Lecture, February 1, 1954

Changes in state of Ac -- the effects: Breakage-fusion-bridge cycles in endosperm; Transposition of Ds (R6gin).

I. In previous two talks, discussed the disappearance of Ac from a known location and its appearance at a new location -- transposition of Ac as explanation given.

Also discussed the origin of changed action of Ac:

1. Double dose action of single Ac
2. Increase in action of that previously present but not doubled.
3. Decrease in dosage action -- one dose produces an earlier timed break at Ds than that produced by Ac it replaced.

II. The changes in state: Besides (E), (2), and (3) above, have other differences arising. These related to action of a single Ac or an Ac in double dose: Control of the time of Ds breaks can be very precise.

III. The relation of changes at Ac to those at Ds: A high rate of coincidence. If a break occurs at Ds, then a change at Ac is quite likely to be detected.

IV. The nature of the patterns produced by doses of Ac and various states of Ac: Begin Jan. 28 outline:

Add: Stabilized Ac action:

C sh bz wx ds ac female x I Sh Bz Wx Ds Ac-stabilized.

Photos: (6) and (7)

V. The transposition of Ds.

1. How such transpositions detected: Those occurring from one position to another in the short arm of chromosome 9 easily found in the tests with Ds.

2. If Ds moved from standard location to position between Bz and Wx:

a). The breaks: I Sh Bz Ds Wx 66...

b). Ds break: produces a dicentric chromatid and acentric fragment:

Prophase: I Sh Bz Wx I Sh Bz Wx

c). The following anaphase:

\[ \begin{align*}
&\text{I Sh Bz} \\
&\rightarrow \text{I Sh Bz} \\
&\rightarrow \text{I Sh Bz}
\end{align*} \]
The telophases

Break at (1)

Next prophase and anaphase

The types of sectors expected in the C sh bx areas: Wx with wx spots.

3. If Ds moved to a position between I and Bz:

Ds break: Prophase

Anaphase of division following

The sectors: Majority will be twins:
4. If Ds inserted to left of I:

\[
\begin{array}{c}
Ds & I & Sh & Bz & Wx \\
\hline
& I & Sh & Bz & Wx \\
& I & Sh & Bz & Wt \\
\end{array}
\]

VI. Analysis of a case of transposition of Ds from standard location to position to the right of I.

1. Cross in which detected:  
C sh bz wx ds ac female \times I Sh Bz Wx Ds Ac 
I Sh Bz wx Ds ac

The kernels on the ear: Table 1

2. The kernel showing Ds to left of I: 
Ds I Sh Bz Wx ds C sh bz wx Ac 
Ds C sh bz wx ac

3. Plant from this kernel grown; crossed to a number of tester plants including females, C sh bz, and either Wx or wx, ds, ac.

(a). Types of kernels on resulting ear:

\[
\begin{array}{c}
Ds I Sh Bz & Ac \\
Ds C sh bz & ac \\
\end{array}
\]

Table 2.

(b). Same plant to females, c sh Bz wx ds ac: Types of kernels:

Table 3.

4. The variegated kernels from crosses to C sh bz Wx ds ac females selected and plants grown from them.

(a) Crossed to C sh bz wx ds ac females. The types of kernels on ear:

Table 4.

(b) Crossed to c sh Bz wx ds ac females. The types of kernels on ear:

Table 5.
Table 1. Origin of Transposed D - 47556:

1. Cross: Cablumeur F x \( \frac{I_{shB_3 \text{ W} \times \text{ D}}}{I_{shB_3 \text{ W} \times \text{ D}}} \) \( \frac{A_c}{ac} \)

2. Appearance of Kernels on ear:

\[
\begin{align*}
I \text{ Wt, non-void} & = 102 \\
I \text{ Wt, void} & = 112 \quad \left\{ \begin{array}{l}
\downarrow \quad 214 \\
\downarrow \quad 186
\end{array} \right.
\end{align*}
\]

\[
\begin{align*}
I \text{ Wt with C by area} & = 104 \\
I \text{ Wt C by area} & = 84
\end{align*}
\]

\[
\Rightarrow \quad \text{5 Kernels with odd type of segregation:}
\]

Kernel appearance:

2 with I Wt in which by areas appeared. Some C byy sector also.

1 \( I_{shB_3 \text{ W} \times \text{ C byy Wt-44}} \) breaks between B3 and Wt.

