Ethnopharmacological and Medicinal Review on *Doronicum hookeri* Clark C.B & J.D Hooker

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Abstract

The rhizomes of the medicinal plant *Darunaj-aqrabi* (*Doronicum hookeri*) (Family Asteraceae) have long been employed in the Unani system of medicine (USM) as a cardiac tonic (invigorating and exhilarating), nervine tonic, carminative, foetal protection, antidotary, and other uses in various dose forms. It is used in a variety of heart medications and is extremely useful for palpitation. Rhizomes are commonly employed in compound formulations with tonic effects for the body. Search engineswas used for all accessible information on *Darunaj-aqrabi* in internationally recognised scientific databases. Additional data was acquired from USM's classic treatise on herbs, the Unani Pharmacopoeia, and other sources. The literature supported its traditional usage in formularies or by rural people. Thus, *Darunaj-aqrabi* has antimicrobial, antifungal, hepatoprotective, and antioxidant properties, according to recent pharmacological investigations. However, the majority of this herb's properties are yet to be discovered. There are also insufficient facts on the phytochemistry and toxicological profile. Due to Darunaj-extensive aqrabi's traditional applications, more research into its pharmacological properties, phytochemistry, toxicity, and adverse effects is needed to assess its medicinal usefulness.

Keywords

Darony Aqrabi, Cardiac Protective, medicinal plants Hepatoprotective

1. INTRODUCTION

Historically, medicinal plants were the source of nearly entire medicines. The medicinal usage of plants is primarily derived from popular knowledge approaches that evaluate its beneficial value in the prevention and treatment of various illness. Throughout such process, traditional medicines has been of significant importance to science, contributing significantly to the finding of novel substances & the choice of species to study (M.F. Lorenconi *et al*., 2020).

Among the other plant families studied, the Asteraceae deserves special attention. There are roughly 1,500 genera and 25,000 species in this family including the genus Doronicum, which has 26 species and four subspecies across Asia, Europe, and North Africa (I.A. Fernandez ; 2003). *Doronicum hookeri* is a well-known medicinal plant of the Asteraceae family, generally known as "Darunaj-aqrabi/Darunaj-aqrabi" in USM and "Leopard's bane" in English. It can be found in the Himalayas between 12,000 and 14,000 feet in Lachen and Tungu, Sikkim, Nepal, Bhutan, and Tibet (M. A. Kalam *et al*., 2019 ; C.P. Khare - Google Books). Doronicum roylei DC. (Native to Punjab), Doronicum falconeri Hook. f. (Native to the North Western Himalayas), as well as European species Doronicum pardalianches, Linn. and Doronicum scorpioides, have all been introduced to subcontinent and are classified as *Darunaj-aqrabi* (C. P. Khare., 2019) .This ancient medicine is claimed to have originated in Greece and Syria (M. Aleem *et al*., 2020). Doronicum is derived from the Arabic word "Darawnay," which is used by at least two different species (I. A. Fernández., 2003). Some historians, however, believe that Doronicum is a straight transcription of the Arabic word "Doronigi," a unique contribution to Islamic pharmaceuticals (Y.C. Kong *et al*., 1996). Pre-Linnaean botanists (Dioscorides, 1554, 1557; Dodoens, 1574) and other Greek writers referred to the species Doronicum as Aconitam pardalianches, and Ibn Sina (c. 980–1037) is said to have introduced the plant into western culture (I.A. Fernandez., 2003).

Doronicum hookeri rhizomes have long been employed as a component of cardiac and nervine tonics, as well as an exhilarant and stomachic that helps to dissolve trapped gases. Doronicum pardalianches Linn is used in nervous depression, melancholia, and as a component of heart tonic formulations, and Doronicum roylei-DC's rhizome has been found to decrease demonstrated to have antibacterial, antifungal, hepatoprotective, and antioxidant properties (D. Gupta *et al*., 2011). The purpose of this article was to examine the botany, phytochemistry, and pharmacological activity of Darunaj-aqrabi, as well as its traditional usage in USM. The taxonomy classification and vernacular names are listed below (Table 1 & 2).

