

Cotton Linter

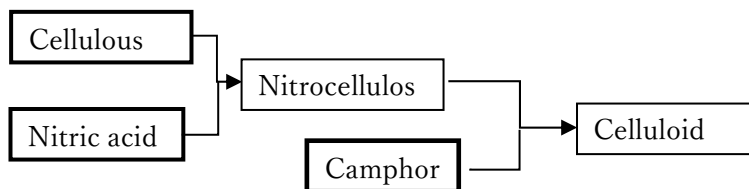
1. A renewable material

As shown in Figure 1, the main raw materials for celluloid are cellulose, nitric acid, and camphor. The name “cellulose“ was made because it is the main component of the “cell wall” of plant cell. Cotton and hemp used for clothing are pure cellulose. The raw material for paper, rayon, etc. is the cellulose extracted from wood and called as “wood pulp”. Cellulose for celluloid is made from cotton scrap called "linter". This is a short fiber that cannot be used for clothing.

Celluloid contains about 20% camphor. It is obtained by the distillation of camphor tree. Nitric acid has been produced by reacting ammonia, which is made by Atmospheric nitrogen fixation.

As you can see, celluloid does not use fossil materials such as petroleum. From the fighting climate change this is an excellent material.

Fig. 1 Celluloid production process



2. Linter for chemical industry

(1) About the linter

Linter, which was used for celluloid, is still used for various purposes. The raw material for linter is cotton (Photo 2). Cotton is an annual crop that blooms like hibiscus in early summer (Photo 1). One flower can produce one cotton like Photo 2. The cotton contains about 20 cotton seeds (Photo 3). The black part of the photo is about the size of a coffee bean and has about 50 mm length fluff on the surface. The fluff is cut and twisted to a long fiber. The operation of twisting is called spinning. The fluff used for spinning is called "lint". The length of lint has a certain distribution, of course, but it varies depending on the production area.

The short fluff cannot be used at the spinning industry, because it falls off even if twisted. The short fluff is called as “lint”. There is no chemical difference between linter and lint. So

it is used as an industrial raw material. The fiber length "linter" is less than about 5 mm.

## (2) Jumping between the textile industry and the food industry

The fiber length of the linter is determined by the difference in collection methods. "5mm or less" is only a guideline. The harvested cotton is collected for lint at the spinning factory. Since spinning requires only the long part of the cotton, the lint is removed by "tearing".

The kernel part of the cottonseed (Photo 6) contains high-quality oil. For this reason, the cottonseed removed from the lint is taken over by the food factory. The cottonseed at this stage has short fluff on the surface as shown in Photo 4. If the oil is squeezed as it is, the oil will be sucked out by the fluff even if it comes out of the kernel. Therefore, before squeeze, the fluff on the surface is removed and made as shown in Photo 5. The method of extraction is different from that of lint collection, which is like polishing the surface of the seeds.

The short fluff removed here is called "linter". The linter is purified and used as a high-purity cellulose.

