Nusun Frying Stability

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Abstract: The frying stability of Nusun (1997 Crop) was compared to that of several different commercially available food service frying mediums. These different frying mediums include partially hydrogenated soybean oil, peanut oil, canola oil, soybean oil and low linolenic canola oil. Used frying oil data suggested that Nusun performed as well as partially hydrogenated soybean oil, peanut oil and low linolenic canola oil, and that Nusun exhibited improved frying stability to that of soybean oil and canola oil. Roundtable sensory analysis suggested that water blanched potato cubes fried in Nusun developed better fried food flavor throughout the duration of the frying comparison.

Key Words: Nusun, frying stability.

Introduction: Nusun sunflower oil shows great potential as a foodservice and commercial frying medium. With the increased oleic acid content , decreased linoleic acid content, and low saturated fatty acid content, Nusun provides to the consumer a stable frying medium with excellent nutritional qualities.

Previous work done in Spain (1) indicates that sunflower oils with similar composition to that of Nusun exhibited good thermal stability and frying performance. The purpose of this test was to determine the frying stability of Nusun compared to that of commercially available frying mediums.

Materials and Methods: Frying mediums were evaluated by using a standard frying protocol. Three different frying tests were used to evaluate Nusun. Frying protocol consisted of using 6.8 kg Star Electric Fryers. Fryers were filled with 6.8 kg of respective frying medium. Frying temperature was maintained at 175°C ±3.0°C twenty four hours a day for eight days. On each day of the frying test, frozen water blanched diced potatoes (NORPAC Foods, Lake Oswego, OR) were deep fried. During each frying period baskets were loaded with 230 grams of frozen potato. Frying time was four minutes. Oil samples were taken at the end of the day and frozen until analyzed. Fryers were then topped off to achieve proper frying level.

Oil samples were analyzed for free fatty acids (AOCS Ca 5a-40), para-Anisidine Value (AOCS Cd 18-90), Hunter Color, and Total Polar Materials (house procedure).

Results and Discussion: Frying test #1 compared Nusun to that of a 104 IV partially hydrogenated soybean oil. Table #1 contains the fresh oil analysis.

Table #1: Frying Test #1 – Fresh Oil Analysis

Analysis	Nusun	104 IV PHSBO
Lovibond R/Y	0.8/8	0.2/12
FFA (%C18:1)	0.05	0.05
IV	101.9	104.1
GLC C16:0	4.6	10.5
C18:0	4.2	6.7
C18:1	61.3	43.6
C18:2	27.3	34.9
C18:3	0.6	3.5
OSI @ 110°C	33.6	35.2

Results of the analytical analysis of used oil samples from frying test #1 are contained in table #2.

Table #2: Frying Test #1 – Used Oil Analysis

Sample	FFA (%C18:1)	p-AV	Hunter L,a,b	Hunter DEW	Total Polars (%)
F1 Fresh	0.05	3.8	49.9.-2.8,8.6	43.7	2.05
F2 Fresh	0.05	0.4	50.6,-1.6,4.2	42.3	1.43
F3 Fresh	0.05	0.3	50.5,-1.7,4.3	42.4	-
F4 Fresh	0.06	3.7	50.0,-2.8,8.6	43.6	-
F1 Day 1	0.06	19.8	47.6,-2.6,11.8	46.6	-
F2 Day 1	0.06	19.8	47.8,-2.6,11.0	46.2	-
F3 Day 1	0.05	23.4	47.7,-2.9,11.4	46.4	-
F4 Day 1	0.06	20.1	47.4,-2.6,12.3	46.9	-
F1 Day 2	0.09	45.5	46.0,-2.9,16.5	49.5	7.73
F2 Day 2	0.12	50.0	45.5,-3.1,17.2	50.2	6.50
F3 Day 2	0.10	51.7	44.9,-3.1,17.7	51.0	-
F4 Day 2	0.10	45.1	45.2,-2.7,17.1	50.4	-
F1 Day 4	0.15	57.1	43.2,-2.0,20.1	53.4	10.42
F2 Day 4	0.13	64.8	42.3,-1.5,21.2	54.6	9.59
F3 Day 4	0.13	66.4	41.1,-0.8,21.3	55.7	-
F4 Day 4	0.14	55.5	42.2,-1.4,20.5	54.4	-
F1 Day 6	0.23	64.3	39.9,1.0,23.1	57.6	14.77
F2 Day 6	0.19	76.9	39.0,2.4,23.2	58.5	13.69
F3 Day 6	0.20	77.4	37.2,3.3,22.8	60.1	-
F4 Day 6	0.25	62.4	38.9,1.7,22.8	58.4	-
F1 Day 8	0.32	61.4	37.4,4.2,23.1	60.1	17.1
F2 Day 8	0.28	72.9	36.3,5.3,22.8	61.1	16.06
F3 Day 8	0.28	74.5	34.8,6.8,22.0	62.3	-
F4 Day 8	0.35	59.4	36.7,4.7,22.9	60.7	-

