III. REPORT ON MAIZE COOPERATIVE

Adequate supplies of improved stocks of most of this project's original collection of genetic traits are now available. A partial conversion of all stocks to the inbred lines M14, W23, and Oh51A is under way. In most cases increases from F_2 segregants have been obtained, and further crosses to the respective inbred lines have been made.

With stabilization of seed supplies now largely accomplished, increased attention is being given to further necessary activities of the project. Among these is the development of improved multiple tester combinations incorporating useful new genetic markers. This in turn is dependent upon the chromosome placement and mapping of the considerable collection of unplaced genes that have accumulated during recent years. Extensive work in chromosome placement and mapping is in progress making use of multiple genetic testers, trisomics, A-B translocations, and chromosome rearrangements.

A large number of traits have been added to the collection during the past year. Most of these are as yet untested and must be checked for allelism with similar known traits. Approximately one hundred clear-cut traits have been obtained from commercial hybrid corn companies in the Midwest. In addition, during the past season 220 maize introductions from the collection maintained at the Plant Introduction Station, Ames, Iowa were grown at Urbana. Most of these represent collections of open-pollinated sources from Canada or from Midwest or Southwest United States. In our plantings each accession was thinned to 45 plants. Observations were made on these plantings during the growing season and a number of mature plant traits noted. Dr. E. R. Leng of the Agronomy Department took agronomic notes on the plantings and made several crosses of each accession to a tester stock to determine general combining ability. It is planned that some of these will be placed in yield tests next year. In addition, each accession was routinely self-pollinated to uncover recessive traits. A total of 4466 selfed ears were obtained. These have been checked for kernel and ear traits and are being tested in the greenhouse for seedling traits. Assistance in running seedling tests of this material is gratefully acknowledged to Dr. Peter Peterson, Iowa State College, Dr. Arnold Wellwood, Ontario Agricultural College, Mr. David Walden, Cornell University, and Mr. Janson Buchert, Connecticut Agricultural Experiment Station. Of the total of 3293 selfed ears from 140 accessions which were tested here, perhaps one-fifth segregated either kernel or seedling traits. When adjustments are made for multiple occurrence of similar traits within a given accession and for those traits not genetically useful, the number of potentially valuable new traits is considerably diminished, though still sizable.

Linkage tests during the past summer indicated that *at* and *si* are very closely linked to *Y*$_1$. *Ms*$_1$ and the new trait "ms-si" were previously found to be very close to *Y*$_1$. In view of the similar phenotypes of all

four of these separately described traits, possible allelism is being checked. Intercrosses of $\underline{bt}_2$ (Chromosome 4) and Singleton's "bt_4" indicate allelism. The trait h (soft starch) and a mutable pale-green have been found to be closely linked. Neither trait is located. The trait Kn, which is ordinarily classified in the mature plant stage by characteristic "knotting" of the vascular bundles, may also be classified with fair accuracy at much earlier stages by a broadening and thickening of the midrib adjacent to the ligule. In this respect, the homozygote appears more extreme than the heterozygote.

Requests for genetic stocks should be sent to the Botany Department, University of Illinois. Many combinations of traits not specifically listed in the accompanying catalogue of stocks are available or may be readily derived. In the case of multiple chromosome testers, for example, various combinations having fewer traits than those listed are available and will usually be more vigorous. Also, traits such as aleurone color, plant color, pericarp color, y, wx, su, etc., are widespread in the stocks and may often be obtained in specific desired combinations with a wide variety of other traits. Following is a listing of Cooperative stocks:

Chromosome 1

ad_1 bm_2; seg P^{RR}, Kn
an_1 bm_2; seg sr, P^{RR}, br_1, gs_1
as
br_1 f_1 bm_2; seg P^{RR}, an_1, gs_1
br_1 f_1 bm_2; seg P^{WW}, an_1, gs_1
Hm
Kn
lw_1
necrotic 8147-31
(p^{CR})
(p^{CW})
P^{mo}
(por)
P^{RR} ad_1 an_1
P^{RR} ad_1 bm_2
P^{RR} an_1 bm_2; seg br_1, ad_1
P^{RR} an_1 gs_1 bm_2
P^{RR} gs_1 bm_2; seg br_1, f_1, an_1
P^{VV}
P^{WR}; seg ad_1, an_1 (coupling)
P^{WR} bm_2
P^{WR} gs_1 bm_2
P^{WW} br_1 f_1 bm_2
P^{WW} hm br_1 f_1
sr P^{WR} an_1 bm_2
sr zb_4 P^{WW}
seg ts_2 P^{WW} bm_2; may seg zb_4 (coupling)

