

Adaptogens: New Age Healing Gems for Physical Wellbeing

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Abstract: Adaptogens are plant products that are effective against a variety of stressors as well as shows nonspecific responses and resistance against diseases in human body. These products are isolated from a plethora of plant species such as extracts from *Rhaponticumcarthamoides*, *Panax ginseng*, *Eleutherococcus senticosus*, *Schisandra chinensis* and *Rhodiola rosea* etc. These adaptogens have been used since ancient times and have a rich history in the day today life of humans in the form of tea, food products and medicines. These products are capable in treating illness, memory impairment, treating depression, age healing and physical weakness. Adaptogens were also used by the sports persons to improve body's physical endurance and in neutralizing the stress. Adaptogens contain a variety of biologically active phytochemicals such as flavonoids, phytosterol, alkaloids, vitamins, lignanes, ecdysones and triterpenoids which are of great importance to the medicine. These adaptogens and the associated compounds were also taken as clinical trials under various loads of stresses in humans but the clinical trials are very limited in the human beings. However there is data available that shows the potential roles of these adaptogens in maintaining blood glucose levels, cortisol levels, nitric oxide levels, plasma lipid profiles, hepatic enzymes and in improving mental health, chronic fatigue and immune protection etc. Some of the edible fungal species also act as a source to adaptogens and are thus included in the diets. Thus a load of adaptogenic compounds, their resources and their medical applications for the human welfare are included in this review.

Keywords-Adaptogens, Clinical trials, Nonspecific, Phytochemicals, Stressors

I. Introduction

Adaptogens are compounds which are synthetic in nature as well as they are natural plant products that belongs to a plethora of plant species. These plant products have the ability to produce non-specific responses in the body to enhance the efficiency and resistance against the loads of stress (physical, chemical and biological). These adaptogens not only enhance the body's ability against stress, but also maintain normal body metabolic processes as well as boost up the mental and physical health [1]. Most of the plant adaptogens were isolated from different classes of plant kingdom e.g. *Araliaceae- Panax ginseng*, *Asteraceae- Rhaponticumcarthamoides*, *Crassulaceae- Rhodiola rosea*, *Schisandraceae- Schisandra chinensis* and *Eleutherococcus senticosus* are specifically considered as plant adaptogens [2, 3].

Currently few, synthetic adaptogens are also introduced in addition to the natural plant adaptogens like Levamisole, bromantane, aphobazole, bemethyl etc. These adaptogens are commonly distributed under two classes- one that belongs to plant products known as plant adaptogens and the synthetic ones known as actoprotectors. However, the applications of these adaptogens have been known from the ancient times but the term adaptogens was introduced by a Russian scientist Lazarev in 1947 after an adaptogenic compound namely Dibazol (2-Benzyl- benzimidazol) was discovered [4]. As, the adaptogens have non-specific effects on the humans and animals, thus are in use from hundreds of years for different purpose in different parts of the world. Their consumption is not only limited to physical health benefits but also they act as vasodilators and decrease lactate and blood sugars too [5]. Adaptogens are also a source of biologically active compounds that show a promising potential for the biological effects in the human beings. Biologically active phytochemicals with adaptogenic properties such as alkaloids, vitamins, flavonoids, lignane, ecdysone, phytosterol and triterpenoids are mostly extracted and further used as potential plant adaptogens [6]. The mechanism's of action to these adaptogens are not clearly known, whereas their intake as extracts or edible parts such as *Schisandra chinensis* roots, *Eleutherococcus senticosus* roots and *Rhodiola rosea* roots triggers the activity of hypothalamic – pituitary-adrenal axis and few other stress mediators in the human beings. Also, their intake affects the blood glucose levels, cortisol levels, nitric oxide levels, plasma lipid profiles, hepatic enzymes etc. [7]. However, the use of these adaptogenic plant materials in food products, in tea or in other vegetables as food will help in mental health, relieving stress and diseases, anxiety, diabetes and cardiovascular diseases in humans. Thus

scientific community is working on the isolation, identification and the effective applications of these adaptogens for mankind [8].

