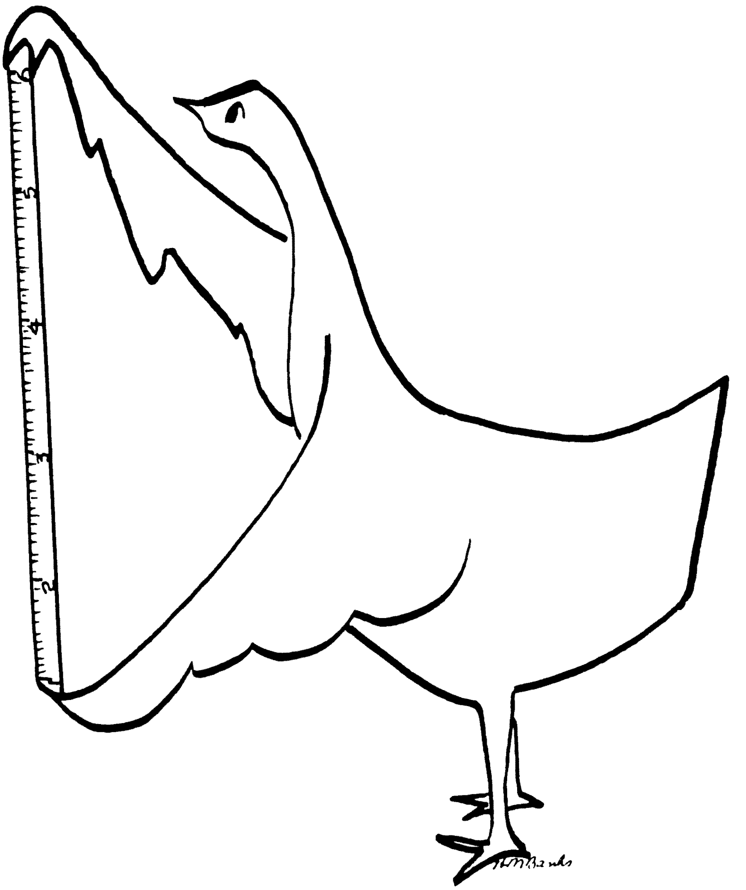
Feeder and Water Allowances for Broiler Crosses



Research Report 27

Virginia Agricultural Experiment Station
Virginia Polytechnic Institute
Blacksburg, Virginia

Feeder and Water Allowances For Broiler Crosses

P. B. Siegel, H. S. Siegel, C. Y. Kramer and C. E. Howes*

INTRODUCTION

Broiler management procedures require constant re-evaluation to keep pace with modern poultry breeding and nutrition. The interrelationships between feeder and water allowances with regard to the requirements of various broiler crosses need further clarification. Recent information on this subject is meager. Krueger *et al.* (1957), using several strains, compared the effects of varying amounts of feeder space on broiler performance. In all strains those groups receiving 1.5 linear inches to 3 weeks of age and 3 linear inches thereafter were heavier than chicks receiving less feeder space. The response of both sexes was similar. According to McCluskey and Johnson (1958), both White Leghorn and New Hampshire chicks fed from trough-type feeders grew and lived as well on 1 inch of feeder space as on 2 or 3 inches.

Two experiments are presented in this report. Experiment I was designed to measure the influence of sex and feeder space on broiler performance, whereas Experiment II considered the effects of sex, feeder space, water space, and broiler cross. Interactions between the variables were measured in both experiments.

EXPERIMENT I

Procedure

Chicks from a popular commercial broiler cross were allowed varying amounts of feeder space. Treatments in linear inches were:

1 inch to 3 weeks and 2 inches thereafter,
1.5 inches to 3 weeks and 3 inches thereafter,
2.0 inches to 3 weeks and 4 inches thereafter.

All feeder space treatments were tested in 10 by 16-foot pens within replicate units. Each unit had an individual temperature and humidity control in addition to forced ventilation, thus providing a fairly uniform environment for all treatments within each replication. The chicks were sexed prior to the start of the test and males and females were equally apportioned to each treatment replicate pen. The experiment involved 1920 broilers reared during the summer of 1958.

A high-energy starting mash was fed until birds were 6 weeks of age; thereafter, a growing ration was fed. Both feeds contained a

*P. B. Siegel, associate professor of poultry husbandry; H. S. Siegel, assistant professor of poultry husbandry; Kramer, professor of statistics; and Howes, head of poultry husbandry.

coccidiostat. At 10 days of age the birds were vaccinated via the drinking water for Newcastle disease.

Data were obtained for weekly feed consumption, 3- and 6-week body weight (by pen), 9-week individual body weight and liveability.

Results

Mean body weights at 3 and 6 weeks of age, by treatment, are presented in Table 1. Replicates were pooled since differences between them were not significant. Broilers allowed the greatest amount of feeder space were the heaviest at both ages. An analysis of variance of these data using pen means showed that none of the differences among feeder space treatments was significant.

Table 1.—Mean body weights at 3 and 6 weeks of age

	Age	
Feeder space[1]	3	6
(linear inches)	*(gm.)*	*(gm.)*
1.0 + 2.0	241	708
1.5 + 3.0	259	731
2.0 + 4.0	272	740

[1]1.0 + 2.0 — 1 inch to 3 weeks and 2 inches thereafter,
1.5 + 3.0 — 1.5 inches to 3 weeks and 3 inches thereafter,
2.0 + 4.0 — 2 inches to 3 weeks and 4 inches thereafter.

