The Milky Way Fashion Project, milk fibers for sustainable fashion

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The Milky Way Fashion Project, is an ecological and sustainable project as well as high social importance. In this Project, **the problems are: babies with atopic skin, milk in massivesurpluses, and employability for women from disadvantaged groups.**

The goal of the Project is to provide a sustainable and innovate solution to these problems starting for the collecting of milk fibers from milk protein (casein).

The Project seeks to manufacture and marketing baby clothes from casein fibers, a milk protein. This type of fibers have the adventage of being appropriate for use on children with atopic skin.

The milk used to make the casein fibers, can be milk whose shelf life has expired, or in massivesurpluses. It should be remembered the crisis unleashed in 2015 summer in Spain.

The casein extraction is a relatively simple procedure from acetic acid. Once the casein has been collected, we can manufacture the fibers and then, we can make the spinning process, with spinning wheels. The following, is to weave in low warp loom. With this woven fabric, we can manufacture baby clothes.

This Project counts with a greatsocial and cultural value since it enables the employability to the labour market of those from disadvantaged groups such as persons with disabilities, employability of Youth and combating social exclusion, particularly for young women.

In this manner, The Milky Way Fashion Project will sign cooperation agreements with various organisations in the social and cultural area:

1. With Harambee Project, young women, particularly in sub-Saharan Africa, spinning the yarns with the casein fibers, in spinning wheels, and weave the fabrics in low warp looms. A very simple and economic method.

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2. In Spain, in colaboration with Las Jaras, occupational center for disable women, we´ll dye with Isatis Tinctorea, a natural an ecological dye, the fabrics from casein fibers.
3. The employability of youth is an important part of the project. In this connection, The Milky Way Fashion Project will work closely in the promotion of vocational training and work experience for students who are coming from Higher Level Training Cycle of Pattern from Fuenllana Technological Institute (Alcorcón, Madrid). These students will make the patterns for garments and the baby´s garment production.

Milk (Small milk producers, milk surpluses in Galicia, Spain) ---------- Casein Fibers (Chemical Laboratory, integral part of the project "The Milky Way Fashion Project", Madrid) ----------

Spinning (spinning wheels in Africa in collaboration with Harambee) ----------

Weaving (Low warp looms in Africa in collaboration with Harambee) --------- Dyed (Isatis Tinctorea, in collaboration with Las Jaras, Madrid) -------- Pattern and Design (students from Fuenllana Technological Institute, Madrid) -------- Prototypes (students from Fuenllana Technological Institute, Madrid) ------- Dressmaking (students from Fuenllana Technological Institute, Madrid) --------- Internet sales from website registered.

Babies with atopic skin

babycentre.co.uk says that eczema is a dry, itchy skin condition that affects up to one in five children. It usually appears for the first time before the child is two years old. The good news is that most children who have eczema will grow out of the condition by the time they are in their teens. Eczema can't be cured, but it can be controlled with the right treatments.

Eczema is also known as atopic eczema, or atopic dermatitis. Atopic means that the child has inherited the tendency to develop conditions such as eczema, asthma and hayfever . The end result is the same: dry, itchy, red and cracked skin, which can sometimes ooze fluid and bleed. The areas most affected in babies are the hands, face, neck, elbows and backs of the knees.

Having eczema means that the skin's barrier doesn't work as well as it should, which makes it drier. His skin will be more prone to infections and allergens can enter the skin more easily, which can make the condition worse.

Protein milk fibers clothing may help, whereas woollen and synthetic fibres may make the baby too warm, and make his eczema worse.

Characteristics of Milk Fibers:

1. In milk fibers,the natural protein humectant factor is present,which makes the skin delicate and smooth. It´s perfect for children with atopic skin.
2. It absorbs moisture very well as it is hygroscopic in nature.
3. It is antibacterial and antifungal as amino acids present in the fiber.
4. It is glossy and luxurious in appearance,feel and comfortability, just like wool.
5. It is very easy to dye and can be dyed under normal temperature.
6. It can be blendedwell with other different fibers, such as cotton.

