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Phytochemical Profiling of *Crocus sativus* L. (Saffron): A Qualitative and Quantitative Analysis of Its Therapeutic Benefits

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Abstract

Crocus sativus L., commonly known as saffron, is a sterile geophyte species that belongs to the Iridaceae family and blooms in the autumn. It reproduces through a vegetative pathway through corms only. The red stigmas from its flowers are prized for their medicinal properties, culinary applications, perfume and cosmetic preparation, and collection, drying, and use as a spice. Because saffron is such a costly, valuable, and opulent spice all over the world, it is also known as "red gold." It is utilized in medicines, flavoring, and fragrance products. Phytochemicals like safranal and picrocrocin give saffron its distinct flavour and iodoform- or hay-like aroma. It contains crocin, a carotenoid pigment that gives dishes and textiles a deep golden-yellow colour. The global yield of saffron under open field conditions is estimated at 3.4 kg ha−1 (418 t y−1 of production in 121,338 ha). In the current work, Crocus sativus L. stigmas were investigated for their phytochemical composition using hot, continuous, and consecutive extraction using a Soxhlet apparatus. A variety of solvents were used for the qualitative assay. Different solvents were used in the extraction process in ascending order of polarity. Alkaloids, flavonoids, tannins, saponins, glycosides, triterpenoids, phenols, steroids, coumarins, cardiac glycosides, and phytosterols were found in the extracts after a qualitative examination using conventional techniques. Alkaloids, flavonoids, phenols, and tannins were all quantified. The highest concentration of alkaloids was found in chloroform and ethanol (600 mg/g), while the highest concentration of flavonoids was found in ethyl acetate and methanol (250 mg/g), and the highest concentration of phenols and tannins was found in ethyl acetate and aqueous extracts (200 mg/g).

Key words: *Saffron, Crocus sativus, stigma, Iridaceae, and phytochemicals*

Introduction

Saffron is a well-known spice obtained from the dried stigmas of Crocus sativus L. flowers [1,2]. It is the most expensive spice in the world and is commonly known as ―Red Gold‖ [3,4]. *Crocus sativus* is an angiosperm plant that belongs to the Iridaceae family and blooms in the autumn, remaining dormant throughout the summer [5]. The flower of the *Crocus sativus* is solitary, purple, with six petals, three stamens, one style, and three red-orange stigmas. It is mainly distributed in the Mediterranean–Europe, and Western Asia. Saffron from Iran accounts for almost 90% of global production [6].

The ideal growing environments for saffron are warm subtropical climates and well- drained sandy soils [5,7]. Saffron has been historically used as a spice; however, literature also justifies its use in ethnomedicine. The ethnomedical applications of saffron include constipation treatment, inhibition of mucus membrane inflammation, depression reliever, easing respiratory congestion, increase in appetite, cough treatment, menstrual flow stimulator, lactation enhancer, and cramps reliever [8]. Saffron has been used as an expectorant, emmenagogue, and adaptogenic agent in Ayurvedic medicine [9]. Saffron has been used in traditional Persian medicine to cure erysipelas. Greeks used saffron to cure wounds, acne, and other skin conditions [10]. Since the Stone Age, natural dyes made from plants, animals, and minerals have been used for a variety of purposes. Saffron has been used to produce yellow or saffron dyes for dying clothes, painting, and other artistic endeavors [11]. Saffron is highly antioxidant, and because of its moisturizing properties, it is widely used in perfumery and cosmetic products and in the prevention of skin cancer. Saffron is used in Various sunscreens and lotions as a UV absorbent agent, thus protecting skin from harmful radiations from the sun. Traditionally saffron soaked with basil leaves is used to treat skin conditions such as acne. Saffron extract along with olive oil or coconut oil helps to improve blood circulation in face skin. Saffron extract can also be used to treat rashes or redness of face [12].

