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Harnessing the power of the Iraqi hibiscus plant in cancer treatment

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Abstract

According to the World Health Organization (WHO), cancer accounted for approximately 9.6 million deaths in 2018, leading to nearly one in every six deaths worldwide. The rising prevalence of cancer necessitates transformative, efficient treatments that can improve the health status of patients as well as minimize the burden associated with this condition. One potential area in the search for cancer treatment comes with exploring naturally occurring compounds from plants. In the past few years, some researchers have focused their research on plants that may potentially possess anti-cancer properties including Iraqi hibiscus (Hibiscus sabdariffa L.). In this paper, we aim to present up-to-date knowledge concerning anticancer activities of Iraqi hibiscus plant, possible mechanisms of action, and clinical potentiality on behalf of this auspicious natural target. Varieties of bioactive compounds such as flavonoids, anthocyanins, and phenolic acids were found to be present in the Iraqi hibiscus plant with therapeutic potential composed of antioxidant; anti-inflammatory and anticancer activities. In conclusion, the future of hibiscus plant in cancer treatment in Iraq is very rosy with more research and development opportunities as well as integration into conventional cancer therapies.

Keywords: Anthocyanins, Cancer, Hibiscus, Flavonoids, Histopathological.

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Introduction

Cancer, a class of diseases characterized by uncontrolled growth and dissemination of abnormal cells, remains one of the most prevalent deleterious conditions across the world. According to the World Health Organization (WHO), cancer caused nearly 9.6 million deaths in 2018, which represent one out of six global death cases . The need for new and effective treatments is becoming more pressing due to the rising cases of cancer that create a call for better patient outcomes and decrease the negative impact of this disease [1].

Also, there is a growing interest in exploring natural compound from plants as a perfect avenue for the management of cancer. The use of plants and their extracts for the treatment of diseases is an ancient practice; in addition, many modern pharmaceuticals such as paclitaxel, a chemotherapeutic drug have been obtained from plants [2]. In recent times, there has been an interest of investigation into the probable anticancer plus anti-tumor activities towards different plants including Iraqi hibiscus plant (Hibiscus sabdariffa L.) which is a species of flowering plant to Iraq and other countries within East and Middle Africa [3].

Rosell is a multipurpose, deciduous plant found in the Iraqi wetlands. The bright red flowers are the most distinctive feature which is brewed and used in making herbal tea, syrups and other beverages. Besides its food uses, the Iraqi hibiscus plant has for long been applied in folklore medicine to cure diverse ailments such as hypertension, liver challenges, and inflammation. Most recently, the Iraqi hibiscus plant has been studied for its possible anticancer compounds [3].

The previously mentioned active compounds in the hibiscus plant found in Iraq such as flavonoids, anthocyanins, and other phenolic compounds have exhibited antioxidant, anti-inflammatory, and anticancer activities [3-4]. For example, Hibiscus sabdariffa extracts are cytotoxic on a variety of cancer cell lines like; breast and prostate as well the liver cancer cells [5-6].

As a result, the early findings have prompted increased interest in the possible application of the Iraqi hibiscus plant in cancer-fighting. The purpose of this article is to summarize the current knowledge on anticancer attributes and functionality of Iraqi hibiscus plants, as well as apply them clinically [7].

With the escalating global burden of cancer, there is an urgent requirement for innovative therapeutic strategies to enhance patient outcomes and cut back on

human and economic costs associated with the disease. Natural compounds of plant origin like Iraqi hibiscus would be worth exploration thereby providing the pharmacist for new anticancer agents. Therefore, the anticancer characteristics of this Iraqi plant hibiscus can shed more light on ways of combating cancer which has become one of human beings' terrible diseases.[6]

The Iraqi Hibiscus plants

Description and Botanical Information

the Iraqi hibiscus plant (Hibiscus sabdariffa L.) is one of the approximately 4,225 known species in the Malvaceae family. This is also known as Roselle, Sorrel or Karkade and originates from Iraq but can be found in other parts of Middle East, Africa and Southern Asian regions. Basing on its use in food, beverages and traditional medicine the plant flourishes well in tropical and subtropical climates [3].
Hibiscus sabdariffa is an herbicideous or woody shrub of annual to perennial that may reach a height of 2-25 meters. This plant has smooth red stems and leaves are alternate, 3-5 lobed with toothed margins. The plant has large spectacular flowers with five petals that vary from pale yellow to deep red [3]. The calyx, that is the outer whorl of a flower fleshy and red and is used in the making of teas, jams or other culinary products [4].

