International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Comparative Evaluation of Standardization, Application and Awareness of Panax Ginseng and Ashwagandha Based Medical Products: India's Context

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Abstract

Panax ginseng together with Ashwagandha (Withania somnifera) are the most important adaptogens of the Indian herbal market which is expected to be worth USD 2.16 billion by 2033. In the present situation, these two herbal plants are undergoing standardization within the frameworks of FSSAI and AYUSH, are being studied for their therapeutic uses in nutraceuticals and Ayurveda, and are being assessed for consumer awareness against regulatory and market dynamics. The standardization of Ashwagandha is being supported through national pharmacopoeias as well as withanolide indicators, while that of Panax ginseng relies on import-based ginsenoside characterization with global inconsistencies. Among the therapeutic uses, both plants are found to be stressed-relievers and immune-boosters, although Ashwagandha has more clinical studies in the local scenario supporting its use. Awareness adds a favorable point for Ashwagandha due to its cultural incorporation, in contrast to ginseng's more limited status. The findings encourage the establishment of common standards and training to facilitate the integration of ginseng.

Keywords: Panax ginseng, Ashwagandha, standardization, FSSAI, AYUSH, nutraceuticals India etc.

Introduction

The herbal medicine industry of India has remarkably grown during the time of the pandemic and is gradually reviving through the inclination of the consumers toward nature in the form of herbal medicines [1]. The international market of adaptogens which was valuated at USD 15.69 billion in 2024 is projected to reach USD 24.92 billion by 2032 with India causing a stir in the auction due to its conventional Ayurvedic therapies and the futuristic nutraceutical industry that is expected to be worth USD 2.16 billion by 2033. In this scenario, Panax ginseng (Asian ginseng) and Ashwagandha (Withania somnifera), often termed “Indian ginseng” have come up as major players. The roots of Panax ginseng are famous for their high ginsenosides content that is believed to improve cognitive functioning, energy, and immune system besides being the main component of the Koran and Chinese herbal medications. On the other hand, Ashwagandha, an indigenous plant primarily cultivated in Rajasthan and Madhya Pradesh, is an integral part of Ayurveda, and its withanolide-rich roots have been the basis for its being the king among stress relievers, hormone regulators, and rejuvenation as a Rasayana herb [2].

The main points of this comparative evaluation are the standardization, applications, and awareness—three main factors—of the medicinal products derived from Panax ginseng and Ashwagandha in the context of Indian regulations and market. Standardization is still the primary difficulty: The Food Safety

and Standards Authority of India (FSSAI) has set stringent criteria for the botanical lists, purity standards, and marker compounds for the ingredients allowed under its 2022 Nutraceutical Regulations. Heavily supported by the Ayurvedic Pharmacopoeia of India (API) and AYUSH guidelines, Ashwagandha is a recognized herb which stipulates withanolide content (0.3-5%) and Good Manufacturing Practices (GMP) regulation. Conversely, Panax ginseng lacks any specific mention in the Indian Pharmacopoeia and relies on international standards such as USP or NIST reference materials for ginsenosides (Rg1, Rb1) which leads to a wide range of quality among imported extracts as well as possibly different quality [3].

Therapeutic applications are similar in some aspects and, at the same time, different in others. Both of the aforementioned herbs have adaptogenic properties, thus maintaining the hypothalamic-pituitary-adrenal axis involved with stress and adrenal hormones' production. Ashwagandha has been found to reduce cortisol levels by as much as 30% in randomized trials and thus decrease anxiety, while ginseng is said to be good for controlling tiredness and increasing mental function, particularly in multiple sclerosis patients [4]. Ashwagandha is predominantly used in India in the forms of churnas, tablets, and syrups, especially for rheumatism, epilepsy, and sexual wellness, and is thus easily integrated into AYUSH systems. Ginseng, on the other hand, is available only in FSSAI-regulated nutraceuticals like energy drinks and capsules, often combined with local herbs, but limited by restrictions on claims regarding its medicinal properties to avoid overlap with medicinal foods.

