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PHARMACOGNOSTICAL PROFILE OF *RHODIOLA ROSEA* PLANT AND THERAPEUTIC USES ON VARIOUS DISEASES: A REVIEW

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INTRODUCTION

Rhodiola rosea L. (syn. *Sedum rhodiola* DC.; *Sedum roseum* (L.) Scop), also known as “roseroot”, “golden root” or “arctic root”, belongs to the plant family Crassulaceae. Russian researchers have classified this perennial plant, which grows to a height of 30 to 70 cm and has a thick rhizome and yellow, fragrant flowers, as a "adaptogen" because of its capacity to increase the body's resistance to biological, chemical, or physical stressors, treat fatigue, extend life, and support mental and emotional health.[1]

In addition to its anti-diabetic, anti-cancer, anti-aging, cardio-protective, and neuro-protective properties, *Rhodiola rosea* is a remarkable herb that has been used in traditional medicine to stimulate the nervous system, protect the body from oxidative stress, free radical damage, and virus infection, and treat cardiovascular systems, Alzheimer's and Parkinson's disease, cancer, and inflammatory diseases. Because of its distinct pharmacological activity, this herb is prized in traditional medicine throughout China, Russia, Asia, and Eastern and Northern Europe.

KEYWORDS: *Rhodiola rosea,* cardio-protective, and neuro-protective effects, Adaptogen, Anti-diabetic.

1.1 Scientific Classification[2]

Kingdom: Plantae

Order: Saxifragales

Family: Crassulaceae

Genus: *Rhodiola*

Species: *Rhodiola rosea*

1.2 Morphology[3]

- **Size**: *Rhodiola rosea* is a fleshy, herbaceous plant that can grow to be 5–40 cm tall.
- **Leaves**: The leaves are densely arranged, sessile, glabrous, and have an acute tip and round base. They are usually 1.3–3 cm long and oblanceolate to narrowly elliptic in shape.
- **Flowers**: The flowers are pale yellow to greenish yellow in color, sometimes with red tips, and bloom in the summer. They have 4 sepals and 4 petals, and are about 1 to 3.5 millimeters long.
- **Rootstock**: The rootstock is thick, subcylindrical, and has a golden outside and pink inside. It is sparsely branched and 2–2.5 cm long.
- **Inflorescence**: The flowers are collected in a cymose inflorescence.
- **Ovary**: The carpels of the ovary are free and isomeric.

If we discuss about the geographical distribution Rhodiola is originated from mountainous regions of Southwest China and the Himalayas. The yellow-flowered herbaceous perennial grows naturally at high elevations in dry sandy soil, on sea cliffs, and in the crevices of mountain rocks in the Arctic areas of Europe and Asia (primarily Siberia), as well as the eastern coasts of North America. *R. rosea* L. has emerged as a significant medicinal plant in the traditional and popular medicine of a number of European and Asian nations, including Sweden, Norway, France, Germany, Iceland, Russia, and China.[4]

1. Phytochemistry of *Rhodiola rosea*

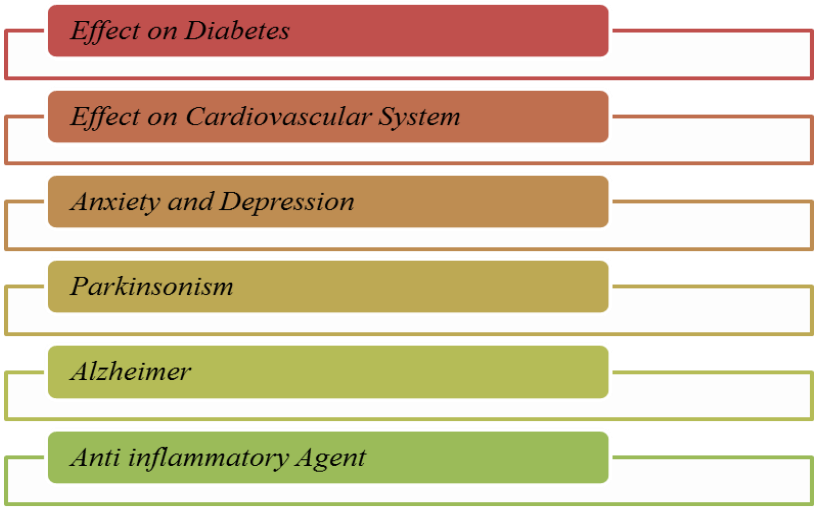
The investigation of the phytochemistry of R. rosea root has revealed the presence of six distinct groups[5]

Chemical compounds	Derivatives
Phenylpropanoids	rosavin, rosin, rosarian
Phenylethanol derivatives	salidroside (rhodioloside), tyrosol;
Flavanoids	rodiolin, rodionin, rodiosin, acetylrodalgin, tricin;
Monoterpernes	rosiridol, rosaridin
Triterpenes	daucosterol, beta-sitosterol
Phenolic acids	Chlorogenic and hydroxycinnamic, gallic acids.

