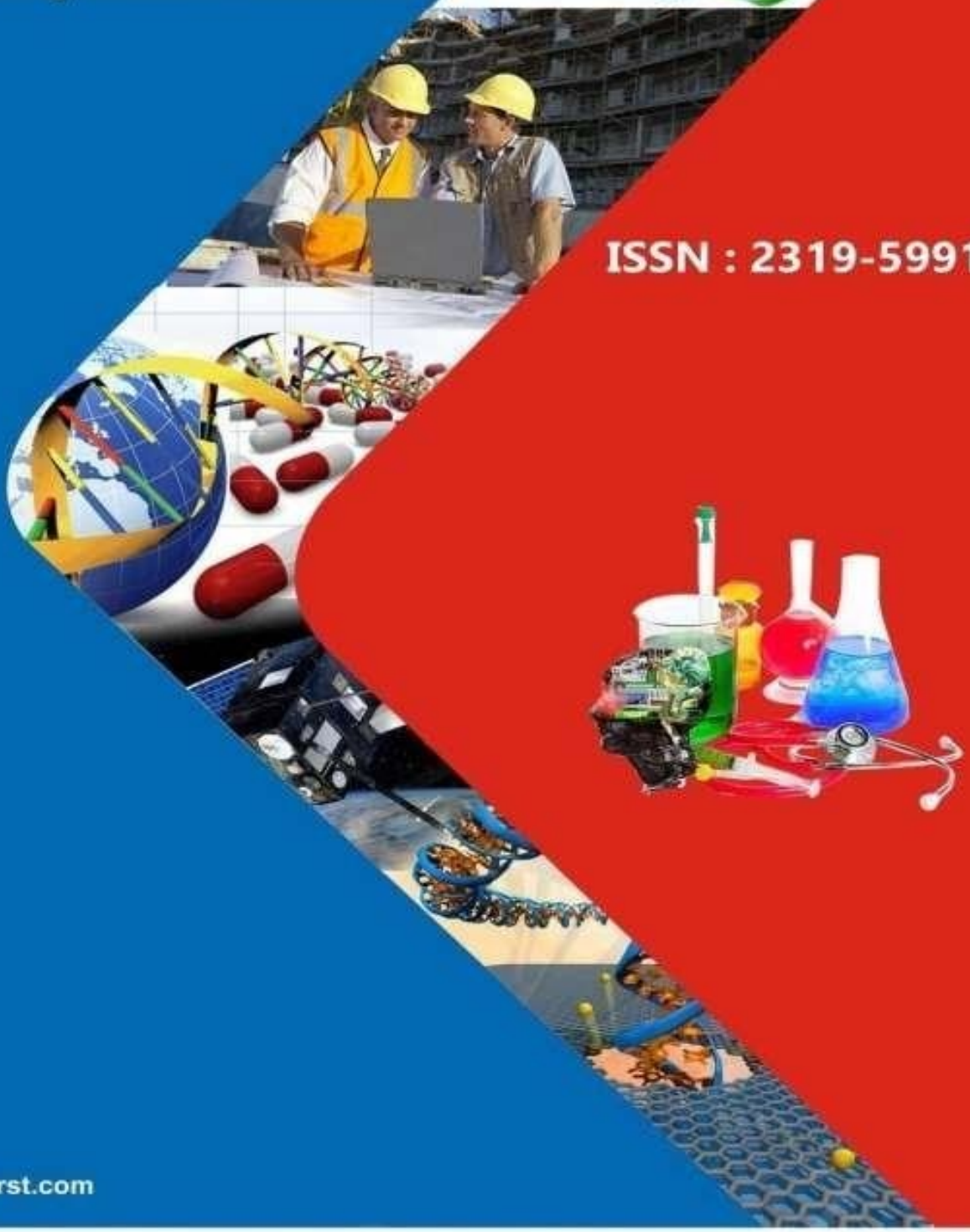
International Journal of Engineering Research and Science & Technology

IJERST

ISSN : 2319-5991



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International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com
Vol. 20, Issue 2, 2024

Evaluating the Antisolar Activity of Calotropis Gigantea Leaf Extracts in Different Solvents: A Comparative Study

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Abstract:

A higher flavonoid concentration was found in the solvent extract of Calotropis gigantea (leaf) in the current phytochemical investigation and anti-solar activity. Using diffused transmittance and a UV-visible range of around 200-400 nm, this chemical substance's photoprotective ability was assessed using UV visible spectrophotometry. The whole spectrum of ultraviolet light may be absorbed by these extracts. All of the solvent extracts tested in this investigation demonstrated excellent UV absorption capabilities across the board. So, a broad spectrum sunscreen may make use of this characteristic to absorb the whole UV range. Instead of using dangerous chemicals, this is a great option for contemporary industry.