Moreover, the awareness level among consumers serves as an additional indicator of the differences between the two products. Ashwagandha has become a household name mainly due to its cultural integration—polls indicate that over 70% of urban Indians are aware of its benefits for blood sugar and energy—research growth after 2020, online promotions, and, thus, studies have facilitated its recognition. On the other hand, ginseng, considered a rare import, has limited its recognition among health-aware consumers, thus worsened by misconceptions and lack of Hindi/rural promotions. Trends in the market point to Ashwagandha's leading position: its segment is expected to be worth USD 732.8 million by 2024, with a 5.2% CAGR rate, while ginseng, on the other hand, is growing slowly and mainly due to the imports.

The current document analyzes the aforementioned factors through the methods of literature synthesis, regulatory scrutiny, and comparative charts, with the purpose to guide the policy for uniform standards, wide applications, and focused awareness programs. India, through the FSSAI and AYUSH unification and the promotion of domestication trials (for instance, ginseng in the Himalayas), can not only enhance these adaptogens for equitable health outcomes but also for export potentials.

Literature Review

The standardizing efforts for Panax ginseng and Ashwagandha in India follow the global WHO guidelines, but the discrepancies appear under the FSSAI's 2022 Nutraceutical Regulations and AYUSH systems. Ashwagandha (Withania somnifera) is an essential part of Ayurveda and the Indian Pharmacopoeia [5]. The Indian Pharmacopoeia (API Vol. I) monographs describe the root as follows: straight, cylindrical, 3-12 cm long, 1-2 cm in diameter, light brown outside, and cream-colored inside. The standardization parameters include loss on drying (≤12%), total ash (≤8%), acid-insoluble ash (≤2%), withanolide content through HPLC (0.3-5% withaferin A), and microbial/heavy metals limits (Pb ≤10 ppm). These parameters confirm the reproducibility of the formulations like churna or ghrita, which is proved through HPTLC fingerprinting and physicochemical analyses. Panax ginseng, being a non-Indian plant, does not have comparable API/IP entries and uses imported standards like USP/EP ginsenoside totals (≥15 mg/g for Rg1,

Rb1, Re) and NIST SRM 3385 references, which already show variability caused by the soil and the climate. FSSAI Schedule II condones both as botanicals with purity according to the pharmacopoeias; however, the ginseng imports must undergo a contaminant examination, otherwise, the local Ashwagandha does not need that.

Looking at the market trends, Ashwagandha is on the top, as the Indian extract market is expected to be worth USD 732.8 million by 2024 with a CAGR of 5.93% throughout the period ending in 2031, with stress- relief nutraceuticals and export activities being the main factors [6]. The 'Atmanirbhar Bharat' incentives result in growing areas for Ashwagandha cultivation over 20,000 hectares in Rajasthan/Madhya Pradesh, including the manufacture of FSSAI-approved gummies/capsules. Ginseng wellness products are regarded as gradually increasing in the market for them, especially in drinks/tablets, and they have to deal with import tariffs and urban health market targeting notwithstanding the fact that they have AYUSH export approvals which help them a lot.

According to Brekhman's definitions, both herbal medicines can be classified as adaptogens, since they relieve the impact of stressors but do not cause any harm [7]. Ashwagandha has withanolides that reduce cortisol levels (25-30% in 60-day RCTs, 300-600 mg) and thus the anxiety that is measured by HAM-A (44-69% scoring dropping), curing insomnia and giving it the place of a supportive agent in schizophrenia. If studied in India, withanolides enhance VO2 max and post-COVID recovery [8]. Ginsenosides from ginseng, on the other hand, improve cognition, mitigate MS-related fatigue (20%) and strengthen immunity by modulating NK cells, all of which activity works well with Ashwagandha mixtures for diabetes. The safety of Ashwagandha roots (the NOAEL 2000 mg/kg in the 90-day studies) is, however, in stark contrast to the high risk of toxicity associated with high-dose leaves.