II. Adaptogens: an overview

Adaptogens are the natural compounds that restore the body metabolic functions by boosting the resistance to biological, physical, environmental and emotional pressure. This restoration of hormones, immune system and other signal molecules allow the body to retain the optimal stability resulting in activation of defensive mechanism to intense and incurable diseases. Recently Scientists explored the more benefits of these compounds and their role in defensive mechanism in preventing the diseases, maintenance of optimal homeostasis and restoration of body strength.

2.1. Adaption of Adaptogens

High altitude and other stressed conditions is the growing environment of Adaptogens. These compounds have adapted so well in adverse conditions (rugged mountains regions, some found at 15,000 feet altitudes above sea level) that they can help us in adapting extreme environmental changes[9]. An Adaptogen, Rhodiola, grow in extreme stressed conditions like high altitude, low temperature, low level of oxygen and intense sunlight. These conditions affected the plant physiology when used ethnomedically. There are several Adaptogens that take years to mature roots and have medicinal properties are as below:

S.No.	Medicinal plant	Root Maturation Time
1	Asian ginseng	5-12 years
2	American ginseng	≥ 7 years
3	<i>Rhaponticum</i>	3-4 years
4	Shatavari	3 years
5	<i>Rhodiola</i>	5-8 years
6	<i>Dang shen</i>	3 years
7	<i>Licorice</i>	3-4 years
8	<i>Astragalus</i>	4-5 years

Other Adaptogens like *Ashwagandha*, *Tulsian* and *Jiaogulan* are easily cultivated and harvested in one year. There are some known native Adaptogens in China, India, Russia and Korea and few are present in North America and Europe.

2.3. Adaptogens and phytochemicals

Primary and secondary metabolites are necessary for the proper metabolism of plants which include lipids, proteins, carbohydrates, enzymes and chemical compounds that have medicinal value. Relation of Phytochemicals and Adaptogens are not clearly understood and research in this area is on-going. Researchers of Russian, South America and Japan documented the potent building properties of specific plants that contain ecdysterone[10]. Plant sterols have important role in biological adaptogenic activities and also improved the muscle growth and athletic performance. *Pfaffiapaniculata* (suma), South American plant contains high level of plant sterols.

Biochemical compounds reported in adaptogens

Triterpenoid Saponins

There are two classes of plants compounds associated with adaptogenic properties: polyphenols and terpenes. Flavonoids are the class of polyphenols that have antioxidant properties. The largest group of secondary metabolites are terpenes that enable the plants to protect against stresses. Triterpenes like Saponins having a particular class called triterpenoids. Triterpenoid Saponins have adaptogenic properties like modulating effects of immune system, hepatoprotective and anti-inflammatory[11]. Some Saponins are involved in the strengthening of the adrenal gland that helps in relieving the stress. Plants triterpenoid saponins are Asian ginseng, Dang shen, Holy basil, Reishi, Astragalus, etc. [12,13,14].

Polysaccharides

Herbal plants containing polysaccharides stimulates the immune system and also increase the capacity of the individual to work through communication between cells and immune system. Astragalus, a saccharide rich plant plays an important role in enhancing the immune system benefits. Polysaccharides rich plants used in herbal medicine are a traditional practice in china to increase the vital energy in addition to enhance the immune functioning[15]. They stimulate the cytokines, granulopoiesis, thrombopoiesis, natural killer cells, B and T lymphocytes and other immune system components. Examples of Adaptogens that contain polysaccharides are American ginseng, Prince seng, Reishi, Rhaponticum, Astragalus, Asian ginseng and Shatavari[16].

III. Adaptogens working mechanism

Various phytochemicals are isolated from adaptogens and studied in animals and in test tubes. All adaptogens have specific mode of action. Scientists isolated the twenty-eight active ingredients from Asian ginseng termed as ginsenosides, was summarized in the Journal of Ethno-pharmacology. This active ingredient regulates central nervous system, endocrine secretions, and cardiovascular system and promotes the proper functioning of the immune system resulting in the stress relive. Herbal Adaptogens stimulate the immune system by regulating the metabolic pathways[17, 18]

The adaptogens affect the glands (thymus, pineal, pancreas, thyroid, pituitary), nerves, brain, and immune system by regulating and enhancing the metabolic reactions inside the body. There is mystery to understand the working mechanism of adaptogens[19, 20, 21]. Researchers know that the good quality of adaptogenic herbs prepare good extracts and use adequate doses helping in improving therapeutic use of herbs.

