Review Article

NATURAL SUBSTANCES FOR ENHANCING ENERGY, COMBATING FATIGUE AND PROMOTING MENTAL WELL-BEING: A REVIEW FOCUSED ON SOUTHEAST ASIA

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Abstract

Low energy and fatigue are key symptoms of Major Depressive Disorder (MDD) and even when depression is partially treated, fatigue often remains as a persistent residual symptom. MDD was the third leading cause of global disease burden in 2008 and is projected by World Health Organization (WHO) to rank first by 2030. Globally, 15.1% of adults and 6.0% of minor's experience fatigue, while 10.1% of adults and 1.5% of minors suffer from chronic fatigue. Hence, it is essential to investigate further strategies to enhance human energy and alleviate fatigue. Traditional natural remedies are gaining attention as alternative therapies for various diseases worldwide. For centuries, various natural substances have been used to enhance physical and mental energy, combating fatigue, playing a vital role in mental health support, particularly in managing conditions like depression. This review aims to fill the gap in comprehensive literature reviews regarding those natural substances in Southeast Asian countries. It focuses on potential natural substances from six countries: Vietnam, Indonesia, Philippines, Bhutan, Malaysia and Thailand. By summarizing and comparing these substances, we can identify shared effects and properties, as well as unique characteristics that differentiate them across various regions. This review examines 454 natural substances from six countries, used to enhance energy and combat fatigue, with a focus on plant-based sources, excluding animals and insects. Among those natural substances, 6.2% are from the Fabaceae family, followed by 4.8% from the Rubiaceae family and 4.2% from the Zingiberaceae family. In all the natural substances used, leaves represent the largest portion at 22.1%, followed by roots at 15.9% and fruits at 13.9%. This review is an attempt to study and compile the traditional and scientific aspects of the potential energizing substances used in Southeast Asia reported till date. ***ASEAN Journal of Psychiatry, Vol. 25 (8) October, 2024; 1-15.***

Keywords: Depression; Energy Enhancement; Anti-Fatigue; Natural Substance; Southeast Asia

Introduction

Major Depressive Disorder (MDD) is a severe psychiatric condition marked by persistent low mood, diminished interest or pleasure in activities, changes in appetite, disrupted sleep patterns, psychomotor agitation or retardation, fatigue, impaired concentration, feelings of guilt or worthlessness and thoughts of suicide [1]. MDD was the third leading cause of global disease burden in 2008 and is projected by the World Health Organization (WHO) to rank first by 2030 [2]. Many patients with MDD do not fully respond to antidepressants, even with adequate dosage and treatment duration. Fatigue is a common residual symptom of partially treated depression [3]. Low energy is often characterized by fatigue, diminished motivation and a lack of interest [4]. A meta-analysis of fatigue prevalence, based on 91 studies with 115 data points, reported global prevalence rates showing that 15.1% of adults and 6.0% of minors experience fatigue, while 10.1% of adults and 1.5% of minors suffer from chronic fatigue. Causes of fatigue include physical, mental, mixed and drug-induced factors [5]. Mental fatigue is widely recognized as a core symptom in many psychiatric disorders, particularly in anxiety and mood disorders like generalized anxiety disorder and depression [6]. Hence, it is essential to investigate further strategies to enhance human energy and alleviate fatigue. Carbohydrates, fats and proteins from our daily, are essential macronutrients that are the primary source of energy for humans [7]. Vitamins

and minerals are micronutrients that confer health benefits, particularly in alleviating mental and physical fatigue, as well as enhancing cognitive and psychological functions [8]. Alongside lifestyle factors such as a balanced diet, regular physical activity, sufficient sleep and meditation, various nutrients and botanicals can contribute to improving energy levels and possessing anti-fatigue properties. Natural substances, including plants, are an essential source of both food and medicinal compounds for humans and are generally considered to be safe [9]. Southeast Asia, renowned for its rich biodiversity and traditional medicinal practices, offers a diverse range of natural substances that are recognized for their energy boosting properties. The potentially energizing natural substances could be used as alternative therapies without the side effects often associated with synthetic stimulants while providing a sustained energy boost and supporting overall well-being. However, there is a lack of comprehensive literature reviews summarizing the use of natural substances for energy enhancement and anti-fatigue in this region. This review aims to find and summarize the natural substances from Southeast Asia, emphasizing their traditional uses or the scientific evidence supporting their energy-enhancing and anti-fatigue properties. It compares and discusses the family names, key bioactive compounds and the parts of these substances utilized across various Southeast Asian countries.