2. MATERIAL AND METHODS

Doronicum hookeri literature was found in online databases such as PubMed, Science Direct, Google Scholar and Web of Science as well as in library books, PhD theses, and published and unpublished books.The keywords used for the search were *Doronicum hookeri*, Nannoglottis hookeri, Doronicum scorpioide, Doronicum, Darunaj-aqrabi, daroonajaqrabi, darunaj, daroonaj, leopard's-bane. The Plant list was used to verify the scientific name and synonyms.

2.1. BOTANICAL DESCRIPTION

In Indian regions, two English botanists, Sir J.D. Hooker &C.B. Clarke (1876), have made the most significant contributions to the Asteraceae family (1881). In his mammoth flora of Victorian India (M. M. Pandey *et al*., 2007), Hooker dealt through the taxonomy history of around 608 Asteraceae species. *Doronicum hookeri* C.B. Clarke ex Hook.f. is a sturdy perennial herb that can grow up to 45cm in length (A. Dhiman *et al*., 2021). This plant's synonym is Nannoglottis hookeri (Hook.f.), Kitam (The Plant List 2013). Doronicum is a genus of 26 species and four subspecies that can be found in Europe, Asia and North Africa. This genus contains only perennial, rhizomatous herbs. Plants can be found in plains or forested areas up to 5000 metres above sea level. The rhizome's shape and structure are consistent across species, but it is not unique to either Rhizomes are fleshy or woody.

Table 1. Botanical Description

Taxonomical Classification	
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Asteridae
Order	Asterales
Family	Asteraceae
Genus	Doronicum
Species	*Doronicum hookeri*
Synonymous	Nannoglottis hookeri Doronicum scorpioide

Table 2. Vernacular Name

Name	Vernacular
Arabic	Aqir, *Darunaj-aqrabi*
Persian	Darunak, Darunā
Urdu	Darunaj Aqrabi, Darunaj
Hindi	Toos, Tarang
English	Leopard's Bane
Hebrew	Qarunās
Sanskrit	Vrishichka

Figure1: Images of parts of *Doronicum hookeri*

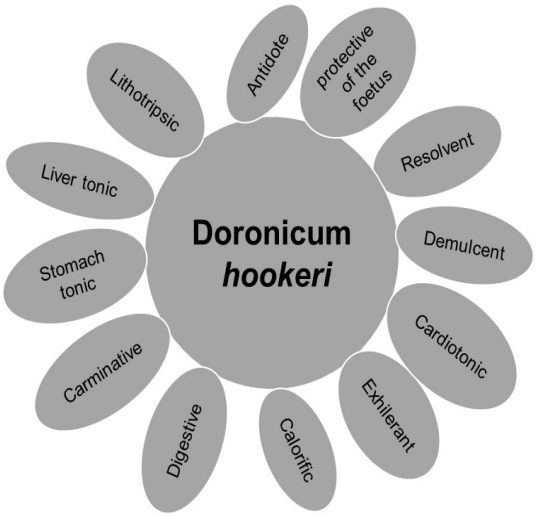

Figure2: medicinal uses of *Doronicum hookeri*

Woody rhizomes are stiff and fibrous, but fresh, fleshy rhizomes are juicy and fragile. In some European species, fleshy rhizomes are easily identified, but woody rhizomes are widely dispersed in Asian species. Rhizomes come in a variety of sizes and shapes. The younger nodes of the rhizomes, as well as the axils of the basal leave

have hyaline, shiny, and smooth trichomes.The fistulose, cylindric, and somewhat ribbed stem is erect, 10–85 cm tall, green when fresh, and pale yellow to brown when dry (I. A. Fernandez., 2003). It has simple, alternating leaves. Upper cauline leaves are reduced, sessile, and oval to bract-like, with petiolate basal leaves. The leaves have an attenuated base, are decurrent on the stem, and have a denticulate edge with a sharply serrated apex. Central Asian species have pinnate venation, whereas European species have crodromous venation (S. Das and M. D. Choudhury *et al*., 2012 ; I. A. Fernandez., 2003).

