Watermelon Transplants

For Healthier, Earlier, and More Profitable Crops

Mississippi State University
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director

STATE COLLEGE  MISSISSIPPI
ON THE COVER:

Figure 1. Watermelon and cantaloupe transplants grown in the greenhouse of the Department of Plant Pathology and Physiology. In the foreground and background are shown larger vines and fruits grown for breeding purposes.
WATERMELON TRANSPLANTS
FOR HEALTHIER, EARLIER AND MORE PROFITABLE CROPS

By S. S. IVANOFF, R. C. ALBRITTON,
CLYDE L. BLOUNT, and B. E. WAGGONER

Watermelon growing is an important enterprise in Mississippi. Efforts are being made by the Experiment Station to make raising this crop more extensive and more profitable. Control of diseases is the chief problem. Along with breeding and testing new varieties, a new approach has been attempted in advancing the culture of this crop. This is the use of young transplants raised in various kinds of pots. By this method of growing watermelons the following benefits are sought:

1. To insure a good stand by avoiding seed and seedling rots. Loss of stand is a common experience. Replanting increases the cost of production and, most of all, sets the maturity of the crop back. Watermelon seed are very susceptible to rotting caused by various soil-inhabiting microorganisms. Seed treatment has not been as effective as with other crops. Replanting has been a frequent necessity.

2. To avoid weeds by getting a head start. Weeds “choke” the young plants. Besides being expensive, removal of weeds may not be possible if the ground stays wet.

3. To produce earlier crops and obtain higher prices. Any method which helps to produce an earlier crop in Mississippi will usually benefit the grower by getting a higher price. Getting the crop harvested earlier reduces hazards from diseases, insects, and weather.

4. To control some foliage diseases and insects, by treating transplants with fungicides and insecticides, before they are set out in the field. Some disease problems have been met by use of disease-resistant varieties. Nematodes remain a problem in some areas, while cucumber beetles and other insects, besides destroying the young plants, also seem to transmit certain diseases, particularly gummy stem blight and viruses, for which no practical control is now available. Any protection that may be given the young plants to give them a good start would be useful. This can be more easily and cheaply done before transplanting, while the plants are still in a close group. In a few minutes enough plants may be sprayed or dusted to plant several acres.

Envisaged in this program is the eventual incorporation, within the soil in the pot, of certain systemic fungicides and insecticides to give protection to the plants for considerable time after transplanting.

5. To make practicable the use of hybrid seed. Since one average-size watermelon contains more than enough seed to plant an acre, if one seed is planted per pot, then the use of first generation hybrid seed becomes practicable from the standpoint of seed expense. (By the common method of direct seeding a grower usually needs a pound of seed for planting and replanting an acre.) Hybrid seed would be advantageous because many desirable characteristics of the watermelon are inherited in a dominant manner. Such outstanding qualities as resistance to diseases, earliness, eating qualities, and many other traits may be combined in the first hybrid generation by crossing two selected parents without the necessity of further breeding.

Furthermore, hybrids are outstanding for uniformity in maturity, size, shape, quality, and other traits. Although we now have good quality watermelons, future demands of trade are likely to be varied and unpredictable. However, a great many first generation hybrids may be produced to satisfy diverse consumer needs and fancies. Production of hybrid seed could eventually become a commercial occupation.

More research in the direction of the study and the massive use of transplants
for row crops may be anticipated. Improving existing methods and searching for new techniques in treating transplants hitherto difficult, or expensive to accomplish, must be one of the first objectives.

The following is an account of experience gained and progress made thus far in the directions outlined, using watermelons and, in some instances, cantaloupes as test plants.

Raising The Transplants

For the experiments reported here all transplants were raised in the greenhouse at Mississippi State University. Previous experience was gained in transplanting watermelons and cantaloupes for a number of years in connection with the breeding work. At first ordinary clay pots were used, 4- and 6-inch sizes. Later other types were employed, made of more or less easily decomposable material, such as porous paper, peat moss, or animal manure, all pressed into suitable shapes and sizes. All of these types are now sold commercially and are advertised in seed catalogues and farm journals.

In testing these various pots it was found that some had advantages over others. Clay pots have the disadvantage of producing root binding. They would also be inconvenient for machine transplanting, the use of which was contemplated in connection with this project. On the other hand, when the plants were taken to the field at the right stage, before too much root binding had taken place, clay pots were found quite satisfactory.

Perishable containers allow the roots

Figure 2. Watermelon vines shortly after transplanting. Notice absence of weeds.
to grow through them and thus avoid undesirable root binding to a considerable extent. In this type of pot the plants may be kept longer before transplanting if weather conditions should be unfavorable, and this is an important consideration.