Saffron (*Crocus sativus* L.) is a sterile geophyte species with autumnal flowering plant, which reproduces exclusively in a vegetative pathway through corms. Its flowers are valuable for their red stigmas that are collected, dried, and used as a spice in food, as a dye, in perfumes and cosmetics preparation, and for medicinal purposes [13]. Saffron is also called ―red gold‖ because of its very expensive, luxurious, and valuable spice across the globe [14, 15]. In addition, it is highly appreciated for its color (Crocin), fragrance (Picrocrocin), and flavor (Safranal) due to over 150 volatile and aromatic compounds [16, 17]. Morocco ranks fourth in terms of production after Iran, India, and Greece, with a production exceeding 10 t in 2020, according to the National Agency for the Development of Oasis Areas (ANDZOA). The traditional saffron production site is located in Taliouine and Taznakht in Taroudant and Ouarzazate cities, respectively. Moreover, the plant is reported to be adaptable to various environmental conditions. It grows well in arid and semi-arid areas as it can adapt to temperate and subtropical climates [18, 19].

In recent years, the demand for stigmas has increased exponentially, especially with the discovery of new therapeutic properties against cancer, depression, hypertension, and other health issues, including psychological problems, gaining more impetus, especially with the current health situation caused by the COVID-19 pandemic. This consumed part of the plant is rich in monoterpenoids, phytosterols, phenolic acids, flavonoids (all glycosidic derivatives of kaempferol), vitamins (riboflavin and thiamine), proteins, amino acids, minerals, starch, and gums [20]. Crocetin and crocin are the most important bioactive components for their effect on a wide range of therapeutic effects, mainly through vigorous antioxidant activity [21]. After pruning the stigmas, it is used as commercial saffron, and other parts of the flower, including the petals and stamen, are discarded as agricultural waste. One kg of stigmas produces about 350 kg of petals, equivalent to 150,000–200,000 flowers [22], which tend to increase parallelly with its production. The worldwide overall produced biomass is estimated at 146,300 t/y. **Chemical Composition/ phytochemistry of saffron**

The primary composition of saffron includes 14–16% water, 11–13% nitrogenous matter, 12–15% sugars, 41–44% soluble extract, 0.6–0.9% volatile oil, 4–5% fiber, and 4–6% overall ash. Saffron also contains two vital vitamins: riboflavin and thiamin, as well as a small amount of β-carotene. Riboflavin is the most abundant vitamin in saffron, ranging from 56 to 138 ng/g. Thiamine concentrations in the saffron range between 0.7 and 4 g/g. Essential fatty acids such as linoleic and linolenic have also been found in the petroleum ether extract from bulbs [23]. In addition, sterols (campesterol, stigmasterol, and beta-sitosterol), ursolic, oleanolic, palmitoleic, and oleic acids are also present in saffron [24].

Saffron is rich in volatile, nonvolatile, and aromatic compounds. These compounds include hydrophilic and hydrophilic proteins, carbohydrates, minerals, vitamins, gums, pigments, mucilage, saponins, alkaloids, crocins, safranal, picrocrocin, crocetin, and other compounds in traces [25]. The principal constituents of saffron in the stigmatic lobes of reddish color include crocetin and its associated glucosidic derivatives [26]. However, the main compounds of saffron are carotenoids (crocetin) in the form α- crocetin, which includes di glucoside, gamma-crocetin, beta-carotene, and zeaxanthin as glycosidic forms. The presence of picrocrocin is the main component of the saffron that imparts a bitter taste to the saffron. Upon hydrolysis, it is crystallized it produces safranal and glucose [27].

Material and methods

Collection and Authentication of Plant Material

The flowers of *Crocus sativus* were collected from Pulwama and Budgam district of Jammu and Kashmir (J&K), India, during August / September in the year 2022. The plant was authenticated by Prof. N.K. Dubey Centre of Advanced Study in Botany Institute of Science, Banaras Hindu University Varanasi, Uttar Pradesh, India (voucher specimen number. Irida.2023/01).

