

***PHYSICAL AND CHEMICAL  
STUDIES ON SOME  
RAPESEED VARIETIES UNDR  
DIFFERENT LEVELS OF  
NITROGEN FERTILIZATION***

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# ***INTRODUCTION***

- Egyptian plant breeders were meditating on producing new varieties with very low or free from erucic acids as well as free or contain very low level of glucosinolates.
- Nitrogen fertilization is important factor affect yield and quality of rapeseed genotypes. Seed yield and yield attributes increased by increasing N levels up to 240 kg/ha.
- The quality of rapeseed oil for human consumption is evaluated by its erucic acid content, since it is believed to cause myocardial lesions in experimental male rate, however, it is poorly digested by man.

# The aim of the work

- This study was implemented to investigate the effect of nitrogen fertilization levels on some characteristics of rapeseed varieties under Egyptian agro-ecological conditions.
- These include seed yield, seed index, oil contents and oil yield, crude protein contents and protein yield, element contents, some physical and chemical properties of extracted oil, total carbohydrates, crude fiber and total glucosinolate contents.

# MATERIAL AND METHODS

- Two field experiments were conducted at El-Serw Agricultural Research station, Damietta Governorate, Egypt.
- A split-plot design with four replications was implemented. Three rapeseed varieties (*Brassica napus* L.) were allocated to the main plots. The sub-plots were nitrogen rates (0, 30, 60 and 90 kg/acre) supplied from urea (46% N). French rapeseed Pactol cultivar and two Egyptian varieties, Serw 4 and Serw 6 as (double zero) because of low or absence of erucic acid and low glucosinolate content were sown.
- Nitrogen fertilizer was applied in two equal doses after thinning just before the first irrigation and the second irrigation. Equal doses (15 kg  $P_2O_5$ /acre) of super phosphate (15%  $P_2O_5$ ) were added to all treatments before planting.

# ***MATERIAL AND METHODS***

- **Yield and yield component**

At harvest the three inner rows from each sub-plot were taken for determine the seed yield and yield attributes.

- **Plant analysis**

The dry seed samples were ground and wet digested with H<sub>2</sub>SO<sub>4</sub>-HClO<sub>4</sub> mixture. NPK% was determined using the method as described by Jakson (1967). Crude protein content was calculated by multiplying N% by the converting factor 6.25 (Robinson, 1975). Protein yield (kg/acre) was also calculated by multiplying crude protein by seed yield. Seed oil percentage, fatty acid composition and its physical and chemical characteristics were determined according to AOAC (1990). Oil yield (kg/acre) was calculated by multiplying oil percentage by seed yield.

# ***MATERIAL AND METHODS***

- **Statistical analysis**

Average values from the four replications of each treatment were interpreted using the analysis of variance (ANOVA) with separation of means accomplished using LSD at 5%

# RESULTS

- **Seed yield and seed index**
- **Oil content and oil yield**
- **Protein content and protein yield**

Treatments	Season	Seed yield Kg /acre	1000 seed weigh t (g)	Oil %	Oil yield Kg/acre	Protein %	Protein yield Kg/acre
<u>Varieties</u>	First season						
Pactol		754.7	3.00	43.73	330.03	19.14	144.45
Serw 4		1023.3	3.26	42.00	429.79	20.22	206.91
Serw 6		1054.3	3.25	40.19	423.72	21.38	225.41
LSD at 0.05		29.10	0.04	1.20	28.6	0.80	21.7
<u>N levels (kg/acre)</u>							
N0		740.5	3.16	43.02	318.56	18.71	138.55
N30		932.6	3.16	42.38	395.24	19.57	182.51
N60		1160.0	3.31	41.75	484.30	20.68	239.89
N90		1260.0	3.41	40.75	513.45	21.93	276.32
LSD at 0.05	45.70	0.18	0.14	27.31	0.92	34.30	
<u>Varsities</u>	Second season						
Pactol		841.6	3.1	43.99	370.22	18.78	158.05
Serw 4		1045.5	3.43	42.14	440.57	20.34	212.65
Serw 6		1082.2	3.28	40.19	434.94	21.45	232.13
LSD at 0.05		33.40	0.12	1.33	26.8	0.95	23.4
<u>N Levels (kg/acre)</u>							
N0		751.4	3.25	43.14	324.15	18.94	142.32
N30		947.5	3.35	42.49	402.59	19.84	179.46
N60		1180.0	3.51	41.83	493.59	20.92	246.86
N90		1303.0	3.59	41.10	535.53	21.64	281.97
LSD at 0.05	51.10	0.04	0.17	39.82	0.41	33.21	



