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Review

Phytoadaptogens: an overview

Charles O. Esimone[1] and Chukwuemeka S. Nworu[2]*

[1]Department of Pharmaceutics, Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, 410001, Enugu State, Nigeria.
[2]Department of Pharmacology and Toxicology, Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, 410001, Enugu State, Nigeria.

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Adaptogens have been described as substances which induce a state of non-specifically increased resistance (SNIR) in experimental animal and man. Plant-derived natural compounds and herbal tonics have been extensively reported to posses this ability to increase the general defence power of an organism and the term "phytoadaptogens" has been coined to describe them. This review presents the general criteria for characterisation, the medicinal effects, the mechanisms of action and the therapeutic application of phytoadaptogens.

Key words: Adaptogens, anti-stress, herbal products, phytoadaptogens, tonics.

INTRODUCTION

The ability to develop resistance and to maintain it is crucial to cope against a variety of stressors encountered in human life. The desire to control the coping mechanisms has led to the origin of the science of adaptation. The interest of biologist, physiologists and pharmacologists has centred on understanding the mechanisms underlying the process of adaptation, identifying what controls this phenomenon and more importantly discovering methods to modify them so that insufficient, excessive, unnecessary or faulty responses can be prevented.

Adaptogens are substances that help organisms to adapt to unfavourable stressful conditions, i.e. physical, biological and mental (Brehkman, 1980; Dahanukar et al., 1997). They could be of natural origin (Koner et al., 1997; Brehkman, 1980). However, most researches on adaptogens have focussed on natural (specifically, plants), and the term "phytoadaptogens" (adaptogens from plants) is gradually gaining pre-eminence.

The concept of adaptogens originated from the Russian scientist, Lazerev in 1947 while working on a synthetic compound Dibazol (2-benzylbenzimidazole), which was found to stimulate non specific resistance of organisms (Dahanukar et al., 1997). However, the term was coined and more precisely defined in 1969 by Israel Brekhman a renowned Russian research pharmacologist and physiologist (Dahanukar et al., 1997). Brekhman and his coworker Dardymov put forth specific criteria that need to be fulfilled to qualify as an adaptogen thus: produces a non-specific response that is, increase the power of resistance against multiple (physical, chemical or biological) stressors; brings any dysfunctioning body system back into balance and must be innocuous and must not influence normal body functions more than required (Dahanukar et al., 1997; Brehkman and Dardymov, 1969).

Brekhman and Dardymov demonstrated that certain plants like *Eleuthrococcus senticocus*, *Panax ginseng*, *Raponticum carthamoides* and *Rhodiola rosea* used as tonics in folk medicine can fulfil these criteria and therefore qualified as adaptogens. Adaptogens began being used by Russian Cosmonauts and elite Russian athletes in the early 1970's when the Soviet Union stepped out into the international arena as a dominant force (Avery, 1995). The breakthrough by Brekhman was kept secrete from the rest of the world until a former Soviet Olympic Coach, Dr. Ben Jabachnik began introducing the Russian adaptogen formula after migrating to the United States in 1990 (Avery, 1995).

The concept that an adaptogen can increase non specific resistance to physical, chemical and biological stressors opened a vast arena of research in India, China, Ja-

*Corresponding author. E-mail: csnworu@yahoo.com.

pan, Russia and other parts of the world. Many of the plants selected for these studies were chosen based on their uses in traditional systems of medicines (Dahanukar et al., 1997).

Characterisation of adaptogens

One of the major problems in the evaluation of an adaptogen is the non-availability of simple models to measure stress responses (Dahanukar et al., 1997). Theoretically, an ideal stress model should possess the following characteristics (Lee and Bianchi, 1971).

The stressor should be quantifiable. It should elicit a characteristic stress response by which the organism reacts to and copes with the situation. The stress response should not vary from time to time or from organism to organism. The manifestations of stress should be measurable, valid and reproducible.

However, good stress models fulfilling all the above criteria are not generally available because: Quantification of a stressor is not always possible especially when the stressors are psychological e.g. when emotions like conflict serve as a stressor. The precise mechanism of stress response is not yet fully understood. Because of (ii) above, emphasis has to be laid on the prevention of stress manifestation; and, stress manifestations vary depending on the type, intensity and severity of the stressor used.

Thus, although by definition a stress response may be non-specific and generalised, the stress manifestations are usually specific (organ- related) and hence subject to variations. Manifestations of stress therefore cannot be looked upon as a reaction only to a particular stressor but should be considered as pleuricausal diseases as they are modified both by endogenous and exogenous factors (Seyle, 1983).

Hence, when the adaptogenic potential is expressed in terms of preventing these manifestations, a number of variables related to the species strain, age, sex, previous exposure to stressors etc., are naturally introduced (Dahanukar et al., 1997). In order to overcome these problems, researchers have tried to identify markers of stress responses and use them in conjunction with stress manifestations to quantify the phenomenon (Dahanukar et al., 1997). Three target sites – the neuro-endocrine system, the immune system and the peripheral organs have been identified on which an agent can act to generate an adaptive response (Dahanukar et al., 1997). These problems notwithstanding, the Ayurveda Research Centre (ARC) Mumbai, India, has been able to come up with well defined study protocols that could be conveniently used to characterise adaptogens (Dahanukar et al., 1997). These protocols based on empirical experiments and research experiences in the field of adaptation / adaptogens are presented as three succinct objectives viz: Objective 1: Studies to prove adaptogenic potentials Objective 2: Comparative adapto-genic effects Objective 3: Mechanism of adaptogenic action.