Rosiridin has attracted particular interest because of its effect in depression and senile dementia. Rhodioloside[6] (salidroside) active principles of the SHR-5 extract were found to have neuroprotective, cardioprotective and hepatoprotective activities and can be effective in

the prevention of a number of disorders related to neuroendocrine and immune system. Three rosavin compounds (rosavin, rosin, and rosarin[7] which are unique to *R. rosea* (the most used species of Rhodiola genus) might be responsible for antidepressant, anticancer, neurotropic, and hepatoprotective effects of this herb.[8]

2. Therapeutics uses in various diseases



The remarkable plant *Rhodiola rosea* has been used in traditional medicine to boost the neurological system and shield the body from viral infections, inflammation, oxidative stress, and damage from free radicals. *Rhodiola rosea* belongs to a class of plant compounds known as adaptogens, which are substances that aid in the body's ability to adjust to different types of stress. It has been suggested that adaptogens help cure a wide range of illnesses, including cancer and weariness.

According to research, *Rhodiola rosea* contains anti-stress, anti-anxiety, anti-fatigue, and anti-depressant qualities without any notable negative effects[9] Because of its pharmacological properties, *Rhodiola rosea* has been taken into consideration for medication development worldwide, particularly in regions of Europe, Asia, and Russia. For anxiety and depression, *Rhodiola rosea* has proven to be more effective and safe than pharmaceutical medications, which can have adverse effects like mood, sleep, and digestive disturbances.

According to this study, *Rhodiola rosea* may help prevent, lessen, and treat serious illnesses like Alzheimer's disease, Parkinson's disease, cardiovascular disease, diabetes, and cancer in addition to curing common conditions like depression, binge eating, anorexia, generalized anxiety disorders, and physical and mental exhaustion. Our next study will focus on

extracting *Rhodiola rosea* into filtration equipment, followed by purification and extended quality control to create tablets for animal testing.[10]

Therapeutic Effects

1. **Anti-diabetic activity:** Because type 2 diabetes (T2D) is always accompanied by issues related to the heart, kidneys, and eyes, it has become a major global health concern. Inflammation is a key factor in the pathophysiology of type 2 diabetes, as well as its long-term microvascular and macrovascular consequences, according to a growing body of evidence. Insulin resistance, type 2 diabetes, and its consequences, including dyslipidemia, diabetic nephropathy[9], retinopathy, and atherosclerosis, are caused by the creation of different inflammatory mediators and other molecules (including leptin). Researchers have recently looked into the use of therapeutic anti-inflammatory medications (IL 1β, MCP-1, TNFα blockers, and salsalate) to treat type 2 diabetes.Results showed that anti-inflammatory drugs can improve insulin secretion or insulin resistance, as well as protect other organ functions, such as kidney, eye and the cardiovascular system. *Rhodiola rosea* L. and its active compounds exhibit a variety of pharmacological effects in different models of T2D, including inhibition of hepatic gluconeogenesis, repression of adipogenesis and lipid peroxidation, enhancing islet B-cell survival et al., through anti-inflammatory effects.[11]

2. **Effect on Cardiovascular System:** Sofren injection, an intravenous Traditional Chinese Medicine (TCM) injection derived from *Rhodiola rosea* L. extract, is the most widely used therapeutic preparation for *Rhodiola rosea* L. In clinical practice, it is mostly used to treat CVD. According to this study, Sofren injection reduced SAP in part by inhibiting oxidation, inflammation, and apoptosis. Similar outcomes were shown while treating myocardial infarction that was worsened by heart failure.[12]

3. **Anti-Inflammatory activity:** Studies on *Rhodiola rosea* L. extracts, preparations, and active compounds' anti-inflammatory properties and associated processes. Based on the information gathered and examined, this paper will present the theoretical underpinnings for its clinical use as well as the supporting data or recommendations for further research and therapeutic uses of *Rhodiola rosea* L.[13]

4. **Adaptogenic activity:** Because of its many advantages and lack of negative effects, *Rhodiola rosea* has grown in popularity. Because of its adaptogenic qualities, it has gained increased notoriety.[14]

5. **Anti-depressant & anti-anxiety activity:** *Rhodiola rosea* is an adaptogen herb from the Crassulaceae family that has been extensively utilized in Russian and Chinese medicine.[15] The herb is used to treat depression, anxiety, mental and physical weariness, and to improve general health. In this systematic review, we looked at the effects of *R. rosea* on depression, anxiety, and mood, which are the most important for mental health. One study revealed evidence that *Rhodiola rosea* may help with symptoms of generalized anxiety disorder.[16]

6. **Anti-parkinsonism activity:** Ageing and age-related neurodegenerative alterations, particularly Parkinson's disease, are characterized by the presence of reactive oxygen species. It is distinguished by evidence of severe oxidative stress and mitochondrial damage in the pars compacta of the substantia nigra. The current study was conducted to examine if R*hodiola rosea* extract might reduce MPTP-induced neurotoxicity in Male Wistar rats.[17]

3. CONCLUSION

This review article discusses some potential important uses of *Rhodiola rosea* in the treatment of various diseases/psychological problems, along with some extra information. *Rhodiola rosea* has demonstrated its multi-benefits in several studies conducted by academics throughout the world. *Rhodiola rosea's* primary effects include antidepressant, anti-anxiety, anti-fatigue, stress reduction, increased work capacities, and improved everyday performance, as well as antioxidant and anti-aging qualities. A commonly used anti-inflammatory medication has a defined target and thus substantial effects, but it is also prone to side effects and severe responses (such as liver and kidney damage and gastrointestinal disturbances). Currently, there have been few reports of hazardous or adverse reactions to *Rhodiola rosea* L.