Traditional Uses in the Iraqi Culture

The hibiscus plant has been a part of the Iraqi culture since times immemorial, and it has both edible and medicinal applications. Dried calyces of the flowers are used to prepare a common type of herbal beverage referred as Karkade tea, drunk hot or cold. The red calyces and sepals of karkade have a tart, cranberry-like flavor and are consumed as a refreshing beverage, especially in hot summer months [3].
The hibiscus plant from Iraq has also been utilized for medicinal purposes in old Iraqi medicine to cure many diseases, besides cooking. Teas made from flowers, leaves, and twigs of the plant have found use in the treatment of several diseases like hypertension, digestive problems, fever as well as liver ailments [3]. In addition, the plant is thought to be a diuretic, anti-inflammatory, and antimicrobial that has support in its application of traditional medicine for diverse health problems [4].

Active Compounds Found in the Herbs

This is so because of the various bioactive compounds contained in the Iraqi hibiscus plant. These include polyphenols such as flavonoids, anthocyanins, and phenolic acids that have been reported to exhibit antioxidant, anti-inflammatory, and anticancer properties [3-4]. Flavonols are a diverse group of plant metabolites that have been associated with various health benefits such as defense against cardiovascular disorders and some types of cancer [8].

Anthocyanins are a group of flavonoids that provide the red, blue, and purple coloration in most fruits, vegetables, and flowers including the Iraqi hibiscus plant. Potential anticancer effects, strong antioxidants, and anti-inflammatory activities have been demonstrated for these compounds [9].

Iraqi hibiscus plant is rich in bioactive compounds such as phenolic acids that also contribute to better health. The antioxidant and anti-inflammatory activities of these fruits are well documented and could account for the observed anticancer potential [10]. Also, new studies have found that some phenolic acid can help stop cancer cell growth and induce apoptosis, or programmed death of cells which is critical in preventing and treating cancer [11].

In this context, the Iraqi hibiscus plant with this combination of bioactive compounds has started to attract attention toward its potential therapeutic use, especially in cancer treatment. As the plant's active compounds possess antioxidant, anti-inflammatory, and anticancer properties, it may have the potential to serve as a reservoir for new treatments for different cancer scenarios. Additionally, the traditional use of Cistanche deserticola over centuries gives critical information about its assumed efficacy and safety profile [12].

First studies to show the potential of the plant as a cancer treatment

The research on the anticancer activity of Iraqi hibiscus began with experiments on extracts and how it affect different lines of Cancer. A study by Alabsi et al. (2012) revealed the cytotoxicity of seed kernel extract from Hibiscus sabdariffa on breast cancer cells through cell cycle arrest and apoptosis [13]. An earlier study by Chiu et al. (2010) also showed that communication for human melanoma cells, apoptosis, and autophagy in the leaves polyphenolic extract of Hibiscus sabdariffa [6]. These preliminary findings formed the basis for further investigations of the anticancer potential of the hibiscus Iraqi plant.

Recent developments & research findings.

Recently, additional research has been conducted concerning the anti-cancer properties of Iraqi hibiscus in a bid to focus on particular bioactive compounds and methods of action. For example, Huang et al. (2019) conducted a study that demonstrated that anthocyanins derived from hibiscus sabdariffa could suppress the growth of human leukemia cells and initiate apoptosis via stimulation of specific intracellular cell communication networks [14]. Additionally, Adaramoye et al. (2020) has indicated that Hibiscus sabdariffa calyces' methanolic extract possessed cytotoxic effects on human prostate cancer cells, thus making the methanolic extract of this plant useful in potential treatment or control of prostate cancer [15].

