STANDARDIZED *RHODIOLA ROSEA*, A UNIQUE PHYTOMEDICINE:

A Current Phytochemical Quality Overview. (2004).

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Rhodiola rosea L. (Crassulaceae), also known historically as “Golden Root”, is the most popular phytomedicine in Russia. A wide array of human health benefits related to mental health and physical performance has been clinically demonstrated using the unique phytomedical form of *R. rosea* extract specifically standardized to *rosavins*. (1-2). *Rhodiola rosea* possesses valuable anti-fatigue, anti-stress, and anti-depressant properties (1-3); it stimulates the bioelectrical activity of the brain and improves memory and mental performance (1-3). In addition, it also increases stamina and accelerates the physical recovery processes after intense training workloads (1-2, 4); it stimulates muscle energy status (4-6), improves glycogen synthesis in the muscles and liver (1-2); and increases muscle protein synthesis and anabolic activity (1-2).

There are approximately 20 species of the genus *Rhodiola* (7). However, the pharmacological properties of phytomedicinal preparations used in most clinical trials come almost exclusively from extracts of the species *Rhodiola rosea*, standardized to the total *rosavins* unique to this species. Thus, the many phytomedicinal benefits of Rhodiola products depend entirely upon which species is being used to manufacture the extract (1-2,8). The vast majority of scientific evidence from more than 40 years of animal and human studies of *Rhodiola’s* health-promoting effects focus almost exclusively on one species: *Rhodiola rosea.* Comprehensive analysis of the extensive scientific and medical literature on the subject indicates that more than 60 percent of the animal studies and 95 percent of the human studies are specifically concern *R. rosea* extracts. Furthermore, it is the human clinical research on *R. rosea* phytomedicine that continues to capture the attention of the vast majority of serious scientific investigators on the subject, particularly those active in Russia, Europe and USA (9-12), because the most impressive results are specifically linked to the extract derived solely from *Rhodiola rosea*, with very little efficacy or serious scientific interest demonstrated for extracts derived from other *Rhodiola* species.

Therefore, education and promotion of the exact technical identification of *R. rosea* among other plant species of the genus *Rhodiola* is of critical importance to serious scientific investigators, particularly because it has been the subject of some scientific and commercial controversy, including instances of adulteration, and invalid substitution using of a variety of products with inferior extracts from other species, especially during the last decade when Rhodiola was first introduced to a rapidly growing number of health product consumers in Europe and North America.

The phytochemical research on R*. rosea* root has revealed to date the presence of distinct groups of compounds that define the pharmacological characteristics of this unique product:

1). Cinnamyl alcohol vicyanosides: rosavin, rosin, rosarin (the rosavins);
2). Phenylethanols: salidroside (rhodioloside), tyrosol;
3). Flavonoids: rhodiolin, rhodionin, rhodiosin, tricin, rhodalgin and acetylrhodalgin;
4). Monoterpernes: rosiridol, rosiridin.

Beginning in the 1970s in the former Soviet Union it was initially accepted that the compound responsible for many of specific pharmacological properties in *R. rosea* was salidroside (p-hydroxyphenyl ethanol-2-D-glucopyranoside, rhodioloside) (1-2, 13-15). Therefore, the first generation of *R. rosea* preparations were standardized to a minimum 0.6–0.8 percent salidroside content, which was consequently approved by the Russian Pharmacopoeia Committee (16).

However, by the late 1980s the Soviet mass-market demand for *R. rosea* root had dramatically increased. Consequently, the wild-crafted raw material was being over-harvested and could not naturally replenish itself fast enough to be sustainable. This resulted in a dramatic, unexplained decline in the quality and effectiveness of *R.*

rosea preparations, disappointing its users and undermining its credibility. The official investigation of this degradation phenomenon revealed that increased demand for raw material was been mistakenly satisfied with more and more substitute supplies of other species of the *genus Rhodiola* that also contained salidroside.

Given the declining efficacy of these substitutes, a logical conclusion was that *R. rosea* must contain other, as yet unidentified active compounds unique to *R. rosea* that produce its impressive array of pharmacological effects. This would explain the reduced efficacy of preparations that were mixed with extracts of other species of the genus *Rhodiola*.

This hypothesis was consistent with the fact that the presence of salidroside is not specific to the genus *Rhodiola*. In fact, salidroside are commonly found in a wide variety of species *t*hroughout the plant kingdom and are in no way unique to the genus *Rhodiola*. Moreover, the term “salidroside” is actually derived from the Latin name *Salix*, the botanical name of willow, because this compound was isolated for the first time in 1926 from *S. triandra* (18). The presence of salidroside has been also found in cranberries, olives, *Rhododendron* and in more than 60 other higher plants, and is also present in several microorganisms (19-21).

More than a decade of intensive research proved conclusively that the chemical composition of *R. rosea* root is, unique among the species of the genus *Rhodiola*. It discovered that only *R. rosea* root contains a unique set of compounds identified as the *rosavins,* including*, rosavin, rosin and rosarin*, as well as the salidroside present in many other species of *Rhodiola* (8, 14, 17; Figure 1 A, B).

Currently, the quality of *R. rosea* extract is best evaluated using specific HPLC “fingerprint” analyses of samples compared with purified *rosavins* reference material. Results should verify the presence of specific markers of *R. rosea* such as rosavin, rosarin, rosin (rosavins), and possible salidroside rather then **only salidroside**. Moreover, the ratio of rosavins to salidroside in true *R. rosea* root is

approximately 3:1 (8,14). Therefore, analysis of the ratio of the rosavins: salidroside in the extract is another useful tool to evaluate whether the extract derived from only *R. rosea* root or from a mixture of various plant species of the genus of *Rhodiola*, which might also include plants outside the genus *Rhodiol*a, containing salidroside.

