



Worth the Wait

Going green takes a historic turn with the creation of the bioresin container, as well as a new industry to support it.

BY SALLY BENSON

You've read the stories. You've heard the rumors. You've probably uttered the groan-inducing cliché, "a chicken in every pot". But the work that's going into creating horticulture containers from chicken feathers is very real, and very serious.

And to many in the industry, it seems it's taking a long time. The initial agreement to begin the project—involving partners the Horticultural Research Institute (HRI), the research affiliate of the American Nursery & Landscape Association (ANLA), and the USDA Agricultural Research Service (ARS) Environmental Quality Laboratory—was signed in 2006. We've seen prototypes of the containers, but they have yet to reach the market. Keep in mind, though, that Rome wasn't built in a day, and neither is a whole new industry.

And that's what it takes. Although the temptation is to focus on the novelty of making pots from chicken feathers, bringing a new product to market entails more than coming up with a concept and producing a pot. An entire supply chain must be created. As Marc Tefteau claims, "We're actually bringing a brand new chemistry to the marketplace." Tefteau is director of research for HRI, and he explains, "As we've moved the research forward and learned more about the material, [we've found] it's not a linear process."

Rather, it's step by careful step. Consider a plastic water bottle, Tefteau says. "Think about all the steps that have to go into making that plastic water bottle and filling it with water. You must engineer a mold to make the bottle, set up the processing facility, establish a supply chain to get the water into the bottle, plus the plastic resin to make the bottle. Then you must package the bottle, develop a market for the bottle We've had to do all that. It's time-consuming and technically challenging."

Turning fluff to stuff

The science of turning fluffy white chicken feathers into a hard, plastic-like material has been around for a



Chicken feathers, which are composed entirely of the structural protein keratin, are ground and pelletized into a bioresin. Eventually they'll become biodegradable containers.

while. Work began in the early 1990s, when researchers at the USDA's Agricultural Research Service (ARS) developed methods to extract keratin, a structural protein, from feathers. Keratin is a natural biopolymer; as such, it is self-sustainable and biodegradable. And considering the size of the U.S. poultry industry, it's continuously renewable. It's estimated that between three and five billion pounds of feather waste are produced annually, and although some of that supply is used for pillow stuffing or ground into cheap animal feed, nearly 80 percent of it is simply discarded.

ARS chemist Walter Schmidt saw an opportunity to kill two birds with one stone, and research was initiated to reduce the amount of waste and turn the material into useful products. Schmidt's initial efforts resulted in the production of decorative paper, filter paper, filters and absorbents—all from a waste product that would otherwise have ended up in a landfill. The process of converting feathers into fiber was patented in 1998, and in 2000 Schmidt and his colleague worked with the auto industry, adding the fiber to existing plastics to manufacture dashboards.

Soon it was discovered that the bioresin fiber could be molded, and uses in biodegradable packaging were pursued. The leap from feather to resin to moldable product—and to a reliable, biodegradable material for plant containers—appeared to be natural. And it is. But you can't make it work overnight.

It's not about the feathers

Because bioresins don't perform in the same way that a petroleum-based product performs, it was necessary to approach the project with fresh eyes. "It's not about the feathers," Tefteau says. "It's about the resin product, and the manufacturing process. We needed to understand this from a plastics industry standpoint." Which meant partnering with container manufacturers and learning how to adapt their procedures and equipment to a new, raw material. Mechanical requirements were reviewed and evaluated, and retooling—or the expense of replacing machinery—was considered.

"Once the resin was made," Tefteau says, "we had to go to a pot manufacturer and ask what their technical requirements were. Not only on the final product, considering its breakage impact and whether it would stand up to

stacking and shipping, but also the performance standards required in making the pot."

Several container manufacturers signed on as partners in the research, including Nursery Supplies, Inc.

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One partner's role

Nursery Supplies, Inc. (NSI), located in Chambersburg, Penn., signed on early as a partner with the Horticultural Research Institute in its chicken-feathers-to-plant-container program. Says Rob Summers, vice president of sales, "NSI has been involved all along the journey in the development of this potential solution with technical support and the use of our manufacturing resources in the testing of the various formulations."

In working with HRI, "NSI has been acting as a manufacturer partner in the project, providing our machines for trial runs of the HRI developed solutions," Summers explains. "We of course are giving guidance to HRI as the trial formulations are run."

The company long has incorporated recycled materials into its products, and is increasing the percentage of post-consumer and post-industrial regrind and reprocessed material. "NSI currently utilizes 100 percent recycled material in place of virgin plastic in all our black containers and to the levels possible in our color containers via color sort recycle and other methods," Summers says. "The keratin-based offering will be another piece of the raw material puzzle that we will incorporate at the highest levels possible based on manufacturing and the economics of the product."