F1 and F4 = Nusun, F2 and F3= 104 IV PHSBO

Figures 1 through 4 at the end of this paper indicate the trends that were observed during the frying study #1.

Frying test #2 compared Nusun to peanut oil, canola oil, and soybean oil. Table #3 contains the fresh oil analysis.

Table #3: Frying Test #3 – Fresh Oil Analysis

Analysis	Nusun	Peanut Oil	Soybean Oil	Canola Oil
PV (meq/kg)	0.6	0.8	0.5	0.8
FFA (%C18:1)	0.05	0.04	0.04	0.05
IV	101.9	97.9	133.5	115.4
GLC C16:0	4.6	10.7	10.3	4.2
C18:0	4.2	2.7	4.1	2.0
C18:1	61.3	51.3	23.2	61.5
C18:2	27.3	31.1	53.8	20.1
C18:3	0.6	-	7.8	10.6
OSI @ 110°C	33.6	38.3	23.8	39.0

Results of the analytical analysis of the used oil samples from frying test #2 are presented in table #4.

Table#4: Frying Test #2 – Used Oil Analysis

Sample	FFA (%C18:1)	p-AV	Hunter L,a,b	Hunter DEW
F1 Fresh	0.04	5.2	50.1,-1.8,5.7	43.0
F2 Fresh	0.04	4.4	50.0,-2.4,6.1	43.1
F3 fresh	0.05	3.6	49.8,-2.8,8.6	43.8

F4 Fresh	0.05	7.0	49.8,-3.1,8.3	43.7
F1 Day 1	0.06	23.3	47.2,-2.4,10.8	46.7
F2 day 1	0.05	26.4	47.1,-3.2,12.7	47.3
F3 Day 1	0.05	21.2	46.9,-3.5,14.8	48.1
F4 Day 1	0.06	22.3	47.5,-2.7,11.7	46.7
F1 Day 2	0.11	45.1	44.3,-2.4,16.7	51.2
F2 Day 2	0.09	59.7	44.5,-3.2,18.5	51.6
F3 Day 2	0.08	52.8	43.4,-2.1,20.4	53.3
F4 Day 2	0.10	59.3	44.7,-2.1,16.9	50.8
F1 Day 4	0.20	57.2	42.4,-1.4,21.0	54.4
F2 Day 4	0.16	77.0	42.4,-1.6,22.2	54.9
F3 Day 4	0.15	69.7	39.8,0.6,22.7	57.5
F4 Day 4	0.18	54.7	42.8,-1.7,21.1	54.1
F1 Day 6	0.30	59.0	39.7,1.4,23.2	57.8
F2 Day 6	0.21	88.3	39.4,1.4,23.4	58.2
F3 Day 6	0.20	78.4	36.3,4.6,22.6	60.9
F4 Day 6	0.23	60.4	40.7,0.6,23.3	56.9
F1 Day 8	0.39	54.3	37.0,4.9,22.9	60.4
F2 Day 8	0.24	85.7	37.1,4.5,23.0	60.3
F3 Day 8	0.28	77.2	33.9,8.0,21.5	63.2
F4 Day 8	0.32	57.2	38.2,3.7,23.2	59.3

F1=Peanut, F2 = Soybean, F3 = Canola, F4 = Nusun

Figures 5 through 7 at the end of this paper reflect the trends that were observed during frying test #2.

Frying test #3 compared Nusun to that of low linolenic canola oil. Table #5 contains fresh oil quality data.

Table #5: Frying Test #3 – Fresh Oil Analysis

Analysis	Nusun	Low C18:3 Canola
Lovibond R/Y	0.8/8	0.7/9
IV	101.9	105.8
GLC C16:0	4.6	3.5
C18:0	4.2	1.7
C18:1	61.3	65.1
C18:2	27.3	23.8
C18:3	0.6	2.8

Results of the analytical analysis of the used oil samples from frying test #3 are presented in table #6.