IV. Adaptogens Health and Well-being

Adaptogens improve health and general strength of body and therefore generating a positive effect on mind. They can help to alter many acute and chronic diseases along with the use of other treatments. This theme of prevention is known as heyamduhkhamanagatam (Avert the danger that has not yet come) In the Yoga Sutras of Patanjali. adaptogens provide an anabolic effect. They support the entire body by permitting the cells to have access to adaptive energy. They protect energy resources from depletion, thus act as tonics in states of weakness and stress. Adaptogens are more vital for those persons which are involved in athletic training and bodybuilding. These are also required when muscle power is weakened either due to weakness (malnutrition) or aging. Adaptogens work at the cellular level to support the body cope with stress-related situations. So antioxidative property of adaptogens defend the cells from oxidative stress. ATP (adenosine triphosphate) is the major source of energy used by the cells. Numerous adaptogens enhance the action of cellular ATP and stimulate mitochondria to produce energy. This produced energy is essential for the physical fitness and strength of the body. Adaptogens strengthen the liver by providing cellular energy through glucose production. As adaptogens improve the liver health, the well-being, energy and vitality, and toxin removal helps the body to function more efficiently. Physiological aging factors such as oxidation and stress are reduced by the usage of adaptogens [22]. Adaptogens balance the anabolic-catabolic processes, reduce inflammation, reduce body deterioration and reduce oxidative stress by slow down free radical formation[23].

4.1. Health benefits of Adaptogens

Due to huge influence of adaptogens on the body, a broad studies have been done on the health benefits of adaptogens. As they are highly effective, so they are used on the routine basis for the overall health benefits. Adaptogens are also known to increase the effectiveness of several drugs that in turn eliminates the side effects produced by the use of these drugs. It has been observed that due to the stabilizing effect of adaptogens, they are used as anti-stressors. Modulation and enhancement of immune system is also done by their use. They are also known to provide various antioxidant nutrients. Because of all these properties of adaptogens, they are known to play an important role in reversing the immune suppression that is caused by the stress, reverse the decline of the immune system functioning because of older age of people and also help in reducing the risk of cancer and heart disease. Several adaptogens are used specifically for different diseases as ageing, cancer, decreased immune cholesterol, weight management etc. Following “Table 1” shows different adaptogens used for treatment of various health issues:

Table 1. Different adaptogens and their health benefits.

S.No.	Health Issues	Adaptogens	References
1.	Adrenal Fatigue	American ginseng, ashwagandha, Asian ginseng, cordyceps, dang shen, eleuthero, holy basil, jiaogulan, licorice, reishi, rhaponticum, rhodiola, and schisandra	[24]
2.	Aging and Longevity	American ginseng, amla, ashwagandha, Asian ginseng, astragalus, cordyceps, dang shen, eleuthero, guduchi, he shouwu, holy basil, jiaogulan, licorice, lycium, prince seng, reishi, rhaponticum, rhodiola, schisandra, shatavari, and shilajit. Asian ginseng, cordyceps, eleuthero, jiaogulan, lycium, he shouwu, reishi, rhodiola, and shilajit. Amla, ashwagandha, Asian ginseng, cordyceps, eleuthero, guduchi, holy basil, jiaogulan, licorice, reishi, rhodiola, schisandra, and shilajit. American ginseng, ashwagandha, Asian ginseng, eleuthero, rhaponticum, schisandra, and shilajit.	[25]
	2.1- Antioxidant Activity		
	2.2- Antiaging		
	2.3-Anti-inflammatory		
	2.4-Anabolic activity		

