The fibre is being touted as the answer to a shortfall between cotton demand and supply. The Canadian company behind Crailar is targeting activewear applications, and its properties are also being harnessed in other areas of the sports sector.

Flax: reaping the benefits



As far as a "natural fit" for sportswear material, flax would not be the first that would spring to mind. It is one of the oldest known fibres, reportedly used as long as 34,000 years ago, and is grown in temperate climates, mainly across North America, China and Europe. The fibre is extracted from the bast or skin of the stem, with the best grades traditionally used for linen and the coarser parts used for other articles including rope. But, for the past few years, a Canadian company, Crailar, has been working on what it describes as the "ultimate" flax fibre, and is at the start of a journey it hopes will lead to it becoming more commonplace in clothing such as sportswear.

"I believe we're at the beginning of another important innovation in apparel," says Crailar's marketing director, Jay Nalbach. "As we work more closely with the partners we have, and talk to yarn spinners, mills and other innovators in the industry, we're going to see a growth trajectory for flax very similar to those we saw for man-made cellulosic fibres, like Tencel and Modal from Lenzing."

Crailar is hoping to piggyback on to that trajectory, last year signing an agreement for the Austrian company to develop a blend that should render it suitable for use in activewear. Dr Peter Bartsch, marketing manager for textiles at Lenzing, says the company is working on the requisite softness.

"We agreed the cooperation because we think it's an interesting fibre," he says. "But, of course, Crailar flax fibre and our man-made fibres are quite different in terms of spinability, fibre

Flax is harvested by pulling the complete plant from the ground as the fibre runs from the root to the tip of the plant. It is harvested after 90-120 days through low-intensity farming, adding to the environmental plus-points.

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quality, length and diameter, so the first step is to evaluate the spinning performance when you blend it together, to find out the optimal blending ratio, the utility values of the fabric later on in terms of pilling and shrinkage, and how to dye and finish it." He adds that they were towards the end of the testing and, if clients are happy, are ready to go into production.

Wheels in motion

At the start of this year, Crailar launched a production facility in South Carolina, US. In the past, flax's application has been limited by its structure, which allowed it to be woven into linen but not knitted like cotton. Crailar's enzymatic treatment process removes stiffening lignins from the flax, resulting in a fibre which it says has cotton's softness and durability and which is only two or three microns larger in diametre.

The company quotes a study from Cotton Inc, which says a kilo of finished cotton requires 2,120 litres of water, as well as a study by Field to Market, an initiative focused on sustainable agriculture, which puts the figure closer to 1,900 litres. It also suggests global demand for material is set to double by 2030, which makes that amount of water "undeniably significant, especially considering that 73% of cotton is produced on irrigated land". In contrast, Crailar says its flax only requires 17 litres to produce the same quantity of finished fibre — 99% less water than cotton, using Field to Market's research.

"We are very confident in the respect that we know from our testing and from building our facilities that we can yield twice as much useable fibre per acre than a modern field of cotton," says Mr Nalbach. "That's a really big deal – when you can get twice as much useable fibre off one acre of land with zero irrigation and very few inputs."

The company is in talks with Cotton Inc about possible tie-ups with some of the US's cotton producers who could use flax as a rotational crop – which, in a heavily summer-based crop region, could be an attractive proposition."If growers have got an interest to make another income and to clean up some of the pesticides and herbicides they've used on summer crops, this is the perfect way to do it. In a nutshell, we're asking people to do more work, but to make more money," adds Mr Nalbach.

Natural benefits

In terms of the material's advantages, the company says its flax wicks water better and absorbs up to 50% more water than cotton; and when blended 80/20 with cotton, garments require up to 10% less dyestuff and shrinkage is reduced by half. It is also chemical-free – up to the dyeing process – and requires minimal pesticides and herbicides to grow. "I believe we can find a footing as the second natural fibre that is grown in North America," adds Mr Nalbach.

