



Yellowhorn

Xanthoceras sorbifolium

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**A New Drought Hardy Nut Crop for
New Mexico**

Yellowhorn

COMMON NAME: Yellowhorn

SCIENTIFIC NAME: *Xanthoceras sorbifolium*

FAMILY: Sapindaceae

Hardiness: 5 to 8

Origin: Northern China

Habit: A shrub or small tree that grows up to 25 feet tall and up to 15 feet wide and develops a wide rounded shape.

Foliage: Leaves are alternate, pinnately compound, 5 to 9 inches long with 9 to 17 leaflets that attach directly to the stem. The individual leaflets are narrow, elliptic to lance-shaped, sharply toothed, 1 ½ to 2 ½ inches long. Their color is lustrous dark green above, lighter beneath. Leaves persist late into the fall.

Flowers: Very showy blossoms in March-April on slender-stalks that are ¾ to 1 inches in diameter. The flowers are white with 5 petals and have a yellow to red blotch at the base of each petal.

Fruit: The fruit is a 3-valved, thick-walled, 2-to-3-inch diameter rounded capsule. Each cell contains several dark brown seeds that resemble chestnuts. They can be roasted to eat but are bitter when raw.

Insects and diseases: Because this tree is so unusual in New Mexico, pests are not an issue.

Tree in Colorado, Utah and New Mexico: There are specimens growing on the western slopes of Colorado in dry and alkaline sites. The Grand Junction Arboretum at Lincoln Park and the CSU Extension garden at the Mesa County Fairgrounds have planted Yellowhorn's for display. Once the tree is established it can put on up to 10 inches of annual growth. There are trees in Albuquerque and Los Lunas, NM. There are now a few trees in private gardens and orchards in Doña Ana County, NM.

Cultivation: Prefers long, hot growing seasons to flower well. In cooler areas provide a protected location to encourage flowering. The Yellowhorn grows well in well-drained moderately fertile to fertile soil.

Best advice: Prefers hot summers and cold winters

Cultivars: Clear Creek' Golden Yellowhorn introduced by Plant Select is an especially hardy strain developed at Green Acres Nursery in Golden, Colorado.

(continued)

- The leaves, flowers, and seeds of Yellowhorn are all edible.
- "Both the husk pulp and the seed kernel can be eaten raw or used as an ingredient for cooking".
- "The seeds and kernels taste like chestnuts, or macadamia nuts". "Both forms are nutritious".
- "Ripe seeds can be used to produce protein drinks".
- X. sorbifolium* has "a long flowering period, fragrant flowers, large nectar content, and rich [reducing sugar](#), (Reducing sugars react with amino acids in the [Maillard reaction](#), a series of reactions that occurs while cooking food at high temperatures and that is important in determining the flavor of food. Also, the levels of reducing sugars in wine, juice, and sugarcane are indicative of the quality of these food products), it is a high-quality [nectar source](#) in early spring. It is worthwhile for beekeepers to produce honey with a special flavor.
- According to medical research papers on *X. sorbifolium* in the United States and China, **"the fruit husk extract can inhibit the cells of [ovary cancer](#), [cervical cancer](#) and [Melanoma](#)".^[12]**
- The husk has two major values: "the raw material of [furfural](#), which has a wide range of industrial uses", and "the raw material for medicines for treating [urinary system](#) diseases".^[13]

- The oil content of the seeds is 40%, and the oil content of the kernels (seed + husks) is 66.8%.
- The [unsaturated fat](#) of oil is as high as 94%.^[14] "Its [saturated fat](#) content is 1.78 times lower than that of olive oil and 1.9 times lower than that of peanut oil". "Its quality is better than peanut oil and sesame oil, and its health care effect is also unmatched by salad oil and olive oil".^[13]
- X. sorbifolium* oil is rich in [nervonic acid](#) (2.6%~5%),^{[14][4]} according to a medical research report in [Shanghai](#), "after taking *X. sorbifolium* oil for 3 months, [stroke](#) sequelae, [Alzheimer's disease](#), [Parkinson's disease](#), [cerebral palsy](#), [cerebral atrophy](#), [head injury](#), memory loss and other [encephalopathy](#) have an average effective improvement rate of 92.8%".^[4]
- In addition, "the average tumor inhibition rate of *X. sorbifolium* oil on [S180](#) (a Sarcoma Cancer line) is 82.94%, which is equivalent to the tumor inhibition effect of [cyclophosphamide](#), but without the toxin of cyclophosphamide".^[4]
- The "meal" after oil extraction is rich in protein, and "can be used as high-protein food, animal feed, or extract [hydrolyzed protein](#) and [amino acid](#)". "Amino acids extracted from *X. sorbifolium* are complete [essential amino acid](#)". "The nutritional value and absorption rate of *X.sorbifolium* protein are higher than [soy protein](#) and [sunflower seed protein](#), close to [casein](#)".^[4]

•"Branches and trunk extracts are effective medicines for treating [rheumatism](#)".^[13]

•The leaves can be used to make tea, "which can [diuresis](#) (increase urine), remove rheumatism, and lower blood pressure".

•**"The leaves contain 19.18% to 23% protein, which is higher than that of [black tea](#), and the caffeine content is close to that of scented tea".**^[4]

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Yellowhorn tree, 8275 South 1300 West, West Jordan, UT 84088

Wikipedia

- *X. sorbifolium* has a long history in China and is distributed in a wide area, but few people knew about it.
- In 2000, no relevant information about Yellowhorn could be found on the Internet.^[4] Also in this year, a person who will be hailed as the "pioneer of the *X. sorbifolium* industry" appeared.^[15] His name is 马成福 /Ma Chengfu, a reporter/writer who pays attention to ecology and people's livelihoods.
- His works "《流血的石羊河》 /The Bleeding [Shiyang River](#)" and "《只有和谐是良药》 /Only Harmony Is the Best Medicine" have been compiled into college textbooks.^[16]
- Ma Chengfu was born in August 1968 in a poor farmer's family in Jingtai County, Gansu.
- Jingtai is located at the eastern end of the Hexi Corridor and south of the Tengger Desert.



