Combining Ability of Ontario-Grown Peanuts (*Arachis hypogaea* L.) for Oil, Fatty Acids, and Taxonomic Characters[1,2]

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ABSTRACT

Undesirably low oleic acid and high linoleic acid concentrations in seed oil are typical of valencia peanuts (*Arachis hypogaea* L.) produced in a cool, short-season climate. Improved oil quality may be achieved by incorporating virginia type germplasm into adapted valencia peanuts. The objectives of this study were to determine the oil quality of nine valencia and four virginia peanut lines, evaluate their combining ability for oil concentration, fatty acid composition of the oil, and several taxonomic characters, and assess the potential for developing cultivars adapted to Ontario with improved oil quality. General combining ability (GCA) of the virginia parents significantly exceeded specific combining ability (SCA) for all fatty acids except arachidic, and also for oleic/linoleic (O/L) ratio, days to first flowering, days to full flowering, and branching pattern (R/R+V ratio). GCA of the valencia parents significantly exceeded SCA only for oil concentration. Significant SCA estimates were found for oil concentration, palmitic and oleic acids, O/L ratio, and height of the main axis (first date). Significant heterosis was detected for all taxonomic characters except days to first flowering. Genetic variability for all characters except arachidic acid indicates that the development of Ontario cultivars with improved oil quality, in terms of higher oil content and reduced linoleic acid levels, appears feasible through breeding efforts.

Key Words: *Arachis hypogaea* L., oil, fatty acids, Design II, combining ability, GCA, SCA.

Valencia type peanuts (*Arachis hypogaea* L. ssp. *fastigiata* Waldron var. *fastigiata*) have been grown commercially on the sandy soils of tobacco-growing regions of southern Ontario since 1980. Peanuts grown in this northern (43 N latitude), short-season (3,000 corn heat units) environment may develop poor seed oil quality in terms of oil concentration and fatty acid composition. Although many factors are known to influence the quality of peanut oil, for the purposes of this study, a line with low seed oil concentration and high linoleic acid content was considered to have poor oil quality. High linoleic acid levels may predispose the oil to rancidity (5,8,18), resulting in unpleasant off-flavors and odors which reduce the quality of the finished product (3). Low oil concentrations and high linoleic acid levels due to low late-season temperatures and northern latitude have been reported in other locations (2,7). Linoleic acid levels reported for cultivars grown in Ontario were higher than levels reported in the literature for similar American-grown cultivars (4,15). However, adapted cultivars with improved fatty acid composition may be obtained from crosses of early-maturing valencia peanuts with virginia genotypes of high oil quality (5,9,15,16,17).

The objectives of this study were to evaluate the oil quality of nine valencia and four virginia parental lines, to assess their combining ability for oil quality and several taxonomic characters, and to determine the potential for developing Ontario cultivars with improved oil quality.

Materials and Methods

A Comstock and Robinson Design II mating design with four virginia parents as males (CH 221, NC 2, Virginia 81B and NC 4, coded 1 to 4, respectively) and nine valencia parents as females (McRan, New Mexico Valencia A, New Mexico Valencia C, PI 355982, Blanco Rio Segundo, Honduras, PI 316126, PI 336956 and Line 546, coded 5 to 13, respectively) was used in the generation of 36 F_1 crosses. The parents CH 221, Blanco Rio Segundo, Honduras, and Line 546 are introductions to Canada from the Peoples' Republic of China, Argentina, Honduras, and Zambia, respectively. One F_1 cross subsequently failed to germinate. Single row plots of 5-8 hand-planted F_1 or parental seeds were grown in a randomized complete block design with two replications on Fox loamy sand near Delhi, Ontario, in 1984.

Days to first flowering (number of days from planting to the production of the first flower in a plot) and days to full flowering (number of days from planting to the production of at least one flower on every plant in a plot) were recorded. Height of the main axis to the terminal node was measured on individual plants on July 28 and September 1. After harvesting, branching pattern in terms of R/R+V ratio (where R and V are the number of reproductive axes and number of vegetative axes, respectively) was recorded for the two cotyledonary branches of whole dried plants.

