

Rhodiola rosea: A Bioactive Breakthrough in Adaptogenic Performance and Functional Stress Nutrition

Shraddha Joshi¹ and Neetu Dobhal²

¹Ph.D. Research Scholar (UGC-JRF), Department of Food Science and Nutrition, College of Community Science, GBPUA&T, Pant Nagar, Uttarakhand

²Assistant Professor, Department of Food Science and Nutrition, College of Community Science, GBPUA&T, Pant Nagar, Uttarakhand

Corresponding Author: shraddha20december@gmail.com

In 2025, stress is no longer a rare inconvenience—it has become a defining crisis of the global workforce. From relentless deadlines to the erosion of work-life boundaries, modern professionals are operating under chronic pressure. According to the 2024 Gallup Global Workplace Report, a staggering 86% of workers globally are either struggling or suffering with mental health and emotional well-being. In India, 40% of employees frequently experience burnout, and over one-third of working women cite poor work-life balance as their top reason for contemplating resignation. This post-pandemic era has exposed a silent epidemic: the rise of chronic stress, fatigue, emotional exhaustion, and burnout.

The consequences are profound—from increasing anxiety, depression, and sleep disturbances to rising cases of premature cardiac events and metabolic disorders. Mental health has become a public health imperative, and the search for sustainable, natural interventions has never been more critical.

The alarming rise in anxiety, sleep disorders, depression, and even premature cardiac events among young professionals has prompted a global reckoning. Mental health is no longer a luxury; it’s a universal need and a public health imperative. The demand for sustainable, natural, and evidence-based stress solutions has become need of the hour. And this is

where the wisdom of ancient herbal medicine converges with modern science. Work-related stress is not just affecting our minds but weakening our bodies too.

Adaptogens are a unique class of natural substances—primarily herbs and botanical extracts—that help the body resist physical, chemical, and emotional stressors by promoting systemic balance or homeostasis. Unlike stimulants that push the body into action, adaptogens work by modulating stress responses, supporting adrenal function, and enhancing resilience without overstimulation. Traditionally used in Ayurvedic, Chinese, and Russian medicine, adaptogens have gained modern scientific recognition for their role in managing fatigue, anxiety, and burnout. Well-known adaptogens include *Ashwagandha* (*Withania somnifera*), *Holy Basil* (*Ocimum sanctum*), *Panax Ginseng*, *Schisandra chinensis*, and *Rhodiola rosea*. Among these, *Rhodiola rosea* has garnered particular attention for its dual benefits on mental and physical performance, making it a promising botanical in today’s stress-laden world.

Rhodiola vs Other Adaptogens: A Quick Comparison

Adaptogens at a Glance

Here’s how Rhodiola stacks up against other well-known adaptogens in terms of stress relief, energy, and cognitive support .

Table 1: Comparative Profile of Rhodiola and Other Leading Adaptogenic Herbs

Adaptogen	Mental Support	Energy Boost	Stress Modulation	Traditional Use
Rhodiola rosea	Enhances mood, focus, mental endurance	Mitochondrial ATP production	Regulates HPA axis & cortisol	Tibetan, Russian, Nordic regions
Ashwagandha (<i>Withania somnifera</i>)	Reduces anxiety & improves sleep	Mild energy balancing	Strong cortisol-lowering effect	Ayurvedic medicine (India)
Panax Ginseng	Supports cognitive function, alertness	Boosts stamina & circulation	Modulates immune stress response	Traditional Chinese medicine
Schisandra chinensis	Improves concentration & adaptability	Liver detox + mild energizer	Balances stress via antioxidant effects	Chinese herbal practices
Holy Basil (<i>Ocimum sanctum</i>)	Eases anxiety & enhances resilience	Gentle tonic	Anti-inflammatory and anxiolytic	Indian Ayurveda

Rhodiola's unique strength lies in its dual-action: restoring both mental clarity and physical stamina without overstimulation.

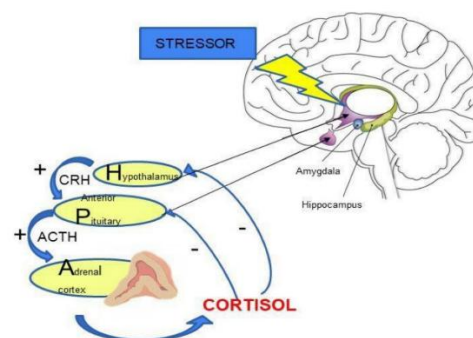
This article delves into the scientific foundations, traditional uses, and emerging potential of *Rhodiola rosea*, exploring its relevance in the context of work-life balance, adaptogen pharmacology, and the pressing mental health challenges of 2025.