- Since Ma Chengfu's childhood, the area suffered from drought, water shortage, and sandstorms in his desert climate.
- This is why he was thinking whether there was a tree species that could improve the ecological environment of his hometown and create economic benefits at the same time.
- To this end, he traveled all over the Hexi Corridor.^[15]
- During a visit in 2000, at the edge of the barren Tengger Desert, Ma Chengfu suddenly saw some trees that grew well and bore fruit (*at the time he didn't know they were X. sorbifolium*).
- Since then, he has embarked on a long journey of [R&D](#) and entrepreneurship of *X. sorbifolium*. The *X. sorbifolium* seedlings cultivated and selected by Ma Chengfu's team-'西北文冠果基地/Northwest *X. sorbifolium* base' "have gone out of Gansu, spread to Northwest, Northeast, and North China, and introduced to [Sichuan](#), [Jiangsu](#), [Hubei](#) and other southern regions".^[15] **More research, development and selections need to be made of *Xanthoceras sorbifolium*.**

- **In the past two decades, *X. sorbifolium* has also attracted other R&D teams.** For example, in [Qiu County, Hebei](#), the planting area in 2018 has reached several thousand hectares, "亩/666.67m²".^[17]
- China's first *X. sorbifolium* research and development, processing, and sales enterprise also appeared in Qiu County, and **achieved a multi-win situation of ecological, economic, and social benefits.**^[18]
- **In April 2021, the "*X. sorbifolium* Industry Development and Medicinal Value Summit Forum" was held in Qiu County, expecting to attract more entrepreneurs to develop the economic value and medicinal value of *X. sorbifolium*, and create an industry-university-research cooperation platform to promote scientific research and innovation achievements.**^[18]

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Xanthoceras sorbifolium Bunge: A Review on Botany,
Phytochemistry, Pharmacology, and Applications

30 August 2021

[Erhuan Zang](#), ^{1,†} [Bin Qiu](#), ^{2,†} [Namuhan Chen](#), ^{3,4} [Caifeng Li](#), ^{3,4} [Qian Liu](#), ¹ [Min Zhang](#), ¹ [Yuchao Liu](#), ^{1,5} and [Minhui Li](#) ^{1,3,4,5,6,*}

Clinical Application

Xanthoceras sorbifolium is rich in 278 compounds, providing a reasonable basis for medicinal use.

- **The triterpenes isolated from the husk are promising candidates for medicines to prevent or cure human cancer, AD, enuresis, urinary incontinence, dementia, and modulate cerebral functions** ([Ge and Wu, 1997](#); [Liu et al., 2007a](#); [Liu et al., 2007b](#); [Chi et al., 2009](#); [Lu et al., 2012](#); [Li and Sun, 2019](#)).
- The leaves are rich in saponin, flavonoids, protein, and trace elements, with a high inhibitory effect on various human tumor cells (such as breast cancer, prostate cancer, gastric cancer, liver cancer, cervical cancer, and leukemia).
- The leaves can improve the functions of the central nervous system, cholinergic nerve system and fight the damage caused by free radicals, assisting the treatment of urine incontinence and an overactive bladder ([Si, 1996](#)).
- After degreasing, the kernels of *X. sorbifolium* can be made into efficient drugs to treat pediatric enuresis. The data from 100 initial clinical results show that its efficacy rate is as high as 93%. In addition, lignum xanthocera is often combined with other medicines in clinical preparations to treat skin diseases and rheumatism.

Edible Applications

- The food value of *X. sorbifolium* is mainly derived from its seeds, kernels, and leaves.
- **Edible oil can be extracted from the seeds and the oil ratio is 30.4% in the seeds and 55–66% in the kernel ([Yan, 2007](#)).**
- The oil is a cooking oil with a high smoke point, a yellowish color and delicious flavor and may help in preventing cardiovascular and cerebrovascular diseases.
- **In the seed oil, the unsaturated fat has been isolated, accounting for 94.0%, including linoleic acid (36.9%) and oleic acid (57.16%). ([Yan, 2007](#); [Zeng et al., 2013](#)).** The tender kernels have a unique fruit flavor that can be eaten raw or processed into canned food for giving to infants during weaning.
- **Additionally, kernels can also be processed into a nutritious fruit juice and a high-quality protein drink.**

- The leaves of *X. sorbifolium* can be processed for tea and lower blood lipids, blood pressure, and protect the cardiovascular and cerebrovascular vessels.
- **In tea, the protein content is as high as 19.8–23.0%**, which is higher than black tea, and the caffeine content is similar to scented tea ([Hua, 2004](#)).
- The flower produces a lot of nectar for honey production and has a long flowering period, enabling a large amount of honey to be produced from the flowers.
- The husk remaining after oil extraction can be made into high-protein beverages ([Li et al., 2003](#)).



Maple River Farms, Owosso, MI



This 9-year-old tree produced 20 gallons of capsules containing nuts.

Don Honcoop at:

don@mapleriverfarms.com



New Generation Plantations (NGP) is an 'ecosystem of collaboration' to make a positive impact for people and nature