Methodology

Through collaborations with Southeast Asian research partners, Delightex is studying natural substances that may enhance mental well-being. This intensive preliminary literature search was conducted by Delightex's research partners, focusing on regionally known substances traditionally used in folk medicine, drawing from local medicinal knowledge and subsequently conducting for scientific evidence using databases and other online sources. The search criteria included keywords such as 'natural substances', 'Southeast Asian countries', 'medicinal plants', 'mental wellbeing'. In this review, data on natural substances provided by research partners were used to compile a list of potential energizing substances. Specific natural substances were identified by narrowing the selection using terms such as 'energy enhancement', 'energy boosting', 'energy increase', 'energy stimulant', 'anti-fatigue', 'increase appetite', 'nutrition', 'tonic' and 'aphrodisiac'. The selected substances were summarized alongside their traditional uses or scientific evidence for energy enhancement. Similarities and differences among these substances were analyzed by country, natural substance family and parts used, with the results visualized using pie charts.

Results and Discussion

Following literature reviews by multiple research collaborators focused on enhancing mental well-being, 454 energizing and anti-fatigue natural substances from 127 plant families were selected and analyzed. Among these, 166 substances are from the research in Vietnam, followed by Indonesia with 113, the Philippines with 77, Bhutan with 58, Malaysia with 23 and Thailand with 17.

Family

Among the 454 natural substances, 6.2% of them are from the Fabaceae family, followed by the Rubiaceae family (4.8%) and the Zingiberaceae (4.2%). Table 1 provides detailed information on the main natural substances from the top three families. This includes their botanical family, scientific name, utilized part, traditional application (where available) and scientific evidence (where available) supporting their energizing effects. Figure 1 depicts the distribution of energizing natural substances in Southeast Asia by family.

Fabaceae: The Fabaceae family, commonly known as the legume, leguminosae, bean, or pea family, is the third largest in the plant kingdom, comprising approximately 19,500 species, which constitute about 7% of all flowering plants [10]. This review has listed and summarized 29 substances within this family, most of which contain flavonoids as their active compounds. *Mimosa Pudica*, also referred to as shame plant and sensitive plant and it is a creeping annual or perennial plant widely distributed in the Philippines [11,12]. Known bioactive compounds include alkaloids, non-protein amino acids (mimosine), flavonoids C-glycosides, sterols, terpenoids, tannins and fatty acids [11]. Studies have suggested that *M. Pudica* have aphrodisiac properties [11-13]. *Glycyrrhiza glabra*, commonly known as Liquorice, belongs to family Fabaceae [14]. Originally, native to the Mediterranean region, it is now found in India, Russia and China and is extensively cultivated in various parts of Southeast Asia, including Indonesia [15]. Licorice extracts and licorice flavonoids have been traditionally utilized for treating sexual debility [16,17]. *Sesbania grandiflora*, the common name of the plant

includes vegetable hummingbird, katurai, agati, as well as crook wood [18,19]. It contains various bioactive constituents such as tannins, coumarone, steroids, triterpenes, isoflavonoids, isovestitol, sativan, betulinic betulinic acid, flavonoid and medicarpin. This plant has a history of its usage in traditional medicine as a tonic [19,20].