Rhodiola Rosea; Amid the unforgiving terrains of the trans-Himalayas grows a yellow-flowered perennial herb known as *Rhodiola rosea*—revered for centuries as a natural elixir of endurance, clarity, and calm. Locally called *Shrolo Marpo* in Ladakh, this resilient alpine plant thrives at altitudes above 14,000 feet, mirroring its adaptogenic role in helping the human body endure physical and emotional extremes. Known as the “golden root” or “roseroot,” *Rhodiola rosea* has gained global recognition for its remarkable ability to combat stress-related fatigue, improve mood, and enhance cognitive performance. Its potent phytochemicals—particularly rosavins and salidroside—have been scientifically shown to regulate cortisol levels, support mitochondrial energy, and protect neurons from oxidative damage.



Fig. 1. Rhodiola rosea: From Alpine Bloom to Resilience Root (Bernatoniene *et al.*, 2023)

What sets *Rhodiola* apart is its dual action on mind and body. This adaptogenic herb exerts a balancing effect on the hypothalamic-pituitary-adrenal (HPA) axis, which governs our stress response. When a stressor activates the brain's amygdala, it signals the hypothalamus to release corticotropin-releasing hormone (CRH). This stimulates the pituitary gland to release adrenocorticotrophic hormone (ACTH), which prompts the adrenal cortex to produce cortisol—the primary stress hormone. Elevated cortisol levels prepare the body for a fight-or-flight response, but



chronic elevation leads to fatigue, anxiety, and metabolic imbalance.

Fig. 2. The Stress Response Pathway and Cortisol Release via the HPA Axis (Mikulska *et al.*, 2021)

Rhodiola rosea helps modulate this HPA axis, restoring hormonal balance and resilience. Unlike synthetic stimulants, *Rhodiola* modulates rather than overrides this system, reducing cortisol levels when they're too high, and supporting energy when we're drained. Its bioactive compounds, especially rosavin and salidroside, are central to these benefits. These compounds have been clinically shown to alleviate symptoms of fatigue, anxiety, and depression, while improving attention, endurance, and mental clarity.

Several studies underline its therapeutic promise. A randomized controlled trial by Darbinyan *et al.* in 2000 found significant improvements in work-related fatigue after just 14 days of supplementation with *Rhodiola* extract. Another multicentre study involving 101 participants recorded steady improvements in stress symptoms, mood, quality of life, and fatigue scores over four weeks. In a large open-label study of 330 patients suffering from burnout, *Rhodiola* reduced complaints by up to 63%—with very high tolerability.

The pharmacological action of *Rhodiola* is impressively broad. It boosts neurotransmitter availability by inhibiting enzymes that degrade serotonin and dopamine—two crucial chemicals for emotional balance and motivation. Simultaneously, *Rhodiola* enhances mitochondrial ATP production, thus energizing the body at a cellular level. This dual action allows it to support not just mental endurance, but also physical performance.

Athletes have long valued *Rhodiola* for its fatigue-fighting effects. From Russian Olympians to high-altitude mountaineers, the herb has helped improve oxygen efficiency, delay exhaustion, and speed

up recovery. Modern research corroborates this: Rhodiola has been shown to increase VO₂ max, reduce oxidative damage from exercise, and lower lactic acid build-up. This makes it an attractive, natural performance enhancer.

Beyond fitness, Rhodiola also contributes to cardiovascular and immune health. Stress, especially chronic, contributes significantly to hypertension, arrhythmias, and endothelial dysfunction. Rhodiola’s ability to regulate autonomic nervous system responses and improve nitric oxide synthesis can help mitigate these risks. In older adults, it boosts immune resilience, reduces chronic inflammation, and activates antioxidant enzymes like superoxide dismutase and glutathione peroxidase—factors central to healthy aging.

India, with its rich tradition of herbal medicine, is uniquely positioned to harness Rhodiola's potential. Yet, due to overharvesting and ecological threats, Rhodiola rosea is now endangered in many regions. Conservation initiatives and cultivation research in Ladakh are thus critical, not only to preserve biodiversity but to unlock the herb’s public health benefits for future generations.

So why are we not seeing Rhodiola prescribed more widely? One key reason is lack of awareness. While it's popular in parts of Europe and America, where it’s included in nutraceuticals and anti-stress formulas, the Indian wellness market is only beginning to catch on. Another challenge is quality control. Not all Rhodiola supplements are created equal. Experts recommend standardized extracts—ideally with 3% rosavins and 1% salidroside—used in dosages between 200 to 600 mg per day.

Rhodiola also holds immense potential in the context of emerging science like nutritional psychiatry. This field, which explores the link between diet, gut health, and mental well-being, emphasizes the role of antioxidants and anti-inflammatory compounds in mood regulation. Rhodiola fits perfectly into this narrative. It reduces neuroinflammation, protects the blood-brain barrier, and enhances serotonin production—all vital mechanisms in managing anxiety and depression. Furthermore, Rhodiola may influence the gut-brain axis indirectly by improving energy metabolism and reducing systemic inflammation.