Drying

After cleaning the flowers, and separate the stigmas from flower. They were left for shade drying on the newspapers for ten days. After that, the stigmas were dried in a hot air oven at 40 °C for an hour just before starting the extraction process to remove the moisture content.

Successive Extraction Using Soxhlet Apparatus

To prepare the extracts of *Crocus sativus* stigmas fresh stigmas were obtained and washed thoroughly with flowing water to eliminate any dirt or debris. The stigmas were extracted using various solvents including hexane, chloroform, ethyl acetate and methanol. Subsequently, the leaves were rinsed again under flowing distilled water to remove any residual contaminants. Dried stigma powder was obtained through a mechanical grinder and sieved through to get the powder of uniform size. The stigma powder was extracted successively in the Soxhlet apparatus with hexane at 60° C, ethyl acetate at 77° C, chloroform at 61° C, and methanol at 65° C. The extraction temperatures were adjusted to boiling points of solvent to allow a faster rate of cycling of fresh solvent. Six hours of duration was allocated to each solvent for hot continuous and successive extraction. All the extracts obtained were then concentrated and dried in an oven at 45 °C. Then the dried extracts were used for the phytochemical screening [28,29,30,31].

Calculation of percentage yield

The dried extracts obtained with each solvent were weighed and yield was calculated concerning the air-dried weight of the plant material.

$$\text{Percentage Yield} = \frac{\text{Weight of the crude(mg/g)}}{\text{Weight of the plant material}} \times 100$$

Screening of Phytochemicals

The stigma extract was subjected to the preliminary phytochemical screening for the presence of secondary metabolites. Phytochemical tests were carried out adopting standard procedures. Tests were performed for alkaloids, flavonoids, saponins, steroids & terpenoids, phenolic compounds, tannins, cardiac glycosides, glycosides, coumarins, anthraquinones, quinones, and resins. The various tests have been conducted qualitatively to find out the presence or absence of bioactive compounds[32, 33, 34, 35, 36, 37, 38, 39, 40].

Detection of Alkaloids

For the Mayer's Test to identify alkaloids, samples were dissolved in a diluted hydrochloric solution and subsequently sieved. Two or three drops of Mayer's reagent were found to be the sweet spot for a 2 ml filtrate.

Test for Flavonoids:

A small amount of concentrated hydrochloric acid and magnesium tube turnings were added to the test liquid, and then it was simmered for five minutes. The mixture will take on a reddish tint if it contains flavonoids.

Test for Saponins:

A tiny sieve was used to eliminate contaminants after the powdered substance had been cooked with twenty milliliters of water at a low temperature for two minutes. The filtrate was after that mixed with water until it was 5 mL in volume, and then violently stirred. A clear sign of saponin presence is the presence of foaming.

Detection of Steroids & Terpenoids:

A mixture of 1 mL of extract, 1 mL of chloroform, 2 mL of acetic anhydride, and 1–2 molecules of concentrated sulfuric acid was prepared for the Liebermann–Burchardt test. Steroids were visible in the liquid due to its dark green color.

Test for Phenolic compounds:

The prediction that a pulverized sample will contain phenolic compounds was confirmed by the following substances. one solution of ferric chloride (5 percent): An extremely deep shade of violet-black. b. the white portion of the lead acetate solution that is still there.

Test for Tannins:

A very small quantity of the medication powder was dissolved in water. The water-based extract was supplemented with a little amount of ferric chloride solution. When tannins are present, the color turns bluish-black.

