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**UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE  
AGRICULTURAL EXPERIMENT STATION**

*Research Bulletin 156*

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VII. Comparative Nutritive Value of Raw  
and Heated Soybean Meal for Poults**

**C. W. ACKERSON, RAYMOND BORCHERS AND F. E. MUSSEHL**

**LINCOLN, NEBRASKA**

**JUNE, 1948**

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## **SUMMARY**

1. The trypsin inhibitor contained in one-half of a lot of soybean meal was destroyed by autoclaving at 15 pounds for 20 minutes.

2. This portion of the meal when fed at a level of 24 per cent to newly hatched poults gave a significantly greater gain in five weeks than did an equal amount of meal in which the inhibitor had not been destroyed.

3. The difference in growth is attributed to the destruction of the trypsin inhibitor.

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## Trypsin Inhibitor.

# VII. Comparative Nutritive Value of Raw and Heated Soybean Meal for Poults

C. W. ACKERSON, RAYMOND BORCHERS AND F. E. MUSSEHL<sup>1</sup>

THE DEMONSTRATION of a trypsin inhibitor in unheated soybeans by Ham and Sandstedt (1) introduced a new concept into the study of the nutritive value of soybeans. Ham, Sandstedt and Mussehl (2) showed that a fraction of unheated soybeans containing the trypsin inhibitor depressed the growth rate of chicks, and Klose, Hill and Fevold (3) found that the growth of rats was similarly inhibited by a factor present in raw soybeans. Previously, Wilgus, Norris, and Heuser (4) reported improvement after heat treatment in the nutritive value of soybean meal for chicks while Shrewsbury and Vestal (5) found that cooked soybeans were better than raw soybeans for hogs.

Because of the importance of soybean meal in practical turkey feeding, it seemed important to investigate the comparative growth value of rations containing raw and heated soybean meal, respectively, for this species. This study was therefore undertaken, using the controlled feed intake method of Ackerson, Blish and Mussehl (6), thus eliminating variations in food intake. Since the initiation of this study, Fritz, Kramke, and Reed (7) have reported that ground raw soybeans were inferior in growth promoting value to soybeans which had been autoclaved at 15 pounds pressure for 20 to 30 minutes when fed to poults. Their study, however, was not done by the paired-feeding technic.

### EXPERIMENTAL

SOYBEAN MEAL<sup>2</sup> was incorporated without heat treatment in the ration of Lot 1, and after destruction of the trypsin inhibitor by autoclaving at 15 pounds for 20 minutes in the ration of Lot 2. Autoclaving at 15 pounds for 20 minutes was selected since tests for the trypsin inhibitor remaining in heated soybean meal by Borchers, Ackerson, and Sandstedt (8) indicated that it was destroyed under these conditions. The ration was mixed from the following ingredients (in

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<sup>2</sup> Solvent processed soybean meal prepared with a minimum of heat treatment, according to the manufacturer's statement.

pounds): yellow corn meal 20, shorts 10, bran 10, pulverized oats 10, alfalfa meal 8, meat scraps 5, fish meal 3, dried buttermilk 3, fermentation dried solubles 3, ash mixture 3, vitamin D blend 2, soybean meal 24.

The ration for each lot was then pelleted separately in a 5/32-inch die and fed as described in earlier work (7). Tests on the finished products showed the inhibitor to be present in the ration containing raw soybean meal but not in the ration containing the autoclaved soybean meal. The analyses of the two rations are given in Table 1.

The lots were started on May 13 with 16 one-day-old poults in each lot. Failure to consume the pelleted feed at the same rate as the majority caused the discarding of one poult of Lot 1 and three from Lot 2. The remaining poults of both lots were continued on the experimental rations until each had consumed 900 grams. This they did in from 33 to 37 days, which made possible a comparison of gains on the basis of the consumption of equal amounts of feed.

TABLE 1. *Analyses of the rations.*

	Lot 1 Raw soybean meal	Lot 2 Autoclaved soybean meal
	<i>Pct.</i>	<i>Pct.</i>
Water	8.7	9.8
Ash	7.9	7.8
Crude protein	25.8	25.8
Crude fat	3.8	3.8
Crude fiber	8.5	8.4
Nitrogen free extract	45.3	44.4

Sex determinations were not made since sex characteristics are not sufficiently developed at five weeks, and the poults were not sacrificed to gain this information. Thus comparisons of gains were made between lots but not between males and females. Comparative data are given in Table 2. Individual weights and gains are not shown, but the low standard error is evidence of the low variability in both lots.

## DISCUSSION

THE DATA in Table 2 show that the variability within lots was low. This variation included that due to sex, since sex characteristics were not developed sufficiently to permit positive determination. The difference between means was  $42 \pm 10.47$ , which gives a "t"<sup>3</sup> value of 4.01. This indicates a highly significant difference between the gains of the two lots in favor of the lot fed the ration containing the soybean meal in which the trypsin inhibitor had been destroyed by autoclaving

<sup>3</sup> "t" value according to Statistical Methods, G. W. Snedecor, 1946.

TABLE 2. *Growth data of poultts at five weeks of age.*

	Lot 1 Raw soybean meal	Lot 2 Autoclaved soybean meal
Number of poultts in lot	15	13
Feed consumed (g.)	900	900
Average weight of poultts (g.)	463	509
Average gain (g.)	404	446
Standard error	6.87	7.40
Grams gain per grams feed consumed	0.45	0.50

at 15 pounds for 20 minutes. This covers the period from hatching to five weeks of age. Interval weights not presented in Table 2 show that differences in gains between lots are apparent in two weeks, and that these differences increase up to five weeks. This effect was achieved on a ration which must be considered very good in view of its content of meat scraps, fish meal, dried buttermilk and fermentation dried solubles, and the growth attained in five weeks.

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