3.	Anxiety and Depression 3.1- Against anxiety 3.2- Anti depressant 3.3- Central Nervous System Support 3.4- Anxiolytic activity	Ashwagandha, jiaogulan, reishi, and schisandra. Ashwagandha, Asian ginseng, holy basil, rhaponticum, rhodiola, and schisandra. Asian ginseng, rhaponticum, schisandra, and shilajit are stimulating; and ashwagandha, cordyceps, jiaogulan, and schisandra are calming. Blue vervain, chamomile, fresh milky oat, hawthorn, linden, motherwort, passionflower, and skullcap. Nervines that have antidepressant effects include Lemon balm, St. John's wort, mimosa, lavender, and rosemary.	[26]
4.	Arthritis 4.1- Anti-inflammatory	Amla, ashwagandha, cordyceps, guduchi, licorice, and reishi. Amla, ashwagandha, Asian ginseng, cordyceps, eleuthero, guduchi, holy basil, jiaogulan, licorice, reishi, rhodiola, schisandra, and shilajit.	[27]
5.	Breathing Problems	Amla, astragalus, cordyceps, dang shen, holy basil, jiaogulan, licorice, prince seng, reishi, rhodiola, and schisandra	[28]
6.	Cancer 6.1- Chemoprotective and Radioprotective adaptogens 6.2- Anti-tumour 6.3- Antioxidant activity	American ginseng, amla, ashwagandha, astragalus, Asian ginseng, dang shen, eleuthero, guduchi, holy basil, lycium, reishi, and rhodiola. American ginseng, amla, ashwagandha, Asian ginseng, astragalus, cordyceps, dang shen, eleuthero, guduchi, holy basil, jiaogulan, licorice, reishi, rhaponticum, rhodiola, schisandra, and shilajit. American ginseng, amla, ashwagandha, Asian ginseng, astragalus, cordyceps, dang shen, eleuthero, guduchi, he shouwu, holy basil, jiaogulan, licorice, lycium, prince seng, reishi, rhaponticum, rhodiola, schisandra, shatavari, and shilajit.	[29]
7.	Diabetes and Blood Sugar Level	American ginseng, amla, Asian ginseng, cordyceps, dang shen, eleuthero, guduchi, he shouwu, holy basil, licorice, reishi, rhaponticum, rhodiola, and shilajit.	[30]
8.	Digestion	Amla, American ginseng, Asian ginseng, astragalus, dang shen, holy basil, licorice, prince seng, shatavari, and shilajit.	[31]
9.	Fatigue	American ginseng, ashwagandha, Asian ginseng, cordyceps, dang shen, eleuthero, holy basil, jiaogulan, rhaponticum, rhodiola, schisandra, and shatavari.	[26]
10.	Liver Damage	Amla, astragalus, cordyceps, guduchi, he shouwu, holy basil, jiaogulan, licorice, lycium, reishi, rhaponticum, and schisandra.	[32]

V. Herbs for Adaptogens

The materiamedica includes a series of herbal monographs. It includes information regarding possible herb/drug interactions and other safety issues. General dosage information is also enlisted, although dosing is dependent on age of the patient, his weight and constitutional strength, and the type and quality of the herbal product [33]. Herbs are administrated in different ways. It includes teas, decoctions, tinctures (mixture of water and alcohol), fluid extracts, spray-dried extracts, capsules, gelpcaps, and tablets. Different plant parts of the herbs are used medically are listed in "Table 2".

Table 2. Different herbs and the edible parts.

S.no.	Botanical name	Common name	Part used
1	<i>Polygonummultiflorum</i>	He shouwu	Root
2	<i>Lyciumchinensis, L. barbarum</i>	Lycium	Fruit
3	<i>Rhaponticumcarthamoides</i>	Rhaponticum	Root
4	<i>Ocimum sanctum, O. gratissimum</i>	Holy basil	Herb
5	<i>Asparagus racemosus</i>	Shatavari	Root
6	<i>Glycyrrhizaglabra, G. uralensis</i>	Licorice	Root
7	<i>Panaxquinquefolius</i>	American ginseng	Root
8	<i>Schisandrachinensis</i>	Schisandra	Fruit, seed