# RESULTS

- Physical and chemical properties of the extracted oil of rapeseed

## 1-Physical properties

<b>Treatments</b>	<b>Refractive Index (RI)</b>	<b>Iodine Value (IV)</b>	<b>Saponification Value (SV)</b>	<b>Acid Value (AV)</b>	<b>Peroxide Value (PV)</b>
<b>Pactol</b>					
<b>N0</b>	<b>1.4712</b>	<b>119.0</b>	<b>190.0</b>	<b>0.35</b>	<b>0.48</b>
<b>N30</b>	<b>1.4711</b>	<b>118.0</b>	<b>191.0</b>	<b>0.37</b>	<b>0.46</b>
<b>N60</b>	<b>1.4707</b>	<b>118.0</b>	<b>190.0</b>	<b>0.37</b>	<b>0.48</b>
<b>N90</b>	<b>1.4701</b>	<b>113.0</b>	<b>189.5</b>	<b>0.39</b>	<b>0.49</b>
<b>Serw 4</b>					
<b>N0</b>	<b>1.4723</b>	<b>128.0</b>	<b>188.0</b>	<b>0.74</b>	<b>0.48</b>
<b>N30</b>	<b>1.4721</b>	<b>127.0</b>	<b>189.0</b>	<b>0.76</b>	<b>0.48</b>
<b>N60</b>	<b>1.4721</b>	<b>127.5</b>	<b>188.0</b>	<b>0.74</b>	<b>0.49</b>
<b>N90</b>	<b>1.4710</b>	<b>123.0</b>	<b>190.0</b>	<b>0.77</b>	<b>0.49</b>
<b>Serw 6</b>					
<b>N0</b>	<b>1.4720</b>	<b>125.5</b>	<b>187.0</b>	<b>0.75</b>	<b>0.66</b>
<b>N30</b>	<b>1.4717</b>	<b>123.0</b>	<b>187.0</b>	<b>0.77</b>	<b>0.64</b>
<b>N60</b>	<b>1.4715</b>	<b>123.0</b>	<b>186.5</b>	<b>0.77</b>	<b>0.65</b>
<b>N90</b>	<b>1.4710</b>	<b>119.5</b>	<b>188.5</b>	<b>0.78</b>	<b>0.66</b>

# RESULTS

## 2- Chemical properties:

(A)- Saturated fatty acids (SFA)

(B): Unsaturated fatty acids (UFA)

Fatty acid	Pactol				Serw 4				Serw 6			
	N <sub>0</sub>	N <sub>30</sub>	N <sub>60</sub>	N <sub>90</sub>	N <sub>0</sub>	N <sub>30</sub>	N <sub>60</sub>	N <sub>90</sub>	N <sub>0</sub>	N <sub>30</sub>	N <sub>60</sub>	N <sub>90</sub>
Myristic	0.6	0.4	0.4	0.7	0.6	0.8	0.8	0.6	0.2	0.9	0.4	0.5
Palmitic	4.6	4.4	4.8	4.6	5.5	6.2	6.2	6.4	4.5	4.4	4.4	4.5
Stearic	1.1	1.0	1.0	1.3	0.2	0.2	0.3	0.2	1.3	1.1	1.2	1.0
Arachidic	0.4	0.4	0.5	0.8	0.8	0.2	0.5	0.6	1.4	1.2	1.2	1.1
<b>Total SFA</b>	<b>6.7</b>	<b>6.4</b>	<b>6.7</b>	<b>7.4</b>	<b>7.1</b>	<b>7.4</b>	<b>7.8</b>	<b>7.8</b>	<b>7.4</b>	<b>7.6</b>	<b>7.2</b>	<b>7.1</b>
Palmitoleic	0.2	0.1	0.2	0.4	0.2	0.1	0.1	0.1	0.2	0.4	0.5	0.4
Oleic	67.0	67.8	67.8	69.6	58.0	60.0	60.0	61.0	62.0	63.8	63.8	65.4
Arachidonic	0.6	0.6	0.4	0.6	1.6	1.4	1.4	1.4	1.2	1.0	1.0	1.2
Erucic	0.4	0.6	0.6	0.5	0.1	---	---	0.1	0.6	0.5	0.8	0.8
<b>Total MUFA</b>	<b>68.2</b>	<b>69.1</b>	<b>69.0</b>	<b>71.1</b>	<b>59.9</b>	<b>61.5</b>	<b>61.5</b>	<b>62.6</b>	<b>64.0</b>	<b>65.7</b>	<b>66.1</b>	<b>67.8</b>
Linoleic	14.7	14.0	14.5	13.8	22.8	21.5	21.3	21.0	20.2	19.0	19.0	18.7
Linolenic	8.5	7.5	7.6	7.0	9.8	8.0	8.0	7.8	8.0	7.5	7.6	6.5
<b>Total PUFA</b>	<b>23.2</b>	<b>21.5</b>	<b>21.1</b>	<b>20.8</b>	<b>32.6</b>	<b>29.5</b>	<b>29.3</b>	<b>28.8</b>	<b>28.2</b>	<b>26.5</b>	<b>26.6</b>	<b>25.2</b>
<b>Total unsaturated Fatty acid</b>	<b>91.4</b>	<b>90.6</b>	<b>91.1</b>	<b>91</b>	<b>92.5</b>	<b>91.0</b>	<b>90.8</b>	<b>91.4</b>	<b>92.2</b>	<b>92.2</b>	<b>92.7</b>	<b>93.0</b>

