These results would suggest that the albino phenotype of w-3 when grown in the light is not due to the inability of the plants to synthesize chlorophyll or to their lack of chloroplasts. The rapid destruction of chlorophyll in this carotenoidless mutant when exposed to light under aerobic conditions would suggest that the colored carotenoids of higher plants have a role in the protection of chlorophyll from auto-photodestruction in the presence of oxygen.

-- I. C. Anderson and Donald S. Robertson

ISTITUTO DI GENETICA VEGETALE, UNIVERSITA CATTOLICA DEL S. CUORE
Piacenza, Italy
and
ISTITUTO DI GENETICA, UNIVERSITA DI MILANO
Milano, Italy

1. Defective endosperm factors from maize teosinte derivatives.

Additional data have been obtained on the defective endosperm types detected in the derivatives of controlled teosinte introgression into the inbred A158. So far, allelism has been established for the following two series:

A. ($de^{t2}$), $de^{t3}$, $de^{t4}$, $de^{t5}$, $de^{t10}$, $de^{t11}$, $de^{t14}$, $de^{t15}$, $de^{t17}$, $de^{t18}$, $de^{t19}$, $de^{t20}$, $de^{t23}$, and $de^{t24}$.

Allelism seems also established for the series:

B. $de^{t13}$, $de^{t22}$, $de^{t26}$, $de^{t27}$, and $de^{t29}$.

As described in previous M N L issues, each series appears to have a characteristic behaviour. When defective kernels of the A-series type, apparently homozygous, give rise to adult plants, these can be self-pollinated and produce ears showing all the kinds of kernels from extreme defective to normal ones. When, on the other hand, apparent homozygotes of the B-type produce adult plants, these, after self-pollination, produce ears showing a 3:1 ratio of normal to defective kernels. Such behaviour seems to hold also for $de^{t28}$. Both $de^{t28}$ and the B-series have in common the condition of a clear cut distinction between the defective and the normal phenotype, which is not the case, as known, for the A-series. Moreover, although allelism tests have not yet been conducted, $de^{t28}$ and the B-series seem located at different "loci." In fact, there is some evidence that the $de^{t22}$ is linked with su, and $de^{t28}$ with y, as suggested by the data presented in Table I. However, this point needs confirmation, in view of the peculiarity of this hereditary behaviour.

Extensive data, on the contrary, are now available on the behaviour of the B-series factors, when kept in heterozygous condition. As reported in MNL 33, normal kernels from ears segregating extreme ($de^{t29}$) or intermediate ($de^{t22}$) defective give rise, following self-pollination, to ears which show no defectives in 1/3 of the cases and in 2/3 of the cases to ears segregating defectives, among which the extreme or intermediate defective, according to the parental condition, represented 9/10 of the defectives and 1/10 were of the alternative type. Moreover, the stocks segregating both types of defectives produce ears in which a unique type is present or both; in the latter case the percentage of defective may exceed greatly the expected 25%.

Table I. $F_2$ segregation data for $\underline{de}^{t22}$ and $\underline{de}^{t28}$ and the markers su and y.