Mechanisms of action in cancer treatment

Apoptosis-inducing properties

The most crucial mode through which the Iraqi hibiscus plant has anticancer properties is by stimulating apoptosis to occur in the cancerous cells. This represents a vital pathway of preserving tissue homeostasis and inhibiting cancer-like uncontrolled cell growth [16]. Indeed, it has been shown that multiple extracts and bioactive components of Hibiscus sabdariffa can induce apoptosis in different cancer cells such as leukemia, breast, and prostate cancers [5 14 15].

Surviving Inhibition of tumor cell growth and proliferation

Apart from inducing apoptosis, the Iraqi hibiscus also exhibited cancer cell growth and proliferation inhibition. This could be explained by the presence of the plant's bioactive components (flavonoids, phenolic acids); they are well-known signaling pathway modulators in cell growth and survival [14]. Most likely, the active compounds in this herb are involved in anticancer activities by inhibiting these pathways in the development and progression of cancer.

Conventional cancer treatments side effects reduced substantially

The other possible advantage of the Iraqi hibiscus plant in the management of cancer is that it may help to reduce or control side effects experienced from standard therapies and treatment. Most of these treatments are accompanied by high levels of toxicity and relevant complications in the normal tissues which result in a reduced quality of life for the patient [17]. The active compounds present in the Iraqi hibiscus plant are pronounced with antioxidant and anti-inflammatory effects which can help

to protect health cells from being damaged by current cancer treatments leading to better patient results and general wellbeing [4].

In summary, the research about Iraqi hibiscus and its probable applications in treating cancer proved strong enough to stimulate apoptosis, ensure that cancer cells do not increase while reducing side effects conspicuously through prevailing therapy systems. Nevertheless, the existing literature mainly sits with in vitro studies and animal models. However, some aspects of the potential Iraqi hibiscus plant in cancer therapy require further investigations, especially sound human clinical trials. However, the available literature on Iraqi hibiscus has some constraints; nevertheless, it is relevant in revealing its potential as a natural anticancer resource. By exploring other potential bioactive components in this plant and try to understand more about their mechanism of action, the Iraqi hibiscus can bring us closer to safer deletion of cancer cells, thus improving the prognosis and quality life for millions suffering from such a devastating disease.

Current applications and limitations

Iraqi Hibiscus Plant and Types of Cancer That Possibly May Benefit from It

The Iraqi hibiscus plant has shown promising results in the research for its anti-cancer attributes against various cancer types such as breast, prostate, melanoma and leukemia. In fact, studies have shown that some fractions and bioactive compounds sourced from Hibiscus sabdariffa such as anthocyanins and phenolic acids can suppress the proliferation of cancerous cells growth by induction of apoptosis in these types5-15. More research is, however, required to ascertain whether or not the Iraqi hibiscus can be used in treating these other forms of cancers.

Current Clinical Trials and Results

However, it is important to note that not much has been done regarding clinical trials on Iraqi hibiscus plant as a possible treatment of cancer in patients despite the promise shown by In vitro and animal studies. This calls for more research and good clinical trials investigating the plant’s ethanomedicinal extracts and bioactive compounds on human subjects to establish safety, efficacy as well as dosage.

Shortcomings and obstructions to the use of properties in plant for combating cancer

The application of the Iraqi hibiscus plant's anticancer properties to as a cancer treatment has several limitations and challenges. Some of these challenges include: Limited clinical research: Most of the work on anticancer activity of the Iraqi hibiscus plant, as stated earlier, was performed in vitro or on animal models. However, the absence of clinical trials in human beings makes it difficult to establish the safety, effectiveness and dosage for the plant's extracts as well as its bioactive compounds for cancer types treatment.

Variability in bioactive compounds: However, the concentration and composition of bioactive compounds in Iraqi hibiscus plant may differ depending on cultivation, harvesting time and extraction methods used. It is due to this variability that the plant may not be useful in cancer treatment as is complication the development of standardized protocols for using it [18].