The studies to prove adaptogenic potentials are based on the original criteria proposed for characterising adaptogens (Berkhman and Dardymov, 1969). These involve:

Demonstration of increase in non-specific resistance against stressors

For this the ARC has delineated various biological, physical and chemical stressors against which potential adaptogens are to be investigated. Examples of biological stressors employed by the ARC protocol include infections induced by *Escherichia coli*, *Klebsiella pneumoniae*, *Candida albicans*, *Staphylococcus aureus* etc. in mice or rats. These micro-organisms are injected in a fixed number to the animals to induce infections. The stress manifestations are assessed by noting the mortality or by culturing the organisms from the blood. Effect on leucocytes count and their functions (expressed as % phagocytosis and killing capacity) serves as markers for immune function. Cold immobilisation is an example of physical stressors. Association of this stressor with gastric mucosal damage is well known (Main and Whittle, 1975) and hence it was chosen to reflect the stress manifestation. Chemical stressors include carbon tetrachloride (CCl_4), a known hepatotoxn, bleomycin (which induces lung damage), ethanol and non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin and indomethacin which are all known to produce gastric damage.

Demonstration of normalizing effect on pathological state

To find out whether the agent exerts normalizing effect irrespective of the direction of pathological change, a model of cisplastin -induced alterations in gastrointestinal motility is chosen. The change in gastric emptying and intestinal transit are studied according to reported methods.

Demonstration of safety

These generally involve carrying out acute and chronic toxicity studies on the agents. Histopathology of vital organs (e.g. liver, spleen, kidney, heart, lungs etc.) is also evaluated. The comparative adaptogenic effect (objective 2) was borne out of the realisation that the degree of protection offered by different adaptogenic agents is not equal against all the stressors. For instance, the alcohol extract of Withania somnifera offered protection against cold immobilisation stress while the aqueous extract could not (Dahanukar et al., 1997).

Medicinal effects and mechanisms of action of adaptogens

The principal medicinal effect of adaptogens is anti-stress (Dahanukar et al., 1997; Bhattarya and Ghosal, 2000). However, this effect proceeds via diverse pharmacological mechanisms, which are not all neces-sarily associated with one particular adaptogen alone. Medicinally, adaptogenic combinations have been shown to combat stress by increasing protein biosynthesis, immunostimulation, evaluating the body's enzyme synthesis via endocrine stimulation, enhancing mental work capacity, uplifting physical work capacity along with endurance and performance, alleviating free radicals to prevent oxidizing pathology, improving eyesight, colour perception and hearing, enhancing cardiovascular and respiratory functions, promoting longevity and generally increasing the body's non-specific resistance to various stresssors (Maslova et al., 1994; Avery, 1995; Panossian et al., 1999b).

Different adaptogens usually have different medicinal effects or varying degree of a particular medicinal effect. This is why for optimum medicinal properties; adaptogens are usually used in combinations (Bhattacharya and Ghosal, 2000). For instance, the unique formula of adaptogens discovered by Brekhman and currently marketed under the Prime Quest High Performance Program is comprised of two products (Prime 1 and Prime plus) that work in synergy. Prime 1 is a liquid herbal food supplement that contains seven different adaptogens; Prime plus is in capsule form and contains three different adaptogens. Scientific evidence has shown that this unique combination of adaptogens can successfully combat the negative effects of stress, improve health and well being and enhance athletic performance (Avery, 1995). A phytoadaptogenic preparation consisting of *Eleuthrococcus senticocus, bioginseng* and *Rhapontican carthamoides* have proved to have an inhibiting effect on the development of nervous system tumours in rats (Bespalov et al., 1992) while Rhodiola rosea was shown to inhibit tumour diss-emination in rats. Some adaptogens have also been shown to have central nervous system (CNS) depressant effects (Ahumada et al., 1991; Bhargava and Singh, 1981).

Several theories have been suggested to explain the effects of adaptogenic substances. One theory proposed by Dardymov and Kirkorian (Brekhaman and Dardymov, 1969) argues that adatoptogens function primarily due to their antioxidant and free radical scavenging effects. While this theory is plausible, it is offers incomplete explanation to the effects of these agents. More recent reports postulates that adaptogens work primarily by affecting the hypothalamic-pituitary-adrenal (HPA) axis and the sympathoadrenal system (SAS) (Panossian, 2003). Thus, adaptogens modulate the organism's response to stress (physical, environmental, or emotional) and help regulate the interrelated endocrine, immune, and nervous systems. This re-regulation of a disordered or highly stressed system is achieved by metabolic regulators such as cytokines, catecholamines, glucocorticoids, cortisol, serotonin, nitric oxide (NO), cholecysto-kinin, corticotrophin-releasing factor (CRF), and sex hormones (Tache and Rivier, 1993).

