

Comparison of high-methionine (HM) maize as a substitute for DL-methionine in broiler diets.

Q: Can high methionine maize be a substitute for synthetic DL-methionine in broiler diets?

A: Preliminary studies show that with a 5% decrease in soybean meal (SBM), high-methionine (HM) corn is a potential ingredient to substitute. But 20% of the flock fed HM corn died from heart attacks.

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Background

Synthetic methionine (DL-methionine) was added to the USDA's permitted organic materials list in 2003, and poultry producers were given until 2005 to develop natural alternatives. However, in 2005 organic livestock companies petitioned the National Organic Standards Board¹ to be able to continue to use it, arguing that there were no good alternatives and not using it could damage animal health. The NOSB granted poultry producers permission to feed DL-methionine until October 1, 2008, stipulating that the organic poultry industry must find natural alternatives by that date². The ban looms ahead for organic poultry producers without alternatives in place. The ban could drastically affect production and the cost of poultry products.

New maize varieties with increased levels of methionine, a limiting amino acid in poultry diets, have been bred over the past five years by breeders at USDA-ARS in Ames, IA and at Michael Fields Institute in East Troy, WI. The methionine level was elevated by using the *floury-2* (*fl-2*) allele. The naturally-occurring mutant allele makes the endosperm of maize kernels soft while increasing the overall protein content and the methionine and lysine content of the protein³. Additionally, Organic Valley and researchers from the University of Minnesota have conducted some initial feeding trials with *floury-2* to assess the value of this maize in broiler and layer diets. No feeding trials have been conducted with PFI farmers nor has an assessment of the bio-availability of the methionine to the animal been conducted.

Approach and methods

To assess the value of HM maize in broiler diets, Vic and Cindy Madsen conducted two separate feeding trials. Samples of diet ingredients were sent to the University of Missouri for amino acid profiling. Feed consumption was measured in the morning and afternoon.

Trial 1 compared Vic's corn to a soft endosperm HM corn. No DL-methionine was fed. Chickens were weighed four times: the entire population as chicks, at 4 weeks and 3 days, 6 weeks and 3 days and 8 weeks. At four weeks and three days of age 10 chickens from each treatment (n=20) were leg banded. Of the 10 chickens, 5 were pullets and 5 were roosters from each treatment group. Final dressed weights of the leg banded birds were taken as well as all birds in each treatment.

Trial 2 compared Vic's corn to a hard endosperm HM corn. SBM was reduced 5% in both diets and no DL-methionine was fed. Birds were weighed 4 times: the entire population as chicks, at 5 weeks, 6 weeks and 7 weeks. At 5 weeks 10 chickens from each treatment (n=20) were leg banded. Of the 10 chickens, 5 were pullets and 5 were roosters from each treatment group. Only final dressed weights were taken of all birds in each treatment.

¹ NOSB, 2005

² Federal Register, 2005

³ Nelson, et al., 1965; Nelson 1969; Misra, et al., 1972

Results and discussion

In trial 1, only type of chicken (male or female) affected the average daily weight gain of the birds. Roosters whether fed HM or Vic's corn grew faster than the pullets in the study. Vic's chickens even without DL-methionine in the diet were not different than other batches Vic and Cindy have had processed this year. Chickens fed the HM corn were very different. There was a layer of yellow fat on the chickens that had to be scraped off. The end dressed weight of the chickens was not significantly different due to the corn but rather because of sex of chicken.

In trial 2, type of corn affected the average daily gain and total gain of the chickens ($P < 0.001$). Chickens fed the HM corn averaged 3.61lb versus 2.56lb total gain. The average daily gain was 0.07lb for the HM corn versus 0.05lb for Vic's corn. Both diets had 5% reduced SBM. The chickens fed the HM corn had a 20% mortality rate due to heart attacks. Weather was a factor also. The farmer reported that the temperature throughout this 7 week trial ranged from 20F to 75F sometimes occurring within a day. This great variability in temperature also added stress to the birds. Compared with other batches of birds on this farm, both treatments of birds grew 0.5lbs less than normal. Overall the birds were smaller.