Rubiaceae: The Rubiaceae family, is commonly known as the coffee, madder, or bedstraw family. This family of flowering plants encompasses around 13,500 species across roughly 611 genera [21]. The leaves, stems and roots are the most commonly used parts of these plants for medicinal purposes, often prepared as powders, infusions, or decoctions [22]. The Rubiaceae family contains a broad range of compounds, such as iridoids, indole alkaloids, anthraquinones, terpenoids (diterpenes and triterpenes), flavonoids and other phenolic derivatives, with a strong emphasis on the production of bioactive alkaloids [23]. *Gardenia jasminoides*, also known as cape jasmine, this plant has demonstrated beneficial effects on the nervous, cardiovascular and digestive systems, with validated hepatoprotective activities from *in vitro* and *in vivo* studies [24]. It has been reported that iridoid glycosides, the main bioactive compound, increased serum levels of triglycerides, phospholipids, lipid peroxidation, blood glucose and free fatty acids, while also improving liver function test outcomes in rats on a high-sugar diet [25]. An eight-week study has suggested that positive effects on the body composition and energy metabolism-regulating hormones are experienced by taking cape jasmine fruits (80 mg/kg, twice a day) [26]. *Morinda citrifolia*, commonly known as noni, is a small, tropical, evergreen tree belonging to the family Rubiaceae. It is native to Southeast Asia and was introduced to the islands of the Western Pacific. Noni is considered one of the most significant traditional medicinal plants in Polynesian culture [27]. Noni fruit or juice is consumed as a traditional drink to provide an energy boost. It is believed that the nutrients and bioactive compounds in noni could help increase energy levels and combat fatigue [28]. Leaf extracts of noni, which contain scopoletin and epicatechin, have demonstrated more potent anti-fatigue effects in mice compared to green tea extracts, which contain epicatechin and green tea catechins [29]. Additionally, Salleh et al., reported that rats administered with 200 mg/kg Body Weight (BW) of noni leaf extracts exhibited the longest swimming time, approximately three times longer than rats fed with green tea or caffeine [30]. These rats showed lower glucose and lactate levels, suggesting more efficient energy metabolism. The observed effects may be attributed to the presence of various flavonoids, including epicatechin, catechin and quercetin [30]. *Mitragyna speciosa*, known as kratom, this plant is native to Southeast Asian countries such as Indonesia, Malaysia and Thailand. It is commonly used as a stimulant to sustain energy during laborious tasks [31]. Kratom has been traditionally used as an herbal remedy to boost energy levels and address various health conditions [32]. Marketing of various kratom strains suggests differing and occasionally opposing, pharmacological effects. For instance, the Thai strain "Maeng-Da" is promoted as a potent energy and mood enhancer, while the Indonesian strain "Sumatra" is marketed as an effective stress reliever [31]. Kratom constitutes various alkaloids such as indole alkaloid, paynantheine and speciogynine which stimulate serotonin receptors *in vitro* and in animal models [33]. This action has been linked to potential mood-improving effects, as seen in animal models of depression and anxiety [34,35].

Zingiberaceae: The Zingiberaceae, commonly known as the ginger family, comprises perennial herbs with creeping horizontal or tuberous rhizomes [36]. It includes approximately 52 genera and more than 1,300 species, widely distributed across tropical regions of Africa, Asia and America [36]. *Curcuma longa*, also commonly referred to as turmeric, possesses various applications. In Southeast Asia, *C. longa* is cultivated in Bhutan, Thailand, the Philippines and Malaysia and is regarded as an ethno medicinally significant plant in both Indonesia and Malaysia [37,38]. Curcumin has been utilized in multiple forms such as capsules, energy drinks, curry, tablets, tea and cosmetics [37]. The bioactive compounds in turmeric are curcumin, curcuminoid and essential oils [39]. In Ayurvedic medicine, turmeric is believed to offer various health benefits, including boosting overall energy and enhancing digestion [37,40]. *Zingiber officinale*, known as ginger, has been commonly consumed as a spice and a traditional medicine for a long time. Ginger consists of various bioactive constituents including phenolic compounds, terpenes, polysaccharides, lipids, organic acids and raw fibers [41,42]. Ginger has been traditionally utilized as the treatment for sickness, colic, upset stomach, gas, bloating, heartburn, flatulence, diarrhea, loss of appetite and dyspepsia [42]. Ginger warms the body, boosts circulation, lowers blood pressure and acts as an

antiviral to treat colds and flu [43]. According to the Indian Ayurvedic medicinal system, ginger is also recommended to enhance the digestion of food [44]. *Kaempferia parviflora*, known as Thai black ginger, it has been used in Thailand over 1,000 years, both as food and in folk medicine, to treat allergy, asthma, impotence, gout, diarrhea, dysentery, peptic ulcer and diabetes [45]. The dried rhizome is typically ground into tea bags, whereas the fresh rhizome is used for brewing wine. This wine, increasingly popular in Thailand, serves as a tonic and aphrodisiac [45]. Also, in Indonesia, Thai black ginger has also been traditionally used to boost strength, energy and as a natural aphrodisiac. Moreover, research revealed that *K. parviflora* increased serotonin, norepinephrine and dopamine in the rat hippocampus [46]. Another study suggested that high concentrations of Thai black ginger extract significantly influence the energy metabolism pathways in mice. This effect may be attributed to its potential to enhance glucose, lactate and lipid metabolism, as well as to regulate mitochondrial function in the liver and muscle, thereby modulating energy metabolism and substrate utilization [47]. Difference of the top families between the six countries are compared in this review (Figure 1). The Fabaceae family occupies the largest proportion in Vietnam and Bhutan while ranks as the second-largest family in the Philippines and the third largest family in Indonesia, excluding unidentified substances represented as Not Applicable (N/A). In Indonesia, the Zingiberaceae family comprises the largest share at 9.7%, followed by Rubiaceae and Fabaceae. Notably, the Philippines does not report any substances from the Zingiberaceae family among the 77 listed. The Philippines demonstrates diversity, with each family representing similar percentages, suggesting that the presence of unidentified substances may influence the variability in the charts. In Malaysia and Thailand, the Rubiaceae family is predominant, whereas the Fabaceae family is less prominent compared to other Southeast Asian countries, with no Fabaceae species reported in Thailand. This discrepancy may be due to the smaller sample sizes in Malaysia and Thailand, with 23 and 17 substances, respectively. A more comprehensive investigation of plant substances is needed to confirm the accuracy of the data for these countries.

