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Common herbs for stress: The science and strategy of a botanical medicine approach to self-care

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ABSTRACT

Frontline healthcare workers have reported elevated levels of stress and increase prevalence of burnout symptoms since the onset of the COVID-19 pandemic. With these heightened levels of stress and burnout comes a need for more evidence-based interventions to address these symptoms earlier, in both a safe and effective way. Some common botanical medicines have a measurable effect on perceived stress, neurotransmitter levels, and circulating cortisol levels indicating their ability to modify the stress response. Botanical medicines are often relatively low cost, increasingly available in retail stores and online marketplaces, and show relatively low reports of adverse effects, making these medicinal herbs an important option for addressing work-related stress for healthcare workers.

1. Stress and burnout in the health-care industry

Stress among healthcare workers has increased significantly since the onset of the COVID-19 pandemic, leaving many workers with an increased need for strategies to cope with heightened stress, feelings of burnout and other mental health conditions. Burnout is characterized by the World Health Organization (WHO) as stemming from work-related stress that has not been resolved, having symptoms of fatigue and exhaustion, feelings of negativity about the workplace, a lack of personal connection and not feeling personal accomplishment from the job (2011).¹ A 2022 study examined burnout prevalence among primary health-care professionals in lower- and middle-income countries, concluding that participants reported a high prevalence of emotional exhaustion (55.7%), depersonalization (39.1%), and diminished personal accomplishment (60.0%).² This meta-analysis, among other studies, also categorizes burnout rates as highest among nurses and primary care physicians.^{2,3} In wealthier countries burnout rates were as high as 65.1%.⁴ Thus, early intervention strategies to address workplace stress are essential to mitigation of burnout in essential front-line healthcare fields. Self-care strategies and stress-management interventions have been identified as effective at reducing physician burnout.^{5,6} More safe and efficacious self-care strategies are needed to alleviate chronic work-place stress and to reduce numbers of healthcare workers that are reporting feelings of burnout. Botanical medicines provide healthcare workers with a safe and efficacious way to abate symptoms of chronic stress.

Botanical medicines have a long historical use to address stress and are popular to use among the general population with an estimated 35% of Americans reporting use of at least one herbal medicine.⁷ The ease of

access, relative perceived safety of the medicines and various forms of delivery (such as teas, tinctures, and capsules) make them an easy self-care intervention when paired with a better understanding of the science and strategy of herbal medicines. The purpose of this article is to examine the safety and science behind four commonly used botanicals for stress reduction and to provide health-care workers with evidence-based strategies for the use of these common botanicals as self-care.

2. The science and safety of common botanicals for stress

2.1. Ashwagandha

Withania somnifera (Ashwagandha) has a long history of use for stress and sleep disturbances. An ayurvedic herb, it is commonly used in formulas designed to attenuate the stress hormone cortisol. Ashwagandha lowers circulating glucocorticoids cortisol and corticosterone through alteration of the Hypothalamic-pituitary-adrenal (HPA) axis, ameliorating stress symptoms.^{8,9} Additionally, it has been proposed that Ashwagandha has GABAergic and serotonergic effects by altering the release of both glutamate and GABA neurotransmitters, making it a potential therapeutic option for sleeping disorders, anxiety and depression.^{8,10} Glutamate, an excitatory neurotransmitter, is elevated during the acute stress response, while GABA is an inhibitory neurotransmitter with calming effects on the central nervous system. Ashwagandha's effectiveness as a stress reduction therapy should be measured for its ability to reduce perceived stress, and not just a decrease plasma cortisol. A 2019 clinical trial saw participants have a reduction on the Perceived Stress Scale (PSS) of 33.77%–38.34% in the

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Ashwagandha group, depending on the dose taken, compared to a 26.74% point drop on the PSS in the placebo group, showing a modest improvement from the herb.¹¹ Another clinical trial of Ashwagandha resulted in a 44.0% reduction of PSS in the Ashwagandha group with only a 5.5% reduction noted in the placebo group.¹² A 2021 review article further showed Ashwagandha ability in clinical trials to reduce markers of stress such as serum cortisol levels and reduced PSS scores compared to baseline levels from participants in the study.⁸ Based upon this evidence, studies lend credibility to the use of Ashwagandha for the reduction of stress as a regular self-care intervention.

