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Review Paper

Pharmacological Activities of (Raphanus Raphanistrum Subsp. Sativus): A review

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ABSTRACT

Raphanus raphanistrum, a member of the Brassicaceae family, is a weed that is extremely difficult to eradicate in southern Australia. The possibility of biological

Researchers are looking for ways to control this weed in Australia by studying it in southern Europe and the Mediterranean region, which is where it first originated. Throughout the Mediterranean region, surveys have been conducted for diseases and insects, with a focus on southern Greece, northern Tunisia, the French Mediterranean coast, and southern Portugal. Even if a large number of the discovered organisms are experts in the Brassicaceae family, the majority of these are insufficiently host-specific to rule out the risk to canola (Brassica napus), the most significant crop connected to wild radish. Raphanus sativus, the edible radish, is another close relative.

Although they are classified as different species, it has been suggested that edible radish originated from wild radish in antiquity. Wild indigenous populations of edible radish are unknown. Finding biological control agents that target the wild radish's seed or reproductive organs or whose host range is limited to wild radish has therefore received a lot of attention. Among the agents that are being examined to reduce seed set are insects that are very specialized in the way they feed on the plant, like the flycatcher gephyraulus raphanistri, which is an insect that has only been found on wild radish.

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1. INTRODUCTION

One of the most significant crop weeds in southern Australia is wild radish (Raphanus raphanistrum L.) (Brassicaceae). Herbicide, crop and pasture rotation, and management techniques are typically used to control this weed. Herbicide resistance in this weed has increased as a result of present treatment[1].

Researchers are looking into the possibility of classical biological management of this invasive weed in Australia in the weed's original distribution regions, which include southern Europe and the Mediterranean region. This review provides an overview of this study, highlighting the issues that still need to be addressed and the potential outcomes.

The goal of classical biological control of wild radish is challenging. The primary concerns, which mostly relate to the security of biological control due to the evolutionary similarities between wild radish and several significant crop species, are outlined in the sections that follow[2]. Raphanus's evolution and genetics According to Hewson and Schulz, the family Brassicaceae has roughly 13 tribes, 375 genera, and 3200 species of wild radish cousins. Raphanus is a member of the tribe Brassiceae, which is thought to be a naturally occurring group. The majority of evolutionary data within the Brassiceae suggests that

Raphanus and the Brassica rapa/oleracea lineage—which also contains canola—share a common ancestor[3].

According to Pistrick's review of the genus, Raphanus contains two species: R. sativus L. (edible radish) and R. raphanistrum, which have three subspecies: R. r. raphanistrum (wild radish), R. r. landra (Moretti ex DC.) Bonnier & Layens, and R. r. rostratus (DC.) Thell[4].

A few writers from past works enumerate five subspecies. It is unknown where edible radish originated. Though it is obviously a different species, it has been suggested that it is descended from one of R. raphanistrum's subspecies . The Mediterranean region, which is home to all R. raphanistrum subspecies, is most likely the center of evolution for this and similar species[5]. As part of the initiative located in France, the phylogeny and provenance of wild radish brought into Australia are currently being investigated.

The tribe Brassiceae has 24 species that are found in Australia. They're all new, and a lot of them are weeds. Apart from edible radish grown as a vegetable, the most significant crop in Australia that is closely related to wild radish is canola, Brassica napus L. In Australia, wild radish has no inherent benefits[6].

In Australia, edible radish The well-known edible radish is popular for domestic vegetable production and is cultivated in market gardens, usually close to cities. Due to the extremely short (4–12 week) production cycle, the plants do not have enough time to Analyzing the possibility of using biological control to manage wild radish (Raphanus raphanistrum) through surveys conducted in the Mediterranean area

Just before harvest, the Thirteenth Australian Weeds Conference was held. Australia produces 1500 tonnes of radish annually on 150 hectares, of which a little amount is exported to Asia .

Asian radish cultivars, or daikon, are not only radish as a vegetable but also a possible export crop to Korea and Japan for pickling purposes[7]. Certain radish types can also be utilized as an oil seed or as a short-season fodder crop. You can also use radish seeds to make sprouts. These are currently possible crops in Australia; nevertheless, a biological control initiative must also take the potential crops' safety into account.

