Burley Harvest and Stripping Mechanization

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Burley tobacco production is very labor intensive, with the biggest part of the labor requirements being harvesting and stripping. Considerable effort has been put into mechanizing harvesting and stripping operations over the years, but as labor remains available at reasonable rates, it is less costly to manually harvest and strip the tobacco than to invest in available mechanization. Accordingly, adoption of new mechanization concepts and devices by producers has been sporadic and short-lived; however, increased difficulties with the availability and cost of labor may spark renewed interest in mechanization.

**Harvesting**

The automated burley harvesters manufactured by GCH International were used to harvest large amounts of tobacco on farms in both Illinois and Kentucky from 2006 to 2009. These machines can drastically reduce the labor requirements for harvesting tobacco, but the system is very expensive. Only one of the units originally manufactured is still in use in the United States. That unit has been used to harvest approximately 80 acres annually on a farm in Henry County, Kentucky. Meanwhile, a tobacco growers’ cooperative in France purchased a new unit of the harvester from GCH and used it to harvest approximately 60 acres in 2011. Subsequently, they purchased a second unit and used both to harvest approximately 165 acres in 2012 (Wells et al., 2012). The quality of the cured leaf using the automated harvester system has been judged to be equivalent or superior to that from conventional harvesting in France, and efforts are continuing there to reduce system cost and improve reliability.

Three-point hitch mounted plant-notching harvesters manufactured by MarCo Manufacturing Company and Kirpy generated considerable interest from growers following their demonstrations at field days in 2005-2007, and a few of them were purchased and used by growers in Kentucky, North Carolina, and Indiana. In the past few years, however, many growers who own the machines have quit using them. There are many reasons for the waning interest in these notching harvesters. While they do speed up cutting operations, the labor savings are largely offset by increased labor requirements for hanging the notched plants one by one on wire, compared to hanging sticks of 5 to 6 stalks of tobacco on a stick. Also, use of the machines imposes some constraints on managing harvest labor. Wagons filled with fresh-cut loose plants cannot be left for more than a few hours before hanging. Stick-cut tobacco can be left in the field for a few days or on a wagon overnight before hanging. Large labor crews may not be able to work largely unsupervised as they can with traditional stick harvesting operations. Another severe limitation is the difficulties these and other harvesting machines have with handling wind-blown, crooked tobacco stalks, as are concerns about excessive losses due to leaf breakage (Wilhoit and Duncan, 2012).

A harvesting concept that partially mechanizes tobacco harvesting operations was developed in the Department of Biosystems and Agricultural Engineering at the University of Kentucky during 2013 to 2015. With this concept, traditional stick-harvested tobacco is loaded onto loose wooden rails carried through the field on a rail wagon, and then these rails are picked up from the rail wagons and set in place on field curing structures using a large set of forks on a tractor front-end loader. The loads of approximately 50 sticks each can be transported to field structures using the tractor with front-end loader provided the distance to the structure is not too far (approximately 600 ft or less). Trials were conducted in 2014 evaluating the use of larger unit loads transported longer distances by tractor to permanent field curing structures. With this configuration of the system, the loader tractors stay at the structure, while multiple transport units (tractors pulling trains of rail wagons) cycle between the tobacco field and the field curing structures. The results of these trials with the larger unit load configuration were encouraging. A benefit of this configuration is that it can be adapted to increasingly larger scale operations by adding additional tractor/rail wagon trains. As with other outside field curing structure systems, the wooden rail harvesting system eliminates hazardous hanging work high off the ground and significantly reduces hanging labor requirements, compared to hanging in traditional tobacco barns.

**Stripping and Market Preparation**

A mechanical leaf-removing stripping machine developed by Carolina Tobacco Services that was introduced at tobacco field days and trade shows in 2006-2007 initially received considerable interest from the tobacco industry. The CTS stripping machine uses “sticker” type chains to hold the tip end of plants hanging vertically downward, conveying them past angled wiper bars that strip off leaves as the plants move through a length of 14 to 16 feet. Different leaf grades fall into boxes below the plants along that length. Tips must be stripped by hand before loading the plants into the machine. Evaluations conducted both by the University of Kentucky and the University of Tennessee have shown that this machine can significantly improve labor efficiency over typical manual stripping. In one study, a crew of seven workers could strip around 70 pounds per worker-hr., or about 35 worker-hr./A for a 2,500-pound per acre crop (compared to 50 to 75 worker-hr./A for conventional stripping) (Wilhoit and Duncan, 2013). This technology was not widely adopted by growers.

References


Tobacco-specific nitrosamines (TSNAs) are so called because they are formed from tobacco alkaloids, and found only in tobacco leaves and in the particulate phase of tobacco smoke. With the current emphasis on the health risks of tobacco, TSNAs reduction has become a major issue for the tobacco industry.

Several TSNAs have been identified, but interest has focused on the four most important: NNK, NNN, NAT, and NAB. Of these, NNN is the most important in burley and dark tobacco. NNN is the most important in burley and dark tobacco.

How Are TSNAs Formed?

Negligible amounts of TSNAs are present in freshly harvested tobacco. They are mainly formed during curing, specifically during the late yellowing to early browning stage. Typically this occurs over a two-week period between the third and fifth week after harvest, but can be earlier or later depending on curing conditions.

TSNAs are formed by the nitrosation of tobacco alkaloids (addition of a nitrogen and an oxygen atom to the alkaloid molecule). NNN is formed by the nitrosation of the alkaloid nornicotine. The nitrosating agent in air-cured tobacco is usually nitrite, derived from the reduction of leaf nitrate by the action of microbes during curing. In fire-cured tobacco, the nitrosating agents are both nitrite and any of several nitrogen-

References


