Continuation of inheritance behavior of $Ac$.

I. Review of previous talk:

1. The inheritance of $Ac$ -- progeny tests:
   a. $F_2$ ratios: $1$ $AcAc : 2$ $Ac$ $ac : 1$ $ac$ $ac$
   b. Backcross tests: $Ac$ $ac \times ac$ $ac$ $1$ $Ac$ $ac : 1$ $ac$ $ac$
   c. $Ac$ $Ac \times ac$ $ac$ $95$ $Ac$ $ac : 1$ no $ac$
   d. The ears produced by $Re$ $c$ $sh$ $Wx$ $ds$ $ac$ $Re$ $c$ $sh$ $Wx$ $ds$ $ac \times C$ $Sh$ $wx$ $Ds$, $ac$

   (1). The regular pattern of variegation -- majority of kernels.
   (2). The unusual types of kernels:
      - No $c$ spots or areas
      - Completely colored kernels
      - Tiny specks of $c$
      - Late $Ds$ breaks in development
      - Areas only with few $c$ spots
      - Early losses or $Ds$ breaks -- Like $1$ $Ac$.

2. The effects of dosage of $Ac$: The higher the dose, the later in time of development that breaks occur at $Ds$.

3. The different isolates of $Ac$: In two doses:
   a. All speckled with recessive spots: late but uniform pattern of breaks at $Ds$ -- in certain cells, late in development.
   b. Areas, distributed over kernel, in which breaks occur in some cells, often associated with areas where no breaks occur. Remainder of kernel has speckled pattern of $Ds$ breaks
   c. Kernels where changes occur early to give sectors: These resemble $0$ $Ac$, $1$ $Ac$, $2$ $Ac$ and $3$ $Ac$ in same kernel.

   Suggest that something is happening to $Ac$ during early development that resembles somatic segregation.

II. The analysis of the unusual kernels on the ears produced by

$Re$ $c$ $sh$ $Wx$ $Ac$ $x$ $C$ $Sh$ $wx$ $Ds$, no $Ac$

1. Initial experiment: selected kernels showing no $c$ specks, that is, no evidence of presence of $Ac$ and 2 kernels that showed very late losses or breaks at $Ds$.

2. Because material available was not great, first experiment was something of a trial to determine something of nature of events. Analysis made of 26 plants derived from aberrant kernels: 26 from kernels with no $c$ specks, and 2 from kernels showing late losses of $c$.

3. Necessary to determine if $Ac$ present or not, if $Ds$ present in $C$ chromosome and if transmissions of chromosomes 9 in next generation were normal -- that is that no alterations had occurred to effect inheritance of chromosomes.

4. The tests: Self pollination of each plant
   Each plant crossed to $c$ $ds/c$ $ds$, $ac$ $ac$
   Each plant crossed to $d$ $ds/c$ $ds$ $Ac$ $Ac$
   Each plant crossed by $Ac$-tester: $I$ $Sh$ $wx$ $Ds$, no $Ac$.

See fig. 1 - on board.
III. Kernel types on ear from initial tests:

1. The plants showing no Ac:
   a). Self-pollinated ear gave ratio of 3 Colored, non-var. : 1 colorles
   b). Crossed by I Sh wx Ds: All kernels colorless in wx class
      No evidence of Ac.
   c). Crossed to c ds/c ds, ac ac Ratio of 1 Colored, non-var : 1 c/c
   d). Crossed to c ds/c ds, Ac Ac:

      25 Colored, non-variegated or not obviously variegated
      1159 Colored with areas of c produced by Ds breaks
      1244 colorless ( c/c class)

      Shows that Ds in C Sh wx chromosome is active in presence of Ac.

2. Conclusions: No Ac is present in these 19, plants.

   a). 7 plants: tests showed that 2 Ac factors present. Not linked.
   b). 2 plants: 1 Ac factor present but in action it resembles two
doses of original Ac. ( Ac x Ac on \( \chi \) )
   c). 2 plants: either 1 Ac with double dose action or 2 Ac very
closely linked; or marked change in action of a
   single Ac factor.
   d). 4 plants: 2 Ac factors present; probably. Either linked, or
   early changes occur in sporogenous cells affecting
   Ac locations. Possibly had induced a change in function of Ac.

