Why a Cosmetic Formulator Needs to Know the Iodine Value in Plant Oils and Butters

The iodine value is one of the most important numbers a cosmetic formulator should understand when working with plant oils and butters. It affects stability, shelf life, and the functionality of the ingredients in formulations. This document explains what the iodine value is, what high and low iodine values mean, how they relate to shelf life, and provides a chart of common plant oils and butters with their approximate iodine values.

What is the Iodine Value?

The iodine value (also called iodine number) measures the degree of unsaturation in an oil or butter. It tells how many grams of iodine react with 100 grams of oil, reflecting the amount of double bonds in the fatty acids. In short:

- High iodine value → more double bonds, more unsaturation.
- Low iodine value → fewer double bonds, more saturation.

Why the Iodine Value Matters in Formulation

1. Shelf Life & Rancidity: Highly unsaturated oils (high iodine value) oxidize and go rancid faster.
2. Texture & Function: Saturated oils and butters (low iodine value) are stable and solid, while unsaturated oils are lighter and more fluid.
3. Formulation Strategy: Knowing iodine values helps balance stability and performance by blending oils and butters.

High vs. Low Iodine Value: What It Means

- High Iodine Value (>100): Very unsaturated oils (e.g., flaxseed, hemp). Quick absorbing, rich in EFAs, short shelf life (~6-12 months).
- Moderate Iodine Value (80–100): Balanced oils (e.g., sunflower, sesame). Shelf life ~1–2 years.
- Low Iodine Value (<70): Stable butters (e.g., shea, cocoa). Longer shelf life 2–3+ years.

Shelf-Life

Shelf-life is not a universal number, it’s dynamic. It depends on how long the supplier stored the oil before selling, how well both the supplier and you store it, and the unique fatty acid composition of that particular batch. For formulators, the “real shelf life” clock starts ticking when the raw material arrives in your lab.

Approximate Shelf Lives of Plant Oils and Butters by Iodine Value

Oil/Butter	Iodine Value (approx.)	Shelf-Life Estimate
Perilla Seed Oil	190-208	6 months
Chia Seed Oil	190-199	6 months
Sacha Inchi Seed Oil	183-199	6 months
Flaxseed Oil	170–200	6 months
Strawberry Seed Oil	160-200	6 months
Raspberry Seed Oil	160-195	6 months
Evening Primrose Oil	160-200	6 months
Pomegranate Seed Oil	152-250	6–12 months
Rosehip Seed Oil	150–190	6–12 months
Hemp Seed Oil	140–170	6–12 months
Borage Seed Oil	130-155	6–12 months
Kukui Nut Oil	130-170	6–12 months
Grapeseed Oil	125-143	6–12 months
Passionfruit Seed Oil	125-150	6–12 months
Camelina Oil	124-160	6–12 months
Walnut Oil	132-162	6–12 months
Blueberry Seed Oil	140-190	6–12 months
Cranberry Seed Oil	140-190	6–12 months
Safflower Oil (high linoleic)	140–150	1 year
Sunflower Oil (high linoleic)	120–140	1-2 years
Soybean Oil	120-139	1-2 years
Hibiscus Oil	119-128	1-2 years
Wheat Germ Oil	115-128	1-2 years
Watermelon Seed Oil	115-125	1-2 years
Cucumber Seed Oil	110-140	1-2 years
Black Cumin Seed Oil (Nigella)	107-128	1-2 years
Pumpkin Seed Oil	103-134	1-2 years
Prickly Pear Seed Oil	100-130	1-2 years
Sesame Oil	100–120	1-2 years
Coffee Seed Oil (roasted)	100-120	1-2 years
Cherry Kernel Oil	95-135	1-2 years
Rice Bran Oil	95–108	1-2 years
Plum Kernel Oil	95-120	1-2 years
Broccoli Seed Oil	90-120	1-2 years
Apricot Kernel Oil	90-115	1-2 years
Peach Kernel Oil	90-115	1-2 years
Argan Oil	90-110	1-2 years
Pracaxi Oil	90-107	1-2 years
Sweet Almond Oil	90–106	1-2 years
Meadowfoam Seed Oil	85-105	1-2 years

Avocado Oil	85–100	1-2 years
Coffee Seed Oil (green)	85-99	1-2 years
Peanut Oil	82-107	2–3 years
Oat Seed Oil	82-100	2–3 years
Castor Oil	81-91	2–3 years
Camellia Oil	80-87	2–3 years
Jojoba Oil*	80-85*	5+ years*
Tamanu Oil	79-98	2–3 years
Desert Date Oil	78-100	2–3 years
Olive Oil	75–95	2–3 years
Baobab Oil	65-95	2–3 years
Tiger Nut Oil	65-89	2–3 years
Papaya Seed Oil	62-80	2–3 years
Neem Oil	60-84	2–3 years
Sea Buckthorn Berry Oil	60-70	2–3 years
Marula Oil	70-80	2–3 years
Macadamia Nut Oil	70-82	1–2 years
Buriti Oil	50-90	2–3 years
Shea Butter	45–70	2–3 years
Palm Oil	44-54	2–5 years
Pequi Oil	40-55	2–5 years
Cupuacu Butter	40-50	2–5 years
Kokum Butter	35-45	2–5 years
Mango Butter	35–60	2–3 years
Cocoa Butter	34–38	2–5 years
Illipe Butter	25-45	2–5 years
Murumuru Butter	10-20	2–5 years
Babassu Oil	10–18	2–5 years
Palm Kernel Oil	10-18	2–5 years
Coconut Oil	8–12	2–5 years

*Jojoba oil is made up of long-chain monounsaturated liquid wax esters. Wax esters are structurally very stable and resistant to oxidation compared to triglycerides. Jojoba oil also contains natural tocopherols (Vitamin E) and other antioxidants that further protect it from oxidation. While the iodine value of jojoba (80–85) suggests a moderate degree of unsaturation, the type of unsaturation matters more than the number itself. Monounsaturated wax esters (jojoba) are far more stable than polyunsaturated triglycerides (like linoleic- or linolenic-rich oils)

How to Check the Iodine Value Before Purchasing

Cosmetic formulators should always check iodine values before purchasing oils and butters:

1. Supplier Specifications: Look at the Technical Data Sheet (TDS) or Certificate of Analysis (COA).
2. Reference Standards: Consult cosmetic chemistry references and databases.
3. Ask the Supplier: Request iodine values if not listed.
4. Third-Party Testing: For critical formulations, send oils for lab testing.