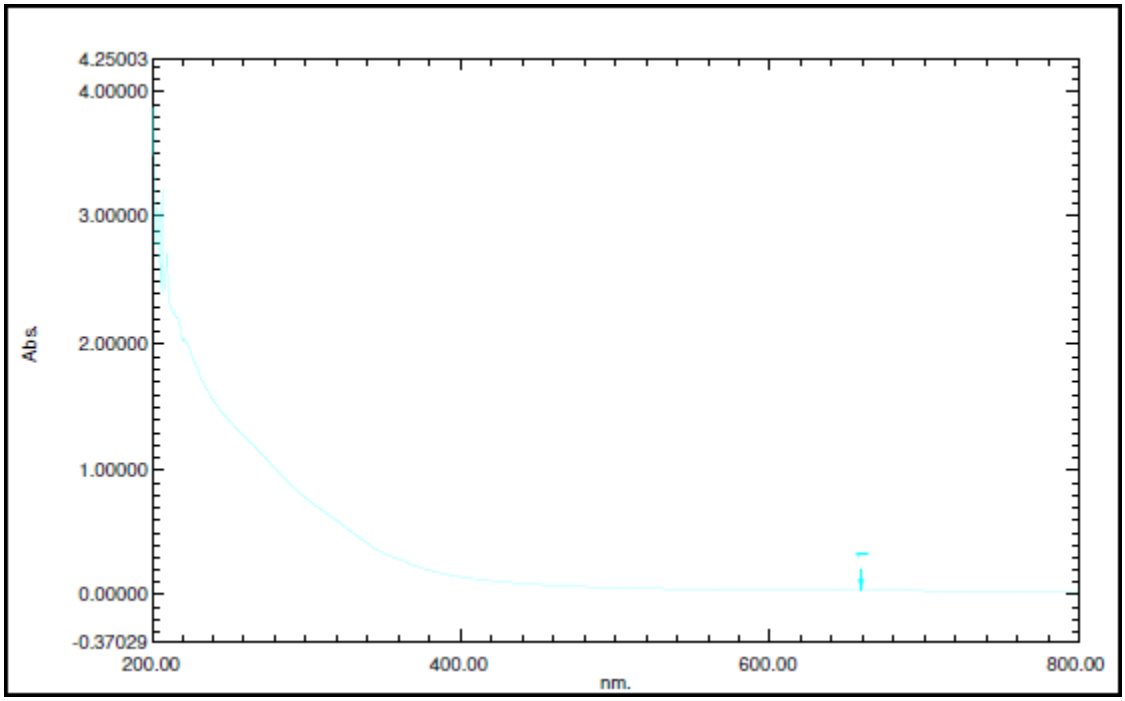


Figure 53: UV Spectrum of 1.2 mg of A.C (after 11 days)

Discussion on IR:

Infrared spectroscopy is used for the analysis of Infrared light which is interacting with a molecule. With the help of IR we can find out the structure, presence of functional group.

Characterization Table:

IR peaks (in $cm^{-1)}$	ν (P-H_2) 2362cm^{-1}, ν(P=O)stretch.1320-1140cm^{-1}, ν (O=P-OH)broad 2725-1600 cm^{-1}, ν(P-CH_3) asym stretch.1371 cm^{-1}, ν (P-O-C) 800 cm^{-1} ν(=C-H) 3284cm^{-1}, ν (C=O) 1686 cm^{-1}, ν (C=C) 1592cm^{-1} .