3. The nature of the tests: The Ac ac; Ac ac plants.

   a). Crossed to c ds/c ds, ac ac: Gave:

      67 C, non-variegated kernels
      266 Colored kernels with c areas: Two distinct classes of
      kernels; those with early losses of Ds, thus some
      large colorless areas; those with late losses of c
      producing kernels with specks of c.
      342 colorless kernels: the c/c class.

   b). Crossed to plants that were c ds/c ds, Ac Ac:

      256 Colored kernels; not obviously variegated.
      6 Colored kernels with area on fully speckled with c
      70 Colored kernels - obviously variegated for c areas
      461 colorless kernels ( the c/c class)

   c). Crossed by Ac taster stock This was Re C Sh Wx ds / I Sh wx Ds, ac/ac.
Kernel types on resulting ears in the I \textit{wxwx} class

**N C Sh wx Ds** \( \times \) **Re C Sh Wx ds** ac

Only the I \( wx \) kernels can be considered:

- 253 I \( wx \) kernels with no obvious variegation for \( C \) areas
- 218 I \( wx \) kernels with heavily speckled pattern of \( C \) (color)

494 I \( Wx \) (the \( c \) \( Wx \) / I \( wx \) class; cant test \( Ac \) in these kernels)

Diagram of appearance of I \( wx \) kernels:

d). If we assumed plants being tested were \( Ac \) \( ac \); \( Ac \) \( ac \), the gametic ratios for \( Ac \) would be:

\[
\begin{align*}
1 Ac^1 Ac^2 & : 1 Ac^1 \quad : 1 Ac^2 : 1 no Ac \\
\text{Or:} \quad 1 Ac^1 + Ac^2 & : 2 Ac^1 : 1 no Ac.
\end{align*}
\]

Gametic ratio for \( Ac \) is 3 with \( Ac \) to 1 with no \( Ac \)

e). In cross to \( c \) \( ds/ \) \( c \) \( ds \), no \( Ac \) would expect a ratio of 3 \( C \) - \( c \) variegated kernels to 1 with no variegation. Observed 266 variegated to 67 non-variegated. Two types of variegated kernels: 1 with 2 \( Ac \) and 1 with 1 \( Ac \). Differences should be seen.

f). In cross to \( c \) \( ds/ \) \( c \) \( ds \), \( Ac \) \( Ac \) plants would get:

<table>
<thead>
<tr>
<th>From female:</th>
<th>From male:</th>
<th>( Ac ) constitution:</th>
</tr>
</thead>
<tbody>
<tr>
<td>c ( ds ) c ( ds )</td>
<td>1 C ( ds/ ) no ( Ac )</td>
<td>( 2 ) ( Ac )</td>
</tr>
<tr>
<td>Ac Ac</td>
<td>2 ( Ac )</td>
<td>( 3 ) ( Ac )</td>
</tr>
<tr>
<td>1 ( Ac ); 2 ( Ac )</td>
<td>4 ( Ac )</td>
<td></td>
</tr>
</tbody>
</table>

In \textit{colored} class would expect 1 with 2 \( Ac \) : 2 with 3 \( Ac \) : 1 with \( 4 \) \( Ac \)

1 \( AcAcAcAc \) : 2 \( Ac \) \( Ac \) \( Ac \) : 1 \( Ac \) \( Ac \)

If \( 4 \) \( Ac \) is too high a dose to give \( Ds \) breaks early enough in development of kernel, then this class would be non-variegated. This would give \( C \) \( Sh \) \( wx \) kernels. \( Ac \) tester stock used as female had an \( Ac \) that gives almost no effect in 3 doses. The small specks of \( c \) that might appear difficult to see. Thus, \( AcAcAc \) class could appear non-variegated. The \( 4 \) doses and 3 doses of \( Ac \) would produce kernels that were not obviously variegated. Thus, ratio expected would be: 3 \( C \) kernels, not obviously variegated : 1 that was variegated, showing speckles of \( c \).

Observed: 256 \( C \), non-variegated : 70 \( C \) - \( c \) variegated and speckled.

6 odd kernels -- only areas of specks of \( c \):

Appearance of kernels:
g). In cross by \( I \) Sh wx Ds ac:

The wx class of colorless kernels:

- \( C \) Sh wx Ds
- \( C \) Sh wx Ds
- \( I \) Sh wx Ds

Female contribution

1 Ac Ac Ac Ac : 2 Ac Ac : 1 with no Ac

1 Ac : 2 Ac : no Ac

Expect: No obvious var. \( I-C \) No var. Gives: 1 non-var \( I \) var.

