

Flax and Linen: What Linen Is, Its Properties and How It Is Made

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In one paragraph

Linen is cloth woven from flax, the fibre that grows in the stem of the flax plant, *Linum usitatissimum*. Flax is the plant and its fibre; linen is the yarn and fabric made from it, and EU labelling law treats the two words as one fibre name, “flax (or linen)”. Linen is strong, takes up more moisture than cotton, lets air through and is prized for hot weather, but it creases easily because the fibre barely stretches. It is slow to make: flax is pulled rather than cut, left in the field for weeks to ret, then scutched and combed before it can be spun. It is also a small fibre, about 0.3% of all the fibre made in the world in 2024, according to Textile Exchange.

At a glance

Linen vs cotton

	Linen (flax)	Cotton
Where the fibre grows	In bundles in the stem, a bast fibre	As hairs on the seed
World production, 2024	About 0.3 million tonnes, 0.3% of all fibre	About 24.5 million tonnes, 19%
Moisture regain	12% (CAMEO)	7.0 to 8.5% (CAMEO)
Agreed moisture allowance, EU	12.00%	8.50%
Creasing	Creases easily: a stiffer, more crystalline fibre that stretches about 2% before breaking	Creases less
Feel, same knitted construction	More air permeable	Higher thermal absorptivity: cooler at first touch
Washing	Boil-wash at 70 or 95 °C if white and boil-proof	The same
Ironing	Three dots, up to 210 °C, while damp	The same
Clothes moths	Larvae cannot digest it	Larvae cannot digest it
Water footprint of the fibre, global average	3,481 m³ a tonne	9,113 m³ a tonne (lint)
Export value	Scutched flax left the EU at an average 4.66 euros a kilogram in 2025	World price 88.78 US cents a pound in July 2026

Properties of flax fibre

Property	Value	Source
Elementary fibre length	6 to 65 mm; 10 to 80 mm in a composites study	CAMEO; Martin, Davies and Baley (2014)
Elementary fibre diameter	15 to 20 µm; widths of 8 to 32 µm are recorded	Akin (2013); CAMEO
Length of scutched fibre bundles	74 ± 9 cm, up to 85 cm, in one industrial batch	Martin and colleagues (2014)
Density	1.5 g/cm³; 1.53 to 1.54 for elementary fibres; 1.40 measured for scutched bundles, which contain voids	CAMEO; Bourmaud and colleagues (2018); Martin and colleagues

Property	Value	Source
Tensile strength, elementary fibres	595 to 1,510 MPa	Bourmaud and colleagues (2018)
Tenacity, fibre bundles (3 mm gauge)	13.88 cN/tex dew-retted, 24.15 cN/tex water-retted, in one study	Róžańska and colleagues (2023)
Elongation at break	1.8% dry, 2.2% wet; 1.6 to 3.6% for elementary fibres	CAMEO; Bourmaud and colleagues
Moisture regain	12%; 8.80 to 9.44% measured at 65% relative humidity	CAMEO; Róžańska and colleagues
Agreed moisture allowance, EU	12.00%	Regulation 1007/2011, Annex IX
Composition, review ranges	Cellulose 60 to 85%, hemicellulose 14.0 to 20.6%, pectin 1.8 to 15.0%, lignin 1 to 3%, wax 1 to 6%	Bourmaud and colleagues (2018)
Composition, one water-retted flax	Cellulose 74.83%, hemicellulose 14.43%, lignin 3.07%, pectin 1.16%, wax 1.42%	Róžańska and colleagues (2023)
Heat and light	Degrades slowly in sunlight and at temperatures above 120 °C	CAMEO
Chemicals	Resists alkali, dilute acid and most organic solvents; degraded by strong acids	CAMEO

Key figures and their sources

- The museum reference CAMEO, of the Museum of Fine Arts, Boston, gives flax a moisture regain of 12% (CAMEO, linen), the same figure the EU uses as flax's agreed moisture allowance, against 8.50% for cotton (Regulation 1007/2011, Annex IX).
Source: CAMEO, linen (cameo.mfa.org)
- Measured regain varies with the fibre and the test: one 2023 study found its flax fibres held 8.80 to 9.44% at 65% relative humidity (Róžańska and colleagues).
Source: Róžańska and colleagues (pmc.ncbi.nlm.nih.gov)
- The linen fabrics “showed higher air permeability values than 100% cotton”, but the cotton fabrics had the higher thermal absorptivity, “indicating that these fabrics felt colder” at first touch (Taştan Özkan and colleagues, *Tekstil ve Konfeksiyon*, 2025).
Source: Taştan Özkan and colleagues, *Tekstil ve Konfeksiyon*, 2025 (doi.org)
- The authors give the working limit: “No more than 2% shrinkage in the cross and lengthways directions of the fabric is allowable” (Malčiauskienė, Rukuižienė and Milašius, *Fibres and Textiles in Eastern Europe*, 2008).
Source: Malčiauskienė, Rukuižienė and Milašius, *Fibres and Textiles in Eastern Europe*, 2008 (epubl.ktu.edu)
- Much of linen's shrinkage happens at the mill: a 70/30 linen and silk fabric measured to ISO 3759 lost 16% of its warp length in washing and softening at the mill, and 23% when it was dyed (Kumpikaitė and colleagues, *Coatings*, 2022).
Source: Kumpikaitė and colleagues, *Coatings*, 2022 (doi.org)
- Flax breaks at an elongation of about 1.8% dry and 2.2% wet (CAMEO, flax).
Source: CAMEO, flax (cameo.mfa.org)
- Flax may also gain strength when damp: a study of flax tow found its breaking tenacity rose with moisture content up to 25% (Radkar and colleagues, *Sustainability*, 2019).
Source: Radkar and colleagues, *Sustainability*, 2019 (doi.org)
- In an industrial scutching line studied in France, “the scutching process yielded 25% of scutched fibers, 11% of tows, 5% of seed”, the rest being shives, and the scutched bundles measured 74 ± 9 cm (Martin, Davies and Baley, 2014).
Source: Martin, Davies and Baley, 2014 (archimer.ifremer.fr)

Formulas and diagrams

Since 300 yards is 274.32 m and a pound is 0.4536 kg, one lea is 604.8 m a kilogram, so $Nm = 0.6048 \times \text{lea}$.

