# REPORT

## of the

# TOMATO GENETICS
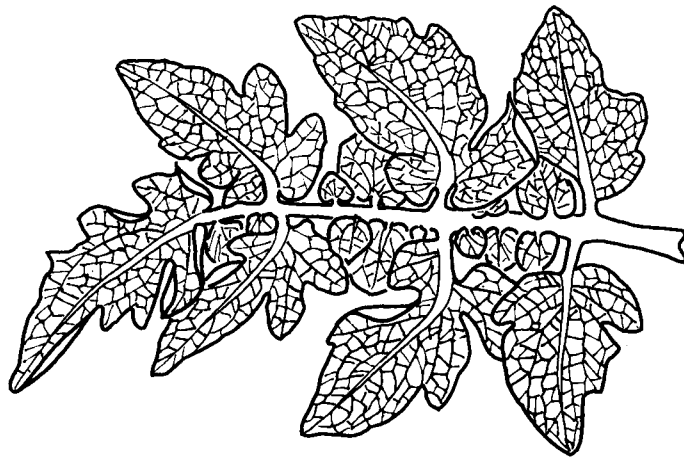
# COOPERATIVE



NUMBER 19          FEBRUARY 1969

## FOREWORD

The Tomato Genetics Cooperative is a group of workers who have a common interest in tomato genetics and who are organized informally for the purpose of exchanging information and stocks.  Participation is voluntary, and costs of activities are met by assessments to members.

Membership as of December 31, 1968 stood at 321.  It is interesting to note that the enrollment of foreign members has increased to 163, now constituting the majority (50.7%) of our membership.  Our financial situation has improved, thanks largely to the increase in membership assessments that took effect last year.  At the end of 1968 the financial balance was $358.51.

The regular annual meeting was held under the auspices of the American Society for Horticultural Science at Davis, California on August 19, 1968. Minutes appear on this page.  Arrangements have been completed and notices sent for the 1969 meeting to be held with the Tomato Breeders Round Table in Denver, Colorado on February 20.  The current tendency toward splintering the AIBS convention into separate meetings of the member societies diminishes the opportunity for holding our annual session with a national meeting attended by a good cross section of our membership.  Our present policy is to rotate TGC meetings among the societies in which most of our membership is represented.

We are deeply grateful to several workers whose assistance was essential for progress of the TGC during the past year.  Dora Hunt again shouldered a major share of the operations.  As Executive Secretary, she was in charge of all membership affairs, and, as Editor, she skillfully compiled the bibliography and revisions of the membership list, prepared the financial statement, and edited all copy for TGC 19.  Virginia Vanderhoff was responsible for the masterful job of typing the stencils.  Many other willing workers assembled the Report and assisted with other details.

Five hundred copies of this Report have been issued.

### Coordinating Committee

| | |
|---|---|
| L. Butler | C. M. Rick, Chairman |
| G. B. Reynard | Department of Vegetable Crops |
| R. W. Robinson | University of California |
| M. L. Tomes | Davis, California 95616 |

## MINUTES OF THE DAVIS MEETING

### August 19, 1968

The annual meeting of the TGC was held in Room 1066 Engineering Building on the Davis campus of the University of California in conjunction with the national meeting of the American Society for Horticultural Science.

Chairman C. M. Rick called the meeting to order.  The question of where and with what society future meetings will be held was brought up, but no decisions were made at this time.  Membership was reported to be well over 300 and the financial balance, $208.

Shig Honma introduced a brief discussion about classifying mutants according to plant parts affected.  No published work has appeared.  C. M. Rick suggested classification might be done conveniently in a table.

An unsolved problem was laid before the group—the proposal to put mutants in a common genetic background.  The difficult hurdle is finding a genotype that is universally satisfactory.  No one offered his favorite variety, so no debate ensued, and the meeting adjourned.

D. G. Hunt, Secretary, pro tem

## PART I

## RESEARCH NOTES

**Butler, L.  A partial map of
   chromosome 2.**

The three-point data given in
my note on coincidence and re-
combination values can be used
to confirm the linear order and map distances for eight of the genes in this
group.  In view of the marked differences of the recombination values for the
aw - d section, it is necessary to accept one value as standard.  The crosses
made to 706 sel. d p o s bk gave recombination values near 10% for this section,
and this will be adopted as standard for the present.  Applying this standard,
then the cross Wo aw d must be discarded because its 22.3% puts it into a dif-
ferent class.  The genes Wo Cu and Me are close together and within 6 units of
wv in contrast to the 15 units found in other crosses.  The two values for the
cross Wo m d are much too large, giving a total distance of 40.1% instead of
29.3% as in the other cross.  There is some doubt about the position of dil,
but most of the evidence indicates that it is between Me and aw.  It does not
seem worthwhile to turn these recombination units into map units until we can
refer all values to the "standard" background, or some other background.  In
the meantime we can hypothesize that the background genes controlling recombina-
tion are affecting the whole chromosome in the same manner, and that, if we
select for the minimum values in each case, we are mapping one end of the
spectrum which we can designate standard.  The order and standard values are
given below.

| | 5.0 | | 9.5 | | 11.8 | |
|---|---|---|---|---|---|---|
| wv  3.1  Wo  3.2 Cu  Me | 10 | | dil | aw | 9.2 | suf  d |

**Butler, L.  Recombination and
   coincidence in chromosome 2.**

Examination of the accumulated
linkage data reveals signifi-
cant heterogeneity.  The re-
combination values depend on the genetic background.  We are now beginning to
place the genes on a uniform genetic background, but it will be several years
before data are available from this source.  In the meantime, some of the best
data available are given by the three-point backcrosses listed below.  The re-
combination values obtained map fairly consistently except in the case of dil,
which gives larger values for the distances Me dil and d dil than are expected.
The coincidence values show that recombination in one region does interfere with
recombination in the adjacent region.  There are two cases of significant
positive interference.  In the one case this is probably because of the diffi-
culty of classification of mottled, but the other case needs further investiga-
tion.  The column headings $a_1$ and $a_2$ refer to recombinants in regions 1 and 2.
The headings $p_1$ and $p_2$ refer to recombination percentage in regions 1 and 2.

| Genes | $a_1$ | $a_2$ | $a_{1,2}$ | N | C | $p_1$ | $p_2$ |
|-------|-------|-------|-----------|---|---|-------|-------|
| wv-aw-d   | 84  | 76   | 4  | 659  | 0.37 | 13.3 | 12.1 |
| wv-aw-d   | 710 | 527  | 71 | 5194 | 0.99 | 15.0 | 11.5 |
| wv-Me-aw  | 44  | 107  | 9  | 1260 | 1.80 | 4.2  | 9.2  |
| wv-Me-aw  | 186 | 563  | 32 | 5194 | 1.28 | 4.2  | 11.5 |
| wv-Me-d   | 21  | 135  | 7  | 488  | 0.86 | 5.7  | 29.0 |
| wv-Me-d   | 164 | 1090 | 54 | 5194 | 1.56 | 4.2  | 22.0 |
| Wo-aw-suf | 30  | 22   | 1  | 291  | 0.41 | 10.6 | 7.9  |
| Wo-aw-d   | 23  | 45   | 6  | 229  | 0.92 | 12.7 | 22.3 |
| Wo-Me-d   | 41  | 189  | 9  | 843  | 0.77 | 5.9  | 23.4 |
| Wo-dil-d  | 20  | 65   | 6  | 368  | 1.20 | 7.0  | 19.2 |
| Wo-Me-dil | 7   | 24   | 1  | 230  | 1.15 | 3.5  | 10.9 |
| Wo-m-d    | 161 | 59   | 12 | 609  | 0.59 | 28.5 | 11.6 |
| Me-aw-d   | 63  | 78   | 2  | 659  | 0.25 | 9.8  | 12.1 |
| Me-dil-d  | 41  | 54   | 10 | 349  | 1.07 | 14.6 | 18.3 |
| Cu-aw-suf | 35  | 55   | 3  | 502  | 0.68 | 7.5  | 11.5 |

**Butler, L.  The interaction of rosette (ro) and white virescent (wv).**

Linkage studies indicated that ro and wv were not closely linked, but it seemed impossible to recover ro wv segregates from repulsion crosses.  A number of these $F_2$ plants which were wv were grown and seed collected.  Several of these wv plants were heterozygous for ro, but the ro segregates did not show virescence.  Four-week-old ro plants were transplanted and grew very slowly because of their poor root development.  At seven weeks they showed typical wv characteristics.  Previous ro plants which had grown for three months failed to show any wv segregates.  It is suggested that the leaves of the non-transplanted wv ro do not become virescent.

**Butler, L.  The linkage of gf and al.**

In 1960 I was working with a fruit color modifier which I had obtained from Philippine tomato stocks.  This gene was called "muddy fruit color."  Subsequently, E. A. Kerr showed it to be identical with gf.  A large backcross was grown which was homogeneous and gave excellent monogenic ratios.  The data were:

| Al Gf | Al gf | al Gf | al gf |
|-------|-------|-------|-------|
| 36    | 880   | 856   | 34    |

These data give a recombination value of 3.8%, which is significantly different from the map distance of 23%.  Perhaps the identity of these genes should be rechecked.

**Contant, R. B., and K. Verkerk  Confusion in fruit shape terminology.**

On the terminology of fruit shape there seems to be some confusion.  The fruit shape of the obl mutant (TGC 17:56-58 and TGC 18:42-43) was called "oblate" in agreement with Butler's description of the fruit shape resulting from o (J. Hered. 43:25-35; 1952).  The same term is used extensively for fruit types with a ratio of polar to

equatorial diameters of less than 0.95 (cf. Zielinski in Genetics 33:405-428; 1948). Strictly speaking, "oblate," meaning "flattened at the poles," does not define the length/width ratio of a fruit. Therefore, this term is inadequate for describing the fruit shape of the obl mutant and also seems incorrect for denoting a fruit that is shorter than its width, unless it is agreed that this term replaces correct descriptions such as "oblate-spherical" or "oblate-spheroid." An elongated fruit may be correctly called "elongate(d)," "ellipsoidal," "ovoid," possibly "ovate." However, there is also difficulty in finding suitable terms to distinguish clearly a strongly elongated shape with flattened poles such as obl from a smooth ellipsoid type. The obl mutant would be well described as having an oblong longitudinal cross-section.

We welcome a glossary of fruit shape terms which would facilitate classification in genetical studies and the assignment of gene symbols.

Contant, R. B., and K. Verkerk            The potential use of mutation
  Development of selection and breeding    induction for the improvement
  methods adapted to irradiated plant      of quantitative traits cannot
  populations.                             be evaluated properly without
                                           knowledge of optimal procedures
of selection and breeding in mutagen-treated material. This problem is studied in tomato by comparing the advance under selection for earliness and yielding capacity in three different groups of $M_2$ material derived from seed irradiation treatments: (1) "major" mutants of approximately normal vigor and good fertility; (2) normal appearing plants in the same progenies as (1); (3) plants selected from non-segregating progenies obtained from the same mutagenic treatments; and (4) plants selected from the unirradiated control.

The possible importance of group (1) is suggested by the following considerations: (a) certain "major" mutations may by themselves confer improvements in quantitative traits; (b) "major" mutations are likely to be accompanied by other mutations, including those affecting quantitative traits; (c) the abrupt induction of "major" mutations in a formerly stabilized genotype may cause genetic unbalance, leading via an increased rate of "spontaneous" mutation to an increased genetic variability for quantitative traits. In the latter two cases, the visible mutation acts as an "indicator." It seems insufficient to consider only group 2 while omitting group 1, as the desirable genes may be genetically linked to the "major" mutation in question. Hypothesis (c) is, to our knowledge, novel in its application to higher organisms, but finds support in the work of S. I. Alikhanian on microorganisms (TGC 17: 16-18).

Of each group, 43 pairs of $M_2$ plants were grown to maturity, each pair selected from a different $M_1$ plant progeny. Groups 1, 2, and 3 were all derived from the same mutagenic (fast neutron) treatments. Several characteristics were recorded per plant; the within-group means + standard deviation of single observations are shown below; for standard deviation of the mean, divide by 9.3.

| Group | Flowering date | No. of leaves below 1st cluster | Length 3rd leaf (mm) | Fertility (weight of seeds per fruit) |
|-------|----------------|--------------------------------|----------------------|---------------------------------------|
| 1 | 15.02+8.95 | 10.02+1.18 | 155.1+28.3 | 52.1+22.3 |
| 2 | 8.55+3.00 | 9.72+0.84 | 173.6+17.6 | 61.7+16.0 |
| 3 | 8.75+3.20 | 9.53+0.84 | 172.3+17.6 | 60.2+15.4 |
| 4 | 8.01+2.48 | 9.77+0.74 | 176.6+13.8 | 73.0+12.8 |

Group 1, composed of mutants with fairly normal phenotype, showed a 13% lower average leaf length, a 29% lower fertility, an increased number of leaves below the first inflorescence, and a concomitant flowering delay of 7 days compared with the control group 4. Groups 2 and 3 were virtually identical in respect to means and variances. In contrast to group 1, the means of the vegetative criteria in these groups were only slightly affected by irradiation, whereas fertility was reduced by 18%. Within-group variation for the different traits was increased by 14 to 29% in groups 2 and 3 and by 60 to 260% in the mutant group. Groups 1, 2, and 3 contained individuals that, in respect to any single character, equalled or even exceeded the most favorable control values. There was no within-group correlation between flowering date, length of the 3rd leaf, and fertility ($r < 0.1$). From each population 12 individuals were selected on the basis of the most favorable combination of the above characteristics, viz. early flowering, long 3rd leaf, and high fertility. Their offspring is subjected to selection for earliness and yield under early season greenhouse conditions.

The most promising lines within each group will also be intercrossed in the $M_3$ generation in order to create optimal opportunities for genetic recombination before proceeding to further inbreeding with its inherent risk of gene losses.

Contant, R. B., and K. Verkerk
    On the genetics of fruit shape in 'San
    Marzano' and the obl mutant of
    'Money Maker.'

The long-fruited variety 'San Marzano' (SM), the round-fruited variety 'Money Maker' (MM), and the long-fruited obl mutant of the latter were crossed in all combinations (TGC 18:42-43). The $F_1$ and the $F_2$ were grown in 1968 to examine fruit shape and its segregation. The data on the reciprocal hybrid were pooled, as no cytoplasmic differences could be ascertained.

The $F_1$ (MM x obl) was round; its $F_2$ segregated 26 round : 7 long. This is consistent with the expected 3 : 1 ratio for the segregation of obl; the + allele behaved as completely dominant in this genetic background.