The disparity in awareness levels is partly attributed to Ashwagandha's Rasayana origin, which has been the case with studies since 2020 — the number of studies has doubled — while polls reveal that over 70% of India has metabolic knowledge. Ginseng is still regarded as "exotic," with the notion restricted by the lack of understanding, though some Tier 2 city efforts are there. There still exist differences in the direct trials in India, and it is high time that regulations are unified.

Standardization

India's regulatory framework for herbal products comprising Panax ginseng and Ashwagandha regulates them under the 2022 Nutraceutical Regulations for supplements by FSSAI and AYUSH for the areas of traditional medicine, thus ensuring safety, purity, and effectiveness. Ashwagandha (Withania somnifera) has a very high degree of standardization according to the Ayurvedic Pharmacopoeia of India (API Vol. I) and Indian Pharmacopoeia (IP 2016), with specific root parameters: cylindrical, 3-12 cm long, 1-2 cm thick, light brown bark with white cambium [9]. Norms are loss on drying ≤12%, total ash ≤8%, acid-insoluble ash ≤2%, alcohol-soluble extractive ≥40%, withanolide A 0.3-5% by HPLC. Microbiological limits (total plate count ≤10^4 CFU/g) and heavy metals (Pb ≤10 ppm, as ≤3 ppm) levels are in accordance with WHO standards, corroborated by HPTLC fingerprinting for uniformity in churna, ghrita, or extracts batch. Farming rules say sandy loam (pH 7.5-8.0), irrigated fields in Rajasthan/Madhya Pradesh and GMPs under AYUSH programs guaranteeing HoSU >15 years of age.

The lack of specific IP/API monographs has caused the standardization of Panax ginseng to lag behind, relying on FSSAI Schedule II for imported plants and international pharmacopoeias (USP/EP). Markers concentrate on ginsenosides: total ≥15 mg/g (Rg1, Rb1, Re proportions), using HPLC for measurement, and NIST SRM 3385 as a standard despite variety/climatic differences (Korean red > white). FSSAI

mandates purity (pesticides <0.01 mg/kg, microbes ≤10^5 CFU/g), food-grade solvent residues only, and labeling per Schedules IV (≤500 mg/day extracts). GRAS extracts such as PurGinseng help to gain entry, but still, the absence of national cultivation except for Himalayan trials creates vulnerability to adulteration.

The FSSAI Ayurveda Aahara initiative allows the use of Ashwagandha in foodstuffs (e.g., laddus), which is not the case with ginseng, thus enabling the sale of local products while imports are subject to port inspections. Both need extract ratios (e.g., 10:1) and stability information but Ashwagandha has already met ASEAN tablet standards (disintegration time <30 min) [10].

Aspect	Panax Ginseng	Ashwagandha
Regulatory Body	FSSAI (Schedule II imports)	AYUSH/FSSAI (Schedule II)
Key Markers	Ginsenosides Rg1/Rb1	Withanolides A (0.3-5%)
Monograph Status	Global (NIST SRM); no IP	API/AYUSH established
Purity Criteria	Pharmacopoeial (IP/USP)	ICMR/BIS; HoSU 15+ years
Cultivation	Experimental NE India	Optimized Rajasthan/Madhya Pradesh

Applications

panax ginseng and ashwagandha (withania somnifera) are considered major players in the nutraceutical and ayurvedic sectors of india due to their adaptogenic properties. they have massive support in terms of immunity and vitality in a market projected to reach usd 2.16 billion by 2033. ashwagandha, being a rasayana in ayurveda, primarily uses roots and leaves in different forms such as churna (powder) for day-to-day tonics, kwath (decoction) for rheumatism, ghrita (medicated ghee) for nervous problems, and taila (oil) for epilepsy and arthritis. modern-day nutraceuticals come in the form of standardized extracts (5% withanolides) in capsules (300-600 mg/day), gummies, and functional drinks, targeting urban stress-related issues like anxiety and insomnia. fssai has cleared these under schedule iv for specific dietary purposes, thus allowing claims such as"enhances energy levels"while prohibiting medical assertions like "heals diabetes." clinical trials corroborate the claims: randomized controlled trials (rcts) reveal 44-69% decrease in ham-a scores among generalised anxiety disorder (gad) patients after 6-8 weeks, overcoming placebo effects. in adjunct treatment of schizophrenia, 1000mg/day is found to be effective in reducing negative symptoms and improving cognitive function while 600mg is found to be beneficial in menopausal fsh reduction and remarkable sleep quality improvement (psqi scores fall by 72%) [11].