Parental or F_2 pods from each single row plot were bulked and shelled mechanically. A random sample of 20-30 sound mature kernel (SMK) seeds (riding a 0.60 x 1.90 mm oblong screen) or the visually most mature seeds in the case of the virginia lines were used in the preparation of peanut meal for subsequent chemical analyses. Oil concentration on a dry weight basis was measured according to Laurence *et al.* (10) modified by using distilled hexanes and a 5 mL aliquot. Methylated fatty acid samples were prepared according to Court *et al.* (4). Quantitative fatty acid analysis (g kg^{-1} of total fatty acids) was carried out using a Hewlett-Packard 5710A gas chromatograph with dual flame ionization detectors, 3390 integrator, and 7672 automatic sampler with 2.0 uL injection volume. A stainless steel column (2.4 m x 2.1 mm i.d.) with 10% SP-2330 on 100/120 mesh Chromosorb W AW was used. The oven was operated isothermally at 195 C; injection port and detector temperatures were both at 250 C. Rate of nitrogen carrier gas flow was approximately 30 mL/min. Two oil concentration determinations were made per sample of ground peanut seed. Oil from one of these determinations was prepared as a methylated sample and two gas chromatograph runs per methylated sample were performed.

In the statistical analyses, all effects were considered fixed. General combining ability for the male (virginia) parents, and for the female (valencia) parents, and an average specific combining ability estimate were obtained from the appropriate mean squares (1,6). An F test (14) was used to determine the relative magnitude of GCA to SCA. Parental means and mean performance of progeny with a common parent were separated using a protected LSD. For the taxonomic characters, heterosis, defined as a significant deviation of the F_1 mean from the midparent mean (6), was evaluated using a t-test.

Results

Oil and Major Fatty Acids

Significant differences were detected among the 13

[1]Contribution of the University of Guelph, Guelph, Ontario, N1G 2W1, Canada.

[2]Mention of a trademark name or a proprietary product does not constitute endorsement by the University of Guelph, and does not imply its approval to the exclusion of other products that may also be suitable.

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virginia and valencia parents for oil concentration, oleic acid, linoleic acid, and O/L ratio (Table 1). Virginia parents were lower in oil concentration than many valencia parents, likely attributable to immaturity due to the short Ontario growing season. Virginia parents except parent 1 (CH 221) also tended to be higher in oleic, lower in linoleic, and higher in O/L ratio than valencia parents. The virginia parent 1 (CH 221) had fatty acid levels similar to those of the valencia parents.

Table 1. Mean oil concentration, major fatty acid concentration, and O/L ratio of 13 parental peanut lines grown at Delhi, Ontario, 1984.

Parent	Oil	Oleic	Linoleic	O/L ratio
	$g\ kg^{-1}$			
1	491.2 cde+	368.36 d	436.94 a	0.84 c
2	445.0 g	434.27 b	384.27 c	1.13 b
3	477.5 def	460.56 a	364.15 cd	1.26 a
4	461.2 fg	460.70 a	355.28 d	1.30 a
5	491.2 cde	384.44 d	416.43 a	0.92 c
6	500.0 cd	380.83 d	421.14 a	0.90 c
7	506.2 bc	378.94 d	427.06 a	0.89 c
8	489.2 cdef	386.41 d	420.12 a	0.92 c
9	537.2 a	381.46 d	413.30 ab	0.92 c
10	509.0 ab	366.15 d	437.89 a	0.84 c
11	531.8 ab	377.78 d	417.83 a	0.90 c
12	473.0 defg	374.53 d	433.89 a	0.86 c
13	469.2 efg	410.21 c	389.21 bc	1.05 b

+ Means within a column followed by the same letter are not significantly different based on $LSD_{0.05}$.

Although general combining ability (GCA) of the male (virginia) parents was not significant for oil concentration, GCA of the female (valencia) parents, and specific combining ability (SCA) were both significant (Table 2). GCA of females significantly exceeded SCA. Valencia parent 9 (Blanco Rio Segundo) had the highest average oil concentration, and produced progeny with the highest oil concentration on the average (Table 3). Valencia parent 13 (Line 546) had the lowest oil concentration of the female parents, and its progeny ranked among the lowest in oil concentration.

For oleic acid, linoleic acid, and O/L ratio, GCA was significant only for the male (virginia) parents, in contrast to the effects for oil concentration (Table 2). SCA was significant for oleic acid and O/L ratio. GCA of males significantly exceeded SCA for all three characters. In particular, virginia parent 3 (Virginia 81B) had superior oil quality in terms of high oleic acid, low linoleic acid, and high O/L ratio (Table 1), and produced progeny with superior oil quality (Table 3). Virginia parent 1 (CH 221) produced progeny with significantly inferior oil quality on average.