Keywords: Calatropisgigantea, Flavonoid, UVradiation, anti-solar.

1. Introduction:

All forms of life would be severely limited in their ability to function in an ideal environment in the absence of plants. According to the traditional claims made by Ayurvedic practitioners, modern researchers are putting a premium on studying the efficacy of different plants and plant components in combating various ailments [1]. People have employed medicinal plants for a wide range of ailments since ancient times, and their popularity is only growing. Currently, medicinal plants are in high demand. Plants have long been seen as a vital resource for pharmaceuticals; in fact, many of the medications sold today originate from medicinal plants. Without a question, plants are vital to ecosystems because of the services they provide. In comparison to their synthetic counterparts, plant-based medications have a number of advantages, the most important of which are their lower cost, greater therapeutic efficacy, and relative safety. The pharmaceutical business relies heavily on natural resources for medication research, and more than half of today's medications come from these sources. The foundation for human illness treatment is natural compounds derived from minerals, plants, and animals. Everyday life and health rely on herbal plants. Their use dates back to ancient times and continues into the modern day.
Many of the negative consequences, such as photocarcinogenesis, photoaging, and photosensitivity, are caused by ultraviolet radiation, which has a shorter wavelength than visible light. Sunburns, wrinkles, lowered immunity to infection, rapid ageing, cancer, and free radicals or reactive oxygen species are some of the negative effects of skin absorbing UV radiation. Therefore, UV protection and preventive measures are necessary [2]. The primary way that ultraviolet light causes skin damage is by creating reactive oxygen species (ROS), which then modify proteins and lipids via interactions. The ultraviolet (UV) spectrum is further subdivided into three bands: (200-280 nm), (280-320 nm), and (320-400 nm). UVA isn't as bad as UVB, but it still cause skin damage [3]. Sunscreens are intended to prevent ultraviolet (UV) radiation and provide extra protection against them. Limiting sun exposure during noon, wearing protective clothes, and using sunscreens have been recommended as photo avoidance strategies by the medical profession and other health care providers. Some have hypothesised that people may spend more time in the sun than necessary due to the widespread belief that sunscreens protect them from sunburn and the subsequent

International Journal of Engineering Research and Science & Technology
ISSN 2319-5991 www.ijerst.com
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encouragement of their usage. Unfortunately, the majority of sunscreens only include chemicals that block UV-B rays, the most dangerous kind of solar radiation. Sunscreens, even those that claim to be broad-spectrum, may only provide little protection against UV-A rays. Protecting skin from the sun's damaging ultraviolet (UV) radiation is the primary function of sunscreens. There are two main types of sunscreens: chemical absorbers and physical blockers. Physical blockers deflect or scatter high-intensity UV rays, but chemical absorbers soak them up. Agvobenzone, padimate O, octisalate, and octocrylene are chemical compounds that are known to be absorbers. Titanium dioxide and zinc oxide are examples of physical blockers [4].

Because of their potential to heal and cure dermatological problems while also improving skin appearance, natural products are still used. Multiple herbal compounds have shown promise as anti-solar agents in previous research. Flavonoids, phenolic compounds, and herbal oils are the mainstays of UV protection because of their antioxidant activity and ability to absorb UV radiation in the UV-A area. In comparison to their synthetic counterparts, plant-based medications have a number of advantages, the most important of which are their lower cost, greater therapeutic efficacy, and relative safety.To protect all skin types from sun damage, there are a variety of chemical and botanical formulations available.India, Indonesia, Malaysia, Thailand, Sri Lanka, and China are among the many Asian nations where the traditional medicinal plant Calotropis gigantea grows. It is a member of the Asclepiadaceae family. Milkweed and laticiferous shrub are two names for it. This plant may reach a maximum length of 2-4.3 metres [5].