Table #6: Frying Test #3 – Used Oil Analysis

Analysis	FFA (%C18:1)	Hunter L,a,b	Hunter DEW	Total Polars (%)
F1 Fresh	0.04	49.1,-2.8,8.8	44.5	2.47
F2 fresh	0.03	49.3,-3.4,9.8	44.5	2.65
F1 Day 1	0.05	47.8,-3.0,12.0	46.5	3.92
F2 Day 1	0.05	47.4,-3.6,13.9	47.4	3.97
F1 Day 2	0.08	45.8,-3.2,16.6	49.7	-
F2 Day 2	0.08	45.1,-3.2,18.8	51.2	-
F1 Day 4	0.13	43.4,-2.0,20.9	53.5	11.89
F2 Day 4	0.15	41.2,-0.6,22.5	56.1	11.98
F1 Day 6	0.21	38.2,3.1,23.0	59.2	-
F2 Day 6	0.22	35.8,5.3,22.2	61.3	-
F1 Day 8	0.30	34.9,6.8,21.9	62.2	18.73
F2 Day 8	0.30	32.0,9.5,20.5	64.8	18.53

In the above frying test F1 = Nusun, and F2 = low linolenic canola oil.
Figures 8 through 10 on the following pages depict the trends that were observed during frying test #3.

Frying test #1 indicates that Nusun exhibited similar frying performance and heat stability to that of the partially hydrogenated soybean oil. According to roundtable discussion the potatoes fried in Nusun developed a more favorable fried food flavor. The nutritional profile of Nusun is noteworthy due to the fact that Nusun contains less than 10.0% saturated fatty acids, and no trans fatty acids, whereas the 104 IV partially hydrogenated soybean oil contains 17.0% saturated fatty acids, and approximately 15.0% trans fatty acids.

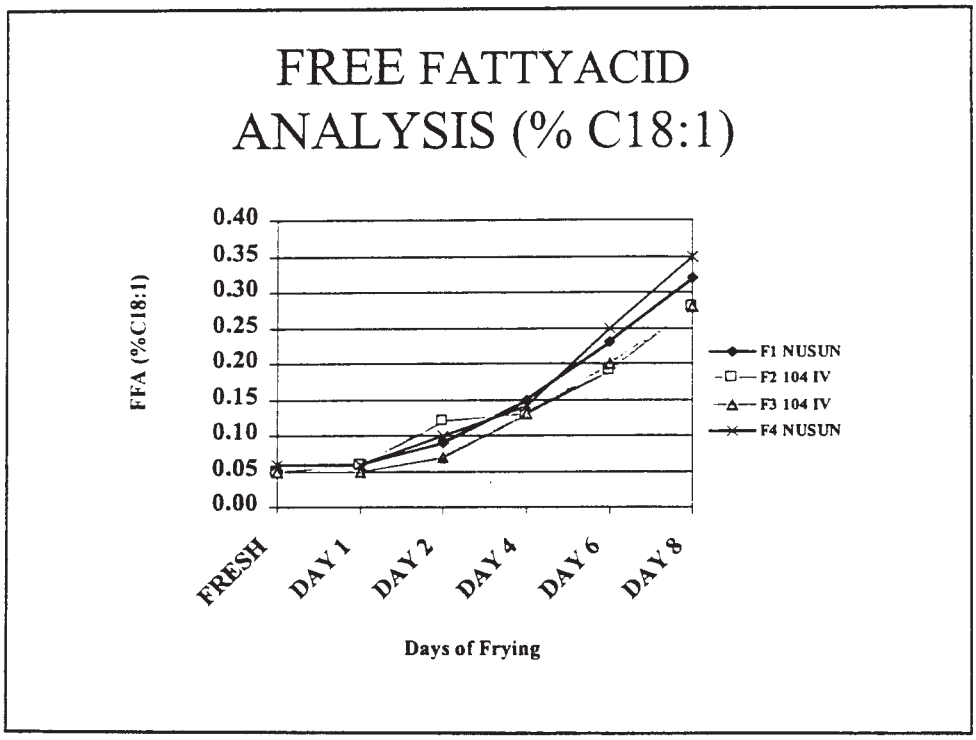
In frying test #2 the stability of Nusun was superior to that of soybean oil and canola oil, and equalled that of peanut oil. Again, potato cubes fried in Nusun developed a more pleasing fried food flavor compared to potatoes deep fried in the other three frying mediums. Saturated fatty acids of Nusun are less than that of peanut oil and soybean oil.

