MAIZE GENETICS COOPERATION

NEWS LETTER

13

April 15, 1939

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Department of Plant Breeding
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Ithaca, N. Y.

948

MAIZE GENETICS COÖPERATION
DEPARTMENT OF PLANT BREEDING
CORNELL UNIVERSITY
ITHACA, NEW YORK

January 21, 1939

To Maize Geneticists :-

The call for material for the 1939 Co-op News Letter has purposely been delayed to allow you more time to analyze last summer's results. Since it is desirable to have the Letter available not later than the first part of March, however, the individual contributions must be received by the Co-op by February 15, 1939.

In order to insure a more uniform system of presentation, please refer to previous News Letters for suggestions concerning the form of your write-up.

Sincerely yours,

D. G. Langham

D. G. Langham,
Secretary

DGL:B

Vol. 13

MAIZE GENETICS COÖPERATION
DEPARTMENT OF PLANT BREEDING
CORNELL UNIVERSITY
ITHACA, NEW YORK

April 15, 1939

To Maize Geneticists:

The material in this letter was obtained from many sources, and has been organized under the following heads:

I. General News Items.
II. Seed Stocks Grown in 1938.
III. Seed Stocks Received For Propagation in 1939.
IV. Maize Publications.
V. Maize Genetics Cooperation Mailing List.

I. General News Items

University of Buenos Aires, Buenos Aires, Argentina -

1. The Argentine varieties of commercial corn are all flint and can be classified in three groups according to endosperm color:

a. Varieties with orange endosperm.
b. " " yellow " .
c. " " white " .

Genetical analysis shows that both groups a and b carry the genes $Y_1Y_1Y_3Y_3$. In the first group the varieties Colorado Cuarenton were tested; in the second group the varieties Amarillo Comun and Amarillo Enans. The difference in color between groups a and b is due to modifying factors. Long White Flint, the only variety of white endosperm tested, has the genotype $y_1y_1Y_3Y_3$.

2. The gene al, besides the known effects upon the development of chlorophyll, reduces the intensity of the endosperm color. In ears segregating AlAl, Alal, and alal, most kernels which have the last combination may be recognized because they have a lighter yellow color. Plants alal give ears with light yellow endosperm. In numerous F_2, no plants of homozygous al and deep yellow or orange endosperm have been found.

T. M. Andres

University of Minnesota, St. Paul, Minn. -

1. Linkage relations of gl_4 with wx and sh. The sample of gl_4 was found in Minnesota in one of our cultures and was being studied at the time of Dr. Sprague's report on gl_4.

Genes	Phase	XY	Xy	xY	xy	Total	Recomb. No.	Recomb. %
Sh Wx	CB	213	66	39	172	490	105	21.4
Sh Gl_4	CB	202	77	55	156	490	132	26.9
Wx Gl_4	CB	235	17	22	216	490	39	8.0

Order of genes sh-wx-gl_4

2. Linkage of zebra seedling-4 (zb_4) with P in chromosome 1. Results are similar to those obtained with F_2 data.

Genes	Phase	XY	Xy	xY	xy	Total	Recomb. No.	Recomb. %
Zb_4 P	CB	67	6	3	67	143	9	6.3

3. An upright habit of the tassel characteristic of inbred line 19 used in 1st cross K (15 x 19) proved recessive in crosses with normal tassel but dominant in the F_1 of the cross between upright and ts_4.

H. K. Hayes

4. I believe it is possible now to arrange the linkage groups in our linkage map still further, so that the linkage groups are oriented in a still more uniform scheme in relation to the chromosomes. In the linkage map sent out with the last corn letter, they are oriented so that the upper end corresponds to, or is in the direction of the short arm end of the chromosome with the exception of #3 and probably #8. My evidence on #3 indicates that this group should be reversed with cr at the zero point or in the direction of the short arm end. For #8, the only data I have are those given below. The numbers are too small, but they suggest that this group should be reversed also, placing l_1 at the zero point. This means that the zero point will be moved as new data come along, but that will be true of several other groups as they stand now.

5. The series of r and R alleles listed in the corn linkage summary does not include the one designated in the original paper on plant colors (pp. 111-113) as r^{rg}. This allele was there described as giving in the dilute types (A b Pl and A b pl) green anthers with red color at the base of the plants, whereas the ordinary r^g allele gave green anthers and green base plants. One suggestion is that the superscript for the r-series may need to be a tri-letter one (anther color, silk color, and base color).

C. R. Burnham

West Virginia University, Morgantown, W. Va. -

1. Linkage data on chromosome 8:

Genes	Phase	XY	Xy	xY	xy	Total	Recomb. No.	Recomb. %
Ms_g J_1	CB	35	1	3	41	80	4	5.0
Ms_gT8-9a	CB	54	26	16	24	120	42	35.0
J_1 T8-9a	CB	56	18	26	31	131	44	33.6

Indicating the order: T8-9a - j_1 - ms_g - end of long arm.

