Ten things the research says about processing dulse

Dulse (Palmaria palmata), wild and cultivated

These ten points come from peer-reviewed studies summarised in the SIRPUTIS research library. Each figure is taken from the paper named in brackets, with the scale of the study (Lab, Pilot, Field, Survey or Model). They are our reading of the literature, not results of SIRPUTIS tests, and conditions in a real plant will differ.

1. **Iodine can be low or high: test every site and season.** In a multi-site study, 2149 mg of dry dulse supplied the recommended daily iodine intake (32 mg for sugar kelp). In Arctic dulse sampled in spring and summer, iodine limited intake to at most 0.63 to 0.92 g dry weight a day. [Survey: Roleda et al. 2018, Food Chemistry; Survey: Maribu et al. 2025, Food Research International]
2. **Land-based dulse can be steered.** Tank culture at 22.5 PSU, 180 µmol photons per m^2 per s and herring process water at 40 µM ammonium raised protein and pigments; iodine was the limiting element, at 23 g dry weight a day. [Lab: Stedt et al. 2025, Algal Research]
3. **Fresh dulse can be pressed.** A pilot screw press gave juice equal to 294 g per kg fresh weight, with 84 g per kg lost inside the press. [Pilot and lab: Gallagher et al. 2020, Journal of Applied Phycology]
4. **Pressing removes water, not protein.** Under 3 % of the pigments and 7.6 % of the water-soluble protein reached the juice. [Pilot and lab: Gallagher et al. 2020, Journal of Applied Phycology]
5. **Ensiling works, but it leaks.** Silage effluent equalled 26 to 49 % of fresh weight and carried 16 to 34 % of the dry matter; pressed dulse gave the least. [Pilot and lab: Gallagher et al. 2020, Journal of Applied Phycology]
6. **Dulse gives up water easily.** Raising air temperature from 40 to 70 °C cut drying time by 61.7 %, and dulse holds its last water far less tightly than winged kelp. [Lab: Bartle and Macleod 2022, Applied Phycology]
7. **Drying temperature decides the product.** Above 60 °C dulse turns from red to green and grey. Drying at 100 °C or more made about 70 % of the xylan extractable with hot water, and the full route gave up to 80 % at about 90 % purity. [Lab: Coelho et al. 2025, Marine Drugs]
8. **Outlet moisture is a product decision.** Dried dulse re-moistened to about 20 %, sealed and stored dark at 12 °C gained flavour after 61 and 126 days; 20 % was chosen after preliminary microbial tests, so confirm water activity and stability per product. Flash-freezing before drying left the sensory profile unchanged. [Lab: Stévant et al. 2020, Algal Research; Lab: Rauf Dahlstedt et al. 2026, Algal Research]
9. **Protein sits in dense tissue.** Alkaline extraction recovered about 60 % of the protein, xylanase-assisted extraction about 27 % and a deep eutectic solvent about 14 %. [Lab: Agusman et al. 2026, Food Chemistry]
10. **Enzymes can concentrate protein in the solids.** A carbohydrase moved 73 % of the dry matter into the liquid and left solids with 38 to 41 % protein, against 20 % in the control. The fresh dulse held only 11.8 % dry matter. [Lab: Maribu et al. 2024, Journal of Applied Phycology]

Questions to ask before you design a line

- Is the dulse wild or cultivated, from which site and in which months? Who tests iodine, arsenic, cadmium and lead per batch?
- Will the product be sold red, keeping colour and native protein, or used for extraction? That decides the drying temperature.
- What end-point moisture and water activity does the product need, and how will it be stored?
- What is the dry matter at intake, and will the line press before drying?
- Which format is the target: flakes, powder, mince or paste?
- How will harvest peaks be buffered: freezing, ensiling or semi-dry storage?
- Where do press juice and silage effluent go?

Sources

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2. Maribu I et al. (2025). Seasonal variation in the nutritional composition and potentially toxic elements of the red macroalga Palmaria palmata in the Arctic. Food Research International 212:116477. https://doi.org/10.1016/j.foodres.2025.116477 (open access (hybrid), CC BY 4.0; scale: field sampling, monthly).
3. Stedt K et al. (2025). From waste to value: cultivating Palmaria palmata in liquid seafood side stream enhances its growth and nutritional composition. Algal Research 92:104371. https://doi.org/10.1016/j.algal.2025.104371 (open access, CC BY 4.0; scale: laboratory (land-based tanks)).
4. Gallagher JA et al. (2020, issue 2021). Bio-processing of macroalgae Palmaria palmata: metabolite fractionation from pressed fresh material and ensiling considerations for long-term storage. Journal of Applied Phycology 33(1):533-544. https://doi.org/10.1007/s10811-020-02295-x (open access, CC BY 4.0; scale: pilot screw press (16 kg); laboratory silage).
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6. Coelho D et al. (2025). Simplified, High Yielding Extraction of Xylan/Xylo-Oligosaccharides from Palmaria palmata: The Importance of the Algae Preservation Treatment. Marine Drugs 23(8):302. https://doi.org/10.3390/md23080302 (open access, CC BY 4.0; scale: laboratory).
7. Stévant P et al. (2020). Semi-dry storage as a maturation process for improving the sensory characteristics of the edible red seaweed dulse (Palmaria palmata). Algal Research 51:102048. https://doi.org/10.1016/j.algal.2020.102048 (open access (hybrid), CC BY 4.0; scale: laboratory).
8. Rauf Dahlstedt S et al. (2026). Sensory profiles of three Nordic seaweeds following industrially relevant post-harvest processing. Algal Research 99:104988. https://doi.org/10.1016/j.algal.2026.104988 (open access, CC BY 4.0; scale: laboratory (trained sensory panel)).
9. Agusman A et al. (2026). Extraction mechanisms of proteins from Palmaria palmata. Food Chemistry 518:149680. https://doi.org/10.1016/j.foodchem.2026.149680 (open access (hybrid), CC BY 4.0; scale: laboratory).
10. Maribu I et al. (2024). Protein enrichment of the red macroalga Palmaria palmata using pulsed electric field and enzymatic processing. Journal of Applied Phycology 36(6):3665-3673. https://doi.org/10.1007/s10811-024-03338-3 (open access, CC BY 4.0; scale: laboratory (10 g samples, pilot-type PEF unit)).