Frying test #3 indicated that Nusun and low linolenic canola oil displayed similar heat and frying stability, with Nusun undergoing less darkening during the later stages of the frying test. Potato cubes fried in Nusun also offered a more pleasing fried food flavor .

Laboratory frying data suggests that Nusun sunflower oil can be successfully used as a foodservice frying medium, offering good frying stability, while producing fried food products with good taste and good nutritional characteristics.

1. Dobarganes,M.C.; Marquez-Ruiz, G.;Perez-Camino, M.C. Thermal Stability and frying Performance of Genetically Modified Sunflower Seed (Helianthus annuus L.) Oils. J. Agric. Food Chemistry 1993, 41, 678-681.

Figure 1:



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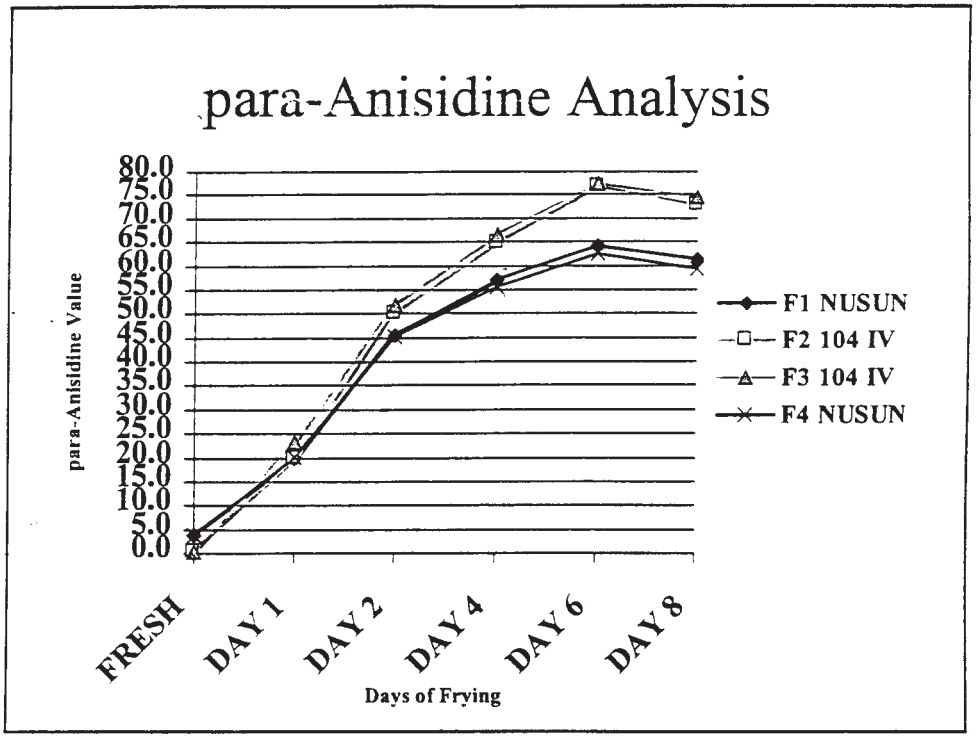

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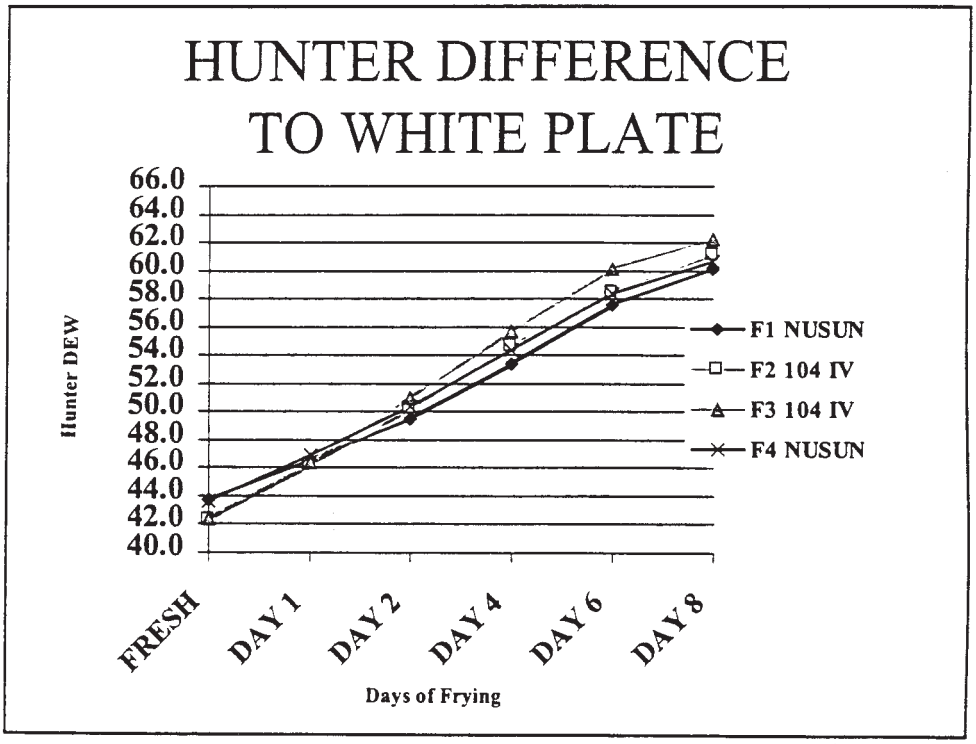