Indian studies provide evidence for cardiorespiratory advantages: VO2 max of athletes increases by 13% after 8 weeks of 500 mg that significantly helps in post-COVID recovery via modulation of the immune system. The anti-inflammatory effects are due to withaferin A's suppression of NF-κB pathways, which are also beneficial for osteoarthritis (WOMAC scores improve by 40%) and rheumatoid arthritis. Safety studies affirm root tolerability at doses as high as 2000 mg/kg in 90-day rodent studies (NOAEL), while human trials report mild gastrointestinal effects at large doses; caution is advised in the case of leaves due to possible cytotoxicity concerns.

Panax ginseng, whose main sources are Korea and China, has been used in energy drinks and other forms such as capsules and stick packs, where the content of the active compounds (ginsenosides) is Rg1, Rb1 ≥15 mg/g for the purpose of improving memory and reducing fatigue [12]. Korean red ginseng has been used primarily for the treatment of erectile dysfunction and for the enhancement of the immune system, while the white variety has been used for general health purposes; in India, it is mixed with Ashwagandha

and tulsi for better diabetes control and libido enhancement. The Food Safety and Standards Authority of India (FSSAI) considers extracts like PurGinseng to be GRAS (generally regarded as safe) for their use in nutraceuticals and sets the daily limit at 500 mg with the claim "enhances mental alertness". Studies show that the fatigue experienced by multiple sclerosis (MS) patients can be reduced (20-30% FSS scores), healthy people get cognitive benefits (memory tasks +12%), and immune system activation occurs through the stimulation of NK cells. The mechanism of ginsenosides on the HPA axis is similar to that of Ashwagandha, as both lead to a reduction of 15-20% of cortisol level in chronic stress; however, direct comparisons reveal that Ashwagandha is more powerful than ginseng for treating anxiety severity. Uses for ginseng as a preventive medicine are still more common than for ginseng as a cure; the ginseng in athletic nutrition is WADA (not prohibited) compliant and is improving athletes' stamina; the Indian market is offering it in OTC tablets for immunity post-pandemic. Different forms of ginseng on the market have increased to include powders for smoothies and effervescent tablets targeted at Tier 2 cities, with the export of AYUSH herbal mixtures anticipated to further boost this market segment.

Mixed Herbalness into Product: Ashwagandha-ginseng capsules for combining the benefits of adaptogens, improving the bioavailability through liposomal technology, and targeting the age group of 25-45 years who are interested in holistic health. Ashwagandha is the king in the domestic (USD 732.8M extracts 2024); it is responsible for 8% of the US supplements and Indian 'laddus' in Ayurveda Aahara; ginseng, being a niche import, is still gaining ground in e-commerce with Amazon/Hindustan Unilever. The applications include the health of women (Ashwagandha's ability to regulate testosterone for relieving PCOS symptoms) and geriatrics (ginseng's possible role as an adjunct in Alzheimer's treatment) [13]. Regulatory aspects are crucial: FSSAI mandates HoSU data (Ashwagandha over 15 years), stability tests, and forbids hormone claims, while AYUSH operates with independent pure herbal licensing.

Application Category	**Panax Ginseng Evidence & Forms**	**Ashwagandha Evidence & Forms**
Stress/Anxiety	Moderate (cortisol -15-20%; capsules 200-400 mg)	Strong (HAM-A -44-69%; churna/extracts 300-600 mg)
Immunity/Energy	High (NK cells +25%; beverages/sticks)	High (VO2 max +13%; kwath/gummies)
Cognitive/Fatigue	MS fatigue -20%; cognition +12% (tablets)	Schizophrenia adjunct; sleep PSQI -72% (ghrita)
Metabolic/Sexual	Diabetes blends; ED support (red ginseng)	PCOS relief; libido boost (Rasayana powders)
Market Penetration	Imports, urban e-com (CAGR high)	Native dominance USD 0.93B 2025 (exports rising)
Regulatory Limits	FSSAI ≤500 mg/day, GRAS extracts	FSSAI/AYUSH ≤1000 mg/day, API validated

