According to the company, the technology combines advancements in plant sciences, agro-nomics and processing to produce cost-competitive sugars, oils, proteins and other green chemicals. This breakthrough will allow the company to compete with the economics of oil production, the company claims; adding that one acre of its patented non-smoking tobacco will outperform corn, soy and other cellulosic feedstocks.

**Tyton BioEnergy takes step toward marketing tobacco-based products**

Tyton BioEnergy Systems, a US company headquartered in Danville, Va., announced in September that it had installed its patent-protected, pilot-scale extractor. The installation means the company is on the way to commercialising its tobacco-based green chemicals and agricultural products.

Tyton BioEnergy’s prototype extractor converts green energy tobacco leaves and stalks into products for the green chemical, biofuel and agricultural industries.
Tobacco stalks and leaves are put through a machine that chops them up in preparation for the extractor

Peter Majeranowski, co-founder and president of Tyton BioEnergy System
In the next 12 months or more, scientists at Tyton BioEnergy will run the pilot extractor to see how well it performs on a regular basis using harvested tobacco. Majeranowski says they will conduct tests to narrow down the parameters to design a larger extractor in the future. That is when more growers and tobacco may be needed.

Field work

Tyton BioEnergy plants two modified, non-smoking varieties that are different than the typical smoking varieties. The first, developed in Italy, resembles an oriental tobacco. It is a high-seed one which grows more flower blooms than typical tobacco plants.

In September 2015, Tyton BioEnergy teamed up with Deinove, a French publicly traded biotech company, to use Tyton’s tobacco sugars to help produce their renewable chemicals. Deinove produces biofuels and bio-based chemicals using Deinococcus bacteria as host strains, according to a press release. Presently, Deinove uses sugar from sources such as corn, wheat and urban waste. Now with the help of Tyton BioEnergy, it will use tobacco as a sugar source, possibly in a more economical way. In the future, the two companies hope to commercialise renewable chemical options, starting in the Southeast region of the United States.

In October 2015, Tyton BioEnergy announced collaboration with Italy-based Sunchem to do research and commercialisation. The partnership would combine Tyton BioEnergy’s research, development and commercial capabilities with Sunchem’s Solaris tobacco variety, according to a press release. The partnership’s goal is to advance tobacco-based green chemicals and biofuels. They will conduct research projects in Tyton BioEnergy’s Danville laboratories in order to boost productivity of Solaris tobacco and to optimise extraction using Tyton BioEnergy’s patented technology.

In the press release, Sunchem’s Chief Executive Officer Sergio Tommasini says the two companies together will accomplish more and “demonstrate that tobacco is the crop of the future, capable of competing with the economies of oil while increasing income for farmers and protecting the planet.” Sunchem also is collaborating with SkyNRG, RSB, South African Airways, Boeing, ENI and Alitalia-Etihad. Their plans are to produce jet fuel from Solaris along with other green components such as paper and biomass, both for biogas and power generation. Sunchem patented Solaris-Energy Tobacco and was granted that patent in more than 100 countries. The company focuses its efforts on the production of Solaris tobacco seeds which can be used as a source for tobacco oil that can be refined into diesel, jet fuel, bioplastics, feed-cake and additional green chemical components.