An approach to biological regulation Wild radish is an annual plant that needs seeds to grow the next year. A biological control agent needs to impact seed production, either directly or indirectly. This can occur through consuming seeds, killing or stressing the plant, which reduces the amount of seeds produced, or indirectly lowering the quality of the seeds. Secondly, the agent needs to be highly specific to the host[8]. It must be demonstrated that the agent is not going to harm canola, a crop that is intimately linked to the weed.

However, the form of the fruit of Raphanus, which is a silique with segments holding individual seeds, differs enough from that of Brassica species, which is a silique without segments, to suggest that there may be a distinct related fauna.

When it comes to edible radish, things get more complicated. Finding suitable agents with sufficient specificity will be difficult, and introducing a biological control agent that harms radishes in household gardens would not go over well.

The combination of these factors suggests a search strategy centered around finding agents that either have extremely high levels of host specificity and stress the plant's leaves or stems to the point where the quality or quantity of seeds declines, or have feeding habits that directly destroy flowers, seeds, or silica, since edible radish does not commercialize this part[9].

2. PHARMACOLOGICAL ACTIVITIES

Hepatoprotective activity

A phenolic extract from Raphanus sativus leaves has been shown to be effective in preventing hepatotoxicity caused by paracetamol. Acetaminophen increased the hepatic enzymes' activity, including serum AP, serum LDH, and serum SGOT and SGPT. A substance that has the ability to inhibit or delay the oxidation of other molecules is called an antioxidant. Free radicals, which can be produced by oxidation events, can set off chain reactions that harm cells[10-11].

There are two primary types of antioxidant defenses: those that stop free radicals from being created and those that absorb any that are already created.

Cardioprotective activity

Chronic cardiotoxicity can be caused by the accumulation of several metabolic pathways leading to cellular damage, which in turn causes myocardiocyte integrity to be disrupted and cardiac function to be lost. A crucial component in the pathophysiology of the heart is nitric oxide (NO), and dysregulation of NO metabolism and nitric oxide synthases (NOSs) activity appears to be a common feature in cardiac diseases[12-13].

Therefore, in patients suffering from acute myocardial infarction and acute coronary insufficiency, uric acid may function as an extra indicator of free radical responses.

Anti-microbial and anti-cancer properties

A methonolic extract of Raphanus sativus leaves was shown to have anti-microbial and anti-cancer properties. The most effective portion of methanol extract against A. salina was the insoluble ethyl acetate fraction. The soluble ethyl acetate fraction from the methanol extract, on the other hand, showed strong inhibitory activity against S. aureus.

Antimicrobial activity: The plant has antifungal and antibacterial raphanin15. Additionally, it has been discovered to be highly active against Salmonella typhi, Escherichia coli, Pseudomonas pyocyaneus, Bacillus subtilis, etc.[14-16].

It prevents the growth of pneumococci, streptococci, and Staphylococcus aureus. Additionally, it has the ability to combat a variety of food-borne pathogenic and food-spoiled bacteria, including Enterococcus, Listeria, Micrococcus, Lactobacillus, and Pedicoccus spp.

Lipid peroxidation-related inhibitory reaction

All living things constantly manufacture free radicals in their bodies, mostly as a result of oxidation processes. The body's antioxidant system can usually fend off oxidative damage that results from regular physiological functions. Many forms of stress, both physical and emotional, are plaguing modern civilization. These include stress from fast food, pollution, and other sources[17-18].

These stressors result in the production of free radicals, which the body's antioxidant system is unable to neutralize. Damage to membrane lipid molecules due to oxidation leads to the emergence of many physiological and pathological conditions. The most effective strategy to prevent these diseases in the body is to inhibit lipid peroxidation in any way possible. It

It has been suggested that the plant prevents lipid peroxidation by raising or sustaining glutathione levels and activating enzyme antioxidants like catalase.

Antiurolithiatic activity

The antiurolithiatic and diuretic properties of the aqueous bark extract of Raphanus sativus were examined. Rats' urinary bladders were implanted with zinc discs to experimentally cause urolithiasis. After treatment, animals that received aqueous extract showed a significant decrease in the weight of stones when compared to control groups[19].

Anti-oxidant and anti-tyrosinase activity

Two different types of R. sativus L. root extracts, namely the methanolic extract and the freeze-dried juice, were assessed for their scavenging activity on DPPH, superoxide anion, and singlet oxygen, as well as their inhibitory effect on mushroom tyrosinase. The hydroxyl radical scavenging effectiveness of the radish sprout methanolic extract was 1.8 times greater than that of L-ascorbic acid. It is proposed that radish roots and sprouts may significantly benefit from the antioxidant activity of flavonoids and sappier-grade acid esters. Additionally, black radish, a cultivar of R. sativus, has the ability to scavenge free radicals and act as an antioxidant[20-21].