The segregation ratios for the other crosses are shown in the table. The distinction in fruit shape between $F_1$ (MM x SM) and $F_1$ (obl x SM), slightly ovate (round-ovate) versus ovate, indicates that obl in heterozygous condition, though by itself unable to affect the round phenotype, does have a detectable expression in combination with the heterozygous condition of the fruit shape genes of SM. Whereas this suggests non-allelic interaction, it is not excluded that in respect to their primary products the genes involved would act additively.

In the $F_2$ of both crosses the proportion of long-fruited individuals (SM type), which is about 1/4, suggests that only one recessive factor determines the characteristic long-fruit shape of SM; the apparent heterogeneity of intermediate phenotypes on the other hand indicates the presence of at least one other factor with less marked expression. Furthermore, at least one gene seems to have intermediate inheritance.

On this basis the existence is postulated of at least two genes for fruit shape in SM, $el_2^*/+$ and $o_2^*/+$. The expression of each gene, in combination with the + alleles of the other genes, may be as follows:

| obl/obl | long | obl/+ | round | +/+ | round |
|---------|------|-------|-------|-----|-------|
| $el_2/el_2$ | long | $el_2/+$ | round | +/+ | round |
| $o_2/o_2$ | ovate | $o_2/+$ | round-ovate | +/+ | round |

However, the heterozygotes obl/+ and $el_2/+$, though individually unable to show an intermediate phenotype, may produce in combination round-ovate fruits. Similarly, the triple heterozygote would become ovate instead of round-ovate as conferred by $o_2/+$ alone.

The segregation ratios expected on the basis of this hypothesis were consistent

* Tentative symbols

with the observed values (see table). All alternative hypotheses tested provided less satisfactory agreement with the data. There was no evidence of linkage. Further tests on larger $F_2$'s and subsequent generations are required for obtaining more conclusive evidence. The major fruit shape gene in 'San Marzano,' which we refer to as $el_2$ according to Butler (J. Hered. 43:25-35; 1952), probably differs from $el(e)$ and $o$. The connection between the genes $obl$ and $o_2$ on the one hand and $el$ and $o$ on the other is still unknown.

|  |  | Observed | Expected | Genotype(s) | | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | $\underline{obl}$ | $\underline{el_2}$ | $\underline{o_2}$ |
| $F_1$ (MM x SM) | round-ovate | All | All | +/+ | $el_2$/+ | $o_2$/+ |
| $F_2$ (MM x SM)[*] | round | 8 | 6.2 | +/+ | ./+ | +/+ |
|  | round-ovate | 11 | 12.4 | +/+ | ./+ | $o_2$/+ |
|  | ovate | 7 | 6.2 | +/+ | ./+ | $o_2/o_2$ |
|  | long | 7 | 8.2 | +/+ | $el_2/el_2$ | ./. |
| $F_1$ ($\underline{obl}$ x SM) | ovate | All | All | $obl$/+ | $el_2$/+ | $o_2$/+ |
| $F_2$ ($\underline{obl}$ x SM)[*] | round | 1 | 1.8 | ./+ | +/+ | $o_2$/+ |
|  |  |  |  | +/+ | ./+ | +/+ |
|  | round-ovate | 5 | 5.0 | $obl$/+ | $el_2$/+ | +/+ |
|  |  |  |  | ./+ | +/+ | $o_2$/+ |
|  |  |  |  | +/+ | ./+ | $o_2$/+ |
|  | ovate | 8 | 6.1 | $obl$/+ | $el_2$/+ | $o_2$/+ |
|  |  |  |  | ./+ | ./+ | $o_2/o_2$ |
|  | long $\underline{obl}$ | 4 | 4.3 | $obl/obl$ | ./. | ./. |
|  | long SM | 5 | 5.8 | ./. | $el_2/el_2$ | ./. |

[*] $Chi^2$   $F_2$ (MM x SM) = 0.96 (n.s.)
$F_2$ ($\underline{obl}$ x SM) = 1.06 (n.s.)

. = either allele

Contant, R. B., and K. Verkerk
  Successful selection for earliness and
  yielding capacity amongst the offspring
  of visibly mutated plants.

The following hypothesis was tested: that $M_2$ plants with slight morphological aberrations but of approximately normal vigor and fertility might be suitable as basic material for selection for quantitative traits in subsequent generations. Nineteen such mutant seedlings were retained from a total $M_2$ population of about 60,000. First results of selection for earliness and yield were reported in TGC 17:16-18 and TGC 18:43-45. In 1968, the best selections were re-examined in 3 identical experiments sown at 2-month intervals through winter and spring. There were 6 x 10 plants per object. Only the first 5 clusters were harvested. This trial largely confirmed the results of the 1967 experiment (2 sowings), as shown in the table for cumulative yields of those lines that were superior to the control.

$L_1$ and $L_5$ were earlier than the mother variety 'Glorie,' but ultimate yields were only slightly higher. In contrast, M and its reselection $M_1$ had a higher yield over the whole harvesting period, but no improved earliness. In 1967, $M_1$ was superior to M, while the opposite was true in 1968; for this

reason it seems worthwhile carrying out further selection in M. Selection $B_1$ was not earlier than its mother variety 'Money Maker,' but progressively outyielded the latter as harvesting proceeded. In all lines, the yielding superiority decreased with later sowing, i.e., as growth conditions became more favorable. Similarly, the inferior mutant lines (not shown) also tended towards the mother variety in the later sowings. This shows that not only defective but also favorable mutations may have a more pronounced expression under suboptimal conditions.

In the first sowing of 1968, mean weight per fruit was 5 to 6% higher in $L_1$ and $L_5$ and 7 to 8% higher in M and $M_1$ compared to 'Glorie.' M developed more fruits on the 3rd to 5th clusters than 'Glorie,' though $M_1$ did not. In contrast, $L_1$ and $L_5$ had less fruits on these clusters, which is responsible not only for the fact that these lines lost their advance over 'Glorie' later in the harvesting period, but also for the fast development of the first clusters, leading to a high early yield. In the later sowings these differences tended to disappear.

In $B_1$, mean weight per fruit was 3 to 8% higher than in 'Money Maker,' also in the later sowings. Fruit number, however, while being 5% higher in the first sowing, was as much as 7% lower in the third sowing. As a result, the yield of $B_1$ was 8 to 13% superior with sowing in winter, but about equal to 'Money Maker' after spring sowing.

These results demonstrate a yielding superiority of 3 out of 19 lines, each derived from a single, fertile, visibly aberrant but not markedly retarded $M_2$ plant. It is important to note that the parent plants of B, L, and M were already recognized as very vigorous when they were first selected. However, neither of these 3 were clearly representative of monogenic recessives, in contrast to the other 16 selected mutants of which parenthetically none had a noticeably superior vigor. The parent plants of L and M occurred as single aberrants in otherwise normal populations; L was noted for its less coarse foliage and M for upwardly curled leaves. B was derived from a progeny that segregated 4 individuals with twisted cotyledons. In the offspring of these selected plants these distinctive features have not been noted again. Due to this puzzling behavior, it is not yet possible to say whether the parent plants of the superior lines legitimately belonged to the category of recessive "major" point mutations ("group 1," cf. this issue p. 4 ) or to a different category of material in which effective selection is apparently possible.

Cumulative yield of selected mutant lines
after 4 and 8 weeks of harvesting, as per cent of control

| Sowing: | 1966/67 | | | | | | 1967/68 | | | |
| | Nov. | | Dec. | | Dec. | | Feb. | | April | |
| Harvesting period (weeks): | 4 | 8 | 4 | 8 | 4 | 8 | 4 | 8 | 4 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mutant line:* | | | | | | | | | | |
| $L_1$ (Glorie) | 111 | 99 | 99 | 97 | 109 | 100 | 108 | 101 | 104 | 102 |
| $L_5$ (Glorie) | 115 | 109 | 112 | 105 | 118 | 102 | 113 | 102 | 108 | 104 |
| M (Glorie) | 111 | 110 | 99 | 108 | 108 | 115 | 111 | 110 | 106 | 106 |
| $M_1$ (Glorie) | 117 | 112 | 112 | 118 | 100 | 113 | 103 | 108 | 105 | 106 |
| $B_1$ (Money Maker) | 94 | 113 | 102 | 105 | 98 | 108 | 100 | 107 | 100 | 101 |

* Variety of origin in brackets. Letter code without suffix: unselected progeny of single plant of second generation; with suffix: single plant reselection made in the third generation. The fourth generation was grown in 1966/67, the fifth in 1967/68. Underlined values significant at P = 0.05.

Contant, R. B., and K. Verkerk
  Transgressive segregation for yield after
  hybridization of 'Money Maker' and the
  self-pruning variety 'Chanasyk Early.'

The $F_2$ of the hybrid between 'Money Maker' (MM) and the self-pruning variety 'Chanasyk Early' (CE) was grown in 1968 together with the $F_1$ and both parents. The analysis of frequency distributions and of correlations is still in progress, but means and ranges are available. The $F_2$ showed continuous variation between the extreme phenotypes of CE and of the vigorous indeterminate $F_1$ in respect to vigor, yielding capacity, fruit and cluster size, and many other traits. The main feature was a 25% segregation of self-pruning plants (44:126); however, the height and the cluster number at which self-topping occurred were extremely variable, reflecting the large genetic variation in plant vigor.

The table summarizes the data on cumulative yields per plant and other criteria. Self-pruning (sp) and indeterminate (tall) $F_2$ plants are considered separately. Selection was practiced in both categories for the most favorable combination of yield and fruit size; average performance of the selected plants is also shown in the table.

The $F_1$ exceeded the highest yielding parent MM throughout the harvesting period of 50 days; previous results (this issue, p. 9 ) have shown that over a longer period of harvesting the $F_1$ may be slightly outyielded by MM. Average performance of the tall $F_2$ plants was as in MM; however, the selected individuals covered virtually the same yield range as the transgressive $F_1$ population, and thus on average exceeded MM by about 17%. If this superior performance is due to gene complementation and not to an advantage of the heterozygotic condition per se, selection for yield in subsequent generations may lead to fixation of a genotype with a higher (early) yield than MM. The tall $F_2$ plants had a slightly greater range for fruit size than the $F_1$, while the mean was almost the same. Eight out of the 10 selected individuals exceeded this mean but were still 15-25% inferior to MM. Selection will be continued with the aim of producing a MM-type tomato with improved earliness/and if possible an equal or slightly higher total yield. The main problem seems to be the need for further improvements in fruit size.

The sp $F_2$ plants varied considerably in cluster number and height. It may be possible to fix the number of clusters at any desired level by further selection. Average yield of this population was more than double that of CE and of the selections even three times as high. However, this was due to a corresponding increase in the number of clusters and in plant height. Average fruit size exceeded CE by 30% and the proportion of unmarketable fruit was much less. Almost the entire harvest was collected within 5-6 weeks against 3 weeks for CE. If this 2-3 weeks longer harvesting period would be acceptable in those regions where CE is of value for its adaptation to a very short growing season, this self-pruning hybrid material may be useful as basic stock for further selection. Seed is available for experimental purposes.

Due to the apparent association between plant vigor and fruit size, it may not be possible to select from this material a very short self-pruning plant type having a fruit size similar to 'Money Maker.' Attempts in this direction are continued.

| | Avg cumulative yield (10 g) after | | | Yield range (50 days) | Avg weight per fruit (g) | | Plant height (cm) | |
|---|---|---|---|---|---|---|---|---|
| | 20 | 40 | 50 days | | Mean | Range | Mean | Range |
| CE sp | 63 | 67 | 67 | 35 - 142 | 31 | 24-37 | 35 | 24-46 |
| MM | 61 | 225 | 305 | 246 - 358 | 79 | 62-98 | -- | -- |
| F$_1$ | 88 | 290 | 361 | 304 - 455 | 56 | 44-69 | -- | -- |
| F$_2$ sp | 102 | 141 | 144 | 81 - 213 | 40 | 31-52 | 65 | 28-95 |
| F$_2$ sp (5 sel.) | 127 | 184 | 185 | 130 - 213 | 42 | 37-49 | 76 | 57-95 |
| F$_2$ tall | 81 | 230 | 295 | 198 - 423 | 54 | 41-76 | -- | -- |
| F$_2$ tall (10 sel.) | 108 | 274 | 358 | 312 - 423 | 60 | 51-68 | -- | -- |

Contant, R. B., and M. J. W. E. van Winkel

  Development and performance of the hybrid 'Money Maker' x 'Chanasyk Early' in relation to its parents.

In TGC 17:13-14, reference was made to the possible interest of the self-topping variety 'Chanasyk Early' (CE) in breeding for cultivation at close spacing. Main advantages are its determinate growth, small size, and high fruit/leaf ratio; disadvantages are its low yield, small fruit size, highly ramified and too large clusters, and, under our conditions, the watery taste of the fruit. In order to try to improve on these features, CE was crossed with 'Money Maker' (MM). The parents and the F$_1$ were studied under winter/spring conditions.

  Two weeks after sowing, the height of the F$_1$ was approximately intermediate, but after 40 days it exceeded both parents in height. At this stage, leaf length of the F$_1$ also exceeded that of the most vigorous parent MM by 10-15%; the ratio leaf length/width was intermediate. General growth habit was as in MM; in a few plants a tendency towards self-topping was noticed at approximately the fifth cluster, but in contrast to CE all F$_1$ plants continued to develop new clusters. Average leaf number below the first cluster (7.6) was only slightly higher than in CE (6.8) and much less than in MM (10.2); however, the number of leaves between subsequent clusters was almost the same as in MM (3.0), against 0-1 in CE. The total number of leaves initiated 40 days after sowing (dissection under a binocular) was as in MM (16.6 on the average), against only 8.5 in the self-topping CE. Due to this developmental pattern, the F$_1$ flowered much earlier than MM and also stayed ahead in respect to the number of inflorescences and clusters throughout the growth period. The F$_1$ had shorter internodes than MM; as a result, it had produced 10 inflorescences at the same height as MM had produced its 7th inflorescence.

  Mean weight, in grams per fruit at first harvest and over the whole harvesting period, respectively, were 31 and 18 for CE, 53 and 41 for the F$_1$, and 96 and 59 for MM. Thus, fruit weight of the F$_1$ remained much more stable throughout the harvesting period than it did for CE or MM, but was considerably less than the mean of the latter. Inheritance of fruit dimensions was intermediate. However, total number of fruits at the final harvest, 92, greatly exceeded that of either parent: 69 in MM and 42 in CE. This was due almost entirely to the advanced cluster formation of the hybrid compared to that of MM and not to differences in the mean number of fruits per cluster.

