

Integrating Science and Commerce: Exploring the Pharmaceutical and Nutraceutical Potential of Ginkgo Biloba

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Introduction

The Ginkgoaceae family has a long history, with fossil records dating back 300 million years to the Permian period and reaching their peak during the Jurassic period 200 million years ago. Today, Ginkgo biloba L. is the sole surviving species of this family, having endured mass extinctions in the Cretaceous and Paleogene periods and the Pleistocene glaciation. This relict species has high ornamental and medicinal value and is highly adaptable to different environments, resistant to air pollution, pests, and pathogens. The leaf extract is valued for its therapeutic properties, including scavenging free radicals, reducing oxidative stress, protecting the nervous system, reducing platelet aggregation, and possessing anti-inflammatory, anti-cancer, and anti-aging properties.

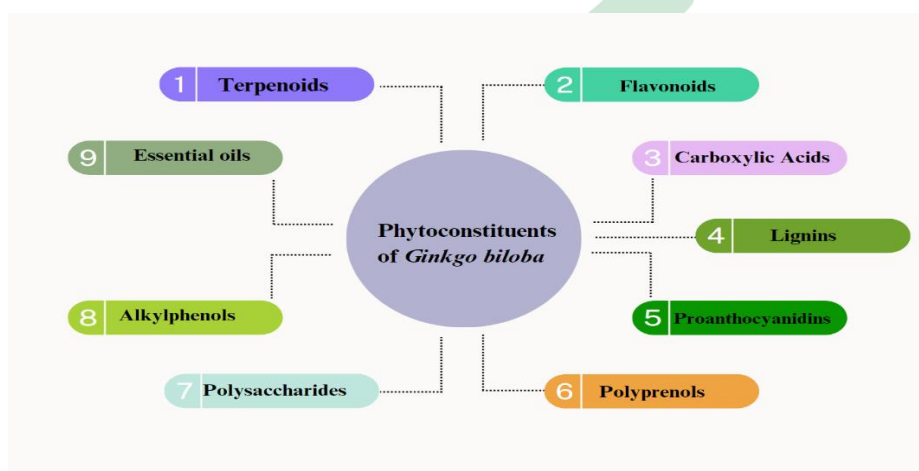


Fig 1. Phytoconstituents of *Ginkgo biloba*

Additionally, *Ginkgo biloba* has been studied for its potential benefits in improving cognitive function, particularly in age-related conditions such as Alzheimer's disease and other forms of dementia. Its resilience and versatility make it a valuable species both ecologically and economically, providing benefits in urban planning, environmental sustainability, and health and wellness.

Table 1. Pharmaceutical and Nutraceutical Properties of *Ginkgo biloba*

S. No.	Function	Reference
1	Anti-inflammatory	[1]
2	Anti-bacterial	[2]
3	Antioxidant	[3]
4	Anti-cancer	[4]
5	Anti-obesity	[5]
6	Neuroprotective and anti-neurodegenerative	[6]
7	Protection of sense organs	[7]
8	Cardiovascular protection	[8]