Detection of Glycosides

The test solution was made by heating the extract in either alcohol or a hydroalcoholic solution. **a) Baljet's test**

In order to run the test, the mixture was spiked with a 2% sodium picrate solution. Glycosides were detected by the pigment's golden orange color.

b) Legal 's test

The sample was found to contain glycosides when the test solution was alkalized with pyridine and a color shift from pink to red was produced by the addition of 2% sodium nitroprusside.

c) Keller-Killiani test

Prior to mixing, 100 mg of extract had been mixed with 1 milliliter of ferric chloride solution and 1 drop of glacial acetic acid. Next, 1 milliliter of concentrated H2 SO4 was added to the mixture to serve as a basis. When glycosides show up as a brown band at the interface, it means that the sample contains glycosides.

Detection of Coumarins:

2 ml of water-based extract was diluted, and then 3 ml of a 10% NaOH solution was added. Coumarins were likely present due to the contents' golden color.

Test for Phytosterols:

The solution of extract was stirred briskly before strong sulfuric acid was added and the mixture was put to storage. In the presence of phytosterols, the chloroform layer at the base of the solution will turn crimson.

Detection of Quinones:

1 ml of crude extract developed a color that indicated the presence of quinones after being treated with diluted sodium hydroxide. You may get this shade of red or blue-green.

Detection of Resins:

In a saucepan over medium heat, mix together 2 ml of extract with 5 to 10 drops of acetic anhydrate. Add 0.5 ml of sulphuric acid. Because they formed a very deep purple color, resins were likely present.

Detection of Cardiac Glycosides:

For the Kellar-Kiliani test, two milliliters of clarified butter were mixed with one milliliter each of ferrous chloride, concentrated sulfuric acid, and glacial acetic acid. Presumably containing cardiac glycosides, the solution became an emerald color when illuminated.

Detection of leuco anthocyanins:

The mixture consisted of an equal quantity of liquid extract and isoamyl alcohol. The presence of leucoanthocyanins has caused the top layer to become red.

Detection of anthraquinone:

An ounce of finely powdered plant material was added after the mixture had been stirred in chloroform for five minutes. Quickly shaking the mixture before analysis, 5 ml of a was ammonia solution was added after sifting the contents. The presence of anthraquinone might be indicated by the vivid pink color of the sample's aqueous layer.

Detection of fixed oils:

A tiny sample is compressed between two filter sheets to extract the active ingredient. The presence of fixed oils can be detected by looking for telltale signs, including oil residue on paper.

Quantification of total content of alkaloids

1 mg of the plant extract was dissolved in dimethylsulphoxide and added 1ml of 2N HCl and filtered. This solution was transferred to a separating funnel, 5ml of bromocresol green solution then 5ml of phosphate buffer were added. The mixture was shaken with 1, 2, 3 and 4ml of chloroform by vigorous shaking and collected in a 10ml volumetric flask and diluted to the volume with the chloroform. A set of reference standard solutions of atropine (20, 40, 60, 80 and

100µg/ml) were prepared in the same manner as described already. The absorbance for standard solutions and test solutions were determined on the reagent blank at 470nm with an UV/Visible spectrophotometer. The content of alkaloids was expressed as mg of AE/g of plant extract[41].

Total content of flavonoids quantification.

Colorimetric assay was used to determine the total content of flavonoid using aluminium chloride for the reaction, the plant extract of 1 ml and distilled water of 4 ml was taken in a 10 ml of flask. 0.30 ml of 5 % sodium nitrite and after 5minutes, 0.3ml of 10 % aluminium chloride was mixed in the flask. 5minutes later, 2 ml of 1M NaOH was treated and diluted using 10 ml distilled water. A set of standard solutions of quercetin (20, 40, 60, 80 and 100µg/ml) were prepared as mentioned earlier. The absorbance was measured for test and standard solutions using reagent blank at 510nm wavelength by UV-Visible spectrophotometer. The total content of flavonoid was denoted as mg of QE/g of extract[42].