Its milky stem and oval, light-green leaves are easily recognisable. There are a number of medical uses for the commonly accessible calotropis gigantea in India. In traditional medicine, C. gigantea has a long list of medicinal uses, including the relief of paralysis, swellings, asthma, catarrh, anorexia, inflammations, fever, intestinal worms, cough, bronchitis, and dyspepsia. The plant's leaves and aerial portions have antibacterial and anti-Candida properties, and they're used to treat external swellings and diarrhoea [6]. An examination of the extract's phytochemical composition revealed the presence of many categories, including phenolic chemicals, glycosides, phytosterols, tannins, alkaloids, and saponins. Based on these findings, it seems that Calotropis gigantea leaves might be to control C. tritaeniorhynchus and C. gelidus mosquitoes, employed as a natural source for the creation of a novel, safe, potentially effective, and environmentally friendly pesticide [6]. The skin disease, intestinal worms, leprosy, and leucoderma were all treated with the plant's stems; leprosy, asthma, cough, elephantiasis, rheumatism, and diarrhoea were all alleviated with the roots; swelling and joint pain were treated with the latex and leaves; paralysis was treated with oil massage; and purgation was accomplished with the juice of Calotropis [7]. The antioxidant and anti-inflammatory activities of Calotropisgigantea have been shown in previous research, which has shown the presence of proteases, glycosides, flavonoids, and phenolic compounds.[8]

Scientific classification:

Kingdom - Plantae

Subkingdom-Viridiplantea

Infrakingdom- Streptophyta

Superdivision-Embryophyta

Division - Tracheophyta

Subdivision -

Spermatophytina Class -

Magnoliopsida

Order - Gentianales

Family -Apocynaceae

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com
Vol. 20, Issue 2, 2024

Sub-family -Asclepiadoideae

Genus - Calotropis

Species -Calotropisgigantea

According to many studies, some plant leaf extracts contain anti-solar characteristics. For example, Gadhave et al. found that the aqueous extract of Psidiumguajava leaves had a higher flavonoid content, according to phytochemical examinations and anti-solar activities [9].The capacity to absorb UV radiation was found by Gharge et.al. in an ethanolic extract of Moringaoleifera leaves. Plants with shown anti-solar activity are valuable assets for preventative anti-solar formulations [10], God Shiva According to Golmohammadzadehet.al, saffron may be used as an all-natural substance that absorbs ultraviolet light. An in vitro approach was used to determine that the 4% saffron lotion had an SPF value that was comparable to the 8% homosalate lotion reference. According to Chakrare M.B. et al., aqueous and ethanolic extracts of leaves of C. gigantea exhibited substantial absorption of UV radiation from 290 nm to 350 nm, however there were no statistically significant variations in skin moisture levels between the saffron lotions and the control base lotion that did not include saffron [11]. The absorption peak occurred between 360 and 400 nanometers. A number of dermatological products may benefit from plant extracts' capacity to absorb UV light [12]. In this investigation, we sought to determine if Calotropis gigantea leaves extracted using various organic solvents had any anti-solar action.

Materials:

Gathered from the Katol District of Nagpur were the leaves of the Calotropis gigantea. After being separated and screened, the Calotropisgigantea were rinsed with distilled water and allowed to dry at room temperature. After drying, the leaves were ground into a powder and kept in an airtight container. Nabira Mahavidyalaya, Katol's Department of Botany verified the plant specimens.

2. Extraction method:

The leaves of the Calotropis gigantea plant were carefully plucked and allowed to dry naturally in the open air. They stayed out of the direct path of the sun. A mortar and pestle were used to crush the dried Calotropis gigantea leaves.At room temperature, the powder sample was preserved in sterile, airtight containers until it was time for use.A 250 ml conical flask containing 10 mg of powder was mixed with 100 ml of ethanol using a magnetic stirrer. The mixture was then aggressively agitated.For the methanol, 1-butanol, and ethyl acetate solvents, the same steps were performed again. The mixture was mixed and filtered after standing for 48 hours. Additional analysis was then conducted using the solvent extracts.

3. Photochemical Examination:

Using the conventional methods, the leaves of Calotropis gigantea were subjected to phytochemical screening. Numerous solvent extracts were subjected to the standard flavonoid identification procedures. Lead acetate solutions were added to tiny amounts of each solvent extract, resulting in the formation of a yellow coloured precipitate. This analysis confirms the presence of flavonoids.