This broad array of biochemical activators helps explain why adaptogens have been equally associated with anti-inflammatory, antioxidant, anxiolytic, antidepressant, nervine, and immunomodulatory effects (Cyong, 1982; Chang, 1986). In general, adaptogens work by:

1. Supporting the adrenal function, thus counteracting the adverse effects of stress;
2. Enabling the body's cell to have more energy;
3. Helping cells to eliminate toxic by-products of metabolic process;
4. Helping the body to utilize oxygen more efficiently;
5. Enhancing and speeding the proper regulation of biorhythms.

Therapeutic applications of some phytoadaptogens

The list of plants with adaptogenic properties is long largely because of the broad definition of the term. Topping the list is red ginseng from Asia (called Chinese, Korean, or Japanese ginseng), considered the "gold standard" of adaptogenic herbs. Other commonly accepted adaptogenic herbs include the white American ginseng, Siberian ginseng, suma, ashwaganda, astragalus, licorice, schisandra, jiaogulan etc. In this section, we shall be considering some established and newer phytoadaptogens, together with their established therapeutic applications and claims in alternative medicine.

Chinese or Korean ginseng root

(*Panax ginseng*) has two varieties- Red Ginseng root and White Ginseng root. Ginseng, especially Red Ginseng, is the most stimulating of the adaptogens. Traditionally it is used in Chinese medicine for older men with impotence, fatigue, and benign prostate hypertrophy or for patients with congestive heart failure. Recent human studies using Asian Ginseng showed it reduced symptoms of chronic obstructive pulmonary disease (Gross et al., 2002), improved survival times in patients with gastric cancer, and reduced incidence of metastases (Suh et al., 2002). Numerous studies support Asian ginseng's effectiveness at improving a person's ability to withstand stress, improve work performance and quality, and enhance mental function (Murray and Pizzorno, 1990). It has also been shown to increase the release of adrenocorticotropic hormone (ACTH), which stimulates an increase in adrenal hormone secretion. It also can counteract

the shrinkage of the adrenal gland caused by corticosteroid drugs (Shibata et al., 1985). An in -vitro study carried out by some Japanese researchers revealed that Asian ginseng extract inhibited hydroxyl radical formation. The authors believe this antioxidant effect may be responsible for ginseng's wide range of pharmacological applications (Zhang, 1996). In a double-blind controlled study, 36 noninsulin-dependent diabetic patients were treated with Asian ginseng for eight weeks. Patients were given either 100 mg or 200 mg of Asian ginseng or placebo. The ginseng elevated participants' moods, improved physical activity and performance, improved glycosylated hemoglobin, and reduced fasting blood sugars and body weight (Sotaniemi et al., 1995). Asian ginseng has been shown to increase RNA and protein content in the muscle and liver tissue of laboratory animals (Witchtl, 1995). That same process may be the biochemical mechanism that makes ginseng such a highly regarded tonic. Studies show this ginseng to be antidepressant, antidiabetic and antihypertensive (Bensky et al., 1986). After evaluating the effect of Asian ginseng in various forms-cooked, dried and fresh root in 1,987 cancer cases, researchers found that the risk of developing certain cancers in a population that used ginseng for at least one year was less than the risk for the general population (Yun and choi, 1995).

Eleuthero root

(Eleutherococcus senticosis), formerly Siberian Ginseng, is less tonifying than the true Ginsengs (Panax sp.). It is neutral energetically and so is appropriate for daily use. Taken regularly, it enhances immune function, reduces cortisol levels and inflammatory response, and it promotes improved cognitive and physical performance. In human studies Eleuthero has been successfully used to treat bone marrow suppression caused by chemotherapy or radiation, angina, hypercholesterolemia, and neurasthenia with headache, insomnia, and poor appetite (Halstead and Hood, 1984; Chen et al., 2004).

American ginseng root *(Panax quinquefolius*)

American Ginseng is less stimulating than Panax ginseng; making it more appropriate for regular use by younger people of both sexes. It is appropriate for fatigue, recovery from pneumonia or bronchitis (especially with a dry cough), asthma, chronic stress with depression or anxiety, and autoimmune diseases of the lungs or GI tract. It is of great benefit for jet lag, metabolic syndrome, adrenal deficiency, immune depletion, sexual neurasthenia, and deficient insomnia. It is much less likely to over stimulate people than is Asian Ginseng (Winston, 2004).

Licorice rhizome (*Glycyrrhiza glabra*, *Glycyrrhiza uralensis*)

Licorice is a versatile and commonly used herb in Traditional Chinese Medicine (TCM), Unani-Tibb and European herbal traditions. It is an immune amphoteric and can be useful for autoimmune disorders (Lupus, Scleroderma, Crohn's disease, rheumatoid arthritis) as well as immune deficiency conditions (cancer, HIV) (Ikegami et al., 1993). It strengthens adrenal function and can be used with Panax ginseng for Addison's disease (Armament and Kargbowiak, 1983). It is also useful for allergies, ulcers, elevated cortisol levels and spasmodic coughs. Excess doses of Licorice can have a hyperaldosterogenic effect (increased retention of sodium and excretion of potassium). Women are more sensitive to this effect than men and patients with hypertension should avoid using this herb on a continual basis (Murray and Pizzorno, 1990)

Ashwagandha root (*W. somnifera*)