Quantification of tannin total content

Folin-Ciocalteu method was used to quantify the tannin total content. About 0.1ml of plant extract was added in 10 ml of volumetric flask containing the distilled water of 7.5ml and Folin-Ciocalteu phenol reagent of 0.5ml, 35% Na2CO3 solution of 1 ml and diluted to 10ml using distilled water. The reagent mixture was well shaken and kept at 30°Ctemperature for 30min. A set of gallic acid solutions (20, 40, 60, 80 and 100µg/ml) were prepared as mentioned earlier. Absorbance of standard and test solutions was analyzed with blank at 725nm wavelength using UV-Visible spectrophotometer. The tannin total content of tannin was expressed as mg of GAE/g of extract [42].

Quantification of total content of phenolic compounds

The phenolic compounds concentration in extract was quantified by Spectrophotometry method. Folin-Ciocalteu method was employed for the quantification of total phenolic content. The reaction mixture contains 1 ml of plant extract and 9ml of distilled water. 1 ml of Folin-Ciocalteu phenol reagent was treated with the mixture and well shaken. After 5minutes, 10 ml of 7 % Na2CO3 solution was treated with the mixture. The volume was 25ml. A set of gallic acid standard solutions (20, 40, 40, 60, 80 and 100µg/ml) were prepared as earlier. Incubated for 90 min at 30°C and absorbance was analyzed for test and standard solutions with reagent blank at 550 nm with using UV-Visible spectrophotometer. The content of total phenolic compound was denoted as mg of GAE/gm of extract [42].

Observations and results

Table:1. Taxonomic classification of *Crocus sativus* L.

Kingdom	Plantae
Phylum	Streptophyta
Class	Equisetopsida

Sub class	Magnoliidae
Order	Asparagales
Family	Iridaceae
Genus	Crocus
Species	*Crocus sativus* L.

Morphological description

Crocus sativus L (Saffron) flower is a beautiful flower grown mostly in Kashmir in India. Saffron, which has for decades been the world's most expensive spice by weight, is native to Southwest Asia. It was first cultivated in the vicinity of Greece. After a period of hibernation in summer, five to eleven narrow and nearly vertical green leaves, growing up to 40 cm in length, emerge from the ground. In autumn, purple buds appear. Only in October, after most other flowering plants have released their seeds, does it develop its brilliantly hued flowers, ranging from a light pastel shade of lilac to a darker and more striated mauve. Upon flowering, it averages less than 30 cm in height. Inside each flower is a three-pronged style; in turn, each prong terminates with a crimson stigma 2.5-3 cm in length. These stigmas are hand harvested, dried and used as the famed saffron. Saffron was traditionally used in coloring the rice in biryani. Saffron Flower is a fall-flowering perennial plant unknown in the wild, and is sterile. Being sterile, the Saffron Flower's purple flowers fail to produce viable seeds—thus, reproduction is dependent on human assistance: the corms (underground bulb-like starch-storing organs) must be manually dug up, broken apart, and replanted. A corm survives for only one season, reproducing via division into up to ten "cormlets" that eventually give rise to new plants. The corms are small brown globules up to 4.5 cm in diameter and are shrouded in a dense mat of parallel fibers (Fig1A-C).

Common name: Saffron Flower, Saffron crocus • Hindi: Kesar के सर • Kannada: ಕೇಸರಿ Kesari, ಕೇಸರ Kesara, ಕುಂಕುಮಕೇಸರಿ Kunkumakesari, ಜಾಗುಡ Jaaguda, ಜಾಪರ Jaapara, ಜಾಪಾರ Jaapaara • Malayalam: Kashmiram കാശ്മീരം • Marathi: के सर Kesar

• Sanskrit: कश्मीरजन्मन्, काश्मीरजन्मन् Kashmirajanman • Urdu: Zafran; Telugu : Kunkuma puvvu

Fig.1A-C; saffron habitat with flower and stigma

Qualitative Phytochemicals analysis of *Crocus sativus* L (Saffron)

In spite of the fact that phytochemicals are primarily responsible for the formation of secondary metabolites related to their function of plant defense, these chemical compounds also exhibit

therapeutic effects that can alleviate some aspects of human health. They are the focus of a significant amount of investigation as a direct result of the fact that they exist. An investigation of the phytochemistry of the stigmas extracts of *C. sativus* was carried out in order to determine the secondary metabolites that were present. In the presence of hexane, chloroform, ethyl acetate, and methanol, the extracts were analyzed to determine the presence of various compounds, including alkaloids, flavonoids, saponins, steroids, terpenoids, tannins, glycosides, coumarins, phytosterols, quinones, anthraquinones, cardiac glycosides, leuco anthocyanins, fixed oils, and resins.