9	<i>Emblicoefficialis</i>	Amla	Fruit
10	<i>Tinosporacordifolia</i>	Guduchi	Root, stem
11	<i>Rhodiolarosea</i>	Rhodiola	Root
12	<i>Eleutherococcussenticosus</i>	Eleuthero	Root, stem bark
13	<i>Withaniasomnifera</i>	Ashwagandha	Root
14	<i>Astragalus membranaceus</i>	Astragalus	Root
15	<i>Panax ginseng</i>	Asian ginseng	Root

Panaxquinquefolius (American ginseng) is used for both its root and leaf. It has antioxidant, immune amphoteric properties. It acts as hypoglycemic agent and as mild demulcent (soothes mucous membranes). Its active constituents include triterpenesaponins, known as ginsenosides or panaxosides. Sesquiterpene are responsible for its bitter taste. Its root is used to improve digestive system. It helps in enhancing digestion and absorption of nutrients. Chewing its root, results in secretion of stomach acid and digestive juices. *Emblicoefficialis*/Amlaisanother herb which has antioxidant, antiviral, aperient (mild laxative), diuretic and anti-inflammatoryproperties. It is an excellent healing plant due to its phenomenal phytoconstituents such as phyllembelin, quercetin, ellagic acid and vitamin C. Another native crop of India is *Withaniasomnifera* popularly named as Ashwagandha. Its key constituents include Steroidal lactones, withanolides A to Y and alkaloids. It acts as antioxidant, antitumor, mild astringent and diuretic. It is very effective to treat insomnia, anxiety, fatigue and stress. Iron rich ashwagandha acts as potent agent against iron-deficient anemia when mixed with milk [34]. *Panax ginseng* commonly known as Asian ginseng is used to treat diarrhea, dyspepsia, vomiting, coughs, and diabetes. Its roots can also cure dizziness, amnesia, and general weakness. Asian ginseng is most studied herbs in the world. *Cordycepsinensis* termed commonly as Chinese caterpillar fungus is collected from alpine grasslands in the foothills of the Himalaya Mountains in Tibet and Bhutan. It helps patients to recover from diseases like tuberculosis and pneumonia when served with pork and chicken soups. Japanese use it to treat aching thighs and knees. *Tinosporacordifolia* popularly named Indian tinospora belongs to family Menispermaceae. Its active constituents are tinosporone, cordifolisides A to E, and syringen. Early Hindu text states that it can be used to treat people with diabetes, liver problems, and kidney problems [35]. Its juice can cure burning urination and urethral discharges. *Ocimum sanctum* is very common and easily found throughout the lowlands of India. Its marvellous constituents are essential oils such as eugenol, carvacol, linalool and methyleugenol. It is used as a spice and also for treating gastro-disorders such as intestinal cramps, gas, headaches, coughs, and sinusitis [36]. *Gynostemmapentaphyllum* known as Jiaogulan is native plant of South China and Korea. It acts as hepatoprotective, cholesterolowering. It works well for lowering blood pressure and restores cardiac functioning. It lowers chances of heart attack or stroke. *Glycyrrhizaglabra* commonly known as Licorice has sweet-tasting triterpenoidsaponins known as glycyrrhizin. It is used by people from ancient times to treat dry coughs and respiratory diseases. It also finds its use in Chinese medicine as a nutritive tonic for the liver, kidneys, and blood. It also provides strength to weak muscles and ligaments. Administration of lycium fruit in chemotherapy patients resulted in boosting white blood cell counts and enhances the effects of the therapy [37]. *Rhodiolarosea* commonly named as *Rhodiola*, is popularly called Golden root plant. It is because of medicinal properties of its roots. The Plant contains salidosides, rosavins and flavonoids namely (rodiolin, rodionin). In Ancient times, it was used to treat dysentery, leucorrhea, hysteria, and headaches. *Rhodiola* helps to treat immune depletion, excessive physical training, and chemotherapy and radiation therapy [38]. At the same time, use of *Rhodiola* is considered sensitive for patients suffering from bipolar, manic, or paranoid. It results in insomnia in sensitive people. Another herb, *Asparagus racemosus* popularly known as Shatavari belongs to the family *Liliaceae* contains glycosides such as diosgenin, shatavarins I to IV and immune-stimulating polysaccharides [39]. In modern ayurvedic practice, shatavari is used as female reproductive tonic as many animal studies conducted reported that it enhances fertility [40]. *Melissa officinalis* commonly termed as Lemon balm, is used to make delightful-tasting tea which helps in mood-elevating and nervine effects. It is used along with other pleasant-tasting herbs such as hibiscus, ginger, linden flower, and fennel seed [41]. It is popularly termed as “beverage medicines.” It has health promoting effects on children, teenagers, pregnant and nursing women. Hence, it can be concluded that these herbs can prove highly beneficial to relieve negative impact of constant worry, inadequate sleep, and unsustainable lifestyles.