2–7 radiating, hemispheric to broadly campanulate, homochromous capitula with yellow or green yellow corollas are present. The capitulum has a diameter of 15 to 20 mm. Ray florets are yellow and hairy above, measuring 2.3–4.5 mm in length. Phyllaries are herbaceous to slightly papery at the base, sparsely distributed in 2 or 3 rows, arachnoid, and acuminate at the apex in some species. Yellow disc florets with sparsely glandular lobes are funnel-shaped and 4–4.5 mm long (A. Dhiman *et al*., 2021). Achenes are narrowly oblong and compressed, measuring 4 mm long.

2.1. Microscopic Characters

Transverse section of rhizome shows epidermis, cortex and vascular tissue; epidermis uniseriate made up of brick-shaped cells, replaced at several places by sclerenchymatous hypodermis, hypodermis tri to five seriate, sclerenchymatous cells filled with brown pigment; cortex multiseriate, parenchymatous with intercellular spaces, some of the cells filled with brown pigment; cortex also contains cells with inulin crystals, aggregations of calcium oxalate crystals; groups of sclereids are also scattered in the cortex, lysogenous cavities filled with oil are seen in the cortical region; vasculature contains a peripheral ring of pericycle made of sclerenchyma; vascular bundles conjoint, collateral, open and end arch; xylem contains vessels with reticulate and scalariform thickenings; pith is crushed leaving large spaces in the centre (M. Aleem *et al*., 2020 ; A. Dhiman *et al*., 2021).

2.2. Description of Darunja qrabi in Unani Literature

Darunaj-aqrabi is an important plant-based medication that is frequently utilised in Unani Medicines in various dosage forms (C. P. Khare., 2008). Fibrous, hard, nodular and weighty, the rhizomes are brown/brownish on the outside and white on the inside. It has the appearance of a scorpion's tail, hence the name Aqrabi (the morphology of the rhizome is similar to that of a scorpion's tail), derivativ eof the Arabian word 'Aqrab', which means scorpion. It's as thick as a finger, tastes starchy, bitter, astringent and acidic, But has no distinct odour (A. Khan and M. Azam., 2013 ; I. Baitar., 1999 ; K. al-A. Ghani and Y. K. Advia., 2011). There are two types of Darunaj-aqrabi, according to Unani classical textbooks: Roman and Persian. The rhizome of the Roman type is of excellent quality, particularly those that are bitter, hard, and white on the interior (A. Khan and M. Azam., 2013).

2.2.1.Properties of Darunaja qrabi in Unani Medicine

Temperament (Mizaj) is one of USM's most essential ideas, and most drugs respond according to their temperament. The mizaj of a drug is defined by four qualities, which are hot (Har), cold (barid), dry (yabis), and moist (ratab) (M. T. Ahsan and S. Zafar., 2012). Darunaj-temperament aqrabi's has been defined as hot & dry in the third degree (A. S. Maghrabi *et al*., 2007; I. Sina., 2007).

Pharmacological Action

It possesses resolvent,demulcent, calorific, exhilarant, cardiotonic, digestive, carminative, stomach tonic, liver tonic, lithotripsic, protective of the foetus, antidote properties (A. I. A. Majoosi., 2010).

Therapeutic Uses:

It is used in the treatment of weakness of the heart, palpitation due to cold, plague, hemiplegia, Bell's palsy, Melancholia (depression), flatulence, abdominal pain, uterine pain due to accumulation of gasses, Uterine flatulence, Insomnia, displacement of vertebral column, superficial inflammation and snake & scorpion bite (A. I. A. Majoosi., 2010). Eating it along with figs is effective in all kinds of poisons, snake and scorpion bites. It attenuates and dissolves intestinal inflammation (A. I. A. Majoosi., 2010).Using it with sugar is beneficial in phlegmatic headache and chest pain. It strengthens the heart and proves to be useful in palpitation. Due to its antidote properties, it is being used in epidemic diseases especially in plague (H. M. Kabeeruddin., 2007).