C. R. Burnham

2. Sterilizing seeds for germination. A hypochlorite solution sold under the trade name "Chlorox" is easier to use than the bleaching powder solution. Field corn soaked in Chlorox solutions at 5% and stronger for 1/2 hour completely controlled the molds but reduced germination. There was very little mold and normal germination at 3% and also at 2%. For genetic material a solution of 2 cc. of commercial Chlorox to 100 cc. of water is recommended, soaking the grains for 1/2 hour. Other hypochlorite solutions are on the market but may vary in the % of the active ingredient.

J. A. Rigney and C. R. Burnham

Connecticut Agricultural Experiment Station, New Haven, Conn. -

1. In seeds treated with X-rays shortly after fertilization numerous paired mosaic areas are found associated with losses of all of the easily identified marker genes such as C, Wx, Pr, Su. In many cases areas showing losses of any of these markers are paired with areas that are either lighter or darker than normal in varying shades of aleurone color. Not all of these can be due to shifts of aleurone color genes and it seems likely therefore that breaks and rearrangements of chromosome fragments may alter the cell metabolism and indirectly affect aleurone color. In the same way other activities of the cell are altered, notably in starch formation, viability, and growth control.

D. F. Jones

2. Fine mottling of rrR seeds. In 1937 an ear of Connecticut 720 y Su A C r when pollinated by C697 (a C R) gave seeds that were all mottled. There were 94 regular or coarse mottled kernels, 86 with very fine mottling, color often limited to a few patches of from one to a few cells each, and 6 colorless. (These probably were fine mottling where no color was visible, or were contaminations. They are being tested).

In 1938 seeds of the two classes were planted in separate rows and selfed or again crossed by 697 A-tester. Two ears of

the fine mottled stock selfed produced only whites, solid, and fine mottling. One ear crossed by 697 gave 180 white, 92 solid color, and 82 fine mottled kernels. Three ears from the coarse mottled stock when crossed by 697 gave 534 white, 250 solid color, 132 coarse mottling and 94 fine mottled kernels. This is not a great deviation from a 4 : 2 : 1 : 1 ratio expected if the fine mottled factor shows independent inheritance with Mt.

Does anyone have any convincing evidence that Mt is not an allele of the R r gene? Kempton's (GENETICS 4: 261-274) data can be interpreted on an allelic basis as well as assuming 12.5% C O. He secured 29.4% mottled seeds when selfed, whereas 33 1/3% of the colored seeds should have been mottled. He incorrectly states he expected 25% whereas 33 1/3% was the correct proportion of the colored kernels. Selfed ears are rather unsatisfactory for determination of this point. We plan to test this by back-crossing if it has not been done.

3. White seedling classification. White seedlings can be classified satisfactorily soon after the seeds have germinated if they are germinated in the light. We use an old glass incubator for a germinator and keep the temperature about 75°F. Seeds are sterilized for 1 minute in a 1% solution of $HgCl_2$ and put in petri dishes, 100 to a dish. Under these conditions chlorophyll develops rapidly and classification can usually be completed within a week after planting.

4. Seedling classification for red or green base. Seedlings germinated by the above method can be classified accurately for the green base (r^g or R^g), or red base (r^r or R^r). The tip of the first true leaf has been found the most reliable place for classification. If any antho-cyanin color is present it will appear at the tips of the leaves. Seedlings so germinated and classified can still be planted without injury or setback. (This method of classification is not new. It is used by Dr. Stadler and his students at the University of Missouri. It is cited here as it may be helpful to some unfamiliar with it).

5. Seeds germinated in the germinator produce pollen and silks early. Last spring one lot of C50, a sweet corn inbred, was planted in the field on June 1. Another lot of the same stock was put into the germinator. As soon as the seedlings were well started they were put into four inch pots and kept in the greenhouse for about two weeks before transplanting to the field. The plants so treated produced pollen a week ahead of those planted in the field and there was a difference of nine days in the silking dates. This method may be utilized for securing early tassels and silks of stocks, without planting early.

6. sp_1 and lo not allelic. We now have definite proof that sp_1 and lo on chromosome 4 are not alleles of the same gene. In

fact they are located on opposite sides of su_1. Complete evidence will be published shortly.

W. R. Singleton

7. A hybrid between a Lancaster inbred (696-3c) and Pamunkey in 1936 produced all semi-sterile ears. Cytological examination of the hybrid in 1938 showed the presence of a heterozygous translocation involving chromosomes 1 and 2. The point of interchange in chromosome 1 is in the short arm, at approximately 6/10 of the distance from the spindle fiber attachment region to the end of the chromosome. The break was between the spindle fiber and a knob on the short arm. The point of interchange on chromosome 2, on the long arm, is approximately half way between the spindle fiber and the end of the chromosome. Chromosome 2 also has a knob. Seed of the homozygous translocation is available.