  The first harvesting day of the F$_1$ was intermediate between those of MM and CE, which differed by 7 days. The first kg of fruit was produced 2-1/2 days earlier in the F$_1$ than in MM. After about 1 month of harvesting, MM surpassed the

hybrid, so that cumulative yields per plant after 2 months were 4.0 kg in MM, 3.7 kg in the $F_1$, and only 0.7 kg in CE. The latter produced 80% of its total yield within 3 weeks; MM and the $F_1$ continued to produce well beyond the recorded harvesting period of 2 months.

An organoleptic test (Sprenger Institute, Wageningen) indicated that the hybrid had a fresh, attractive flavor; in fact, it was more aromatic than MM, but this comparison was biased by the exceptionally large fruit size of the latter, which reduced flavor. The result nevertheless shows that good quality hybrid fruits can be obtained.

The first data on the segregating $F_2$ and results from selection for yield and fruit size are reported separately (this issue, p. 8 ).

Ecochard, R.  Isotopic control of radio-
   sensitivity in tomato pollen irradiated
   with thermal neutrons.

It was shown (TGC 18:12) that a change in the isotopic composition of boron, stable isotopes $^{10}B$ vs. $^{11}B$, in tomato pollen treated with thermal neutrons results in a marked change in radiosensitivity.

A further investigation was conducted in 1968, in which the isotopic form of nitrogen was also changed. The reason for it was that, in tissues activated by thermal neutrons, the protons emitted by the atoms of natural nitrogen $^{14}N$ constitute, together with the alphas emitted by $^{10}B$, the main source of ionization responsible for genetic damages.

Dry pollen of the tomato variety Moneymaker containing almost exclusively the following isotopes, $^{14}N^{10}B$, $^{14}N^{11}B$, $^{15}N^{10}B$, or $^{15}N^{11}B$, was exposed in the pile of Wageningen to an identical flux of thermal neutrons, and then applied to emasculated flowers of L. esculentum line 221 (kindly provided by R. D. Brock).

The genetic effect of irradiation was determined for every treatment by scoring the seed set, namely, the number of normal as well as small seeds per fruit, and the mutagenesis in $F_1$—that is, the percentage of all mutant seedlings and the frequency of the various types of mutations, including those of the marker genes (a /+, aw/+, and hl/+, dominant in the pollen and recessive in the female partner, Brock and Franklin, TGC 14:8). For all these criteria of radiosensitivity the relative nitrogen effect, i.e., damages in presence of $^{14}N$ minus damages in presence of $^{15}N$ over the latter, was found to be very high, ranging from 112% for the reduction in number of small seeds per fruit to 193% for the frequency of chlorophyll mutations. In other words, replacing the natural nitrogen by its $^{15}N$ isotope reduces the radiation effect by more than half.

Similarly, a relevant boron effect was also found, but smaller than the nitrogen effect. It ranged from 15% for the number of normal seeds per fruit to 85% for the frequency of morphological mutations.

Calculation of the components of the absorbed dose was done in the present experiment, knowing the chemical composition of pollen. This calculation, together with consideration of the usual values of proton and alpha RBE's and of their average track length, led to the following conclusion:

Nitrogen is distributed rather homogeneously within the resting pollen grains in contrast with active cells—microsporocytes, for instance— which have a lower concentration of this element in the cytoplasm than in the nucleus. In opposition to this, boron, the role of which in pollen germination is well known, is almost exclusively concentrated at the periphery, perhaps at specific sites of the tegument.

Gilbert, J. C., and J. T. Chinn      Although various recombinations of
    Bacterial wilt resistant combinations.      genes for bacterial wilt
                                     (Pseudomonas solanacearum) resistance
with those for resistance to other diseases plus commercial fruit size have been
sought by tomato researchers in southern and tropical areas, the highest levels of
resistance have been difficult to recombine with certain of these other characters.
Somewhat intermediate levels of B. W. resistance, however, have been combined now
with commercial fruit size, Fusarium resistance (I gene), root knot resistance (Mi
gene), TMV tolerance, and spotted wilt resistance (SW-1). This year in Hawaii,
spider mite resistance was also added to the above combination, using the variety
Kalohi as a source.

The use of small-fruited, more highly B. W. resistant lines as rootstocks has
proved a useful means of obtaining plants with both the B. W. resistance and the
commercial qualities of large-fruited $F_1$ hybrids commonly used here. The bacterial
wilt resistance in the root system of the tomato stock is effective even when com-
pletely B. W. susceptible scions are used.

Temperature limitations on the usefulness of bacterial wilt resistance were
noted again this year, with summer temperatures (over 85°F) producing a higher
mortality in test fields, particularly when these fields also carry large popula-
tions of root knot nematodes.


Graham, T. O., and R. E. Harris    A new type      The first Beaverlodge stock to come
    of earliness found in stocks from       to Guelph was designated as 48-2111-
    Beaverlodge.                            B. It was found in 1962 that
                                     certain plants of 48-2111-B had
three leaves below the first fruiting truss on the main stem as contrasted with the
normal six to twelve. Seed was saved from these plants. In 1963 the resulting
second generation plants seldom had as few as three leaves below the first fruit-
ing truss.

Seed from the second generation plants with only three leaves below the first
fruiting truss was saved again in 1963 and was sown indoors in the winter of 1967-
68. A total of 50 plants were grown. One of these had one leaf below the first
fruiting truss, 2 plants had 2 leaves, 17 had 3 leaves, 18 had 4 leaves, and 12
had 5 leaves. Many plants had the first and second fruiting truss on the main
stem abort.

This aborting on the main stem may provide the clue to the reason for the
earliness in stocks from Beaverlodge. They have such heavy branching and fruiting
on the lower nodes that the apical dominance on the main stem is weakened. The
energy of the plant goes into the lower side branches and activity on the upper
part of the plant is suppressed.

A more comprehensive survey of this work and details of the origin and pedi-
gree of this trait will be given in: Graham, T. O., J. H. Lee, and J. G. Metcalf.
1968. Changing pattern in the breeding program at Guelph as necessitated by the
presence of open type tomato vines with exposed fruit. Proc. Can. Soc. Hort. Sci.
7 (in press).


Honma, S., J. C. Bouwkamp, and J. D. Vriesenga    In an attempt to obtain lines that
    Gametophyte factor linked with jointless      are jointless (j ) and Fusarium
    character.                           wilt resistant (I), large popula-
                                     tions were grown from crosses with
parents carrying these factors. The $F_2$ did not segregate jointless plants in the
expected ratio of 3:1. Therefore, a selected cross as shown below was grown the
following year to obtain a record of its segregation.

| Progeny | No. plants | + | j | Ratio |
|---------|-----------|---|---|-------|
| 66-102 x VF 145 | 649 | 617 | 32 | 19.28:1 |
| VF 145 x 66-102 | 1180 | 1123 | 57 | 19.70:1 |

The significant deviations from the expected ratio of 3:1 are evident and can probably be ascribed to a gametophyte factor similar to that reported by Soressi (TGC 18:39) or that reported earlier by Bohn and Tucker (Mo. Agr. Exp. Sta. Res. Bull. 311, 1940).


Kerr, E. A.  Linkage relations of Never ripe (Nr).

Many populations segregating for Nr have been grown since it was obtained in 1956.  Suggestions of very loose linkage were obtained with r, tf, wt, yv, hp, and ug, but other tests with these genes were negative.  Negative results have also been obtained with Jau, y, br; d, v-2, o; clau, ls; mc, gq; c, sp, og; al, gf, l; ag, t, h, Xa-3, u; f, a, hl, j; and alb.  That leaves only chromosome 9.

A few years ago Nr was crossed with ah, but unfortunately the parental plant was heterozygous and the only F₁ plant grown was normal for Nr.  In 1968 an F₂ population of Nr ug o wt c a hl X marm al was grown.  The Nr - marm data were Nr + 91, Nr marm 15, ++ 14, + marm 20.  This indicates that Nr is on chromosome 9 about 24 crossover units from marm.


Kerr, E. A.  Pranks on chromosome 8.

The possible location of hp on chromosome 8 was reported in TGC 18:22.  Backcrosses A and B (Table 1) were used to test this further.  Two F₁ plants were used in cross A and one in cross B.  As the two plants of cross A gave similar results, the data are combined.

Seeds were placed between moist paper towels in the dark at room temperature.  As they germinated, they were classified for hp and transplanted to flats containing a medium with low nutrient content.  Classification of the other characteristics was done when the plants were about 6 inches tall.  The expected segregation ratios were obtained for all gene combinations except tp-hp and l-hp, both of which gave crossovers much in excess of 50% (Table 2).

There was some difficulty in classifying some of the hp plants, and the deficiency of hp indicates that some were classified as normal.  If only hp-tp plants were erroneously classified, the linkage between tp and l would account for much of the aberrant behavior between hp and l.  This supposition does not account for all of the abnormal ratios and, besides, I have no explanation as to why hp-tp plants would be misclassified.  Is it possible that the anomaly is concerned with the presence of the two genes dp and tp which originated fairly recently following irradiation?  Has anyone an explanation?

Table 1.  Production data on tp-l-hp backcrosses.

| Cross | Parentage | Total seeds | No. germinated | Died + hp |
|-------|-----------|-------------|----------------|-----------|
| A | (dp y d sp h u^Fs a f X d mc l tp hp h) X (d/+ mc l tp hp h/+) | 261 | 260 | 6  7 |
| B | (dp y r mc gs gf u a X d mc l tp hp h) X (d/+ mc l tp hp h/+) | 234 | 231 | 4  4 |

Table 2.   Segregation data on tp-l-hp backcrosses.

| Cross | Gene pair | | + + | + mut B | Mut A + | Mut A  mut B | Co. % |
|-------|-----------|-----------|-----|---------|---------|--------------|-------|
|       | Mut A | Mut B |     |         |         |              |       |
| A | hp | tp | 66 | 104 | 67 | 10 | 69.2 |
| B | hp | tp | 38 | 97 | 74 | 14 | 76.7 |
| A | hp | l | 66 | 104 | 53 | 24 | 63.6 |
| B | hp | l | 49 | 86 | 60 | 28 | 65.5 |
| A | tp | l | 91 | 42 | 28 | 86 | 28.3 |
| B | tp | l | 85 | 27 | 26 | 85 | 23.8 |
| A | hp | d | 97 | 73 | 40 | 37 | 45.7 |
| B | hp | d | 105 | 30 | 61 | 27 | 44.0 |
| A | hp | h | 98 | 72 | 33 | 44 | 42.5 |
| B | hp | h | 107 | 28 | 64 | 24 | 45.0 |
| A | tp | d | 75 | 58 | 63 | 51 | 49.0 |
| B | tp | d | 78 | 34 | 88 | 23 | 57.0 |
| A | tp | h | 65 | 68 | 66 | 48 | 54.3 |
| B | tp | h | 86 | 26 | 85 | 26 | 49.8 |
| A | l | d | 71 | 48 | 67 | 61 | 46.6 |
| B | l | d | 75 | 34 | 90 | 24 | 57.5 |
| A | l | h | 65 | 54 | 66 | 62 | 48.6 |
| B | l | h | 81 | 28 | 90 | 24 | 53.6 |

Laterrot, H., and P. Pecaut
  Gene Tm-2:   new source.

The hypersensitive reaction to TMV in the material of R. K. Soost, where the resistance is linked to nv, and in the material of L. J. Alexander, is given by alleles at the locus Tm-2 (Report 1964, Station d'Amélioration des Plantes Maraîchères, Montfavet, France). The allele of Alexander's material was named Tm-2$^2$ by Schroeder, Provvidenti, and Robinson (TGC 17).

A new source of resistance has been found at the Station of Montfavet.  It comes from L. peruvianum P.I. 126,926.  Before crossing it with L. esculentum, this accession was selected by selfing and sib-crossing to obtain lines homozygous for TMV resistance.

By crossing one of these lines with L. esculentum 'St. Pierre,' we obtained, after embryo culture, a resistant diploid hybrid.  The first backcross with L. esculentum 'Moneymaker' gave rise to several diploid resistant plants (named Perou), and in the progeny of one of them (Perou 2), one line, homozygous for TMV resistance, was studied for its resistance.

This Perou 2 line shows the same hypersensitive reaction as Tm-2 lines when inoculated with usual TMV strain and with a strain virulent on Tm/Tm plants.

We made a test of allelism with the line 630,818 of Alexander.  Segregation tests have been made by inoculating the cotyledons of 15-day-old seedlings.  The response was read 20 days after the inoculation.

| | Inoculation with a + strain of TMV Number of seedlings | | |
| --- | --- | --- | --- |
| | Total | Susceptible | Resistant |
| $F_2$ Perou 2 X 630,818 | 690 | 0 | 690 |
| Saint Pierre X ($F_1$ Perou 2 X 630,818) | 300 | 0 | 300 |
| $F_1$ Perou 2 X 630,818 | 95 | 0 | 95 |
| Perou 2 | 31 | 0 | 31 |
| 630,818 | 81 | 0 | 81 |
| Saint Pierre | 92 | 92 | 0 |

These results show that the gene of resistance of Perou 2 is located at the locus Tm-2.

During 1968, we have obtained new results which confirm that Perou 2 possesses the allele Tm-2 without nv, instead of Tm-$2^2$. (See R. Provvidenti, etc., TGC 1968.) We made artificial inoculations with the above technique, using a TMV strain isolated on the $F_1$ hybrid (L. esculentum X L. peruvianum P.I. 126,926), which has been propagated vegetatively since 1963.

| | Inoculation with a Tm-2 strain of TMV | | |
| --- | --- | --- | --- |
| | Mosaic symptoms | Virus multiplication | Genotype |
| Saint Pierre | + | + | +/+ |
| H.E.S. 5639-15 | 0 | + | Tm/Tm |
| 630,818 | 0 | 0 | Tm-$2^2$/Tm-$2^2$ |
| B 2162 | (+) | + | Tm-2nv/Tm-2nv |
| Perou 2 | + | + | Tm-2/Tm-2 |
| $F_1$ St. Pierre X 630,818 | 0 | 0 | Tm-$2^2$/+ |
| $F_1$ St. Pierre X B 2162 | + | + | Tm-2nv/+ |
| $F_1$ Perou 2 X 630,818 | 0 | 0 | Tm-2/Tm-$2^2$ |
| $F_1$ 630,818 X B 2162 | 0 | 0 | Tm-$2^2$/Tm-2nv |

(+)  No visible symptoms, but disturbed growing.

These results show that allele Tm-$2^2$ is dominant over allele Tm-2 and that Tm (H.E.S. 5639-15) gives tolerance to this Tm-2 strain of TMV.

Laterrot, H., and P. Pecaut
   Gene Tm:  new test of allelism.

allele Tm (TGC 17:42).