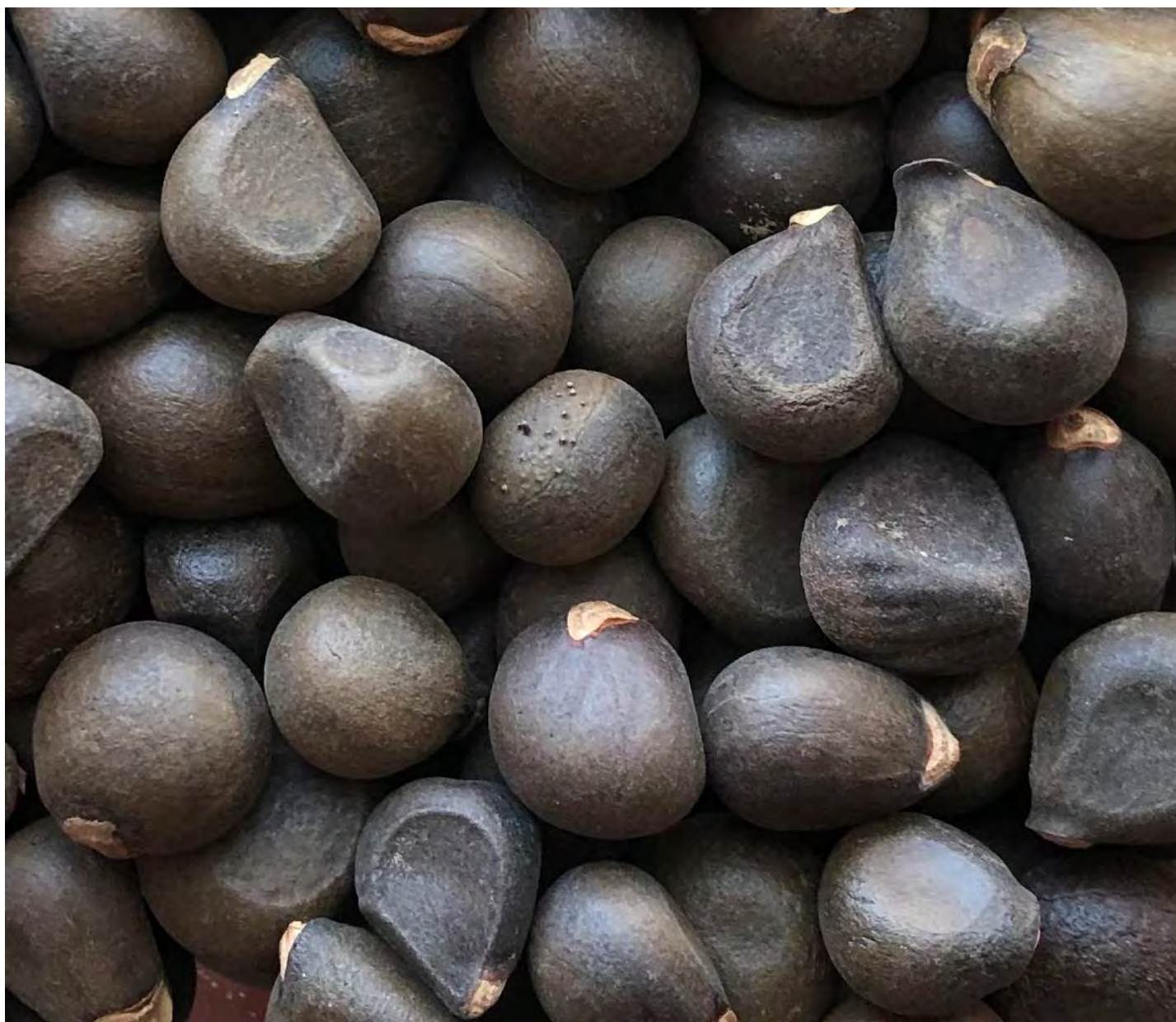
While few trees thrive in desert harsh landscapes, one species stands out.

- Yellowhorn (*Xanthus sorbifolium*) grows naturally in these desert climates, withstanding the sub-freezing winters and hot summers, and produces oil-rich seeds that can be used in food, cosmetics and as a biofuel.
- Could this be a potential solution for stabilizing soils, reversing the spread of the desert and providing livelihoods for local people in a water-stressed region?
- The Chinese State Forest Administration is supporting the planting of 940,000 hectares (2,322,791 acres) of Yellowhorn trees across China. Suzano, an NGP participant, has established a 14-hectare (34.6 acre) research, development and seedling production center for the species in Gansu.

Why grow trees in desert regions, where trees aren't meant to grow?

- There's a number of good reasons. **Trees can help to stabilize soils** and provide windbreaks, **checking the spread of desertification and sandstorms.**
- **In 1978, China launched the “Three North Shelter Forest Program” – also known as the Great Green Wall** – in an attempt to stop the spread of the Gobi Desert.
- **The biggest tree-planting project in the world**, it's expected to cover 350,000 km² (135,136 sq. miles, >the state of NM, 121,280 sq. miles), by 2050. As well as protecting against desertification, **it will sequester a vast amount of carbon in biomass and soils.**

- Yellowhorn flowers and leaves can be used to make tea with various purported health-giving properties.
- **The leaves and the oil from its seeds are rich in nervonic acid, which can be used to fight dementia and Alzheimer's disease – clinical tests are underway in China.**
- **The oil is richer in healthy unsaturated fats than olive oil or soy oil,** making it an attractive edible oil. It can also be used in cosmetics, or even to make biodiesel.
- All told, Yellowhorn offers huge ecological, social and economic potential. But while the Chinese State Forest Administration has big plans to support Yellowhorn planting – it wants to see 900,000 hectares (2,223,948 acres), planted in Gansu alone – it's still in its early days.



- But of course, a note of caution should be sounded. Many “miracle plants” have failed to live up to expectations.
- **While Yellowhorn is drought resistant, if you want it to crop productively then it needs some irrigation, which could limit its expansion.**
- **And there’s a great deal of research, capacity building and investment needed.**



Xanthoceras sorbifolium extracts ameliorate dendritic spine deficiency and cognitive decline via upregulation of BDNF expression in a rat model of Alzheimer's disease

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Abstract

Xanthoceras sorbifolium, a traditional Chinese folk medicine with anti-inflammatory effects, has been used for a long time in China, especially in the Inner Mongolian area for the treatment of rheumatism. **Inflammation is one of the main causes of Alzheimer's disease (AD)**. AD is characterized by aggregation of amyloid β -peptide ($A\beta$) plaques, neurofibrillary tangle formation, synaptic dysfunction and neuronal loss. To investigate whether *Xanthoceras sorbifolium* extracts (XSE) improve cognition and protect dendritic spines, we performed behavioral tests to investigate learning and memory in an $A_{\beta 25-35}$ -induced dementia animal model of AD as well as Golgi staining to observe dendritic spine formation in CA1 pyramidal neurons and western blots to test the expression levels of PSD95, [BDNF](#) and downstream signaling pathways.