Sr. No.	Extract in solvent	Yellow Precipitate
1	Methanol	+
2	Ethanol	+
3	Ethyl acetate	+
4	1- Butanol	+

International Journal of Engineering Research and Science & Technology
ISSN 2319-5991 www.ijerst.com
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4. Antisolar Activity:

The UV absorption spectra of the Calotropis gigantea leaf extract were measured using a Shimadzu-1700 double beam UV-Visible spectrophotometer in the 200-400 nm wavelength range, using solvents including methanol, ethanol, 1-butanol, and ethyl acetate.

5. Results:

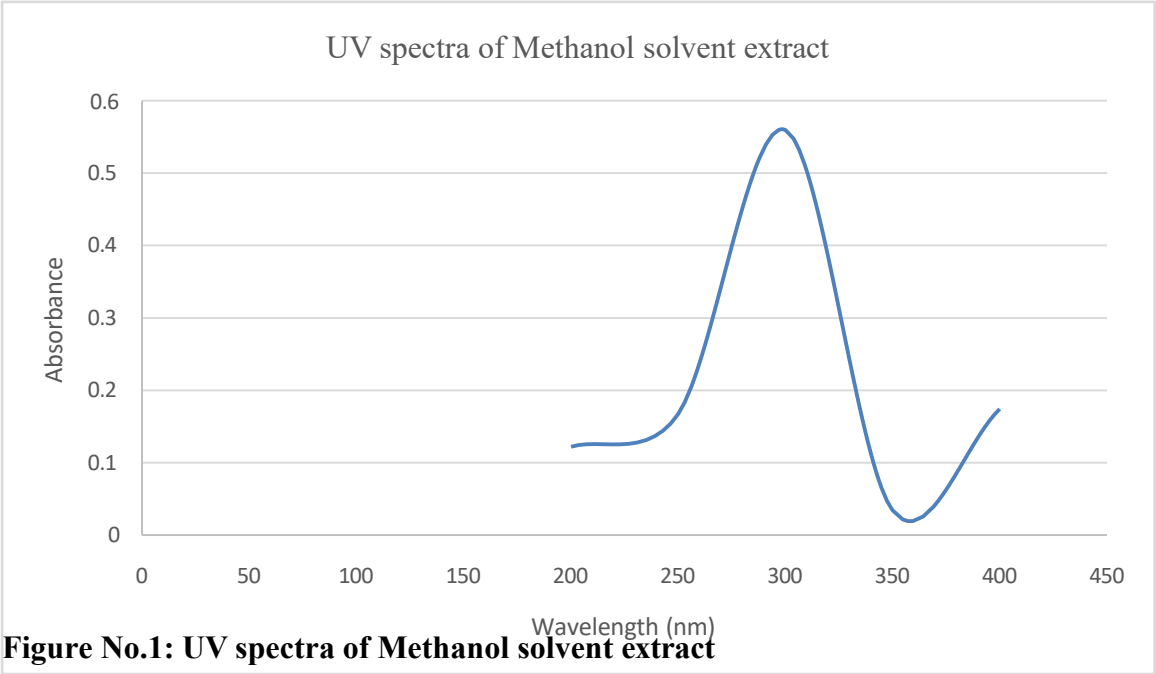


Figure No.1: UV spectra of Methanol solvent extract

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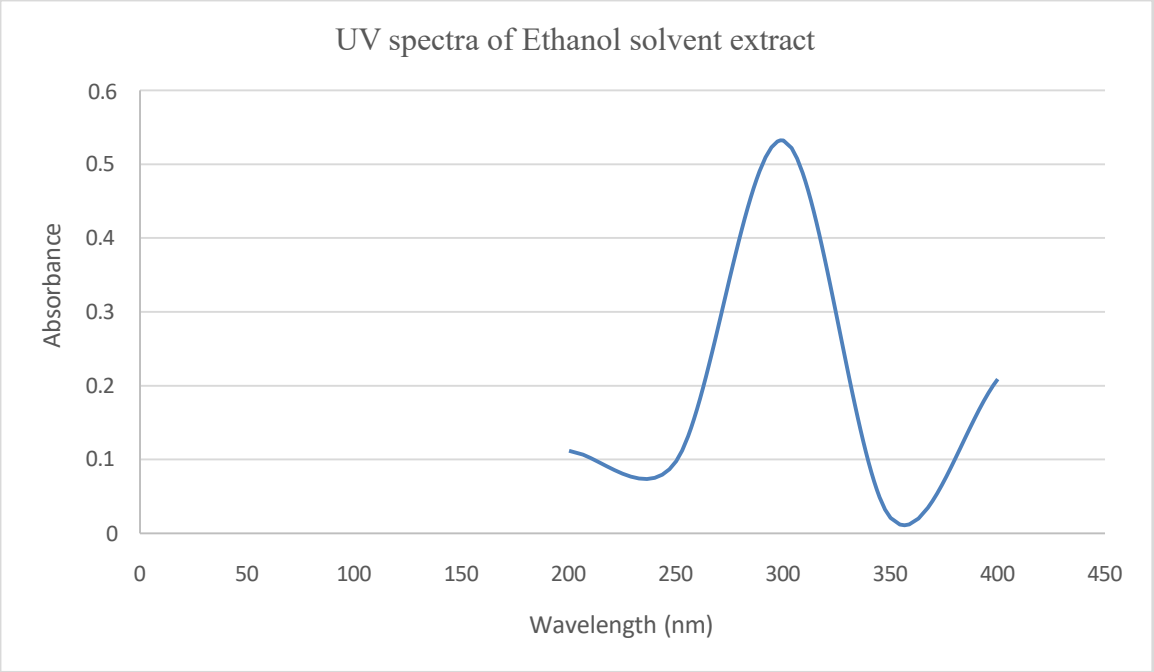