The best pots were found to be those made of cattle manure, followed in preference by the peat moss and paper pots. In the commercial “Ferto-Pots” (cow manure) the watermelon and cantaloupe plants grew stockier, greener, and had a better root system than in any other kind of tested pots. Improvements may be made with other pots, however, if organic matter and other nutrients are added to the potting soil. The soil used was medium heavy in consistency, with some sand and organic matter added for better drainage. The most suitable size for watermelons was a four-inch pot, but a smaller container may also be satisfactory. Using a three-inch pot, an area of only 30 square feet will be necessary to grow enough transplants to plant one acre of watermelons.

A single seed was ordinarily planted in each pot. The plants were started about four to six weeks before transplanting time. At this stage they have become well established in the pot but are not yet ready “to run.” Some hardening of the transplants is of help. Time may be saved in raising the plants if the seed are kept in a warm, wet “rag doll” for 24 hours prior to planting.

Plants were grown at temperatures varying from 70° to 80° F during the day. Temperatures above 90° made the plants grow spindly and are to be avoided. On the other hand, temperatures below 65° F will retard germination and the seeds may rot before any stand is produced.

The time for transplanting is after the danger of frost has passed.

The question arises: How would the average grower raise his plants if he had no greenhouse? Until a grower obtains the services of a greenhouse, plants may be raised in cold frames or hot beds like other transplants, such as tomatoes, peppers, cabbage, etc. Certain indoor conveniences may also be adapted by providing sufficient artificial lighting and ordinary temperature control. Enough artificial light, combined with some day light, is necessary to maintain a good green color of the leaves. Before any large-scale transplanting work is attempted, a grower should do some experimenting himself in order to learn firsthand how to handle such plant material. Eventually these transplants may be raised in quantities by commercial greenhouses, if sufficient demand is made for them.

Some disadvantages in growing watermelons from transplants are to be expected, such as the cost of raising the plants and the necessity of using water at transplanting, and often after transplanting, if rains do not come to help the crop get established. It is very important that a close contact is maintained between the potted plant and the soil surrounding it for several days after transplanting. This latter condition will ease the “shock” and will insure the success of the transplanting.

Transplanting Experiments in 1958

Three replicated trials were made at three branch experiment stations (Poplarville, Newton, and Verona) to compare maturity and yields from transplanted vs. directly-seeded watermelons. (A fourth trial at Yalobusha County with a private grower was abandoned to the weeds because of continuous rains.) Yields for the respective locations are presented in Tables 1, 2, and 3.

At Poplarville some of the plants were sprayed with dieldrin (before and after transplanting) to control cucumber beetles which are strongly suspected of transmitting gummy stem blight, a prominent fungus disease against which no resistant variety is now available. The melons from
the transplants matured 10 to 14 days earlier. Their yield was about 60 percent greater in pounds per acre than that of the directly seeded crop. The dieldrin-sprayed transplants yielded a larger number of early maturing melons than the non-sprayed transplants. The transplants were grown in clay pots.

At Newton results were similar to those from Poplarville. The transplants produced an earlier crop. Their total yield was four times heavier than the one from the directly-seeded plots. At this location the relative yield differences were particularly great because of the fast-growing grass weeds which retarded the growth of the directly seeded crop to a much greater extent. However, yields in general were light and the melons small. All transplants were grown in 4-inch paper ("Vita-Green") pots.

At Verona the transplants showed the greatest advantages. Here the dieldrin treated transplants (sprayed only once prior to being set in the field) yielded 189 melons per acre from the first two harvests, the non-treated transplants yielded 146 melons, while only 9 melons per acre

### Table 1. Watermelon trial with transplants vs. direct seeding at South Mississippi Branch Experiment Station, Poplarville, Mississippi. 1958. Yield from five replicated test plots reported on per acre basis.

<table>
<thead>
<tr>
<th>Materials used for planting</th>
<th>First harvest</th>
<th>June 27</th>
<th>Second harvest</th>
<th>July 10</th>
<th>Sum of two harvests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. fruits harvested</td>
<td>Wt. in lbs</td>
<td>No. fruits harvested</td>
<td>Wt. in lbs</td>
<td>No. fruits harvested</td>
</tr>
<tr>
<td>Transplants, sprayed with Dieldrin</td>
<td>136</td>
<td>2827</td>
<td>285</td>
<td>4941</td>
<td>421</td>
</tr>
<tr>
<td>Transplants, not sprayed</td>
<td>105</td>
<td>2101</td>
<td>335</td>
<td>6689</td>
<td>440</td>
</tr>
<tr>
<td>Direct seeding</td>
<td>25</td>
<td>533</td>
<td>291</td>
<td>4904</td>
<td>316</td>
</tr>
</tbody>
</table>

### Table 2. Watermelon trial with transplants vs. direct seeding at Coastal Plain Branch Experiment Station, Newton, Mississippi. 1958. Yield from 5 replicated test plots reported on per-acre basis.