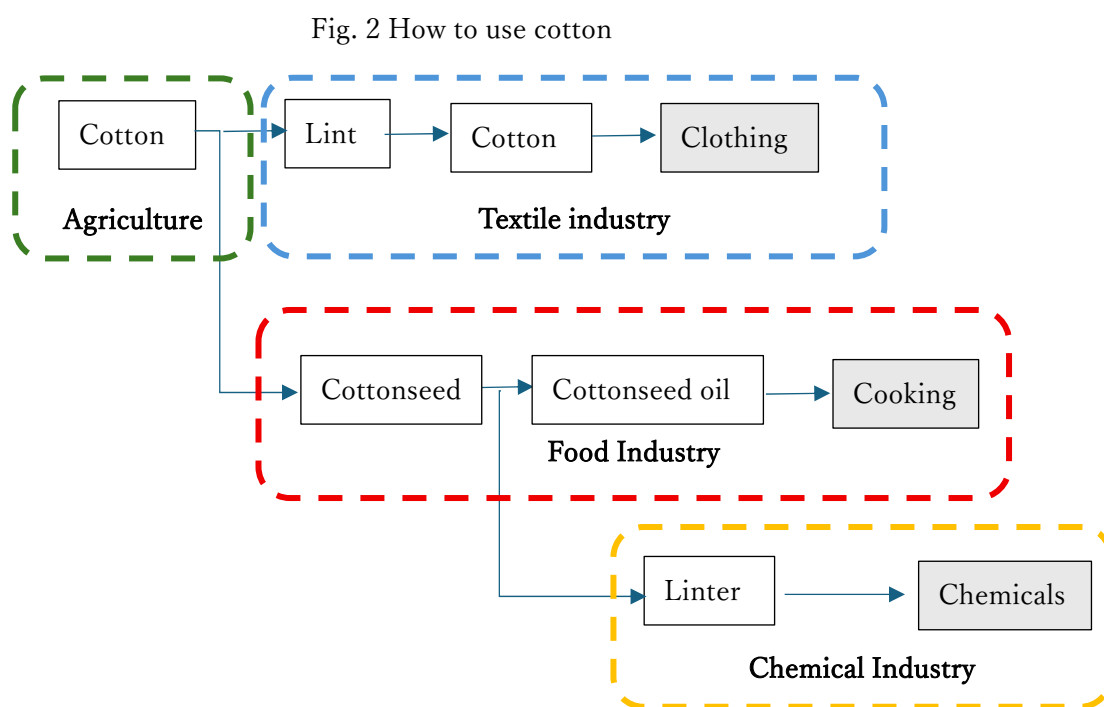


Figure 2 shows the typical use of cotton. The harvested cotton is first divided into lint and cottonseed at the spinning mill. The lint is about 50 mm, it is refined into "cotton". Lint is twisted by a spinning machine to make long yarn. It is woven or knitted to make our clothing.

The linter separated by the oil refinery contains various impurities, so it is refined and used as a raw material for celluloid and other materials.

As you can see from Figure 2, lint covers a wide range of industries, including agriculture, textile industry, food industry, and chemical industry. Since it is rare to cover these industries in a region, it is used only for clothing and the others are discarded. To compensate for this, lint, linter, cottonseed, etc. are international products that travel around the world.

Even now, with the advancement of synthetic chemistry, carbohydrates such as cellulose, starch, and sugar are still produced in agriculture. Among these, cotton is rarely discarded, as mentioned so far. If we expand the application fields and further sophisticate and refine the industrial structure, we will also contribute to the prevention of global warming.

### 3. Linter digression

#### (1) Two “cotton”



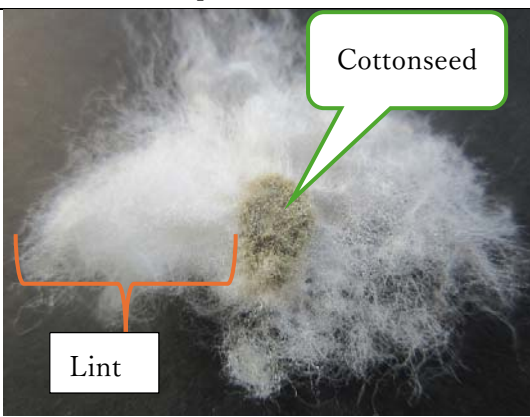

As you know there are ideograms in Japanese characters. In it there are two types of “cotton” ideograms: those that indicate plant and those that indicate textile. If it has already been mowed, like a linter, but not fiber, I don't know which one to use.

#### (2) Lint-Linter-Lintest

Cotton used in the textile industry is called “lint”. However, since short fiber lengths cannot be used, they are used as fillers, papermaking, and chemical raw materials. This is called a “linter”.

However, there is the shorter unusable part in the linter. The linter dust (should I call it lintest?) was found that this was excellent as a culture bed for earthworms. The earthworms that grew here were healthy and long-lived, so they were very popular as fishing bait.

Attached photo

1. Cotton flower	2. Cotton
	
3. Composition of cotton	4. Cotton seeds (before linter removal)
	
5. Cotton seeds (after removing the lint)	6. Cottonseed cross-section