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Field work

Tyton BioEnergy plants two modified, non-smoking varieties that are different than the typical smoking varieties. The first, developed in Italy, resembles an oriental tobacco. It is a high-seed one which grows more flower blooms than typical tobacco plants. The second variety was developed in the Tyton BioEnergy laboratories in the US city of Philadelphia and is similar to a dark fire-cured variety. This genetically modified variety creates a high sugar and high oil, Majeranowski says, and the oil is in the large leaves instead of the seeds. This allows the company to harvest the entire plant for both ethanol and biodiesel.
When grown in the field, Tyton BioEnergy varieties are spaced closer together to produce more plants per acre or to maximum density, Majeranowski says. For instance, the traditional tobacco variety is grown at about 6,000 plants per acre. In comparison, the Tyton BioEnergy high-seed variety is grown at about 25,000 plants per acre. Its high-sugar and high-oil variety is grown at about 15,000 plants per acre. A less expensive fertiliser is used to grow the plants, but it is much like a traditional one that growers apply. “We thought by adding more plants we were going to need a little more fertilisation,” he says, “but we haven’t had to.” Sucker control is unnecessary. When harvesting, growers just cut the entire stalk either by hand or with a machine. Unlike traditional flue-cured tobacco, the leaves are not cured. Instead, the whole stalk with leaves are just brought to the Tyton BioEnergy facility in Danville after the tobacco is cut.

“We’re trying to automate it as much as possible,” Majeranowski says. What will Tyton BioEnergy pay for the grower-raised tobacco? “We’re trying to determine all the outputs for that,” Majeranowski says. “Traditional tobacco will still be more profitable per acre. However, we’re not trying to compete for that traditional tobacco acreage. We’re competing for that land, and we think we can be more competitive than corn. We’re very much trying to repurpose tobacco to become like a row crop.

“It’s very adaptable in different countries,” he says, “and it also can grow places where traditional row crops cannot.”

A new buzz

The beginnings of this new research buzz started with the nonprofit institute, Biotechnology Foundation Laboratory in Philadelphia. The institute’s founder, Hilary Koprowski, wanted to create plant-based vaccines and did so, but he believed more could be done. He challenged Majeranowski to come up with other ways to utilise plant-based crops. Majeranowski decided a plant, other than corn, to produce fuel energy was worth pursuing. So he knew he could raise tobacco plants in a large density per acre with an increased sugar and oil content.

To head down the preferred path, in 2009 the Biotechnology Foundation Laboratory filed a patent to increase the natural oil in green biomass. Shortly afterward, the institute formed Tyton Biosciences, now known as Tyton BioEnergy Systems. In 2011, Tyton Biosciences filed a second patent to increase sugar as a precursor to oil formation. While Majeranowski and other scientists were proficient in the laboratory, they knew little about growing tobacco.

To seek more factual information about raising the crop of tobacco, Tyton BioEnergy sought out the help of university agronomists and tobacco growers. The company has been conducting field trials on university research farms and at on-farm sites. Some of the US universities involved include Virginia Tech, North Carolina State University, University of Georgia, and University of Kentucky. Majeranowski chose tobacco for the company’s research because the plants are easily manipulated and “because tobacco is the most widely grown non-food crop in the world.” He and his co-founder and chief technology officer, Julian Bobe, settled on Danville for its long history of tobacco growing and university research in Virginia as well as North Carolina.

“What better place in the Commonwealth of Virginia than Danville, Pittsylvania County: this entire area to locate a potential new use, multiple uses, for leaf tobacco,” says Todd Haymore, the Virginia secretary of agriculture and forestry. “It just made such sense.” Because of the increasing buzz on biotechnology, Haymore believes it will become one of the leading industries for the future of Virginia. “There are so many things to be discovered, undiscovered out there that can lead to new opportunities in job creation.” Haymore says he is excited to learn more about what Tyton’s future plans are for uses of a crop that has been around Virginia since colonial times, when early US settlers grew tobacco and exported it to England. Tobacco is the top export of Virginia, he says, and Virginia’s governor has said that he wants to establish the commonwealth as the East Coast capital for agriculture and forestry exports. Last year, Virginia recorded USD 3.35 billion (EUR 3.1 billion) in agriculture and forestry exports. “This [Tyton BioEnergy] product at some point in the future could probably play a role in that growing export market,” Haymore says.

While traditionally grown tobacco is still an important export, possibly, the new Tyton BioEnergy use will increase jobs in the future. Hopefully, he says, this new use for tobacco will give tobacco growers more opportunities in the global marketplace.

Rocky Womack