| Row and Ear No. | Factors and supposed linkage phase involved | | No. of Individuals | | | | Percent of recombination ± P.E. (Immer tables) |
|---|---|---|---|---|---|---|---|
| | | | XY | Xy | xY | xy | |
| 56-482-3 | $Y_1$ $De_{28}$ | R | 95 | 50 | 50 | 10 | 36.5 ± 3.96 |
| -11 | | C | 167 | 40 | 44 | 21 | 40.5 ± 2.73 |
| 58-505-2 | | R | 142 | 57 | 61 | 17 | 45.0 ± 3.20 |
| -1 | | R | 79 | 30 | 30 | 6 | 41.0 ± 4.60 |
| 59-105-9 | | R | 45 | 24 | 14 | 4 | 41.5 ± 5.92 |
| -106-12 | | C | 158 | 31 | 3 | 6 | 21.0 ± 2.24 |
| -11 | | R | 92 | 36 | 27 | 4 | 36.5 ± 4.57 |
| -10 | | C | 77 | 24 | 16 | 10 | 40.5 ± 3.97 |
| -3 | | R | 54 | 19 | 28 | 5 | 40.5 ± 5.41 |
| -108-3 | | C | 150 | 50 | 32 | 37 | 33.0 ± 2.45 |
| -6 | | R | 83 | 34 | 32 | 5 | 36.5 ± 4.65 |
| -5 | | R | 149 | 73 | 47 | 5 | 30.0 ± 3.66 |
| -8 | | R | 132 | 62 | 26 | 6 | 40.0 ± 3.72 |
| 56-459-14 | $Su_1De_{22}$ | C | 185 | 48 | 19 | 11 | 39.0 ± 2.72 |
| 498- 4 | | R | 269 | 101 | 78 | 14 | 40.0 ± 2.22 |
| 498-14 | | R | 182 | 86 | 38 | 7 | 37.5 ± 2.44 |
| 58-500-5 | | R | 109 | 45 | 34 | 9 | 44.0 ± 3.36 |
| -7 | | C | 217 | 62 | 47 | 16 | 47.5 ± 2.66 |
| 501-1 | | R | 224 | 77 | 70 | 16 | 48.0 ± 2.51 |
| -3 | | C | 200 | 67 | 40 | 24 | 42.0 ± 2.52 |
| -5 | | R | 164 | 63 | 52 | 11 | 41.5 ± 2.68 |

Table II. Results in self-pollinated ears produced by plants originated from normal seeds of ears segregating extreme defectives for two successive generations.

| Row and ear No. | Approximate percentage of defectives | | Total number of seeds | No. of ears ears segregating no de |
|---|---|---|---|---|
| | extreme type | intermediate type | | |
| 153 | | | | 2 |
| 154 | | | | 6 |
| -2 | 21 | 0 | 107 | |
| -3 | 11 | 1 | 179 | |

Table III. Results in self-pollinated ears produced by plants originated from normal seeds of ears that segregated extreme defective in 1957 and extreme plus intermediate defectives in 1958 (58-578-10 and 61)

| Row and ear No. | Approximate percentage of defectives | | Total number of seeds | No. of ears ears segregating no de |
|---|---|---|---|---|
| | extreme type | intermediate type | | |
| 155 | | | | 1 |
| -4 | 11 | 24 | 68 | |
| -7 | 15 | 5 | 185 | |
| -8 | 10 | 20 | 226 | |
| 156 | | | | 1 |

Table IV. Results in self-pollinated ears produced by plants originated from normal seeds of ears segregating intermediate defectives for two successive generations.

| Row and ear No. | Approximate percentage of defectives | | Total number of seeds | No. of ears ears segregating no de |
|---|---|---|---|---|
| | extreme type | intermediate type | | |
| 145 | | | | 3 |
| -1 | 10 | 27 | 286 | |
| -3 | 12 | 12 | 257 | |
| -7 | 8 | 25 | 182 | |
| -9 | 10 | 27 | 292 | |
| -10 | 8 | 20 | 305 | |
| 146 | | | | 4 |
| -3 | 2 | 15 | 58 | |
| -5 | 6 | 25 | 219 | |
| -7 | 2 | 18 | 133 | |
| -8 | 8 | 21 | 159 | |
| -9 | 12 | 26 | 173 | |
| 147 | | | | 3 |
| -1 | 16 | 24 | 222 | |
| -3 | 3 | 22 | 109 | |
| -6 | 35 | 14 | 54 | |
| -7 | 25 | 6 | 33 | |
| 148 | | | | 1 |
| -1 | 3 | 42 | 178 | |
| -3 | 1 | 27 | 140 | |
| -4 | 4 | 31 | 54 | |
| -6 | 1 | 19 | 108 | |
| -7 | 1 | 25 | 237 | |
| -8 | 6 | 19 | 227 | |
| 149 | | | | 5 |
| -1 | 10 | 22 | 271 | |
| -5 | 6 | 18 | 116 | |
| -6 | 1 | 24 | 102 | |