Among the difficulties presented in the research was that of overharvesting, which is being mitigated by Ashwagandha’s cultivation over more than 20,000 Hectares, faking, where ginseng was substituted with Siberian types, and misuse of claims that may lead to inspections by FSSAI. The future perspectives are mostly on nano-encapsulation to make the product more available for the body and symbiotic clinical trials for athlete FSDU endorsements. These aspects illustrate the established versatility of Ashwagandha

that is being contrasted with the growing acceptance of ginseng, and thus support the need for the establishment of regulations based on the evidence for increased production.

Awareness Levels

The situation of consumer awareness of Panax ginseng and Ashwagandha-based products in India paints a picture of a great deal of these factors coming into play: significant cultural differences, the aspect of market access, and regulations. Ashwagandha has a wide recognition owing to its native Ayurvedic heritage while ginseng is more of a specialized case and dependent on imports. Ashwagandha, called "Indian ginseng" or Rasayana as per classical literature like Charaka Samhita, has become a part of every household as its presence is strong both in urban and rural areas. Research indicates that more than 70% of adults aged 25-55 are aware of its efficacy for stress relief and boosting energy. This rise correlates with the doubling of scientific papers since 2020, post-COVID health trends being one of the reasons and the government-supported AYUSH initiative of promoting it through digital platforms in Hindi/Tamil and distribution in Tier 2/3 cities being another reason [14]. Market data supports this: Ashwagandha's USD 732.8 million extract sector in 2024 comes with a 5.93% CAGR which is mainly contributed by e-commerce giants like Amazon and Flipkart, where the reviews from buyers stress the understanding of blood sugar control and sleep enhancement. The PIB reports depict the blending of Ashwagandha into daily routines—churna in milk for kids, tablets for workers—boosted by the celebrity endorsement and ICMR providing the evidence for the metabolic benefits. The population of awareness knows the safety aspects: consumers point out that root extracts (popular for their tolerability) are the main source while leaves will be guided by FSSAI's labeling requirements which state "not for medicinal use" on the products marketed as nutraceuticals.

The knowledge about Panax ginseng is very limited; it is regarded as an "exotic" product from Korea/China that is meant for premium urban health and therefore, the recognition by a national survey is less than 30%, mainly in the cities of Mumbai and Delhi. The limited availability is due to high costs (₹2000-5000 per pack as against Ashwagandha's ₹300-800), the dependence on imports, and the lack of Hindi-speaking educators, even though the substance is showing up more frequently in energy drinks and capsules made by Himalaya and Dabur. The misconceptions revealed in surveys are that a lot of people connect it vaguely with “energy enhancers” without a clue of ginsenoside functions or even being able to distinguish between red and white types, which leads to limited use among fitness enthusiasts only. The regional marketing initiatives in Northeast India, that are using Himalayan cultivation pilots, are showing early increases, but still, consciousness across the nation is behind Ashwagandha by 40-50% in metabolic/immunity awareness. Online shopping reviews say that the mixing of Ashwagandha makes the tolerance better; however, tales of side effects (such as insomnia from excessive doses) are still being told without any backing from AYUSH-based pharmacovigilance.

Comparative dynamics show the support of Ashwagandha' s cultural prominence, its native roots facilitating intergenerational sharing - grandmothers prescribing kwath for fatigue - while ginseng is attracting the younger generation via Instagram influencers. According to CRN, Ashwagandha has a global supplement usage of 8% (it is on the rise in India), and ginseng at 2-3% in the domestic market, where its growth is constrained by the FSSAI's claim restrictions that negatively impact the effectiveness of promotion [15]. There are gender differences: women (60% of users) are inclined towards Ashwagandha for hormones' balance, while men go for ginseng in terms of performance enhancement, as per Nielsen's research. Digital footprints make the disparities even larger—Ashwagandha has 5 times more Google

searches—while Tier 3 knowledge is developed through the distribution of AYUSH kits by ASHA workers after the pandemic in the community.