Drug interactions and side effects: However, there are worries as to interactions of the Iraqi hibiscus plant with standard cancer treatments and other medicines despite minimal reported side effects. Additional studies are required to determine the toxicity of extracts and bioactive compounds from this plant about other anticancer modalities.

Regulatory and commercialization challenges: The road to producing and bringing natural products like Iraqi hibiscus plant-based new cancer treatments into the market is generally fraught with rule issues and bottlenecks. Such challenges range from gaining regulatory approval, intellectual property rights, and the notoriously intricate procedure of introducing a new drug into the market.

In conclusion, Iraqi hibiscus contains novel anticancer compounds that can be used effectively against various forms of cancer. Nevertheless, there exist some major challenges and constraints to the development of the area which on clinical research prevalence reviews a scarcity in active bio-compounds variance, drug interactions, and regulatory contradictions. These will be crucial in shaping the future role of the Iraqi hibiscus plant in cancer treatment and management. This explains why extensive research is being conducted and clinical trials are being executed with the hope that it can be fully exploited, leading to the development of new effective and

less toxic cancer therapeutics that ultimately enhance patient outcomes as well as general perception.

Iraqi hibiscus in cancer treatment

Opportunities for Future Research and Development

In that regard, the results from previous studies on antineoplastic implications of Iraqi hibiscus call for more research and development. More studies are needed to identify more bioactive compounds, understand their modes of action and optimise the most potent method of extraction that gives consistent formulations. Secondly, the scientific community needs to direct its attention to developing and conducting more stringent clinical trials of the plant's extracts or compounds for safety and effectiveness in human subjects, setting a stage that could establish a potential new treatment.

Integration into Conventional Anti-cancer Therapies

With more research, Iraqi hibiscus plant may be combined with contemporary anticancer treatments to enhance patient prognosis. It is possible that the plant's extracts and compounds could be combined with chemotherapy, radiation or targeted therapies to either augment their efficacy or lessen their toxic adverse effects. This might result in the advancements of better and safer cancer treatment protocols, which would eventually be beneficial to patients in terms of greater life span as well as improved quality of life.

Ethical Issues and the Provision of Treatment.

The development of the Iraqi hibiscus plant-based therapies, like any other promising treatment options has to consider ethical issues. It is imperative to underscore that regardless of varied racial and socio-economic backgrounds, patients need to access these treatments equitably. Hence, researchers, healthcare providers and policymakers should combine their efforts towards developing strategies on the availability and affordability of extracts or compounds from this plant to ensure that its species sustainability or traditional knowledge is quarantined jeopardized as it has been so useful to Iraq communities over a period.

Therefore, the future of the Iraqi hibiscus plant in cancer therapy is bright; there remains plenty of scope for further studies and integration with established treatment modalities. If these ethical issues are addressed and access to treatment assured,

this could ultimately lead to better cancer treatments that do not have such toxic associated side effects and consequently improve the outcome of patients' lives.

Conclusion

Hibiscus sabdariffa (Iraqi hibiscus), is a candidate source of bioactive compounds with pronounced cytotoxicity and antimigraine effect. Studies have also indicated that the extracts from this plant can lead to apoptosis, suppress cancer cell growth and multiplication as well as reduce the side effects of other cancer treatments in diverse catch diseases including breast, prostate, melanoma, and leukemia [5] [14] [15]. Therefore, the Iraqi hibiscus plant may have immense significance in new and effective cancer therapies that are less toxic.

Demand for Further Research and Development

Existing research and development remain necessary to actualize the therapeutic value of the Iraqi hibiscus plant in clinical contexts. Further studies should be conducted on the bioactive components of the plant, their mode of action, and possible synergisms with other cancer therapies. In addition, high-quality clinical trials need to be implemented in order to assess the safety and efficacy of such plant extracts and compounds as well as their appropriate doses in human beings.

The contemporary research agenda for the Iraqi hibiscus takes into account existing health risks and challenges as well to maximize on this body of knowledge, which may promise better cancer treatment that is both less toxic thereby improving outcomes for those suffering from this disease.