However, the company admits that the process is a "learning curve", with blends needing to be refined and customers convinced of the benefits. It has been working with yarn spinners, including one of the largest in the US, Tuscarora Yarns. "Their expertise goes up to about 30 singles, so we may be speaking to other spinners that can take us to 40 singles and finer – but for the purposes of our partners and some of the sportswear testing we're doing, 30 singles is appropriate," says Mr Nalbach.

For the sports brands, a lengthy testing period is required before decisions are taken. "We're doing our best to work within their own supply chains, not disrupting what they currently do so we can enter seamlessly into their raw material needs," adds Mr Nalbach. Crailar is looking at various performance blends with branded polyester fibres – wicking attributes, stretch, shrink and strength, and odour reduction. Nike, Under Armour and adidas are testing samples; outdoor group Hanes and denim company Levis Strauss already have lines in production.



With 50 million players worldwide, the tennis market is significant, and CELC showed adding flax can reduce the risk of muscle injury.

CELC

Crailar is not the only company pushing flax in the direction of sportswear. China's Duksung was showing Organo, a linen/cotton mix, at the recent Premiere Vision trade show in Paris. The flax is from China and organic cotton from Turkey, it is spun and woven or knitted in China and finished in Korea. Speaking at the show, Reebok's creative director of apparel, Johan Buskqvist, said of the fabric, "The handle is really important. I like the linen blend with a colourful and iridescent coating. It's lively, with a relaxed handle and a colourful shine."

Wide-ranging applications

Three years ago, a scientific committee set up by CELC, the European Confederation of Linen and Hemp, began to research flax's properties as a composite. "At first we set out to compete with carbon and glass fibres, but we didn't understand flax fibre and its intrinsic properties," says Professor Ignaas Verpoest, president the committee. "To produce one kilo of flax fibre uses five times less energy than one kilo of glass, and 20 times less than carbon fibre; flax is also

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For downhill skis, like these from Rossignol, using flax fibre reinforcement offers better vibration damping, which makes them more comfortable on hard snow.
CELC

half the weight."

Research by the 10-strong team led to some surprising findings – including flax's ability to withstand shock. "The ability to reduce vibration is very interesting as there are problems with vibration in standard composites," explains Mr Verpoest. This made them realise there was significant potential in the sports and leisure sector, particularly as applications using flax-reinforced thermoplastic and thermoset composites fibres are both environment friendly and technical.

Artengo, the research company behind French sportswear group Decathalon, invested in a project to test the material for tennis racquets. The flax was incorporated into the frame as drape-formed plies of flax/epoxy and carbon/epoxy prepregs. The research concluded that a flax content of 8% to 25% gives effective results that reduce the risk of tennis elbow. A racquet incorporating 15% flax content improves the damping factor by 22%. Today, seven models are on the shelves, alongside a raft of other flax composite products: surfboards, fishing poles, helmets and mountain bikes, as well as skis by French ski companies Rossignol and Idris.

"We can mix polymer with a ribbon of unidirectional flax, which didn't exist a few years ago," adds Mr Verpoest. "There is both determination and know-how within the linen industry and so, over a short time, several industries and partners have developed new types of yarns and textiles."

At a meeting at Leuven University in Belgium in December, the committee presented its latest findings to the sports equipment industry, automotive and aviation groups, among others, which demonstrated the wide-ranging applications of flax. A spokeswoman from CELC suggests that advances that companies such as Crailar are making are also helping to boost the fibre's profile around the world.

Mr Nalbach says Crailar will attend the upcoming textile and sports trade fairs, discussing possibilities with brands, and intends to have its own stand at Outdoor Retailer in Salt Lake City in August. By that time, there should be a number of commercially available products to show to interested parties.

"Competitors are all fibres – and our friends are all fibres, as well," he adds. "We're not battling for any ground in flax or bast fibres because our process results in a fibre that is wholly unique. It's something all fibres, all spinners, all brands can learn about and figure out how to work into their own products without fear of it coming at them from any other source."



This flax-reinforced helmet weighs less than a fibreglass version and is better ventilated, thanks to the capacity of natural cellulose fibres to absorb moisture.
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