Awareness Metric	Panax Ginseng	Ashwagandha
Recognition Rate	<30% (urban niche)	>70% (pan-India)
Knowledge Domains	Energy (vague); ginsenosides low	Stress, immunity, blood sugar (detailed)
Promotion Channels	E-com, fitness influencers	AYUSH campaigns, TV, family traditions
Market Driver	Imports, blends (CAGR emerging)	Native cultivation, exports (USD 0.93B)
Barriers	Cost, misconceptions	Minimal; overharvesting concerns
Demographics	Males 25-40, metros	All ages/genders, rural-urban

The refrain from ginseng awareness may also lead to adulteration which is one of the challenges whereas another one is overuse of Ashwagandha that is detrimental to wild populations though more than 20,000 ah of cultivation exists. It is suggested that the FSSAI-AYUSH portals should make comparative infographics, and the school curricula should include them, and randomized awareness trials should be conducted to close the gaps, thus, promoting the rightful use of herbs.

Comparative Analysis

In the Indian herbal scenario, Ashwagandha is clearly the winner against Panax ginseng in terms of standardization, applications, and nearing even in the recognition aspect. Standardization is a major reason that troubles ginseng in the importation process as Ashwagandha sets the pace with defined API/IP monographs (withanolides 0.3-5%, validated by HPTLC) and AYUSH GMP, thus eases FSSAI nutraceutical licensing, while ginseng imports are subjected to purity inspection based on the fluctuating global ginsenoside markers (Rg1/Rb1 ≥15 mg/g) without national standards which adds to their inconsistencies. So, Ashwagandha guarantees its export batch consistency (ASEAN compliant) while ginseng faces the risk of contamination from the external sources [16].

Along with the whole of support of the Indian RCTs (HAM-A -44-69%), the applications show the impressive versatility of Ashwagandha in Ayurveda (churna, ghrita for anxiety, VO2 max +13%) leading the USD 732.8M market of extracts; ginseng, on the other hand, is limited in the psycho-cognition and MS-fatigue areas (20% improvement) [17]. Ginseng, however, comes mainly in blends, has no local evidence, and has lost its traditional beverages use. Awareness divides are extremely visible: Ashwagandha's recognition of over 70% through Rasayana tradition and ongoing research helps push its 5.93% CAGR, whereas ginseng is still a below 30% urban market player, mainly due to its price point.

Dimension	Panax Ginseng Strengths/Weaknesses	Ashwagandha Strengths/Weaknesses
Standardization	Global markers; import variability	National monographs; native GMP
Applications	Cognition/immunity; blends emerging	Stress/Rasayana; RCTs dominant
Awareness	Niche urban; low comprehension	Pan-India cultural; high trust
Market Share	Imports growing	USD 0.93B leadership

Challenges and Recommendations

The Indian markets for Panax ginseng and Ashwagandha are facing key challenges among which the regulatory separation of FSSAI and AYUSH is the main one leading to claim uncertainties and lack of

proper enforcement. Ginseng, on the one hand, is exposed to standardization issues due to the absence of IP monographs, the problem of import adulteration (Siberian fillers), and the barriers of high costs that limit the awareness of the product to urban elites only, while Ashwagandha is at risk of overharvesting despite the large area under cultivation (20,000+ ha). Moreover, the potency of ginsenosides/withanolides fluctuates and hence advanced HPTLC/HPLC is required, however, small manufacturers do not have access to these tools; consumers are still confused about the dosages and interactions.

The recommendations call for the unification of pharmacopoeial markers through IP changes, financing ICAR experiments for ginseng cultivation in the Himalayas, and FSSAI-AYUSH bringing together the hybrid approval process. To increase the equitable adoption of ginseng, multilingual awareness portals, ASHA-led campaigns, and pharmacovigilance apps should be launched. The market for nano-formulations and WADA-compliant sport endorsements should be expanded through prioritization.

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