Ashwagandha is generally perceived as a safe herb with its long history of traditional use, and consistent presence in herbal formulas. Moreover, the safety of Ashwagandha has been studied and established based on its relative few adverse reactions reported,¹³ and a lack of statistical change in biomarkers,^{14,15} liver enzymes, thyroid hormone and immunological markers tested.¹⁶ These studies demonstrate the relative safety of the herb for up to 8 weeks of use at doses up to 600 mg per day of herbal extract, and higher doses of 1250 mg per day for up to 10 days. The safety of the herb in relative high doses, combined with its efficacy in multiple studies makes Ashwagandha an excellent choice for a self-care intervention.

2.2. *Rhodiola*

Rhodiola rosea (Rhodiola) is an adaptogen used to manage physical symptoms of daily stress with a long history of traditional use. As a self-care therapy, this herb can be valuable in reducing mental fatigue, depression, and improving recovery from stress-induced physical fatigue. The European Medicines Agency (EMA) herbal monograph describes its traditional use for short-term relief of mild and moderate stress-related symptoms.¹⁷ A 2022 review article examines the effectiveness of rhodiola in stress-induced depression and fatigue as well as its ability to positively affect work productivity and provide anti-inflammatory benefits.¹⁸ A 2017 trial looked at rhodiola's efficacy in treating symptoms of burnout for a period of 12 weeks and found that Rhodiola was effective in alleviating most of the tracked variables in as little as 1 week with continued reduction in these variables over time.¹⁹ Another 2022 placebo-controlled trial, which combined rhodiola with B-vitamins, green tea, and magnesium, found that there was a decrease in perceived stress in both the variable and placebo groups on the DASS-42 stress questionnaire, but that the variable group showed a statistically significant decrease in scores when compared to placebo.²⁰ These studies lend significant evidence to the ability of rhodiola to mitigate the stress response and reduce symptoms of burnout providing benefit as a self-care strategy to healthcare professionals and the public alike.

Several mechanisms for the stress-resiliency activity of rhodiola have been proposed. One mechanism looks at the activation of Heat Shock Protein 70, a stress-sensor and a reduction of Nitric Oxide (NO) via decreased NO synthase II.²¹ A reduction of Nitric Oxide may reduce physical fatigue and improve musculoskeletal endurance. Additionally, whole plant extracts of Rhodiola are thought to interact with the HPA Axis and limit the release of glucocorticoids, accounting for its use as an adaptogen to mitigate the stress response.²² These mechanisms help explain Rhodiola's effect on the stress response, and lend further credibility to its use as a self-care herb.

Regarding safety, rhodiola has been studied and shown to be well tolerated over a wide range of doses in several clinical trials based on few reported adverse outcomes. A 2017 systematic review saw rhodiola used from 50 mg to 660 mg per day in capsular form and up to 1500 mg with no reported adverse reactions as a single ingredient versus placebo.²³ Further clinical trials on the efficacy of rhodiola had relatively low dropout rates and only mild reactions reported, such as nervousness and dizziness in the rhodiola group, lending evidence to the safety of the herbal product.^{24,25} With significant research available in the study of its efficacy and few reports of adverse reactions, rhodiola can easily be

adapted as a regular self-care intervention to reduce perceived stress, fatigue, and plasma cortisol levels.