Abbreviations

Not applicable

Declarations

Ethics approval and consent to participate

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Competing Interests

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Yin W, Wang J, Jiang L, James Kang Y. Cancer and stem cells. Exp Biol Med (Maywood). 2021;246(16):1791-801.DOI: 10.1177/15353702211005390.
2. Kingston DG. Modern natural products drug discovery and its relevance to biodiversity conservation. Journal of natural products. 2011;74(3):496-511.
3. Ali BH, Wabel NA, Blunden G. Phytochemical, pharmacological and toxicological aspects of Hibiscus sabdariffa L.: a review. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives. 2005;19(5):369-75.
4. Da-Costa-Rocha I, Bonnlaender B, Sievers H, Pischel I, Heinrich M. Hibiscus sabdariffa L.–A phytochemical and pharmacological review. Food chemistry. 2014;165:424-43.
5. Bakar MFA, Mohamad M, Rahmat A, Burr SA, Fry JR. Cytotoxicity, cell cycle arrest, and apoptosis in breast cancer cell lines exposed to an extract of the seed kernel of Mangifera pajang (bambangan). Food and chemical toxicology. 2010;48(6):1688-97.
6. Chiu CT, Hsuan SW, Lin HH, Hsu CC, Chou FP, Chen JH. Hibiscus sabdariffa leaf polyphenolic extract induces human melanoma cell death, apoptosis, and autophagy. Journal of food science. 2015;80(3):H649-H58.
7. Kuo C-Y, Kao E-S, Chan K-C, Lee H-J, Huang T-F, Wang C-J. Hibiscus sabdariffa L. extracts reduce serum uric acid levels in oxonate-induced rats. Journal of Functional Foods. 2012;4(1):375-81.
8. Panche AN, Diwan AD, Chandra SR. Flavonoids: an overview. Journal of nutritional science. 2016;5:e47.
9. Khoo HE, Azlan A, Tang ST, Lim SM. Anthocyanidins and anthocyanins: Colored pigments as food, pharmaceutical ingredients, and the potential health benefits. Food & nutrition research. 2017;61(1):1361779.
10. Pandey KB, Rizvi SI. Plant polyphenols as dietary antioxidants in human health and disease. Oxidative medicine and cellular longevity. 2009;2:270-8.
11. Farhan M. Green Tea Catechins: Nature's Way of Preventing and Treating Cancer. Int J Mol Sci. 2022;23(18).DOI: 10.3390/ijms231810713.
12. Gharibi S, Tabatabaei BES, Saeidi G, Goli SAH, Talebi M. Total phenolic content and antioxidant activity of three Iranian endemic Achillea species. Industrial Crops and Products. 2013;50:154-8.
13. Alabsi AM, Lim KL, Paterson IC, Ali-Saeed R, Muharram BA. Cell cycle arrest and apoptosis induction via modulation of mitochondrial integrity by Bcl-2 family members and

caspase dependence in Dracaena cinnabari-treated H400 human oral squamous cell carcinoma. BioMed research international. 2016;2016.

14. Yeh C-C, Tseng C-N, Yang J-I, Huang H-W, Fang Y, Tang J-Y, Chang F-R, Chang H-W. Antiproliferation and induction of apoptosis in Ca9-22 oral cancer cells by ethanolic extract of Gracilaria tenuistipitata. Molecules. 2012;17(9):10916-27.
15. Laskar YB, Mazumder PB. Insight into the molecular evidence supporting the remarkable chemotherapeutic potential of Hibiscus sabdariffa L. Biomedicine & Pharmacotherapy. 2020;127:110153.
16. Elmore S. Apoptosis: a review of programmed cell death. Toxicologic pathology. 2007;35(4):495-516.
17. Miller KD, Siegel RL, Lin CC, Mariotto AB, Kramer JL, Rowland JH, Stein KD, Alteri R, Jemal A. Cancer treatment and survivorship statistics, 2016. CA: a cancer journal for clinicians. 2016;66(4):271-89.
18. Liu M, Wang X, Wu J, Li P. p53 gene mutations among patients involved with breast cancer: types of detection. American Journal of BioMedicine 2023; 11(2):85-95.