Conclusions

The HM corn is a potential substitute for DL-methionine in broiler diets. It could also be used to decrease SBM in the ration but more testing and a more balanced ration is necessary. Although chickens fed HM corn did grow faster than chickens fed Vic's corn with 5% decreased SBM 20% of those birds died because as the farmer reports "the ration was too hot." A more balanced ration with more treatments will help discover the potential substitutability of this corn. Finally, weather did affect the second trial greatly.

Impact of results

These results have provided us with more ideas of future treatments to test and how to conduct these trials on-farm.

Appendix

Graph 1. Average gain of rosters and pullets fed HM corn and Vic's corn with no DL-methionine.

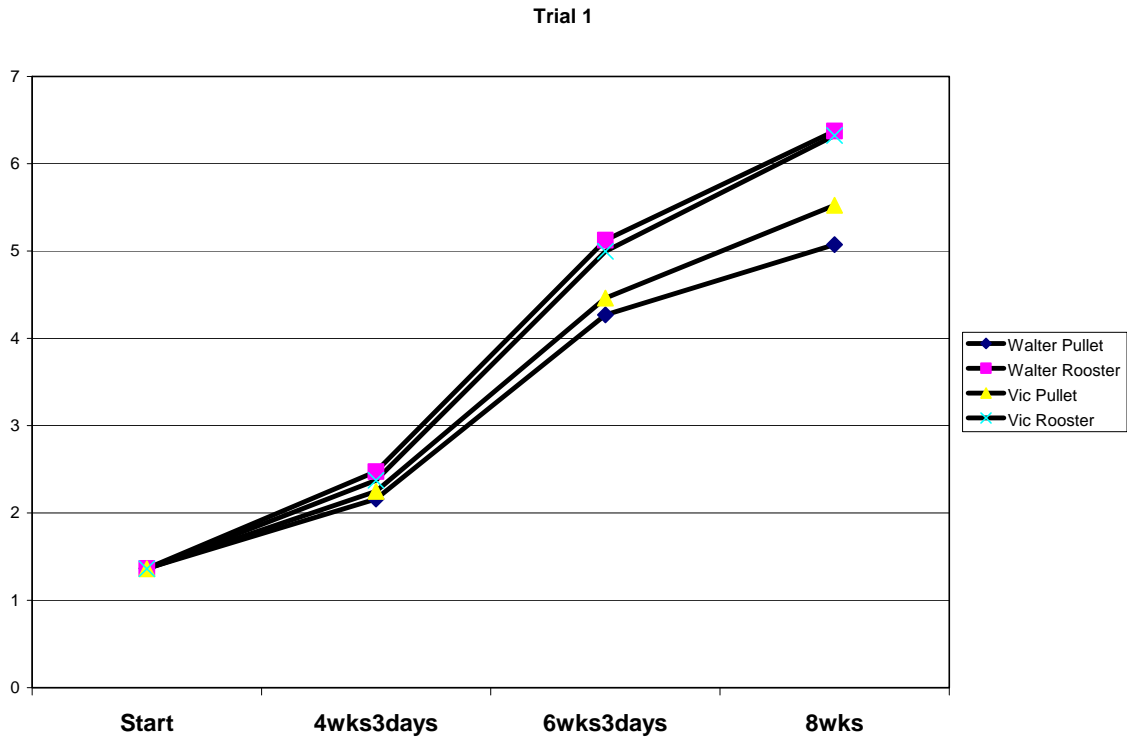


Table 2. Comparison of HM corn and Vic's corn with no DL-methionine in broiler diets.

