

Genetic experiments are now in progress to validate cytological observation and to possibly reveal the existence of knob-linked genes having some control on the expression of quantitative plant characters.

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1. Fatty acid composition of corn oil of certain inbred lines and their F₁ hybrids.

Two groups of inbred lines (selected for high oil content in the kernel) were grown at Experiment, Georgia, in 1961. One group (I) of inbred lines which had been developed by a number of experiment stations was selected from the breeding nursery at the Georgia Experiment Station. A second group (II) of inbred lines was selected from inbreds developed at the Pee Dee Agricultural Experiment Station, Florence, South Carolina. Selfed seed of these inbred lines were analyzed for oil content and fatty acid distribution. All possible single crosses within groups I and II were also made in 1961. During the winter of 1961-62, these single crosses were grown in Florida and 5 to 7 selfs were made in each cross. Fatty acid analyses were made on the selfed seed of F₁ progeny from crosses of inbreds of high x high, high x low, and low x low composition for each of the five important fatty acids in corn oil. The results of fatty acid analyses of the inbred parents and their F₁ hybrid single crosses are given in Table 1.

The F₁ hybrids had less palmitic acid than the average of the parents for all types of crosses in groups I and II. The cross of two inbred lines low in palmitic acid resulted in F₁ hybrids with less palmitic acid than the low parent. The F₁ hybrids were lower in stearic acid than the average of the parents in crosses of high x high and low x high. Crosses of low x low resulted in a slight increase of stearic acid in the F₁ as compared to the average of the parents. For oleic acid, the high x high cross gave F₁ hybrids with less oleic acid and the low x low cross had more oleic acid as compared to the parental averages. The low x high cross had less oleic acid in F₁ hybrids of group I and more in group II as compared to the average of the parents. Linoleic acid content of the F₁ hybrids was slightly increased over the parental average in the high x high cross, moderately increased in the high x low cross, and considerably increased in the low x low cross. F₁ hybrids had lower linolenic acid contents than the average of the parents in all types of crosses except the low x low cross in group II.

Additional crosses of high x high, high x low, and low x low for each of the fatty acids are being made to substantiate the results obtained so far. Segregation in the F₂ generation will also be studied for each of the fatty acids.

This study was made possible by the cooperation of several individuals. The South Carolina inbred lines were made available by Dr. Alfred Manwiller. Oil analyses were determined by the Clinton Corn Processing Company, a division of Standard Brands, Inc., Clinton, Iowa. Fatty acid distributions were determined at the Blue Bonnet Division of Standard Brands, Inc., Indianapolis, Indiana. The oil and fatty acid analyses were made possible by grants from the Corn Industries Research Foundation to the Clinton Corn Processing Company and the Blue Bonnet Laboratories.

Table 1. Fatty acid distribution in seed of F₁ progeny (single crosses) of inbred lines of high x high, high x low, and low x low composition of the five important fatty acids in corn oil.

Fatty acid and pedigree	Group and type of cross	Percent on total fatty acid basis ¹				
		Female parent	Male parent	Average of parents	F ₁ Single cross	Diff.*
Palmitic						
<u>Group I</u>						
Mpl68 x Mpl28	H x H	18.3	16.5	17.4	16.7	-0.7
Mpl68 x GE84	H x L	18.3	11.9	15.1	13.1	-2.0
GE84 x GE72	L x L	11.9	12.0	12.0	11.3	-0.7
<u>Group II</u>						
SC246C x SC138-28	H x H	17.0	16.6	16.8	16.2	-0.6
SC246C x SC212D	H x L	17.0	13.0	15.0	13.6	-1.4
SC313 x SC212D	L x L	13.1	13.0	13.1	12.3	-0.8
Average		15.9	13.8	14.9	13.9	-1.0
Stearic						
<u>Group I</u>						
Pl21 x GE72	H x H	4.48	4.21	4.35	4.16	-0.19
Mpl28 x GE72	L x H	2.25	4.21	3.23	2.66	-0.57
Tx203 x Mpl28	L x L	2.44	2.25	2.35	2.45	+0.10
<u>Group II</u>						
SC260E x SC138-28	H x H	3.30	4.17	3.74	2.41	-1.33
SC313 x SC138-28	L x H	1.67	4.17	2.92	2.64	-0.28
SC313 x SC212D	L x L	1.67	2.16	1.92	2.06	+0.14
Average		2.64	3.53	3.08	2.73	-0.35

Fatty acid and pedigree	Group and type of cross	Percent on total fatty acid basis ¹				
		Female parent	Male parent	Average of parents	F ₁ Single cross	Diff.*
<u>Oleic</u>		<u>Group I</u>				
T202 x GE72	H x H	46.5	45.8	46.2	39.4	-6.8
Mpl28 x T202	L x H	31.0	46.5	38.8	36.8	-2.0
Tx39-16 x Mpl28	L x L	32.7	31.0	31.9	33.1	+1.2
		<u>Group II</u>				
SC260C x SCL38-2	H x H	43.8	44.4	44.1	40.4	-3.7
SC313 x SCL38-2	L x H	24.3	44.4	34.4	36.7	+2.3
SC313 x SC311A	L x L	24.3	37.4	30.9	33.6	+2.7
Average		33.8	41.6	37.7	36.7	-1.0
<u>Linoleic</u>		<u>Group I</u>				
Mpl28 x GE84	H x H	49.0	47.6	48.3	49.2	+0.9
Mpl28 x T202	H x L	49.0	35.1	42.1	45.8	+3.7
T202 x GE72	L x L	35.1	37.3	36.2	44.0	+7.8
		<u>Group II</u>				
SC313 x SC211E	H x H	59.7	45.3	52.5	52.8	+0.3
SC313 x SC260C	H x L	59.7	35.7	47.7	49.3	+1.6
SC260C x SCL38-2	L x L	35.7	36.5	36.1	40.0	+3.9
Average		48.0	40.0	43.8	46.9	+3.1
<u>Linolenic</u>		<u>Group I</u>				
T202 x P121	H x H	1.61	1.46	1.54	1.10	-0.44
T202 x GE72	H x L	1.61	0.82	1.22	1.11	-0.11
GE80 x GE72	L x L	1.04	0.82	0.93	0.00	-0.93
		<u>Group II</u>				
SC313 x SC311A	H x H	1.39	1.37	1.38	0.98	-0.40
SC313 x SCL38-28	H x L	1.39	0.79	1.09	Trace	-1.09
SC246C x SCL38-28	L x L	0.99	0.79	0.89	0.94	+0.05
Average		1.34	1.01	1.17	0.69	-0.48

¹Average of two fatty acid analyses.

* Difference of the F₁ single cross compared to the average of the two inbred parents.

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