Adverse Effect:

Darunaj-aqrabi induces headaches and is especially dangerous to people who have a strong temper (A. Khan and M. Azam., 2013).

Correctives/Corrigent:

Some Unani remedies' substances, in addition to having significant pharmacological properties, may too have a hazardous effect due to nature. As a result, definite correction methods, as mentioned in Greek literature, are applied to medications in order to improve their therapeutic impact. This is done in order to lessen the drug's toxicity by partially changing it using particular remedial techniques. If it is not possible to apply corrective measures to the drug, another substance that acts as a corrective agent is either administered or admixed in conjunction with the primary drug to reduce the drug's undesirable effects (S. A. A. Makbul et al., 2008). To reduce the harmful effect of Darunaj-aqrabi, Foeniculum vulgare Mill.,carbohydrates, Apple juice, dry extract of grapes are used as correctives (M. Aleem *et al* ., 2020).

Substitute:

When the original drug is unavailable, a substitute (Badal) is utilised. There is no medicine that can completely replace another medicament. If a medicine is replaced by another drug with the same property, the second drug should be used to replace the original drug for that exact specific activity (S. Perveen *et al*., 2020). According to Al Razi (865-925 AD),"the benefaction and objectivity of such medical system would end" if "the drugs mandatory for the treatment of a specific disease are not available, and the Practioner isuninformed of their substitutes which may be second-hand in place of the compulsory drugs" (S. Z. Rahman et al., 2008 ; S. A. A. Makbul et al., 2018).

An equal dose of Curcuma zedoaria and 1/3rd dose of Syzygium aromaticum is administered as a *Darunaj-aqrabi* alternative in cardiac disorders, and for uterine flatulence, an equal dose of Curcuma zedoaria and 2/3rd dose of *Syzygium aromaticum* is provided. Colchicum luteum), *Anacyclus pyrethrum* DC. and *Saussurea lappa* are some scholars' alternatives for *Darunaj-aqrabi* (A. Dhiman *et al*., 2021).

Dose:

Recommended dose: 3.5-7g (A. Khan and M. Azam., 1999).

Compound Formulations:

There are different dosage forms of Greek medicines which contain *Darunaj-aqrabi* as

as one of the ingredients such as Laboob Kabir Khas, Dawa al-misk, Majun Hamal Ambari Alvi Khan, Mufarreh Yaquti, Majun -e-Alkula, Khamira Marwareed Banuskha-e-Kalan, Khamira Murakkab, Majun Chob Chini Ba Nuskha Kalan, Majun Muqawwi ul Arwah, Mufarreh Azam, Arq Ambar, Habb-e-Muqawwi Khas, Nawed-e-Nau, Shababi, Ambari, Qalbeen, Yashbi, Jawarish Muqawwi-mi 'da. Brief descriptions of compound formulations mentioned in different Qarabadeen are given in Table 3.

Shelf Life

External features, colour, smell, taste, consistency, structure, weight, clarity, cleanliness, and taste were all used by ancient Greek physicians to evaluate medicine shelf-life (freshness). When all of these characteristics of the drug are safe, the drug is deemed stable and its shelf life is maintained; if any changes are noticed, the drug is said to have lost its shelf life. *Darunaj-aqrabi* has a shelf life of about ten years (A. Yasmeen *et al.*, 2020).