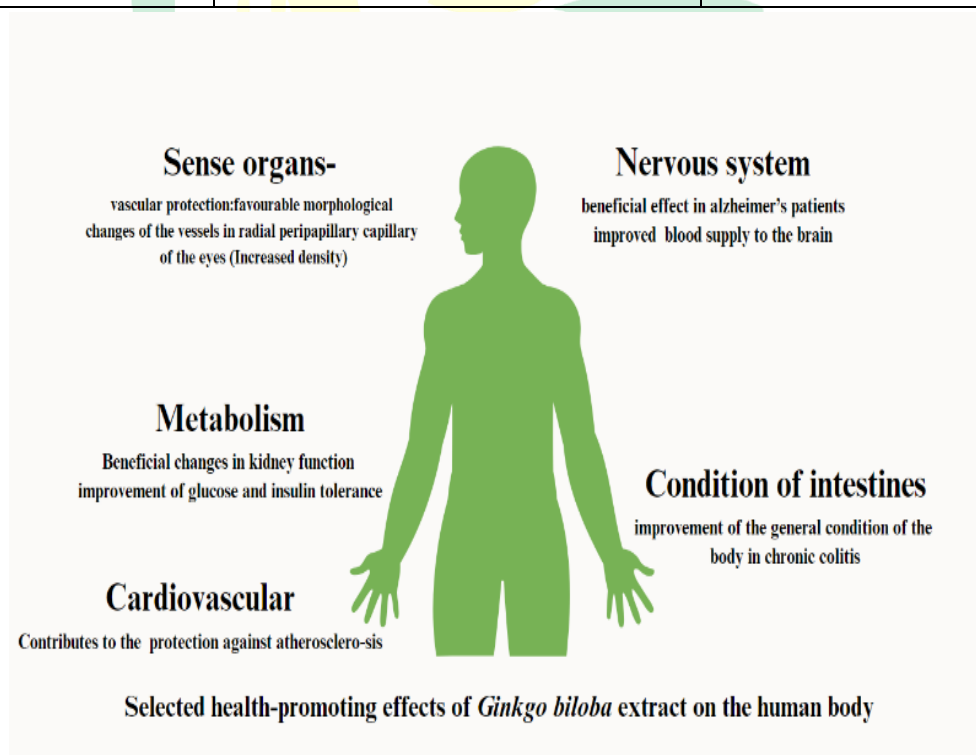


Figure. Selected health promoting effects of *Ginkgo biloba* extract on human body.

Toxicity: Risks and Precautions

Toxic components in Ginkgo biloba include alkylphenols, particularly ginkgolic acid, a mixture of 2-hydroxy-6-alkylbenzoic acids. Ginkgo seeds are used in Asian cuisine for stuffing, soups, desserts, meat, and vegetarian dishes, and roasted seeds are a popular delicacy. While cooked seeds are safer than raw, they can still be toxic if consumed in large amounts or over a long period, especially in children, due to the presence of ginkgotoxin (MPN, 4-methoxypyridoxin). Ginkgo seeds contain high levels of alkylphenols, with over 4% ginkgolic acid, and eating more than 10-20 seeds a day can pose health risks. Ginkgotoxin levels in seeds peak in early August but then drop sharply. Canned and cooked seeds have only about 1% of the ginkgotoxin found in raw seeds due to its water solubility, while roasted seeds retain slightly less ginkgotoxin as the compound is thermally stable. Therefore, ensuring the safety of patients is crucial when using Ginkgo biloba extract preparations.

Market Analysis of *Ginkgo Biloba*

Trends of the market are dynamic and are certainly affected by umpteen factors such as the behavior of consumers, political stability, economic conditions of the nation, target market, and prominently, the competition.

How can Ginkgo Biloba escape from the behavior of the market segment?

Market researchers have a profound interest in analyzing the exclusive ongoing evolutionary journey of Ginkgo Biloba. Precisely, the market segmentation for Ginkgo Biloba involves catering to the entire market into distinct categories of consumers. The predominant distinction is that the motive for its consumption is meticulously different for varying age groups. It is apparent that seniors are mainly concerned about mental health; however, adults and youth are generally confined to relieve their stress and maintain their cognitive health properly. Moreover, high-income consumers are more interested in its consumption than middle or low-income groups since they prioritize affordable options. The most interesting fact regarding the psychology of consumers reveals that people, who are conventional users of alternative medicine approaches and also health enthusiasts are impulsive consumers of Ginkgo Biloba. This intrinsic study has certainly brought useful insights into broadening the horizons for its demand in the prevalent market.

Demand Forecasting

After a decade, the worldwide market share of Ginkgo Biloba is projected to reach a value of around US\$ 2,579.2 million, which should be US\$ 860.1 more than what it will be by

the end of 2024. Additionally, an average CAGR (compound annual growth rate) of 4.1% is anticipated for the study period from 2024 to 2034 [9].

Factors Affecting the Future Demand of Ginkgo Biloba

Awareness about its benefit for health: with the growing knowledge regarding the advantages of Ginkgo Biloba, its demand is supposed to increase as it helps in enhancing memory and cognitive function.

- ✚ **Regulatory Environment:** Demand is influenced by various health authorities (FMA, EMA) laws and regulations.
- ✚ **Affordability and price:** a customer's decision may be affected by the price of Ginkgo Biloba supplements as compared to other similar products. There will be an upsurge in demand if it is available at a reasonable cost.
- ✚ **Customer Preferences and Demographics:** Demand can be impacted by various demographic factors such as: lifestyle choices, age, income, as well as an individual's taste for organic supplements. Owing to its psychological merits, Senior citizens are the major consumer of this medicinal plant.
- ✚ **Availability of Substitutes:** Market share can be subjected to accessibility and acceptance of substitute supplements or treatments. To epitomize, the demand for Ginkgo Biloba may decline if an alternative supplement get recognized with same perks.
- ✚ **Quality Assurance:** Ginkgo Biloba products quality, authenticity, and safety can adversely affect the its demand. Product tampering or subpar quality reports can deter customers.

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