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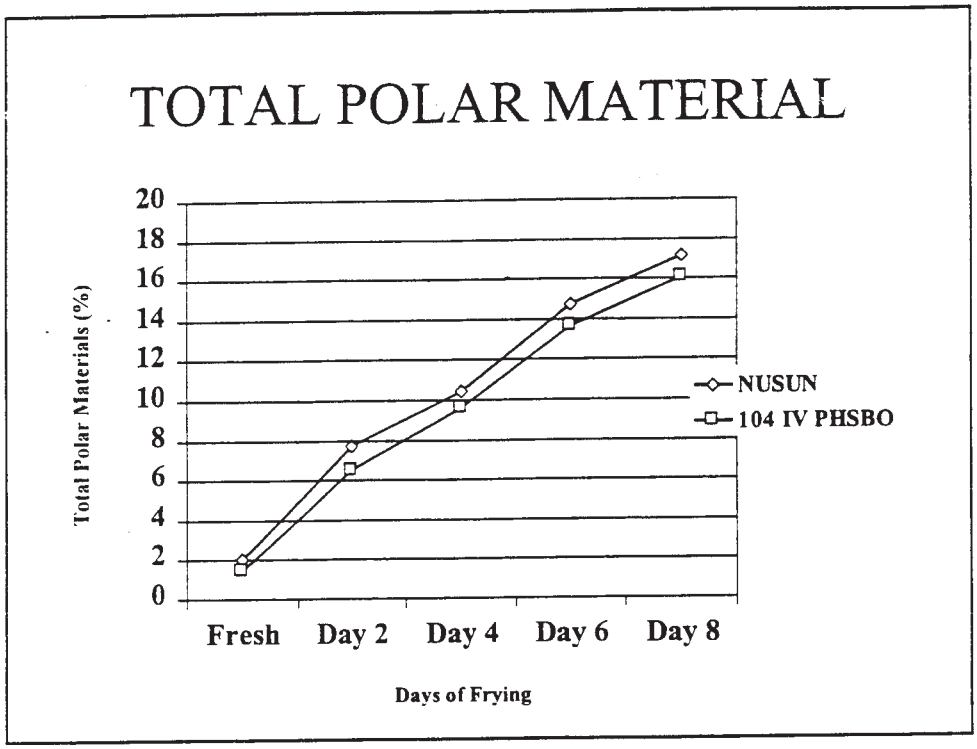