1 \( I_{shB_3 \text{ W} \times \text{ byy Wt}} \) with voidation indicating break between B3 and Wt.

\( \checkmark \) 1 \( I_{shB_3 \text{ Wt with voidation indicating breaks to left B3}} \)

Analysis of plant from kernels:

2 are Triplet Sp: \( \frac{Cblumeur/\text{ISHB}_3 \text{ W} \times \text{ D}}{I_{shB_3 \text{ C byy Wt}}} \)

Transposed D: \( I_{shB_3 \text{ W} \times \text{ D}} \) (47556)

no germination of kernels

Transposed D: \( D \text{ O I}_{shB_3 \text{ Wt}} \) (Transposed D 47556 D)

To be investigated
Table 2

\[
(a+b) \times \frac{\text{Do I Sh} B2 \text{ Ac}}{\text{Do C ash} G \text{ Ac}} = (5160 \text{ D-4})
\]

the I closer of kernels:

\[
\begin{align*}
\text{I Sh} \text{ non-var.} & : 440 \quad \text{(non-crossed with Ac; Acon side region I)} \\
& \quad \text{non-crossed region II, no Ac.}
\end{align*}
\]

\[
\begin{align*}
\text{I Sh} \text{ with } B2 \text{-Cl var.} & : 376 \quad \text{(non-crossed, no Bc, no Ac)}
\end{align*}
\]

\[
\begin{align*}
\text{I Sh} (g) \text{ non-var.} & : 27 \\
\text{I Sh with Cl area} & : 22
\end{align*}
\]

\[
\begin{align*}
\text{I Sh} (g) \text{ non-var.} & : \text{(with 1st group; had not learned to recognize them at this time)}
\end{align*}
\]

\[
\begin{align*}
\text{I Sh} \text{ with Calpaxen} & : 7
\end{align*}
\]

The C closer of kernels:

\[
\begin{align*}
\text{C ash} G & : 793 \quad \text{(no var. can be told -)}
\end{align*}
\]

\[
\begin{align*}
\text{C Sh B2 non-var.} & : 55 \\
\text{C Sh B2 with CalB area} & : 0
\end{align*}
\]

\[
\begin{align*}
\text{C Sh B2, non var.} & : 15 \\
\text{C Sh B2 with Cl area} & : 0
\end{align*}
\]

Total: 1735

872.5 : 863 C.
Table 3

\[
\text{Cash A\text{\textregistered} m} \times \frac{\text{Do I Sh B\text{\textregistered} m}}{\text{Do Cash A\text{\textregistered} m}} \quad \frac{A}{\text{c}} = 0.7 \quad (51600 - 4 \cdot 07) =
\]

\[
\text{Cash A\text{\textregistered} m} \times \frac{\text{Do I Sh}}{\text{Do Cash A\text{\textregistered} m}} \quad \frac{A}{\text{c}}
\]

I kernels

\[\text{I Sh}_2 = 317\]
\[\text{I Sh}_1 = 17\] (was for Sh 1 not classified. Too difficult)

C kernels.

\[\text{Cash non-wax} = 299 \quad \text{Deformed} = \bigcirc\]

\[\text{Cash wax cases. Twin deep cash} / c. = 18\]
\[\text{C.O., cash} = 18 \text{ wax} + 18 \text{ non-wax} = 36\]

\[\text{Cash, non-wax} = 16\]

\[\text{Cash wax cases} = 0\]

Total C = 333

\[\text{C.O., cash} / \text{Sh.} = 16 = \frac{4,5\%}{\text{C.O., cash} / \text{Es.} = 18 \text{ wax} + 18 \text{ non-wax} = 36 = 10,9\%}\]
<table>
<thead>
<tr>
<th>Reg 1</th>
<th>Non-var = 48</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Sh Bz Wt</td>
<td>44.8</td>
</tr>
<tr>
<td>Ca2+</td>
<td>Cu2+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reg 2</th>
<th>Non-var = 34</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Sh Bz Wt</td>
<td>22.2</td>
</tr>
<tr>
<td>Ca2+</td>
<td>Cu2+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reg 3</th>
<th>Non-var = 163</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Sh Bz Wt</td>
<td>137</td>
</tr>
<tr>
<td>(React to Bz Wt)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C.o.</th>
<th>Non-var = 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Sh Bz Wt</td>
<td>4</td>
</tr>
<tr>
<td>Ca2+</td>
<td>Cu2+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C.o.</th>
<th>Non-var = 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Sh Bz Wt</td>
<td>3</td>
</tr>
<tr>
<td>Ca2+</td>
<td>Cu2+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C.o.</th>
<th>Non-var = 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Sh Bz Wt</td>
<td>7</td>
</tr>
<tr>
<td>Ca2+</td>
<td>Cu2+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total C kernels</th>
<th>1708</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.o. DoTo I</td>
<td>8.07%</td>
</tr>
<tr>
<td>I to Sh</td>
<td>5.6%</td>
</tr>
<tr>
<td>Sh to Wt</td>
<td>20.7%</td>
</tr>
</tbody>
</table>
Table 5

