Housz admitted the development of oxygen by chlorophyll-bearing plants without the presence of CO₂. But neither proved the assimilation of CO₂ from the atmosphere, even though Ingen-Housz observed and recognized it. Either, however, carried Priestley's and Bonnet's observations into the field of exact experimentation, and but few fundamental discoveries in plant physiology have been as carefully and persistently documented.

Senebier's studies of the cause of etiolation were quite exhaustive, but barren of valid result. More successful were his studies on the sleep-movements (afterwards continued by his friend A. De Candolle), by which it was proved that a degree of turgor remains even amidst the periodic movements.—J. Christian Bay, John Crear Library, Chicago, Illinois.

**GRAFTING EXPERIMENTS WITH COTTON**

(with one figure)

A successful method of reproducing cotton asexually offers interesting possibilities in retaining parental genotypes of this crop indefinitely. In previous papers the author has described his attempts to propagate cotton by stem cutting.²,³ More recently some preliminary experiments in grafting cotton have been completed and it is desired to present the results of this work in the present paper. While no attempts have been made by the author to try budding in connection with the propagation of cotton, McNamara and Hooton⁴ of the U. S. Cotton Breeding Station at Greenville, Texas, have succeeded in propagating cotton by budding. Grafting as a method of reproducing cotton asexually has received the attention of the writer only after poor results were secured with cuttings. Although numerous attempts have been made to root cotton stem cuttings, less than 10 per cent. of the cuttings resulted in new plants. Since little or no difficulty was experienced in securing a high percentage of callusing in stem cuttings, it was expected that grafting might be very successful.

The saddle graft method was used in these trials, fig. 1.⁵ The main stem of the cotton plant to be used as the stock was trimmed to a slender wedge immediately above the lower node. Any leaves or branches below this node were removed. A scion of medium mature wood and of similar diameter to the stock was selected and cut to retain three nodes. In preparing the scion a cross-sectional cut was made immediately below a basal bud. The lower end of the scion was then split a short distance and fitted over the wedge of the stock so that the cambium layers of the scion and stock were matched.

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¹ Contribution from the Division of Agronomy, Texas Agricultural Experiment Station. Approved by the Director as Technical Contribution no. 130.
⁴ McNamara, H. C., and Hooton, D. R. Unpublished data.
at least on one side. After placing the scion the complete graft was wrapped with paraffined cotton string and sealed with warm paraffin. Several weeks later, after the scion had put out a leaf bud and the physiological union appeared to have taken place, the string and paraffin were removed and all leaf buds on the stock prevented from developing.

Using the saddle graft method 188 trials were made during the summer of 1930. Of this number of grafts 87, or 46.2 per cent., were successful and resulted in the production of vegetative growth and fruiting of the scion. Scions were placed at seven different dates as is shown in table I. The trials made on a specific date were comparable; however, the scions placed on the several dates were under varied conditions.

On May 14, June 25, August 9 and August 21, a total of 38, 32, 18 and 13 grafts, respectively, were made under similar conditions. The scion and stock used on these dates were all of the Lone Star variety of cotton but in each case the scion was of a different plant from the stock. The grafting was accomplished early in the morning while the temperature was moderate and the work was usually completed prior to 9 A. M. Each scion and stock was prepared and the graft completed before disturbing the next plants. Using this procedure 63.2, 75.0, 72.2 and 84.6 per cent. of the grafts attempted on May 14, June 25, August 9, and August 21, respectively, were successful. In all, 101 plants were grafted in this series and 72 scions grew, making an average of 71.3 per cent.

This was by far the most successful lot of grafts made in these preliminary trials. The plants used as stocks on May 14 were growing in 8 inch flower pots on the greenhouse bench. On September 4 at an age of 113 days the scions used on these plants were only 10 inches long but had blossoms and half mature green bolls on them. The plants used on June 25 were in 16 inch wooden tubs and had made considerably greater vegetative growth.
TABLE I
Summary of Preliminary Grafting Trial with Cotton