The tolerance to TMV found by Holmes, Kikuta and Frazier, and Walter is given by the same

A new origin of tolerance has been obtained by Mészöly (Kecskemet, Hungary) from a complex cross between L. esculentum, L. hirsutum, and L. peruvianum.

This material of Mészöly shows the same symptoms of tolerance as the Holmes lines, with the usual strain of TMV used at Montfavet. Moreover, the TMV strain

isolated on old Tm/Tm plants gives clear mosaic symptoms when inoculated on seedlings of Mészöly's lines, as it does on seedlings of Tm/Tm lines.

The following results illustrate that the tolerance is given by the same allele in the lines from Mészöly and in the line from Holmes.

**Materials used:**
  a)  n° 2940 D (issued from P.I. 235,673) received in 1960 from F. O. Holmes.
  b)  n° KFh 1738, KFh 1743, KFh 1758 received in 1967 from G. Mészöly.

Segregation tests have been made by inoculating the cotyledons of the 12-day-old seedlings with an aucuba tomato strain of TMV. A clear-cut response has been read 12 days after the inoculation. The results with the three Mészöly lines have been added.

|  | Number of seedlings | | |
|---|---|---|---|
|  | Total | Susceptible | Tolerant |
| F$_2$ Mészöly lines X 2940 D | 854 | 0 | 854 |
| (F$_1$ Mészöly lines X 2940 D) X St. Pierre | 817 | 0 | 817 |
| 2940 D | 65 | 0 | 65 |
| Mészöly lines | 138 | 0 | 138 |
| St. Pierre | 99 | 99 | 0 |

Considering these tests of allelism, and regarding the fact that the two materials give the same reaction to TMV, we can say that the Meszöly lines possess the Tm allele.

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**Lesley, J. W., and R. K. Soost**  More evidence of linkage of Crinkled (Crk) and anthocyaninless (ah).

Previous data suggested linkage of Crinkled and ah in chromosome 9 (TGC 18:24-26). More data with Crk$^+$ and ah in coupling as in the previous report are as follows:

F$_2$, F$_3$, and backcross progenies of Crinkled (Crk) (homozygous lethal) and ah with Crk$^+$ and ah coupled

| Parents | Phase | Crk ah$^+$ | Crk ah | Crk$^+$ ah$^+$ | Crk+ ah | Linkage chi square | P |
|---|---|---|---|---|---|---|---|
| 67.118.1 x 67.100.22 BC | C | 43 | 42 | 9 | 20 | ---- | |
| 67.118.1 selfed (0) F$_2$ | C | 64 | 12 | 22 | 15 | 6.0 | 0.02 |
| 67.100.1 selfed F$_3$ | ? | 25 | 4 | 7 | 10 | 11.3 | 0.01 |

The backcross data differ significantly from the independence ratio 2:2:1:1 (chi square = 6.4 p = 0.01) and closely approach those expected with 25 per cent crossing-over (chi square = 3.6). F$_2$ also suggests linkage with a crossover value p = 0.30 $\pm$ 0.06 and, similarly, F$_3$ with p = 0.24 + 0.05, but the F$_2$ and F$_3$ standard errors are high. All the deviations agree as to phase. If Crk and ah were closely linked, and Crk/Crk lethal, with Crk$^+$ and ah coupled, an increased proportion of ah phenotypes in F$_2$ would be expected. In the three F$_2$ families available the ah$^+$:ah ratio is 209:79. The excess of ah phenotypes suggests linkage. Evidence from Crk$^+$ and ah in repulsion is lacking, but in coupling there is an indication of linkage with 20 to 30 units between Crk and ah in chromosome 9.

Moens, Peter B.    Recombination in plants
    homozygous for as, as-4, or as-6.

Plants homozygous for one of the as genes and heterozygous for chromosome 2 markers d (dwarf), aw (green stem), and wv (white virescent) were backcrossed to plants normal for as and homozygous for d, aw, and wv.  In the control crosses heterozygous as plants were used.

| Gene | Recombination d-aw | Recombination aw-wv | Total progeny | Seeds per fruit |
|------|-----|-----|-----|-----|
| as | 12.2 | 19.1 | 1360 | 25 |
| Control | 11.4 | 14.5 | 607 | 30 |
| as-4 | 30.6 | 39.0 | 787 | 4 |
| Control | 12.4 | 16.1 | 1009 | 24 |
| as-6 | 18.4 | 36.4 | 640 | 12 |
| Control | 12.3 | 16.0 | 1516 | 22 |

The observed effect of the as genes at the diplotene stage of meiosis is a reduced frequency of bivalents and a corresponding increase in the number of univalents.  Chromosomes 2 are therefore paired only in a limited number of pollen mother cells, and when they are paired, they have less than normal chiasmata (Soost, Genetics 36:410-434, 1951).  Reduced chromosome pairing can also be observed at pachytene, but a higher level of pairing at early pachytene suggests that desynapsis rather than asynapsis is involved.

It is obvious that there is a discrepancy between chiasmata and observed crossing-over in desynaptic plants.  The frequency of recombinants among the off-spring, however, may not be a valid estimate of actual crossing-over at meiosis.  The few viable gametes formed by these plants may not be a random sample of meiotic products.  Cells with high levels of crossing-over and chiasmata may have a selective advantage at meiosis I and, therefore, be represented dispro-portionately among the offspring.  In the case of as-6, however, the differential increase along the chromosome suggests that the processes which normally regulate the frequency and distribution of crossovers along the bivalent are affected.

Nettancourt, D. de, and R. Ecochard
    New incompatibility specificities in the
    M3 progeny of a clonal population of L.
    peruvianum.

As was reported last year (TGC 18:27), three plants with re-duced self-incompatibility have been detected in a progeny derived after selfing a clonal population of L. peruvianum which had been chronically exposed to low dose rates of γ-radiation.  The M3 progeny (204 plants) of one of these individuals was analyzed in 1968 and found to segregate for three different incompatibility alleles.  Diallelic crosses on 25 individuals taken at random suggested, further-more, that the M3 plants can be classified in three groups of cross-compatibility ($S_1/S_2$; $S_1/S_3$; $S_2/S_3$).  This result cannot be attributed to pollen contamination, because only one clone was introduced in the Institute, which is 5 miles away from any other breeding station.  Therefore, it appears that the parental M2 plant which gave rise to the M3 progeny formed a new specificity at the S locus and produced more than two different types of gametes with regard to the S factor.  An alternative to this explanation is that the specificity of a given S allele can be completely modified in certain of the genetic backgrounds which are constituted during inbreeding.  However, four plants among the 25 tested did

not conform to the classification and were either cross-compatible with only some members of a given group or appeared to carry specificities in the pollen which were different from those of the style.

With regard to self-compatibility, only one $M_3$ individual displayed the same capacity of the parental $M_2$ plant to set seeds upon selfing, all other $M_3$ plants (203 in all) being either self-incompatible or very weakly self-compatible. As this exceptional self-compatible $M_3$ plant belongs to the group of 4 individuals which appeared to be forming different specificities in the style and in the pollen, the conclusion is reached that self-compatibility in the inbred population studied is a temporary phenomenon which possibly expresses itself at the time a new specificity is being formed in the pollen or in the styles.

Pollen tube growth was analyzed by means of U.V. microscopy in the styles of self-incompatible $M_3$ individuals which had been self-pollinated 24 hours earlier. In 9 out of 23 plants examined, pollen tube growth did not appear to be inhibited in the style, a large number of pollen tubes having reached the bottom of the style at the time the observation was made. The phenomenon was particularly striking in the case of one plant, classified $\underline{S_2/S_3}$, which was fully interfertile with $\underline{S_1/S_3}$ and $\underline{S_1/S_2}$ genotypes, displayed complete self-incompatibility, and yet did not present any symptom of pollen tube growth inhibition after self-pollination. These results strongly suggest that pollen tube growth inhibition in the style is not the only barrier to self-fertility in the $M_3$ population investigated.

All conclusions presented here are tentative and are being verified presently in further experiments.

<u>Noor, M. A., and W. H. Lachman</u>    The response of neglecta to light intensity.    Neglecta (neg) mutant has been described (TGC 9) as small, weakly branched plants having paler leaves with darker veins, becoming progressively necrotic, prematurely dropping. During 1968 some shaded plants growing in the greenhouse failed to develop the "neglecta-like" symptoms. Later, other neglecta plants placed in the shaded portion of a greenhouse did not become necrotic. To check this observation further, 2-week-old neglecta seedlings and those of the parental variety, 'Condine Red,' were placed in a growth chamber at different light intensities (250, 600, and 2300 ft-c). Temperature was maintained at 75°F during the day and 60°F at night, with 16 hours of light. The percentage of plants showing the symptoms was recorded and an arbitrary scale[1] was used to describe the degree of necrosis.

In a repetition of the experiment an attempt was made to determine the effect of light intensity on chlorophylls and carotenoids, using a method described by Boynton.[2] The uppermost leaves, not showing necrosis, were used for triplicate pigment analyses.

It appears that a decrease in light intensity reduces the degree and extent of the necrotic symptom associated with <u>neg</u> (Table 1). Content of both chlorophyll a and b increased with increased light intensity from 250 to 600 ft-c, but decreased at 2300 ft-c. On the other hand, carotenoid content increased for the range of intensities studied (Table 2).

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[1] Relative degree:    0 - no necrosis
                        1 - necrotic cotyledons
                        2 - necrotic first true leaf
                        3 - necrotic secondary leaves

[2] Boynton, John E.  1966.  Hereditas 56:171-199.

Table 1.  Influence of light intensity on development of the neglecta phenotype.

| Experiment No. | Light intensity (ft-c) | Percentage of necrotic plants | Relative degree of necrosis |
|---|---|---|---|
| 1 | 250 | 0 | 0.0 |
|   | 600 | 71 | 0.7 |
|   | 2300 | 100 | 2.2 |
| 2 | 250 | 0 | 0.0 |
|   | 600 | 60 | 0.8 |
|   | 2300 | 100 | 1.6 |

Table 2.  Per cent chlorophylls and carotenoids of neglecta vs. normal seedlings ('Condine Red') under different light intensities.

| Pigment | 250 ft-c | 600 ft-c | 2300 ft-c |
|---|---|---|---|
|  | ---------------- Per cent -------------------- | | |
| Chlorophyll a | 74.16 | 91.15 | 77.72 |
| Chlorophyll b | 72.35 | 91.08 | 72.60 |
| Carotenoids | 87.03 | 117.53 | 161.42 |

Pelham, J.  (Submitted by L. A. Darby)        Isogenic lines of the variety
  Isogenic lines to identify physiologic        'Craigella' differing for $Tm$,
  strains of TMV.                               $Tm$-2 (ex Soost), and $\overline{Tm\text{-}2^2}$
                                                separately or $Tm$ and $\overline{Tm\text{-}2}$
together have been bred in backcross pedigrees.  By crossing these with the
susceptible recurrent parent, 'Craigella,' and with each other, a very uniform
series of test genotypes has been produced.

Test plants were inoculated with the Ohio isolates of McRitchie and Alexander
(Phytopathology 53:394) and with isolates from local nurseries and from various
experimental material.  The following table summarizes the results and suggests
a logical system for classifying tomato strains of TMV.

| Ohio isolates | I and II | III | IV | - |
|---|---|---|---|---|
| Suggested strain nomenclature | 0 | 1 | 2 | 1.2 |
| Test plant genotype | | | | |
| Susceptible | S | S | S | S |
| $Tm$/+ | T | S | T | S |
| $Tm$-2/+ | I | I | S | S |
| $Tm$/+  $Tm$-2/+ | I | I | T | S |
| $Tm$-$2^2$/+ | I | I | I | I |
| $Tm$/+  $Tm$-$2^2$/+ | I | I | I | I |
| $Tm$-2/+  $Tm$-$2^2$/+ | I | I | I | I |
| $Tm$/+  $Tm$-2/+  $Tm$-$2^2$/+ | I | I | I | I |

S = Susceptible              T = Tolerant                    I = Immune

The seedlings are inoculated on the cotyledons with a sample of sap and the results are observed in approximately 2-3 weeks. The necrotic reaction frequently found on Tm-2$^2$/+ plants is a quick indication of the presence of TMV in the sap sample. The "tolerant" reaction is not complete, and the Tm/+ plants sometimes show a faint mottling. Both necrosis and mottle are more marked at higher temperatures.

Test plants have been used in surveys of TMV strains in the United Kingdom. Eighty TMV samples collected from commercial nurseries prior to 1966 were all found to be Strain 0. Subsequently, since the introduction of varieties which incorporate the single gene Tm for protection against TMV, there has been a very rapid increase in the incidence of Strain 1. This is the predictable response of certain pathogen populations when genes for resistance are released sequentially.

Perez, Antonio T., and William H. Lachman
  Some evidence of gibberellic acid action
   in the yg-6 mutant.

The yellow-green-6 (yg-6) mutant, induced by irradiation from Lycopersicon esculentum var. cerasiforme Line 018, comprises a syndrome of several characters: yellow-green first true leaves, elongated and colorless hypocotyl, and little or no development of anthocyanin in the stems and leaves (TGC 14:30). Compared to its parental source, yg-6 is spindly and weak but much taller during the first two or three weeks after germination. These characteristics of yg-6 resemble those which are regulated by gibberellins.

The promotion of extensive hypocotyl elongation in response to gibberellin (GA) applications is well recognized. Endogenous gibberellin-like substances, extracted from different plant parts of at least 15 species of different families of flowering plants, were found to induce resumption of normal growth of dwarf-1 corn mutant (Proc. Nat. Acad. Sci. 43:398). Interestingly, Bachelard (Aust. J. Biol. Sci. 18:699) reported the inhibition of anthocyanin formation in red maple, due to gibberellin treatment.

Reid and Marsh (unpublished) have observed a higher specific activity (30 to 100%) of phenylalanine ammonia lyase (PAL) in tall corn than in dwarf corn, and also found that the PAL activity of dwarf corn was increased after GA application to the level of PAL activity of untreated tall plants.

These observations led us to investigate the PAL activity in the stems of yg-6 and its parent, and the activity after applications of two levels of GA$_3$. The specific activity of PAL in yg-6 (Table 1) was about double that of the parent, which suggests that the higher PAL activity may be related to a higher endogenous level of GA in the mutant.

The specific activity of PAL in extracts of yg-6 and parent was increased by about 200 and 300% over the control with application of $10^{-5}$M and $10^{-4}$M GA$_3$, respectively (Table 2).

It is suggested that the characters exhibited by yg-6, including the higher specific activity of PAL, could be the effects of excess gibberellins.

