RESEARCH NOTE
TOBACCO SCIENCE

MECHANICALLY TOPPING BURLEY TOBACCO

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The purpose of this research was to compare mechanical- and hand-topping to determine the feasibility of adapting mechanical topping for burley tobacco. The objectives were to determine the labor requirements, topping efficiencies, number of leaves per plant after harvesting, and number of leaves damaged during topping for hand- and mechanical-topping. The results showed a 67% reduction in labor requirements for mechanical-topping compared to hand-topping, but at a sacrifice in topping efficiency of 96% for mechanical-topping compared to 100% for hand-topping. About one leaf per plant was damaged during mechanical-topping, but the number of leaves per plant after topping showed no significant difference. Mechanical-topping is a viable alternative to hand-topping for burley tobacco.

Additional key words: hand-topping, labor requirements, efficiency.

INTRODUCTION

Burley tobacco (*Nicotiana tabacum* L.) is produced in the United States primarily in Kentucky, Tennessee, western North Carolina, Virginia, Ohio, Indiana, and Missouri. Methods of labor reduction are always of interest among burley tobacco producers. Labor requirements for producing burley tobacco have been reduced from 1014 labor-hr/ha in 1952 (1) to 557 labor-hr/ha in 1990 (2). A recent innovation is the float plant system, which provides relief from pulling plants and further reduces labor requirements by 30 to 38 labor-hr/ha (3). The float plant system was developed in the flue-cured tobacco belt and adapted to burley tobacco, and it is thus natural for burley producers to look to flue-cured production innovations that can be adapted to burley tobacco.

Among burley tobacco producers, the numbers of new producers are fewer than that of retirees. As burley production moves toward a consolidation of quotas into larger production units, producers are searching for ways to reduce labor. Flue-cured tobacco producers have mechanically topped their tobacco for several years, but burley tobacco producers are still hand-topping their tobacco. Because they are already commercially available, burley producers may look toward mechanical toppers as a potential means of reducing labor input.

A two-year experiment was conducted to evaluate the application of mechanical-topping to burley tobacco. Specific objectives of this research were 1) to evaluate machine-topping efficiency by determining the percentage of plants topped, 2) to determine the labor requirements of machine- and hand-topping, 3) to evaluate machine-topping quality by determining the number of partially severed leaves, and 4) to observe other factors such as tendencies in topping height by machine- and hand-topping.

MATERIALS AND METHODS

A high-clearance machine with two commercial toppers (Powell Manufacturing Co., Inc., Bennettsville, SC) with lawnmower-type blades was used in this research. Centrifugal fans directed air vertically downward at the tobacco plants to blow the leaves downward during topping to minimize the number of partially severed leaves. The toppers were mounted on a high-clearance sprayer and connected by a common shaft that was powered hydraulically. The toppers were mounted near the front of the sprayer so that the operator had a clear view of the tobacco entering and exiting the toppers. Topping height was 1.44 m at a machine speed of 4.9 km/hr.

Data were collected over two years. Three blocks were topped the first year and two blocks were topped the second year. Eight

[1]The investigation reported in this paper (97-05-86) is in connection with a project of the Kentucky Agricultural Experiment Station and is published with the approval of the Director of the Station.

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Contribution received July 14, 1997. Tob. Sci. 42:16-17, 1998.

Table 1. Mean values of labor requirements, topping efficiencies, number of leaves per plant after topping, and number of leaves damaged during topping for mechanical- and hand-topping.

	Mechanical Topping	Hand Topping
Labor requirements (minutes/1000 plants)	8.1	24.4
Topping efficiency (percent)	95.7	100.0
Total leaves/plant after topping	22.5	23.6
Leaves damaged/plant during topping	0.8	0.0

Mean values of labor requirements, topping efficiencies, and leaves damaged/plant were significantly different by analysis of variance at the 1% level. Mean values of total leaves/plant were not significantly different at the 5% level.

rows (an average of 320 plants/row) were hand topped and 12 rows were mechanically topped in each block. Time and motion data were recorded for both hand- and machine-topping to provide a comparison of labor requirements on the basis of the time required to top 1000 plants. All blocks were at one-third bloom stage for hand-topping and the first pass of machine-topping. Machine-topping required a second pass at the same height 10 days later to top the smaller plants that were missed on the first pass. The time required for both passes of the mechanical toppers were summed and compared to the labor requirements of hand-topping. The percentage of topped and untopped plants were determined by counting topped and untopped plants.

Other data recorded were average number of leaves per plant for both hand- and machine-topped tobacco and number of severed leaves per plant for the machine-topped tobacco. The former was accomplished by randomly selecting five plants in each row and counting the leaves on each plant. The latter was accomplished by randomly selecting 10 plants in each row after the second pass and counting the number of leaves severed during mechanical-topping.

The effect of mechanical- and hand-topping on labor requirements, topping efficiency, total leaves per plant after topping, and leaves damaged per plant during topping was determined by analysis of variance.

RESULTS AND DISCUSSION

Mean values of labor requirements, topping efficiencies, number of leaves per plant after topping, and number of leaves damaged during topping for mechanical- and hand-topping are shown in **Table 1**. Topping by machine, even when two passes were required, was much faster than topping by hand, requiring 67% less labor. Topping efficiency was sacrificed when using the machine (96% compared to 100%) to gain the speed of topping. About one leaf per plant was severed by mechanical-topping.

The advantage of mechanically topping burley tobacco comes in the machine's ability to cover large acreages of tobacco. The data taken in this paper does not consider breaks for the hand laborers which would likely be greater than breaks for the machine operator. Mechanical-topping of four rows at a time is feasible if a four-row transplanter is used to transplant the crop. The machine could be operated more than eight hours per day, thus increasing coverage, whereas workers topping by hand would be greatly fatigued at the end of the day. The mechanical topper may also be run at a higher speed than in this study. The operator felt that a one-third to one-half increase in ground speed would be feasible.

The major conclusion from this research is that mechanical-topping of burley tobacco is recommended as a viable alternative to hand-topping. The major advantages of mechanical-topping are the ability to cover large production areas in a timely manner and a major labor savings compared to hand-topping.

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