Table 3. *Darunaj-aqrabi* Containing Compound Formulations and their Indications

S. No.	Name of Formulation	Pharmacological actions	Therapeutic uses	Dose
1.	Dawa ul-misk moatadil	General tonic, Cardiotonic	Vital organs insufficiency, Palpitation, Melancholia, Psychosis	Bedtime 5-10 g
2.	Dawa-ul-misk Har-sada	Cardiotonic, Neuro tonic	Palpitation, Melancholia, Psychosis, Diseases which occur due to excess of phlegm and black bile, epilepsy, Facial palsy	5 g in morning
3	Dawa-ul-misk-Har-Jawahar-wala	Cardiotonic, Neuro tonic	Palpitation, Melancholia, Psychosis, diseases which occur due to excess of phlegm and black bile	5 g in morning
4.	Dawa ul-misk-moatadil-jawaharwala	Cardiotonic, Liver tonic stomachic	Melancholic, palpitation, Psychoneurosis, Weakness of Heart	3-7 g O. D
5.	Dawa-ul-misk	Tonic for Principal organs	Melancholia, Psychosis, Hemiplegia, Facial palsy	5 g O. D
6.	Laboob-Kabir-Khas	Aphrodisiac, Neuro tonic, Nervine tonic, Cardiotonic and Renal tonic	Sexual weakness, Nervine weakness	5 g empty stomach

7.	Majun Hamal Ambari Alvi Khan	Protective of foetus	Useful in threatened miscarriages, excess bleeding after delivery or for women whose offspring's die at birth	5 g with empty stomach
8.	Mufarreh Yaquti	Exhilarant, Tonic for Principal organs, Appetizer	Antidiarrheal, Beneficial in Uterine Diseases, cardiac diseases	5 g in morning
9.	Majun-e-Alkula	Renal tonic, aphrodisiac, Nervine tonic	Disease of kidney, Disease of bladder, Weakness of kidney, Weakness of bladder, Sexual weakness	6 g B.D
10.	Khamira Marwareed	Tonic for Principal organs, cardiotonic, neuro tonic	Palpitation, Weakness of Heart, Disease of the heart	4.5 g B.D
11.	Khamira Marwareed Banuskha-e-Kalan [43]	Cardiotonic, Neuro tonic and Memory tonic	It is beneficial in palpitation, Debility after disease.	3-5 g B.D
12.	Khamira Murakkab [41]	Cardiotonic	Disease of the heart, Weakness of Heart, Palpitation, disease of brain	5 g with milk empty stomach
13.	Khamira-e-Abreshamsada	Cardiotonic, Neuro tonic	Palpitation, Distress, Weakness of Heart	5-10 g B.D.
14.	Safoofdarunaj	Cardiotonic	Palpitation due to cold, Weakness of Heart	4.5 g with honey
15.	Majun Murawweh-ul Arwah	Cardiotonic, Neuro tonic, Liver tonic, stomachic	Weakness of Heart, disease of liver, Palpitation	1g B.D
16.	Mufarreh Azam	Exhilarant, Relieves palpitation, Aphrodisiac, Beneficial in Cholera, Beneficial in Plague.	Palpitation, Cholera, Plague, sexual weakness	5 g in the morning
17.	Arq Ambar	General tonic	Weakness of Heart, Weakness of the brain, Weakness of the liver, Fainting, Asthenia	60 ml

18.	Yaquti	Cardiotonic	Palpitation, Vertigo, Weakness of Heart	4.5 g in the morning
19.	Yaquti har	Cardiotonic, Neuro tonic, Renal tonic	disease of the heart, Palpitation, Carminative	1.75 to 3.5 g morning
20.	Majun isteqrarehamal	To promote conception		1 g in morning
21.	Majoon hakim alvi khan	Antiepileptic	Infantile Epilepsy	4.5 g B.D
22.	Hab-e-Ta'un	Plague	Beneficial in plague	1 pill thrice a day
23.	Hab-e-Amber Momiyaie	General tonic, Aphrodisiac, Cardiotonic	Sexual weakness, Spermatorrhoea, Nocturnal emission, Premature ejaculation, Strengthens Vital organs, Removes sexual debility and impotency, Enhancement of normal sexual function	2 pills at bedtime
24.	Mufarreh Shaikhul-Rais	Exhilarant, Cardiotonic, Vital organ tonic	Tubercular fever, Melancholic fever and palpitation),	3 g in morning
25.	Mufarreh motadil	Cardiotonic, Exhilarant	Disease of the heart, Weakness of Heart	6 g in morning
26.	Mufarreh har	Exhilarant, Relieves Palpitation, cardiotonic	Disease of the heart	9 g in morning