Table 1. Phenylalanine ammonia lyase (PAL) activity of the stems of 34-day-old seedlings of yg-6 and its parent.

| Genetic material | mU/g fresh weight[1] | Specific activity[2] |
|---|---|---|
| yg-6 | 1.33 + 0.19 | 2.10 + 0.16 |
| parent | 0.90 + 0.05 | 1.11 + 0.07 |

[1] One unit (U) of PAL is defined as the amount of enzyme catalyzing the formation of 1 micromole of cinnamate per minute at 30°C.

[2] Specific activity refers to mU of PAL per mg of protein. Standard deviation is given.

Table 2.  PAL activity of the stems of yg-6 and parent one day after application
          of $GA_3$.

| Material | $GA_3$ concentration | mU per g fresh wt [1] | Specific activity[2] |
|----------|---------------------|----------------------|---------------------|
| yg-6 | Control | 1.25 | 2.16 |
|  | $10^{-5}M$ | 1.76 | 4.09 |
|  | $10^{-4}M$ | 0.98 | 6.76 |
| Parent | Control | 0.83 | 0.85 |
|  | $10^{-5}M$ | 2.38 | 1.69 |
|  | $10^{-4}M$ | 5.12 | 3.42 |

[1,2] See Table 1.

Petrescu, Cornel N.  Study on hybrid vigor in some tomato varieties and lines with a view to produce early $F_1$ hybrids.

The experiment made between 1963 and 1966 aimed to clear up some of the most important factors on which hybrid vigor depends and to find out the best criteria for selecting the parents.  In this respect we used three directions of investigation: the study of specific combining ability and the study of the main biochemical and physiological indexes of metabolism in the hybrids and their parents.  The practical purpose of these studies was to develop early $F_1$ hybrids superior in quality to Nr. 10 X 'Bison,' the main $F_1$ hybrid used for early crops in Romania.

Among the cultivars the lines Nr. 10, Nr. XXIV-13, Stupike polnerani, Kecskemet 363, and Tiomnocrasnii have shown the highest heterosis effect concerning earliness, total yield, environmental adaptability, and resistance to diseases.

The highest combining ability concerning hybrid vigor has had the varieties and lines arising from crossing with wild species (S. racemigerum).  One of these, line XXIV-13, was outstanding in yielding and coldsetting ability, fruit uniformity, shape and uniform color of the fruits (u gene), and high ascorbic acid and solids content regardless of its use as male or female parent.

Among the $F_1$ hybrids tested in comparative plots, XXIV-13 X Tiomnocrasnii, 10 X Tiomnocrasnii, 10 X XXIV-13, and Kecskemet 363 X XXIV-13 excelled the check, Nr. 10 X Bison, in earliness, yielding ability, disease resistance, solids, firmness, shipping and storing qualities, and, finally, in economic efficiency.

A positive relation was found between photosynthesis intensity, earliness, and productivity in $F_1$ hybrids and their parents.

The intensity of respiration toward the end of the season decreased sooner in hybrids than in parents.  The rate of respiration was lower or intermediate in hybrids in comparison with the parents.

The catalase activity was higher in hybrids, especially in the seedling stage.  The reductive sugar content in hybrids was lower than in parents, and the ascorbic acid was lower than in the best parent.  The acidity was higher in hybrids, while the dry matter content was slightly reduced compared to both parents.

The paper chromatography determination of amino acids in the leaves of the hybrids compared with their parents has generally shown an intermediate content of the 19 amino acids.  During the growing season the content of glutamic acid increases very much, and the α-amino-butyric acid, asparagin, glutamin, serin, tirosin, arginin, and glicocol decrease.  The content of arginin is higher in hybrids than in their parents.

In conclusion, the best partners for hybridization should have very high content of solids, sugar, and ascorbic acids.

Philouze, Jacqueline   A gene for the very   The orange-fruited Jubilee variety
  light green shoulder color in the old   (obtained in 1943 by W. Atlee Burpee
  variety Jubilee.   Co. from Tangerine x Rutgers) and
                                               some red-fruited lines bred from

crosses with Jubilee at the Station d'Amélioration des Plantes Maraîchères (Montfavet,
France) produce fruits with color which before maturity is different from $\underline{u}$ fruits
by the presence of a very light green shoulder color, and from $\underline{ug}$ fruits by their
lighter general color; they are very similar to $\underline{u^G}$ fruits (in LA 1020 from Rick).

Experiments have been conducted to study the heredity of this character. It
appears from the first results that this color distribution is controlled by a
single allele at the u locus. We give the symbol $\underline{u^J}$ ($\underline{u^{Jubilee}}$) to this allele.
Our results are as follows:

| Crosses | $F_1$ phenotype | $F_2$ segregation | Backcross with recessive parent |
|---------|-----------------|-------------------|---------------------------------|
| $u^J u^J$ x $u^+ u^+$ | [$u^+$] | $70[u^+],30[u^J],x^2 = 1,33$ | $31[u^+],29[u^J],x^2 = 0,07$ |
| $u^J u^J$ x ug ug | [$u^+$] | | |
| $u^J u^J$ x u u | [$u^J$] | $190[u^J],60[u],x^2 = 0,13$ | $28[u^J],22[u],x^2 = 0,72$ |
| $u^J u^J$ x $u^G u^G$ | [$u^J$] or [$u^G$] ? | | |

The dominance relations at $\underline{u}$ locus are: $\underline{u^+}$   $\underline{u^J}$   $\underline{u}$. We cannot conclude now
if u and $u^G$ are different alleles: their phenotypes are very similar, but it was
difficult to compare them, because we observed $\underline{u^J}$ in large-fruited lines and $\underline{u^G}$ in
a very small-fruited line.

Philouze, Jacqueline   Linkage studies with   We chose ms-32 and ms-35 among a
  two male-sterile mutants: ms-32 and ms-35.   collection of male-sterile mutants
                                            because the phenotypes of these
two mutants seemed very favorable for hybrid seed production in our conditions.

No seedling marker was known to be linked to these genes; their linkage groups
were also undetermined.

We have performed a number of crosses between Red Cherry ms-32 or Pearson
VF 11 ms-35 (stocks from Rick) and a lot of markers. Our work began before the
publication of Andrásfalvy's results (TGC 18), so some linkage tests are a repeti-
tion of his crosses.

| | | 1 | | 2 | | | | 3 | | | 4 | | 5 | | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | au | scf | s | Wo$^M$ | ps | aw | d | wf | sy sf | ful | e | mc | tf | yv c | sp |
| ms-32 | A | S | | | | | X | X | X | | | X | | X | | X X | |
| | B | | X? | X | X | | X | X | | X X | X | X | X X? | | X X | |
| ms-35 | A | | | | ? | | S | X | | | | X | | X | | X | X |
| | B | | X | L | L | | L | L | | X X | X | X X | | X X | | X X |

| | 7 | 8 | | | | 9 | 10 | | | 11 | | | | ? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | La | l | bu | dl | al | ah | u | h | ag | j | hl | a | f | $f^D$ |
| ms-32 A | X | X | | X | | X | X | | | | | X | | |
| B | | X | X | X | X | X | | X | X | X | X | X | X? | X |
| ms-35 A | | X | | | | | | X | | | | | | |
| B | | X | X | X | X | X | X | X | X | | X | X | | X |

A   Andrásfalvy's results (TGC 18).
B   Results obtained at Montfavet.

X   Independence.
X?  Probable independence, but some difficulty determining the phenotype.
    These crosses need to be studied again.
L   Linkage.

The localization of ms-32 on the chromosome map is so far unknown. Our results give ms-35 on chromosome 2. Further studies are needed to determine its exact location on chromosome 2.

Pilowsky, M.   (Submitted by D. Lapushner)          Two sources of TMV resistance—
    Responses of Tm-2—nv and Tm-2² stocks to       Tm-2—nv and Tm-2² stocks
    TMV inoculation under high temperature.        (Alexander's selection from
                                                    Lycopersicon peruvianum P.I.
128650)—were tested for their responses to high temperature following TMV inoculation.

Plants homozygous and heterozygous for Tm-2—nv and Tm-2² were inoculated twice with TMV (common Israeli strains) at the cotyledonary and first true leaf stages. The plants were then exposed to a high temperature treatment of 40°C for 72 hours. For the next three weeks temperature was maintained at 20°C. The following results were obtained:

| Genotype | No. of plants showing mosaic symptoms | No. of plants showing necrotic symptoms | No. of symptomless plants |
|---|---|---|---|
| +/+ | 15 | - | - |
| Tm-2—nv/Tm-2—nv | - | - | 20 |
| Tm-2—nv/+ | - | - | 14 |
| Tm-2²/Tm-2² | - | - | 15 |
| No. 848 Tm-2²/+ | - | 8 | 7 |
| No. 1328 Tm-2²/+ | - | 4 | 2 |

Virus recovery tests were made on Datura stramonium L., a most sensitive local-lesion host for TMV. Virus could be recovered from all plants showing mosaic and necrotic symptoms. No virus could be recovered from symptomless plants, except from two Tm-2—nv/+ plants.

Provvidenti, R., and W. T. Schroeder
  Further evidence that 'Perou 2' is a
  new source of Tm-2 not linked with nv.

In a previous report (TGC 18:29-30) it was indicated that 'Perou 2,' developed at Station d'Amélioration des Plantes Maraîchères, Montfavet, France, might be a source of Tm-2 free of the virescent character incited by nv.

Confirmatory evidence was obtained when 'Perou 2' was crossed and backcrossed to a line carrying Tm-2—nv and the progenies tested with two differential strains of TMV at 27-30C.

| Genotypes | Number of plants tested with TMV | | | |
| --- | --- | --- | --- | --- |
| | Normal (Alex.V) | | Aberrant (NY66-4) | |
| | Sl. | Susc. | Sl. | Susc. |
| Perou 2 | 40 | - | - | 20 |
| Tm-2—nv/Tm-2—nv | 40 | - | - | 20 |
| $F_1$ (Perou 2 x Tm-2—nv) | 96 | - | - | 20 |
| $F_2$ (Perou 2 x Tm-2—nv) | 584 | - | - | 40 |
| $Bc_1$ (Perou 2 x Tm-2—nv) x Tm-2—nv | 188 | - | - | 20 |
| $Bc_1$ (Perou 2 x Tm-2—nv) x Perou 2 | 136 | - | - | 20 |
| $Tm-2^2/Tm-2^2$ | 40 | - | 40 | - |
| +/+ | - | 20 | - | 20 |

Sl. = Symptomless; Susc. = Susceptible (typical mosaic).

Segregation for nv was 3:1 (P=0.20-0.30) in the $F_2$ and 1:1 (P=0.50-0.90) in the $F_1$ backcrossed to Tm-2—nv.

The data presented in the accompanying table indicate that the resistant factor in 'Perou 2' is located at the Tm-2 locus. Since with the aberrant strain this factor behaved differently from $Tm-2^2$, the only other gene known presently to be at that locus, it is concluded that 'Perou 2' possesses Tm-2, free of nv.


Rick, C. M., and R. W. Zobel    Segregation
  and linkage relations of viroid (vrd).

This mutant was discovered by Dr. Penny von Wettstein-Knowles as a variant in Verkerk's anthocyaninless 704-27αα (New Mutant Program). It is not certain whether vrd arose spontaneously or as a delayed product of radiation. The stock as acquired is both aw and vrd. In the winter greenhouse, vrd reaches its maximum expression. Cotyledons are scalloped, resembling wiry mutants. Leaves are highly distorted with a white speckled chlorosis irregularly mixed with very dark green areas. At maximum expression vrd scarcely survives beyond the cotyledon stage, but the phenotype changes progressively until, during the June-September period, it is indistinguishable from normal in early stages. It is, therefore, satisfactory for scoring only during a 2-month period in mid-late spring and another in the early fall. Only the spring plantings can be grown to maturity when flowering and fruiting are relatively normal (in the greenhouse), although growth always seems somewhat stunted and the foliage darker green than normal. We have not attempted field culture. Thus, although fascinating in its extreme environmental sensitivity, this mutant is highly demanding in its seasonal requirements for satisfactory scoring and culture to maturity. Its usefulness as a marker is thereby considerably limited.

In crosses to eight different tester stocks, viroid behaved as a complete

recessive, regardless of season of culture. The total segregation in 16 $F_2$ families was 3255+ : 785 (19.4%) vrd. The segregation in most families was sharp, and no additional intermediate phenotypes were seen. The deviation below 25% is highly significant but consistent among families (heterogeneity $X^2$ = 20.24, 15 df, P = 0.1-0.2). Growth under conditions marginal for identification might account for the deficiency of recessives in some families, the percentage of vrd ranging from 11.5-26.2.

Satisfactory linkage tests have been completed with the following markers of chromosome 1: au, inv, scf; 2: $Wo^m$, d; 3: sy, sf; 4: ful, e; 5: tf; 6: c, yv; 7: not; 8: l, dl; 9: marm, ah; 10: ag, h; 11: a, hl; 12: alb, fd. With sy a variable but never strong index of linkage was obtained. The same families deviated slightly toward linkage with sf and no triple recombinants were scored in a total of over 1000. The absence of triples suggests that vrd might lie between sy and sf, but the estimated vrd-sy and vrd-sf distances are too large to be thus accommodated. We regard this as a spurious linkage in contrast to the following evidence for a locus on chromosome 1:

| Tester | + + | + t | m + | m t | Adj. cont. chi-square | Co. |
|--------|-----|-----|-----|-----|----------------------|-----|
| scf | 259 | 75 | 92 | 3 | 17.2 | 22.5 |
| inv | 241 | 93 | 91 | 4 | 22.3 | 22.5 |

No triples were obtained in this 3-point test, and the estimated distances fit to the known 40 units between inv and scf. A locus midway between the latter genes is suggested at approximate position 75. The tests with au and all other markers were negative.

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Sawhney, V. K., and R. I. Greyson    External ovules associated with stamenless mutants.

When grown in our greenhouse conditions and also in growth chambers at 65°F-75°F with 12 hours dark and 12 hours light, the stamenless mutant sl/sl (from C. D. Clayberg, originally described by Bishop in TGC 3) produces flowers with green stamens which adhere to the pistil, giving it a ridged appearance. These stamens can, however, be separated from the pistil. In their distal half they bear abnormal pollen sacs, and near their base, which is in close contact with the ovary wall, they bear many external ovules on their adaxial surface.