Our results indicated that oral treatment with XSE significantly reduced cognitive impairments in behavioral tests (passive avoidance test, novel object recognition test, Y-maze test and Morris water maze test).

Golgi staining results revealed that XSE ameliorated dendritic spine density deficits in CA1 pyramidal neurons in the hippocampus. Western blot analysis suggested that XSE upregulated PSD95, which is the major scaffolding protein in synapses. BDNF levels and the ratio of p-TrkB/TrkB increased, and the expression of the RhoA, a member of the Rho-GTPase family, and its downstream target protein ROCK2 decreased in the dementia animal model following treatment with XSE. Therefore, the cognition-improving effects of XSE probably resulted from dendritic spine protection effects through regulation of BDNF signaling pathways.

Introduction

Alzheimer's disease (AD) is a progressive neurodegenerative disease and the most common form of dementia [1]. The hallmark pathologies of AD are the progressive accumulation of the beta-amyloid protein fragment outside neurons in the brain and twisted strands of the tau protein inside neurons. These changes are eventually accompanied by a loss of neurons and synapses in the brain [12]. **Dendritic spines are the primary recipients of excitatory input in the central nervous system and serve as part of the neural networks with emergent encoding and processing of information [18].** BDNF-TrkB signaling can influence dendritic spine plasticity in cortical and hippocampal neurons and is critical for the induction and maintenance of LTP [11].

Xanthoceras sorbifolium is one of the peculiar tree species belonging to the *Sapindaceae* family, which is distributed widely in northern China in the Inner Mongolia, Liaoning, Hebei, and Shanxi provinces in addition to other locations. In Mongolian areas, the bark of the stem and branch, which are called “Wen Guan Mu” by locals, are used to treat rheumatism. As a traditional Chinese folk medicine, the crude extracts of the seeds of *Xanthoceras sorbifolium* have been used clinically for the treatment of central nervous system diseases such as enuresis, (involuntary urination, especially by children at night), which is conducted mainly due to the immaturity of the brain (China Food and Drug Administration, Approval number: Z20040007 [2]). The effectiveness of these treatments indicate that bioactive substances in the seeds of *Xanthoceras sorbifolium* can pass through the Blood Brain Barrier and act as anti-inflammatory agents. In recent years, it has been reported that the extract and some ingredients of *Xanthoceras sorbifolium* showed anti-inflammatory, anti-HIV, and antitumor activities as well as improvements in intelligence [17].

Saponin compound originated from shiny-leaved Yellowhorn, and preparation method and application thereof

Abstract

The invention relates to a saponin compound originated from shiny-leaved Yellowhorn and a preparation method thereof. The preparation method comprises the following steps: crushing dried shell of shiny-leaved Yellowhorn, carrying out reflux extraction with 70% ethanol, filtering the obtained extract, subjecting the obtained filtrate to pressure reduction so as to recover the solvent and extracting the obtained concentrate with ethyl acetate and n-butanol so as to obtain ethyl acetate extract and n-butanol extract; and subjecting the n-butanol extract to silica gel rapid column chromatography by using an ethyl acetate-methanol system and further subjecting a fraction obtained after elution with ethyl acetate-methanol to semi-preparative HPLC with methanol-0.05% trifluoroacetic acid as a mobile phase so as to obtain the compound. **The saponin compound provided by the invention is capable of preventing and treating the Alzheimer disease.**

CN105198953A
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Xanthoceras sorbifolia extracts ameliorate dendritic spine deficiency and cognitive decline via upregulation of BDNF expression in a rat model of Alzheimer's disease

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Senile dementia mainly refers to Alzheimer's disease (Alzheimer's disease, AD), is a kind of nerve degenerative diseases being feature with Progressive symmetric erythrodermia cognition dysfunction and memory impairment.

Its typical clinical manifestations is hypophrenia (comprising going down of the ability such as memory, abstract thought), and mental act is abnormal, social activity decline.