# RESULTS

- **Total carbohydrates contents**
- **Crude fiber contents**
- **Total glucosinolates content**

Treatments	Total carbohydrates %		Crude fiber %		Total glucosinolates μ moles/g meal	
	1 <sup>st</sup> season	2 <sup>nd</sup> season	1 <sup>st</sup> season	2 <sup>nd</sup> season	1 <sup>st</sup> season	2 <sup>nd</sup> season
<b>Pactol</b>						
<b>N0</b>	24.4	24.10	8.69	8.79	16.94	17.07
<b>N30</b>	24.09	23.58	8.40	8.59	16.75	17.01
<b>N60</b>	23.67	23.40	8.27	8.46	16.98	16.94
<b>N90</b>	23.61	23.35	8.38	8.48	17.06	17.01
<b>LSD at 0.05</b>	0.12	0.10	0.17	0.11	---	---
<b>Serw 4</b>						
<b>N0</b>	24.64	24.45	8.36	8.29	18.42	18.36
<b>N30</b>	24.33	24.16	8.20	8.11	18.55	18.42
<b>N60</b>	24.12	23.82	7.95	7.90	18.14	18.04
<b>N90</b>	24.08	23.67	7.96	7.93	18.55	18.55
<b>LSD at 0.05</b>	0.12	0.07	0.08	0.12	---	---
<b>Serw 6</b>						
<b>N0</b>	23.60	23.32	9.57	9.43	21.92	21.74
<b>N30</b>	23.47	23.08	9.19	9.09	21.96	21.83
<b>N60</b>	23.17	22.83	9.04	9.05	21.73	21.69
<b>N90</b>	23.18	22.81	9.06	9.06	21.96	21.74
<b>LSD at 0.05</b>	0.17	0.09	0.04	0.04	---	---

# RESULTS

- **Elements contents**

Treatments	Season	Pactol			Serw 4			Serw 6		
		N%	P%	K%	N%	P%	K%	N%	P%	K%
N rates (kg/acre)	1st									
N0		2.84	0.660	0.758	2.99	0.714	0.631	3.20	0.718	0.668
N30		2.93	0.693	0.799	3.13	0.760	0.680	3.33	0.748	0.712
N60		3.16	0.710	0.842	3.31	0.782	0.712	3.48	0.772	0.747
N90		3.32	0.704	0.854	3.51	0.787	0.718	3.66	0.780	0.743
N rates (kg/acre)	2nd									
N0		2.79	0.642	0.742	3.03	0.683	0.626	3.21	0.743	0.646
N30		2.87	0.678	0.783	3.17	0.758	0.695	3.35	0.770	0.697
N60		3.04	0.697	0.821	3.35	0.781	0.687	3.52	0.782	0.725
N90		3.28	0.699	0.842	3.46	0.789	0.698	3.65	0.795	0.738