This herb is one of the Rasayana (rejuvenative) herbs of Ayurveda. It is one of the few calming adaptogens and has traditionally been used for anxiety, bad dreams, mild obsessive compulsive disorder, insomnia, and nervous exhaustion. It acts as an antispasmodic and anti-inflammatory and is very useful for fibromyalgia, restless leg syndrome, mild Tourette's syndrome, and osteo-arthritis. It is an immune amphoteric useful for hyper- and hypoimmune conditions (Bhattacharya et al., 1987). It is especially useful for autoimmune conditions affecting the muscles and joints such as rheumatoid arthritis, ankylosing spondylitis, polymyositis, and polymyalgia rheumatica (PMR). It enhances male fertility (sperm count and sperm motility) and, due to its iron content, it is of benefit in iron-deficient anemia. Ashwagandha also stimulates thyroid function. Studies in mice showed significant increases of serum T3 (18%) and T4 (111%) after 20 days of use (Panda and Kar, 1998).

Holy basil herb (Tulsi) (*Ocimum sanctum*)

Holy Basil has a long tradition of use in Ayurvedic, Siddha, and the Unani-Tibb systems of medicine. It is considered a Rasayana or rejuvenative medicine and is traditionally used to improve memory, to treat coughs, colds, indigestion, asthma (with Black Pepper), and fatigue. Research has also shown it reduces excess immune response in allergic asthma and allergies while enhancing normal immune function (Ghosal et al., 1989). In addition, in animal studies, it increases endurance, inhibits ulcer formation, and protects against gamma radiation. In a human trial, Tulsi showed benefits in non-insulin dependent diabetes mellitus, reducing fasting

blood glucose (17.6%) and postprandial blood glucose (7.3%) (Rege et al., 1999).

Wu Wei Zi berries/seeds (*Schisandra chinensis*, *Schisandra splenathera*)

Schisandra berries mildly stimulate CNS activity and can be used (with Prince Seng) for neurasthenia and exhaustion. It is very useful as part of a protocol for hepatitis B and C, asthma (with Licorice), and for nervous system disorders including Parkinson's disease, Meniere's syndrome, deficient depression, and adult anti-diuretic hormone deficiency. Wu Wei Zi is used in Fu Zheng therapy to support immune function and prevent side effects caused by cancer chemotherapy. Traditionally, this herb is used to control urinary incontinence, leucorrhoea, diarrhoea, and spermatorrhea and to reduce excessive sweating.

Shatavari (*Asparagus racemosus*)

This Indian species of Asparagus is used as a Rasayana remedy in Ayurveda. It has long been used as a tonic remedy, especially for women, promoting fertility and reducing menopausal symptoms. It is also used for dry coughs, to heal or prevent gastric ulcers, as a nutritive tonic for cachexia, and as a soothing diuretic. Recent research indicates Shatavari enhances immune function, increases corticosteroid production, and promotes cell regeneration (Rege et al., 999).

Dang Shen root (*Codonopsis pilosula*)

Codonopsis, also known as "poor man's ginseng" is used in TCM as a mild substitute for Panax. It is a spleen tonic and is used for poor appetite, gastric irritation, and ulcers, fatigue, and weak limbs. It is also a lung tonic and can be used for shortness of breath with a dry cough and frequent respiratory tract infections (with Prince Seng). Dang Shen is commonly used to strengthen the immune system (cancer, HIV, mononucleosis) and is frequently used to prevent side effects from chemotherapy or radiation. It increases haemoglobin levels and the number of red blood cells as well (You-ping, 1998; Chen and Chen, 2004).

Rhodiola root (*Rhodiola rosea*, *Rhodiola crenulata*)

Known as Rose Root, Golden Root, or Arctic Root, Rhodiola has a long history of use in Scandinavia, Eastern Europe, and Russia as a rejuvenative tonic. Rhodiola has been an official medicine in the Soviet Union (now Russia) since 1969, as a mild central nervous system stimulant, memory enhancer, cardiotonic, and immune tonic (Brown et al., 2002). In human studies, this root has been shown to be effective for treating mild depression, neurasthenia, nervous palpitations, impaired cognitive function, erectile dysfunction, amenorrhea, and infertility in women. Due to its cooling nature, Rhodiola is very useful for patients with hypertension, liver failure, rising headaches, and insomnia. Traditionally, Rhodiola is used in Tibetan medicine for "nourishing the lungs" to increase blood circulation, and for fatigue, altitude sickness, and weakness (Dorbinyan, 2000; Chen and Chen, 2004).

Eucommia bark (*Eucommia ulmoides*)

Traditionally, it is used for hypertension, low back pain, impotence, strengthening bones, ligaments, and muscles, and preventing miscarriage. Recent research has shown that this herb promotes collagen synthesis, protects against gastric ulcers, and relieves stress and hypertension (Chen and Chen, 2004). It also lowers LDL and VLDL cholesterol levels and increases phagocytic activity (You-Ping, 1998).

Cordyceps fungus (*Cordyceps sinensis*)

The caterpillar fungus (winter insect, summer plant) is one of the more unusual adaptogens. While the parasitized larvae are still available, most Cordyceps is now grown on soybeans. It is used in TCM for pains associated with chronic disease state and extreme rigorous labour/athletic training. It improves libido and sperm count, relieves fatigue, anaemia, chronic coughs, and bone marrow (erythroid) suppression due to radiation therapy. Cordyceps also has active antitumor and antileukemic activity (use with Panax ginseng), it enhances circulation and cardiac output, as well as lung capacity. Cordyceps combined with nettle seed and unprocessed Rehmannia is very useful for treating degenerative kidney disease. In human studies Cordyceps has shown significant benefit for male sexual dysfunction, hyperlipidemia, low platelet counts, allergic rhinitis, tinnitus, and chronic tracheitis (Chen and Chen, 2004).