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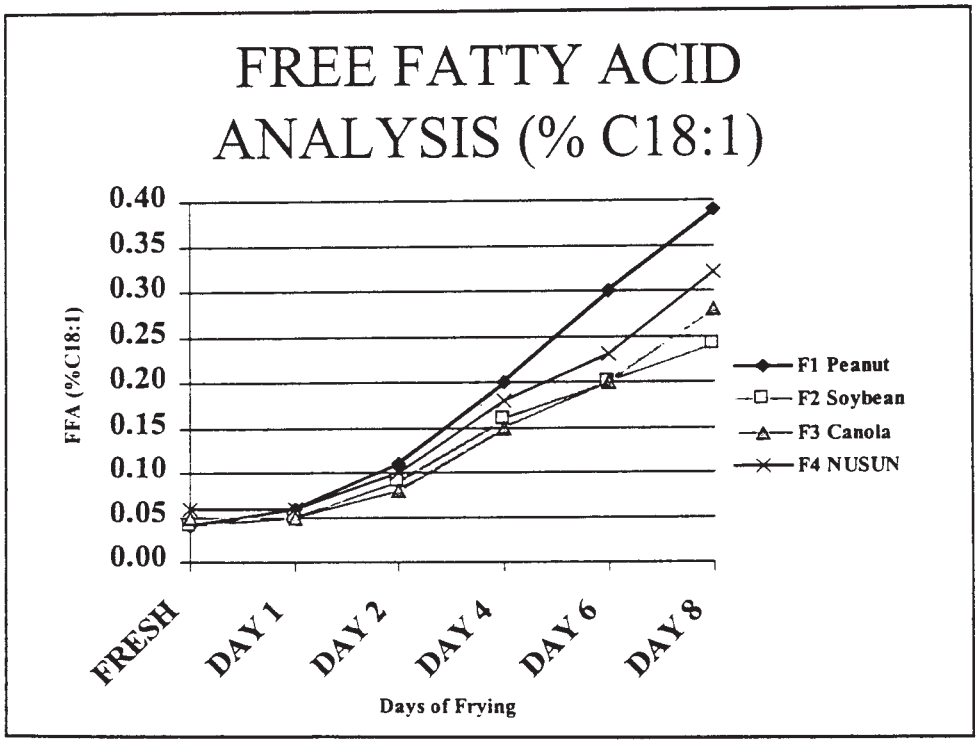

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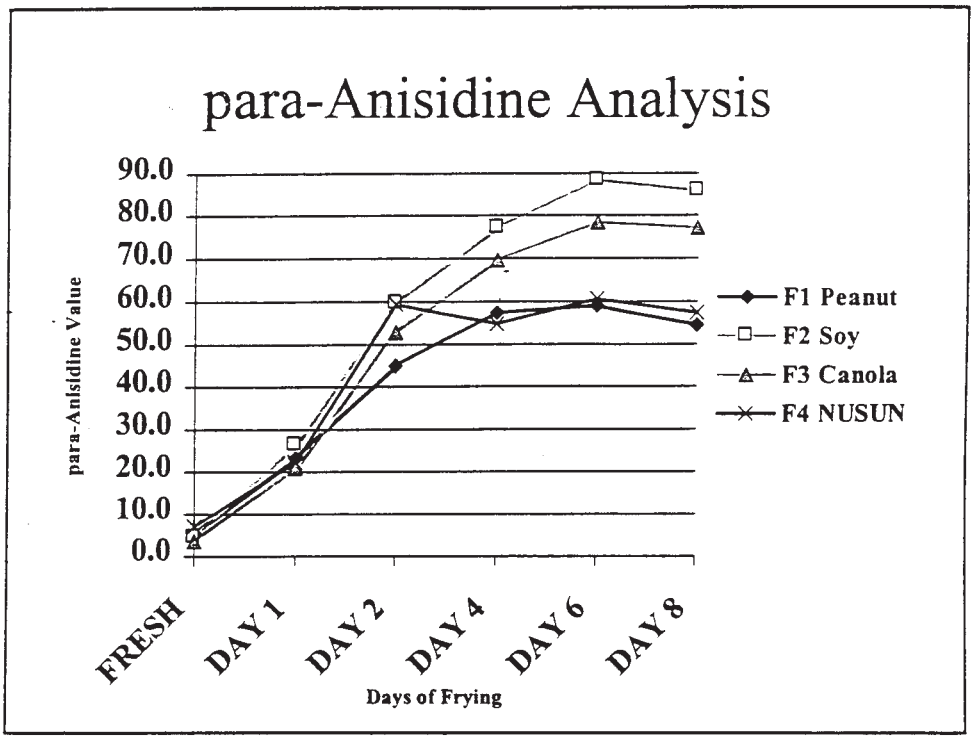