2.3. BIO-ACTIVE COMPOUNDS:

Doronicum hookeri chemical constituents have not yet been studied and described. Recently a new Allelochemical (Figure 3; compound 1) 5, 7,4'–trihydroxy-6-methoxyflavone-5-O-a-L-rhamno-pyranosyl-1'!4)-O-aL-arabinopyranosyl-4'-O-â-D-glucopyranoside, along with two known compounds (Figure 4; compound 2) 5-hydroxy-3, 7, 4'-trimethoxy flavone and (Figure 5; compound 3) 7, 3'- dihydroxy-5, 4', 5'-trimethoxy isoflavone have been isolated from methanolic extract of the flowers of *Doronicum hookeri* (S. Z. Rahman *et al*., 2008 ; Syed *et al* ; S. KITAMURA.,1969). isolate Flavonoids, alkaloids, saponins, cardiac glycosides from the rhizomes. Phenolic contents were isolated by Gupta *et al.*, 2001. Alkaloid otosenine is believed to have cardiovascular properties (M. Mohsin *et al*., 2008).

2.4. PHARMACOLOGICAL STUDIES

Doronicum hookeri has been shown to have antimicrobial , antifungal (V. P. Kumar *et al*.,2006) antioxidant and hepatoprotective properties (D. Gupta *et al*., 2011).

Blood pressure has recently been proven to have cardioprotective, antiatherogenic, and lowering benefits. Although the effect of *Doronicum hookeri* has yet to be determined, a number of compound compositions including it have been clinically examined (Sultana *et al*., 2011) discovered that Habb-e-Hamal, which contains *Doronicum hookeri* as one of its components, has a fertility-enhancing impact. Safoof Darunaj was given in powder form at a dosage of 5 g twice day for 30 days, coupled with 200 cc of Honey water in another trial. The investigation found that the test medication improved cough, dyspnoea, pulmonary and extremity oedema significantly (M. A. Kalam *et al*., 2019 ; A. Dhiman *et al*., 2021) . Similarly, following 90 days of treatment, Qalbeen (2 pills twice a day), a herbomineral formulation containing *Doronicum hookeri*, was reported to improve chest discomfort, dyspnoea, and palpitation in individuals with ischemic heart disease (M. Mohsin *et al*., 2008) Khamira Marwareed, a Greekherbo-mineral concoction that includes *Darunaj-aqrabi* as one of its constituents, is a powerful cardiac tonic with well-known antioxidant capabilities (M. S. Khan *et al*., 2011)

2.4.1.Antifungal Activity:

Bioactive compounds derivative of natural sources as plants could be a possible source of antifungal medicines, especially given the current situation in which human and plant-parasitic infections have developed resistance to antifungal drugs (M. Shirazi *et al*., 2020).*Doronicum hookeri* has demonstrated good antifungal efficacy in vitro. In the nutritive agar medium, dichloromethane and methanol extracts of *Doronicum hookeri* rhizome were tested against Saccharomyces cerevisiae and Candida albicans at doses of 1000 and 500 g / ml and found to have substantial antifungal activity (V. P. Kumar *et al*., 2006).

2.4.2.Antibacterial activity

Streptococcus faecalis was grown in nutrient agar media with a mixture of methanol and Dichloromethane (1:1, v/v) extract of *Doronicum hookeri* at various doses in an in vitro study. Bacterial growth was inhibited at 500 mg/ml concentrations of the extract, demonstrating its antibacterial action . Streptococcus faecalis, also known as Enterococcus faecalis, is the most common enterococcal pathogen, responsible for 95 percent of enterococcal infections, counting infections of the biliary tract, urinary tract, ulcers (e.g., bed sores), wounds (especially abdominal), and in rare cases, endocarditis and meningitis (M. Aleem *et al*., 2020).

