Fashion History Through Textiles

Module 4: Flax/Linen
What is flax?

Flax is a tall and slender plant with a bell-shaped, blue flower. There are two types of flax plants, one grown for fibers and the other grown for seeds. The fiber flax plant is cultivated, harvested and processed in order to create linen fabric. The seed flax plant is processed for linseed oil. Linen is a highly absorbent, strong fabric. It is a good conductor of heat, smooth and lint-free with a high natural luster. The properties of linen make it ideal for a variety of things including, bedding, draperies, clothing and more. Fragments of flax fiber, and fabric have been around since the Stone Age.

Linen is produced in many parts of the world but mostly in Western Europe in countries like Poland, Austria, France, Germany, Denmark, Lithuania, Latvia, Netherlands, Spain and Switzerland. High quality linen fabric is produced in Ireland, Italy and Belgium.

Colour in the European countries that produce linen fabric
Flax harvesting

Flax is harvested by pulling the plants when the fibers are soft (usually 90-100 days after planting.) Flax must be harvested on a dry, sunny day and pulled up roots and all. Before 1930, hand pulling was done. Twelve to fifteen men would pull a hectare (2.47 acres) a day. Most flax farmers now use pulling machines. A two-row pulling machine can pull a hectare in one hour. The pulled plants are bundled and allowed to dry by leaning them against a chair or table and rotating them occasionally so the sun can dry it all around.

Flax math

A flax farm has 90 hectare’s of crops and 75 farm hands. How long will it take to pull all the flax? (use maximum number of farm hands per group)

And how long would it take for just one pulling machine? (assume 9 hour days)

How much faster is the machine (in percentage) compared to the people?
Flax that has been harvested and dried is called flax straw and is ready for processing. There are five steps to the flax process.

1. Rippling – the process that removes the seed bolls from the flax stems – done with a rippling comb (an iron or wooden device with rows of very long metal nails)

2. Retting – process that separates the fiber from the stem – dissolve the pectin which connects and binds the fibers together. Two methods of retting include dew retting (flax is spread on ground for the process) and water retting (flax is put into water for the process).

3. Breaking – process of crushing the fiber to separate it from its woody core – uses wooden mallets or a flax brake (like a sawhorse with a hinged blade) – now there are machines

4. Scutching or swingling – process which removes bits of boon (inner core of plant) that is stuck to the fiber – it is a scraping process

5. Hackling – process to separate long line of fibers from short tow fibers to prepare them for spinning – a hackle is a miniature bed of nails that the flax fiber is pulled across

Number the pictures to indicate which step in the flax to fiber process is illustrates.
Flax processing results in two types of flax fiber. Line flax is the longest, most lustrous and best fiber. It has even colour and is shiny. It is either natural blonde (water retted) or gray (dew retted).

Tow flax is a shorter fiber that is available in natural or dyed colours.

A spinning wheel or distaff can be used to spin flax fiber. The spun yarn is then wound onto skeins. The finishing process includes setting the twist which helps stabilize the yarn and scouring which softens, cleans and shrinks the yarn.

Yarn spun from water retted flax scours to a creamy colour which produces antique shades when dyed with dark dyes. In order to have lighter colour when dyed the yarn must first be bleached.

Bleaching can be done by exposing the yarn to sunlight, which is a long process, or can also be bleached chemically which is quicker but the process will weaken the yarn.

The best and easiest method of dyeing linen is to dye the yarn. Dyes can be natural (plant based) or synthetic (chemical based). Natural dyes are not as strong or varied so fabric would not be a vibrant colour. Synthetic dyes have a wide range of colours and is a quicker process but measurements and calculations need to be more precise.

Linen can be woven, knitted, and used for making paper (money is woven with linen). Much of the fabric is spooled and put through weaving or knitting machines. However, very fine linen is usually still woven by hand.
Natural dyes

Many plants produce dyes that can be used to colour linen. The dyeing process can be direct, where it attaches directly to the fiber or vat dyes which require chemicals to reduce the dyestuff which does not dissolve in water. There are also adjective dyes that require a metal salt (mordant) for the dye to bond to the fiber.

