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"THROUGH RESEARCH"

THE EFFECTS OF ADDED FAT IN LAYER DIETS

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The dietary intake of energy by laying hens fed *ad libitum* is dependent upon many factors. Body weight, productivity and environmental temperatures are significant factors influencing energy consumption. It has been observed by many researchers that diet composition also plays a role in determining energy intake. When two diets are compared, the one with a higher content of fat will usually result in a higher caloric intake.

B.L. Reid, at the University of Arizona, found a significant increase in energy consumption and improved egg production when fat was added to the ration of young hens during the hot summer months. The addition of 3 percent fat increased energy intake by 4 percent. In later experiments conducted with older hens at 95^{0}F, he also found an increase in calorie consumption, but egg production was not improved.

Reid postulates that energy intake may be the limiting factor for summer production and adding fat may give a boost to egg production rates. On this assumption, the following experiment was set up.

EXPERIMENTAL PROCEDURE

Location: University of California, Moreno Ranch, Riverside County.

Housing: California open-type with curtains and hot weather foggers. Three hens per 12" wide by 16" deep cage. Cages placed back to back.

Feeding: *Ad libitum* hand feeding, front feeder.

Watering: One Hart cup for 4 cages, in rear.

Duration of experiment: July 10 to September 4, 1979 (8 weeks).

Stock: Shaver 288 - 4.3 lb avg. weight.

Temperatures during experiment: Mean daily high, 97^{0}F; mean daily low, 64^{0}F.

Age: 108 to 116 weeks of age. Molted at 67 weeks of age.

Experimental design: Randomized block, 5 replicates of 15 hens each, 5 treatments.

Measurements: Daily -- egg production, feed consumption and mortality. Biweekly egg weights. Body weights were taken at the beginning and end of test.

Treatments:

Control - basal diet, days 1-56

2% corn - 98% basal diet +
2% corn oil

4% corn - 96% basal diet +
4% corn oil

2% soy - 98% basal diet +
2% soybean oil

4% soy - 96% basal diet
4% soybean oil

Ration formula:

Basal Diet

Ingredient	Percent
Ground corn	40.7
Burr milo	22.7
Meat & bone meal	7.5
Limestone	7.5
Soybean meal	5.7
Cottonseed meal	5.0
Wheat millrun	5.0
Dehydrated alfalfa meal	2.5
Fish solubles	1.5
Fish meal	1.0
Fat	.5
Vitamins, trace minerals & salt	.4

Calculated Ration Analysis:

	Control	2% Fat diet	4% Fat diet
Energy (M.E.), kcal/lb	1269	1322	1374
Crude protein, %	17.0	16.7	16.3
Fat, %	4.0	5.9	7.8
Fiber, %	3.4	3.3	3.3
Ash, %	11.6	11.4	11.2
Calcium, %	3.8	3.7	3.7
Phosphorus, %	.74	.73	.71
Methionine, %	.35	.34	.34
Methionine + cystine, %	.61	.60	.59
Lysine, %	.81	.79	.78
Cost $/100 lb	7.00	7.26	7.52

TABLES OF RESULTS

Table 1. Egg production, egg size and mortality - 56 days*

	Treatment				
	1	2	3	4	5
Measurement	Control	2% Corn	4% Corn	2% Soy	4% Soy
Hen-day egg production, %	62.3	60.3	55.1	58.5	56.0
Eggs/hen-housed	34.5	33.2	30.9	32.7	31.3
Average egg weight, g	63.4	63.8	63.5	64.2	64.2
Jumbo eggs, %	9.3	8.8	10.2	7.9	15.0
X-large eggs, %	39.3	45.3	40.5	48.4	35.9
Large eggs, %	45.8	39.3	40.3	39.5	46.0
Medium eggs, %	5.6	5.1	7.1	4.2	3.1
Small eggs, %	0	1.6	2.0	0	0
Pee wee eggs, %	0	0	0	0	0
Avg. egg value/dozen, ¢**	44.7	44.4	44.2	44.8	44.8
Total egg mass, kg	2.19	2.12	1.95	2.10	2.00
Mortality, %	2.8	2.7	1.4	1.4	1.4

*No significant differences were noted between treatments ($P > 0.05$).
**45¢/dozen for large eggs, 40¢/dozen for medium and 25¢/dozen for small.