2.3. *Passionflower*

Passiflora incarnata is a flowering herb native to the Southeastern part of North America. This herb has been used prolifically by traditional herbalists for its nerve and mild sedative effects. Passionflower has been studied to determine the effects of the plant on mental stress and related disorders such as anxiety. A 2022 systematic review looked into the efficacy of Passionflower for stress reduction. While included studies were limited, the authors concluded that passionflower was an effective method of treating stress reactivity, anxiety and insomnia.²⁶ The mechanism of action of the herb is not fully identified, and proposed mechanisms may differ depending on the condition treated. Most current research looks predominately on the GABAergic mechanisms with relation to its anxiolytic effects,²⁶⁻²⁸ with one article showing an affinity for acting on the hippocampus,²⁹ which has been shown as a potential target area for stress reduction.³⁰

There is limited data evaluating the safety of Passionflower in the last 10 years. The European Medicines Agency categorizes Passionflower as safe based on its years of traditional use with no reported side effects.³¹ A 2013 study examined the safety of Passionflower as part of a multitherb formula, revealing only mild adverse events from the combination of Passionflower with Valerian and Hops—with drowsiness the most commonly reported.³² A 2019 animal study concluded that Passionflower revealed no adverse effects in mice through chronic use of the herb.³³ Despite the lack of adverse effects reported in these limited studies there are still a few cautions to consider. Passionflower does contain the flavonoid 5,7-dihydroxyflavone,³⁴ more commonly called chrysin which has been shown to inhibit the enzyme aromatase, affecting the conversion of testosterone to estradiol,³⁵ and prolonged use should be contraindicated in individuals with hormone-balance conditions such as Polycystic Ovary Syndrome (PCOS).

2.4. *Lavender*

A well-known aromatherapy herb with uses for insomnia, stress, and anxiety, *Lavandula angustifolia* has some published evidence supporting its use. Due to its availability and its ease of use, Lavender is a great resource for those wishing to practice herbal self-care. A 2018 clinical trial looked at the efficacy of lavender aromatherapy on 38 members of a nursing staff. The study reports a statistical reduction of heart rate and blood pressure, but no statistically significant reduction on psychological stress.³⁶ Other studies examining the efficacy of lavender aromatherapy on stress levels found a measurable reduction in plasma and salivary cortisol levels in the aromatherapy groups.³⁷⁻³⁹ A 2014 meta-analysis noted some supportive evidence of aromatherapy on perceived stress levels, but no statistical reduction on salivary cortisol levels. While this meta-analysis included studies with combined aromatherapy, lavender was the most common herb included.⁴⁰ Lavender has also been studied for its use in anxiety and insomnia. Evidence from clinical trials shows its efficacy in treating General Anxiety Disorder when compared to placebo,⁴¹ and a 2020 trial reported a reduction of anxiety on the Visual Anxiety Scale (VAS) in patients undergoing bone marrow biopsy.⁴² For insomnia, Lavender was effective in improving sleep quality, but no statistical difference was seen in Resting Eye Movement (REM) sleep time or total sleep time between the lavender and placebo groups.⁴³ Other studies have combined lavender aromatherapy with sleep hygiene practices for improved benefit in sleep quality, vibrancy, and energy.^{44,45} Overall, the literature does indeed support its use as a self-care therapy, but the evidence is limited in quality with low sample sizes, and lack of quality placebo-controlled groups.

The mechanism for Lavender's effect is more difficult to ascertain than some of the previously mentioned herbs as there are a limited

amount of studies on its physiological effect. A 2016 study examining the mechanisms for Lavender aromatherapy found no effect on the HPA axis, but measurable changes in Chromogranin A (CgA), an indicator for catecholamine levels, demonstrating a potential effect on the acute stress response via the sympathoadrenal medullary (SAM) pathway.⁴⁶ Another study examining lavender aromatherapy during sleep, showed an increase in activity in the temporal lobe and increased delta-waves, which are associated with deep sleep, in the lavender group.⁴⁷ Mechanism is particularly hard to study for aromatherapy due to the identifiable nature of the strong lavender smell, which was correctly identified by 50% of participants of one study,⁴⁶ illustrating the difficulty in creating quality placebo-controlled studies.