VI. Clinical uses of Adaptogen

Lots of clinical case studies reported by various herbalist, doctor and scientist suggest that adaptogen are one of the best formulae for curing various kinds of severe diseases occurring in human bodies. The below mention “Table 3” enlisted the various clinical adaptogens used for curing various severe diseases.

Table 3. Clinical case study reports showing various clinical adaptogens used for curing various severe diseases.

S.No.	Clinical case files Name	Clinical case study reports	Herbal adaptogen used for cure	Effects of herbal adaptogen used	References
1	David Winston's Case Files—Poor Sleep, Aching Joints	Women complained to have a poor sleep, mild anemia, chronically aching joints and irritable bowel syndrome	Amla, Ashwagandha, Rhodiola used in combination with antiinflammatory herbs and nervines	Relief in joint pain, have quality sleep, less nighttime waking and disappearances of irritable bowel symptoms	[42]
2	Christopher Hobbs' Case Files—American Ginseng for increase Health	Christopher Hobb , his many patients and especially Americans	Ginseng	Increased in energy level, mental clarity , mental performance, nourishing yin deficiency, treating adrenal burnout, asthmaand reduced chronic inflammation in lung	[43]
3	Amanda McQuade Crawford's Case Files	81-year-old man suffering from arthritis	Ashwagandha, Asian ginseng, eleuthero, and urtica as a combination of 1:2 tinctures	No joint pain and no stiffness after the used of herbal remediation	[42, 44]
4	Alan Tillotson's Case Files—Shilajit for Dysentery	Alan Tillotson (elder man) suffering from severe amoebic dysentery	Strong-smelling black pill (a composition of 50 percent shilajit, 30 percent triphala, and a number of other minor herbs) in combination with specific diet and other dysentery medicine	Regain lost weight, energy and restored health rapidly	[45]
5	Kathy Abascal's Case Files—Addiction Retrieval	Smoking Saddiction problem of Kathy (a young women)	Abascal	Herbal adaptogen abascal used makingPatient to retain positive changes in their life. It help in creating awareness that	[42, 46]

				adaptogen is an great tool for coping with the stress in their life	
6	Chanchal Cabrera’s Case Files— Autoimmune Disease	Chanchal Cabrera (64-year-old woman) suffering from autoimmune disease polymyalgia rheumatica	Combined stimulants (prickly ash, cinnamon, ginger) with anti-inflammatory (turmeric, wild yam), analgesics (kava, Jamaica dogwood), and adaptogen immune modulators (licorice, astragalus)	Cured autoimmune disease polymyalgia rheumatica	[42, 47]
7	Mary Bove’s Case Files— Autoimmune Hyperthyroidism (also called Graves’ Disease)	Kay (34-year-old mother of 7 weeks old baby) diagnosed with autoimmune hyperthyroidism, known as Graves’ disease	Ashwagandha, astragalus, lemon balm, nettles and motherwort.	Normalized pulse rated, decline heart palpitation and help in disappearances of various symptom	[42, 47]
8	Mary Bove’s Case Files—Low White Blood Cells (WBCs also called Leucopenia)	Carol (57-year-old woman) having chronic low white blood cell counts also known as leucopenia	Four powdered herbs: cordycepsreishi, maitake and shiitake	Cure leucopenia	[42, 47]