<table>
<thead>
<tr>
<th>Date of Trial</th>
<th>Condition of Trial</th>
<th>Plants Successfully Grafted</th>
<th>Plants Used</th>
<th>Successful Grafts</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 14</td>
<td>Scion and stock of Lone Star, cut immediately before use. Work accomplished prior to 9 A.M.</td>
<td>24</td>
<td>38</td>
<td>63.2</td>
</tr>
<tr>
<td>June 25</td>
<td></td>
<td>24</td>
<td>32</td>
<td>75.0</td>
</tr>
<tr>
<td>August 9</td>
<td></td>
<td>13</td>
<td>18</td>
<td>72.2</td>
</tr>
<tr>
<td>August 21</td>
<td></td>
<td>11</td>
<td>13</td>
<td>84.6</td>
</tr>
<tr>
<td>Sub total</td>
<td></td>
<td>72</td>
<td>101</td>
<td>71.3</td>
</tr>
<tr>
<td>July 17</td>
<td>Scion of Willet Red Leaf and stock of Lone Star. Scion cut 48 hours prior to use and re-cut just prior to placement. Work accomplished prior to 9 A.M.</td>
<td>None</td>
<td>19</td>
<td>0.0</td>
</tr>
<tr>
<td>August 13</td>
<td>Scion and stock of Lone Star. Scion cut 1 hour prior to use. Work accomplished prior to 9 A.M.</td>
<td>7</td>
<td>29</td>
<td>24.1</td>
</tr>
<tr>
<td>August 20</td>
<td>Scion and stock of Lone Star used immediately after cutting. Work accomplished from 11 A.M. to 3 P.M.</td>
<td>8</td>
<td>39</td>
<td>20.5</td>
</tr>
<tr>
<td>Grand total</td>
<td>For all trials</td>
<td>87</td>
<td>188</td>
<td>46.2</td>
</tr>
</tbody>
</table>

than the early lot. The stems on some of these plants were 30 inches long. The development of the other lots of grafts varied all the way from the opening of a single leaf bud to three or four leaves. The information regarding the growth of the scion is offered only to show that the scion made normal development corresponding to the environment of the stock.

In the case of 19 scions of Willet Red Leaf cotton, placed on a like number as Lone Star stock on July 17, all died. These scions had been transported a considerable distance before being used and were cut from the parent plants 48 hours prior to placement on the stock. Although the scion wood was kept in loosely closed moist glass jars and a fresh cut was made on each scion as it was used, it is supposed that the delay injured the scions. On August 13 there was a delay of one hour between the time the scion-stick was cut from the parent stalk and placed on the stock. This treatment resulted in only 7 out of 29 of the scions growing, or 24.1 per cent. Again
on August 20 a total of 39 scions were placed under conditions thought to be injurious. This time the grafting was done during the heat of the day from 11 A. M. to 3 P. M. Only 8, or 20.5 per cent., of these scions grew.—H. E. Rea, Substation no. 5, Texas Agricultural Experiment Station, Temple, Texas.

TEMPERATURE AS A POSSIBLE FACTOR IN REGENERATION

In view of some recent publications on the subject of regeneration the writer believes that he is justified in mentioning some observations made in 1926 while at the University of New Hampshire.

The Botany Department had two greenhouses in operation at that time, one maintained at a nearly constant temperature of 18° C. and the other at 15° C. For a time the temperature of the warm house was run above 25° C. for as much as four hours a day, but the cold house was not allowed to run above 20° C. During the course of other work the writer decided to see if temperature could have any effect on the regeneration of buds from tomato hypocotyls where the tops had been removed. Tomato was chosen because other members of the family had given striking examples of such regeneration after such operations had been performed while tomato itself refused absolutely to give any such results under normal conditions.* Accordingly pans of seedlings of tomato were prepared and started under normal conditions. When these had reached a good size, the seedlings were carefully clipped off well below the cotyledons, care being taken to see that no primordial buds such as are generally found in the axils of cotyledons remained. Checks were also kept of uninjured seedlings. Certain seedlings were then placed in the "hot" house, and an equal number in the "cold" house, each with their checks.

In a short time the writer was interested to note that practically every one of those in the "hot" house regenerated their tops by means of shoots arising from the top of the hypocotyl and thriftily produced a new set of tops. On the other hand, not one seedling of the "cold" house regenerated a new shoot or even produced a single bud. The best that they seemed able to do was to turn green and to remain alive for a time. All of these finally died. The experiment was repeated again, with the same results.

From these results the writer is inclined to believe that temperature plays a part in the regeneration of injured parts, at least in the tomato.—Fred R. Clark, Southeastern State Teachers' College, Durant, Oklahoma.