The qualitative investigation revealed that the *C. sativus* plant's stigma could be classified into multiple phytochemical categories. From the results provided **(Table- 2 and Fig- 2),** we can compare the solvents employed in the extraction process.

The phytochemical investigation revealed that the methanol extract was the sole extract containing alkaloids, glycosides, and saponins. Flavonoids and coumarins were present in all extracts except for the petroleum ether extract. The chloroform and methanol extracts were found to contain steroids and terpenoids. Only the chloroform and ethyl acetate extracts contained phenols and tannins, although phytosterols were present in all extracts save the chloroform extract. Cardiac glycosides were identified in all extracts except for the ethyl acetate extract. The chloroform extract was the sole one containing quinones and anthraquinones, but the ethyl acetate extracts uniquely revealed the presence of resins. Both the petroleum ether and chloroform extracts exhibited a favorable reaction for fixed oils. Finally, none of the extracts contained leucoanthocyanins. **(Table- 2).**

In order to produce crude extracts, the following solvents were utilized, each of which resulted in a different percentage of yield: hexane (6.2% yield), chloroform (24.16% yield), ethyl acetate (38.2% yield), and methanol (52.5%), respectively.

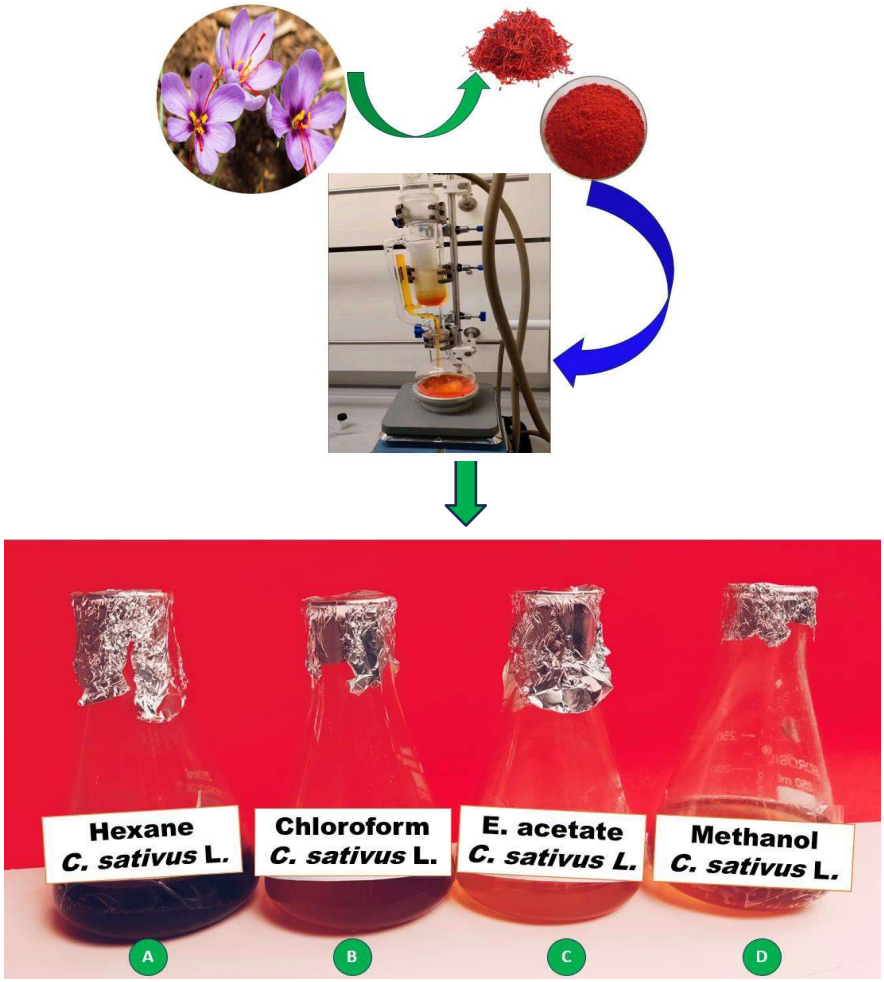

Fig 2A-D: Phytochemical extractions with variant solvents

Fig 3: phytochemical test tube tests (positive)

Table :2. Phytochemical analysis of *C. sativus*

S.No	Phyto. Name	Hexane	Chloroform	Ethyl acetate	Methanol
1.	Alkaloids	-	-	-	+++
2.	Flavonoids	-	++	+++	+++
3.	Saponins	-	-	-	+++
4.	Steroids & Terpenoids	-	++	-	+++
5.	Phenols	-	++	+++	-
6.	Tannins	-	++	+++	-
7.	Glycosides	-	-	-	+++

8.	Coumarins	-	++	+++	+++