<table>
<thead>
<tr>
<th>Transplants</th>
<th>First harvest</th>
<th>No. melons</th>
<th>Total wt. lbs</th>
<th>Direct seeding</th>
<th>No. melons</th>
<th>Total wt. lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>218</td>
<td>3314</td>
<td>11</td>
<td>153</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Second harvest</td>
<td>87</td>
<td>1079</td>
<td>11</td>
<td>207</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Third harvest</td>
<td>338</td>
<td>4338</td>
<td>153</td>
<td>1700</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>643</td>
<td>8731</td>
<td>175</td>
<td>2060</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3. Watermelon trial with transplants vs. direct seeding at Northeast Branch Experiment Station, Verona, Mississippi. 1958. Yield from five replicated test plots reported on per-acre basis.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>First two harvests</th>
<th>All five harvests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. melons</td>
<td>Ave. wt. (lbs.)</td>
</tr>
<tr>
<td>Transplants treated with Dieldrin</td>
<td>189</td>
<td>34</td>
</tr>
<tr>
<td>Transplants not treated</td>
<td>146</td>
<td>34</td>
</tr>
<tr>
<td>Direct seeding</td>
<td>9</td>
<td>31</td>
</tr>
</tbody>
</table>

### Table 4. Experiments with watermelon transplants vs. direct seeding. Summary of three replicated trials at three locations in 1958. Yields given on per-acre basis.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>First harvests</th>
<th>All harvests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. melons</td>
<td>Ave. wt. (lbs.)</td>
</tr>
<tr>
<td>All transplants</td>
<td>159</td>
<td>25</td>
</tr>
<tr>
<td>Direct seeding</td>
<td>17</td>
<td>15</td>
</tr>
</tbody>
</table>
were harvested at the same time from the direct seeding. The total yield after five harvests from the transplants was rather large, about 24,000 pounds per acre, and the melons were of good size, averaging 27 to 34 pounds. The much lower total yield from the direct seeding, 8,710 pounds, was chiefly due to the abundance of weeds which also delayed further the maturity of the crop. Most melons, particularly from the first three harvests, were of the highest quality.

Pots used were mostly clay, but a few paper pots were also employed. The clay pots were removed, of course, while the paper pots were set in the ground and covered. Some retardation in growth was noticed in the paper pots because they did not disintegrate quickly enough. The Ferto-Pots disintegrated in the ground more quickly and for this reason they were used predominantly in later trials.

The summarized and averaged results of the 3 trials of 1958 are shown in Table 4. From this it may be confirmed that:
(1) By far the largest part of the early harvests came from the transplants.
(2) The melons from the transplants were larger, and
(3) The total weight of the crop from the transplants was nearly three times higher than from the direct seeding.

Trials in 1959

It was planned to repeat some of the outlying field experiments of the previous season with certain modifications, chiefly by incorporating anti-parasitic toxicants within the pots. Some injury was caused,
however, by an excess of certain of these experimental chemicals. These treatments will be modified and reported later. In addition, it was demonstrated that weather hazards and lack of precaution during transplanting may cause varying degrees of failure.

The transplanting trials, however, were continued at State College where an experiment was devised which combined chemical weed control with transplanting or direct seeding. It was conducted on several acres and included cantaloupes as well as watermelons.

All potted plants were raised in 3-inch "Ferto-Pots." The herbicide used was Alanap-3 at a rate of 4 lb./A of the concentrate (diluted with 40 gal. of water), which was sprayed on the ground a day or two before the transplants were set in the field.* This chemical has been demonstrated earlier by other workers to be particularly adaptable to cucurbit crops. The treatment gave a very good weed control. Most of the weeds were crabgrass (Digiteria spp.).

Results of this trial showed the benefits from combining transplanting with chemical weed control.

As a further step in the development of this project, consideration was given to the construction of a machine to transplant and water the potted plants at the same time. A preliminary model of such machine was made ready by Felix E. Edwards of the Department of Agricultural Engineering of this Station. Using this machine, a successful small-scale demonstration was made in 1959 in transplanting both watermelon and cantaloupe plants in experimental plots at State College.

Further work on all aims presented in this article is in progress.

*The writers are indebted to Mr. Tildon Easley and Dr. Rupert D. Palmer of the Department of Plant Pathology and Physiology for supervising the application of the chemical in the field.