8. A subterminal knob was found on the long arm of chromosome 9 in 38-1174 (segregating sp_1 and lo). This knob is similar in appearance to the chromosome 4 knob, but examination of crosses with unrelated stocks showed no evidence of a translocation involving chromosomes 9 and 4. The knob is quite close to the end of the chromosome with about 1/5 of the long arm beyond it. Seed of this is available.

F. J. Clark

University of North Carolina, Raleigh, N. C. -

1. Opaque endosperm-H. Endosperm similar to o_1 and o_2. Classification good in white dent stocks. Seed segregate 75% normal (O_H), 25% opaque (o_H). All O_H seeds produce normal plants while all o_H seeds produce dwarfish, yellow-green striped, abnormal leaved plants which die in four weeks under field conditions. Some seedlings of o_H lived two months in greenhouse but never got over 5 inches tall. Germination of o_H seed approximately 50%.

Paul H. Harvey

2. Red leaf tip (rl). Appears when plants are 8 to 12 inches high under field conditions. Red color gradually extends from tip to cover approximately one-half of blade. Classification good in F_2. Segregates 75% normal (Rl) to 25% red (rl). All rl plants smaller than normal.

3. Burned leaf (bu). Tissue in leaf tips begins to die and turn brown when plants are 10-18 inches high under field conditions. Condition spreads to one-half or more of leaf. Somewhat resembles conditions caused by certain plant food deficiencies. Classification fair, though a few heterozygous plants show some evidence of burning along leaf margins. Segregates 75% normal (Bu) to 25% burned (bu). All bu plants smaller than normal.

G. K. Middleton

Texas Agricultural Experiment Station, College Station, Texas -

1. With further reference to our hypothesis that (1) maize originated from a wild form of pod-corn, (2) that teosinte is the product of natural hybridization between maize and Tripsacum, and (3) that most North American varieties of maize are contaminated with Tripsacum, we have spent a good share of the past year in reviewing the archaeological and historical evidence which has a bearing on this problem. We have found nothing seriously in conflict with the hypothesis and a great deal of evidence in support of it.

In the last News Letter we made the suggestion that the knobs on the chromosomes of maize may have come originally from Tripsacum, in which case pure South American varieties might be found in which the chromosomes were knobless. This has proved to be the case. Of 17 lots received from Peru, all but two had knobless chromosomes. Collections from other parts of South America, however, all had knobbed chromosomes, the average numbers being as follows:

Venezuela	5.50	Dutch Guiana	3.00
Uruguay	5.00	Argentina	2.00
Brazil	4.08	Peru	0.83
Paraguay	3.50		

If the knobs on maize chromosomes have come originally from Tripsacum, it is evident that Tripsacum-infected varieties have replaced pure maize varieties in all parts of North and South America except the Andean region, which we regard as the primary center of domestication. Bolivian varieties have not yet been studied from the standpoint of chromosome knobs, but we anticipate that the majority of them will be found to be knobless.

The objection most frequently raised to the hypothesis that maize originated from pod-corn is that pod-corn is sterile in the homozygous condition and a sterile form could scarcely have served as a progenitor. We have attributed pod-corn's sterility to the fact that it has been maintained in a heterozygous condition for so many generations it is now a monstrosity when homozygous. We have suspected, however, that a fertile, homozygous form might still be developed by selection since there is great variation in the expression of the glumes and other characteristics of pod-corn. During the past season we have found that the $\underline{Ts}_5$ gene apparently is a strong modifier of fertility of TuTu plants. Homozygous tunicate plants carrying the $\underline{Ts}_5$ gene are highly fertile on the pistillate side and exsert a few good anthers. Self-pollination is impossible because the silks are dried up before anthesis occurs. Sib-pollinations can be made, however, and we expect to have true-breeding stocks of pod-corn available in the near future.

P. C. Mangelsdorf and R. G. Reeves

Duke University, Durham, N. C. -

1. Lg_3 (dominant liguless) is in chromosome 3 as shown by the following summary of data from six small cultures:

Genes	Phase	XY	Xy	xY	xy	Total	
Rg Lg_3	RB	3	138	124	0	265	(p = .011)

A greater portion of the ligule is present in Lg_3 plants than in either lg_1 or lg_2 plants. But for the characteristic "liguless" appearance of the plant as a whole the character might more appropriately be called "defective ligule". Classification (except for seedlings), viability, and fertility (except perhaps for homozygotes) are satisfactory.

A test for allelism with lg_2 and three-point tests are being made.