It is highly probable that the Thai roots could have significantactivity of antioxidants and antityrosinase, which will benefit the skin.

Gastroprotective activity

Radish juice has an antigastric ulcer-prevention effect that is likely due to the phenolic, terpenoidal, and sulphurated components in it. These constituents work to prevent the buildup of excessive free radicals and shield the stomach tissue from harmful chemical challenges. This could be because it produces PG, has antioxidant and/or mucus-secreting qualities, and strengthens the integrity of the mucosal barrier—the first line of defense against endogenous and external ulcerogenic chemicals[22].

Antidiabetic properties

The dangerous condition known as diabetes mellitus is brought on by a disruption in glucose homeostasis, which raises blood glucose levels [40]. This metabolic condition is among the leading causes of death in the world each year.

The presence of flavonoids and anthocyanins in red R. sativus roots may contribute to their hypoglycemic impact. Diabetes risk may be lowered by consuming flavonoids or foods high in flavonoids. The best concentration of dried red R. sativus roots to reduce blood glucose levels was found to be 7.5%. By boosting lipoprotein lipase activity, R. sativus decreases lipid plasma and promotes lipid metabolism. R. sativus showed a substantial reduction in the postprandial glycemic load caused by starch, indicating a possible antidiabetic effect[23].

It has been discovered that the anthocyanin pelargonidin effectively lowers blood sugar levels . R. sativus root extracts have demonstrated the ability to lower blood sugar through a variety of mechanisms, including the control of hormones involved in glucose metabolism, the prevention of oxidative stress, and the balance of sugar intake and absorption. It has been demonstrated that R. sativus root extract raises adiponectin levels, which are important for controlling glucose and fat metabolism. It has been discovered that adiponectin increases gluconeogenesis, fatty acid oxidation, bodyweight reduction, and insulin sensitivity .

Anti-nephrotoxic properties

Increased levels of urea, creatinine, and uric acid were indicative of a constellation of renal function abnormalities in rats drunk with dimethoate[24]. Leek juices and R. sativus have a strong antioxidant effect that helps prevent oxidative stress. Since it significantly increased GSH and SOD activity in the liver and kidney, R. sativus extract and zearalenone were successful in restoring the antioxidant enzyme activities. This may have been caused by the extract's higher content of isothiocyanate, kaempferol glycosides, and L-tryptophan compounds, as well as their capacity to scavenge free radicals. The inclusion of polyphenolic chemicals may have contributed to the reversal of the decreased levels of reduced GSH and SOD by R. sativus methanolic extract.

Giving leek juice and R. sativus to mice that had been inebriated with dimethoate brought the levels of these changed biochemical parameters back to normal and improved renal dysfunction. Nephroprotection against gentamicin-induced nephrotoxicity is demonstrated by R. sativus. They suggested that its strong antioxidant impact might be the cause of this . Acute renal failure and other renal or nephrotoxicity issues are brought on by rifampicin.

The antioxidant qualities of ethnomedical herbs—which include flavonoids, alkaloids, saponins, and tannins—may be the reason why these plants lessen nephrotoxicity. Quercetin is one of the flavonoids that has been shown to be nephroprotective and to reduce drug-induced nephrotoxicity in laboratory animals. Because R. sativus leaves contain quercetin, which shields the cell lining, the kidney's normal morphology was preserved when treated with ethanolic and water extracts. Diuretics are medications that stimulate the production of urine. One way they work is by raising the glomerular filtration rate, which raises urine production. Excellent diuretic qualities are possessed by R. sativus. R. sativus extracts, both alcoholic and water-based, have nephroprotective properties against rifampicin[25].

3. CONCLUSION

Raphanus raphanistrum's plant medicine qualities are a result of its bioactive chemical compounds. Many conditions can be treated using Raphanus raphanistrum, including diuretic, anti-cancer, and antimicrobial effects.

The following comprehensive description makes it extremely straightforward to defend Raphanus multidisciplinary attribute.

This versatile vegetable is readily available throughout the year and possesses phytochemical properties in both its fruit and leaf. These properties give it increased potency in combating a variety of lifestyle disorders and pave the way for scientific research on a wide range of life-threatening illnesses.

4.CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

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