Parts of plants used

Figure 2 shows the distribution of the total 454 energizing natural substances in Southeast Asia based on the plant parts used. Different parts of certain natural substances have been shown to effectively enhance energy levels. Among all these substances, leaves constitute the largest proportion at 22.1%, followed by roots at 15.9% and fruits at 13.9%.

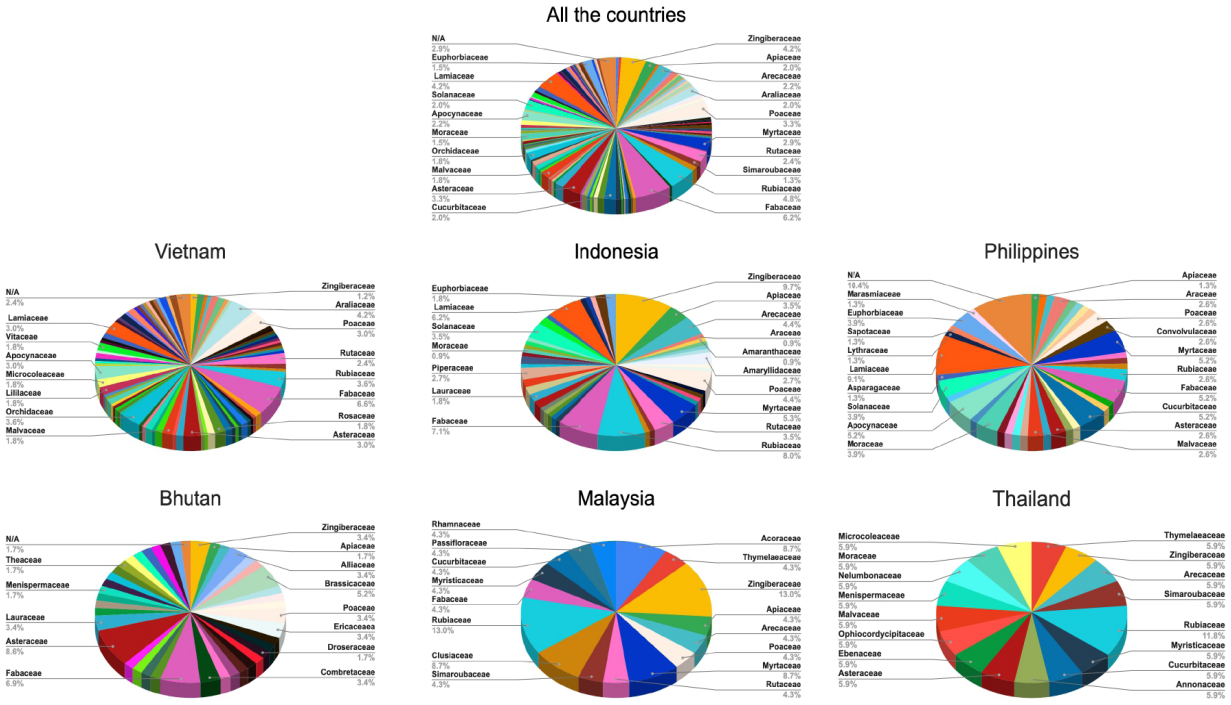

Figure 1. Pie chart of the categorization of energizing natural substances in Southeast Asia by family names.