Minor Fatty Acids

Significant differences among the 13 parents were detected for all minor fatty acids except arachidic (Table 4). General combining ability of male (virginia) parents for palmitic, stearic, eicosenoic, behenic and lignoceric

Table 2. Significant combining ability effects from the ANOVA for oil, major and minor fatty acids, O/L ratio, and taxonomic characters among 35 F_1 peanut hybrids grown at Delhi, Ontario 1984.

	Source of Variation		
	GCA		
Character	Males	Females	SCA
oil	n.s.	**	**
Major fatty acids			
oleic	**	n.s.	*
linoleic	**	n.s.	n.s.
O/L ratio	**	n.s.	*
Minor fatty acids			
palmitic	**	**	*
stearic	**	n.s.	n.s.
arachidic	n.s.	n.s.	n.s.
eicosenoic	**	n.s.	n.s.
behenic	**	**	n.s.
lignoceric	**	*	n.s.
Taxonomic characters			
days to first flowering	**	n.s.	n.s.
days to full flowering	**	*	n.s.
main axis height 28 July	n.s.	n.s.	*
main axis height 1 Sept.	n.s.	n.s.	n.s.
R/R+V ratio	**	n.s.	n.s.

*,** Significant effects at $\alpha = 0.05$ and 0.01, respectively.

Table 3. Mean progeny performance of virginia and valencia parents for oil and major fatty acid concentration and O/L ratio, Delhi, Ontario, 1984.

	Oil	Oleic	Linoleic	O/L ratio
	$g\ kg^{-1}$			
Virginia parent				
1	487.9+	381.20 c‡	422.89 a	0.90 c
2	490.2	407.75 b	402.10 b	1.01 b
3	491.5	423.34 a	388.16 c	1.09 a
4	489.7	406.92 b	401.26 b	1.01 b
Valencia parent				
5	495.7 b	406.44+	402.69+	1.01+
6	493.1 b	403.35	404.00	1.00
7	490.1 bc	409.20	398.78	1.03
8	473.2 d	410.67	397.40	1.03
9	511.0 a	400.37	406.14	0.98
10	491.8 bc	397.43	410.76	0.97
11	490.9 bc	405.80	400.53	1.01
12	480.6 cd	402.24	412.42	0.98
13	479.6 cd	407.70	399.73	1.02

+ Means are not significantly different.

‡ Means within a column and parental group followed by the same letter are not significantly different based on $LSD_{0.05}$.

acid was significant (Table 2) and significantly exceeded SCA. GCA of females was also significant for palmitic, behenic, and lignoceric acid, but did not exceed SCA.

Significant SCA was found only for palmitic acid. Virginia parent 1 (CH 221) was significantly higher than other virginia parents for palmitic acid, and lower for eicosenoic acid (Table 4). Progeny from parent 1 also ranked high for palmitic and low for eicosenoic (Table 5). Virginia parent 4 (NC 4) and its progeny ranked lower than other virginia parents and progeny for palmitic acid. Valencia parent 12 (PI 336956) was significantly lower than other valencia parents for palmitic and behenic acid, and its progeny also ranked low for these fatty acids.

Table 4. Mean minor fatty acid concentration of 13 parental peanut lines grown at Delhi, Ontario, 1984.

Parent	palmitic	stearic	arachidic	eicosenoic	behenic	lignoceric
	----------	----------	---------- $g\ kg^{-1}$	----------	----------	----------
1	108.46 a†	20.72 ef	9.46‡	11.36 cd	27.42 gh	14.76 d
2	92.02 g	15.35 g	10.32	16.87 ab	28.68 fg	18.21 a
3	90.26 g	15.94 g	9.78	16.07 b	27.02 h	16.22 bc
4	87.16 h	19.38 f	11.64	17.78 a	30.71 de	17.37 ab
5	102.91 e	24.38 abcd	13.26	11.68 cd	31.34 cd	15.56 cd
6	105.75 bcd	24.54 abcd	9.60	12.14 c	30.90 de	15.10 cd
7	103.03 a	21.32 def	11.96	12.14 c	30.37 de	15.16 cd
8	103.09 de	22.18 cdef	9.78	11.60 cd	31.79 bcd	15.02 cd
9	106.60 ab	25.77 ab	14.12	10.74 c	33.07 ab	14.95 cd
10	102.22 e	25.23 abc	8.52	11.74 cd	32.57 bc	15.67 cd
11	105.84 abc	25.38 abc	11.08	11.79 cd	34.46 a	15.61 cd
12	98.01 f	23.02 bcde	12.14	11.20 cd	29.59 ef	15.12 cd
13	103.27 cde	27.00 a	14.06	10.78 d	31.07 d	14.39 d

† Means within a column followed by the same letter are not significantly different based on $LSD_{0.05}$.