Table V. Results in self-pollinated ears produced by plants originated from normal seeds of ears that segregated intermediate defective in 1957 and a mixture of extreme plus intermediate defectives in 1958 (58-577-9,11, 23)

| Row and ear No. | Approximate percentage of defectives: extreme type | Approximate percentage of defectives: intermediate type | Total number of seeds | No. of ears segregating no de |
|---|---|---|---|---|
| 150 | | | | 4 |
| -1 | 1 | 28 | 203 | |
| -2 | 11 | 27 | 218 | |
| -4 | 2 | 13 | 185 | |
| -7 | 5 | 21 | 149 | |
| 151 | | | | 2 |
| -4 | 6 | 23 | 257 | |
| 152 | | | | 1 |
| -1 | 2 | 29 | 165 | |
| -2 | 2 | 36 | 282 | |
| -3 | 1 | 22 | 254 | |
| -4 | 1 | 19 | 231 | |
| -6 | 1 | 23 | 181 | |

Table VIII. Results in self-pollinated ears produced by plants originating from normal seeds of ears that segregated both kind of defective in 1957 and only the intermediate type in 1958 (58-579-4, 23, 37)

| Row and ear No. | Approximate percentage of defectives: extreme type | Approximate percentage of defectives: intermediate type | Total number of seeds | No. of ears segregating no de |
|---|---|---|---|---|
| 166 | | | | 1 |
| -5 | 1 | 29 | 192 | |
| -10 | 8 | 33 | 166 | |
| 167 | | | | 4 |
| -3 | 7 | 21 | 194 | |
| -5 | 4 | 19 | 360 | |
| -7 | 5 | 25 | 185 | |
| -9 | 1 | 24 | 339 | |
| -15 | 5 | 20 | 168 | |
| 168 | | | | 2 |

Table IX. Results in self-pollinated ears produced by plants originating from normal seeds of ears that segregated defective in 1957, but were completely free of defective in 1958.

| Row and ear No. | Approximate percentage of defectives: extreme type | Approximate percentage of defectives: intermediate type | Total number of seeds | No. of ears segregating no de |
|---|---|---|---|---|
| | 1957 : intermediate de | | | |
| 169 | | | | 7 |
| -2 | 4 | 2 | 136 | |
| -3 | 10 | 21 | 149 | |
| 170 | | | | 5 |
| 171 | | | | 4 |
| -2 | 1 | 5 | 216 | |
| -3 | 20 | 0 | 304 | |
| -5 | 5 | 9 | 339 | |
| 172 & 173 | | | | 9 |
| 174 | | | | 9 |
| -1 | 20 | 17 | 343 | |
| 175 | | | | 8 |
| -3 | 2 | 4 | 303 | |
| 176 | | | | 7 |
| -6 | 5 | 10 | 313 | |
| | 1957 : extreme de | | | |
| 177 to 182 | | | | 38 |
| | 1957 : extreme and intermediate de | | | |
| 183 & 184 | | | | 11 |

Table VI. Results in self-pollinated ears produced by plants originating from normal seeds of ears that segregated extreme and intermediate defectives for two successive generations.

| Row and ear No. | Approximate percentage of defectives | | Total number of seeds | No. of ears segregating no de |
|---|---|---|---|---|
| | extreme type | intermediate type | | |
| 157 | | | | 2 |
| -6 | 3 | 32 | 138 | |
| -7 | 26 | 23 | 309 | |
| -8 | 24 | 25 | 217 | |
| -9 | 11 | 18 | 266 | |
| 158 | | | | 2 |
| -3 | 16 | 1 | 322 | |
| -4 | 11 | 21 | 136 | |
| -5 | 3 | 24 | 331 | |
| -6 | 19 | 23 | 68 | |
| -7 | 3 | 5 | 81 | |
| 159 | | | | 1 |
| -1 | 27 | 16 | 256 | |
| 160 | | | | 1 |
| -2 | 36 | 23 | 59 | |
| -3 | 25 | 18 | 319 | |
| -4 | 23 | 21 | 326 | |
| -5 | 6 | 25 | 180 | |
| -6 | 24 | 18 | 186 | |
| 161 | | | | 1 |
| -1 | 32 | 15 | 149 | |
| -3 | 14 | 17 | 173 | |
| -5 | 32 | 1 | 111 | |
| -6 | 28 | 33 | 136 | |
| -7 | 35 | 9 | 134 | |
| -10 | 1 | 35 | 183 | |

