



Julia Nehring

HOMETOWN

Austin, Texas

MAJORS

Environmental Studies, Spanish

ACADEMIC LEVEL

Senior

RESEARCH MENTOR

Mary Anne Jordan, *Professor of Textiles*

Q&A

How did you become involved in doing research?

I became interested in a plant fiber that has hardly been researched, so I created a hands-on project where I could test it out myself.

How is the research process different from what you expected?

I thought I would have to complete a full manuscript by the end of my research, but the project is what you make of it. While it wasn't my original plan, my research became more of a creative project than a scientific one. Changes like that are part of the process.

What is your favorite part of doing research?

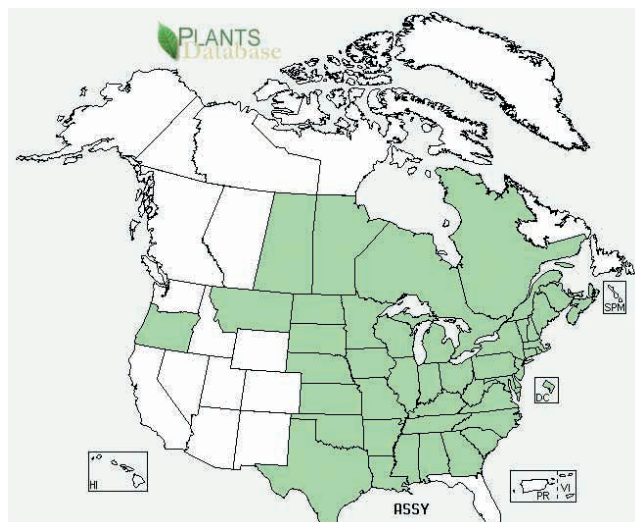
Realizing how many students are doing independent research, and the great breadth of the different kinds of research.

The potential of milkweed floss as a natural fiber in the textile industry

Julia Nehring

INTRODUCTION

I work at an on-campus lab called Monarch Watch and became interested in milkweed because it grows all over the country, extending into Canada, and it is the only food source for monarch larvae. Map 1 shows the states and providences in which common milkweed grows; there are other species of milkweed that grow in Florida and all the Western states ("*Asclepias syriaca*"). So not only are we surrounded by this plant, but it also provides essential habitat to one of America's favorite insects.



MAP 1

Unfortunately, as the name suggests, it does have the negative reputation for being a weed. Milkweed’s numbers are declining as people use herbicides to get rid of them, even though they are not particularly unsightly plants. Another source of peril to milkweed is the conversion of land to make room for monoculture crop production. This means replacing milkweed and other native perennials with row after row of one crop and using herbicides to kill off any native plant that might pop back up. No matter what the cause, its numbers are declining, thus putting the monarch migration in danger.

Monarch Watch is fighting against the destruction of monarch habitat. Several years ago, the organization began a campaign to restore milkweed populations all over the country. Volunteers from all corners of the United States send seeds to the lab, the lab sends the seeds to its partner nursery, the nursery grows the seeds into plugs, and then sells the plugs back to the public to plant locally.

My role in this supply chain involves processing the seeds when volunteers send them to us. The seeds are attached to fluff, which both grow together in a seedpod. People sent us pounds of these seedpods in the fall of 2013, and, as I handled them every day, I became more and more curious about the

fluff. I learned the fluff is actually individual fibers that are durable, hollow, buoyant, wax-coated, water-resistant and hypoallergenic. Above all, they are still very soft and have a cotton-like appearance. This fiber sounded incredible to me and I wondered why I had never heard of it being used before.

MILKWEED FLUFF USE

My initial research led me to find that the fluff has actually served several little-known purposes. During World War II, the Japanese cut off the United States’ supply to a fiber called kapok; without kapok, they did not have any stuffing for lifejackets. Subsequently, the government launched a program that enlisted the help of children: if they could fill up a large onion bag of milkweed fluff, they would receive fifteen cents. This incentive proved very popular, and the U.S. was able to stuff over 1.2 million life vests with milkweed fluff (Woodward).

The only current commercial role is its use in pillows and comforters. There are just a couple of companies that supplement down feathers with milkweed fluff. Table 1 shows the cost of milkweed fluff relative to the cost of down, making it easy to see why it is a sound economic choice. It is worth repeating that milkweed fluff is incredibly soft and hypoallergenic,

which are essential qualities in bed linen production.

Because it is so soft and looks like cotton, I was eager to find some use in textile production. The only examples I found in this category were demonstrated by a handful of eccentric women who took to the blogging world to showcase their spinning experiments involving all kinds of plant fibers, animal fur, and even their own hair. I could not find any commercial use of milkweed fluff in textiles.