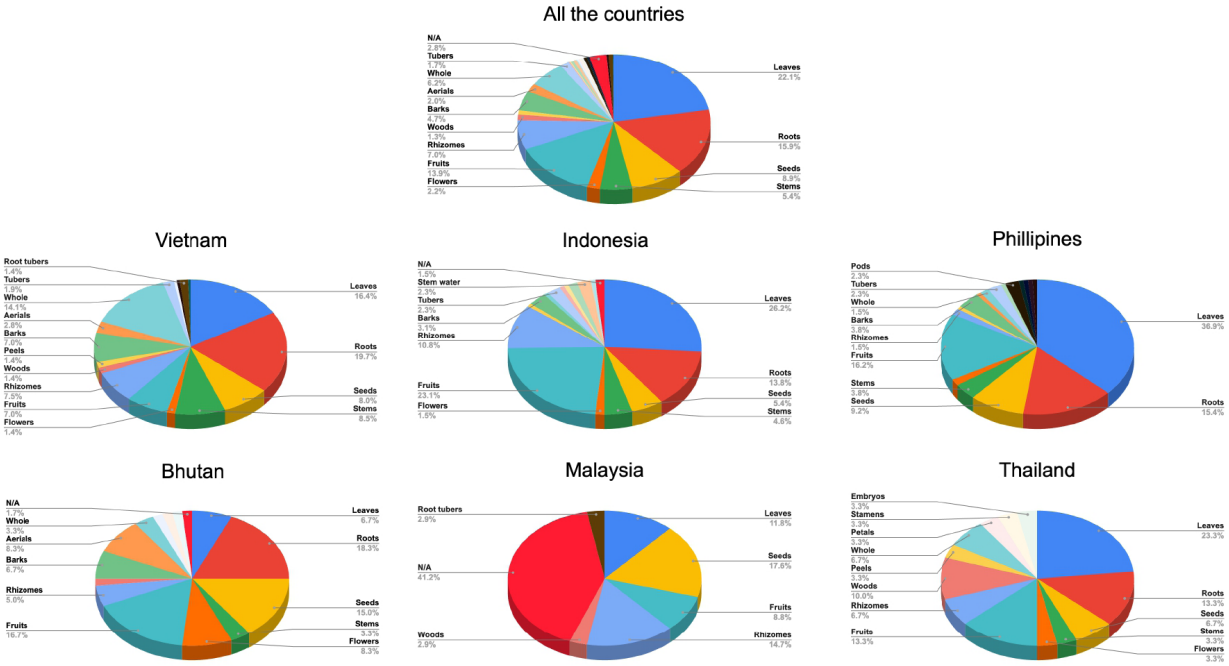

Figure 2. Pie chart of the categorization of energizing natural substances in Southeast Asia by parts of plants used.

Leaves

Leaves are the primary photosynthetic organs of plants, capturing light and converting it into energy [48]. Edible plant leaves, for example, moringa (*Moringa oleifera*), tea (*Camellia sinensis*), providing an essential source of polyphenols in the global diet [49]. Leafy vegetables are recognized for their rich content of bioactive compounds, with polyphenols being among the most prominent [50]. *Ficus pubigera*, known as mar grateub rong in Thai, is a species in the Moraceae family [51]. It is widely acknowledged in traditional Thai medicine for its health-promoting properties. It is used for sexual tonic, general tonic or blood tonic, relieve physical exhaustion and backache [52]. Various parts of the plant, particularly the leaves and roots, are highly valued for their invigorating effects. Traditional medicinal practices often utilize herbal infusions or decoctions made from different components of *F. pubigera* to alleviate fatigue, boost vitality and improve physical endurance. *Premna oblongifolia*, commonly known as green cincau, belongs to the family Lamiaceae, is a traditional food of Indonesia and provides a natural source of dietary fiber and antioxidants [53]. It has been reported that the green cincau leaves contain 29.37% fiber, 0.98% alkaloids and 2.12% total phenolic compounds [54].

It acts as a refreshing plant with a high chlorophyll content that enhances endurance and its phytochemical compounds are beneficial in treating various diseases [55]. *Salvia Rosmarinus*, known as rosemary, belongs to the family Lamiaceae. It is referred to as dumero, romero and rosmiro in the Philippines [56]. Rosemary leaves are a rich source of phenolic compounds, including flavonoids, phenolic diterpenes, abietane-type triterpenoids and other compounds such as carnosic acid, carnosol, rosmadial, rosmaridiphenol and rosmarinic acid [57]. Traditionally, rosemary leaves are believed to improve circulation, support digestion, enhance mood and increase energy levels [58].

Roots

Roots are vital for plants to absorb water and nutrients from the soil, influencing their growth and overall productivity [59]. *Glycyrrhiza glabra*, commonly known as licorice, has already been discussed in the Fabaceae family section. The primary bioactive component of its roots is glycyrrhizin, a triterpenoid saponin that is approximately 50 times sweeter than sucrose and serves as the principal active compound [60].

In traditional medicine, licorice roots have been used to treat a variety of ailments, including sexual debility. Ancient Hindus used licorice to enhance

sexual vitality, while the Chinese valued it for boosting strength and endurance, often preparing it in tea form [61,62]. *Eurycoma longifolia*, commonly known as Tongkat Ali, belongs to the Simaroubaceae family and it is native to several Southeast Asian countries, including Indonesia, Malaysia and Vietnam, as well as Cambodia, Myanmar, Laos and Thailand [63]. The root extracts of Tongkat Ali, have been employed in traditional medicine to treat various conditions, including sexual dysfunction, aging, exercise recovery, fatigue and muscle weakness [63].