	Cotton	Silk	Wool	Milk
Fineness (dtex)	1.52	1.2-2.0	1.0-2.8	6-9
Dry tensile strength (CN/dtex)	2.8	1.9-3.1	3.8-4.0	2.6-3.5
Dry breaking elongation	25-35	7-10	11-16	14-25
Wet breaking elongation	28.8	13	27-33	50
Moisture regain	5-8	7-8	8-9	15-17
Specific gravity	1.22	1.5-1.54	1.46-1.52	1.34-1.38

Dye ability: The fiber can be dyed in bright colors using reactive, acid or cationic dye technology.

History of Milk Fiber:

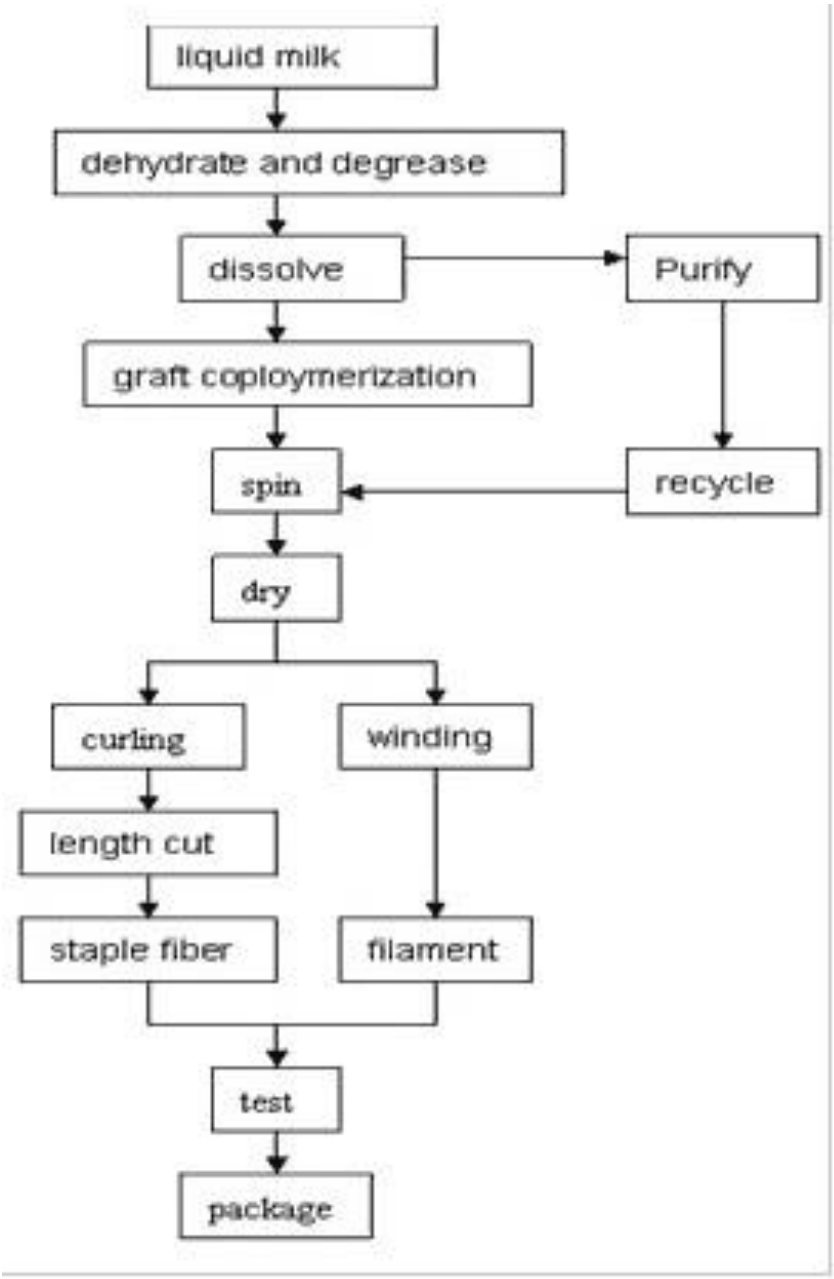
According to Euroflax Industries, milk fiber was invented in 1930's in both Italy and America and was called "milk casein".Casein was inventedway before the 1930s – apparently they've discovered that many churches from the 14th and 15th centuries were painted with casein-based paints – the colors are still bright and unfaded.