H. S. Perry

California Institute of Technology, Pasadena, Calif. -

1. List of translocations involving chromosome 3:

Near left end (i. e. short arm)-

T3-6b	S	.8	$d_1 \pm 0.5$
T3-7b	S	.8	$d_1 \pm 0.4$
T2-3c	S	.8	$d_1 \pm 0.8$
T1-3d			$d_1 \pm 0.6$

Middle region -

T3-9a			ts_4	- 2.9 -	d_1	- 34.0 -	T - 25.0 -	lg_2
T3-7a			ts_4	- 5.0 -	d_1	- 20.2 -	T - 15.9 -	lg_2
T3-8b	L	.1	ts_4	- 0 -	d_1	- 17.6 -	T - 14.8 -	lg_2
T3-9c	L	.1						
T3-10a	L	.1+	ts_4	- 10.4 -	d_1	- 11.2 -	T - 11.7 -	lg_2
T2-3b			ts_4	- 1.1				
T3-10b			ts_4	- 0.8				
T3-10c			ts_4	- 0.7				
T3-6a					d_1	- 18.0 -	T - 12.0 -	lg_2
T3-5a					d_1	- 24.5 -	T - 7.9 -	lg_2

T1-3a L .2 ts_4 - 4.2 - d_1 - 23.4 -T - 5.9 - lg_2

T3-8a L .6 ts_4 - 2.5 - d_1 - 29.5 -T - 5.7 - lg_2

Near right end -

T3-7c L .6 ts_4 - 20.0 - T - 22.0 - a

T3-9b lg_2 - 7.9 - T - 18.0 - a

T3-5b na - 4.8 - T - 19.1 - a

T2-3e na - 7.5 - T - 20.7 - a

T3-5c na - 11.7 - T - 12.5 - a

T2-3d na - 13.0 - T - 7.1 - a

List of translocations involving chromosome 6 -

T3-6b	Satellite	Clarke and Anderson, 1935
T1-6b	Satellite	Burnham, 1932
T2-6	Satellite	Clokey (unpublished)
T5-6b	Satellite	McClintock (unpublished)
T6-9a	Nucleolus	McClintock, 1934, Anderson, 1934
T6-10b	S .5	McClintock (unpublished)
T5-6c	S .1	McClintock (unpublished)
T2-6a	S .1	Burnham, 1932
T4-6a	L .2	Very near Y
T4-6b	L .2	Very near Y
T1-6c	L .2+	Very near Y
T6-9b		Very near Y
T4-6c	L .2	Probably near Y (not well tested)
T2-6c	L .25	Probably near Y (not well tested)
T2-6d	L .4	Near Pl and sm. Probably T-Pl-sm
T2-6e	L .4	Near Pl and sm. Probably T-Pl-sm
T6-8a	L .5	Near Pl
T2-6b	L .6+	Near Pl
T3-6a	L .6+	Near Pl (Probably T-Pl-sm)
T1-6a		Brink and Cooper y-Pl-8-T
T6-10a	L .7	Pl-sm-22-T

E. G. Anderson

Cornell University, Ithaca, N. Y.-

1. The Linkage Summary suggests a possible allelism of g_4 and yg_2. They are distinct genes, as an F_1 between them contained only green plants. In F_2 both g_4 and yg_2 segregated.

2. Dull endosperm, du, which intensifies su^{am} and su_1 (see Corn Letter of March 23, 1937, p. 13) has no distinctly visible effect on su_2. Three separate crosses of du x su_2 were made and F_1s selfed. Six ears from each F_2 showed no definite effect of

du on su_2. Any such effect is very slight if existent at all. Therefore, the mechanisms by which the su_1 and su_2 genes act must be different, at least in part.

3. Slit blade, sb, has shown various abnormalities. Sometimes F_2 ratios are atypical in crosses involving sb. Last year an 8:1 ratio of sb was reported. This year one plant of 90 F_2s was a dwarf, resembling mi_{sh}. Various genes have appeared following sb crosses (see below); some of these, at least, seem to be new. In the progeny of an open pollinated mi_{sh}sb plant there was one very abnormal plant. It was ms, striped, bm, with a silkless ear, possessing much enlarged glumes. Slit blade itself is variable, ranging from almost normal-appearing plants to small "deficiency-like" plants with narrow, thick leaves. Many sb plants are nearly or completely sterile. In the light of these divers abnormalities, it is suggested that sb is, or is closely accompanied by, some chromosomal abnormality.

4. Possible new genes from sb crosses:

tw_{sh} -- an adherent showing in both the seedling (causing it to be twisted) and the tassel. Viability good. Classification good.

mi_{sh} -- a semi-dwarf with compact tassel, rather stiff leaves, small seeds. Viability good. Fertility good. Classification good except with lg.

g_{sh} -- a vigorous golden, showing golden late. May be g_2, for it showed about 30% recombination with a.

John Shafer

5. F_2 data (News Letter, March 23, 1937) indicated that pb_4 is located between Y_1 and Pl in chromosome 6. Backcross data obtained last summer, however, suggest rather close linkage of Y_1 and pb_x.