In fact, a high salidroside product vaguely labeled "*Rhodiola,*" with no mention of rosavins content*,* probably means that it is not made from *R. rosea* root. In our view, first and foremost, it is absolutely essential that the public be given all the scientific evidence available that justifies the use of extracts of true *Rhodiola rosea*.

Why this sense of urgency? Because the most important contribution that *Rhodiola* can make to global public health is in the prevention, management, and treatment of the mental and physical effects of chronic stress. Only *Rhodiola rosea* extract, standardized to total rosavins, can be relied upon to make this contribution.

Chronic stress is a global health problem that has been growing for decades. Standardized *R. rosea* extract is relatively new to the western consumer. The true information about standardization of *R. rosea* extract is needed to educate the experts and consumers about the product standards that are required for *R. rosea* to be used safely and effectively now- especially since *Rhodiola* products are gaining popularity in Europe and the United States primarily as dietary supplements. Consequently, there is a compelling need to prevent the exploitation of its rising popularity as a supplement by the inappropriate offering of substitute products, which often use other species of *Rhodiola*, which contain little or no active rosavins and cannot provide the essential benefits demonstrated by its extensive clinical trials.

Unfortunately, this kind of exploitation of legitimate supplement innovation is a historical pattern that has been repeated many times in the dietary supplement market, which can set it back their development for years by confusing or misleading the interested consumer. All too often worthwhile new supplements have been stunted or have failed because of the unethical marketing of substituted products that cynically

prey upon the public's innocence during the early introductory period. Fortunately, we are confident that a fair and open-minded assessment of the scientific information now available on standardized *R. rosea* extract is enough for reasonable people of good will everywhere to conclude that this unique natural product has something of significant value to offer millions of consumers suffering from the many debilitating effects of chronic stress.

Thanks to the vigorous educational efforts of the authors and others, the consensus of leading researchers has effectively influenced responsible media, marketers, and manufacturers to champion the introduction of more and more products that contain *R. rosea* with true rosavins to an expanding audience of receptive consumers, with excellent results. However, vigilance is still essential. The most important ingredient needed for the success of any new, worthwhile supplement is the active interest of skeptical, well-informed consumers willing to take the initiative in intelligent self care decisions in collaboration with their family health care professionals. The decision about any product that promises to improve their lives deserves no less. The more it promises the greater the scrutiny it deserves*. Rhodiola* rosea is no exception.

We are convinced that 40 years of scientific research strongly supports the conclusion that *R. rosea* extract, standardized to rosavins, is a versatile phytomedicine of unique value for the fundamental global health concerns of the 21st Century. It is worthy of serious consideration by everyone.

Of particular importance to the focus of this presentation is the HPLC reference fingerprint of true *R. rosea* extract and *R. crenulata* provided below (Figure 1 A, B). Legitimate suppliers and manufacturers of true *R. rosea* extract, standardized to *rosavins*, will be willing and able to verify this essential quality indicator by validated independent laboratory analysis of *R. rosea* phytomedicine that they sell.

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Figure 1A. Typical HPLC fingerprint of Siberian *Rhodiola rosea* root extract

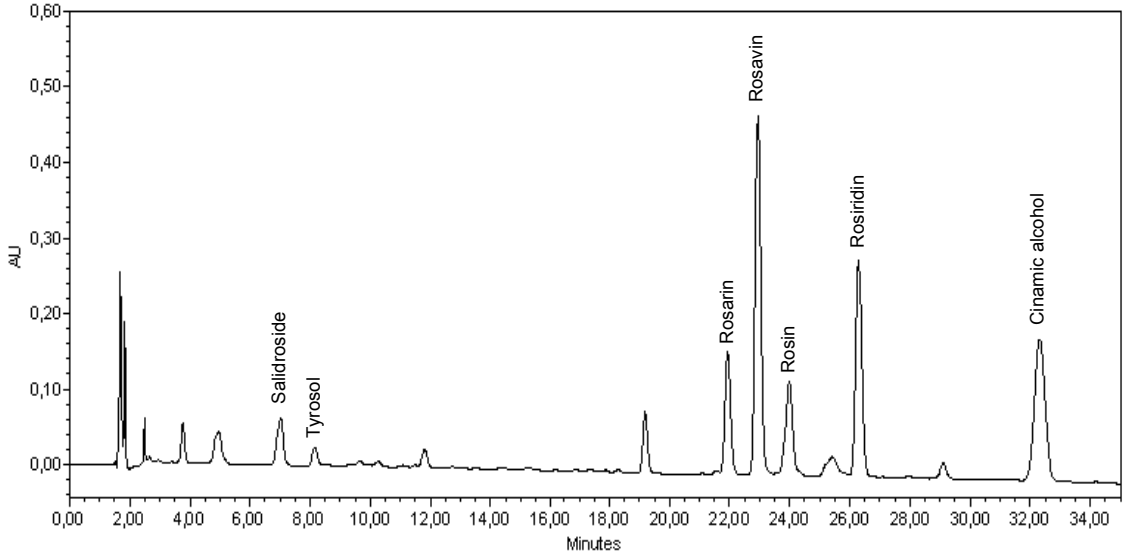

Figure 1B. HPLC fingerprint of *Rhodiola crenulata* root extract