Apparently “milk casein” fiber was used in many clothing and household items in America and Europe during the 1930s and ’40s, says Joan Kiplinger of Fabrics.net. It was substitute for wool, which was needed by men on the front lines. However, it fell out of use after WWII ended and newer, cheaper synthetics such as nylon grew in popularity. The fiber was blended with other natural fibers and known under the brand names of Aralac, Lanatil and Merinova.While these brands’ fabrics were very similar to wool and could be dyed by the same processes, apparently there were some flaws with the milk casein fiber – namely, that it was not as strong and firm, nor as elastic as wool, and the fibers mildewed easily when they got damp.

Production Process of Milk Fiber:

Milk casein fibers production line application processing system can not do without the cooperation of the link. Shanghai is home on R & D Technology Co., Ltd. milk silk protein fibers, also engaged in spinning, dyeing and finishing of technical research, raw material quality, technology is complete, customers can better support the promotion of milk fiber.

Milk casein fiber can be used, in theory, cationic dyes, acid dyes, neutral dyes, generally more than the actual cationic dye and reactive dye used is suitable for pure milk casein fiber and its products, such as staple fiber, yarn line, knitted fabrics, woven fabrics and garments. Period in order to milk casein fiber textiles as an example of pure cationic dyes and reactive dyes on the usage described as follows.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After Treatment of Milk Fiber:

Cationic dyes and finishing the first treatment process, due to temperature and moisture absorption of the products are strong, so do not need special treatment. With 60 ºwater, liquid running back 10s, and then the second can of cold wash. In the special white process, the use of prescription and bleaching conditions were as follows: 5% sodium hydrosulfite (95 ?with warm water even after accession); 5% of the standard soap powder (use warm water even after the accession), not alkaline , does not contain brighteners; bath ratio 1:20 ~ 30; temperature of 95 ~ 98 time is about 15s ~ 30s, but also according to liquor ratio, equipment and raw materials of different thickness to adjust. Note that, if so special white, raw materials without cooling; If the training is finished, then white, must be 2% to 3% of the HAC, 60 water running 5s ~ 10s, cold washed twice, and then softening. Prescription and use of the whitening process conditions: 1.6% cationic brighteners (Dilute with warm water even after accession); 3% HAC (Dilute with warm water even after accession); temperature of 95 ~ 98 ? time of 15s ~ 20s ; bath ratio 1:25 ~ 30. In the dyeing process, the basic cationic dye with the general approach, but not 1227, and NaAc. To liquor ratio 1:25 to 30, for example, dyeing conditions to control the following table. Cleaning, light to be 1 or 2 times the cold wash, cold wash in the dark to be 1 or 2 times and then wash with hot water, 70 º10s, and finally cold wash 1 or 2 times. In the post-treatment processes, the use of softener 5% to 8%; temperature 45 ~ 50 ? time of 20s or so; bath ratio 1:20 ~ 25.

According to different requirements of customers can choose different softeners, such as the fabric soft, smooth, elastic anti-wrinkle, anti-contamination, etc. when requested, by the production units to decide. In the dehydration process, in order to reduce the discount video, dehydration, slower, time is shorter, usually 1 minute each time, while patients have to row together, try not to let cloth folded. In the drying process, the use of the cage drying temperature of 80 º time is 20s ~ 30s, speed too quickly, after drying grounds lit 12 to 24 hours after the stereotypes. Using rotary drying temperature of 90 º fast speed, the disadvantage is the easy bit like a very light, must be strictly controlled temperature.

In the setting process, the general shape of water rolling open sites, the effect is better than the cylindrical shape. Process parameters are 150 ? 5% overfeed of 10%, the line speed 15m / s, the pressure head of about 4kg. Reactive dyeing of basic aspects of pre-treatment with the former, but if the dye houses using recycled water, pH value may be unstable or reactive groups dealing with different materials, can be the first treatment bath by adding 1% of the HAC, it will give the pH value of the cloth evenly from the inside out, but also conducive to color dyes.