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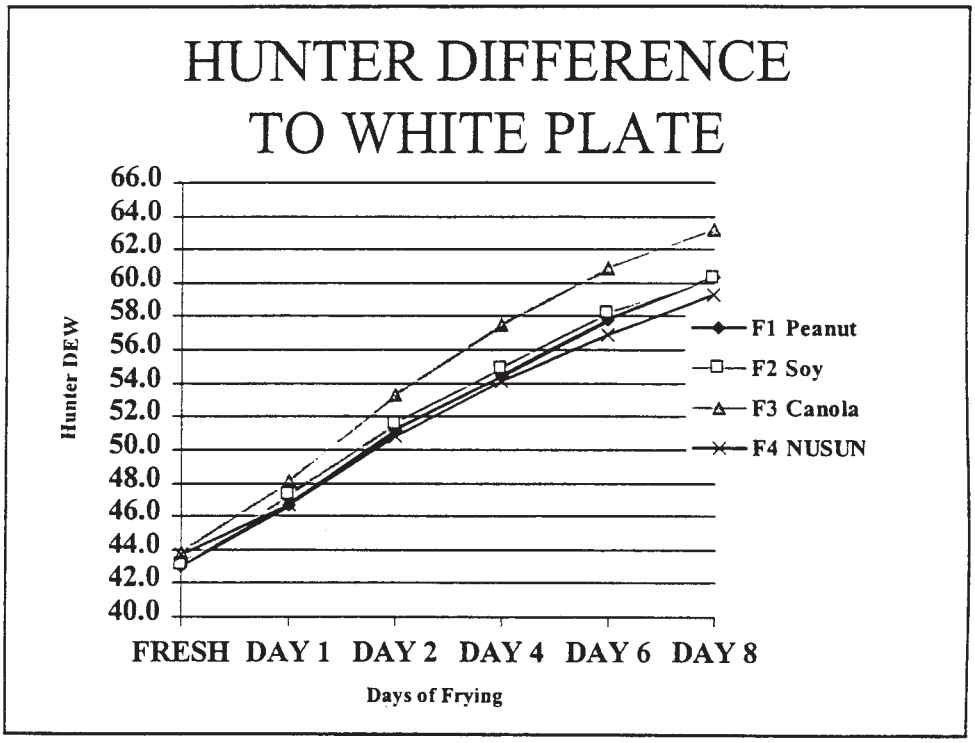

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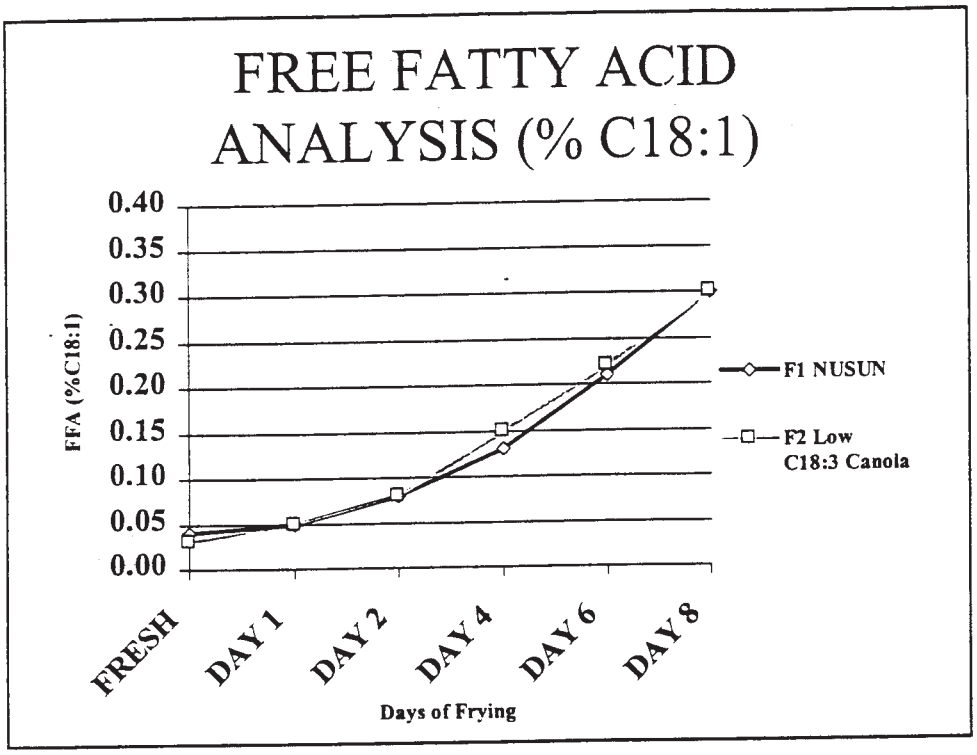