9.	Phytosterols	++	-	+++	+++
10.	Cardiac Glycosides	++	++	-	+++
11.	Quinones	-	++	-	-
12	Resins	-	-	+++	-
13.	Leuco anthocyanins	-	-	-	-
14.	Anthraquinones	-	++	-	-
15.	Fixed oils	+	++	-	-

Present = "+ " ; Absent = "-"

Quantitative Phytochemical analysis of *C. sativus*

To ascertain the distribution and quantity of distinct bioactive components, the phytochemical content of *C. sativus* stigma extract was assessed in a range of solvents. Atropine equivalent (500 mg/g) was the highest concentration of any alkaloids found in the study of leaf extract based on methanol. On the other hand, extracts made using different solvents did not contain any alkaloids. Different solvents had different amounts of flavonoids, according to flavonoid quantification. The highest flavonoid content was found in the ethyl acetate extract (650 mg/g Quercetin equivalent), followed by methanol (570 mg/g) and chloroform (440 mg/g). But there were no discernible flavonoids in the petroleum ether extract. Additionally, the total phenol and tannin concentration was evaluated in several solvent combinations. The largest concentrations of phenol (580 mg/g) and tannin (486 mg/g), which are both comparable to gallic acid, were found in ethyl acetate extract. Following chloroform extract, the amounts of tannin and phenol were 360 mg/g and 440 mg/g, respectively. By comparison, no phenol or tannin was obtained from the petroleum ether and methanol extracts. These results demonstrate how well different phytochemicals from *C. sativus* stigmas may be extracted, depending on the solvent used.The variations that have been observed emphasize the significance of choosing the right solvent for phytochemical extraction and demonstrate the potential of *C. sativus* as a useful source of bioactive chemicals for a range of applications. **(Fig-4).**