VII. Adaptogens as Food

Humans and other animal groups are directly or indirectly have relied on the plants for a variety of nutrient and other mineral elements. These plant products are specifically required to operate a series of biochemical and metabolic reactions in the biological system. These plant products not only includes vegetable and fruits but also includes a variety of adaptogenic foods such as in the form of spices, teas, condiments known to alter mood, to enhance appetite and to boost physical and mental health of the human beings. They also work as medicines to heal traumas and to improve the health of sick patients [48]. These adaptogens were selected by mankind as a result of animal and self-trials and the best suited herbs and food materials were selected and added to their diet. Some of the sweet and sour adaptogenic fruits like Schisandra berries, Amla and Lyceum fruits were a pleasant selection. In addition to this some sweet tasting plant roots like Dang shen and Licorice were also included in the diets as adaptogens, whereas Ashwagandha and Shilajit were also selected as good adaptogens [49].

The traditional method for using these adaptogens as tea or infusion is applicable to all except Shilajit. Some adaptogens such as Rhodiola, Ashwagandha and Asian ginger are used as beverages teas or medicinal teas or foods. The root adaptogens namely Dang shen, Ashwagandha and Ginger are also cooked as medicinal foods by adding honey, milk, ghee and rice porridge. Some of the mushroom species are also cooked as soups and medicinal foods e.g Cordyceps, Maitake, Black reishi, Shiitake while some of the leafy vegetables like Spinach and Jiaogulan and Holy basil are also taken as medicinal foods [50].

Functional foods are also introduced in the diets as they just not only provides nutrition’s but also they add health benefits by adding herbs or nutritional supplements in the fruits and vegetables foods. The most common examples for adaptogens in functional foods in beverages e.g Ginger, Schisandra and Rhodiola are added in many drinks for adding health benefits.

7.1. Adaptogens as foods- uses and recipes

Some of the herbal adaptogens as foods and their usage in different recipes are tabulated in the “Table 4”.

Table 4. Adaptogens as foods.

S.No	Adaptogens from different herbs/plants	Uses and recipes	References
1	American Ginseng	American Ginseng Chicken Soup Quail’s Eggs with American Ginseng Dessert. Ginse, In tea and mushroom	[51]
2	Amla	Most famous ayurvedic preparations: triphala and Chyavanprash Amla fruit to avoid thirst, as the fruit stimulates the flow of saliva. e fresh ripe fruit are pickled and used as appetizers to stimulate the appetite.	[52]
3	Ashwagandha	In India it is commonly cooked in milk with molasses as a sweet, nourishing beverage to relieve weakness, anemia, and insomnia. The powdered root is eaten by men to relieve impotence or low sperm count. Ashwagandha seeds are used in Sudan to coagulate milk for making cheese.	[53]
4	Dang Shen	Dang shen root has a sweet taste and is cooked in soups, stews, and rice porridge. Dang shen tea nourishes the digestive, immune, and endocrine systems.	[48]
5	Holy Basil	Holy basil (tulsi) can be enjoyed as a simple herbal tea. A tea made of holy basil with ginger or alone is good for digestion. When sick, increase the strength of your holy basil tea. To lower a fever, use three to five tea bags.	[54]
6	Licorice	Licorice A tea made from licorice roots is an excellent thirst quencher. Honey-Roasted Licorice Tea is also famous.	[55]
7	Lycium	Lycium berries act as sweetener in tea blends. Lycium fruit tea nourishes the eyes, enriches the blood, and helps control blood sugar levels.	[56]

VIII. Conclusion

Natural plant adaptogens are potential compounds with nonspecific effects in relieving stress, illness, physical weakness, anxiety and to improve mental health. They contain a plethora of biochemical boosters from alkaloids, flavinoids, liganane, ecdysone, phytosterol, triterpenoids etc. However, the application of these adaptogens have been known from ancient times but their use in the modern society is getting a boost due to their age healing and stress resistance properties. These plant products can be taken in tea, in food as well as in the form of medicine and supplements. There is a knowledge gap into the usage and findings of a plethora of new adaptogens and the discovery of new plant species which could be a game changer in the medical science.

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