Tongkat Ali is a rich source of diverse classes of bioactive compounds, including quassinoids, β-carboline alkaloids, canthin-6-one alkaloids, triterpene-type tirucallane, squalene derivatives, as well as eurycolactone, eurycomalactone, laurycolactone, biphenyl neolignans and bioactive steroids [63-67]. *Polyscias fruticose*, commonly known as Ming aralia, belonging to the the Araliaceae family. *P. fruticosa* has been widely cultivated in Vietnam and various Asian countries for centuries, valued both as a traditional medicinal plant and as a key ingredient in local cuisines [68]. The roots of *P. fruticosa* are rich in bioactive compounds, including saponins polyphenols and flavonoids, all of which offer significant health benefits [68]. Traditionally, it has been used to nourish the body, alleviate weakness, emaciation and fatigue and improve digestion. Additionally, it enhances physical endurance, stimulates brain activity and has shown potential benefits for conditions such as Parkinson's disease [69].

Fruits

The potential health benefits of these three groups of fruits are numerous. The primary bioactive compounds found in tropical fruits include vitamins C and E, carotenoids, flavonoids and thiol (SH) compounds [70]. Among these, polyphenolics are the most prevalent secondary metabolites, playing a key role as the main antioxidant compounds [70]. *Garcinia mangostana*, known as mangosteen, belonging to the Clusiaceae family, is a functional food and has various pharmacological effects [71]. The aril, which is the edible portion of the fruit, is rich in vitamins, minerals, beta-carotene and beta-cryptoxanthin. The mangosteen pericarp, constituting approximately 70% of the fruit, is an excellent source of phenolic compounds, including xanthones, anthocyanins, proanthocyanidins, phenolic acids and flavonoids [71]. A tea prepared from mangosteen fruits is commonly used as a tonic to alleviate fatigue and enhance energy levels in the Caribbean and Latin America [72]. Mangosteen is also employed to prevent the loss of essential nutrients from the gastrointestinal tract and to reduce dehydration during diarrhea, attributed to its astringent properties [73]. *Durio zibethinus*, known as durian, is a seasonal tropical fruit, belongs to the Malvaceae family and is predominantly cultivated in Southeast Asian countries, including Malaysia, Thailand, Indonesia and the Philippines [74]. Durian is rich in macronutrients such as sugars and fats, as well as micronutrients like potassium. It is also a good source of dietary fiber and contains various volatile compounds [74]. The energy content of durian ranges from 84 kcal to 185 kcal per 100 grams of Fresh Weight (FW) and durian has the highest energy content compared to other tropical fruits like mango, jackfruit, papaya and pineapple [74]. Due to its high sugar and fat content, durian may significantly contribute to daily energy intake while also raising postprandial blood glucose levels [74]. *Piper retrofractum*, commonly known as cabya, Javanese chili, is a member of the Piperaceae family and a species of pepper, native to Southeast Asia and predominantly cultivated in Indonesia and Thailand [75,76]. It has been traditionally used in folk medicine for centuries, particularly for its aphrodisiac properties [77]. The administration of the combined infusion of *P. retrofractum*, *Centella asiatica* and *Curcuma domestica* exhibited a significant aphrodisiac effect by boosting sexual libido in rats [77]. This effect is likely linked to piperine, a potent compound found in the fruit of *P. retrofractum*, known for its ability to strengthen the body and enhance blood circulation [77].

Difference of the top parts used between the six countries are compared. The distribution of leaves, roots and fruits in Thailand is similar to that of the six studied countries. In both the Philippines and Indonesia, leaves are most prevalent, followed by fruits and roots. This shared pattern highlights commonalities between the two distribution charts. Furthermore, a similar trend is observed in both Bhutan and Vietnam, where roots dominate the charts. It is interesting to note that leaves do not hold the same dominance in Bhutan as they do in other Southeast Asian countries. In Vietnam, fruit constitutes a mere 7%, while whole plants, seeds and stems encompass significant segments of the chart. In Malaysia, based on limited information, seeds show the highest utilization rate at 17.6%, with

rhizomes at 14.7% and leaves at 11.8%. The variations observed in these charts could likely be attributed to the diverse environments and conditions in which these crops are cultivated.

Furthermore, analysis of the data has also revealed that among the 454 substances, a substantial proportion exhibited positive effects on organs such as the kidneys, stomach, skin and liver. These effects may contribute to energy enhancement and combating fatigue, highlighting the need for further investigation and detailed analysis.