Proven, low temperature dyeing cotton used reactive dyes more suitable, light-colored soda instead of baking soda can be used as dyeing auxiliaries, the amount can be as long as required to achieve the color, the dark can be used for dyeing auxiliary sodium sulfate and soda ash , the amount of cotton fiber dyed with similar.

Spining the milk casein fibers

The milk casein fibers obtained, will be yarned in Africa in cooperation with Harambee Project.

It´s a simple and economic process which only requires spinning wheels, very easy to use by women.

A single drive wheel has one drive band, that goes around the flywheel and the bobbin or the flyer. Most of the drive bands for single drive wheels are made from synthetic cord, which is elastic and does not slip easily on the wheel.

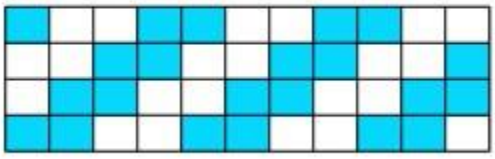
While the spinner is making new yarn, the bobbin and the flyer turn in unison, but when the spinner wants to wind the yarn onto the bobbin, the bobbin or the flyer slows down and thus the yarn winds on. The one part slows down because of the brake band, which loops over that element. The tighter the brake band is, the more pull on the yarn, because the more friction the bobbin has to overcome to turn in sync with the flyer.

Low warp looms

The Milky Way Fashion Project manufacturing assets, while forming partnerships with Harambee that specialize women in weaving by low warp looms.

WEAVING TECHNIQUES || THE TWILL WEAVE

A twill weave is created by passing the weft thread over two or more warp threads and then repeating that pattern one warp thread over, so that a diagonal line is formed.



The blue color is the weft passing over the warp and the white color is the warp showing as the weft passes under it.

This improves a fabric similar to denim because twill weave has been defined as a category of compactweaves with inclined diagonals.

Dyeing with Isatis Tinctorea

Natural dyes are non-toxic, harmless, non-polluting and make a comeback.

Advantages of using natural dyes: 1. Natural dyes are more eco-friendly than the synthetic dyes, as the synthetic dying procedure can produce pollutants and certain diazo dyes are carcinogenic. 2. Natural dyes are also free from carcinogenic components. 3. Most natural dyes are known as antioxidants. 4. Clothes dyed with natural dyes could be sold at lower prices. 5. Depending on the mordants used with one dye can give variety of colors which also depends on the source of the dye. One dye may obtain 5 to 15 varying colors and shades. 6. Natural dyes are all derived from natural sources unlike their counter parts, synthetic dyes. 7. Inconsistencies in color could be marketed as unique or one of a kind.

Clothes dyed with woad indigo at first appear yellow, but as they dry they turn green, then turquoise then finally deep blue. Often used alongside Madder, Weld and Chamomile, together with Woad, they are the very best natural dyes for temperate areas. Madder makes shades of red, Weld and Chamomile yields a bright yellow, and Woad gives blues. (Indigotin is the blue dye, whether you get it from woad- Isatis tinctoria, Indigofera tinctoria, or some other source.).
They are all quite colourfast and produce excellent quality dyes that are used amongst artists etc who want to work with natural dyes. Woad mills are still worked at Wisbech, but not for the dye itself, the produce also improve the quality, colour and fixes true indigo, and is also used to form a base, or mordant, for a black dye.
Although woad has not been grown commercially since the 16th century, it was produced in Lincolnshire during the 1920s and 1930s to provide dye for Royal Air Force uniforms, before the adoption of synthetic colourings. It has also been grown occasionally by artisan weavers and spinners for their own use.

