The following list organizes herbs and botanical extracts based on the strength of evidence supporting their efficacy for age-related vision enhancement, specifically focusing on Age-Related Macular Degeneration (AMD) and cataracts. They are sorted from **Clinical Evidence (Human Trials)** to **Preclinical Evidence (Animal/In Vitro Models)**.

Tier 1: Clinical Evidence (Human Trials)

These herbs have been tested in human subjects with measurable outcomes regarding visual acuity, contrast sensitivity, or anatomical improvements.

1. Saffron (*Crocus sativus*)

- **Efficacy:** High relative to other herbs; shown to improve visual function in mild-to-moderate AMD.
- **Clinical Findings:** In randomized clinical trials, oral saffron supplementation (20 mg/day) for 12 months resulted in modest improvements in multifocal electroretinogram (mfERG) responses and visual acuity in patients with AMD 1, 2. Short-term improvements in retinal flicker sensitivity and contrast sensitivity have also been documented 3.
- **Mechanism:** The active constituents (crocin and crocetin) are potent antioxidants that protect photoreceptors from oxidative stress, inhibit apoptosis (cell death), and preserve retinal morphology 4, 5, 6.

2. Goji Berry (*Lycium barbarum* / Fructus Lycii)

- **Efficacy:** Moderate; supported by pilot human trials and extensive historical use.
- **Clinical Findings:** A randomized pilot trial demonstrated that daily consumption of goji berries for 90 days significantly increased Macular Pigment Optical Density (MPOD) and skin carotenoids in healthy middle-aged adults, which may help prevent or delay AMD 7, 8.
- **Mechanism:** Goji berries are a rich source of zeaxanthin dipalmitate and unique polysaccharides that provide neuroprotection, reduce oxidative stress, and inhibit apoptosis in retinal pigment epithelial (RPE) cells 9, 10.

3. Marigold (*Tagetes erecta*)

- **Efficacy:** High (as the primary source of Lutein and Zeaxanthin).
- **Clinical Findings:** While often labeled as "nutrients," the carotenoids Lutein and Zeaxanthin are extracted from marigold flowers. Large-scale trials (AREDS2) confirmed that these compounds can reduce the risk of progression to late AMD 11, 12. They increase MPOD, improve contrast sensitivity, and protect against light-induced damage 13, 14.
- **Mechanism:** They act as blue-light filters and antioxidants within the macula, protecting the retina from photo-oxidative damage 15, 16.

4. Ginkgo Biloba (*Ginkgo biloba*)

- **Efficacy:** Inconclusive/Mixed.
- **Clinical Findings:** A Cochrane review identified two small randomized trials suggesting possible benefits on vision for AMD, though results were not robust enough to form a definitive recommendation 17, 18.
- **Mechanism:** Ginkgo extracts contain flavonoids and terpenoids that provide antioxidant protection, reduce inflammation, and potentially improve ocular blood flow 19, 20.

Tier 2: Preclinical Evidence (Animal & In Vitro Models)

These herbs demonstrate significant potential in laboratory settings (protecting retinal cells or inhibiting vessel growth) but lack large-scale human clinical data for vision restoration.

5. Turmeric (*Curcuma longa*) / Curcumin

- **Potential:** High potential for neuroprotection and anti-angiogenesis.
- **Findings:** Curcumin acts as a potent anti-inflammatory and antioxidant. It inhibits the Wnt/β-catenin signaling pathway, which is involved in inflammation and angiogenesis in wet AMD 21. It also protects RPE cells from hydrogen peroxide-induced cell death 22, 23.
- **Limitation:** Clinical application is currently hindered by low bioavailability and rapid systemic elimination, though nanoparticle formulations are being investigated to overcome this 24.

6. Grape / Japanese Knotweed (*Polygonum cuspidatum*) / Resveratrol

- **Potential:** Strong experimental evidence for inhibiting neovascularization (blood vessel growth).
- **Findings:** Resveratrol (a polyphenol found in grapes and *Polygonum*) suppresses choroidal neovascularization (CNV) and fibrosis in mouse models 25, 26. It also protects retinal cells from toxicity associated with A2E (a component of lipofuscin) 27. One case report noted lipofuscin reversal and visual improvement in a human patient treated with a resveratrol-containing mixture 28.
- **Mechanism:** Activates anti-aging pathways (SIRT1), reduces oxidative stress, and downregulates vascular endothelial growth factor (VEGF) 29.