In $sl_2/sl_2$ (from C. D. Clayberg, described by Hafen and Stevenson in TGC 8), when grown under our growth conditions, stamens do not adhere to the pistil. They are yellowish-green and run short of pistil length. Anthers have pollen sacs which generally bear aborted pollen. On their adaxial surfaces some stamens bear a cluster of external ovules which range in number from 1-80 per stamen. In some flowers only 2 stamens bear these, while in others all stamens do so. Anatomical studies reveal that these ovules carry embryo sacs which do not develop further. Both anatomical analyses and experimental studies are continuing on this material.
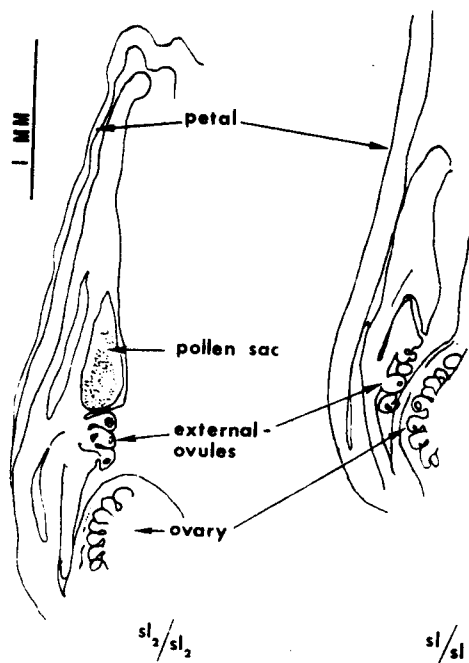
Mid-longitudinal sections of nearly mature flowers from sl$_2$/sl$_2$ and sl/sl plants.

**Schroeder, W. T., and R. Provvidenti**
  Identification of the TMV resistance
  in four tomato lines.

Four TMV-resistant lines derived from complex species hybrids, one developed by Davis and Webb (USDA) and three by Mészöly in Hungary, were tested with two strains of TMV and their reactions compared with lines carrying the known genes for resistance, Tm, Tm-2, Tm-2—nv, and Tm-2$^2$.

All four lines were found to be susceptible to a normal strain and tolerant to an aberrant strain of the virus as manifested by a mild mottle. Identical results were also obtained with plants possessing Tm/Tm, indicating that all four lines were phenotypically identical to the TMV resistance conditioned by Tm.

Inheritance studies involving F$_1$, F$_2$, and reciprocal F$_1$ backcrosses of the above USDA line 63G463 x Tm confirmed that the resistance is at the Tm locus rather than at the Tm-2 locus, as implied by Davis and Webb.

| Genotypes | Number of plants tested (27-30C) | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | Normal TMV (Alex.V) | | | Aberrant TMV (NY66-4) | | |
| | Sl. | Tol. | Susc. | Sl. | Tol. | Susc. |
| Kecskemet, Fh. 1706* | - | - | 16 | - | 16 | - |
| "  " 1738* | - | - | 16 | - | 16 | - |
| "  " 1743* | - | - | 18 | - | 18 | - |
| 63G463 | - | - | 36 | - | 36 | - |
| Tm/Tm | - | - | 36 | - | 36 | - |
| F$_1$ (63G463 x Tm) | - | - | 53 | - | 54 | - |
| F$_2$ (63G463 x Tm) | - | - | 208 | - | 209 | - |
| Bc$_1$ (63G463 x Tm) x Tm | - | - | 75 | - | 78 | - |
| Bc$_1$ (63G463 x Tm) x 63G463 | - | - | 77 | - | 76 | - |
| Tm-2—nv/Tm-2—nv | 33 | - | - | - | - | 33 |
| Tm-2/Tm-2 (Perou 2) | 33 | - | - | - | - | 33 |
| Tm-2$^2$/Tm-2$^2$ | 33 | - | - | 33 | - | - |
| +/+ | - | - | 33 | - | - | 33 |

Sl. = Symptomless; Tol. = Tolerant (mild mottle); Susc. = Susceptible (typical mosaic).

* Mészöly lines.

Sweaney, Wilma P. (Submitted by L. Butler)     While germinating seed from the
  The effect of germination rate on             backcross of +me++/wv+awd, a
  segregation bias.                             wide variation in germination
                                                percentages was observed. Seeds
from other crosses were not exhibiting this phenomenon; thus, investigation
became imperative to determine whether certain genotypes were being selectively
removed from the scores.

Treatment of seed with half-strength sodium hypochlorite improves germina-
bility (Rick and Hunt, TGC 11). The seeds from ten fruits of the backcross were
divided into 2 or 3 groups such that each group contained 40-50 seeds. One group
served as control; the other(s) were treated with half-strength Javex (available
chlorine = 5.25%). Seeds of 'Ailsa Craig' that had been stored for several years
were also tested for comparison.

The seeds to be treated were allowed to soak in half-strength Javex for 15
min., 30 min., or 1 hour. The seeds were then washed in distilled water 5-6
times. Each group of seed was then placed on filter paper in a sterile plastic
petri plate, moistened with distilled water, and left to germinate at room tem-
perature. When the cotyledons were free of the seed coat, the seedlings were
planted in a flat in the greenhouse and scored as germinated. The seedlings were
scored several weeks later for genotype.

The 'Ailsa Craig' seed showed no effect of treatment, germination being
equally rapid and complete in both control and hypochlorite-treated groups.

The backcross seed of +Me++/wv+awd gave a different result. The treated
seed germinated more quickly and more completely. Treated seeds required an
average of 9.8 ± 1.7 days to reach 50% germination. The untreated seeds required
18.1 ± 2.6 days, a difference significant at the 0.001 level (t test). There was
no difference between the three treatments used. The final germination percent-
ages of the 15-min. and 30-min. treatments were significantly higher than control,
94.8 ± 5.9% to 61.2 ± 21.6% (P = 0.001).

After the seedlings were scored, the monogenic ratios for the four genes
were tested by chi-square. There were no significant deviations from the
expected 1:1 ratio in any of the groups.

It is concluded that the low germination does not occur in specific geno-
types, but is random. No bias, then, is introduced using low germinability seeds.


Tal, Moshe    Salt tolerance in the wild       The species used in this research
  relatives of the cultivated tomato.          were the cultivated tomato
                                                Lycopersicon esculentum var.
marmande and the two wild species L. peruvianum and L. esculentum minor collected
by Dr. C. M. Rick in dry habitats in Chile and the Galapagos, respectively.
Plants were sown in vermiculite and young seedlings transferred to half-concentra-
tion Hoagland solution. Half of the plants of each species, used as a control,
continued to grow in the original solution. NaCl was added gradually to the
other half over a period of 8 days to a final concentration of 10,000 mg/liter.
To find good physiological criteria for salt tolerance the following character-
istics were investigated: shoot/root dry weight ratio, leaf dry weight/leaf
area ratio, succulence, relative turgidity, and the concentrations of protein,
chlorophyll, $Na^+$, $K^+$, and $Cl^-$. These data have now been analyzed and detailed
results and conclusions will be published elsewhere. It should be noted that
the cultivated plants treated with NaCl developed only very small, hard seedless
fruits. However, in the wild species grown under the same salt stress, it is
possible to select plants which develop normal fruits and seeds. Based on these
observations, a selection and breeding program, as well as a continued physio-
logical study, has been planned.

Tal, Moshe, and Dorot Imber    Abnormal stomatal
    behavior and hormonal imbalance in flacca,
    a wilty mutant of tomato.

The mutant flacca tends to wilt faster than the normal tomato plant under water stress. This wilting tendency results from the fact that the stomata of the mutant resist closure. It was found that the stomata of the mutant plant grafted onto a normal root are less open than when grafted on the original mutant root. Similarly, in the normal plant grafted on a mutant root, the stomata tend to be more open compared with those of the normal plant grafted on its original root. This observation suggests the existence of a root factor influencing the behavior of stomata. In addition, mutant plants 4-5 weeks old develop symptoms characteristic of an excess of auxin. These symptoms include epinasty of leaves, swelling of the upper shoot, and emergence of roots from the stem. It was also found that closure resistance of the mutant stomata decreases with the aging of the leaf and the plant.

From these observations, it was decided to compare the endogenous concentrations of the three main plant hormones in young and old mutant and normal plants. For all three hormones these comparisons were based on two methods: 1) extraction and bioassay; 2) influence of external hormones on protein synthesis, as indicated by incorporation of a labeled amino acid. Counts per minute are plotted against the hormone concentration. The lower the external hormone concentration required for maximal protein synthesis, the higher is the endogenous hormone concentration. The main findings were that auxin activity, in accordance with external morphology, is higher in the mutant. There are also indications that cytokinin activity is higher in the mutant. In respect to gibberellin concentration the situation is still not clear. More detailed results and discussions will be published elsewhere.

Tomes, M. L.    Identification of the gene
    in the flesh pigment mutant 706-27αα.

A mutant designated as 706-27αα was isolated from irradiated material at Wageningen. On the basis of chemical analyses (Tomes and Verkerk, TGC 15:61-62; Tomes, TGC 16:37-38), it was suggested that 706-27αα was an apricot type. In a cross between 706-27αα and apricot the $F_1$ phenotype was apricot, and all plants in a small $F_2$ progeny (20 plants) were also apricot. Thus, 706-27αα and apricot (at) are allelic or identical.

Tomes, M. L., H. T. Erickson, and R. J. Barman
    The linkage relationship between $og^c$, B, and
    sp on chromosome 6.

Crimson ($og^c$) is synonymous or allelic with old gold (og) and is closely linked with B and sp on chromosome 6 (Tomes et al., TGC 16:38-39; Thompson et al., 1967, Proc. Amer. Soc. Hort. Sci. 91:495-504). Three 1965 $F_2$ progenies involving 529 plants from crosses between B and $og^c$ yielded no B $og^c$ recombinants, nor were reciprocal, normal red-fleshed recombinants apparent. In 1966 nine backcross progenies (B + x + $og^c$) x + $og^c$ yielded 313 B + : 337 + $og^c$, but no B $og^c$ or + + recombinants.

Since by this time crossovers between $og^c$ and self-pruning (sp) had been found, the backcross was remade as a 3-point cross: (+ $og^c$ sp x B + +) x + $og^c$ sp. These progenies totaling 557 plants were grown in 1968. Since $og^c$ also affects flower color, this was recorded early in the season. Plants were scored for sp and for flesh color later. These yielded 289 plants B + + and 264 + $og^c$ sp. All of the latter had og-like flowers. There were 4 other plants which were also + $og^c$ sp, but in which flowers were noted as normal yellow or questionable. Flower color associated with $og^c$ is subject to both environmental and genotypic modification (Robinson and Shannon, TGC 16:32; and references above). Flower color was not rechecked. With sp these plants ceased flowering late in the season. Again, no

normal red-fleshed plants were found, nor were $\underline{B}$ $\underline{og}^c$ recombinants detected. Flowers were classified on the possibility that $\underline{B}$ $\underline{og}^c$ plants might have $\underline{B}$-like flesh but $\underline{og}^c$-like flowers.

Although the numbers are not large, these data suggest complete linkage between $\underline{B}$ and $\underline{og}^c$, and they raise several interesting questions:

1. If $\underline{B}$ $\underline{og}^c$ recombinants were present, could they be detected? $\underline{B}$ enhances beta-carotene at the expense of lycopene; $\underline{og}^c$ lowers beta-carotene and enhances lycopene. The quantitative effect of $\underline{B}$ is more drastic than that of $\underline{og}^c$, so one might predict that the flesh color of $\underline{B}$ $\underline{og}^c$ would be similar to that of $\underline{B}$. And, since the og-like effect of $\underline{og}^c$ on flower color is often faint, $\underline{B}$ might mask this pigmentation. Thus, $\underline{B}$ $\underline{og}^c$ recombinants might be classed as $\underline{B}$ +; but one should find normal-flowered, red-fleshed reciprocals. Now, $\underline{og}^{c+}$ is known to lack complete dominance. Heterozygotes ($\underline{og}^{c+}/\underline{og}^c$) in certain backgrounds appear somewhat crimson-like, and an intermediate chemical effect has been demonstrated. Elsewhere such heterozygotes had normal flowers. Thus, the 4 +-flowered, $\underline{og}^c$-fleshed plants might be + + crossovers which were heterozygous because of the backcross.

2. Is it probable that crossovers did occur and these were not detected? This seems unlikely, since no $\underline{B}$ $\underline{sp}$ recombinants were recovered either. We have recovered $\underline{og}^c$ $\underline{sp}$ recombinants in other crosses, so crossing over in the region is possible.

3. Can $\underline{og}^c$ and $\underline{B}$ be allelic? It is interesting that two genes so closely linked both affect the carotene pigment system. Allelism is tenable, for the dominant allele in each case shifts the pigment equilibrium in the same direction.

4. Could $\underline{B}$ involve a chromosomal rearrangement which blocks all crossing over in this region? Our $\underline{B}$ stocks were extracted from $\underline{L}$. hirsutum. That hirsutum might differ from esculentum in this region of chromosome 6 is possible. This would explain the results. In other work we have crossed $\underline{B}$ with $\underline{sp}$ varieties many times without recovering a $\underline{B}$ $\underline{sp}$ recombinant. Ito and Currence (TGC 14:14-15) and Chmielewski (TGC 15:28-29), however, do report $\underline{B}$ $\underline{sp}$ recombinants with a Co. frequency of 0.3 and 0.12, respectively. In the latter case, $\underline{B}$ was derived from $\underline{L}$. minutum.

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Verkerk, K., and R. B. Contant    Further progress in the selection for yield of easy peeling tomato lines.

Selection for yield amongst easy peeling material with round and elongated fruits derived from the cross of two 'Money Maker'

mutants, $\underline{ep}$ and $\underline{obl}$, was continued. In 1967, 10 plants were selected from the best $F_3$ line, which on average yielded 96% of 'Money Maker'; 6 of these 10 plants were round fruited, 4 had long fruits (TGC 18:11-12). A small offspring was grown in 1968. Segregation for fruit shape was observed in 3 round-fruited lines. In both generations, plant height and fruit yield from the first 5 clusters were recorded. Results are summarized in the table.

Within each group according to fruit shape genotype (No. 1-3, 4-6, 7-10), the order of the selections with regard to plant height was the same. Residual variation in plant height in the $F_4$ was still much higher than in the inbred varieties, though considerably less than in the original mutant lines. The correlation coefficient for total fruit yield on the first five clusters in $F_3$ and $F_4$ was only 0.63. In judging this value correlation it should be kept in mind that each of the $F_3$ data was based on one single plant only. Even so, the highest yielding single $F_3$ plant also produced the highest yielding $F_4$ line. Average yield levels were virtually the same in both years. 'San Marzano,' included for comparison in 1968, had the lowest yield. The mean of all 10 selections exceeded 'Money Maker' by 7-9%.

The best yielding round- and long-fruited easy peeling selections, No. 1

and 10, surpassed their mother variety, 'Money Maker,' by 33 and 19%, respectively.
Even when allowing for the possibility that this percentage will appear to be
lower in commercial culture, there is no doubt that the aim of obtaining lines
with a yielding capacity equal to 'Money Maker' has been amply fulfilled.