Cultivation:

Woad plants like an alkaline soil, so apply lime to the soil about a week before transplanting. For use as a dye - for dark colours woad needs plenty of nitrogen, which it can get from fertilisers such as dried blood & bone meal or hoof & horn meal.
Like other plants of the cabbage family, woad plants are susceptible to club root. Rotate annually and do not plant where other brassicas have been grown. Hardy to -15°C (5°F)
It will take 20 months to flower. The leaves are harvested when fully grown and 3 - 4 harvests can be made in total
Plants self-sow freely when they are grown in a suitable position, though they tend not to thrive if grown in the same position for more than two years. To prevent woad from self seeding cut back all but one or two flower stalks and the remaining flowers will provide all the seeds you need for the next season.

How to make woad dye...

Teresinha at **Woad.org.uk**

1. Harvesting the woad leaves

July and August are the best months for harvesting woad in the UK. Cut leaves from first year woad plants with secateurs, near to their base, and fill a supermarket carrier bag full (about 1250 grams).

Wash them well under the tap. Wash again by dipping and shaking a handful at a time in a bucket full of water. There is almost no blue dye in the stalks and, therefore, you can remove the stalks if you have many leaves.

2. Woad production - Tearing the leaves

Tear the leaves by hand (much easier than chopping them with a knife), and do not tear them too small otherwise they will go through the colander later on. It is OK to pick woad leaves either in late morning or in mid afternoon and then process it early the following morning.

If you can't process the woad straight away, keep the leaves in a closed supermarket carrier bag in the shade but not in the fridge.

3. Dye Extraction - Steeping the leaves

Fill a 10 litre stainless steel saucepan two-thirds full with water. It is best to use soft water, e.g. rain water. Heat the water up to 90°C but do not let it boil inside the saucepan.

Put the leaves in the saucepan and let them steep for just 10 minutes in water at 80°C.

4. Cooling the liquid

Remove the saucepan from the heat and put it in a bowl full of cold or icy water. The liquid must cool down quickly. This appears to be to prevent the woad from breaking down.

I aim to get the liquid down to 55 degrees C in 5 minutes. I keep stirring the saucepan and changing the water from the bowl. Sometimes I put a tray of ice cubes in the bowl to cool it more quickly.

5. Straining the liquid

When the liquid has reached 55 degrees C, put a colander over a bucket and then

strain the liquid through the colander.

Put on rubber gloves to press the leaves and extract all the liquid. Pour the liquid back into the saucepan leaving the debris behind in the bucket. The spent leaves can then go on the compost.

6. Adding soda ash

Fill a mug-size container with boiling water and add 3 teaspoons of soda ash (it produces less froth than washing soda), dissolve well and let it cool slightly.

When the woad extract liquid in the saucepan has cooled to 50°C, add the soda ash. Do not put soda ash when woad solution is over 50°C, or you will destroy the blue.

The vat will turn to a greeny-brown colour and the pH should be about 9.

7. Aerating the vat

The woad vat now needs to be aerated to precipitate the pigment. To aerate the vat, whisk with an electric whisk or a manual one. Some people pour the liquid from one saucepan to another.
I usually whisk for 10 minutes with an electric whisk until the froth turns blue and then green again. Sometimes the froth remains blue however long you whisk but this does not usually affect the results. Once, in late September, I had almost no blue in the froth but, to my surprise, a large amount of woad pigment settled out.

It takes about two hours for the froth to subside and I found it better to discard the froth using a spoon. After discarding the froth you will end up with a dark green solution with no hint of blue in it.

8. Settling out the Woad Pigment

Let the pigment settle undisturbed for 2 to 3 hours. Using a soup ladle, very gently transfer a third of the liquid from the top of the pan into a bucket. Pour the remaining liquid into 4 or 5 large coffee jars with the help of a funnel. Put the jars in the shade and let the sediment settle for a couple of hours.

Gently tip the liquid from the top of each jar into the bucket, leaving the last 6 cm of liquid in each jar. Using a large pipette (for example, a glass siphon sold as a turkey baster in kitchen shops) to siphon liquid from the top of the jar is even better. The pipette allows me to remove most of the unwanted liquid with little

disturbance to the pigment in the bottom of the jar. (Pipettes sold in wine making shops are often not very useful, as they are designed to remove pigment from the bottom of a container, rather than skim liquid from the top).

Consolidate the contents of the jars into one jar.