7. Chinese Skullcap (*Scutellaria baicalensis*)

- **Potential:** Protective against retinal cell death.
- **Findings:** The active compounds Baicalin and Baicalein protect RPE cells from oxidative stress and inhibit inflammation-mediated cell death (pyroptosis) 30, 31. They also attenuate choroidal neovascularization in laser-induced mouse models 30.

8. Red Peony (*Paeonia lactiflora*)

- **Potential:** Protection against retinal ischemia.
- **Findings:** The active compound Paeoniflorin protects retinal pigment epithelium from oxidative stress and inhibits apoptosis 32. It also mitigates retinal ischemia and downregulates pro-angiogenic factors in rat models 33, 34.

9. Gardenia (*Gardenia jasminoides*)

- **Potential:** Anti-angiogenic.
- **Findings:** Geniposide, an iridoid glycoside from Gardenia, inhibits choroidal neovascularization and downregulates VEGF expression in hypoxic RPE cells 35.

10. Burdock (*Arctium lappa*)

- **Potential:** Protection against dry AMD progression.
- **Findings:** Extracts from Burdock leaves suppressed cell death induced by A2E (a toxic byproduct of the visual cycle) in RPE cells and protected the retina from light-induced damage in mice 36, 37.

11. Red Sage (*Salvia sclarea*)

- **Potential:** Anti-angiogenic.

- **Findings:** The diterpenoid Sclareol, derived from *Salvia sclarea*, inhibited angiogenesis and cell proliferation in models of neovascularization, suggesting potential as an oral therapy for wet AMD 38, 39.

12. Kudzu (*Pueraria lobata*)

- **Potential:** Protection against ferroptosis (iron-dependent cell death).
- **Findings:** Puerarin, an isoflavone from Kudzu, attenuates iron overload-induced cell death in the retina via the Nrf2 antioxidant pathway 40.

13. *Erigeron breviscapus*

- **Potential:** Inhibition of angiogenesis.
- **Findings:** Scutellarin, extracted from this herb, is a potent inhibitor of hypoxia-mediated angiogenesis in retinal cells and mouse models of CNV 41, 42.

14. *Alstonia boonei* and *Aspilia africana*

- **Potential:** Anti-cataract activity.
- **Findings:** Aqueous extracts of these plants delayed cataract formation and preserved lens transparency in rat models of diabetic and age-related cataracts 43, 44.

15. *Cordyceps militaris*

- **Potential:** Protection against light damage.
- **Findings:** This medicinal fungus protected mouse retinas against light-evoked photoreceptor cell death and improved visual function recovery 45.

16. Traditional Chinese Herbal Formulas

- **Qihuang Granule:** Shown to protect RPE cells from oxidative stress and regulate the complement pathway in mice 46.
- **Shihu Yeguang Pill:** Attenuated bright light-induced retinal structure impairment and photoreceptor apoptosis in mice 47.
- **Ziyin-Mingmu Decoction:** Regulated cholesterol metabolism, oxidative stress, and gut microbiota in AMD mouse models 48.
- **QiJu-DiHuang Wan:** Shown to treat age-associated dry eye by inhibiting inflammation and oxidative stress pathways in rats 49.

Analogy for Understanding

Think of the aging eye as a **vintage car engine**.

- **Oxidative stress** (a major cause of AMD and cataracts) is like the **rust and heat** that build up over decades of operation.
- **Clinical Herbs (Saffron, Marigold/Lutein)** are like **premium oil additives** proven to coat the gears (retina) and prevent further rust, allowing the engine to run smoother for longer.
- **Preclinical Herbs (Curcumin, Resveratrol)** are like **experimental synthetic coolants**; they work amazingly well in lab simulations to stop overheating, but we are still figuring out exactly how to get them into the engine effectively without them breaking down too fast.