Figure No. 2: UV spectra of Ethanol solvent extract

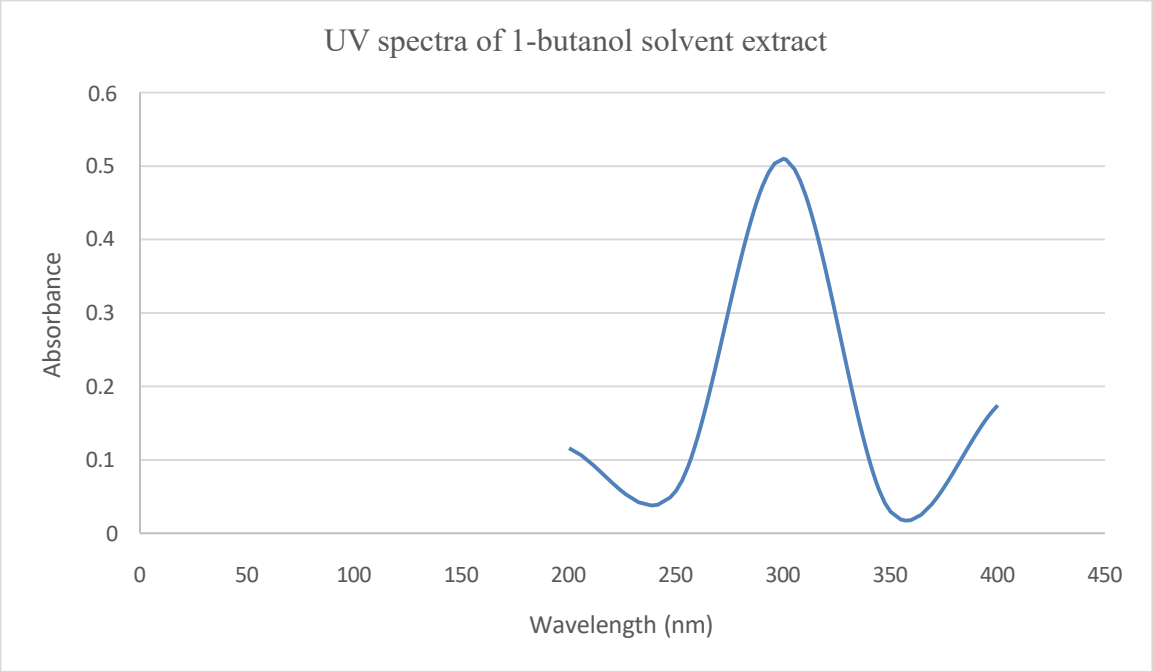


Figure No. 3: UV spectra of 1-butanol solvent extract

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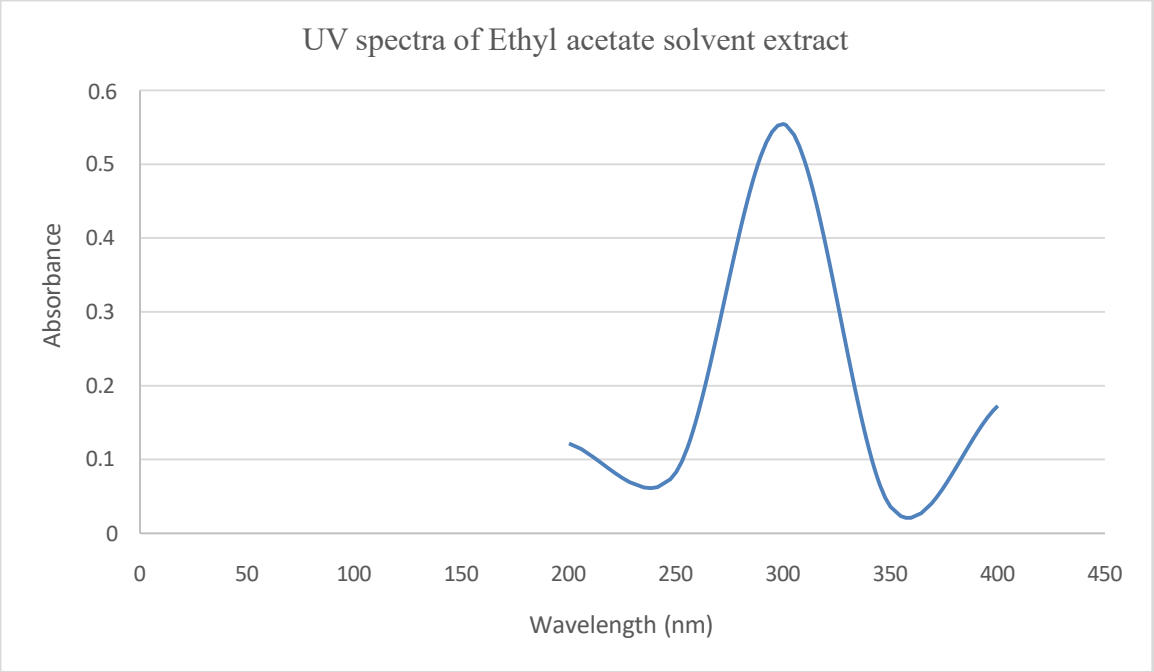


Figure No. 4: UV spectra of Ethyl acetate solvent extract

Methanol extract, ethanol, 1-butanol, and ethyl acetate all exhibited a prominent absorption peak in the 250–350 nm region of their UV scanning absorption spectra. The findings demonstrated that the extract could absorb UV light, proving that it might provide UV protection. Absorbance values between 250 and 350 nm were quite high for the extract. Between 200 and 250 nm, a considerable absorption was detected

6. Discussion:

One key feature for identifying flavonoids in their natural forms is their ability to absorb ultraviolet light.It is well-known that flavonoids have pharmacological effects. Colourful pigments called flavonoids are mostly found in plants like flowers and leaves. One of its crucial functions in plant defence is light absorption, which it uses to shield photosensitive compounds in leaves. The presence of flavonoids was confirmed by chemical testing of Calotropisgigantea leaf extracts in different solvents. The presence of flavonoids allowed for strong to moderate absorption of UV light, as seen in the data. Since flavonoids and polyphenols are more soluble in ethanol and methanol, these extracts of Calotropis gigantea leaves performed better than 1-butanol and ethyl acetate. UV light, which can damage DNA, causes plants to store phenolics and flavonoids in their dermal tissue. These compounds have great antioxidant and photoprotective qualities, making them a potential, safe, and effective sunscreen ingredient.

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ISSN 2319-5991 www.ijerst.com
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7. Conclusion:

The capacity to absorb UV radiation was shown by the ethanol, methanol, 1-butanol, and ethyl acetate extracts of Calotropis gigantea leaves, which exhibited strong antisolar activity. In comparison to the current industry standard of using potentially dangerous chemical sunscreens, this will be superior, less expensive, and safer. The effectiveness and safety of organic molecules derived from plants, particularly those with traditional botanical applications, have recently garnered more attention. A number of dermatological products may benefit from plant extracts' capacity to absorb UV rays.

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