Chromosome 1 (Cont'd)

Ts_6
Vg
vp_5
vp_8
zb_4 ms_{17} PWW
zb_4 PWW bm_2
zb_4 PWW br_1
zb_4 PWW br_1 bm_2
zb_4 ts_2; seg PWW

Chromosome 2

al lg_1
al lg_1 gl_2 B sk
al lg_1 gl_2 b sk
ba_2
fl_1
lg_1 gl_2 B
lg_1 gl_2 b
lg_1 gl_2 b fl_1 v_4
lg_1 gl_2 gs_2 b v_4
lg_1 gl_2 gs_2 b v_4 Ch; may seg sk
lg_1 gl_2 B sk v_4
lg_1 gl_2 b sk v_4
lg_1 gl_2 B v_4
lg_1 gl_2 b v_4
lg_1 gl_2 b v_4 Ch; may seg sk
lg_1 gs_2 v_4
seg ts_1 v_4 (coupling); may seg lg_1, gl_2
ws_3 lg_1 gl_2 B
ws_3 lg_1 gl_2 b
ws_3 lg_1 gl_2 b fl_1 v_4; A_1 A_2 C R

Chromosome 3

A_1 ga_7; A_2 C R
a_1 et; A_2 C R Dt
a_1 sh_2; A_2 C R Dt
a_1 sh_2; A_2 C R dt
a_1 sh_2 et; A_2 C R Dt
A^{d-31}; A_2 C R
a^P et; A_2 C R Dt
a_{x-1}; A_2 C R
a_{x-3}; A_2 C R
a_{x-3} et; A_2 C R
ba_1
Cg

Chromosome 3 (Cont'd)

(cr$_1$) ts$_4$ na$_1$
d$_1$
d$_1$ gl$_6$
d$_1$ lg$_2$
d$_1$ Lg$_3$
d$_1$ pg$_2$
d$_1$ Rg
d$_1$ ts$_4$ lg$_2$
d$_2$
g$_2$
gl$_6$
gl$_6$ lg$_2$ a$_1$ et; A$_2$ C R Dt
gl$_6$ Lg$_3$
gl$_6$ Rg
gl$_6$ v$_{17}$
Lg$_3$
ms$_3$
pg$_2$
pm
ra$_2$
ra$_2$ lg$_2$ pm
ra$_2$ pm
Rg
rt; A$_1$ A$_2$ C R
sh$_2$
ts$_4$ na$_1$
vp$_1$

Chromosome 4

bm$_3$
bt$_2$
de(1 or 16?)
Ga$_1$ Su$_1$
ga$_1$ su$_1$
gl$_3$
j$_2$
la su$_1$ gl$_3$
la su$_1$ Tu gl$_3$
lo Su$_1$
lo su$_1$
lw$_4$; lw$_3$
o$_1$
sp$_1$ Su$_1$
sp$_1$ su$_1$
st
su$_1^{am}$

Chromosome 4 (Cont'd)

su_1 bm_3
su_1 gl_3
su_1 gl_4
su_1 j2 gl_3
su_1 Tu
su_1 Tu gl_3
su_1 zb_6
su_1 zb_6 gl_3
Ts_5
Ts_5 su_1
Tu gl_3
v_8

Chromosome 5

a_2 pr; A_1 C R
a_2 bm_1 pr v_2; A_1 C R
a_2 bt_1 pr; A_1 C R
bm_1 bt_1 bv_1 pr; (a_1) A_2 C R
bm_1 pr; A_1 A_2 C R
bm_1 pr ys_1; seg v_2; A_1 A_2 C R
bm_1 yg_1
bt_1
bt_1 pr; A_1 A_2 C R
Ga Bt_1
ga bt_1
gl_5
gl_8
gl_{17} a_2 bt_1 v_2; A_1 C R
gl_{17} v_2
intensifier of pr closely linked to bt_1
lw_2
lw_3; lw_4
na_2
pr; A_1 A_2 C R
sh^{fl} = "sh_4"
tn
v_3 pr; A_1 A_2 C R
v_{12}
vp_2 gl_8
vp_2 pr; A_1 A_2 C R
vp_7
vp_7 pr; A_1 A_2 C R