There is a small amount of pigment in the bucket, which could be used to dye a scarf with the chemical dyeing method, but I usually throw the contents of the bucket away.

9. Concentrating the Pigment

Let the liquid in the jar settle for a couple of hours. You may see a blue sludge at the bottom of the jar. Carefully empty 2/3 of the jar or siphon most of liquid away with a glass siphon. Then fill it again with clean water. Repeat two or three times more until there is clear water over blue sediment. This is very exciting!

[I have tried filtering woad using an old gold-plated coffee filter, but the woad went straight through. I have also tried a car pollen filter, supposed to be 100 micron, but the pigment went straight through that as well. The woad pigment does not go through proper filter paper used in chemistry. I put a square of filter paper folded inside a funnel, and the liquid dripped very slowly. It took me 24 hours to pass all the liquid through the funnel].

We are currently using a piece of Habotai silk to filter the woad pigment. First wet the silk, then place it on the funnel, with plenty of silk overhanging the borders of the funnel. Slowly pour the liquid into the funnel. A very small amount of pigment may go through, but most of the pigment stays on the silk. You let the

pigment dry on the silk and gently scrape it away with a blunt knife.

In the past we used Whatman Grade 1 filter paper, which has an 11 micron retention size, but a slightly larger micron size might also work well.

Fill the jar to overflowing one last time, and put lid on tightly. The woad should last for a year or more. It is better to use a glass jar to decant and store the woad pigment. In the past, I have used plastic soda water bottles and the woad pigment stuck permanently to the walls of the bottle.

10. Making woad dye - Drying the Pigment

The woad can now be used for dyeing or dried for more permanent storage. To dry the woad pigment, pour or siphon away as much water as possible from the glass jar, and then empty content of the jar into an old Teflon saucepan or frying pan; an old ceramic plate can also be used.

After a few days the woad dries up and peels easily from the saucepan. It helps if you keep the saucepan somewhere warm, such as near a radiator. I have tried drying on greaseproof paper, but the pigment stuck to the paper.

Yield

One large woad plant weighs about 700 grams. 1 kilo of leaves will produce between 1 gram to 4 grams of pigment. The yield depends on the soil, how well the plants were fed, and how warm the summer was. 1 gram of woad will dye about 20 grams of fibre. So if you only get a very pale blue from your first experiment don't despair. Try feeding your plants more, and collecting the pigment from several extractions, to get darker colours.

In this way, the dying will be made by students of Las Jaras (Majadahonda, Madrid). The palette ranges from turquoise blue to light green. That is why, there will never be two identical gardments.It is at the dyeing process that the fabric is dyed and finished.

The Isatis Tinctorea is sourced from sustainably managed cultivation in Santiuste de Pedraza (Segovia, Spain).

Design, pattern and prototype manufacturing

The last step in the process will be realised in a partnership between The Milky Way Fashion Project and students from Fuenllana Technological Institute (Alcorcón , Madrid), Higher Level Training program of Pattern and Middle-level Training program of clothing production.

The Milky Way Fashion Project ompleted the design of the garments, and the students from Fuenllana Technological Institute will made the pattern for these garments. The students prepare a computer pattern in different sizes from babys.

The prototype manufacturing will also be made by students from Fuenllana.

This improves the students professional internships.

Sales

Sales will took place through a website, and in the near future, a Milky Way Fashion Project store will be opened

Main conclusions

- Strong commitment to environmental friendliness in all the activities of the Project.
- The Project is seeking, in the same way, to create solidarity experiences such as working in an international team, to revive the sensitivity to women social problems as being integral to youth ministry and commitment.
- Being a stable solution to the problems of milk surpluses and the collapse of prices.
- Handcrafted work.
- Close cooperation from Vocational Educational Training.

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The Milky Way Fashion Project is an original idea by **María de la Luz Jiménez Castro**, Bachelor of Chemical Sciences from the Complutense University of Madrid, Master in Polymers at the Institute of Polymer Science and Technology (CSIC, Madrid) , Pattern Designer and professor of Textile Fibers in Fuenllana Technological Institute (Alcorcón, Madrid).

The process of trademark, enlisting and registration is currently ongoing.