‡ Means are not significantly different.

Oil concentration was not significantly correlated with any of the fatty acids or O/L ratio in the 35 F_1 crosses (Table 6). However, in the parents, oil was strongly negatively correlated with oleic, eicosenoic, lignoceric acid and O/L ratio, and strongly positively correlated with palmitic, stearic, linoleic, and behenic acid. Oleic and linoleic were strongly negatively correlated in the parents (r = -0.971) and in the F_1's (r = -0.977).

Taxonomic Characters

Significant differences were detected among the 13 parental lines for all taxonomic characters (Table 7). For days to first flowering and days to full flowering, GCA of males was significant (Table 2) and significantly exceeded SCA; GCA of females was also significant for days to full flowering, but did not exceed SCA. SCA was nonsignificant for both characters. Significant differences in average performance of their progeny were detected among the male parents for first and full flowering, and among the female parents for full flowering. In particular F_1 crosses of parents 2 and 4 (NC 2 and NC 4, respectively) flowered much later than F_1 crosses of the other two male parents (Table 8), as did the actual parents (Table 7). No evidence of heterosis was found among the F_1 crosses for days to first flowering. Positive heterosis, in which the F_1's reached full flowering 10 to 15 days later than expected based on midparent values, was found in three crosses (11 x 3, 8 x 4, and 12 x 4), but no cases were found in which the F_1 crosses flowered later than the latest parent of the cross.

For height of the main axis, GCA was nonsignificant for both the males and females (Table 2). SCA was significant only on the first date of measurement (July 28). Significant positive heterosis for height, ranging from 4.8 to 7.2 cm, was found on the first date in four crosses (9 x 2, 12 x 2, 10 x 4, and 11 x 4) and on the second date, ranging from 8.0 to 15.0 cm, in nine crosses (5 x 1, 6 x 1, 12 x 1, 12 x 2, 13 x 3, 5 x 4, 9 x 4, 10 x 4, 13 x 4).

Table 5. Mean progeny performance of virginia and valencia parents for minor fatty acid concentration, Delhi, Ontario, 1984.

	palmitic	stearic	arachidic	eicosenoic	behenic	lignoceric
	----------	----------	---------- $g\ kg^{-1}$	----------	----------	----------
virginia parent						
1	104.94 a†	22.55 a	11.62‡	11.74 c	29.83 bc	15.23 c
2	99.79 b	18.55 b	10.25	14.15 b	30.64 b	16.17 b
3	99.23 bc	19.47 b	10.97	13.58 b	29.36 c	15.89 bc
4	97.93 c	17.02 c	10.94	16.08 a	32.52 a	17.32 a
valencia parent						
5	101.03 abc	20.02‡	11.45‡	13.30‡	29.71 c	15.37 e
6	102.62 a	18.91	11.49	13.72	30.22 bc	15.67 cde
7	102.13 a	19.13	10.86	13.89	30.42 bc	15.59 de
8	99.97 bc	19.13	11.50	14.38	30.46 bc	16.50 abcd
9	100.64 abc	20.07	10.86	13.64	31.39 ab	16.89 a
10	99.81 bc	19.23	10.64	13.98	31.34 ab	16.80 ab
11	99.24 cd	20.02	10.78	14.69	32.22 a	16.74 abc
12	97.60 d	18.94	9.88	13.58	29.28 c	16.07 abcde
13	101.68 ab	19.14	11.05	13.81	30.24 bc	15.75 bcde

† Means within a column and parental group followed by the same letter are not significantly different based on $LSD_{0.05}$.

‡ Means are not significantly different.

Table 6. Correlations of 8 fatty acids and O/L ratio with oil concentration in 35 F_1 peanut crosses and 13 parental lines grown at Delhi, Ontario, 1984.

	F_1 crosses	Parental lines
palmitic	0.153+	0.644**
stearic	0.183+	0.447*
oleic	-0.061+	-0.616**
linoleic	0.062+	0.540**
arachidic	-0.048+	0.000+
eicosenoic	-0.213+	-0.541**
behenic	-0.126+	0.604**
lignoceric	-0.156+	-0.448*
O/L ratio	-0.051+	-0.591**

*,** Significant at α = 0.05 and 0.01, respectively.