\[
\begin{align*}
\text{C. sh. W}^+ & \times \frac{\text{O} \times \text{I} \times \text{I}}{\text{C. sh. W}} & \overset{\text{Ac}}{\longrightarrow} \\
\text{C. sh. W}^+ & \times \frac{\text{O} \times \text{I} \times \text{I}}{\text{C. sh. W}} & \overset{\text{Ac}}{\rightarrow} \\
\end{align*}
\]

I kernels (colored)

\[
\begin{align*}
\text{c.o.} & : \text{I sh. my.} = 1167 \\
\text{not classifying for sh. var. too different} \\
\text{c.o.} & : \text{I sh. W}^+ \text{ var.} = 59 \\
\text{among my} \\
\text{c.o.} & : \text{I sh. W}^+ \text{ var.} = 48 \\
\text{among my} \\
\text{c.o.} & : \text{I sh. W}^+ \text{ var.} = 219 \\
\text{among my} \\
\text{c.o.} & : \text{I sh. my.} = 17^* \\
\text{cause classifying for sh.} \\
\end{align*}
\]

C. kernels (colored B3)

\[
\begin{align*}
\text{I sh. my.} & \times \text{O} \times \text{I} \times \text{I} \\
& \overset{\text{Ac}}{\longrightarrow} \text{C. sh. W}^+ \times \text{O} \times \text{I} \\
& \overset{\text{Ac}}{\rightarrow} \\
\text{I sh. W}^+ \times \text{O} \times \text{I} \\
& \overset{\text{Ac}}{\longrightarrow} \\
\text{I sh. W}^+ \times \text{O} \times \text{I} \\
& \overset{\text{Ac}}{\rightarrow} \\
\end{align*}
\]

\[
\begin{align*}
\text{c.o.} & : \text{I sh. my.} = 1287 \\
\text{not classifying for sh. var. too different} \\
\text{c.o.} & : \text{I sh. W}^+ \text{ var.} = 68 \\
\text{among my} \\
\text{c.o.} & : \text{I sh. W}^+ \text{ var.} = 96 \\
\text{among my} \\
\text{c.o.} & : \text{I sh. W}^+ \text{ var.} = 0 \\
\text{among my} \\
\text{c.o.} & : \text{I sh. W}^+ \text{ var.} = 390 \\
\text{among my} \\
\text{c.o.} & : \text{I sh. W}^+ \text{ var.} = 3 + 3 + 1 + 4 \\
\text{among my} \\
\text{c.o.} & : \text{I sh. W}^+ \text{ var.} = 4 \\
\text{among my} \\
\end{align*}
\]

\[
\begin{align*}
\text{C. sh. W}^+ & \times \text{O} \times \text{I} \times \text{I} \\
& \overset{\text{Ac}}{\longrightarrow} \\
\text{I sh. W}^+ & \times \text{O} \times \text{I} \\
& \overset{\text{Ac}}{\rightarrow} \\
\text{I sh. W}^+ & \times \text{O} \times \text{I} \\
& \overset{\text{Ac}}{\rightarrow} \\
\end{align*}
\]

\[
\begin{align*}
\text{C. h. m.} & = 1848 \\
\text{C. o.} & = 68 + 3 = 71 \times 2 = 142 = 7.7\% \\
\text{(Ac)} & (\text{Ac}) \\
\text{C. o.} & = 96 + 4 = 100 = 5.4\% \\
\text{C. o.} & = 390 + 3 + 4 = 397 = 21.4\% \\
\end{align*}
\]