The relative amounts of locular substance in the fruits were given scores
from 1 to 5. Only one selection equalled 'Money Maker' or the original ep
mutant (score 5), the others varying between scores 4 and 2. 'San Marzano' also
had slightly hollow fruit (score 3), whereas the obl mutant was somewhat better
(score 4). The round-fruited selections had on average a higher content of
locular substance than the long-fruited lines.

'Money Maker' and the selected mutant lines were much taller than 'San Marzano'
and had thinner stems; however, all selections were sturdier than either 'Money
Maker' or the parental lines ep and obl.

Fruit yield and other characters of single plants selected from $F_3$ (ep x obl)
and of their offspring, in comparison with various controls

| Identity of plant or line | $F_3$ single plants, 1967 | | | $F_4$ progeny of selected $F_3$ plants, 1968*** | | | |
|---|---|---|---|---|---|---|---|
| | Fruit shape | Plant height till 5th cluster (cm) | Fruit yield (10 g) | Plant height till 5th cluster (cm) | Fruit yield (10 g) | Avg weight of 1 cm stem section (g) | Locular substance (score 1-5) |
| 1 | round | 114 | 448 | 120+4.0 | 448 | 2.0 | 3 |
| 2 | round | 136 | 342 | 134+2.2 | 322 | 1.7 | 4 |
| 3 | round | 168 | 370 | 154+4.0 | 343 | 2.2 | 5 |
| 4 | round* | 124 | 338 | 129+4.9 | 320 | 1.8 | 3 |
| 5 | round* | 137 | 388 | 142+7.6 | 351 | 1.9 | 5 |
| 6 | round* | 140 | 333 | 153+8.5 | 350 | 1.7 | 4 |
| 7 | long | 122 | 405 | 150+3.8 | 346 | 1.6 | 2 |
| 8 | long | 147 | 345 | 158+5.1 | 368 | 1.6 | 2 |
| 9 | long | 155 | 285 | 162+4.8 | 356 | 1.6 | 3 |
| 10 | long | 145 | 388 | 166+6.6 | 401 | 1.8 | 4 |
| Mean of 1-10 | -- | 139 | 364 | 147 | 360 | 1.8 | |
| Money Maker** | round | 112 | 333 | 104+ 1.9 | 335 | 1.4 | 5 |
| ep mutant** | round | 125 | 281 | 133+ 8.2 | 310 | 1.5 | 5 |
| obl mutant | long | -- | -- | 164+7.0 | 291 | 1.5 | 4 |
| San Marzano | long | -- | -- | 72+1.0 | 255 | 2.5 | 3 |

* Segregating in $F_4$.

** Mean of 32 plants per line/variety.

*** Mean of 9 plants per line/variety.

Zobel, R. W., J. J. Alán, R. T. Opeña, and
C. M. Rick    Further tests with Dr.
Stubbe's mutants.

In the present progress note we report linkages of 4 more genes belonging to the Stubbe series II, IV, and V. The format of presentation, abbreviations, etc. correspond to those that we have followed in previous reports. Information on the testers used for each gene is presented in Table 1, and segregations that provided the evidence of linkage, in Table 2. Pertinent information concerning loci is given in the following section.

cn (cana): Aside from suggesting linkage with several other markers, our data indicate a strong relationship with markers of chromosome 3. The two groups of data with sy-sf in Table 2 represent three-point tests between cn and the sy-sf tester. Both show close linkage between cn and sy, but none between cn and sf. The second set is more dependable because the family was much larger and scoring more accurate. Two of the three cn-sy crossovers were also sf, signifying a locus distal to sy, a conclusion supported also by the independence between cn and bls. The rather tight linkage between cn and con argues for a locus on the short arm for the latter, whose position had previously been uncertain. We conclude that cn should have a locus at approximate position 24.

mua (multifurcata): The most convincing case for linkage is with fd on chromosome 12, no recombinants having been obtained in two independent tests. Since no linkage was detected with alb, mua must lie beyond fd from alb, but probably no more than 10 units from the former.

coa (corrotundata): The evidence is overwhelmingly in favor of a locus for coa on chromosome 6. In each of the four families grown of the three-point test coa x c-yv, moderate linkage with both testers was demonstrated. The largest and most reliable test (last family listed in Table 2) yields a total for the yv-coa and coa-c distances equal to the standard of 59 units for yv-c distance. Concordant is the lack of any double recombinants in any family and the tight linkage with vf, previously spotted in the vicinity of m-2—hence a locus for coa at position 37. Also consistent is a weak linkage of some 39 units between coa and tl.

mta (mutata): The data are consistent for locating mta on chromosome 9. Both three-point tests of mta x ah-marm indicated fairly tight linkage with ah and a much weaker one with marm. Both mta-ah recombinants (one in doubt) were also marm, clinching a locus for mta to the left of ah. Assuming that one of the mta-ah recombinants was wrongly identified, the mta locus would be positioned at about 17.

Table 1. Summary of exploratory tests.

| Chromosome | Stubbe group | | | |
| --- | --- | --- | --- | --- |
| | II | IV | V | |
| | cn | mua | coa | mta |
| 1 | inv, scf, lz-3 | inv(S), scf, lz-3(S) | au, inv | inv |
| 2 | Wo$^m$, d(S) | Wo$^m$, d | Wo$^m$, d | Wo$^m$, d |
| 3 | con(L), sy(L), sf, bls | sy, bls, sf | sy, sf | sf |
| 4 | clau, ful(S), e, di, ra | clau, e | ful, e | e |
| 5 | tf | tf | tf(S) | tf |
| 6 | c(S), vf, yv(S) | c, yv | tl(S), yv(L), vf(L), c(L) | |
| 7 | not, La | lg-5, not | | not |
| 8 | l, dl | l, dl | l, dl | l, dl |
| 9 | ah | ah | ah, marm | ah(L), marm(S) |
| 10 | h, ag | h, ag | h, ag | |
| 11 | a, hl | a, hl | a, hl | a, hl |
| 12 | alb, fd(S) | alb, fd(L) | | alb |

S = segregations that suggested linkage.  L = significant indications of linkage.

Table 2.  Summary of linkage tests.

| Combination | + + | + t | m + | mt | $x^2$ | Co. |
|---|---|---|---|---|---|---|
| cn–sy | 297 | 77 | 67 | 0 | 15.4 | 0.0 |
| sf | 282 | 91 | 49 | 18 | N.S. | 51.5 |
| sy | 657 | 118 | 149 | 3 | 21.1 | 22.0 |
| sf | 592 | 183 | 109 | 43 | N.S. | 53.5 |
| bls | 125 | 28 | 48 | 18 | N.S. | 57.5 |
|  | 213 | 58 | 36 | 16 | N.S. | 57.0 |
| con | 270 | 75 | 77 | 1 | 16.7 | 16.0 |
|  | 280 | 58 | 75 | 0 | 13.6 | 0.0 |
| mua–fd | 178 | 42 | 121 | 0 | 24.6 | 0.0 |
|  | 384 | 91 | 274 | 0 | 58.0 | 0.0 |
| alb | 205 | 64 | 56 | 13 | N.S. | 46.0 |
|  | 695 | 88 | 174 | 23 | N.S. | 50.5 |
| coa–c | 207 | 83 | 62 | 7 | 9.2 | 32.5 |
| yv | 208 | 82 | 63 | 6 | 10.5 | 30.5 |
| c | 348 | 124 | 138 | 20 | 11.7 | 37.5 |
| yv | 319 | 153 | 136 | 22 | 19.0 | 35.0 |
| c | 185 | 81 | 101 | 9 | 30.7 | 28.5 |
| yv | 197 | 69 | 100 | 10 | 12.3 | 33.0 |
| c | 490 | 187 | 171 | 12 | 34.8 | 27.5 |
| yv | 497 | 180 | 168 | 15 | 26.7 | 31.0 |
| tl | 204 | 70 | 68 | 11 | 4.1 | 39.5 |
| vf | 201 | 78 | 74 | 0 | 25.0 | 0.0 |
| mta–marm | 271 | 77 | 67 | 6 | 6.5 | 34.0 |
| ah | 260 | 88 | 72 | 1 | 19.3 | 14.0 |
| marm | 167 | 55 | 41 | 5 | 3.5 | 36.0 |
| ah | 148 | 74 | 45 | 1? | 11.1 | 14.5 |

## PART II

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*Last complete list issued in TGC 18.

## PART III

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    between weight and dry matter content of tomato fruits and their heritabilities.
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    Gent  33:925-930.

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    Inst. Ontario (Canada) p. 62-64.

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    ascorbic acid content.  Hort. Res. Inst. Ontario (Canada).  p. 65-68.

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    the aid of radioactive isotopes).  Lucrăr. Sti. Inst. Cercet. Hort.-Vit.
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    tomato varieties).  Genet. Agr., Pavia 20:110-120.

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    artificially in tomato varieties).  Genet. Agr., Pavia 20:204-219.

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    with ripening of tomato fruits.  Arch. Biochem. Bioph. 113:554-568.

## PART IV

## FINANCIAL STATEMENT

(to December 31, 1968)

|  |  | Total |
|---|---|---|
| **Balance from 1967** |  | $188.73 |

**Receipts**

| | | |
|---|---|---|
| Assessments | $486.23 | |
| Sale of back issues | 122.60 | |
| Interest on savings | 10.35 | 619.18 |
| **Assests** | | 807.91 |

**Expenditures**

| | | |
|---|---|---|
| TGC Report No. 18, 1968, Multilithing | 344.93 | |
| Postage | 85.67 | |
| Newsletter duplicating | 7.35 | |
| Copying back issues | 9.10 | |
| Envelopes | 2.35 | 449.40 |
| **Balance** | | $358.51 |

## MEMBERSHIP STATUS

(to January 31, 1969)

| | | |
|---|---|---|
| Assessments paid for | 1968 | 86 |
| | 1969 | 137 |
| | 1970 | 49 |
| | 1971 | 21 |
| | 1972 | 2 |
| | 1973 | 1 |
| | 1978 | 2 |
| **Total members** | | 298 |

APPENDIX

## Interim Report of the Committee on Varietal Pedigrees 1968

Listings of previous reports: TGC 9: 1959 - an attached supplement between pages 36 and 37. TGC 11: 36-51, 1961. TGC 16: 53-67, 1966. TGC 18: 64-71, 1968.

### COMMITTEE ON VARIETAL PEDIGREES

Alexander, L. J.
Andrásfalvy, András (Hungary)
Angell, F. F.
Chmielewski, Tadeusz (Poland)
Circulli, M. (Italy
Darby, L. A. (England)
Daskaloff, C. (Bulgaria)
Foskett, A. L.
Frankel, Rafael (Israel)
Frazier, W. A.
Gabelman, W. H.
Gilbert, J. C.
Graham, T. O.
Groszmann, H. (Australia)
Hernandez, T. P.

Honma, Shigemi
John, C. A.
Kooistra, E. (Holland)
Lambeth, V. N. (Chairman)
Lana, E. P.
Leeper, Paul
Mészöly, G. (Hungary)
Odland, M. L.
Pecaut, M. (France)
Peto, Howard B.
Robinson, R. W.
Strobel, James W.
Sumeghy, J. B. (Australia)
Tomes, M. L.

### Tomato Pedigrees, Characteristics, and Reference Publications

Honma, S., H. H. Murakishi, and S. H. Wittwer. 1968. Moto-Red - a tobacco mosaic virus resistant greenhouse tomato. Mich. Agric. Expt. Sta. Quarterly Bulletin Vol. 50, No. 3; pp 285-287.
MOTO-RED
Pedigree:

```
                       P.I. 235673
                       (Holmes)
        Moto-Red─┤                    Ohio WR Globe
                 │ Spartan Red 8─┤
                 │                │ Porter
                 │                └┤
                                   Bounty
```

Characteristics: I, TM, for forcing

Strobel, J. W. Fla. Agric. Expt. Sta. 1968. Walter tomato. Correspondence dated October 2, 1968.
WALTER
Pedigree: (See attached page)
Characteristics: sp, Sm, I, graywall, Fusarium (race 2).

Strobel, J. W. Fla. Agric. Expt. Sta. 1968. Tropic tomato. Correspondence dated October 2, 1968.
TROPIC
Pedigree: (See attached page)
Characteristics: I, Ve, Sm, graywall

WALTER
(STEP 535)

STEP 461 ─── Indian River
         └── STEP 389 ─── Homestead 24
                      └── Manapel

STEP 530 ─── 377-6 CAStMW ─── 262-2-1 CAStMW ─── 225-8-1-3-1 CAStW, a member of the sub-family from which Manapel came
                          └── STEP 305
         └── 648-R1 CAStMWd ─── Manapel
                            └── Immokalee

608 CAStMW in $F_1$

373-1 CAStMW ─── 232-4-2-1 CAStMW ─── STEP 345
             │                     └── Indian River
             │                     └── 122-5-Bk-Bk-3 CAStMW ─── 54-1-2 CAStMW
             └── 262-2-1 (see above)

533-R1 CAStMWd ─── 388-2-Bk CAStMW ─── 262-2-1 (see above)
                │                   └── 287-2 CAStMW ─── Manalucie
               └── 724-FP3 CAStWd ─── Indian River ─── STEP 305
                                  └── P.I. 126915-1

♀ Manalucie

(nat. cross)

♀ Indian River ─── ♂ Manelee

♀ Manalucie ─── ♂ 123 CStw

♂ 80-3-Bk-1-2 CAStw

♀ 210-5-2-2-Bk-EBk-1 MStw ─── ♂ 36-1-2 CAStw

Manalucie ─── 123CStw

♀ 41-1-2-1-Bk-1-Bk ─── ♂ 80-3-Bk-1-2 CAStw

♀ Manalucie ─── ♂ 123 CStw

♀ Indian River ─── ♂ 80-3-Bk-1-2 CAStw

159-3-4-2-Bk CAStMW

225-8-1-3-1 CAStw (sister of Manapal)

♀ 225-Q9-1-Bk-Bk-Bk CAStw ─── ♂ 258-4-2 CAStMW

♀ 479-6-1 CAStMW

♂ 18-D2-D4-8-1 CAVStw

♀ Indian River ─── ♀ Moscow VR ─── ♂ Manalucie

♂ 1 CAVStw in $F_1$

TROPIC

Kerr, E. A.  Horticultural Research Institute of Ontario, Vineland Station,
   Ontario.  1967.  Veecrop tomato.  Ontario New Varieties list dated December
   6, 1967.
   VEECROP
   Pedigree:  Glamour x (Early Baltimore x Pritchard)
   Characteristics:  sp, u, Ve, cold setting ability

Muehmer, J. K., and E. A. Kerr.  Horticultural Research Institute of Ontario,
   Vineland Station, Ontario.  1967.  Vendor tomato.  Ontario New Varieties
   list dated December 6, 1967.
   VENDOR
   Pedigree:  (sister line of Vantage) x Indian River
   Characteristics:  for forcing, short internode, TMV res.