2.4.3.Antioxidant Activity

The antioxidant research of a methanolic extract of *Doronicum hookeri* rhizomes, which had a high phenolic content and thus high free radical scavenging and reduction activities, was measured in vitro. Methanol extract scavenged DPPH (2,2- diphenyl-1-picryhydrazy) radicals at a concentration of 0.5 mg/ml, which was similar to standard BHT (butylated hydroxytoluene) (85 percent) in the radical scavenging assay. It also inhibited ABTS radicals by over 90% at doses over 0.3 mg/mL, which was higher than the dichloromethane extract. Dichloromethane extract, on the other hand, was high in flavonoids and had strong radical scavenging properties, including metal chelating, superoxide nitric, oxide. (D. Gupta *et al*., 2011). Total reducing power and total phenolic content were used in another in vitro test to assess the ethanolic and aqueous extracts' free radical scavenging capabilities. In total reducing power tests, the ethanolic extract showed stronger antioxidant activity than the aqueous extract, and both extracts showed a dose-dependent rise in antioxidant potential.

Total phenolic components were found in ethanolic and aqueous extracts at 39.8 and 12.3 mg GAE/g, respectively, while an ethanolic extract of *Doronicum hookeri* rhizomes showed antioxidant activity at 500 mg/kg in vivo experiments (D. Gupta *et al*., 2011).

2.5. Hepatoprotective Activities

Because *Doronicum hookeri* is a liver tonic and has been used to treat liver illnesses in the past, substantial pharmacological research has been done to investigate the hepatoprotective properties and mechanisms of extracts and compounds derived from this plant. In either sexed Charles Foster albino rats, ethanolic and aqueous extracts of *Doronicum hookeri* rhizomes showed hepatoprotective efficacy against CCl4-induced hepatotoxicity. Only ethanolic extract at a level of 500 mg/kg provided partial hepatoprotection against CCl4-induced toxicity, according to the study. Both the control and test groups had similar levels of Alkaline Phosphatase, however there were no significant differences in Total Bilirubin levels. The rationale for these results could be due to the study's short duration (S. N. Syed *et al*., 2014). As a result, more research into the hepatoprotective action is required.

3. RESULTS AND DISCUSSION

TOXICITY

Investigator used non-pregnant female rats to conduct an acute toxicity test in accordance with OECD guidelines 423. Three non-pregnant female rats were administered 300 mg/kg of alcoholic and aqueous extracts of *Doronicum hookeri* rhizomes and were monitored for 14 days to see their survival. To corroborate the findings, the same test was conducted in another group at a dosage of 2000mg/kg b.w. Because no mortality was seen at either dose, 300 mg/kg or 2 g/kg b.w., the LD50 was determined to be 2000mg/kg b.w. Both extracts of the test medication were determined to be nontoxic up to a dose of 2000mg/kg b.w,. in the study (S. A. Rather *et al*., 2017; A. Dhiman *et al*., 2021).

4. CONCLUSION:

Based on the data gathered so far, it is reasonable to conclude that *Doronicum hookeri* has been utilised in traditional medicine for centuries. Dawa al-misk, Laboob Kabir Khas, Khamira Marwareed, Banuskha-e-Kalan, Mufarreh Azam, and other *Doronicum hookeri* formulations are commercially available and are often given by traditional medicine practitioners.The key goal of this review was to give a venue for the reader to obtain a better knowledge of the potential therapeutic effects as stated in ancient literature that has yet to be confirmed by modern medicine.

The phytochemistry of *Doronicum hookeri* has not revealed a significant link between its chemical constituents and their pharmacological effects, and no research has been done to distinguish its chemical constituents from those of other species in the genus. As a result, more research is needed to understand these differences between species. In this research, an approach should be taken to determine the specific mechanism of action of the species' chemical constituents, as well as the safety of the species' chemical constituents in clinical applications. The antifungal and antimicrobial effects of the plant have been studied only on a few fungal and bacterial species. Furthermore, there was no in vivo analysis in this limited research. In future, it will be critical to determine the mechanism of action and pharmacokinetics using in vitro, in vivo, and human research models.

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