Table VII. Results in self-pollinated ears produced by plants originating from normal seeds of ears that segregated both kind of defective in 1957 and only the extreme type in 1958 (58-579-3,10,22,28)

| Row and ear No. | Approximate percentage of defectives | | Total number of seeds | No. of ears segregating no de |
|---|---|---|---|---|
| | extreme type | intermediate type | | |
| 162 | | | | 1 |
| -4 | 33 | 0 | 92 | |
| -6 | 25 | 2 | 59 | |
| -7 | 15 | 2 | 143 | |
| -10 | 21 | 0 | 186 | |
| 163 | | | | 4 |
| -1 | 28 | 0 | 229 | |
| -2 | 27 | 1 | 183 | |
| -6 | 28 | 3 | 69 | |
| -8 | 1 | 6 | 205 | |
| -9 | 28 | 7 | 228 | |
| -10 | 17 | 7 | 271 | |
| 164 | | | | 1 |
| -2 | 48 | 5 | 87 | |
| -7 | 21 | 0 | 99 | |
| -8 | 27 | 6 | 131 | |
| -10 | 22 | 13 | 287 | |
| -11 | 16 | 11 | 97 | |
| 165 | | | | 2 |
| -6 | 25 | 26 | 173 | |
| -7 | 26 | 1 | 329 | |
| -10 | 19 | 3 | 294 | |
| -11 | 17 | 11 | 76 | |

Last summer progenies of about 10 plants each were grown from the normal seeds on most of the ears that in 1958 segregated extreme defective, intermediate defective, both defectives, or no defective, and a total of about 300 ears was obtained, as presented in Tables II-IX. (The percentages appearing in such tables have been obtained from diagrams constructed on the basis of the actual weights of the individual kernels.)

An inspection of Tables II-VIII confirms what has been described previously, and reported above.

Table IX shows that the non-segregating ears, sibs of those segregating defectives, breed true, in the sense that in successive generations they do not give defective seeds. However, there are some remarkable exceptions: these occur in the progeny of De De ears thatwere derived in the pervious generation from sibs of individuals segregating the intermediate type of defective endosperm. Tentative conclusions can be drawn as follows:

a) the intermediate type of defectiveseedthat is observable in certain derivatives of teosinte introgression is highly unstable;

b) the genetic factors conditioning such a defective may be brought to what can be considered a homozygous condition by selfing heterozygous plants; however, the 25% defective kernels supposed to be homozygotes give rise to plants which appear heterozygous; the progeny of the normal sibs of such homozygotes seems to behave in a relatively normal way (30 proved to be segregating; 16 non-segregating);

c) normal individuals, sibs of homozygous intermediate defectives, in about 2/3 of the cases again segregate defectives; however, the percentage often exceeds significantly the expected 25%, and, besides the intermediate type, the extreme type is found with a consistent proportion; the other 1/3 supposed to be of DeDe genotype occurring in the progeny of ears segregating the extreme de behave in a more orthodox way;

d) the preceding facts seem understandable if an extragenic element, or a controlling element in the sense of McClintock, is postulated, which would interact chiefly with the intermediate type of defective, and to a minor degree with both the extreme one and with the "normal" condition.

-- Angelo Bianchi
-- Annamaria Morandi

2. Mendelian characters in Italian maize varieties.

To detect genetic mutants in Italian varieties, self-pollination has been carried out in a few plants grown from many seed samples of populations grown throughout Italy. The selfed ears were examined and scored first for kernel characters. Subsequently 50 kernels from every ear were germinated in the greenhouse and classified for seedling mutants.

With the exception of color characters (A C R Pl system) the segregation was often 3:1; in other cases the ratio was close to 15:1.

The following mutants have been obtained in a total of 347 selfed-ears belonging to 128 different open-pollinated varieties: