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Limitations and Benefits to Cultivating Tobacco

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Introduction

Historically, between-row cultivation for weed control has been an integral part of tobacco production. In one season, a grower might perform five or more cultivations and several hand weeding operations for adequate weed control. Early herbicide chemistries would control some weeds, but not all, forcing the producer to cultivate and hand weed. The development of better herbicides improved the range of weeds controlled, sometimes to the point that cultivation for weed control was not warranted. Many producers are so accustomed to cultivating they have forgotten why cultivation was necessary. The decision to cultivate should largely be based on the presence of weeds, but there are exceptions.

Cultivation loosens the soil between tobacco rows at depth and distance (from the row) settings that depend on equipment type and cultivator shank arrangement. Some weeds are directly removed from soil by cultivation and other weeds are killed by disruption of root to soil contact. Without adequate root to soil contact, weeds are not able to acquire water and die. This also occurs if the cultivator shank gets too close to a tobacco plant. Shaking, shifting or turning tobacco plants when cultivating too close causes them to wilt and results in sunscald, severe stunting, and potentially death, especially if there is no rainfall shortly after injury. Tobacco roots typically grow horizontally as far away from the plant as the width of the leaves. Cultivator shanks are often set close to the plant row to remove as many weeds as possible, and this can disrupt or prune a large percentage of tobacco roots. This phenomenon is sometimes referred to as “steel shank” because of similar visual plant symptoms as those due to the fungal disease black shank. Contrary to the belief of some, root pruning is not advantageous to tobacco yield.

Another process that occurs during cultivation is the movement of moist soil from a greater depth to the surface, where this moisture evaporates and is not utilized by the tobacco plant. Further, the deeper the cultivation, the greater the amount of moisture lost from the soil and the crop. The old adage “when you plow tobacco you bring up moisture from depth so the plant can utilize it” is entirely wrong..

Reasons to cultivate

There can be reasons other than weed control for cultivation or pre-season tillage. Incorporation of soil applied fungicides after planting places the chemical closer to the root zone, where it is needed to control the fungal pathogen. Incorporation of some soil applied herbicides and fungicides will reduce photodegradation. Incorporation of urea based fertilizers will reduce volatilization losses of N when urease inhibitors are not used.

Some soils can form fairly dense “crusts” with significant rainfall after tillage. These crusts reduce infiltration and increase surface runoff and soil erosion. Surface soil compaction in areas trafficked during transplanting may increase water runoff in these tracks. Cultivation is an acceptable method to break up surface crusts and reduce this occurrence. Another reason to cultivate may be to smooth or level a field after substantial erosion. However, if another intense rain occurs, soil loss by erosion can recur.

Limited data suggests that “throwing” soil to the base of the plant might reduce the incidence of ground suckers. Complete coverage of suckers is necessary to accomplish this. Covering the base of tall, “leggy” transplants with soil can help to prevent lodging as these plants become larger later in the growing season.

Reasons not to cultivate

Cultivators and equipment tires can move soil to other locations within the field. This can spread soil borne diseases such as black shank (*Phytophthora parasitica* var. *nicotianae*) and Fusarium wilt (*Fusarium oxysporum*). Both diseases can cause tremendous yield loss in susceptible varieties. Increased root pruning occurs as cultivation depth increases and the distance between the plant and the cultivator tool decreases. This root pruning creates entry points for plant disease inocula.

Another reason for less cultivation might seem counterintuitive – cultivation can actually decrease field weed control. Newer herbicides are most effective when applied as a broadcast treatment onto the soil surface and not incorporated or at most have very shallow incorporation. The herbicide is usually distributed throughout the upper two inches of soil after rainfall or irrigation. This herbicide barrier controls weeds that germinate within the zone. Disruption of this zone by cultivation results in areas that have little or no herbicide to provide weed control. Further, the cultivator can move weed seed closer to the surface, from deeper in the soil, where that seed might find more favorable germination conditions.

Field trial results

Tobacco yield and leaf quality, in the presence or absence of cultivation, was determined from field trials conducted in fields that were kept relatively weed free by the use of herbicides. Weed control in all plots was achieved with sulfentrazone and clomazone applied prior to plant establishment at recommended rates. Cultivation treatments varied between years and locations due to environmental conditions (e.g. too wet to cultivate at certain times). Treatments were replicated three times, except Spindletop in 2009, where treatments were replicated four times. In all trials, all treatments, except the “no cultivation, no weeding” treatment, were hand-weeded once at layby. No other weed removal was done.

Though site-year yields varied considerably due to seasonal weather differences, leaf yield did not differ, with or without cultivation, for any of the four site-years (Table 1). Yield differences due to soil moisture conservation would be expected in the absence of cultivation in dry years (e.g. Spindletop 2008). The 2009 crop season received the most rainfall during the growing season, and this resulted in the highest leaf yield,

but there were no yield differences among the cultivation treatments. In 2010, the Spindletop location received more rainfall than the Woodford County location, but no statistically significant differences in leaf yield were observed at either location. Weed pressure was minimal at all sites and would not have warranted weed control cultivation. No differences in tobacco leaf quality were observed for any site-year of this study (data not presented).

Treatment	-----Cured Leaf Yield (lb/A)-----			
	ST 2008	ST 2009	ST 2010	WC 2010
No cult, not weeded	2493	3084	2863	1927
No cult, hand weeded	2623	---	2774	---
Early cult	--- ‡	2937	---	2061
Late cult (layby)	2539	3009	2935	2024
Early + late cult	---	3082	---	2165
3 cultivations	2340	---	---	---
Pr>F †	Pr>F = 0.91	Pr>F = 0.82	Pr>F = 0.20	Pr>F = 0.42

† If the probability of a greater F statistic (Pr>F) is greater than 0.10, then the treatment yield means are not significantly different at the 90% level of confidence.

‡ --- No data.

Summary

Tobacco cultivation can control weeds if herbicides are not effective. However, cultivation did not increase burley tobacco leaf yield when weed pressure was minimal. Some Kentucky producers consistently produce quality tobacco using no-tillage production methods where in-season cultivation is not an option. There are reasons to cultivate other than weed control, but these are specific to certain situations and circumstances, which are usually not widespread. Cultivation should be used for a defined reason rather than as a customary operation in burley tobacco production. Cultivation should be done as shallow as possible while still accomplishing the intended operation. Soil moisture is often a major limiting factor in tobacco production. The more plant-available soil moisture that is retained for plant growth, the better the tobacco crop will fare.



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