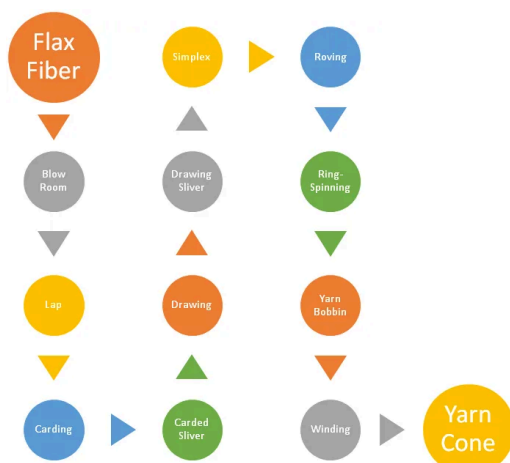
The direct rule is $\text{tex} = 1,653.5 \div \text{lea}$.



Flax in flower near South Kyme, Lincolnshire, in July. Photo: Ian Paterson, geograph.org.uk, CC BY-SA 2.0.



From field to fibre. The three retting steps in the chart are alternatives: a crop is retted one way, not three.



The short-staple route, used for cottonised flax and tow on cotton-system machinery. Long line flax is spun on flax machinery instead, wet or dry.

Revision questions

The questions readers ask most, with the article's own answer.

Is flax the same as linen?

Yes, in the sense that matters on a label. The EU's textile-names regulation lists the fibre as "flax (or linen)" and defines it as "fibre obtained from the bast of the flax plant (*Linum usitatissimum*)", and it reserves each listed name for the fibre it describes: the names "shall not be used for other fibres, whether on their own or as a root or as an adjective" (Regulation (EU) No 1007/2011, Article 5 and Annex I).

Is linen breathable?

Yes, on both counts that breathability usually means: linen fabrics let air through readily, and the fibre itself takes up water vapour. The museum reference CAMEO, of the Museum of Fine Arts, Boston, gives flax a moisture regain of 12% (CAMEO, linen), the same figure the EU uses as flax's agreed moisture allowance, against 8.50% for cotton (Regulation 1007/2011, Annex IX).

Does linen shrink?

It can, a lot, unless the fabric has been stabilised. In a study of linen honeycomb fabrics washed five times at 30 °C, stabilisation in finishing cut the shrinkage “by a factor of between 6 and 19”: the stabilised fabrics shrank 0.50 to 2.50% in warp and weft, while the unstabilised ones shrank roughly 9 to 19% in the paper’s charts.

Why does linen crease so easily?

Because the fibre hardly stretches and does not spring back. Flax breaks at an elongation of about 1.8% dry and 2.2% wet (CAMEO, flax).

Is linen sustainable?

Linen has a good case, but not every claim made for it is measured. The firmest figure is water.

Test yourself

Ten questions on this topic. Answer them without looking, then check on the last page.

1. What is the botanical name of the flax plant from which linen is made?
2. What moisture regain does CAMEO give for flax, and what EU moisture allowance does cotton have by comparison?
3. What is the elongation at break of flax fibre, dry and wet (CAMEO)?
4. Why does linen crease so easily?
5. What substance glues flax elementary fibres into technical fibres (bundles)?
6. What does retting do to flax stems?
7. How long does dew retting of flax take, according to a 2023 review?
8. In flax scutching, what is the difference between line and tow?
9. What is a 40 lea linen yarn in metric count (Nm)?
10. What does the Masters of FLAX FIBRE label require of where flax is grown and scutched?

Answers

Each answer is stated in the article; the section to read again is named after it.

1. **Linum usitatissimum.**
See: Opening
2. **12% for flax, the same as its EU allowance, against 8.50% for cotton.**
See: Is linen breathable?
3. **About 1.8% dry and 2.2% wet (CAMEO).**
See: Why does linen crease so easily?
4. **A fold presses the fibres past the small strain they can recover from, so the crease stays.**
See: Why does linen crease so easily?
5. **Pectin.**
See: Properties of flax fibre
6. **Microbes break down the pectins that cement the fibre bundles to the skin and the core.**
See: How linen is made › Retting: dew, water and enzymes
7. **28 to 41 days, depending on region and weather.**
See: How linen is made › Retting: dew, water and enzymes
8. **Line is the long fibre keeping the stem's length; tow is the short, tangled fibre beaten out with the shive.**
See: How linen is made › Breaking, scutching and hackling: line and tow
9. **Nm 24.19.**
See: How linen is made › Spinning: wet and dry
10. **It must be grown and scutched in Western Europe: France, Belgium and the Netherlands.**
See: European flax labels: Masters of FLAX FIBRE and Masters of LINEN

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