One limitation of this review is that it is a secondary analysis based on preliminary literature reviews conducted by multiple research collaborators focusing on mental well-being improvement. Consequently, there may be some energizing natural substances from the six Southeast Asian countries that are not included in this review (Table 1).

Table 1. List of natural substances in Southeast Asia countries and their traditional usage for energy enhancement.

Family	Scientific name	Part	Country	Traditional use/scientific evidence	References
Fabaceae	*Archidendron pauciflorum*	Fruit	Indonesia	The fruit is abundant in both macro (e.g. sodium, potassium, calcium, magnesium and phosphorus) and micro mineral constituents (e.g. sulphur, boron, copper, iron, manganese and zinc)	[78]
Fabaceae	*Caesalpinia sappan*	Stems	Indonesia	Treat fatigue	[79]
Fabaceae	*Cassia grandis*	Fruits	Vietnam	The fruit pulp has been traditionally used to help regulate normal blood glucose levels; The extract demonstrated a hypoglycemic effect, with the 200 mg/kg dose showing no statistically significant difference compared to 25 mg/kg of glibenclamid	
Fabaceae	*Cassia tora*	Seeds	Bhutan	Aphrodisiac	N/A
Fabaceae	*Clitoria ternatea*	Roots	Philippines	A traditional Ayurveda medicine and root is used as a brain tonic and aphrodisiac	[80]
Fabaceae	*Desmodium gangeticum*	Roots	Vietnam	The n-hexane root extract exerts significant aphrodisiac effects by increasing blood testosterone levels and affecting phosphodiesterase type 5 (PDE5) activity in rats	[81]
Fabaceae	*Eriosema chinense*	Tubers/ roots	Vietnam	The decoction of grains is used as tonic	[82]
Fabaceae	*Erythrina variegata*	Seeds	Bhutan	Replenishes and rejuvenate kidneys. Heals kidney disorders	N/A
Fabaceae	*Flemingia strobilifera*	Leaves	Indonesia	The decoction of leaves is traditionally used as a health tonic, applied externally by rubbing it on the body	[83]
Rubiaceae	*Gardenia jasminoides*	Leaves, flowers	Malaysia	Refer to the main body	

Fabaceae	*Glycine max*	Seeds	Indonesia	A major source of protein meal for human and animal nutrition	[84]
Fabaceae	*Glycyrrhiza glabra*	Roots	Vietnam, Bhutan	Refer to the main body	
Fabaceae	*Lespedeza juncea*	Aerial parts	Vietnam	Energizing	N/A
Fabaceae	*Medicago sativa*	Aerial parts	Vietnam	Daily administration of 100 and 200 mg/kg/day of an aqueous extract mixture of *M. sativa* and *Salvia officinalis* resulted in an increase in body weight and reproductive organ mass in mature female mice	[85]
Fabaceae	*Millettia dielsiana*	Stems	Vietnam	This plant is widely recognized in traditional medicine, not only as a renowned tonic but also in folk remedies for treating a variety of conditions, including muscle aches, pains	[86]
Fabaceae	*Millettia speciosa*	Root tubers	Vietnam	Various animal studies have demonstrated the anti-fatigue effects of extracts or plant polysaccharides	[87]
Fabaceae	*Mimosa pudica*	Roots, Leaves, Seeds	Malaysia, Philippines	Refer to the main body	
Fabaceae	*Pisum sativum*	Seeds	Bhutan	The administration of pea peptides (100 mg/kg/day, 200 mg/kg/day and 400 mg/kg/day) over 30 day's demonstrated significant anti-fatigue effects in mice. These effects were achieved through enhanced glycogen storage in both muscle and liver tissues, the reduction of lactic acid accumulation, inhibition of oxidative stress caused by free radicals and an overall improvement in immune function	[88]
Fabaceae	*Pithecellobium dulce*	Leaves	Philippines	Extract of leaves is employed as a remedy for indigestion	[89]
Fabaceae	*Pithecellobium lobatum*	Fruits	Indonesia	Energy is 184 kcal/100 g with high protein content (5%)	[90]
Fabaceae	*Pueraria mirifica*	Root tubers	Vietnam	It has been utilized in traditional Thai medicine as a rejuvenating tonic and is known for its estrogenic activity	[91]
Fabaceae	*Sesbania grandiflora*	Barks, Roots, Leaves, Flowers	Vietnam	Refer to the main body	
Fabaceae	*Tamarindus indica*	Leaves, Fruits	Indonesia	Has rich nutritional value; Frequently used in tropical regions for its laxative effects and aphrodisiac qualities	[92]