PURPOSE

After realizing how little experimentation with milkweed fluff there has been in the textile industry, I chose to spin it into yarn to show its potential as a textile. The blogging women and my faculty mentor, Dr. Mary Anne Jordan in the Department of Visual Art, both agreed that milkweed fluff would be too brittle to spin on its own. This meant I had to choose a fiber to spin with it. Wool was selected because it is the easiest fiber to learn how to spin with, making it the obvious choice for a person, like me, who had no experience with spinning.

Since a 100% milkweed blend was not possible, the purpose of my project became finding the maximum amount of milkweed fiber that could be combined with wool.

TABLE 1

Market	Floss value (\$/kg)
Down	15-30
Nonwovens	1-20
Cotton/milkweed	1-5
Pulp and paper	0.5-1.5

Source: Knudsen

METHOD

This section will use the help of visual aids to show the process that led up to the eventual spinning of the fibers.



Step 1: Collect seedpods

As aforementioned, I handle the seedpods that people send to Monarch Watch from all over the country. Because seedpods are only ripe during summer and into fall, there is a narrow window of time in which people collected and sent their seeds.



Step 2: Separate seeds from fluff

The seeds are attached to the fluff so that they can blow away in the wind. Unfortunately, this meant a very time-consuming process to separate the two. This step involves dumping them both into the makeshift seed separator contraption (made from a garbage can) and giving it a few spins using the PVC pipe lever. The seeds fall to the bottom while the fluff floats around the top. Opening the lid afterward sent fluff flying everywhere, but this method was still faster than separating by hand.



Step 3: Weigh fibers

I selected several different ratios of wool to milkweed fluff that I wanted to attempt to spin. This step meant weighing the fibers based on these ratios, which are discussed in the next section.



Step 4: Card fibers

Once the correct ratios were measured, they needed to be carded, or blended together. This was the most time-consuming process, as I had to brush the two fibers over and over again until they all evenly lined up in the same direction.



Step 5: Roll into rollag

When the fibers were all aligned, they were rolled into what is called a rollag—basically just a concentrated form of the blended fibers that one spins with.



Step 6: Spin

Using the wheel, I handspun all the different samples. My spinning lessons began late into my research process, meaning the samples I made were never perfect, but they serve the purpose for this project.



Step 7: Ply

After spinning two separate rollags on two separate bobbins, I made yarn by plying them together, which basically means winding one around the other.

RATIOS TESTED

This section contains the image results of the different ratios I selected to test. The ratios were measured by weight; in doing this, I would end up with a huge pile of milkweed fluff and just a small amount of wool because the wool is so much heavier. This made it very difficult to card the fibers together—because the milkweed fibers are raw, they face all directions

and tend to fly away. The wool is used to help hold the fibers together, but having such a small amount made it difficult to blend.

I was pleasantly surprised that I was able to spin 75% milkweed; just a small sample took several hours, but it was doable in the end. The more milkweed I used, the fluffier and less uniform the yarn became.

RESULTS

Overall, using smaller amounts of milkweed fluff was much easier and took less time to process. If 75% milkweed was doable for me, though, then it would certainly be possible to have a more experienced spinner or a machine do the work.

When I presented my research at the Undergraduate Research Symposium, I asked people which yarn sample they liked best. I was very pleased to hear that people preferred the 25% milkweed blend to the 0% blend. This indicates to me that people like the texture and softness that milkweed fluff adds to the yarn, meaning that this sustainable fiber could have great potential in textiles.

FUTURE

In the future, I would like to try dyeing the milkweed-wool yarn to see how it holds color. Seeing how it holds up after several washings would also be essential if it were to be used in mainstream textiles.

Perhaps most important, though, is seeing how durable it is. To do this, I would like to weave samples of the different ratios. There are different professional ways to test the durability, but I will do a simple weight test. This involves starting with a small amount of weight on the sample, then adding more and more weight until, essentially, it falls apart.

Blending milkweed fluff with cotton could also help show the potential of the fiber in textiles. Milkweed fluff and cotton are very similar in size, so it may actually be easier to spin those two together.

Future researchers and/or artists should test the durability of textiles made with milkweed fluff to determine whether or not it could be suitable for large scale production. If it proves to be durable (throughout extended use and multiple wash cycles), then it could be grown in



100% wool, 0% milkweed



75% wool, 25% milkweed



50% wool, 50% milkweed



25% wool, 75% milkweed

mass. This means an increase in milkweed plants, which would result in more monarch butterflies and other pollinating species. It could also mean less dependence on less sustainable fibers, such as cotton.

ACKNOWLEDGEMENTS

Thank you to the Department of Visual Art for the supplies and use of the facilities. A special thanks is due to my faculty mentor in the department, Mary Anne Jordan, and the person who taught me how to spin, Danielle Yackle.

I am also very grateful to have received the Ruben Zadigan Award through the Environmental Studies program, which helped me fund this project. A huge thanks to the faculty in the program who inspire me to challenge the status quo and seek alternatives in every aspect of life.

Lastly, I would like to thank the Center for Undergraduate Research, which also provided me with funding and ample opportunities to better my research.

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