	Methionine Fed	Lysine Fed	Crude Protein Fed
	lbs.		
SBM	3.89	18.12	278.81
Vic's	2.03	3.27	104.20
Kelp	0.02	0.05	1.16
TOTAL	5.94	21.44	384.17
SBM	3.89	18.12	278.81
HM (HM)	2.77	4.49	126.27
Kelp	0.02	0.05	1.16
TOTAL	6.68	22.66	406.25
HM - Vic's	0.74	1.22	22.07

Graph 3. Average gain of rosters and pullets fed HM corn and Vic's corn with 5% decreased SBM and no DL-methionine.

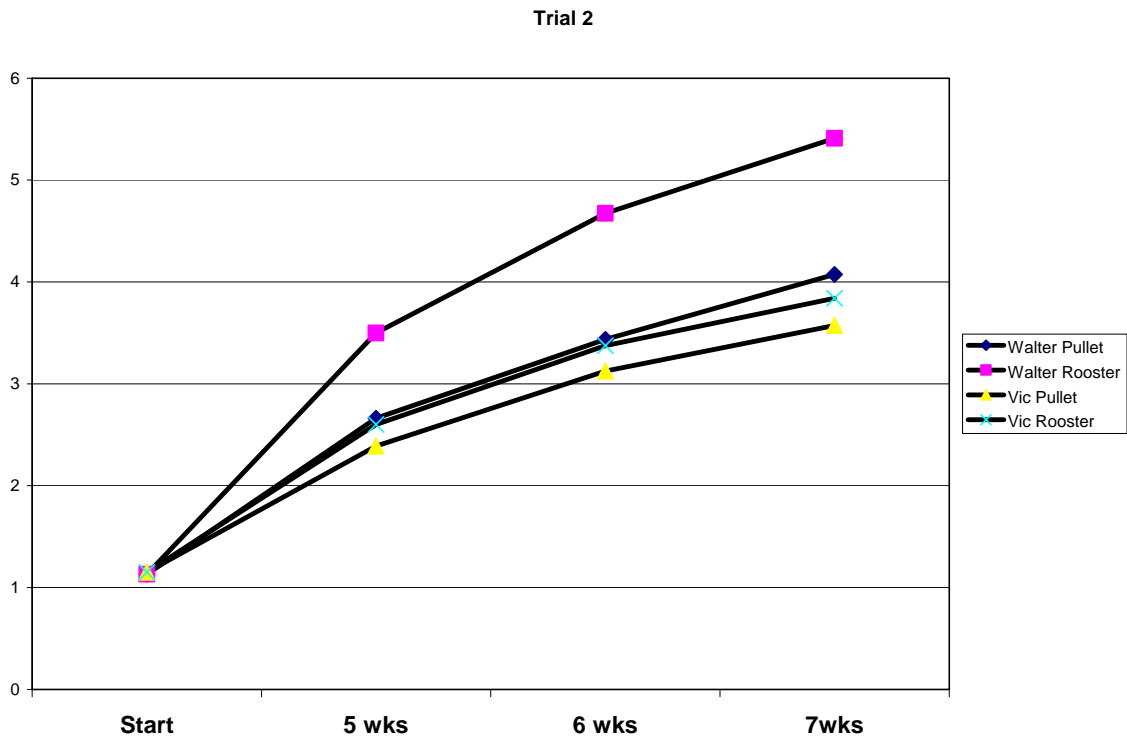


Table 4. Comparison of HM corn and Vic's corn with 5% decreased SBM and no DL-methionine in broiler diets.

	Methionine Fed	Lysine Fed	Crude Protein Fed
	lbs.		
SBM	3.24	15.10	232.35
Vic's	2.19	3.52	112.23
Kelp	0.02	0.05	1.16
TOTAL	5.45	18.67	345.73
SBM	3.24	15.10	232.35
HM (HM)	3.77	4.40	153.23
Kelp	0.02	0.05	1.16
TOTAL	7.04	19.55	386.74
HM-Vic's	1.59	0.88	41.00