Amla fruit (*Emblica officinalis*)

Amla or Amalaki is a Rasayana or rejuvenative remedy used in Ayurvedic medicine. A 1999 animal study by Rege et al. (1999) concluded that Amla was not only a useful antioxidant and anti-inflammatory, but had adaptogenic activity as well. The extract was shown to protect against biological, physical, and chemical stressors (Rege et al., 1999). Amla is used clinically for connective

tissue disorders (Scleroderma, Rheumatoid arthritis, Lupus, Ankylosing Spondylitis), to build blood (anemia–use with Ashwagandha), and strengthen bones, capillaries, and the eyes. It also inhibits atherosclerosis, carcinogennesis, and may help slow the degeneration caused by Alzheimer's disease (Chen and Chen, 2004).

Bryonia root (Bryonia alba)

Usually thought of as a highly toxic plant, Bryonia root has been found to be both an adaptogen and non-toxic if gathered in the spring or autumn. The summer- gathered roots have a very different chemistry and are, as commonly thought, quite toxic. Bryonia (commercially known as Lostak) is available as a tonic remedy in Russia and Eastern Europe. It is used to prevent radiation-induced cell damage, side effects from chemotherapy, and it improves physical endurance and work capacity (Panossian et al., 1997).

Aralia sp. (*Araliaceae*) *Aralia manshurica*, *Aralia elata*, Aralia schmidtii roots

These three species are native to Siberia and Manchuria, and are used in Russia as mild adaptogenic tonics. *A. elata* is the most researched of the three, and in animal studies it protected mice against radiation damage (Wagner, 1994). It is noteworthy that not all Aralia sp. have adaptogenic activity (e.g. *Aralia racemosa*, *Aralia spinosa*).

Jiaogulan herb (*Gynostemma pentaphylla*)

This member of the *Curcubitaceae* family has a long history of use in Southern China and Taiwan as a folk remedy for fatigue, weakness, asthma, hepatitis, migraines, and cancer. Due to its low cost and safety, it has become much more widely used as a "Ginseng" substitute and adaptogen throughout Southeast Asia. Interestingly, some of the active constituents, gypenosides, are chemically identical to ginsenosides found in the unrealted Panax species. Clinically, Jiaogulan is useful for hypertension, congestive heart failure, liver disease, elevated blood lipids, and to strengthen the immune system and inhibit cancer (Blumart and Jialiu, 1999; Winston, 2004).

Guduchi stem (*Tinospora cordifolia*)

Guduchi is another example of Ayurvedic Rayana remedies. It is traditionally used for impotence, gout, oedema, arthritis, and general weakness. Human and animal studies have shown it increases uric acid excretion, is a powerful anti-inflammatory for arthralgias, acts as an immunomodulator (useful for cancer patients undergoing chemotherapy), hepatoprotective agent (hepatitis B and C), and it reduces elevated blood sugar levels (Chen and Chen, 2004; Winston, 2004).

***Trichopus zeylanicus* seed**

Is used by the Kani tribe of India for energy, to increase stamina, and to promote immunity and vitality. It has been shown in animal studies to increase adrenal corticosterone levels, act as a hepatoprotective agent, and an aphrodisiac (Singh et al., 2001).

Hoppea dichotoma root

An Ayurvedic plant traditionally used as a nerve tonic. It has been shown to have adaptogenic properties (Chen and Chen, 2004).

Rhaponticum carthamoides* root/*Leuzea carthamoides

A Russian herb used as a CNS stimulant and as a restorative agent to the nervous system. Animal studies have shown immunostimulant, antitumor, and cognitive enhancing effects (Wagner, 1995).

Shalajit-bitumenous pitch

An Ayurvedic mineral remedy used to enhance immune function and tonify the heart, liver, and kidneys. It is hepatoprotective, anti-inflammatory, antihistamine, and gastroprotective. It is used clinically to treat diabetes, hepatitis, constipation, digestive disorders, cancer, degenerative kidney disease (use with Cordyceps), and anemia. (Chen and Chen, 2004).

Mimosa flowers or stems bark (Albizzia julibrissin)

Japanese researchers have suggested Albizzia has adaptogenic effects. There is little data to support this statement, but the flowers and bark of this small, shrubby tree are superb mood-elevators and are used with Hawthorn and Rose petals to treat "broken hearts". In TCM the bark (and flowers) are used for emotional problems caused by short temper, depression, irritability, impaired memory, and pre-menopausal syndrome-/menopausal mood swings (Chen and Chen, 2004).

Saw Palmetto berries (Serenoa repens)

Saw Palmetto is thought of as a "prostate herb", but in reality it is much more. When it was introduced into

Western medical practice in 1877 it was used for cachexia, neurasthenia, anorexia, and general depletion. From a TCM standpoint, it is a tonic to the kidney yin, lung, and spleen. These qualities are consistent with most, if not all, Chinese adaptogenic remedies. It is used in practice for asthenic, deficient patients who are underweight, have difficulty breathing, and have dry hair and skin (Chen and Chen, 2004; Winston, 2004).