The only study which examined the safety of oral administration of lavender oil for up to 10 weeks found lavender oil to be well tolerated in this capacity.⁴¹ As lavender is primarily used externally, it is not recommended for internal use. Skin irritation is the primary adverse effect from external use of Lavender essential oil.

While more quality placebo-controlled studies are necessary to verify the efficacy and safety in long term use, for these four botanicals, the body of current scientific evidence indicates that they are both safe and effective for use as a self-care strategy to address stress and symptoms of stress. More studies are also necessary to address the effectiveness specifically for healthcare workers, but most studies agree that these herbs can address general stress and related disorders such as anxiety, insomnia, and physical manifestations of stress. When combined with the limited reports of adverse events, these interventions could be used daily for short-term relief of stress and symptoms which may help to prevent or reduce feelings of burnout in frontline healthcare workers.

3. Instructions and recommendations for use

Recommendations for choosing the best preparation of an herb are to pick the method that is easy to find, meets the needs of the self-care practitioner, and is supported in the peer-reviewed evidence. Ashwagandha has studies showing its safety and efficacy at doses as high as 600 mg–1250 mg each day. Herbal products listed in milligrams (mg), would be best consumed as a dried herb or capsule as the quantity is easily measured. Some liquid and alcohol extracts will give the total amount in milligrams, but many do not provide this information. Most self-care practitioners will likely find it easier to obtain the herb in capsular form with a maximum dose of 600 mg per day for up to 8 weeks.¹⁶ It is best to follow the instructions for use from the manufacturer when possible and adhere to any specific warnings on the label. Avoid extended use of the herb beyond 8 weeks consecutively, as more safety information for long-term use is necessary.

Rhodiola is almost exclusively found on the market in capsular form, with dosages ranging from 200 mg–1000 mg easily available. It is noteworthy that most studies used dosages in the 200–300 mg per day range, and headaches were reported at doses as low as 200 mg.²³ Those individuals using Rhodiola for self-care should start with lower dosages and discontinue use prior to 12 weeks, which was the maximum time of the longest study conducted. Prolonged use of Rhodiola is not recommended as long-term studies on adverse effects have not been conducted to assess safety.

Passionflower is readily available in liquid extract, tablet, and capsular forms. Studies on its efficacy saw most clinical research using lower dose 90 mg extracts of passiflamin a singular constituent of passionflower, 260 mg tablets of the whole herb, or 5 mL aqueous extracts—containing up to 700 mg of passionflower.²⁶ Other monograph sources indicate a posology of 60 drops of fluid extract up to three times daily.⁴⁸ None of the studies indicate usage longer than 6 weeks and use should be discontinued beyond this.

Lavender is usually found as an essential oil for use in aromatherapy. Specific dosage recommendations are less necessary with this type of preparation, as essential oils are recommended for external use. One concern with essential oils is avoiding direct contact with the skin,

without the use of a carrier oil. Common carrier oils can include olive oil, coconut oil, and grapeseed oil. These oils help to dilute the essential oil and reduce the risk of skin irritation from direct contact. Other recommended uses include adding small amounts of lavender oil to bed linens, and clothing to bring about the desired effect. Long-term use of Lavender is safe if used topically with a carrier oil.

4. Strategies for safe use

As botanicals are common sources of pharmaceuticals, it is important to consider interactions with other medications in the use of these products. Individuals taking pharmaceutical prescriptions should consult their prescribing physician for any potential herb-drug interaction prior to use. Likewise, there is very limited information on the safety of botanicals in individuals who are pregnant and nursing. Due to limited information on safety, individuals who are pregnant or nursing should avoid almost all botanicals as a self-care option. Finally, individuals with allergies, especially severe reactions to other plants should consult a physician prior to using any new botanical medications.