Table 2. Feed consumption, feed conversion, feed cost per dozen eggs, and body weight change - 56 days*

	Treatment				
	1	2	3	4	5
Trait	Control	2% Corn	4% Corn	2% Soy	4% Soy
Feed/hen-day, lb	.2250a	.2280a	.2159b	.2294a	.2227ab
Feed/dozen eggs, lb	4.35	4.58	4.75	4.72	4.83
Feed/24 oz. dozen, lb	3.89	4.07	4.23	4.16	4.26
Feed:egg ratio	2.59	2.71	2.82	2.78	2.84
Feed/hen-housed, lb	12.5b	12.6ab	12.1c	12.8a	12.4b
Feed cost/dozen, ¢	30.4b	33.3ab	35.7a	34.3ab	36.3a
Body weight change, %	+.4ab	+2.6a	+2.4a	-2.7b	+1.8ab

* Treatment means in any row with different letters are significantly different ($P < 0.05$).

Table 3. Egg income, feed cost and egg income minus feed costs - 56 days*

	Treatment				
	1	2	3	4	5
Trait	Control	2% Corn	4% Corn	2% Soy	4% Soy
Egg income/hen-housed, $	1.29	1.23	1.14	1.22	1.17
Feed cost/hen-housed, ¢	.87b	.91a	.91a	.93a	.94a
Egg income minus feed cost/ hen-housed, ¢	.42a	.32a	.23b	.29a	.23b

* Treatment means in any row with different letters are significantly different ($P < 0.05$).

RESULTS AND DISCUSSION

No significant performance effects were noted among treatments with the exception of those relating to feed consumption (Tables 1, 2, 3). Hen-day egg production, hen-housed egg production, and total egg mass were all numerically higher in the control group.

The feed consumption of the 4% corn oil treatment was significantly lower than the consumption of the other treatments which did not differ statistically (Table 2). Energy intake was significantly higher in all added fat groups when compared to the control (Table 4). The groups with added fat consumed an average of 5.9 percent more calories than the control group. No additional energy was consumed when fat levels were increased from 2% to 4%. Also, when the corn oil and soybean oil treatments were compared, there were no significant differences in caloric intake. The addition of fat to the basal diet resulted in a slight dilution of nutrient density. However, nutrient intake of all treatments (Table 4) appeared adequate to support normal production for hens of this age.

Increasing the caloric intake from 285 kilocalories per day to 300+ did not improve egg production or egg size in this experiment. Daily energy intake of the control group was apparently adequate to support the level of egg production at which these hens were capable of producing. The Arizona research showed advantages of increasing daily caloric intake from 291 to 303, but this was with young pullets producing an average of 48 grams of eggs per bird per day. The California experiment was with older hens producing only 40 grams of eggs per bird per day.

In theory, energy requirements may not be met in some instances when high environmental temperatures depress feed intake. The pattern of temperature

Table 4. Daily nutrient intake - 56 days*

Trait	Treatment 1 Control	2 2% Corn	3 4% Corn	4 2% Soy	5 4% Soy
Crude protein, g	17.40a	17.30a	16.00b	17.40a	16.48ab
Methionine, g	.36a	.35a	.33b	.35a	.34ab
Methionine + cystine, g	.62a	.62a	.58b	.62a	.60ab
Lysine, g	.83a	.82a	.76b	.82a	.79ab
Calcium, g	3.90a	3.83a	3.63b	3.85a	3.74ab
Phosphorus, g	.76a	.76a	.70b	.76a	.72ab
Energy (M.E.), Kcal	285b	301a	297a	303a	306a

* Treatment means in any row with different letters are significantly different ($P < 0.05$).

within the day may also have a bearing on how the flock responds. In southern California, high daytime temperatures of 100°F or more are offset by nighttime temperatures in the low or mid 60°F range. This results in summer/winter differences in caloric intake of only 5% to 10%.

Egg production losses attributable to insufficient energy intake are more likely to occur during peak egg production when high temperature stress conditions exist. If energy intake drops below that required for maintenance and full production, this must result in changes in egg weight, egg numbers, or body weight. Under such conditions, dietary fat additions might be justified as a means of increasing energy intake to maintain optimum egg production. These conditions apparently did not occur during this test.

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