Backcross data:

Genes	Phase	XY	Xy	xY	xy	Total	% Recombination
Y_1 Pb_x	CB	187	2	-	139	328	0.6

Three-point test:

F_1 genotype	0		1		2		1,2		Total
Y_1 + Pl / + pbx +	170	132	-	2	47	35	1	1	388
	302		2 0.5%		82 21.1%		2 0.5%		

Whether $\underline{pb}_x$ is located to the right or to the left of Y_1 can not be decided from these data. The white and yellow patches on plants obtained from backcrosses are considerably larger than those found on piebald plants from the F_2, and are found not only on the leaves but also on the husks. This is attributed to the effect of modifiers rather than to environment.

G. A. Lebedeff

6. Sterility in tetraploid maize. An investigation of the possible causes of the variation in degree of sterility observed in different lines of tetraploid maize was made both from the cytological and genetical angles. In a study of microsporogenesis, both self-sterile and self-fertile lines showed a large number (8-10) of quadrivalents at diakinesis. This indicates that quadrivalent formation is not an important factor in causing sterility in tetraploid maize.

The chromosome number of the microspores varied from 14 to 24. Much of this variation was found to be due to the lagging of univalents and non-disjunction of chromosomes resulting in the formation of micronuclei, and to a lesser extent to the three to one separation of quadrivalents. From one to six chromosomes, usually in univalent groups, were seen to lag in sporocytes showing lagging. Gametes having 18 to 22 chromosomes are considered to be functional, since the chromosome numbers of the progeny of a tetraploid maize plant ($4n = 40$) has been shown to range from 37 to 42. The frequency of microspores having between 18 and 22 chromosomes agreed very well with the percentage of apparently good pollen in the fertile and sterile lines in which this was studied.

Four F_1 populations resulting from crosses between lines with a high degree of pollen abortion (25%) and lines with a low degree of pollen abortion (10%), showed a low mean percentage of aborted pollen, suggesting a possible genic basis for this.

The coefficient of correlation between degree of pollen abortion and percentage of aborted ovules, when only fertile lines were considered, was found to be -0.651 ± 0.025, indicating that factors causing pollen abortion are also operative in causing ovular abortion.

Evidence was obtained indicating that genetic factors for incompatibility were also involved in causing sterility in tetraploid maize. Some self-compatible lines were found to be cross-incompatible with other self-compatible lines when used as the pollen parent. This relationship was true even when the effect of different pollen was compared on two ears from the same plant, one ear being self-pollinated and the other cross-pollinated. In crosses between self-compatible and self-incompatible stocks a unimodal distribution was obtained for the F_1 and a bimodal

distribution for the F_2 population, indicating the existence of at least one dominant or epistatic gene for self-compatibility. A study of reciprocal crosses between self-compatible and self-incompatible lines showed that self-incompatible lines were cross-compatible only when used as the pollen parent. No evidence of pollen tube competition was found in a compatible cross between a self-compatible and a self-incompatible line when mixed pollinations were made to determine this.

Some evidence was obtained indicating that the chromosome number of the plant was not very important with respect to degree of fertility since a 38 chromosome plant was found to be 75% fertile (seed set) when self pollinated. This supports the conclusion that much of the sterility in tetraploid maize is due to genic rather than chromosome number difference.

If genes for self and cross-incompatibility are concerned in causing sterility in tetraploid maize, it is necessary to assume that these genes were present but inhibited in diploids, but became effective because of a genic unbalance resulting from chromosome doubling, i. e. upon doubling some genes increase in effectiveness and others remain static as far as their activity is concerned.

Harold E. Fischer

7. A sib cross between two iojap plants in a culture obtained from A. A. Bryan gave an ear which is homozygous for white seedlings. Forty seeds from this ear were planted. Thirty-eight germinated; all the seedlings were white and died within two weeks. This is interpreted as a case of extreme variation in the expression of iojap.

8. In a tester stock of 11 plants with the genetic constitution pr v_2 A b pl C R eight plants were dilute sun red, as expected, but three showed occasional red sectors in the leaves, husks, and tassel. When the leaves were stripped down and the stalk exposed to the sunlight, red sectors appeared on it, too. Apparently b is unstable and mutates to B.

9. Linkage of g_4 and thin kernels. In a cross of Inbred II x g_4 wx, three F_2 ears segregated 25% thin kernels and the other four F_2 ears were normal. Seed was taken from an ear segregating thin kernels, and the normal kernels planted separately from the thin ones. Theoretically, g_4 should have segregated 3:1 in each group. All 14 plants obtained from the kernels of normal thickness were green, while the 10 plants from the thin kernels were g_4. This behavior suggests that the gene (or small deficiency ?) for thin kernels is closely linked with g_4.

10. New characters in maize, teosinte, and maize-teosinte hybrids:

Maize -

ad_L -- adherent plant. Can be classified in early seedling stage; tips of leaves stick together. Plant becomes almost normal until anthesis, when anthers, tassel branches, and silks become sticky and tend to adhere. Viability and fertility good. Chrom. unknown.