Indigo is a plant extract. It does not dissolve in water and therefore needs to be vat dyed. The only way fabric can be dyed with indigo is through chemical reactions in the dye pot. It produces a blue dye.

Cochineal is a direct dye. It is a substance that comes from bugs. It can be crushed to a powder and boiled with the yarn to make pinks and purples.

Madder root powder needs a mordant (like alum) and can create a medium raspberry red or light shades of pink and purple.
What plant dye was used?
Match the plant with the coloured yarn it would produce

- Onion skins
- Rhubarb
- Coffee
- Chamomile
Linen in Ancient Egypt

Linen cloth was used extensively in Ancient Egypt as the flax plant grew along the Nile river. It was used for clothing, towels, bed sheets, sails, fishing nets and ropes. The earliest known Egyptian linen dates back to about 5000 B.C.E. Linen was comfortable and practical for the hot, dry climate of Egypt. The men wore a wrap around skirt that was tied at the waist with a belt. The length of the skirt varied depending on the fashion at the time. During the Old Kingdom the skirt was short, in Middle Kingdom it was calf length and in New Kingdom period the skirt was pleated. Women wore full-length straight dresses with one or two shoulder straps. During the New Kingdom dresses also became pleated. Children of ancient Egypt did not wear clothes until they were about six years old, then they wore similar clothes to the adults. The bodies of most Ancient Egyptians were swathed in linen and buried in the desert. Important people were mummified and the mummies were wrapped in linen cloth.
Look at the Egyptian pictographs and determine which stage of the flax processing system it depicts.
Linen as clothing

Linen is one of the strongest plant fibers (2 to 3 times stronger than cotton). The use of linen in the clothing industry has greatly increased in the past 30 years. In 1970s, the use of linen for fashion clothing was only 5%, but by the 1990s had risen to 70%.

Flax fiber can be woven into a wide range of fabrics from handkerchief sheerness to mailbag sturdiness. Linen fabrics vary according to their weave pattern.

**Damask** is a type of linen fabric with a smooth texture and reversible design. It is woven on a jacquard loom, using a combination of plain and satin weaves. Most often it is used for napkins, table runners and tablecloths.

**Plain-woven** linen is made for various uses. Cambric linen is the thinnest and finest linen and is used to make lingerie, handkerchiefs and doilies. Another plain-woven linen is butcher’s linen which is a strong, stiff, coarse linen often used in making butcher aprons and other heavy duty clothing.

Bird’s eye linen is a *loosely woven* linen that is highly absorbent. It is commonly used in the making of cloth diapers.

**Sheeting** linen has a wider width which makes it a good choice for linen sheets. It is also used for material in making suits.

Linen can also be blended with cotton, polyester, nylon, rayon, wool or silk to combine the advantage of greater softness and less wrinkling.

Linen is widely used in summer clothing selections because of its cool feeling and good absorption quality. The stiffness of the fabric keeps it from clinging to the skin allowing the wearer to feel more comfortable on hot days. It is a strong fiber that actually gets stronger when wet. It is a more rigid fabric so appears more elegant but is used in both formal and casual wear. Linen is relatively easy to care for and resists dirt and stains and does not have pilling (when fabric fuzz balls develop). It does however wrinkle easily so is better if hung to dry.

Currently research is being done to develop a cotton/flax blend to create new yarns. This, it is hoped, will improve the heaviness of denim making it more comfortable to wear during hot and humid weather.
Design a fashion advertisement that expresses the qualities of linen.
Other plants that can be used for fiber - Hemp

Hemp is a fiber (called Bast) that comes from the cannabis plant. It has been used to make clothes since before recorded history. Bits of hemp fabric have been found that date back to 8000 B.C.E. Hemp crops require virtually no chemicals for its growth because it is naturally resistant to most pests. Compared to cotton or flax, hemp can produce more fiber per square foot of land (twice the amount of cotton and six times the amount of flax grown on the same land.)