Chromosome 6

pb_4
po y
Y at si
y at si
Y L_{10}
y l_{10}
y ms(1)
y pg_{11} pl; A_1 A_2 C R wx pg_{12}
Y Pl; A_1 A_2 b P^{RR}
y pl Bh; A_1 A_2 B sh_1 wx
y Pl; seg luteus on chrom 6; A_1 A_2 b
Y Pl sm py; A_1 A_2 b P^{RR}
Y pl; seg w_1
y Pl; seg w_1; A_1 A_2 b P^{RR}
y pl; seg w_1
y; seg w_1, luteus on chrom 6; carries P^{RR}
y su2
"male sterile-silky"
"orobanche" (seedling)
"ragged" (seedling)
"white-8522" (seedling)
"white-8896" (seedling)

Chromosome 7

Bn_1
gl_1 sl Bn_1
gl_1; y A_1 A_2 C R pr
gl_1; Y wx A_1 A_2 C R Pr
Hs
ij
in; pr A_1 A_2 C R
o_2
o_2 gl_1 sl Bn_1
o_2 ra_1 gl_1
o_2 v_5 ra_1 gl_1
o_2 v_5 ra_1 gl_1; seg Hs
ra_1 gl_1
Tp_1
v_5 gl_1 Tp_1
va_1
vp_9 gl_1; wx

Chromosome 8

mn
v_{16} ms_8 j_1
v_{16} ms_8 j_1; l_1
"necrotic-6697" (seedling)
"sienna-7748" (seedling)

Chromosome 9

au_1 au_2
Bf_1
bk_2
bk_2 Wc
bm_4
c sh_1 wx; y A_1 A_2 R b Pl
c sh_1 wx gl_4(Coop); A_1 A_2 R
c sh_1 wx gl_{15}; A_1 A_2 R
c wx; y A_1 A_2 R b Pl
c wx bk_2; A_1 A_2 R
Dt_1 (See Chromosome 3 stocks)
gl_{10}
I wx; A_1 A_2 R Pr B pl
I wx; A_1 A_2 R pr B pl
l_7
ms_2
ms_2 sh_1; A_1 A_2 C R
ms_{20}
sh_1 wx d_3
sh_1 wx l_7
sh_1 wx pg_{12}; y A_1 A_2 B pl pg_{11}
sh_1 wx v_1
wx^a
wx ar
wx Bf_1
wx da_1; A_1 A_2 C R
wx g_4
wx l_6
wx pg_{12}; y A_1 A_2 B pl pg_{11}

Chromosome 10

a_3 g_1 R; A_1 A_2 C b pl
bf_2
du_1
g_1
g_1 l_2
g_1 rg; A_1 A_2 C
gl_9

Chromosome 10 (Cont'd)

l_1; v_{16} ms_8 j_1
li g_1 R; A_1 A_2 C
li g_1 r; A_1 A_2 C
li g_1 r; A_1 A_2 C; carries abnormal 10
nl_1 g_1 R; A_1 A_2 C
Og R; A_1 A_2 C B Pl; may carry B chromosomes
R^{mb}; A_1 A_2 C
R^{nj}; A_1 A_2 C
R^{st}; A_1 A_2 C
v_{18}
w_2
zn
"oil yellow" (seedling)
"Waseca stripe" (plant)

Stocks of unplaced genes

an_2
bk_1
cl
de_{17}
du_2
dv
dy
fl_2
gl_{11}
gl_{12}
gl_{13}
gl_{14}
gl_{16}
gl_g
h
ms_5
ms_6
ms_7
ms_9
ms_{10}
ms_{11}
ms_{12}
ms_{13}
ms_{14}
Mt
New starchy
ra_3
Rs_1
rs_2
"sh_5"

Stocks of unplaced genes (Cont'd)