Teosinte -

Several plants each of Nobogame, Huixta, Novocayan, and Durango teosinte were selfed and progeny tests made for genetic characters. The following characters segregated in 3:1 ratios:

zb_t -- zebra seedling.
ad_t -- adherent leaves.
d_t -- dwarf.
pg_t -- pale green (two cultures).
f_t -- fine stripe.
gl_t -- glossy.
w_t -- white seedling (two cultures).
co_t -- corrugated leaf (three cultures).
gs_t -- green stripe (three cultures).
ys_t -- yellow stripe.
la_t -- lazy teosinte (reported in 1938 News Letter).

These genes will be crossed with similar maize genes to test for possible allelism.

Maize-Teosinte hybrids -

sd -- response to short day. Recessive to "weak" response to length of day in maize. Mendelian character.
pd -- single female spikelets. Recessive to paired female spikelets of maize. Segregates in 3:1 ratio. (Collins and Kempton, 1923).
tr -- two-ranked ear and two-ranked central branch of the tassel. Recessive to the many-ranked ear and many-ranked central branch of the maize tassel. Mendelian character.

pd is linked with tr with 20% recombination. Chromosome unknown.

11. Brittle stalk-X (bk_x) reported by R. G. Wiggans in the News Letter, March 6, 1938, p. 12, is an allele of bk_2.

Fine stripe-X (f_x) from the same report is an allele of ij.

D. G. Langham

II. Seed Stocks Grown, 1938

1. Testers.

Chromosome 1:

(P br f_1 bm_2 x P zb_4) x zb_4 br f_1

zb_4

Chromosome 2:

+/d_5

(lg_1 gs_2 b v_4 x Inbred I)self

(ws_3 lg_1 x gl_2) x (ws_3 lg_1 x gl_2)

lg_1 gl_2 v_4 x fl_1

lg_1 ts_1 +/gl_2 +/v_4 x lg_1 gl_2 +/ts_1 +/v_4

lg_1 +/sk_1 x lg_1 sk_1

+/ba_2 x ba_2

Chromosome 3:

(pm x lg_2 d_1) x (pm x lg_2 d_1)

+/d_1 x d_1

d_2

lg_2 d_1 +/ts_4

(ts_4? Rg x d_1^s) x lg_3/?

+/ba_1 x ba_1

a_1 lg_2 ra_2

Chromosome 4:

su_1 gl_3 +/wl

sp_1 su_1

Chromosome 5:

bm_1 bv pr

bm_1 pr v_2

bm_1 bt

Chromosome 6:

v_7

Pl sm +/py x Pl sm py

Y_1 Pl sm A b

Inbred II x pb_x

Inbred I x pb_x

Chromosome 7:

Hs

v_5

o_2

Chromosome 8:

ms_8 j_1 v_{16} x (ms_8 j_1 x v_{16})

Chromosome 9:

+/vp4

ms_2 x ms_2/+

ms_{20} x Ms_{20}

sh +/d_3

+/l_7

sh wx +/w_{11}

Inbred I x ar wx

Inbred II x c sh bp wx

Chromosome 10:

+/vp_1

r^{st}

R^{mb}

R^{nj} A_1 C Pr

R^{rg} A_1 C pr P^{vv}

r^r y su_1

+/w_2

v_{18}

Og g_1 li

Og a_3

a_3 g_1

Inbred I x zb_5 Nl_1/? G_1/?

2. Miscellaneous:

f_x Pu_x

de_c

v_{20}

a_1 C R^g pr in wx y

a_1 C R Y pr in

ms_{11}/+

+/ws_3

v_9

A c R^g su_1 +/v_9 x v_9

+/v_{13}

o_1

h

fl_2

at x at/+

+/bk_1

bk_2

a_1 B Pl C R Pr Y_1

A_1 C r g_1 y

A_1 B pl C R^g Pr Sc_x y_1 lg_1

ms_7 x Inbred II

Ts_6 Og

Inbred I x bm_3

Lo/?

hf x +/hf

Ts_6/+ x al

+/ tw_3

+/ba_x (Singleton)

+/ra_x (Singleton)

zb f x ys

3. No germination:

Inbred II x S_x

lo su_1

ws_x

bt_2

a^p B Pl P

Ms_3/? sh g_1

ms_4 x ms_4/+

4. Too late:

gigas

ms_{12} x Inbred II

ms_{42} x Inbred II

Hy x mg

Inbred II x yg_3

In In

d_b

fs

mg

ms_{27} x ms_{27}/+

su_1 gl_3 Wl/?

sh pk_1 seg. fl_1

gl_9

ys_x(Singleton)