Wiebe, J.  Horticultural Research Institute of Ontario, Vineland Station, Ontario.
   1967.  Vivid tomato.  Ontario New Varieties list dated December 6, 1967.
   VIVID
   Pedigree:  Earliest of All x Pink Red Jacket backcrossed 5 times to Earliest
              of All
   Characteristics:  u, y

Wiebe, J.  Horticultural Research Institute of Ontario, Vineland Station, Ontario.
   1967.  Pink Vogue tomato.  Ontario New Varieties list dated December 6, 1967.
   PINK VOGUE
   Pedigree:  Vogue x Pink Red Jacket backcrossed 3 times to Vogue
   Characteristics:  y, otherwise resembles Vogue

Daskaloff, C.  Institute of Genetics and Plant Breeding, Sofia, Bulgaria.
   Correspondence dated December 5, 1968.
   TRIUMPH ($F_1$) 1968
   Pedigree:

$$
\begin{array}{ccc}
& & \text{Canner of Trophy} \\
& & 1890 \\
& & | \\
\text{Marglobe} & \longrightarrow & \text{Santa Clara} \\
& & 1926 \\
\text{XXIV-13} \quad\quad \text{Kecskemet} & & \\
\text{sp } O^{ob} \text{ } u^+ \quad\quad \text{Hungary} & & \\
\text{Triumph } (F_1) & & \\
\text{sp}^+ \quad O^{ob} & & \\
1963 & &
\end{array}
$$
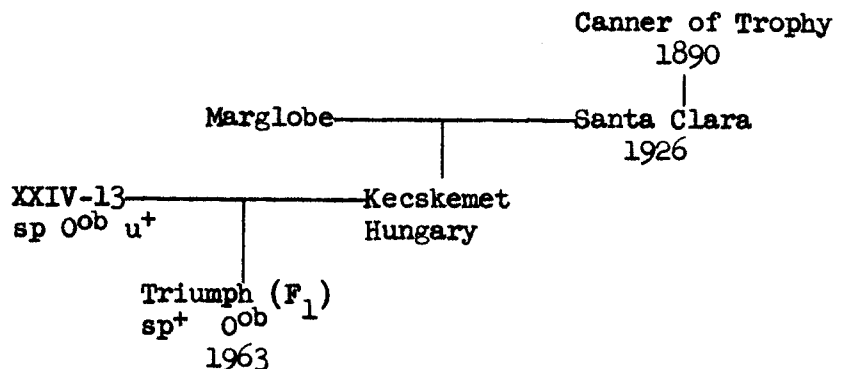
   Characteristics:  sp, u, $O^{ob}$

Daskaloff, C.  Institute of Genetics and Plant Breeding, Sofia, Bulgaria.
   Correspondence dated December 5, 1968.
   $F_1$ hybrid (No. 10 x Rutgers).  1953.

Pedigree:  Break-O-Day————1936————L. racemigerum Lange
                                   (L. pimpinellifolium Mill)

            1955 /6a————1942————Break-O-Day
            1941

                    No. 10————————Rutgers
                    1946              1934

                No. 10 x Rutgers (F$_1$)
                        1953

Characteristics:  sp, u, tolerant high temperatures

Daskaloff, C.  Institute of Genetics and Plant Breeding, Sofia, Bulgaria.
     Correspondence dated December 5, 1968.
     OGOSTA (F$_1$)
     Pedigree:        XXIV-a————————Roma

                    Ogosta (F$_1$) 1966
                    sp+, Ol, u

Characteristics:  sp, Ol, u

Daskaloff, C.  Institute of Genetics and Plant Breeding, Sofia, Bulgaria.
     Correspondence dated December 5, 1968.
     MADARA (F$_1$)
     Pedigree:        XXIV-a————————King Humbert

                    Madara (F$_1$) 1964

Characteristics:  sp, Ol, u

Daskaloff, C.  Institute of Genetics and Plant Breeding, Sofia, Bulgaria.
     Correspondence dated December 5, 1968.
     KRICHIMSKA KONSERVA
     Pedigree:        Break-O-Day————1936————L. racemigerum Lange
                                              (L. pimpinellifolium Mill)
                              78/3a
                      Plovdivska konserva
                        1946  sp, o, u

                      Kricimska konserva
                            1964

Characteristics:  sp, u, juices

Daskaloff, C.  Institute of Genetics and Plant Breeding, Sofia, Bulgaria.
     Correspondence dated December 5, 1968.
     Linia XXIV-13, XXIV-2, XXIV-a
     Pedigree:        Break-O-Day————1936————L. racemigerum Lange
                                              (L. pimpinellifolium Mill)
                              F$_8$
                      2870/1b 1941
                          XXIV
                          1952
            XXIV-a        XXIV-13        XXIV-2
            1956          1959           1959

Characteristics:  sp, Ol, u; sp, O$^{ob}$, u; sp, O, u

Daskaloff, C.  Institute of Genetics and Plant Breeding, Sofia, Bulgaria.
    Correspondence dated December 5, 1968.
    DRUZHBA
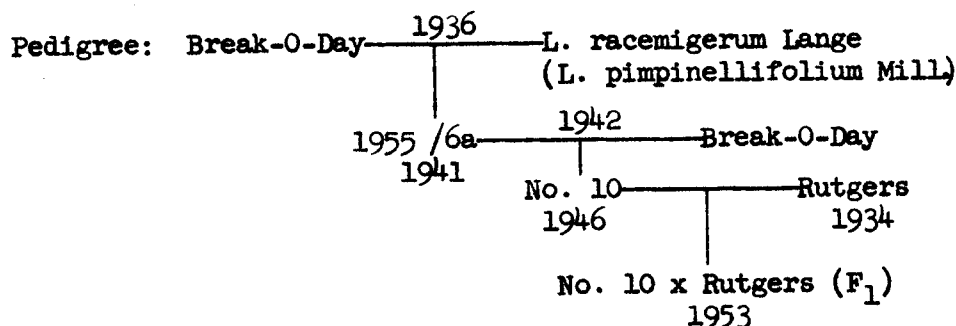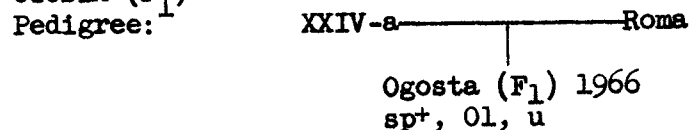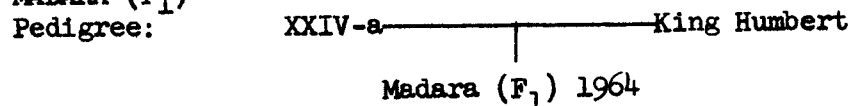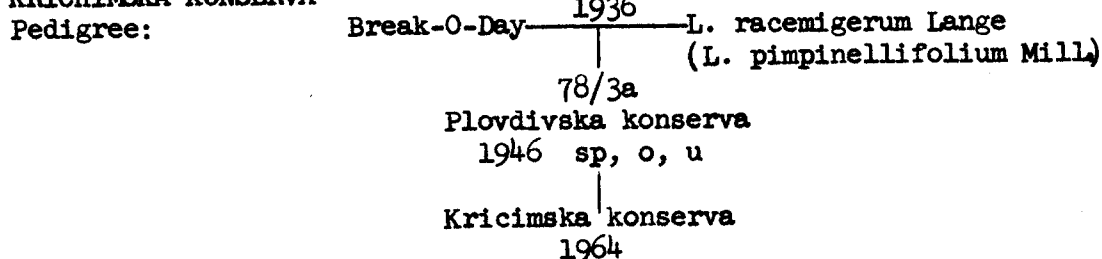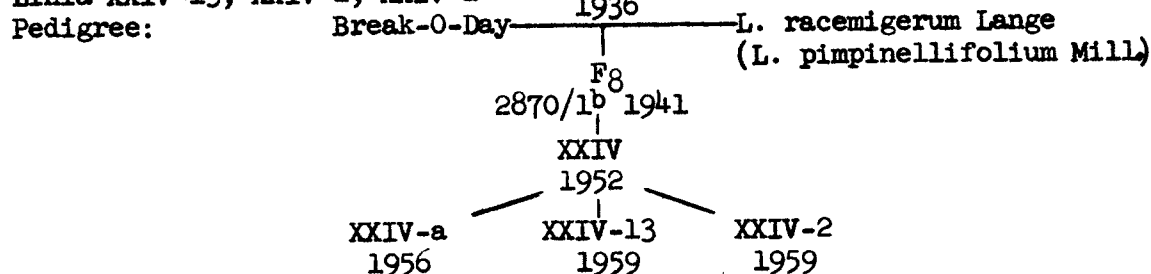    Pedigree:     XXIV-13————————1961————————Ace
                   1959                          1953
                   sp, $O^{ob}$                     sp, u
                                    F8
                                  Druzhba
                                    1967

    Characteristics:  sp, u

Pecaut, P., and H. Laterrot.  Institut National de la Recherche Agronomique,
    Montfavet, France.  1963.  Annales Amélioration Plantes, 1964:87-95.
    RONITA
    Pedigree:  Anahu x 6 (Roma)
    Characteristics:  u, sp, Mi, I, Roma type

Pecaut, P., and H. Laterrot.  Institut National de la Recherche Agronomique,
    Montfavet, France.  1963.  Annales Amélioration Plantes, 1964:87-95.
    PIERNITA
    Pedigree:  Anahu x 6 (Saint Pierre)
    Characteristics:  u, sp, Mi, Saint Pierre type

Pecaut, P., and H. Laterrot.  Institut National de la Recherche Agronomique,
    Montfavet, France.  1968.  Correspondence dated December 20, 1968.
    MONALBO
    Pedigree:  Loran Blood x 6 (Moneymaker)
    Characteristics:  u, sp, Ve, Moneymaker type

Pecaut, P., and H. Laterrot.  Institut National de la Recherche Agronomique,
    Montfavet, France.  1968.  Correspondence dated December 20, 1968.
    MONITA
    Pedigree:  Anahu x 6 (Moneymaker)
    Characteristics:  u, sp, Ve, Moneymaker type

Pecaut, P., and H. Laterrot.  Institut National de la Recherche Agronomique,
    Montfavet, France.  1968.  Correspondence dated December 20, 1968.
    MOTABO
    Pedigree:  Anahu x Loran Blood x 6 (Moneymaker)
    Characteristics:  u, sp, Ve, Mi, Moneymaker type

Pecaut, P., and H. Laterrot.  Institut National de la Recherche Agronomique,
    Montfavet, France.  1965.  (Pépiniéristes - Horticulteurs - Maraîchers 1966,
    3342).
    $F_1$ MONTFAVET N° 63-5
    Pedigree:  Apedice (=Ace x Précoce) x Porphyre (=Potentate x Pearl Harbor)
    Characteristics:  u, sp, middle size, early, for greenhouse

Clause Co., France.  1966.  Submitted by Pecaut in correspondence dated
    December 20, 1968.
    RAF
    Pedigree:  Red Global x Marmande
    Characteristics:  u, sp, I, Marmande type

Lambeth, Victor N.  1968.  Release of Hybrid Tomato Pink Gourmet.
   Mo. AES SR 93, March, 1968.
   PINK GOURMET
   Pedigree:  $F_1$ of Tomboy x Ozark Wonder
   Characteristics:  $\underline{I}$, beefsteak type, high table quality

Petrescu, C.  College of Agriculture "N. Balcescu," Bucharest, Romania.  1968.
   $F_1$ Hybrid (XXIV-13 x Tiomnocrasnîi)
   Pedigree:

   Break of Day——1936——L. pimpinellifolium (S. racemigerum)

   $F_8$

   1955/6$^A$——————Break of Day

   Nr. XXIV-13——————x——————Tiomnocrasnîi

   1964 $F_1$ (XXIV-13 x Tiomnocrasnîi)
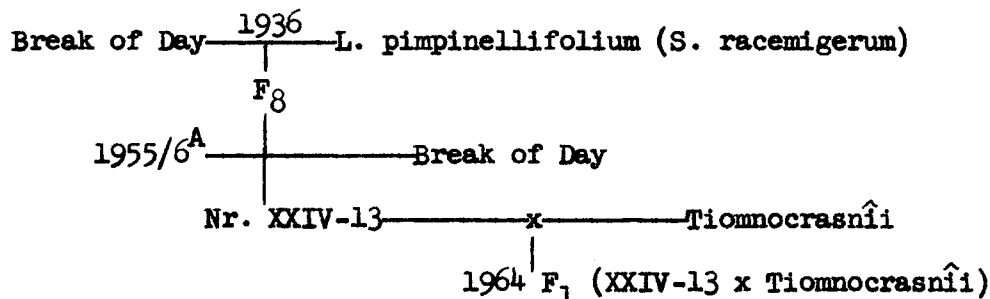
   This hybrid is being grown in over 2000 acres in Romania in 1969.

Petrescu, C.  College of Agriculture "N. Balcescu," Bucharest, Romania.  1968.
   VITAMINA $F_1$ hybrid (Kecskemet 363 x XXIV-13)
   Pedigree:

   Break of Day——1936——L. pimpinellifolium (S. racemigerum)

   $F_8$

   1955/6$^A$——————Break of Day

   1964 Kecskemet 363 x Nr. XXIV-13
                     1963
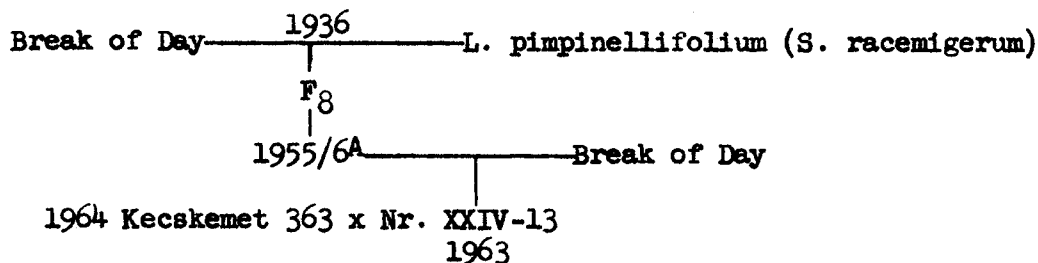
   Characteristics:  This hybrid has a very high ascorbic acid content.  It
                     is being tested in Romania in 1969.