Ts_3
tw_1
tw_2
$v13$
$v17$
va_2
$vp6$
wa
ws_1 ws_2
zb_1
zb_2
zb_3

Multiple gene stocks

(A_1 A_2 C R) Pr
" Pr wx
" Pr wx y
" Pr wx Y gl_1
" pr
" pr wx
" pr wx y
" pr su_1
" Pr B Pl; seg Og; may carry B chromosomes
A_1 A_2 C Rg Pr B pl lg_1 fl_1 y
(A_1 A_2 c R Pr) su_1
" y wx
" y sh_1 wx
(A_1 A_2 C r Pr) su_1
" su_1 y g_1
" y wx
" y sh_1 wx
bm_2 lg_1 a_1 su_1 pr Y gl_1 j_1 wx g_1
colored scutellum
lg_1 su_1 bm_1 y gl_1 j_1
su_1 y wx a_1 A_2 C Rg pr
wx lg_1 gl_2 b v_4
y su_1 ra_1 gl_1
y wx gl_1

Popcorns useful in studies of Ga factors

Amber Pearl
Black Beauty
Hulless
Ladyfinger

Popcorns useful in studies of Ga factors (Cont'd)

Ohio Yellow
Red
South American
Supergold

Exotics and varieties

Argentine Popcorn
Black Mexican Sweet Corn (without B chromosomes)
Black Mexican Sweet Corn (with B chromosomes)
Gourdseed
Maiz chapolote
Papago Flour Corn
Parker's Flint
Strawberry Popcorn
Tama Flint
Tom Thumb Popcorn
Zapaluta chica

Primary trisomics

Stocks of trisomics 3, 4, 5, 6, 7, 8, 9, and 10 are available. Stocks of trisomics 1 and 2 are not yet represented in the collection. An effort is being made to mark the trisomics genetically as an aid in selecting trisomic plants. Various procedures are being used, depending upon the markers available in each instance. In most cases, the relative effectiveness of alternative procedures remains to be tested. Among the procedures being tested are the use of closely-linked markers, dosage effects of alleles, and multiple allelic series. The latter method is especially valuable in the cases of chromosomes 3 and 10 where multiple allelic series are available at the $\underline{A}_1$ and $\underline{R}$ loci. In the former case, pale kernels with dots are being selected from the cross $\underline{a}^P\ \underline{a}^m\ \underline{a}^{st} \times \underline{a}^{st}\ \underline{Dt}$. In the case of trisomic 10, kernels with both $\underline{R}^{nj}$ and $\underline{R}^{st}$ phenotype are selected from the cross $\underline{R}^{nj}\ \underline{R}^{st}\ \underline{r} \times \underline{r}$. Trisomic 9 plants of the constitution $\underline{Wx}\ \underline{Wx}\ \underline{wx}$ may be recognized by the ratio of $\underline{Wx}$: $\underline{wx}$ pollen.

Chromosome rearrangements

A selected group of inversions and reciprocal translocations, whose breakpoints mark most of the regions of the ten chromosomes, is being maintained primarily for use in determining the chromosome locations of new traits. Two inversions, Inv 2a and Inv 9a are included. In all cases, the rearrangements are marked with closely-linked endosperm or

seedling traits. Most of the translocations are closely linked to wx, the remainder being linked to su_1, y, gl_1, gl_2, or lg_1. The list is as follows:

Inversions

lg_1 or gl_2 Inv 2a (also available with Ch)
wx Inv 9a

Reciprocal translocations

wx 1-9c
wx 1-9 4995-5
wx 2-9b
wx 3-9c
wx 3-9 5775-1
wx 4-9b
wx 4-9 5657-2
wx 4-9g
wx 5-9a
wx 5-9c
wx 5-9 4817-7
wx 5-9 5614-3
wx 6-9a
wx, y 6-9b
wx 6-9 4505-4
wx 6-9 4778-9
wx 7-9a
wx or gl_1 7-9 4363-1
wx 8-9d
wx 8-9 6673-6
wx 9-10b
su 1-4a (also available with P^{RR})
su 1-4d (also available with P^{RR})
su 4-5j
su, y 4-6a
su 4-8a
su, R 4-10b
y 1-6c (also available with P^{RR})
gl_2 2-3c
gl_2 2-3 5304-3
gl_2 2-6b
gl_2, R 2-10b
gl_1 6-7 4545-5

Stocks of A-B chromosome translocations

B-1a	1L .2	Proximal to *Hm*
B-1b	1S .05	
B-3a	3L .1	
B-4a	4S .25	Proximal to *su*$_1$
B-7b	7L .3	Proximal to *ra*$_1$
B-9b	9S .4	Between *C* and *wx*; close to *wx*
B-10a	10L .35	Proximal to *g*$_1$

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