

## Shallow Strip Tillage in Seedbed Preparation

K. R. Frost

Numerous tests on both field and vegetable crops at the University of Arizona during 1962 and 1963 demonstrated the effectiveness of petroleum strip-mulches in improving early-season germination and emergence. Early-season stands often result in increased yields because of a lengthened growing season. Effective application of petroleum emulsion requires a smooth soil surface which will result in development of a thin, continuous film of petroleum at a minimum application rate. The reduction of cloddy and rough surfaces is necessary if emulsion performance and cost is to be physically and economically satisfactory.

Strip-seedbed preparation may be required in either moist or dry soils. Cotton is normally planted in soil moisture at or near field capacity. Initial field trials of strip-tillage machines indicated that wet and dry seedbeds required quite different mechanical treatment for satisfactory pulverization. Strip tillers were developed for wet and dry soil preparation. In these units the strip tiller, tiller housing, adjustable vee-type clod pushers, seed furrow openers, seed hoppers and drops, seed press shoe, and convex zero-pressure smoothing press-wheel are combined into one assembly.

The tillage rotor for moist soils was designed for strip-tillage. It consists of a spring-tined tiller 8 inches in diameter and is rotated at 700 to 900 rpm in the forward-rolling direction. Reduction of clods is accomplished by impact and the pulverized soil is smoothed into place by the deflector plate. This tiller operates in the range of one to two inches in depth.

The spring-tined tiller had little effect in changing the size of aggregates of dry soil. The most effective device for dry soils was a 5-inch-diameter grinder. This rotor was operated at 1200 to 1400 rpm in a counter-rolling direction. Soil flows up and over the rotor and is pulverized by rubbing action against the shear plate. The pulverized soil flows out below and to the rear with respect to the shear plate and is deposited in a 1/2- to 3/4-inch layer.

This type of soil treatment has made it possible to develop satisfactory petroleum films at application rates of 8 to 10 gallons per acre per inch of band width at 40-inch row spacing. Two-stage application of the petroleum emulsion has been found most effective for film development.

### Field Results

Preliminary field testing of the strip-tiller system for petroleum emulsion treatment of cotton was conducted in 1964. The spring-tined tiller of the grinder was used in these tests depending on soil-moisture conditions. In these tests the petroleum emulsion had been applied at 70 to 80

gallons per acre in 8-inch bands on 40-inch centers. Plantings were made "to a stand" with no subsequent chopping.

Some difficulty was experienced in maintaining proper seed depth. Germination was not good where seeds were shallower than 1-inch, but deeper placement was felt to be practical under petroleum emulsion because of the soil temperatures developed.

In 1965 field tests were again conducted in cotton and included strip-tillage, petroleum-emulsion, and strip-tillage with petroleum-emulsion as compared to conventional seedbeds. Also included were tests of planting depth under emulsion. These tests were conducted near Phoenix, Arizona. Very early plantings were also conducted near Wellton, Arizona, on March 7. A fair stand was obtained although rows were overirrigated and two rains followed which left soil in hard and cracked condition. A poor stand resulted from the germination on conventional seedbeds.

Table 1 shows results of four plantings in 1965 and indicates better stands with petroleum-emulsion applications and for strip-tiller mulched rows compared with nonmulched. The last planting (April 21) resulted in no advantage to the emulsion application as soil was sufficiently warmed to germinate seeds in all treatments.

Table 1. Emergence of Cotton Plants per 100 feet

Date of Planting	SHALLOW				DEEP			
	Emulsion		No Emulsion		Emulsion		No Emulsion	
	Tiller- mulched	Un- mulched	Tiller- mulched	Un- mulched	Tiller- mulched	Un- mulched	Tiller- mulched	
Wellton, Ariz. March 4, 1965	110			44				
Phoenix, Ariz. March 8, 1965	114	101	84		74	54	46	
Phoenix, Ariz. March 26, 1965	184	176	137	103	170	176	93	
Phoenix, Ariz. April 21, 1965	207		260	83	187	182	260	