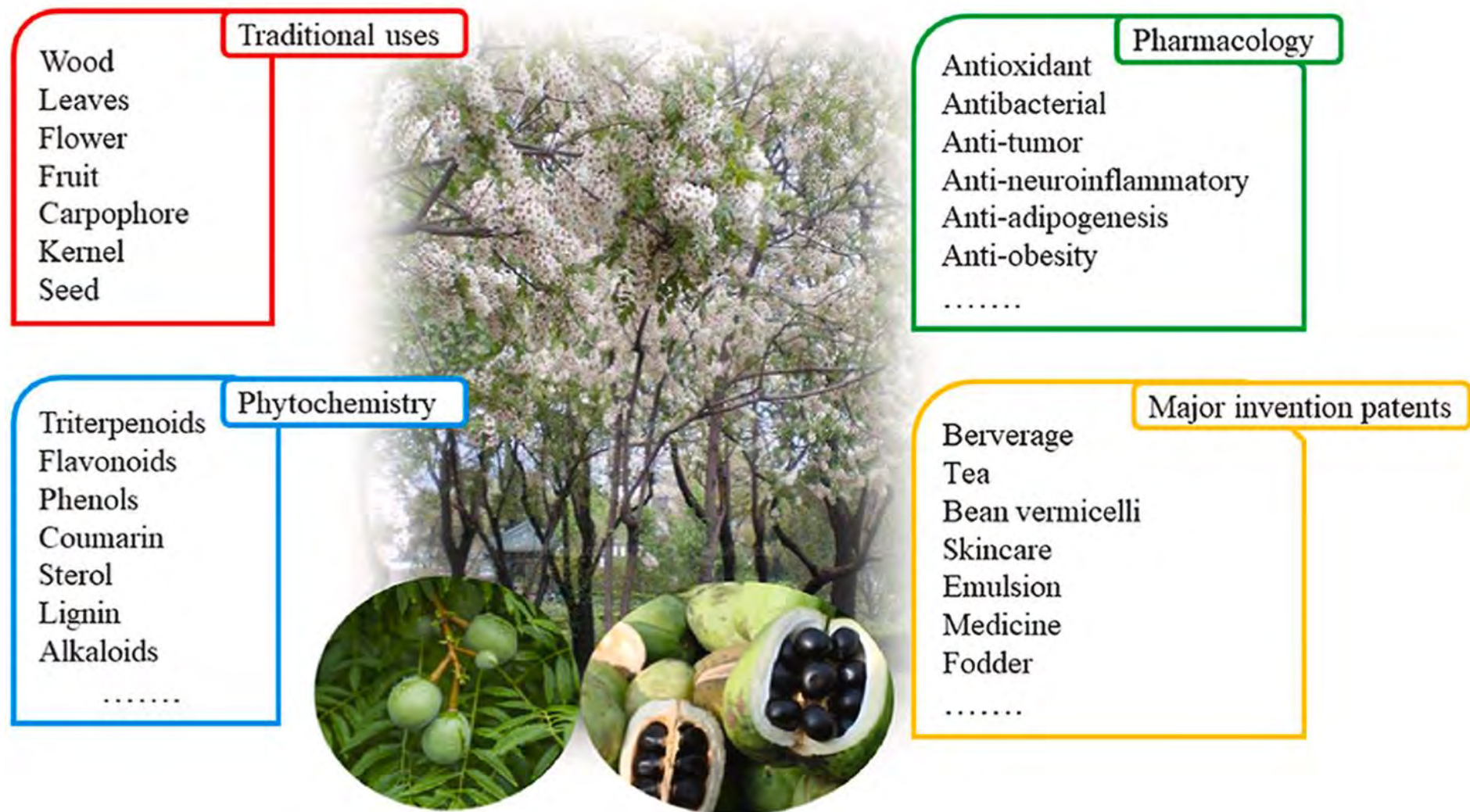
Its characteristic pathological change shows as pallium and subcortical structure intracellular neuronal mat-ups (NFT), a large amount of senile plaque in extracellular (SP) are formed and selective neuronal disappearance.

China is the country that AD patient numbers is maximum in the world, and along with the increase of China aging populations, patients of senile dementia will present the trend increased faster.

Spreading of senile dementia not only also brings white elephant to society to patient home. Therefore, the medicine studying the control senile dementia of also development of new has great importance.

Current most scholar thinks that AD pathogenesis is relevant with the deposition of A amyloid-beta.

Study of behavior result illustrates, saponin(e) of the present invention (compound 1) can improve the learning and memory function that D-Gal share rat caused by A β 25-35, **demonstrates the preventive and therapeutic effect to Alzheimer's Disease.**



Xanthoceras sorbifolium Bunge (*X. sorbifolia*)



Maple River Farms, Owosso, MI



Xanthoceras sorbifolium

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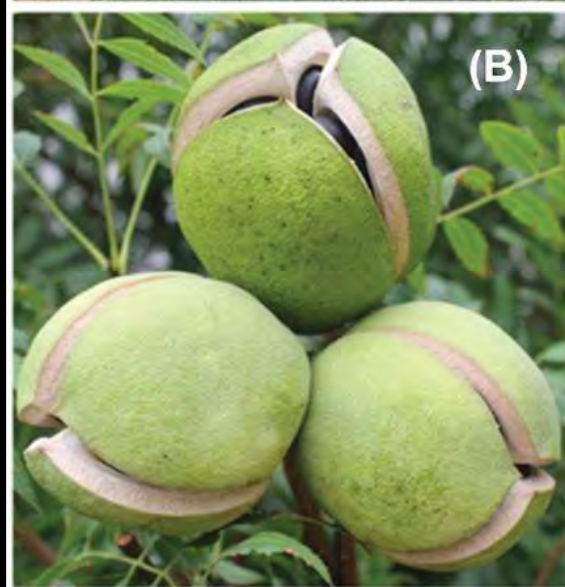






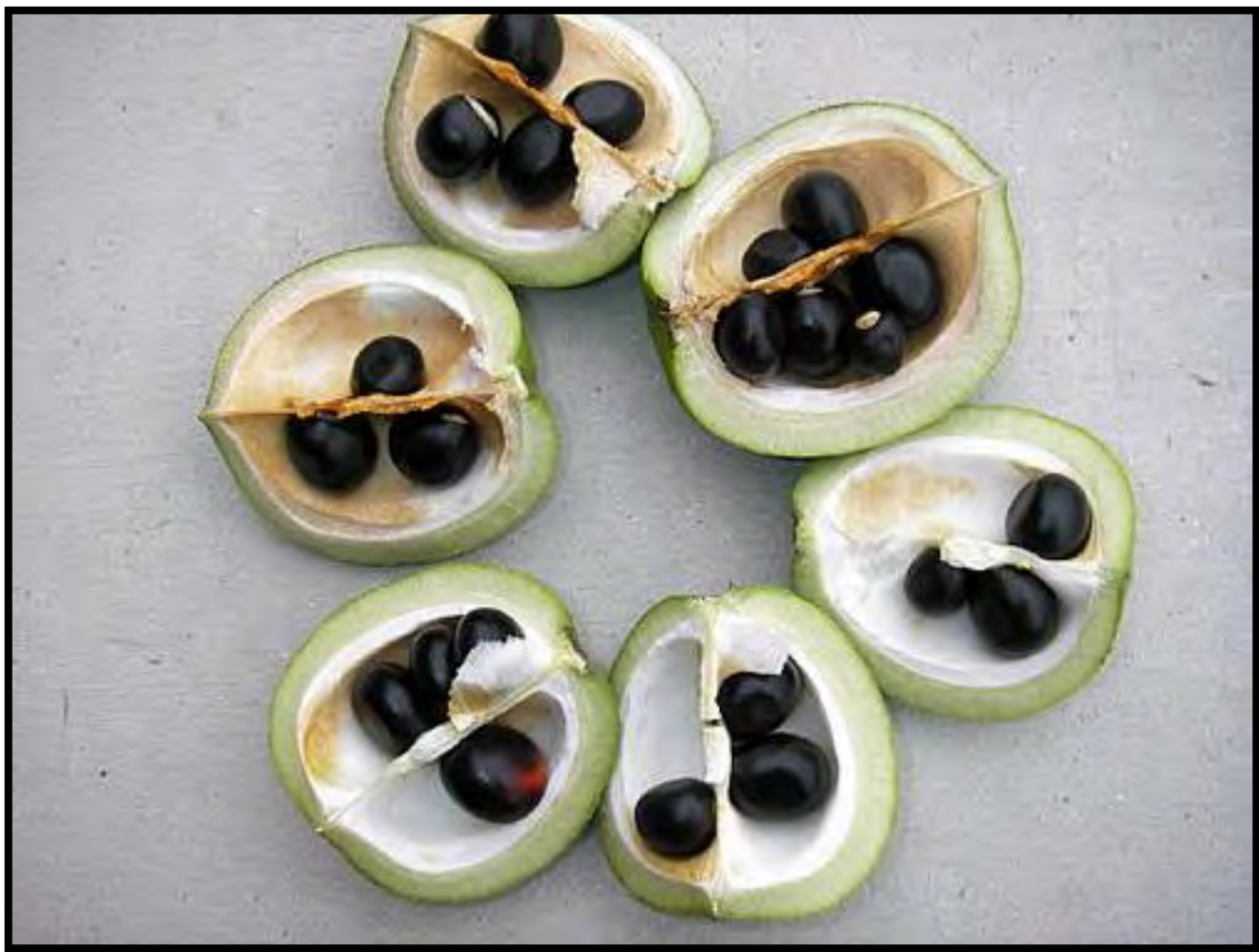
Morphological characteristic of yellowhorn superior "WF18".
 (A) Raceme and shoot. (B) Hermaphrodite flower at 1, 3, and 5 DPF (days post flower). (C) Capsular fruits. (D) Seeds and kernel.