Suma bark (Pfaffia paniculata)

Incorrectly called “Brazilian Ginseng”, Pfaffia is reported to have a long history of ethnobotanical use. Modern phytochemical studies were initiated in Japan in the 1980’s and among the constituents identified is Ecdysone. This substance is a type of biologically active phytosterol that mimics insect hormones and is of great interest to researchers. Clinically, Suma has been used to regulate hormones (Diabetes, benign prostrate hypertrophy, menopausal symptoms), enhance immunity, and inhibit tumor growth (You-ping, 1998; Chen and Chen, 2004; Winston, 2004).

Prince Seng root (Pseudostellaria heterophylla)

Known in TCM as Tai Zi Shen (or Hai Er Shen), Prince Seng is often referred to as “Ginseng of the Lungs”. It is a very important lung yin tonic for dry coughs, emphysema, lung damage, or hot/dry lung conditions. It mildly stimulates the immune system and has been used to treat malaise, neurasthenia, and asthma. It is a useful remedy for deficient, sensitive patients who need tonics, but get easily over stimulated by stronger adaptogens (Chen and Chen, 2004; Winston, 2004).

Conclusion

An adaptogenic substance is one that demonstrates a non-specific enhancement of the body's ability to resist a stressor. Brekhman, a Russian holistic medical doctor, stressor. Brekhman, a Russian holistic medical doctor, and his colleague Dardymov, established the following definition of an adaptogen: It "must be innocuous and cause minimal disorders in the physiological functions of an organism, it must have a non-specific action, and it usually has a normalizing action irrespective of the direction of the pathological state." The core of an adaptogen's scope of actions is the ability to help the body cope more effectively with stress, exerting a normalizing influence on the body, neither over-stimulating nor inhibiting normal body function, but rather exerting a generalized tonifying effect.

Having harmonised criteria for characterising a putative adaptogenic substance is very crucial because of the broad scope of the definition. However, in keeping with this definition, many researchers have demonstrated that some plants and plant materials have this ability. Also, some mechanisms have been postulated by which phytoadaptogens exert its actions. All over the world, the acceptability of adaptogenic herbs is very high. These substances are used to improve health and performance and are found in many proprietary dietary supplements.

REFERENCES

Ahumada F, Trincado MA, Arellano JA, Hancke J, Wikman G (1991). Effect of certain adaptogenic plant extracts on drug-induced narcosis in female and male mice. Phytother. Res. 5(1): 29-31.

Anisimov MM, Fronert E B, Froleva G M, Suprunov N I (1997). Effect of glycosides of Eleuteroccocus senticosis on early embryogenesis of sea-urchin. Izy. Akad. Nauk SSSR Otd. Biol. Nauk. 4: 590–593.

Asaoka Y, Nakamura S, Yoshida K, Nishizuka Y (1992). Protein kinase C, calcium and phospholipid degradation. TIBS. 17: 414–417.

Avery G (1995). The research on the health and athletic benefits of adaptogens. Peak running Performance 5(6): 3-7.

Barnard EA (1992). Receptor classes and the transmitter-gated ion channels. TIBS 17: 368–274.

Bezdetko GN, Brekhman II, Dardymov IV, Zil’ber ML, Rogozkin VA (1973). Eleutherococcus glycosides effect on nuclear RNA polymerase activity in skeletal muscles and liver after physical strain“, J. Voprosy Med. Khimii. 19(3): 245–248.

Bhargava KP, Sing N (1981). Antistress activity of Ocimum sanctum, Linn. Ind. J. Med. Res. 873: 443.

Bhattacharya SK, Goel RK, Kaur R, Ghosal S (1987). Antistress activity of Sitoindosides VII and VIII, new acylsterylblucosides from Withania somnifera. Phytother. Res. 1 (1): 32–37.

Bhattacharya SK, Ghosal S (2000). Experimental evaluation of the antistress activity of a herbal formulation, Zeetress. J. Nat. Remed. 1:1-7.

Blumart M, Jialiu L (1999). Jiaogulan, China’s “Immortality” Herb, Torchlight Pub. pp. 1-80.

Brekhman II, Dardymov IV (1969). New Substances of Plant Origin which Increase Nonspecific Resistance. Annu. Rev. Pharmacol. v. 9.

Brekhman II (1977). What can oppose stress? Adaptation and Adaptogens. Proceedings of the 2nd Symposium: Processes of Adaptation and Biological Active Substances (May 1975). Vladivostok: Far East Scientific Center of the Academy of Science of the USSR. p. 81.

Brekhman II (1980). Man and biologically active substances: the effect of drugs, diet and pollution on health. New York: Pergamon press. pp. 1-89.

Bensky D, Clavey S, Stoger E (2004). Chinese Herbal Medicine: Materia Medica, 3rd ed. Seattle, Wash.: Eastland Press., pp. 1-1311.

Bredt DS, Hwang PM, Snyder SH (1990). Localization of nitric oxide synthase indicating a neural role for nitric oxide. Nature 347: 768–770.