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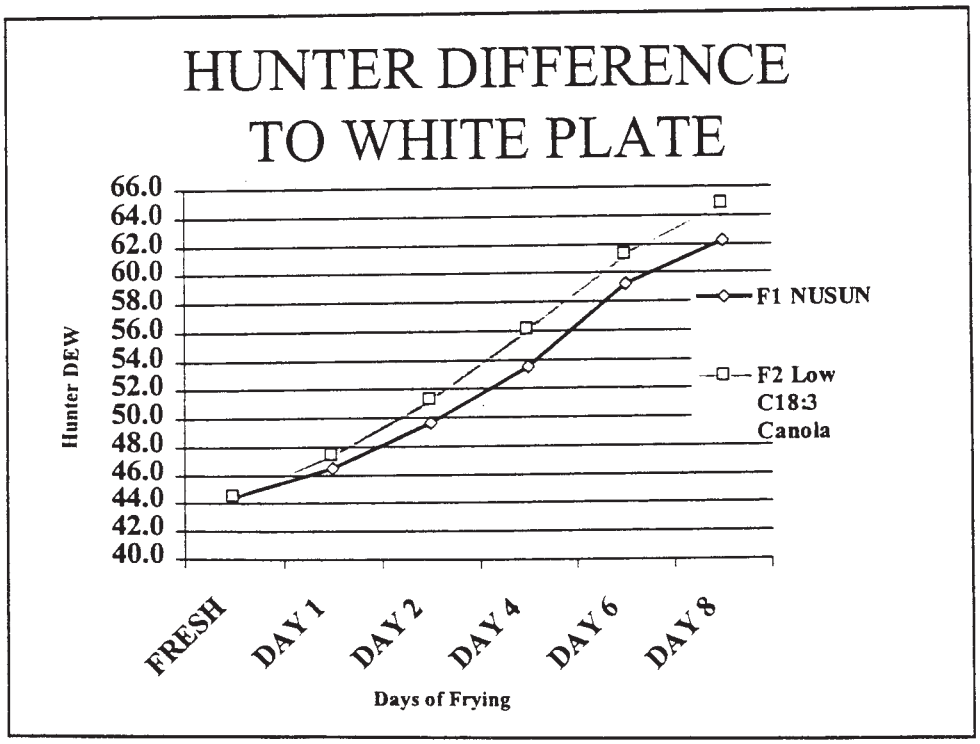

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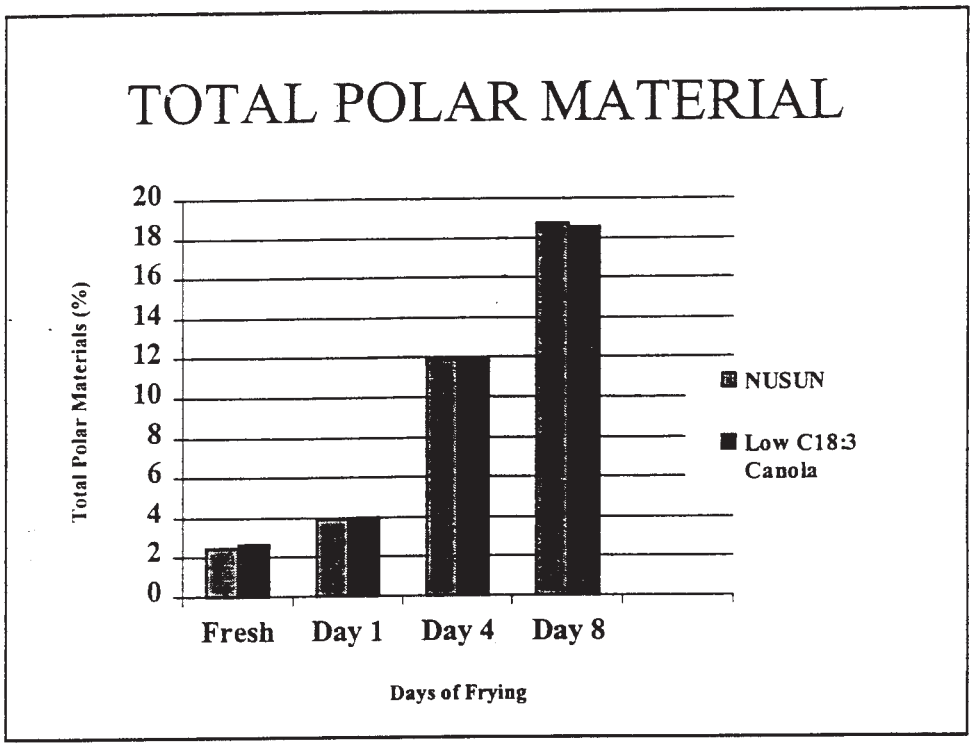
TOTAL POLAR MATERIAL
Total Polar Materials (%)
20
18
16
14
12
10
8
6
4
2
0
Fresh
Day 1
Day 4
Day 8
Days of Frying
NUSUN
Low C18:3 Canola