Fabaceae	*Trigonella foenum-graecum*	Leaves, Seeds	Vietnam	The seed hydro-alcoholic extract enhances recovery from various impairments related to physical fatigue	[93]
Fabaceae	*Vigna radiata*	Sprouts	Indonesia	It offers a substantial amount of protein (240 g/kg) and carbohydrate (630 g/kg) along with a variety of essential micronutrients in the diet	[94]
Fabaceae	*Vigna unguiculata ssp. sesquipedalis*	Bean pods	Philippines	Beans are highly nutritious for humans and beneficial to health. For example, five cultivars of beans commonly grown in Bangladesh are high in folate (58.75 µg-67.31 µg), vitamin A (846.23 IU-869.36 IU), vitamin B1 (0.096 mg-0.115 mg), vitamin B2 (0.109 mg-0.118 mg), vitamin B3 (0.40 mg-0.42 mg), vitamin B6 (0.020 mg-0.025 mg) and vitamin C (18.20 mg-20.22 mg), sodium (3.97 mg-4.18 mg) and potassium (230.03 mg-246.57 mg)	[95]
Rubiaceae	*Coffea arabica*	Seeds	Vietnam, Indonesia	Contains approximately 1.0% caffeine, which stimulates the central nervous system, reduces sleep and enhances heart muscle activity	[96,97]
Rubiaceae	*Coffea canephora*	Seeds	Indonesia	Contains approximately 1.7% caffeine, which stimulates the central nervous system, reduces sleep and enhances heart muscle activity	[96,97]
Rubiaceae	*Mitragyna speciosa*	Leaves	Thailand, Philippines	Refer to the main body	
Rubiaceae	*Morinda citrifolia*	Leaves, Fruits	Malaysia, Thailand, Vietnam, Indonesia	Refer to the main body	
Rubiaceae	*Morinda officinalis*	Rhizome	Vietnam, Malaysia	The root has a long-standing history of use as a tonic and nutritional supplement, helping to alleviate various conditions, including impotence and Alzheimer's disease, while also exhibiting anti-fatigue properties	[98]
Rubiaceae	*Paederia foetida*	Leaves	Vietnam, Indonesia	Enhances sexual vitality, increases semen volume and overall strength and promotes a radiant, youthful appearance	[99]
Zingiberaceae	*Alpinia galanga*	Rhizomes	Vietnam	Enhances sexual desire, stimulates appetite and acts as a tonic and aphrodisiac	[100]
Zingiberaceae	*Curcuma aeruginosa*	Rhizomes	Indonesia	Increases appetite	[101]

Zingiberaceae	*Curcuma longa*	Rhizomes	Bhutan, Malaysia, Thailand, Indonesia	Refer to the main body	
Zingiberaceae	*Curcuma xanthorrhiza*	Rhizomes	Indonesia	Tonic	[102]
Zingiberaceae	*Kaempferia galanga*	Rhizomes	Indonesia	The administration of a syrup formulation containing a rhizome extract at doses of 37 mg/kg-147 mg/kg body weight demonstrated an anti-fatigue effect in male Wistar rats	[103]
Zingiberaceae	*Kaempferia parviflora*	Rhizomes	Malaysia, Indonesia	Refer to the main body	
Zingiberaceae	*Zingiber aromaticum*	Rhizomes	Indonesia	Treats anorexia	[104]
Zingiberaceae	*Zingiber officinale*	Rhizomes	Malaysia, Bhutan, Indonesia	Refer to the main body	
Zingiberaceae	*Zingiber officinale* var Amarum	Rhizomes	Indonesia	Helps restore stamina after childbirth	[105]
Zingiberaceae	*Zingiber officinale* var Rubrum	Rhizomes	Indonesia	Alleviates headaches in patients with hypertension by applying warm compresses to deliver soothing heat energy	[106]

Conclusion

Southeast Asia, known for its rich tradition of medicinal practices and natural remedies, offers a wide range of substances with potential to enhance physical and mental energy, combat fatigue, boost appetite and support mental health, particularly in managing conditions like depression. This review synthesizes data on 454 natural substances originating from, cultivated in, or traditionally used in the region, encompassing 127 different families. We have analyzed the similarities and differences among these substances by country, family and part utilized. The review evaluates both traditional knowledge and scientific evidence regarding their energizing and anti-fatigue effects, while highlighting the bioactive compounds present in these substances. However, the specific compounds responsible for these energizing related effects and their underlying pharmacological mechanisms remain largely unexplored. Future research should focus on elucidating the mechanisms that contribute to the energizing and anti-fatigue properties of these substances.

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