\+ Not significant

Table 7. Mean days to flowering, main axis height and R/R + V ratio of 13 parental peanut lines grown at Delhi, Ontario, 1984.

Parent	days to first flowering†	days to full flowering‡	height of main axis, 28 July§	height of main axis, 1 Sept.§	R/R+V ratio¶
			------------cm------------		
1	41.0 b#	50.5 bcd	12.8 de	20.0 g	0.78 cde
2	52.0 a	62.5 a	12.8 de	28.1 defg	0.46 f
3	44.5 b	49.0 bcde	12.8 de	21.8 fg	0.91 ab
4	50.5 a	53.0 b	10.7 e	23.5 efg	0.48 f
5	43.0 b	47.5 bcde	23.0 ab	33.0 abcd	0.94 a
6	41.0 b	44.5 de	22.5 ab	37.5 abc	0.82 bcd
7	41.0 b	46.0 cde	18.8 bc	38.0 ab	0.70 e
8	43.0 b	44.5 de	22.6 ab	41.2 a	0.90 ab
9	43.0 b	49.0 bcde	17.7 c	31.2 bcde	0.95 a
10	43.0 b	43.0 e	23.3 a	40.5 a	0.87 abc
11	44.5 b	50.5 bcd	16.6 cd	34.3 abcd	0.75 de
12	41.0 b	46.0 cde	19.6 abc	35.2 abcd	0.90 ab
13	43.0 b	52.0 bc	18.9 abc	29.7 cdef	0.89 abc

† Number of days from planting to production of first flower in a plot

‡ Number of days from planting to production of at least one flower on every plant in a plot

§ Height to terminal node or apex

¶ Number of reproductive branches divided by total branch number

\# Means followed by the same letter within a column are not significantly different based on $LSD_{0.05}$.

Table 8. Mean progeny performance of virginia and valencia parents for days to flowering, main axis height and R/R + V ratio.

	days to first flowering†	days to full flowering‡	height of main axis, 28 July§	height of main axis, 1 Sept.§	R/R+V ratio¶
			----------cm----------		
virginia parent					
1	43.6b#	50.3 c	16.36††	33.87††	0.873 b
2	47.3 a	55.4 a	18.92	37.23	0.502 c
3	44.4 b	52.4 b	17.79	35.18	0.934 a
4	46.9 a	55.1 a	17.85	37.11	0.505 c
valencia parent					
5	44.9††	50.9 b	17.75††	36.90††	0.692††
6	44.9	51.0 b	17.65	36.81	0.707
7	44.8	53.6 ab	16.36	36.09	0.725
8	45.1	54.0 ab	16.52	34.58	0.715
9	45.2	54.4 ab	18.71	35.09	0.714
10	45.6	50.1 b	19.21	37.59	0.698
11	46.8	57.1 a	17.62	33.54	0.672
12	44.8	56.0 a	18.79	36.98	0.667
13	48.1	52.9 ab	16.28	35.06	0.743

† Number of days from planting to production of first flower in a plot

‡ Number of days from planting to production of at least one flower on every plant in a plot

§ Height to terminal node or apex

¶ Number of reproductive branches divided by total branch number

\# Means within a column and parental group followed by the same letter are not significantly different based on $LSD_{0.05}$.

†† Means are not significantly different.

However, height of the F_1 crosses did not significantly exceed height of the tallest parent in the cross.

Only GCA of males was significant for R/R + V ratio, and it significantly exceeded SCA (Table 2). The male parents differed significantly in their actual R/R + V ratios (Table 7) and in the average performance of the F_1 progeny (Table 8). Parents 1 and 3 (CH 221 and Virginia 81B, respectively) had high mean R/R + V ratios which were similar to those of the valencia parents, and produced progeny with similarly high R/R + V ratios. In contrast, parents 2 and 4 (NC 2 and NC 4, respectively) produced F_1 offspring with low mean R/R + V ratios, not significantly different from mean ratios recorded for the virginia parents. Only one cross displayed significant positive heterosis; the high mean R/R + V ratio of 0.94 of F_1's from the cross of parent 7 and parent 1 (with R/R + V ratios of 0.71 and 0.79 respectively) was significantly greater than the mean R/R + V ratio of either parent.

