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Title: Development of High-Oil Peanuts for Use as Biodiesel Fuel
Personnel: Charles E. Simpson¹, Mark D. Burow^{2,3}, Michael R. Baring⁴, and
A. Michael Schubert²

Agencies:

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Objective.

The objective of this project is to improve the competitiveness of peanut as a biofuel. To do this we propose to increase the oil content of peanut from about 48% to near 60%. This will result in an increase of 25% of the gallons of oil that can be produced. We have wild species accessions that have oil content in this range, and cultivated accessions containing 50 to 55% oil. These and the "ugly peanut" do not have appearance in shape and size typical of normal peanut varieties. However, the shape and size is not a primary concern for oil production. The Tamrun 98 variety has improved shell out, which could increase the oil extracted by 5%. We propose to combine the high oil trait with the high yield and improved shelling percent to develop a variety that can be more competitive for use as biodiesel fuel and give growers another market for peanuts. We have set up a system for oil analysis of plots. The AgriLife Research-Lubbock Center has a NMR spectrometer for measurement of oil content and we have developed standards by using conventional chemical analyses.

Results.

- (a) We have identified quite a number of materials that have elevated oil content from the 175 lines we screened from the interspecific hybrid population. Two different groups of materials that have come from our wild species program that have oil contents well above currently grown varieties in Texas have been identified. Some of these lines are significantly higher than those identified when we screened the core of the U.S. peanut core collection. Some of the individual plants were as high as 63.9 % oil, and some of the highest individual plants will be used in crosses in 2009.
- (b) We are also testing varieties under multiple combinations of irrigation and spacing to determine profitability of peanut production under reduced inputs. We will determine the oil content and yield per acre to determine effects of reduced input-cultivation on oil yields. Again, we are still evaluating our data and do not have conclusions at this time.

(c) We have crossed numerous lines that are identified in the literature as higher in oil content, and we have many of those hybrids growing in the greenhouse now for seed increase. We have also made eleven backcrosses and will soon have seed for oil analyses from these populations of lines that are high-yielding, disease resistant and/or drought-tolerant

We feel that significant progress has been made in identifying high oil lines and we are optimistic about the future use of peanut oil as a bio-fuel.

Acknowledgment

We want to thank the Texas Peanut Producers Board and The National Peanut Board for their support of this important research.

Respectfully submitted,
Charles E. Simpson, Co-PI

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BioFuels Project NPB
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Results.

(a) We have identified quite a number of materials that have an elevated oil content from the 175 lines we screened from the interspecific hybrid population. Tables 1 and 2 show the analyses results from two different groups of materials that have come from our wild species program that have oil contents well above currently grown varieties in Texas. Some of these lines are significantly higher than those identified when we screened the core of the U.S. peanut core collection. The oil percents shown in Table 1 are averages for the number of plants shown per line. Some of the individual plants were as high as 63.9 % oil, but we decided to show averages per population rather than individual plants. Some of the highest individual plants will be used in crosses in 2009.

(b) We are also testing varieties under multiple combinations of irrigation and spacing to determine profitability of peanut production under reduced inputs. We will determine the

oil content and yield per acre to determine effects of reduced input-cultivation on oil yields. Again, we are still evaluating our data and do not have conclusions at this time. (c) We have crossed numerous lines that are identified in the literature as higher in oil content, and we have many of those hybrids growing in the greenhouse now for seed increase. We have also made eleven backcrosses and will soon have seed for oil analyses from these populations of lines that are high-yielding, disease resistant and/or drought-tolerant

(d) For the longer term material, we have made several crosses with the wild peanuts that have been reported to have at least 64% oil. We presently have some interspecific hybrids growing that are the first steps in the introgression of genes for the 60 plus oil percent transfer to cultivated peanut. Some of these hybrids will be important as we progress in the introgression pathway to get the 64% oil content genes established in the cultivated peanut.

Table 1.
High oil percent Texas Breeding lines
Backcross three generation

Population ID	No. of Plants	Mean Oil %
1	11	57.7 a
2	5	56.2 ab
3	11	55.8 a-c
4	13	55.6 a-d
5	18	55.4 b-e
6	8	55.3 b-e
7	1	55.2 b-f
8	13	55.1 b-f
9	2	54.8 b-g
10	3	54.7 b-g
11	8	54.7 b-g
12	18	54.4 b-g
13	13	54.2 b-h
14	14	54.0 b-h
15	16	53.7 c-i
16	12	53.6 c-i
17	15	53.5 d-i
18	24	53.3 e-j
19	13	53.1 f-k
20	13	52.8 g-l
21	7	52.7 g-l
22	16	52.6 g-l
23	7	52.6 g-l
24	1	52.6 g-l
25	16	52.6 g-l
26	3	52.1 h-l
27	3	51.5 i-l
Flavorrunner 458	9	51.1 j-l
Tamrun 0L02	9	50.6 l
Mean =		53.3
LSD =		2.23
CV =		3.4%

Table 2.
High oil percent Texas Breeding lines
Backcross four generation

Line ID	Oil Content %
1	50.3
2	54.2
3	48.6
4	53.7
5	54.2
6	51.8
7	53.4
8	51.5
9	49.2
10	50.9
11	50.3
12	49.0
13	48.1
14	50.0
15	51.6
16	53.7
17	53.3
18	52.7
19	54.8
20	45.6

We feel that significant progress has been made in identifying high oil lines. All of the lines listed in Tables 1 and 2 are fully cross compatible with cultivated peanut, and some of them are high yielding and might possibly be suitable for a direct release. Full yield testing will be required before that type of decision can be made.

Acknowledgment

We want to thank the Texas Peanut Producers Board and The National Peanut Board for their support of this important research.

Respectfully submitted,
Charles E. Simpson, Co-PI