Observed: 258 I wx, no certainly var. (some had few C specks)

218 I wx clearly var. for C specks

f). If this projected constitution is correct, then it should be possible to prove it by progeny tests; This was done for 4 of the 6 plants that gave ratios in these initial tests indicating the presence of 2 Ac factors, independently located in chromosome complement and not linked to factors in short arm of chromosome 9.

IV. The progeny tests conducted with plants assumed to be Ac ac; Ac ac.

1. The Appearance of plants: Table on board.

2. The reason for the white streaks and their frequency:

   a). \( Ds \) break could occur in either chromosome; If in \( W \) Ds chromosome, a white streak would appear. If a coincident \( Ds \) in both chromosomes, then cells homozygous deficient for 2/3 of short arm would be formed. These do not produce tissue that can be seen. They appear to be cells with enormous nuclei:

   This seen in the examination of the glumes of such plants:

   b). If Ac dose is high, then events occur very late. \( w \) streaks may not be seen in the green background. If 1 Ac present, \( Ds \) breaks occur early enough to produce a good streak, easily seen.
3. Tests of the plants in columns A and B for Ac inheritance. Two plants selected from both A and B of each culture in Fig. 2

a). Each plant crossed to a C sh bz wx ds, ac plant:

The cross: Female Male

Column A C sh bz ds, ac I Sh Bz Ds Ac ac; Ac ac

Column B " " Ac ac

b). Expected ratio of kernel types from crosses of plants in column A:

(1) Gametes: 1 Ac Ac : 2 Ac : 1 no Ac

$ with Ac to 1 with no Ac

Kernels should be in both I and C classes: 3 variegated to 1 non-var.

(2). The observed ratio of kernel types: Figure 3 on board.

All ratios as expected except for 1 aberrant plant: This plant had new change of Ac. It was AcAc ac.

Reason why C Bz variegated kernels fewer than expected: Can not see variegation in a purely speckled pattern.

The two types of variegated kernels: Early losses of Dominant: 2Ac

4. Tests of plants in column B for Ac inheritance. Two plants selected from each culture to be tested: The expected gametic ratio for Ac : 1 with 1 Ac : 1 with no Ac.

The expected ratio of kernel types: 1 variegated to 1 non-varieg.

The observed types of kernels in cross: Figure 4, on board.

5. Conclusions:

1. Summary of procedure so far:

a). Ac ac plants self-pollinated

b). Found the expected 1 Ac Ac : 2 Ac ac : 1 ac ac in F2 (Allelic)

c). Gametes of Ac Ac plants tested for Ac, by cross with ac. All should have 1 Ac

Majority of kernels had expected pattern produced by Ac Few unexpected types of kernels. Among them, Ac with no evidence of Ac.

23 such kernels removed from ears. Plants grown from them and tested for Ac.

11 plants: No evidence for Ac. Ac not in gamete produced by Ac Ac plant.

12 plants: Ac present. In 6 of them, constitution was apparently Ac ac; Ac ac. Two non-allelic, non-linked Ac factors from plant that was Ac Ac, allelic. All gametes should have had only 1 Ac.
Progeny from 4 of the 6 plants assumed to have Ac ac; Ac tested. These tests confirmed the Ac ac constitution in the 4 selected cases derived from C non-var. kern.

2. The reason that Ac not seen in original non-variegated kernel:
The dose of Ac too high: 4 Ac present in the endosperm.

3. To see the Ac action, must use an Ac ac; Ac ac plant as a pollen parent. Then, kernels have either Ac Ac or Ac - 2 or 1 dose of Ac.

4. Evidence so far shows that Ac can be lost to a gamete in an Ac Ac plant (allelic positions of Ac). Or, an extra Ac factor can appear in some gametes.

7. The relationship between the two suspected. Ratios were 11 to 12.

8. Can suspect transposition of Ac from one location to another.

Diagram of possible origin of 0 Ac and 2 Ac.

9. This would fit with observations of the sectorial kernels. Photos; Somatic segregations of the Ac factor, would give these patterns. In many cases, associated with a break at Ds.

IV. The examination to present:
V. Tests of the AcAc ac plants: N C Sh wx Ds
   Re c sh Wx ds

1. Kernel types in crosses to c ds, ac females:

   104 C to c variegated: late losses of C. Like Ac Ac type of original
   124 C, non-variegated
   233 colorless (c/c kernels)

2. Kernel types in crosses to c ds/c ds, AcAc (allelic)

   68 with no sharp variegation -- small specks of c in some or small
   areas of C to c.