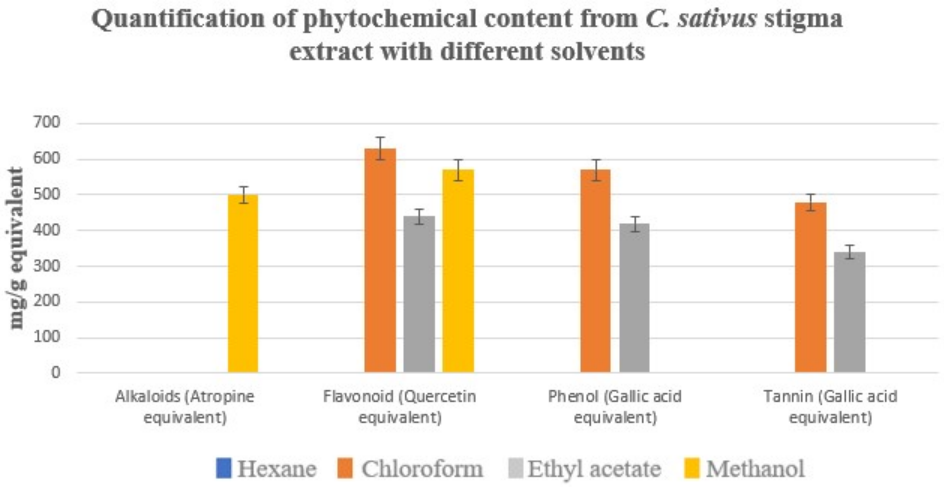

Fig :4. Graphical representation of quantitative phytochemical analysis of *C. sativus*

Discussion :

Plant-derived phytochemicals are considered a potential therapeutic agent with minimum side effects compared to chemically manufactured medications [43, 44, 45]. Several studies have been conducted to explore the therapeutic applications of saffron. Besides being used as a popular spice, Saffron has also been found to be significant in the treatment of several diseases, including asthma [46], depression [47], menstruation disorders [48], cardiovascular disease [49], digestive ailments [50], cancer [51], insomnia [52] and several other disorders. The presence of phytochemicals like crocetin, safranal, and crocins in saffron is considered to be associated with the therapeutic benefits of this spice [53]. Saffron has been found to be an effective gastrointestinal modulator for preventing gastrointestinal atonia [54] and a major therapeutic agent for female genitals [55]. Chronic bronchitis and other respiratory conditions may be effectively treated with safranal. It acts on alveoli through the vagus nerves, making coughing less severe [56]. Crocin, an analgesic, has been recommended for painful dysmenorrhea because it helps slow down uterine contractions [57]. On the other hand, Picrocrocin has been shown to have a tranquilizing property and thus induce a sedative impact on lumbar and spasm pains [58]. Even though compounds of saffron are significantly effective, crocetin has shown more remarkable pharmaceutical activities because this ensures the oxygen transport speed, which makes it useful in the treatment of atherosclerosis [59], hemorrhages [60], alveolar hypoxia [61],
arthritis [62], tumors [63] and cell production [64]. Present qualitative phytochemicals studies reveles alkaloids, flavonoids, saponins, steroids, terpenoids, tannins, glycosides, coumarins, phytosterols, quinones, anthraquinones, cardiac glycosides, leuco anthocyanins, fixed oils, and resins, To make crude extracts, hexane (6.2% yield), chloroform (24.16% yield), ethyl acetate (38.2% yield), and methanol (52.5%) were used. The study assessed the phytochemical content

of C. sativus stigma extract in various solvents. Results showed that the highest concentration of alkaloids was found in atropine equivalent, while different solvents did not contain any alkaloids. The highest flavonoid content was found in ethyl acetate extract, followed by methanol and chloroform. The largest concentrations of phenol and tannin were found in ethyl acetate extract, followed by chloroform extract.

Conclusion

Phytochemical screening was crucial in discovering diverse phytoconstituents in plant extracts. *Crocus sativus* L. is an important medicinal plant cultivated extensively for nutritional and economic use. Saffron and its components possess significant pharmacological properties. Further clinical trial study will undoubtedly yield fresh insights into the unexplored qualities and biological constituents of saffron, aimed at treating or preventing numerous diseases and disorders. The work established a significant foundation for subsequent research on the separation and characterisation of phytoconstituents from the chosen plants for medication development. The research relied solely on qualitative analysis and screening. A quantitative analysis of their bioactivity and IR spectra of the various phytochemicals would be advantageous. The investigation would be enhanced if the detection, analysis, and separation of the phytoconstituents were achievable.

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