Liang, Qiang & Li, Huayang & Li, Shouke & Yuan, Fulin & Sun, Jingfeng & Duan, Qicheng & Li, Qingyun & Zhang, Rui & Sang, Ya & Wang 王年, Nian & Hou, Xiangwen & Yang, Keqiang & Liu, Jian & Yang, Long. (2019). The genome assembly and annotation of yellowhorn (*Xanthoceras sorbifolium* Bunge). *GigaScience*. 8. 10.1093/gigascience/giz071.

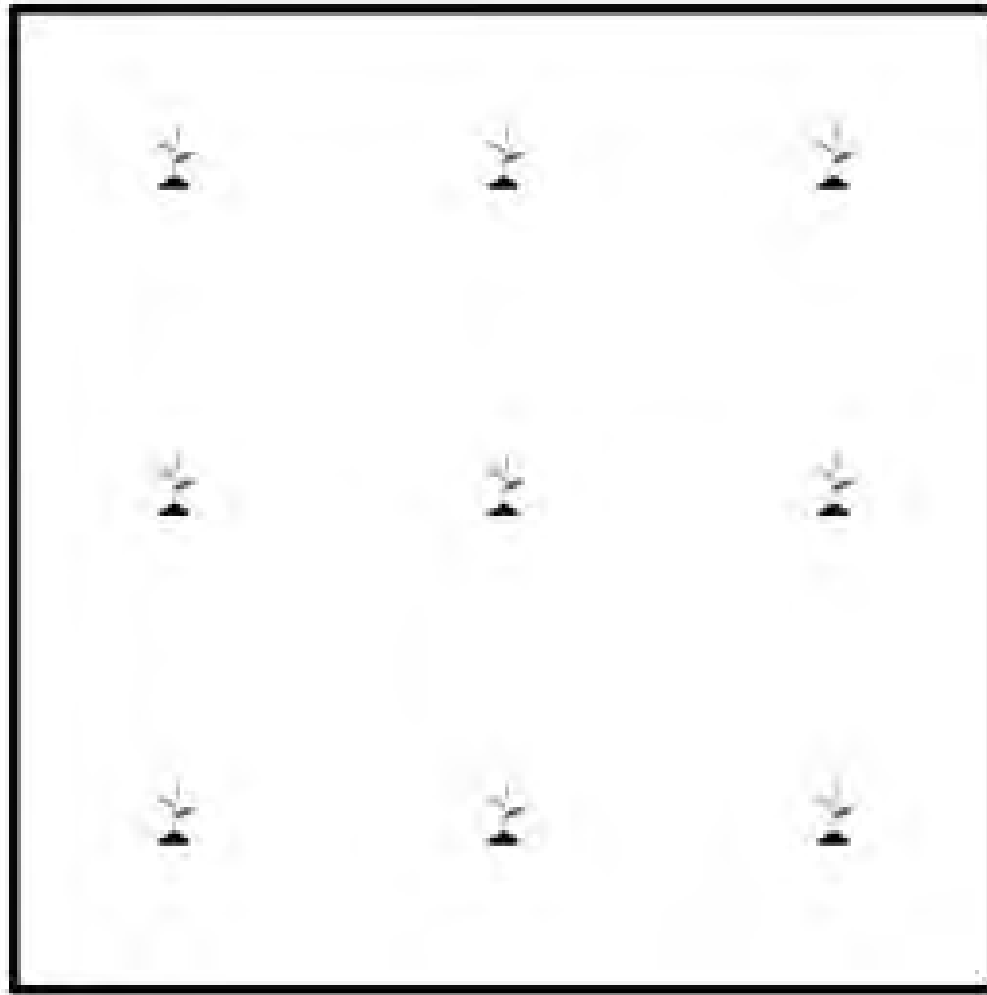












208.71'

Yellowhorn Tree Spacing

- $208.71' \times 208.71' \sim 43,599.86'$
- 12' x 12' TREE SPACING
- $208.71'/12 \sim 17$ TREES/ROW
- 17 X 17 ~ **289 TREES/ACRE**