Brekhman II, Dardymov IV (1968). New substances of plant origin which increase nonspecific resistance, Ann. Rev. Pharmacol. 8: 419–430.

Brown RP, Gerarg P, Ramazanov Z (2002). Rhodiola rosea, A Phytomedical Overview, Herbalgram 56: 40-52.

Cambronero JC, Rivas FJ, Borrell J, Guaza C (1992). Role of arachidonic acid metabolism on corticotropin releasing factor (CRF) release induced by interleukin-1 from superfused rat hipothalami. J. Neuroimmunol. 39: 57–66.

Cannon WB (1935). Stresses and strains of homeostasis. Am. J. Med. Sci. 89: 1–14.

Chang M, But P (1986). Pharmacology and Applications of Chinese Materia Medica: Hong Kong: World Scientific, pp. 199-200.

Chen JK, Chen TT (2004). Chinese Medical Herbology and Pharmacology, Art of Medicine Press, City of Industry, CA.

Chevallier A (1996). The Encyclopedia of Medicinal Plants., Dorling Kindersley, London/New York/Stuttgart/Moscow. p. 336.
Chrousos GP, Gold PW (1992). The concept of stress system disorders: overview of behavioral and physical homeostasis. JAMA 267: 1244–1252.
Cyong J (1982). A pharmacological study of the anti-inflammatory activity of Chinese herbs. A review. Acupunct. Electro. Ther. 7: 173-202.
Dahanukar SA, Thatte UM, Rege NN (1997). Adaptogens. Proceedings of International Workshop on Medicinal Plants, their bioactivity, screening and evaluation. Lucknow, India, Dec 2-5, L 13, pp. 1-23.
Dardymov IV (1976). Ginzeng, eleuterococc. On the mechanism of biological activity, Nauka, Moscow; 184.
Dardymov IV, Brekhman II (1969). The influence of antimycin D on the regulation of carbohydrate metabolism, caused by Eleutherococcus glycosides and adrenal ectomy in rats, Materiali Itogovoj Naucknoy Sess ii, VNIIFK.
Dardymov IV, Bezdetko GN, Brekhman II (1972). Incorporation of P32 into rat liver RNA under physical exercises and the effect of Eleutherococcus glycosides, Voprosy Med. Khimii, 18 (3): 267–269.
Dardymov IV, Khasina EI (1972). The effect of Eleutherococcus glycosides on glucose uptake by rat diaphragm, In: Lek. Sredstva Dal'nego vostoka (Remedies of the Far East), The Institute of Biologically Active Substances of the USSR, Academy of Science, Vladivostok, Russia 2: 52–55.
Dorbinyan V, Kteyan A (2000) Rhodiola rosea in Stress-Induced Fatigue-A Double-Blind Cross-Over Study of a Standardized Extract SHR-5 With a Repeated Low-Dose Regimen on the Mental Performance of Healthy Physicians During Night Duty. Phytomedicine: 7(5): 365-372.
Evans WC (1996). Trease and Evans Pharmacognosy. WB Saunders Company Ltd, London–Philadelphia–Toronto –Sydnay–Tokio. p. 612.
Fulder S (1980). The Drug that builds Russians. New Sci. 21: 83–84.
Ghosal S, Lal J, Srivatava R, Battacharya R, Upadhyay SN, Jaiswal AK, Chattopadhyay U (1989). Anti-stress activity of Sitoindosides IX and X, New C-27-glycowithanolides from Withania somnifera Phytother. Res. 3 (5): 201–209.
Goodwin JS, Webb DR (1980). Regulation of immune response by prostaglandins. Clin. Dermatol. Immunopathol. 15: 106–122.
Gross D, Shenkman, Z (2002). Ginseng Improves Pulmonary Functions and Exercise Capacity in Patients With COPD, Monaldi. Arch. Chest Dis. 57(5-6): 242-246.
Halstead B, Hood L (1984). Eleutherococcus senticosis–Siberian Ginseng, OHAI. p.7.
Iwu MM (1999). Garcinia kola: a new adaptogen with remarkable immunostimulant, anti-infective and antinflammatory properties. Abstract of the International Conference on Ethnomedicine and Drug Discovery; Silver Spring, Maryland, USA, Nov 3-5, pp. 1 -26.
Kopin IJ (1995). Definitions of stress and sympathetic neuronal responses. In: Stress. Basic mechanisms and clinical implications. Eds. Chrousos GP, McCarty R, Pacak K, Cizza G, Sternberg E, Gold PW, Kventansky R. Ann. NY. Acad. Sci. 771: 1–18.
Koner BC, Banerjee, BD, Ray A (1997). Effects of stress on gamma glutamyl transpeptidase (GGT) activity in lymphoid system of rats: modulation by drugs. Ind. J. Expt. Biol. 35: 222-224.
Kurkin VA, Zapesochnaya GG (1986). The chemical composition and pharmacological properties of plants of the genus Rhodiola (A Review), Khim. Farm. Zh. 20(10): 1231– 1244.
Lau BHS (1989). Macrophage chemiluminescence modulated by Chinese herbs Astragalus membranaceus and Lingustrum lucidum. Phytother. Res. 3(4): 148-53.