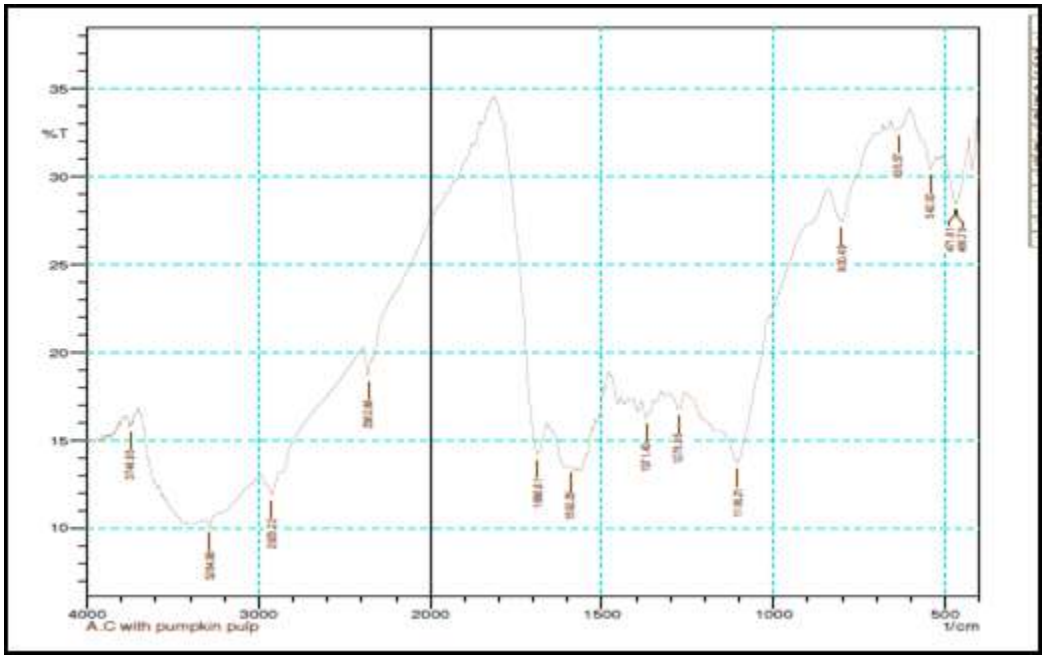


Figure 54: IR spectrum of Activated Carbon

OBSERVATIONS AND CALCULATIONS:

To Check Hardness Formula Used:

Hardness =Volume of EDTA *N* 50*1000/Sample water

Observations:

Time (in min)	**TDS (in ppm)**	**Volume Of EDTA used (in ml) (Final – Initial)**	**Hardness**
Blank	323	3.1 – 0 = 3.1	310
0 min	459	4.5 - 0.6 = 3.9	390
10 min	458	8.5 – 4.5 = 4	400
20min	462	12.2 – 8.5 = 3.7	370
30min	459	16 – 12.2 = 3.8	380
40 min	461	11.5 – 8.5 = 3	300
50 min	460	14.6 – 11.5 = 3.1	310

1 hour	449	18.2 – 14.6 = 3.6	360
1 hour 10 min	458	21.4 – 18.2 = 3.2	320

Observation for Ash Content:

Weight of Crucible (in gm)	**Weight of crucible with Sample(in gm)**	**Weight of crucible after 1hr30 min(in gm)**
52.284	53.287	53.089

Formula used:

Ash % = (Ash weighed / Oven dry weigh) * 100

= (0.198 / 1.003) * 100

= 19.74%

Observation for determination of Iodine Number:

For Blank Solution(in ml)	**Initial**	**Final**	**Volume Used**
	30.2 ml	32.1 ml	1.9 ml
For Sample Solution (in ml)	1.4 ml	2.5 ml	1.1 ml

Formula Used:

$$\% \text{ Iodine} = \frac{\text{Vol. of } Na_2S_2O_3H \text{ for blank - Vol. of } Na_2S_2O_3 \text{ for sample} * 100}{\text{Vol. of } Na_2S_2O_3 \text{ for blank}}$$

$$= \frac{1.9 - 1.1 * 100}{1.9}$$

= 42.10 %

CHAPTER 4

CONCLUSION

Activated carbon is prepared from pumpkin pulp using phosphoric acid and it has been observed that it removes the dye present in water sample whereas without activated carbon it is not possible.

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