208.71'



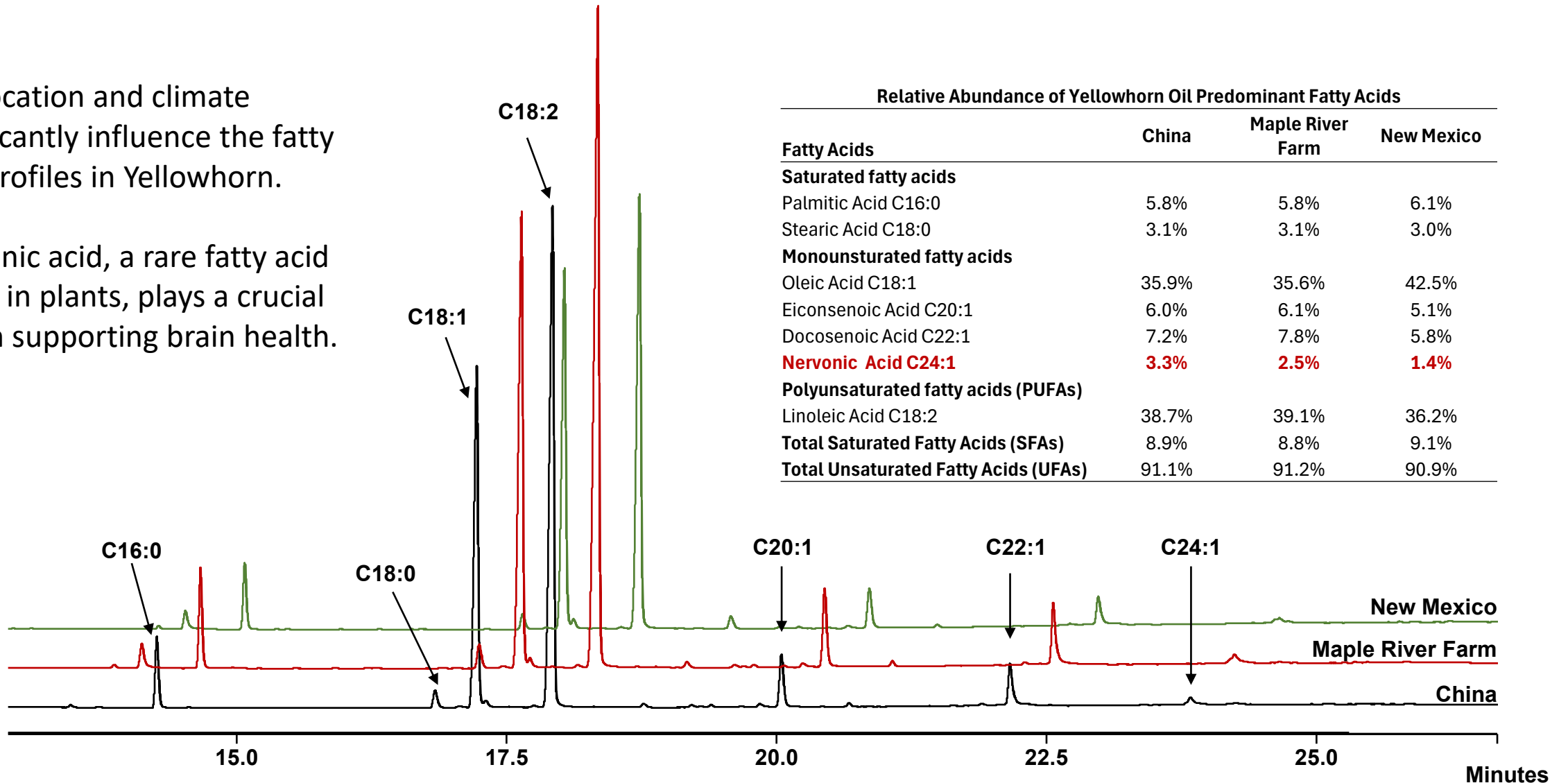




Yellowhorn tree, 8275 South 1300 West, West Jordan, UT 84088

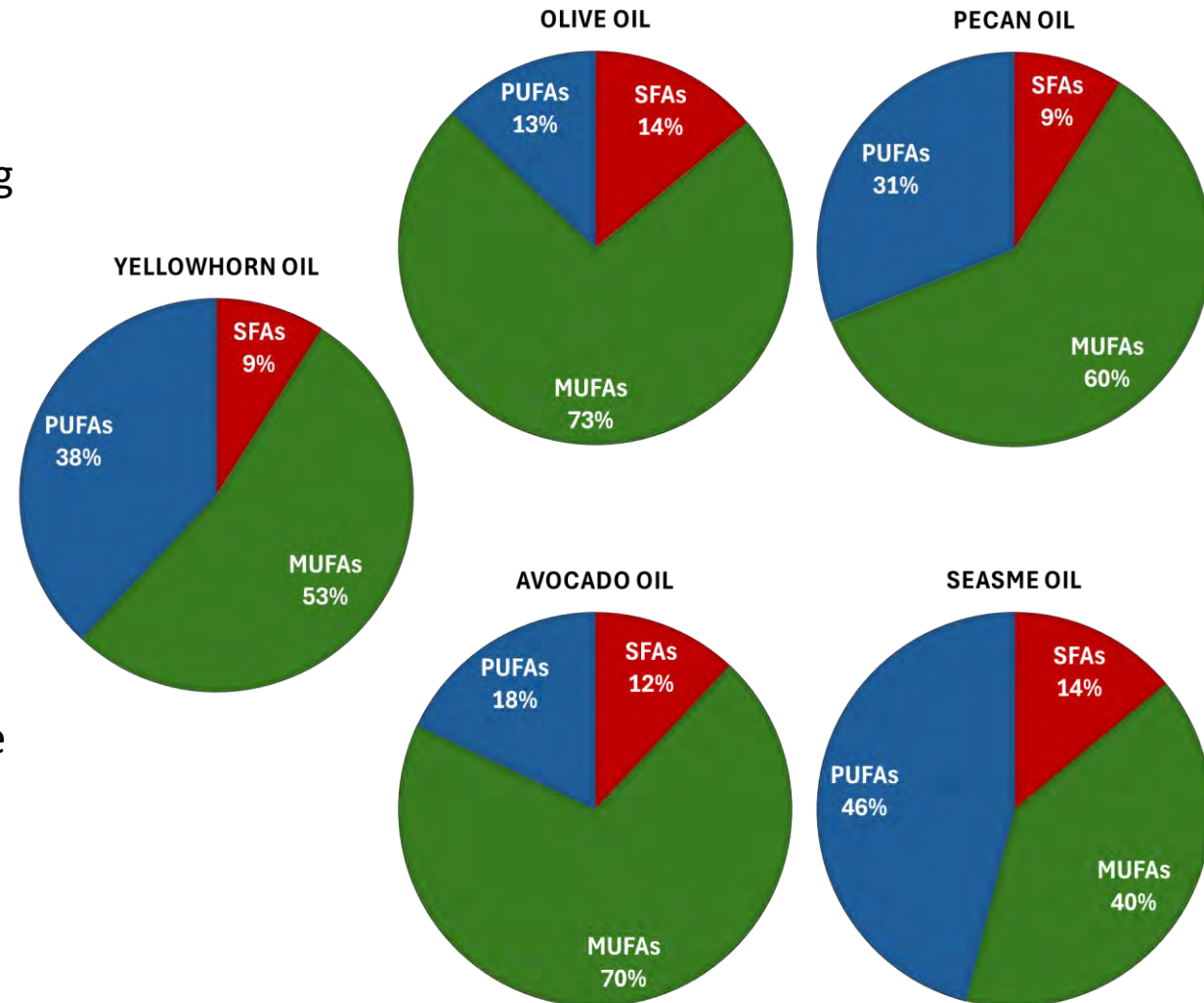
Yellowhorn Major Fatty Acid Profiling

- The location and climate significantly influence the fatty acid profiles in Yellowhorn.
- Nervonic acid, a rare fatty acid found in plants, plays a crucial role in supporting brain health.



Yellowhorn Oil Compared to Other Healthy Oils

- Yellowhorn oil has a balanced fatty acid profile, with moderate saturated fat content, high monounsaturated fats similar to sesame oil, and a rich polyunsaturated fat composition, making it higher in PUFAs than most other oils.
- Heart Health Benefits: With a balanced mix of MUFAs and PUFAs, Yellowhorn oil can contribute to reducing bad cholesterol levels, promoting cardiovascular health similar to olive and avocado oils.
- Anti-inflammatory Properties: The high PUFA content, makes Yellowhorn oil beneficial in reducing inflammation and supporting immune function, much like the benefits of sesame and pecan oils.



Take Away Points

Health Benefits

1. Yellowhorn seed oil is a semi-drying oil, cold pressed from the seeds of *Xanthoceras sorbifolium* Bunge, also called Xanthoceras seed oil, Yellowhorn fruit oil, goldenhorn oil.
2. It is rich in unsaturated fatty acids, up to 94%, easy to absorb and digest, Meanwhile Yellowhorn oil can lower cholesterol, soften blood vessels, reduce hair loss and skin diseases.
3. It is anti-inflammatory, improves cardiovascular health, is anti-viral, anti-cancer, and possesses other health benefits. However, more research needs to be conducted on these issues.

(A semi-drying oil is a vegetable oil that partially hardens when exposed to air, drying slowly and leaving a tacky surface. Semi-drying oils have an iodine number of 115–130, and some examples include: Sesame oil, Cottonseed oil, Soybean oil, Sunflower oil, Poppy oil, and Safflower oil).

4. **Yellowhorn seed oil contains approximately 4% nervonic acid**, which can supplement brain nutrition, repair brain trauma, improve brain development in infants and young children, can enhance memory, delay aging, prevention and treatment of Alzheimer's disease. It is why Yellowhorn seed oil is known by scientists as "brain gold."