   71 with typical 2 Ac dose C to c variegation

   146 colorless (c/c)

3. By w I Sh wx Ds / Re C Sh Wx ds, ac ac.

   The I kernels only:

   88 I wx, with a few specks of C : 8 I wx, heavily speckled with C

4. 11 plants from these kernels (like 1 Ac of original Ac)

   All had few wd streaks

   (Like 2 Ac action of original Ac)

5. 2 plants crossed to females: C sh bz, ds, ac

   I, non-var. I-Cbz C Bz CBz-Cbz

   Plant 1 74 61 63 40
   Plant 2 100 118 112 100

   Both crossed to females: C sh bz ds, ac

   I-Cbz CBz CBz-bz

   Plant 1 97 111 84 88
   Plant 2 225 165 195 166

6. Plant of and case of Ac/Ac gave the new results.

Table 54-55
6. Conclusions: Altered Ac acts like AcAc -- double dose of Ac action at a single locus or:
   Two Ac loci present, closely linked.

VI. Although first experiment showed much, I was not satisfied with the tests in every case, especially the ones that appeared to show altered Ac action as well as altered numbers. Also, the tests were not large enough for any one plant; also, the Ac-tester stocks could have been better. Therefore, the second experiment conducted, and much more precisely with regard to details.

Summary of results of the combined experiments, I and II.

42 plants examined from C, non-variegated kernels:

19 - No Ac
16 - Ac ac; Ac ac Two non-linked Ac
  1 AcAc ac; Ac ac Two non-linked Ac; one with double-dose action.
  6 AcAc ac

8 plants from kernels showing only a few c specks

  4 Ac ac; Ac ac Two non-linked Ac
  1 AcAc ac; Ac ac Two non-linked Ac; one with double dose action.
  3 AcAc ac

8 plants from kernels showing a heavily speckled pattern of c dots. Late losses of C but uniform in pattern.

  2 AcAc ac or two closely linked Ac. In one dose, very irregular patterns; gametic ratios irregular; many altered types of patterns of var. Suggests early transpositions of Ac.
  4 Ac ac; One Ac but dosage action increased over that of original Ac but not doubled in action.

1 "AcAc" ac. The Ac action altered. Produces early sectorials in one dose.

1 Ac ac. One Ac. Could not discover any modification in action compared to original Ac.

VII. What happened next? Further studies needed in later work.
Four bones with absorbance.

Ac etodinitrile:

H 1

Li 4

3

K 7

C 2

23

C 19

P 2

A 14

In ground.

P = e - b x (K - C)

Ca x 3 A x 2

On brand.
<table>
<thead>
<tr>
<th>Projected</th>
<th>Deep ( \text{Fe} ) constitution</th>
<th>Red 12000 ( \text{Fe} ) ( \text{Fe} ) constitution</th>
<th>Red 12000 ( \text{Fe} ) ( \text{Fe} ) constitution</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 plants</td>
<td>3 C non-ver:   1 colorless</td>
<td>253 I ( \text{Fe} ), not do.</td>
<td>256 4 ( \text{Fe} ) ( \text{Fe} ), not do.</td>
</tr>
<tr>
<td></td>
<td>1 colorless</td>
<td>2165 ( \text{Fe} ) ( \text{Fe} )</td>
<td>566 ( \text{Fe} ) ( \text{Fe} ), (2 chain of ( \text{Fe} ) )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.14 ( \text{Fe} ) ( \text{Fe} )</td>
<td>104 ( \text{Fe} ) ( \text{Fe} ), ( ( \text{Fe} ) ( \text{Fe} )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>441 ( \text{Fe} ) ( \text{Fe} )</td>
<td>342 ( \text{Fe} ) ( \text{Fe} ) ( \text{Fe} )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.53 ( \text{Fe} ), not do.</td>
<td>70 ( \text{Fe} ) ( \text{Fe} ) ( \text{Fe} ), ( ( \text{Fe} ) ( \text{Fe} ) )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>218 ( \text{Fe} ) ( \text{Fe} )</td>
<td>401 ( \text{Fe} ) ( \text{Fe} )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>494 ( \text{Fe} ) ( \text{Fe} )</td>
<td>1 ( \text{Fe} ) ( \text{Fe} ) ( \text{Fe} ), 1 ( \text{Fe} ) ( \text{Fe} )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( \text{Fe} ) ( \text{Fe} ) ( \text{Fe} )</td>
<td>1 ( \text{Fe} ) ( \text{Fe} ) ( \text{Fe} ), 1 ( \text{Fe} ) ( \text{Fe} )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( \text{Fe} ) ( \text{Fe} ) ( \text{Fe} )</td>
<td>( \text{Fe} ) ( \text{Fe} ) ( \text{Fe} )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( \text{Fe} ) ( \text{Fe} ) ( \text{Fe} )</td>
<td>( \text{Fe} ) ( \text{Fe} ) ( \text{Fe} )</td>
</tr>
</tbody>
</table>
on board

Appearance of plants derived from selected lines grown in cases of N W . C. Shewan's Acro. Aco. + x Re. W. C. Shewan 3/4 oc.