Up until the 1920s, approximately eighty percent of clothing were made from hemp. Canvas was even used in the first pair of jeans. The strong hemp fibers can be spun and woven into a linen like cloth as fine as lace, as smooth as silk or as coarse as burlap. Also, hemp fibers can be blended with other fibers like flax, cotton, wool, or silk.

The hemp fabric is three times as strong as cotton, warmer, softer and more absorbent. It is also resistant to molds, mildew, heat and insects making it ideal for outer wear.

The process of making hemp fabric from the plant fiber is similar to that of flax.
Other plants that can be used for fiber - Bamboo

Bamboo is the fastest growing grass in the world. It can grow up to 1 yard/.9 metres a day. It is ready for harvesting in about 4 years and does not require replanting because its root system continually sprouts new shoots.

There are two ways to manufacture bamboo fiber into cloth, mechanical and chemical way. The mechanical way involves crushing the woody parts of the plant and then using natural enzymes to produce a mushy mass that natural fibers can be combed out of. It is a similar process to that of flax or hemp. The fabric created from this process is called bamboo linen. However, very little bamboo linen is manufactured for clothing because it is a time consuming and costly process.

The chemical manufacturing process involves “cooking” the bamboo leaves and shoots in strong chemicals. This process is similar to the one used to make rayon from wood or cotton waste byproducts. The fabric created in the chemical process is called bamboo rayon. However, there are health risks and environmental damage caused by the chemical process. Other chemical processes and nano-technologies are being introduced to reduce the toxicity of the manufacturing process of bamboo.

Bamboo fabric has a natural sheen and softness similar to silk. It is easy to launder and more wrinkle-resistant than cotton. It is very absorbent and can keep water away from the body 3 to 4 times faster than cotton keeping the wearer dryer, cooler and more comfortable in hot, humid weather.

If the bamboo grew 1 yd/.9 m a day, how tall would it be at the time of harvesting?
If a flax farm has 90 hectare’s of crops and 75 farm hands. How long will it take to pull all the flax?

\[ 75 \div 15 = 5 \] (75 farm hands divided into 5 groups of 15)
Each group can pull 1 hectare a day

\[ 90 \text{ (hectares)} \div 5 \text{ (groups)} = 18 \]
It will take 18 days to pull all the flax

And how long would it take for just one pulling machine?

Machine pulls 1 hectare/hour so it will take 90 hours
\[ 90 \text{ (hours)} \div 9 \text{ (hours/day)} = 10 \text{ days} \]

How much faster is the machine (in percentage)?

\[ \frac{18 \text{ days} - 10 \text{ days}}{18} = \frac{8}{18} = 44.5 \% \]

The machine is 44.4 % faster than the people
Answer sheet – Steps in Flax Making

Number the pictures to indicate which step in the flax to fiber process is illustrates.

1

2

5

4

Answer sheet – Bamboo math

If the bamboo grew 1 yd/.9 m a day, how tall would it be at the time of harvesting?

\[
\begin{align*}
1 \text{ yd} \times 365 \text{ days} &= 365 \text{ yds} \\
0.9 \text{ m} \times 365 \text{ days} &= 328.5 \text{ m} \\
365 \text{ yds} \times 4 \text{ years} &= 1460 \text{ yds} \\
328.5 \text{ m} \times 4 \text{ yrs} &= 1314 \text{ m}
\end{align*}
\]

At the time of harvesting the bamboo would be 1460 yds or 1314 m tall.
Answer sheet – Plant Dye

- Onion skins
- Rhubarb
- Coffee
- Chamomile
drying

harvesting

bundling

weaving

spinning

Retting or dyeing
Resources

Websites


http://www.dyeman.com/natural%20Dye%20recipe.htm

http://www.countrysmallholding.com/features-growing-plants-to-dye-for--212721

http://www.ehow.com/about_4743622_types-linen-fabric.html

http://ezinearticles.com/?Hemp-Fiber---Eco-Friendly-Fabric&id=4211093


Books