A_1 R^g c sh wx pr y su_1

g_4 sh ar Bn

III. Seed Stocks Received for Propagation in 1939

1. P. C. Mangelsdorf, College Station, Texas:-

   du_2 du_2 seg. da_1 su^{am}

   Du_2du_2 seg. du_1 su^{am}

2. P. H. Harvey, Raleigh, N. C.:

   o_H o_H

   O_H o_H

3. J. Shafer, Ithaca, N. Y.:-

   wx v_1 gl_4

   sh wx v_1 gl_4

   yg_2 sh wx seg. gl_4 lg_1

IV. Some Recent Papers on the Cytogenetics of Maize

During the past year several maize geneticists have written to the Co-op for a list of recent publications in maize. In view of this demand, what do you think of the idea of making such a list a part of the annual Maize Genetics Cooperation News Letter? Most of the maize literature to 1935 is included in the combined bibliographies of "Genetics of Zea Mays" by W. H. Eyster, and "A Summary of Linkage Studies in Maize" by Emerson, Beadle, and Fraser. If these bibliographies were brought up to date, a list of all the papers published between February, 1939, and February, 1940, could be included in the 1940 News Letter, and all those to February, 1941, in the following News Letter.

If your reaction to this suggestion is favorable, will you help bring the following list of papers up to date (I have more than likely missed some)?

Anderson, E. G. - Translocation in maize involving chromosome 9. Genetics 23: 307-313. 1938.

Bindloss, E. A. - Nuclear size in plumular meristems of inbred and hybrid maize. Amer. Journ. Bot. 25: 738-743. 1938.

Brieger, F. G. - Genetic control of gametophyte development in maize. I. A gametophyte character in chromosome five. Jour. Genetics 34: 57-80. 1937.

_____, Tidbury, G. E. and Tseng, H. P. - Genetic control of gametophyte development in maize. II. The quarter test. Jour. Genetics 36: 17-38. 1938.

Brink, R. A. - Linkage relations in the A-Rg group in maize. Amer. Nat. 69: 283-285. 1935.

Burnham, C. R. - Differential fertilization in the Br-Pr linkage group of maize. Jour. Amer. Soc. Agron. 28: 968-975. 1936.

Catcheside, D. G. - The bearing of the frequencies of X-ray induced interchanges in maize upon the mechanism of their induction. Jour. Genetics 36: 321-328. 1938.

Clark, Frances J. - A gene for abnormal meiotic spindle formation in maize. Genetics 24: No. 1, p. 68. 1939. (Abstract).

Clarke, A. E. and Anderson, E. G. - A chromosomal interchange in maize without ring formation. Amer. Jour. Bot. 22: 711-716. 1935.

Dobzhansky, T. H. and Rhoades, M. M. - A possible method for locating favorable genes in maize. Jour. Amer. Soc. Agron. 30: 668-675. 1938.

Emerson, R. A., Beadle, G. W. and Fraser, A. C. - A summary of linkage studies in maize. Cornell Agr. Exp. Sta. Memoir 180, 83 p. 1935.

Haber, E. S. - A study of drouth resistance in inbred strains of sweet corn Zea mays var. rugosa. Iowa A. E. S. Res. Bul. 243: 55-72. 1938.

Harvey, Paul H. - Hereditary variations in plant nutrition. Genetics 24: No. 1, p. 74. 1939. (Abstract).

Jenkins, M. T. - Linkage relations of the A_2-a_2 factor pair in maize. Jour. Amer. Soc. Agron. 26: 719-720. 1934.

Johnson, I. J. and Hayes, H. K. - The inheritance of pericarp tenderness in sweet corn. Jour. Amer. Soc. Agron. 30 (3): 220-231. 1938.

Jones, D. F. - Mutation rate in somatic cells of maize. Proc. Nat. Acad. Sci. 22: 645-648. 1936.

_____ - Somatic segregation and its relation to atypical growth. Genetics 22: 484-522, 1937.

_____ - Translocations in relation to mosaic formation in maize. Proc. Nat. Acad. Sci., U.S.A., 24 (5): 208-211. 1938.

_____ - Growth changes associated with chromosome breakage and reattachment. Genetics 24, No. 1, p. 77. 1939. (Abstract).

_____ - Variable effect of the C locus in maize following translocation. Genetics 24, No. 1, p. 100. 1939. (Abstract).

Kempton, J. H. - Maize as a measure of Indian skill. Univ. New Mexico Bul. 296: 19-28. 1936. (In symposium of prehistoric agriculture.)

_____ - Maize, our heritage from the Indian. Ann. Rep. Smithsonian Inst. 1936-37: 385-408. 1938.

Langham, D. G. - The inheritance of intergeneric differences in Zea-Euchlaena hybrids. Genetics 24, No. 1, p. 78. 1939. (Abstract).

Lincoln, R. E. and Lindstrom, E. W. - Micro-evolution of host-parasite interactions in bacterial wilt of maize. Genetics 24, No. 1. 1939. (Abstract).

Longley, A. E. - Morphological characters of teosinte chromosomes. Jour. Agr. Res. 54: 835-862. 1937.