From a practical standpoint, Rhodiola offers a much-needed tool for those caught in the crosshairs of work pressure and personal responsibilities. Whether

it’s a corporate executive battling burnout, a student overwhelmed with academic deadlines, or a homemaker juggling endless tasks, Rhodiola’s effects on energy, focus, and emotional resilience can make a tangible difference.

To be aware, Rhodiola isn’t a panacea. It’s a powerful aid, not a replacement for lifestyle changes. Experts agree that managing stress effectively requires a multifaceted approach: adequate sleep, regular exercise, mindful eating, social support, and assertiveness in the workplace. Adaptogens like Rhodiola can amplify these efforts, not replace them.

HOW TO CHOOSE RHODIOLA SUPPLEMENTS

Not All Golden Roots Are Created Equal so when selecting Rhodiola rosea supplements, quality and consistency are key. Here are practical tips to ensure efficacy and safety:

Table 2: Rhodiola Supplement Selection Guide

Criteria	Recommended Guidance
Standardization	Look for extracts standardized to 3% rosavins and 1% salidroside , the key bioactive compounds.
Botanical Source	Ensure the Latin name <i>Rhodiola rosea</i> is clearly listed; avoid unverified blends with other herbs.
Dosage Range	Clinical studies support doses between 200–600 mg/day , typically in divided doses.
Formulation Type	Capsules and tablets preserve stability better than liquid tinctures unless verified for potency.
Third-Party Testing	Seek products with GMP certification , or verified by USP, NSF , or other independent bodies.
Origin Transparency	Ethical brands disclose sourcing (e.g., cultivated in Ladakh vs. wild-harvested) to support sustainability.

Avoid proprietary blends that don’t disclose exact concentrations of rosavins or salidroside. Transparency is a sign of trust.

As 2025 progresses, workplace well-being is emerging as a global priority. Mental health is no longer taboo; it’s a KPI. Employers are beginning to recognize that investing in mental wellness is not a luxury—it’s a

necessity. Governments are framing policies that support psychological safety at work. In this evolving landscape, natural solutions like *Rhodiola rosea* stand at a fascinating intersection of tradition and innovation, science and sustainability.

In an era where chronic stress, burnout, and mental fatigue have become everyday realities, *Rhodiola rosea* stands out as a powerful natural ally. With its adaptogenic ability to regulate cortisol, support neurotransmitter balance, and enhance mitochondrial energy production, it offers a comprehensive approach to stress management. Clinically validated for improving fatigue, focus, and mood, *Rhodiola* addresses both the psychological and physiological toll of modern life. Its key bioactive component rosavin and salidroside, work synergistically to restore balance in the body's stress axis without overstimulation. Especially in India, where work-life imbalances and anxiety are rising, *Rhodiola* aligns well with both traditional wellness systems and modern nutritional psychiatry. It is not just a supplement, but a symbol of resilience, reminding us of the strength found in nature's design. However, its endangered status calls for urgent conservation and sustainable cultivation. As we seek healthier, more mindful lifestyles, *Rhodiola* offers more than relief—it offers renewal. In choosing it, we don't merely fight stress; we reclaim our vitality, focus, and emotional well-being. It's time to draw the line—and let resilience take root.

References

<https://www.gallup.com/workplace/349484/state-of-the-global-workplace.aspx>

<https://www.hindustantimes.com/trending/86-of-indian-employees-are-struggling-or-suffering-gallup-global-workplace-report-2024-101718170185253.html>

<https://botanicalinstitute.org/herb-comparison-guide/>

Darbinyan, V.; Aslanyan, G.; Amroyan, E.; Gabrielyan, E.; Malmström, C.; Panossian, A. Clinical trial of 24 *Rhodiola rosea* L. extract SHR-5 in the treatment of mild to moderate depression. *Nord. J. Psychiatry* 2007, 61, 343–348

Bernatoniene, J.; Jakstas, V.; Kopustinskiene, D.M. Phenolic Compounds of *Rhodiola rosea* L. as the Potential Alternative Therapy in the Treatment of Chronic Diseases. *Int. J. Mol. Sci.* 2023, 24, 12293.

Ivanova Stojcheva, E. and Quintela, J. C. 2022. The Effectiveness of *Rhodiola rosea* L. Preparations in Alleviating Various Aspects of Life-Stress Symptoms and Stress-Induced Conditions-Encouraging Clinical Evidence. *Molecules.* 3(5):421-429.

Mikulska, J., Juszczuk, G., Gawrońska-Grzywacz, M., & Herbet, M. (2021). HPA Axis in the Pathomechanism of Depression and Schizophrenia: New Therapeutic Strategies Based on Its Participation. *Brain Sciences*, 11(10), 1298.
