Mechanization of the blackberry industry has been necessary due to the increasing scarcity and expense of hand-labor which threatened to eliminate blackberries as a processing crop. The Univ. of Arkansas has been a leader in this mechanization effort with the development of a tractor-drawn prototype harvester in 1964 (3, 9). The self-propelled, hydraulically driven commercial model was developed subsequently and is now a prominent harvester in the major production areas of the United States (4). A mechanical pruner for erect blackberries also was developed at the Univ. of Arkansas. This mechanization of harvesting and pruning has allowed, indeed required, the development of an efficient new integrated production system for blackberries (7, 8, 9).

MECHANICAL HARVESTING

The Univ. of Arkansas’ original mechanical blackberry harvester prototype had 2 ground-driven vibrators placed over V-belt carriers driven by pitman-like mechanisms. Mechanical shaking of the canes utilized the development of the fruit abscission layer at maturation to allow only the more mature fruit to be harvested. Improper adjustment and operation of the harvester resulted in a product inferior to that obtained from hand-harvesting.

Today, the self-propelled, hydraulically driven commercial model has a set of horizontal beaters positioned in a vertical plane on each side of the row to agitate the fruit from canes (Fig. 1). This set of beater arms allows for a reduction in the number of strokes needed per minute to harvest fruit, thereby reducing damage to new canes. The range of 100 to 150 strokes per minute at a ground speed of 1.6 km per hour (1 mph) is adequate to harvest only the ripe fruit, leaving the unripe fruit for later harvesting. This frequency of stroke also provides a complete shaking throughout the hedgerow, which is important since berries that remain in the interior of the hedgerow often develop mold. Break-away catcher plates form an enclosure at the base of the plants and deposit the ripe berries directly onto 2 horizontal conveyor belts which move the berries to the rear of the machine. Air-blast cleaners remove leaves and foreign matter as the berries drop from the conveyor belts; berries fall onto a sorting belt and are deposited in crates. Sorting belts allow workers to remove culls, moldy berries, and any remaining foreign material missed by the air-blast cleaners.

One of the features of the commercial model (Fig. 2) is that it can be raised, lowered, and leveled to fit the plane of the field and the height of the canes. This capability is extremely important for harvesting erect blackberries due to the low fruiting habit of this species.

**DEVELOPING A MECHANICAL HARVESTING SYSTEM FOR BLACKBERRIES**

Justin R. Morris

University of Arkansas, Fayetteville, AR 72701

Published with the approval of the Director of the Arkansas Agr. Expt. Sta.

The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked advertisement solely to indicate this fact.

Dis. 66:949–951.


21. Costa, A.S. and V. da Costa Lima Neto. 1976. Transmissão do virus eret blackberries also was developed at the Univ. of Arkansas. This development of a tractor-drawn prototype harvester in 1964 (3, 9).


temperatures, resulting in fruit of better quality.

Machine harvesting at the lowest possible temperature would be advantageous for maintaining fruit quality during handling and storage. The harvester is equipped with lights, so that berries can be harvested at night instead of during periods of high daytime temperatures, resulting in fruit of better quality.

Most insects can be eliminated from cane fruits prior to machine harvest by following recommended spray programs for the specific insect problem. However, insects in machine-harvested fruits can be removed by a washing technique in which infested berries pass through water containing a 0.1% nonalkaline anionic wetting agent (2). A water spray then is used to remove insects, debris, and wetting agents. Ninety-five percent of the insects can be removed by this method with no loss of quality.

NEW CULTURAL SYSTEMS

It was realized during development of the mechanical harvester for blackberries that new cultural systems had to be developed for erect blackberries that involved a continuous hedgerow of plants shaped to fit the mechanical harvester. Poor stands and skips in the row reduce the harvest efficiency of the machine as well as having the obvious effect of reducing yields.

Five to 7 harvests at 4- to 5-day intervals may be required to harvest the entire crop mechanically; therefore, it is desirable to concentrate maturity to reduce the number of harvests. A preharvest ethephon spray at 1000 or 1500 ppm increases early yields and improves color (10, 12). These ethephon sprays increase pH and improve Color Difference Meter quality values of the raw product and sensory color quality of the processed berries. Ethephon lowers the average weight, percentage of total soluble solids, and titratable acidity of the berries. These studies show that producers and processors of blackberries could benefit from the use of ethephon to improve harvest distribution and fruit color.

MECHANICAL PRUNING

Studies were implemented to determine the effects of mechanical pruning and removal of old canes. In one study, mechanical pruning and either removing or not removing the old canes was compared to continuous hand-pruning throughout the growing season (7). The results indicated that an erect blackberry planting that is to be mechanically harvested can be pruned mechanically, and the old canes can be left in the hedge with no reduction in fruit yields.

A mechanical pruner for erect blackberries was developed at the Univ. of Arkansas that could trim the top and shape both sides of the hedgerow. This pruning unit will fit on the front of the mechanical harvester or on a specially designed high-clearance tractor. The pruner can be adjusted for continued hedge growth and still accomplish the desired cane tipping. The V-shape of this pruning unit allows for the hedgerow to be maintained at about 35 cm at the ground-line, tapering to about 90 cm at the crown (Fig. 3). Some of the vigorous new canes will push above the current year’s fruiting surface before completion of harvest. Hand-pruning of these new vigorous canes to a height of 90 cm is required until mechanical

Fig. 1. Diagram of commercial blackberry harvester which consists of the following: a) cane vibrator, b) break-away catcher pans, c) fruit conveyor belt, d) air-blast cleaning system which removes leaves and foreign material, e) fruit inspection belt, f) inspector, g) fruit containers, and h) inside rear wheel which automatically locks, allowing machine to pivot 180°. Front wheels will turn 90° in order for the machine to head directly onto the next row.

Fig. 2. This commercial model of the blackberry harvester and a crew of 5 can do the work of 80 to 85 hand-pickers. This machine is equipped with lights for night harvesting, which allows for harvesting and handling while the fruit is at a cooler temperature.
CULTURE AND MANAGEMENT OF BLACKBERRIES IN THE UNITED STATES

John A. Lipe1
Texas Agricultural Extension Service, Texas A&M University, Fredericksburg, TX 78624

Lloyd W. Martin2
North Willamette Experiment Station, Oregon State University, Aurora, OR 97002

Three basic types of blackberries (Rubus spp.) are grown in the United States: 1) erect and semierect, 2) western trailing, and 3) southeastern trailing, commonly called "dewberries" (22).

The erect and semierect blackberry is the main type grown in the field. A year of production for mechanical harvesting will be lost after an erect blackberry planting has been renovated in this manner, since the regrowth after harvest will not reach sufficient height and erectness to allow for mechanical harvesting the following year. However, the production from this off-year can be hand-harvested if labor is available (7).

RESEARCH NEEDS

Breeding programs on blackberries have as one of their objectives the development of cultivars that are adapted to mechanization (6). New productive cultivars with good vigor and erect canes need to be developed for all production regions. These characteristics are present in the Arkansas cultivar ‘Creeksy’ (5, 12). New cultivars with improved firmness and a more concentrated harvest season also would be desirable.

Continued research to refine cultural systems for producing machine-harvested blackberries is needed. Additional research in postharvest handling of machine-harvested blackberries will be required.

Literature Cited