McClintock, B. - The production of homozygous deficient tissues, with mutant characteristics by means of the aberrant mitosis behavior of ring-shaped chromosomes. Genetics 23: 315-376. 1938.

_____ - The fusion of broken ends of sister half-chromatids following chromatid breakage at meiotic anaphases. Missouri Agr. Exp. Sta. Res. Bul. 290, 48 p. 1938.

Maize Genetics Cooperation - Recent linkage studies in maize. Genetics 24: 59-63. 1939.

Mangelsdorf, P. C. - Modification of Mendelian ratios in maize by mechanical separation of gametes. Proc. Nat. Acad. Sci. 17 (12): 698-700. 1931.

_____ and Reeves, R. G. - The origin of maize. Proc. Nat. Acad. Sci. 24: 303-312. 1938.

Mather, Kenneth - Chiasma frequencies in trisomic maize. Genetics, vol. 24, No. 1, p. 104. 1939. (Abstract).

Maxwell, L. R. - The mechanism of delayed killing of maize seeds with X-radiation. Proc. Nat. Acad. Sci. 24: 377-384. 1938.

Nemec, B. - Gold in Zea mays. Ber. Deut. Bot. Ges. 53: 560-562. 1935.

O'Mara, Joseph G. - Cytological observations on Zea-Euchlaena hybrids. Genetics 24: No. 1, p. 82. 1939. (Abstract).

Perry, H. S. and Sprague, G. F. - A second-chromosome gene, Y_3, producing yellow endosperm color in maize. Jour. Amer. Soc. Agron. 28: 990-996. 1936.

Randolph, L. F. - Developmental morphology of the caryopsis in maize. Jour. Agr. Res. 53: 881-916. 1936.

_____ - The occurrence of parthenogenetic diploids in tetraploid maize. Proc. Nat. Acad. Sci., Vol. 25, No. 3, 1939.

_____ and Hand, David B. - Increase in vitamin A activity of corn caused by doubling the number of chromosomes. Science, 87, No. 2263: 442-443, 1938.

_____ - Cytogenetics of tetraploid maize. Jour. Agr. Res. 50, No. 7: 591-605, 1935.

Randolph, L. F. - A new fixing fluid and a revised schedule for the paraffin method in plant cytology. Stain Technology. 10 (3), p. 95, 1935.

Reeves, R. G. and Mangelsdorf, P. C. - Chromosome numbers in relatives of Zea mays L. Amer. Nat. 69: 633-635. 1935.

Rhoades, Marcus M. and McClintock, B. - The cytogenetics of maize. Bot. Rev. 1: 292-325. 1935.

Rhoades, Marcus M. - A cytogenetic study of a chromosome fragment in maize. Genetics 21: 491-502. 1936.

_____ - The effect of varying gene dosage on aleurone colour in maize. Jour. Genetics 33: 347-354. 1936.

_____ - Note on the origin of triploidy in maize. Jour. Genetics 33: 355-357. 1936.

_____ - Effect of the Dt gene on the mutability of the a_1 allele in maize. Genetics 23: 377-397. 1938.

_____ and Rhoades, Virginia H. - Genetic studies with factors in the tenth chromosome in maize. Genetics 24: No. 2: 302-314. 1939.

Singleton, W. R. - Early researches in maize genetics. Jour. Hered. 26: 49-59. 1935.

_____ - Early researches in maize genetics (concl.). Jour. Hered. 26: 121-126. 1935.

_____ - Effect of colored cellophane on the production of sun-red color in maize. Science 84: 488-489. 1936.

_____ - Cytological observations on deficiencies produced by treating maize pollen with ultraviolet light. Genetics 24, No. 1, p. 109. 1939. (Abstract).

Sprague, G. F. - Random sampling and the distribution of phenotypes on ears of back crossed maize. Jour. Agr. Res. 51: 751-758. 1935.

Tavcar, A. - Beitrag zur Vererbungsart der Spindel-farbung an vierkorn-reihigen Maiskolben. Zeitschr. Indukt. Abstam. u. Vererbungsl. 71: 341-352. 1936.

Thomas, H. L. - The glossy character (gl_3) in maize and its linkage relations. Jour. Agr. Res. 44 (2): 167-173. 1932.

Van Overbeck, J. - Auxin production in seedlings of dwarf maize. Plant Physiology 13: 587-598. 1938.

Van Overbeck, J. - "Laziness" in maize due to abnormal distribution of growth hormone. Jour. Hered. 29: 339-341. 1938.

Weiss, M. G. and Wentz, J. B. - Effect of luteus genes on longevity of seed in maize. Jour. Amer. Soc. Agron. 29: 63-75. 1937.

Wellhausen, E. J. - Genetic investigations of bacterial wilt resistance in corn as caused by Bacterium Stewartii (Smith) Migula. Iowa State College, Jour. of Sci., Vol. IX, No. 3. 1935.

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