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JOINT PROCEEDINGS

TROPICAL REGION

21st Annual Meeting of the Caribbean Food Crops Society and 32nd Annual Meeting of the American Society for Horticultural Science — Tropical Region

technology for agricultural development

Hilton Hotel, Port of Spain, Trinidad
8 - 13 September 1985

Host Institutions

— Caribbean Agricultural Research and Development Institute

— Ministry of Agriculture, Lands and Food Production, Trinidad & Tobago

— Faculty of Agriculture, University of the West Indies

Published by the Caribbean Food Crops Society, Box 506, Isabela, Puerto Rico 00662

MECHANICAL PLANTING AND HARVESTING ON PLASTIC MULCHED BEDS

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ABSTRACT

Plastic mulches have many advantages for agriculture; however, their use was limited until compatible mechanized planting methods were developed for mulch. Mechanical methods for transplanting or seeding before or after mulch applications are discussed. Transplanting of containerized plants, including use of the water-wheel planter and sowing of ungerminated, pre-germinated, dry-coated, gel-coated or uncoated seeds using plug-mix, gel and gel-mix planters are described. Experimental mechanical and semi-harvesters were evaluated for market tomato harvests in Florida in the early 1970s; processing harvesters were modified to harvest market tomatoes from mulched beds in the mid-1970s and a few years later mechanical harvesters were used to harvest pineapples from mulched bed systems in Hawaii. Muletrain type and conveyor belt harvest aids were easily adapted to harvest from mulched beds.

RESUMEN

Los, abonos vegetales plásticos ofrecen muchas ventajas para la agricultura. Sin embargo, se utilizaron de manera manera limitado hasta que se desarrollaron unos métodos de plantación mecanizados que se podían utilizar con los abonos vegetales. Se examina los métodos mecánicos de transplantación o de siembra, tanto antes como después de la aplicación del abono vegetal. Se describe la transplantación de plantas en recipientes, incluídos el uso de la plantadora de tipo rueda hidráulica y la siembra de semillas no-germinadas, pre-germinadas, tratadas en seco, tratadas con gel o no-tratadas, utilizando las plantadoras de tipo plug-mix, gel y gel-mix. A principios de los años 70, se evaluó las segadoras mécanicas y semi-segadoras experimentales para la cosecha de tomates destinados a los mercados de Florida. A mediados de los años 70, so modificó las segadoras preparadoras existentes afin de poder tratar los tomatos procedentes de semilleros tratados con abono vegetal. Unos años más tarde, se utilizó segadoras mecánicas en Hawaii para cosochar piñas procedentes de semilleros tratados con abono vegetal. Se adaptó fácilmente los equipos auxilares de cosecha de tipo caravana y correa transportadora para cosechar los frutos procedantes de semilleros tratados con abono vegetal.

Keywords: Water-wheel; Punch planter; Plug-mix; Gel; Gel-mix.

Plastic mulch has been a sound investment for many horticultural enterprises in humid, tropical and temperate areas. After plastic film mulches were perfected for agriculture, commercial application was minimal until effective mechanized systems were developed to transplant or sow seeds through the film.

Transplanting

Convential types of transplanters were used to plant before mulch application and plant tops were pulled through holes cut in the film by hand, shortly after mulch was applied. This required extensive hand labour and plant heat stress occured during hot days when plant tops were under the film too long. Transplanters with cups to punch planting holes through plastic, developed by Holland Transplanters Company and Mechanical Transplanter Company improved efficiency and eliminated the probelm of heat stress. A grower designed water-wheel transplanter was a metal wheel, resembling a tire, with holes spaced around the circumference of the wheel, corresponding to the plant spacing desired. A wedge with open sides was attached outside the wheel over each hole. As the wedge rolled to a down position, a planting hole was punched through the plastic. At the same time, water, which was continually supplied to the inside of the wheel flooded the planting hole and settled the soil around roots of the transplant placed in the hole by hand by someone riding behind the planter wheel. This system is effective for transplanting as well as for planting seed-peat-lite mixtures.

A dibbling transplanter was designed and tested at the University of Florida Agricultural Engineering Department in 1984. It is a high speed automatic transplanter capable of working through plastic mulches, with wide plant spacing, using commercial containerized seedlings. This machine has a transplanting mechanism which should provide; high speed cycling (over 130 plants/minute); prolonged acceptance movement compatible with automatic feeding of the seedlings; extended deposition movement capable of placing the seedlings through plastic mulch while maintaining zero relative velocity; and gentle and precise handling of the seedlings. At present further work is required on the design of (1) an appropriate feeding device; (2) a synchronous drive system and (3) a method to vary plant spacing.

Seeding

A machine was designed by an Israeli Company (Teotechnic) in the late 1970s to sow seeds in clumps with a convential planter, followed by plastic mulch with holes burned in the plastic and synchronized to match the seed clumps just planted. This planter could not be used with fumigants because of the timing of the sowing and the holes placed in the film at the time of application.

A system was needed to sow seeds through plastic. After extensive research by hand planting methods a plug-mix system was developed that involves incorporation of crop seed and water into a mixture of peat moss and vermiculite with nutrients. A plug-mix planter was designed to mechanically plant the plug-mix through plastic mulch. The use of mulch for tomato production on the calcareous soils of South Florida expanded two fold each year after a demonstration in 1974 convinced L & D Farms to

use the new planter.

Pre-germinated seed has the potential to produce more uniform seedling emergence. Though fluid drill planters for sowing on soil without mulch were developed in the mid 1970s none were designed for mulch until 1979, when a Canadian firm developed the Skipper model K–1–G6 electronic gel seeder for mulched beds with equipment to deposit anticrustant over the gel-seed mixture. The electronic seeder mechanism caused problems unless certain engine rpm were maintained, thus the seeder was modified to function mechanically.

Fluid drilling Ltd. in England developed, the model 567 mulch planter with a stainless steel hole punch wheel which was effective on sandy soils. Mays Farms modified the 567 planter by adding a peat-lite dispenser, brushes to move media into plant holes and water to wet the peat-lite media. The hole punch was not effective on rock soil.