The effect of varying the level of dietary linoleic acid on egg size in laying hens

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A study was conducted on six strains of laying hen to investigate the effect of three dietary levels of linoleic acid on egg size. March and MacMillan (1990) reported that adequate levels of linoleic acid are required in the diet to produce maximum sized eggs. The current experiment investigated whether egg size could be reduced significantly by reducing linoleic acid concentrations in the diet, particularly in imported strains of laying hens.

Of the six strains of hen used in this trial, four were imported strains including Isa Brown, Hy-Line Brown, Lohmann Brown and Hi-Sex Brown. The other two strains were Australian, the Tegel Super Brown and the Hy-Line CB Black. The diets were wheat based containing 0.6, 1.3 or 3.0% linoelic acid. Corn flour was used as a linoleic acid free energy source in the 0.6% linoleic acid diet to maintain a constant metabolisable energy in all diets.

Eggs were collected for egg size and egg and egg shell quality measurements throughout the laying life of the hens. The first collections began at point of lay and continued until the birds reached 50% lay. Egg collections of one week then took place every two weeks for four weeks, every four weeks for eight weeks and every eight weeks until the birds reached 68 weeks of age.

To date three egg collections have been analysed. No significant differences were found in egg weight during the first collection. However during the second collection Hi-Sex Brown hens on the 3.0% linoleic acid diet produced heavier eggs ($P<0.01$) and Tegel Super Brown hens produced lighter eggs ($P<0.01$) on the 0.6% linoleic acid diet. The third collection found Hy-Line CB Black hens producing heavier eggs ($P<0.01$) on the 3.0% linoleic acid diet when compared to the other diets. Also during this period the Tegel Super Brown hens produced heavier eggs ($P<0.05$) in the 3.0% linoleic acid diet when compared to the 0.6% linoleic acid diet. Therefore it appears that linoleic acid does not produce consistent changes in egg size in imported strains of laying hens early in lay, although the Australian strains appear to be more readily manipulated.

Reference

March, B. E. and MacMillan, C. (1990). Linoleic Acid as a Mediator of Egg Size. *Poultry Science* **69**, 634–639.

Table 1 The effect of linoleic acid on egg weight.

Strain	Diet	Collection		
		One	Two	Three
Hi–Sex Brown	1.3% Linoleic acid	49.28±0.69	56.73±1.10[b]	60.38±0.91
	0.6% Linoleic acid	50.08±1.24	56.42±0.76[b]	60.41±0.88
	3.0% Linoleic acid	49.95±0.74	61.54±1.35[a]	62.09±0.83
Isa Brown	1.3% Linoleic acid	43.69±0.82	56.93±1.17	59.02±0.70
	0.6% Linoleic acid	45.14±1.04	55.25±1.20	57.89±1.08
	3.0% Linoleic acid	43.94±0.63	54.95±0.59	58.94±0.94
Hy–Line Brown	1.3% Linoleic acid	48.12±0.74	56.45±1.07	59.17±0.59
	0.6% Linoleic acid	46.24±0.75	54.14±0.54	57.57±0.58
	3.0% Linoleic acid	46.49±0.65	55.88±0.80	60.08±1.14
Lohmann Brown	1.3% Linoleic acid	47.28±0.76	56.67±1.21	59.12±0.56
	0.6% Linoleic acid	47.97±0.77	57.39±1.49	60.93±0.89
	3.0% Linoleic acid	45.92±0.60	58.65±0.98	61.27±0.92
Hy–Line CB Black	1.3% Linoleic acid	40.77±0.55	48.52±0.83	52.24±0.63[b]
	0.6% Linoleic acid	40.80±0.73	48.49±1.10	50.66±0.53[b]
	3.0% Linoleic acid	42.41±0.65	50.48±0.71	54.09±0.54[a]
Tegel Super Brown	1.3% Linoleic acid	45.18±1.24	57.17±2.13[a]	57.79±1.00[ab]
	0.6% Linoleic acid	45.21±1.33	50.02±0.69[b]	55.00±0.68[b]
	3.0% Linoleic acid	46.72±1.44	54.79±1.36[a]	59.97±2.31[a]

[a,b]Diets with different superscripts within a strain differ significantly at $P< 0.05$.