5. **Nervonic acid is the core natural component of nerve fibers and nerve cells in the brain**. Deficiency of nervonic acid can cause brain diseases such as stroke sequelae, Alzheimer's disease, cerebral palsy, brain atrophy, memory loss, insomnia and forgetfulness, and may even lead to brain failure. The human body itself is difficult to produce nervonic acid, can only rely on food intake to supplement.

Take Away Points

6. **Yellowhorn seed oil can effectively replenish the brain, promote brain cell regeneration, activate the brain cells.** It is the best brain health care products for the middle-aged and elderly, pregnant women, children, scientists, writers, teachers, students and other brain workers. Yellowhorn oil also helps the patients of insomnia, forgetfulness, depression (especially postpartum depression), cerebral atrophy, cerebral palsy, stroke, cerebral thrombosis, epilepsy, Parkinson's disease and other cerebrovascular diseases.
7. **Yellowhorn fruit oil provides prostaglandin synthesis,** sustains normal development, promotes cholesterol degradation, prevents and treats atherosclerosis, and prevents skin and kidney damage. It has strong biological activity, with improved memory, anti-hypoxia, anti-ischemia, anti-fatigue and other health functions.
8. **In addition, Yellowhorn oil has the special effect of digesting blood lipids,** softening blood vessels, eliminating thrombosis, blocking subcutaneous fat formation, reducing blood lipids and cholesterol, and has a particularly significant prevention and treatment effect on obesity and cardiovascular disease. The oleic acid has an excellent effect on lowering blood pressure.



‘Yellowhorn’ Healthy, Sustainable and Economically Profitable

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<iframe width="740" height="436" src="https://www.youtube.com/embed/Pe8KQptDLT4" title="Yellowhorn - A Viable Crop for New Mexico" frameborder="0" allow="accelerometer; autoplay; clipboard-write; encrypted-media; gyroscope; picture-in-picture; web-share" referrerpolicy="strict-origin-when-cross-origin" allowfullscreen></iframe>