<table>
<thead>
<tr>
<th>Plant</th>
<th>Parent Plant</th>
<th>A: Im with swell area of 1/4 of C.</th>
<th>B: Im: having affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant 1</td>
<td>(4539A-1)</td>
<td>Suspected A constituting plant on bases of same appearance = A+A</td>
<td>Composed of two plants only 3/4 oc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Plant 2</td>
<td>(4540A-2)</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Plant 3</td>
<td>(4541B-1)</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Plant 4</td>
<td>(4543-2)</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>4</td>
<td>22</td>
</tr>
</tbody>
</table>

Plants Present:
1. 4935 A and B
2. 4942 A + B
3. 4946 B + C
4. 4951 A + C
Courses of plants in B column, figure 2. To C after one
C x C, 1 x 1, 07 I ShBz with Ac. A x C ShBz with Do

<table>
<thead>
<tr>
<th>Plant from Column B</th>
<th>I in kernels</th>
<th>I - C$_{Bz}$ not observed</th>
<th>C$<em>{Bz}$ - C$</em>{Bz}$ observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>147</td>
<td>107</td>
<td>161</td>
</tr>
<tr>
<td>2</td>
<td>223</td>
<td>186</td>
<td>228</td>
</tr>
<tr>
<td>3</td>
<td>49</td>
<td>52</td>
<td>54</td>
</tr>
<tr>
<td>4</td>
<td>104</td>
<td>88</td>
<td>91</td>
</tr>
<tr>
<td>5</td>
<td>133</td>
<td>144</td>
<td>132</td>
</tr>
<tr>
<td>6</td>
<td>181</td>
<td>166</td>
<td>181</td>
</tr>
<tr>
<td>7</td>
<td>135</td>
<td>111</td>
<td>106</td>
</tr>
<tr>
<td>Total</td>
<td>1150</td>
<td>981</td>
<td>1089</td>
</tr>
<tr>
<td>H414</td>
<td>145</td>
<td>35</td>
<td>113</td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
</tr>
<tr>
<td>1260</td>
<td>63</td>
<td>96</td>
<td>181</td>
</tr>
<tr>
<td>490</td>
<td>98</td>
<td>212</td>
<td>235</td>
</tr>
<tr>
<td>176</td>
<td>143</td>
<td>212</td>
<td>86</td>
</tr>
</tbody>
</table>

**Totals:**

<table>
<thead>
<tr>
<th>H414</th>
<th>145</th>
<th>35</th>
<th>113</th>
<th>74</th>
<th>37</th>
<th>111</th>
</tr>
</thead>
<tbody>
<tr>
<td>1260</td>
<td>63</td>
<td>96</td>
<td>181</td>
<td>271</td>
<td>245</td>
<td>106</td>
</tr>
<tr>
<td>490</td>
<td>98</td>
<td>212</td>
<td>235</td>
<td>175</td>
<td>210</td>
<td>98</td>
</tr>
<tr>
<td>176</td>
<td>143</td>
<td>212</td>
<td>86</td>
<td>39</td>
<td>109</td>
<td>270</td>
</tr>
</tbody>
</table>

**Winces:**

<table>
<thead>
<tr>
<th>H414</th>
<th>145</th>
<th>35</th>
<th>113</th>
<th>74</th>
<th>37</th>
<th>111</th>
</tr>
</thead>
<tbody>
<tr>
<td>1260</td>
<td>63</td>
<td>96</td>
<td>181</td>
<td>271</td>
<td>245</td>
<td>106</td>
</tr>
<tr>
<td>490</td>
<td>98</td>
<td>212</td>
<td>235</td>
<td>175</td>
<td>210</td>
<td>98</td>
</tr>
<tr>
<td>176</td>
<td>143</td>
<td>212</td>
<td>86</td>
<td>39</td>
<td>109</td>
<td>270</td>
</tr>
</tbody>
</table>