Which brings up a critical point: the cost.

Economic realities

"Our desire is to have these products as close to 'cost neutral' as possible," Summers says, "but at this point that is a little premature. The infrastructure for mass availability has not been developed yet, but once the process is fully trialed, we expect that to change."

The perceived value and the true cost of an innovation may be two entirely different things. And ultimate cost to the consumer has been a part of this project's complicated equation all along. "If we were to bring a green, resin-based container into the market," Tefteau says, "it had to perform cost-effectively." Throughout the research and development, it's been critical to "adapt the product to meet current production requirements." Costly retooling would necessarily up the ante, and adaptation takes time. "The R+D," Tefteau explains, "has been longer and more intense than a lot of people thought."



USDA-ARS chemist Walter Schmidt and HRI director of research Marc Tefteau examine plant containers made from chicken feathers.

Additionally, one pot does not fit all. Because plastic is built to last—and last, and last—it doesn't really matter if it contains a woody plant or a perennial. It may eventually be chipped, but it does not biodegrade. Bioresin containers can be reused; although they're formulated to degrade, they won't begin to do so until they're exposed to soil. This necessitates different resin formulations for long-term use, such as with woody ornamentals, and for shorter turnaround plants, such as perennials or annuals. More research; more testing; more time required to perfect the product prior to a market rollout.

End users of the product are necessarily considered in the cost versus value balance. On the one hand, the current eco-craze encourages home gardeners to "go green" whenever and wherever

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they can. However, the current economy requires that they watch their pennies—whenever and wherever they can. Good intentions may be strong, but the pocketbook can be stronger. “Let’s dispel a myth,” Tefteau says. “The consumer wants to be green, but the consumer is not willing to spend his green to be green. If [a sustainable product] costs

“The consumer wants to be green, but the consumer is not willing to spend his green to be green. If [a sustainable product] costs 20, 30, 40 percent more, they won’t buy. It’s an economic fact of life.”

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Professional customers (ornamental plant growers), adds Tefteau, “are extremely price-point conscious on all inputs. If they don’t see any return in that investment in the marketplace, they’ll not participate.”

There’s more: Working with poultry producers, who provide the feathers and are happy to be rid of them, means another partner in the project with the potential to increase turnover and, inevitably, cost. The more you handle the material, the more you pay to do so. But there’s a built-in solution to keeping costs in line.

Domestic poultry producers may realize a reliable source of additional income while eliminating another step in the process. Rather than dump the waste, poultry producers now may incorporate the bioresin processing facilities onsite. It’s more cost-effective to locate the pelletizing plant at the source than it is to gather the waste, transport it to a processing plant, then move it again to a container manufacturing plant.

Marketing—and environmental—advantages

If the cost is right, bioresin containers made from chicken feathers may give growers that extra marketing edge. Summer explains: “I believe the grower would embrace the ‘eco-marketing’ side of this offering, as it utilizes a supply source that is currently being placed in landfills, so with the avoidance of the millions of pounds of chicken feathers that go to landfills and the pounds of traditional plastic that would be replaced by the keratin-based product, the grower would have a platform to build around in a marketing effort to growers and retailers.”

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Using a biodegradable pot has its value. Add to that the caché of chicken feathers, and you've got another bullet in your marketing arsenal. But what may also help to sell this product is the fact that it's homegrown. "We're using a domestic waste product," Teffeau offers, "and because of restrictions in the exclusive license with the USDA, the project must be produced in the U.S. Plus, it's not in the food stream, not like ethanol."

An added benefit? It reduces our reliance on foreign petroleum products currently used in container production. This helps the industry realize a dual advantage: It avoids the ever-escalating cost of petroleum, and keeps the dollars flowing stateside.

Teffeau sees feather-based, bioresin plant containers as "a transitional green product. We're replacing a petroleum-based resin with an agricultural waste product and moving toward a container that's 100 percent biodegradable."

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Progress has been sure and steady. HRI recently was granted the exclusive U.S. and Canadian license rights for the 2006 U.S. Patent No. 7,066,995, "Compositions and Films Comprised of Avian Feather Keratin." The organization has formed a for-profit, wholly-owned corporation—Green Industry Innovations LLC—to promote the commercialization of products resulting from its research—ultimately, the keratin-based, bioresin, eco-friendly, chicken-feather pot.

Considering the overall benefits, it'll be worth the wait. ♡

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