REFERENCES

1. Wei-ling Pua,b, Meng-ying Zhanga,c, Ru-yu Baia,c, Li-kang Sunc,,*, Wen-hua Lid,,*, Ying-li Yua,b,Yue Zhanga,b, Lei Songa,b, Zhao-xin Wanga,b, Yan-fei Pengc, Hong

Shia,b, Kun Zhoua,b,e, Tian-xiang Lif Anti-inflammatory effects of Rhodiola rosea L.: A review Biomedicine & Pharmacotherapy, 2020; 121: 1-10.

2. Panossian, A.; Wikman, G.; Sarris, J. Rosenroot (Rhodiola rosea): Traditional use, chemical composition, pharmacology and clinical efficacy. Phytomedicine, 2010; 17: 481–493.
3. "Flora of the Canadian Arctic Archipelago - Rhodiola rosea L." *nature.ca*. Retrieved 10 June 2023.
4. Tao, H.; Wu, X.; Cao, J.; Peng, Y.; Wang, A.; Pei, J.; Xiao, J.; Wang, S.; Wang, Y. Rhodiola species: A comprehensive review of traditional use, phytochemistry, pharmacology, toxicity, and clinical study. Med. Res. Rev., 2019; 39: 1779–1850.
5. Petsalo, A.; Jalonen, J.; Tolonen, A. Identification of flavonoids of Rhodiola rosea by liquid chromatography-tandemmass spectrometry. J. Chromatogr. A 2006; 1112: 224–231.
6. Emilija Ivanova Stojcheva * and José Carlos Quintela the Effectiveness of Rhodiola rosea L. Preparations in Alleviating Various Aspects of Life-Stress Symptoms and Stress-Induced Conditions—Encouraging Clinical Evidence Molecules 2022; 27: 3902 pahe 1-17.
7. Rafie Hamidpour, Soheila Hamidpour, Mohsen Hamidpour, Mina Shahlari, Mahnaz Sohraby, Nooshin Shahlari, Roxanna Hamidpour, Chemistry, pharmacology and medicinal property of Rhodiola rosea from the selection of traditional applications to the novel phytotherapy for the prevention and treatment of serious diseases Int J Case Rep Images, 2015; 6(11): 661–671.
8. Hiramatsu H, Morishima T, Nakanishi H, et al. Successful treatment of a patient with Klinefelter's syndrome complicated by mediastinal germ cell tumor and AML(M7). Bone Marrow Transplant, 2008 May; 41(10): 907–8.
9. M. Wang, et al., Salidroside improves glucose homeostasis in obese mice by re pressing inflammation in white adipose tissues and improving leptin sensitivity in hypothalamus, Sci. Rep., 2016; 6: 253-99.
10. Emilija Ivanova Stojcheva * and José Carlos Quintela the Effectiveness of Rhodiola rosea L. Preparations in Alleviating Various Aspects of Life-Stress Symptoms and Stress-Induced Conditions—Encouraging Clinical Evidence Molecules, 2022; 27: 3902 pahe 1-17.
11. X. Wang, et al., Inflammatory markers and risk of type 2 diabetes, A Systematic Review and Meta-Analysis, 2013; 36(1): 166–175.

12. H. WANG, S. YANG, X. YANG, Effect and mechanism of sofren injection in the treatment of stable angina pectoris, Inf. Trad. Chinese Med., 2017; 34(6): 56–60.
13. M.Y. Donath, Multiple benefits of targeting inflammation in the treatment of type 2 diabetes, Diabetologia, 2016; 59(4): 679–682.
14. Jagtap Pradnya Nilesh, Mhetre Omkar S. and Malavdkar Poonam R., "A Review Article on Rhodiola Rosea: An Adaptogen Having Multiple Benefits", Internatinal Journal of Pharmacocognosy, 2020; 7(3): 62-69.
15. Bystritsky A, Kerwin L and Feusner J: A pilot study of Rhodiola rosea (rhodax®) for generalized anxiety disorder (gad). The J of Alter and Complem Me., 2008; 175-80.
16. Fanaras Konstantinos1, Reinhard Heun,, The effects of Rhodiola Rosea supplementation on depression, anxiety and mood – A Systematic Review, GLOBAL PSYCHIATRY - 2020; 3(1): 72-82.
17. Jacob Reenu, G. Nalini, N.Chidambaranathan, "Neuroprotective effect of *Rhodiola rosea* Linn against MPTP induced cognitive impairment and oxidative stress, Annals of Neurosciences, 2013; 20(2): 47-51.