Discussion

Oil and Fatty Acids

Additive effects were more important than non-additive effects in determining oil content among the crosses in this study, in agreement with other researchers (11,16). Although oil content is reportedly under embryonic control (11), the oil content of seed from the F_1 crosses studied was greatly influenced by the valencia parent, which could represent either some degree of maternal effect, or entirely genetic control. A study of reciprocal crosses and the determination of oil concentration in F_1 seed would help clarify the nature of the influence. In breeding for a higher oil content in Ontario peanuts, Blanco Rio Segundo (valencia parent 9) may be useful. This parent had the highest oil content of the 13 parents, and the mean of its progeny was also the highest.

With the exception of arachidic acid, levels of the fatty acids and the O/L ratio in seeds from the F_1 plants were greatly influenced by the virginia male parent. In breeding for improved oil quality through lower linoleic acid, higher oleic acid, and higher O/L ratio, the virginia parent 3 (Virginia 81B) could be very valuable based on the average performance of its progeny. Although breeding for improved fatty acid composition appears feasible, reducing linoleic levels to less than 250 g kg^{-1}, as has been recommended (22), will be difficult. In a study of a number of lines grown in Ontario, the lowest level found was 346 g kg^{-1} for Virginia 81B (15). In our study, NC 4 had a slightly lower linoleic content than Virginia 81B, but was still well above the recommended 250 g kg^{-1}.

Highly significant negative correlations between oleic and linoleic were found, in agreement with other studies (2, 9, 13, 16, 17), indicating that selection for lower linoleic levels will bring about a corresponding increase in oleic levels and O/L ratios. The non-significant correlations of oil with the 8 fatty acids and O/L ratio found in the valencia x virginia crosses indicate that selection for both increased oil content and decreased linoleic levels is possible.

Taxonomic Characters

In this study, GCA appears to be more important in determining days to first and full flowering than SCA, in agreement with other studies of days to first flowering

(12, 20, 21). The male parents had the greatest influence on flowering date of the F_1 crosses. From our study, virginia parent 1 (CH 221) appears to be the best male parent to use in breeding for early first and full flowering. Significant heterosis, in which the F_1's flowered later than expected based on midparent values, was found in only three crosses for full flowering, not in the majority of crosses as found by Parker *et al.* (12). Results suggest that the development of early-flowering Ontario cultivars is possible.

For height of the main axis, both GCA and SCA were nonsignificant on the second date, in agreement with Parker *et al.* (12), although SCA was significant on the first date. Positive heterosis was found in a number of crosses, in agreement with Parker *et al.* (12). It is apparent that the particular male x female combination may be very important in determining mean plant height of the F_1 offspring.

Using the typical R/R + V ratios that characterize virginia (0.5), spanish (0.6 — 0.7), and valencia (1.0) market types (19), two of the male parents, parents 1 and 3 (CH 221 and Virginia 81B, respectively) would be classified as valencia plant types. These lines were also aberrant for other taxonomic characters, producing main axis inflorescences and reaching first and full flowering early, yet their seed type was distinctly virginia-like. Mean R/R + V ratio in the F_1 offspring of the valencia x virginia crosses was largely controlled by the male parent. Complete dominance of virginia over valencia was found in all 17 F_1 crosses with the virginia type parents 2 and 4 (NC 2 and NC 4, respectively), in agreement with the results of Wynne (19) for the cross NC 4 x valencia type parent, but in disagreement with other results where partial dominance of virginia over valencia was indicated in the mean R/R + V ratios of F_1's and F_2's obtained from a valencia x virginia cross and its reciprocal (19).

Conclusions

In breeding for higher oil concentration, choice of the valencia parent appears most important. However, choice of the virginia parent appears to have the greatest influence on fatty acid levels of the offspring. Significant genetic variability, GCA in excess of SCA, and nonsignificant correlations between oil and fatty acids for the F_1 crosses, indicate that breeding for improved oil quality in terms of higher oil content and lower linoleic levels is possible. In particular, the valencia parent Blanco Rio Segundo may be useful in increasing oil content, and the virginia parent Virginia 81B may be of great value in the development of Ontario cultivars with improved fatty acid compositions.

Results on the inheritance of the taxonomic characters, days to first flowering, days to full flowering, height of the main axis, and R/R + V ratio, are in general agreement with the literature. In particular, breeding for early first flowering and full flowering appears possible, and may contribute to the development of early-maturing Ontario peanut cultivars.

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