Lee YH, Bianchi, PG (1971). Peptic ulcer In: Pfeiffer, CJ (ed). Lippincott, Philadelphia, p. 329.
Liu GT, Zhang TM, Wang BE, Wang YW (1992). Protective action of seven natural phenolic compounds against peroxidative damage to biomembranes. Biochem. Pharmacol. 43(2): 147–152.
Lu H, Liu GT (1991). Effect of dibenzo-cycloctene lignans isolated from fructus Schizandrae on lipid peroxidation and antioxidative enzyme activity, Chem. Biol. Interact. 78: 77–84.
Lu H, Liu GT (1992). Anti-oxidant activity of dibenzocyclooctene lignans isolated from Schizandraceae, Planta Medica 58: 311–313.
Main IHM, Whittle NB (1975). Investigation of vasodilation and antisecretory role of prostaglandin in rat mucosa by use of NSAIDs. Br. J. Pharmacol. 53: 217-224.
Maslova LV, kondratev BI, Maslov LN, Lishmanov IB (1994). The cardioprotective and adrenergic activity of an extract of Rhodiola rosea in stress. Eksperim. Klinich. 57: 61-63.
Murray M, Pizzorno J (1990). Encyclopedia of Natural Medicine; Prima Publishing:Rocklin, Calif, p. 499.
Panda S, Kar A (1998). Changes In Thyroid Hormone Concentrations After Administration of Ashwagandha Root Extract To Adult Male Mice. J. Pharm. Pharmacol. 50: 1065-1068.
Panossian A, Gabrielian E, Wagner H (1997). Plant adaptogens II Bryonia as an adaptogen. Phytomedicine 4 (1): 83–97.
Panossian, Oganessian A, Ambartsumian M, Gabrielian E, Wagner H, Wikman G (1999). Effects of heavy physical exercise and adaptogens on nitric oxide content in human saliva, Phytomedicine 6 (1): 17–26.
Panossian A, Wikman G, Wagner H (1999a) Plant Adaptogens III, earlier and more recent aspects and concepts on their mode of action. Phytomedicine 6(4): 287-299.
Panossian A, Wikman G, Wagner H (1999b). Plant adaptogens. New concepts on their mode of action. Phytomedicine 6(4): 1-14.
Panossian A (2003). Adaptogens Tonic Herbs for Fatigue and Stress, Alternative and Complementary Therap. 9(6): 327-331.
Rand MJ (1992). Nitrergic transmittion: nitric oxide as a media-Plant adaptogenes III of non-adrenergic, non-cholinergic neuro-effector transmission. Clin. Exp. Pharmacol. Physiol. 19: 147–169.
Rege NN, Thatte UM, Dahanukar SA (1999). Adaptogenic Properties of Six Rasayana Herbs Used in Ayurvedic Medicine, Phytotherapy Research: 13(4): 275-91.
Selye H (1950). Stress. Acta Medical Publisher. Montreal, Quebec, Canada. pp. 1-127.
Selye H (1983). The stress concept: past, present, and future In: Cooper, C L. (ed) Stress Research: issues for the Eighties. New York: John Wiley and Sons, pp. 1-20.
Shibata S (1985). Chemistry and pharmacology of panax. Econ. Med. Plant Res. 1: 217-84.
Singh RH, Malviya PC, Sarkar FH, Udupa KN (1979). Studies on the psychotropic effect of Indian indigenous drug, Ashwangada (Whithania somnifera, Dunol). Part II: experimental studies. J. Res. Ind. Med. Yoga Homeo 14: 49.
Suh SO, Kroh M (2002). Effects of Red Ginseng Upon Postoperative Immunity and Survival in Patients With Stage III Gastric Cancer. Am. J. Chin. Med. 30(4): 483: 494.
Sotaniemi E (1995). "Ginseng therapy in non-insulin-dependent diabetic patients. Diabetes Care 18(10): 1373-75.
Tache Y, Rivier C (Eds) (1993). Corticotropine-releasing factor and cytokines: role in the stress response. Hans Selye symposium on neuroendocrinology and stress. Ann. NY Acad. Sci. p. 697.
Wagner H, Heur YH, Obermeier A, Tittel G, Bladt S (1982). Die DC-and HPLC-Analyse der Eleutherococcus Droge, J. Med. Plant Res. 44: 193–198.
Wagner H, Nörr H, Winterhoff H (1994). Plant adaptogens Phytomedicine 1: 63–76.
Wagner H, Norr H, Winterhoff H (1994). Plant Adaptogens, Phytomedicine 1(1): 63-76.
Wagner H (1995). Immunostimulants and Adaptogens From Plants. In: Arnason, J. Phtochemistry of Medicinal Plants, Plenum Press, NY. pp.1-18 .
Winston D (2004). Native American, Chinese, and Ayurvedic Materia Medica, HTSBM, pp. 1-14.
You-Ping Z (1998). Chinese Materia Medica, Chemistry, Pharmacology, and Applications Harwood: Amsterdam. pp. 1-714.
Yun TK, Choi SY (1995). "Preventative effect of ginseng intake against various human cancers: A case-control study on 1,987 pairs," Cancer Epid, Biomarkers and Prev. 24(3): 221-29.
Zhang D (1996). Ginseng extract scavenges hydroxyl radical and protects unsaturated fatty acids from decomposition caused by iron mediated lipid peroxidation. Free Radical Biol. Med. 20(1):145-50.