While studies have shown the relative safety of the herbs reviewed, it is important to point out that botanicals do have potential side effects, and an inventory of these side effects is a useful tool for safe use of these herbs. Ashwagandha can sometimes cause gastrointestinal discomfort, diarrhea, and headaches. Due to its ability to effect circulating levels of cortisol, Ashwagandha can also cause sleepiness. While recent studies on safety show no effect on elevation levels of thyroid hormone,¹⁶ the potential to modulate thyroid hormone level is cause for ashwagandha to be contraindicated for individuals taking thyroid medications. Furthermore, ashwagandha has been seen in recent studies to increase immunoglobulin levels and cytokine activity⁴⁹ and thus should be avoided for individuals with autoimmune disorders. Due to its effects on the immune response, individuals who may be undergoing surgical procedures should notify their surgeon of the use of this herb and follow physician recommended discontinuation guidelines prior to any surgical procedure.

While most studies support the safety of Rhodiola a few individuals reported adverse events in the experimentation groups including increased salivary production, headaches and insomnia.²³ Likewise, Passionflower has a sedative effect and thus may cause drowsiness or mental fatigue with use. In higher doses of dried alcoholic extract, uncoordinated muscle movements have been reported.⁵⁰ Therefore, recommendations for use of Passionflower are to avoid high doses and extended use to minimize the risk of adverse effects.

Additionally, herbal remedies may need more time than pharmaceuticals to build up to therapeutic levels in the blood stream and use of botanicals for self-care may not have immediate noticeable effects. Individuals experiencing a need for more immediate symptomatic relief should discuss available options with their primary care physician (PCP) prior to botanical use. Likewise, it is a good practice to consider discussion with a PCP prior to beginning any new botanical regimen.

5. Resources for continued use

There are many free and easily accessible online resources with evidence-based information for botanical medicines. The following resources provide more information on these and many other herbs:

1. European Union Monographs (https://www.ema.europa.eu/en/medicines/field_ema_web_categories%253Aname_field/Herbal/field_ema_herb_outcome/european-union-herbal-monograph-254) – Published by the EMA, this website provides options to look up herbs by scientific binomial and English common name. The full monographs are limited to a smaller number of herbs, but users can utilize the search function and find basic information on herbs when a full monograph is not available.

- Medline Plus Herbal Database (https://medlineplus.gov/druginfo/ herb_All.html) This database, provides users with a short review of evidence, usage information and information on drug-herb interactions. Medline plus is an excellent resource for self-care practitioners to find efficacy and safety information on many herbs. Disadvantages are the limited number of herbs available in the database and categorization of botanicals by common name only.
- Memorial Sloan-Kettering Cancer Center Integrative Medicine Database (<https://www.mskcc.org/cancer-care/diagnosis-treatment/symptom-management/integrative-medicine/herbs/search?letter=A>) Providing information about many herbs, supplements and integrative health interventions, this tool provides users with information on safety and efficacy. The website design includes fast links that show the mechanism of action of the botanical viewed when available.
- NCCIH Health Topics Database (<https://www.nccih.nih.gov/health/atoz#linkA>) The National Center for Complimentary and Integrative Health (NCCIH) provides information links on a limited number of botanical medicines. This website provides users with information on many integrative therapies and is an excellent resource for information about safety of some herbs.

5.1. Key take-aways

- Stress and burnout are serious problems in the healthcare industry and new strategies are necessary to address the symptoms of stress, mitigate the body's response to stress and reduce burnout.
- Herbal medicines such as Ashwagandha, Rhodiola, Passionflower and Lavender provide a safe, effective and easy-to-use method for mitigating the stress response with extensive research for their use.
- Herbal medicines are readily available, and easy to use when using them within evidence-based recommended ranges
- Herbal medicines may interact with other pharmaceuticals and have little data on their safety for pregnant and nursing individuals. Caution is recommended in these groups.
- Herbal medicine online resources can provide quick access to evidence and safety information for the use of these herbs and others.

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