Presented in Table 2 are body weights by sex and treatment at 9 weeks of age. Broilers provided 1.5 and 3.0 linear inches of feeder space were 28 and 32 grams heavier, respectively, than birds allowed 2.0 and 4.0 linear inches and those allowed 1.0 and 2.0 linear inches of feeder space. Males and females responded similarly to the feeder space treatments. There was no significant sex x feeder space interaction, according to analysis of variance.

Table 2.—Mean body weights by sex at 9 weeks of age

Feeder space[2]	♂♂	♀♀	Combined[1]
(linear inches)	*(gm.)*	*(gm.)*	*(gm.)*
1.0 + 2.0	1416	1153	1276[a]
1.5 + 3.0	1444	1185	1308[b]
2.0 + 4.0	1403	1167	1280[a]

[1]Any 2 means with the same superscript are not significantly different.
[2]1.0 + 2.0 — 1 inch to 3 weeks and 2 inches thereafter,
1.5 + 3.0 — 1.5 inches to 3 weeks and 3 inches thereafter,
2.0 + 4.0 — 2 inches to 3 weeks and 4 inches thereafter.

The average feed conversion was 2.35 ± .02 lbs. feed/lb. gain for this experiment. Analysis of variance of these data indicates no significant differences among feeder space treatments.

The percentage liveability was 97.2 in two treatment groups and 98.6 in the third group. Differences between groups were not significant, according to a chi-square analysis.

EXPERIMENT II

Procedure

Chicks from two commercial broiler crosses were allowed varying amounts of feeder and water space. Feeder space treatments in linear inches were:

1.5 inches to 3 weeks and 3 inches thereafter,
1.8 inches to 3 weeks and 3.75 inches thereafter.

Water space treatments were either 0.5 or 1 inch throughout the entire experimental period. Both crosses were tested in all feeder-water combinations, giving the experiment a symmetrical design.

Each treatment combination was replicated in 10 by 16-foot pens, allowing 1 square foot of floor space per chick started. Eighty males and 80 females were reared in each of 16 pens, giving a total of 2560 broilers. Ration and management procedures were the same as in Experiment I. The test was conducted in the late fall of 1958.

Data were obtained for weekly feed consumption (by pens), 3- and 9-week individual body weights, and liveability.

Results

The analysis of variance of 3-week body weights presented in Table 3 show no significant differences between water spaces and highly significant differences between sexes and between crosses. At this age male and female chicks allowed 1.5 inches of feeder space weighed significantly more than their respective sexes which received 1.8 inches of feeder space. Table 3 shows that the water x feeder interaction was highly significant and that the cross x feeder interaction was significant.

Table 3.—Analysis of variance of 3 and 9 week body weights

Source of variation	3 weeks		9 weeks	
	Df	MS	Df	MS
Between subclasses	31	16,414**	29	2,354,810**
Between replicates	1	122	1	869,464**
Between supertreatments	15	27,498**	15	4,430,965**
Replicates x supertreatments	15	6,416	15	63,702
Within supertreatments				
Between sexes	1	364,138**	1	65,727,347**
Between water spaces	1	143	1	5,785
Between feeder spaces	1	6,890*	1	34,517
Between crosses	1	12,304**	1	13,255
Sex x water	1	1,254	1	38,607
Sex x feeder	1	74	1	25,462
Sex x cross	1	169	1	63,712
Water x feeder	1	13,788**	1	105,891*
Water x cross	1	2,195	1	5,601
Cross x feeder	1	7,250*	1	116,169*
2nd and 3rd order interactions	5	854	5	65,626
Within subclasses	2495	1,289	2325	21.960

* $P \leq .05$.
** $P \leq .01$.

Data presented in Table 4 show that at the lesser water space treatment an increase in feeder space resulted in slightly increased body weights at 3 weeks of age, whereas a similar increase in feeder space at the greater water space allowance resulted in lower body weights. This table also shows that an increase from 1.5 to 1.8 linear inches of feeder space resulted in reduced body weights for one cross and no change in body weights for the other cross.

Table 4.—Mean body weights at 3 weeks of age for significant interactions by sex

		Feeder space allowed[2]	
		1.5	1.8
Water space allowed[2]		(*gm.*)	(*gm.*)
0.5	♂♂	272	274
	♀♀	247	248
	Combined	260	261
1.0	♂♂	276	268
	♀♀	253	246
	Combined	265	257
Cross I	♂♂	278	270
	♀♀	253	249
	Combined	266	259
Cross II	♂♂	270	271
	♀♀	247	245
	Combined	258	258

[1]Significant interactions were water x feed and cross x feed.
[2]Linear inches per chick started.

At 9 weeks of age there was a highly significant difference between sexes but not between water spaces, feeder spaces, or crosses used (Table 3). Water x feeder and cross x feeder interactions were significant, following the same pattern that was found at 3 weeks. According to the data presented in Table 5, an increase in feeder space at the 0.5-inch water space treatment resulted in lower body weights. Contrariwise, at the 1-inch water space allotment an increase in feeder space resulted in increased body weights. These data also show that when feeder space was increased there was a decrease in body weights for one cross and an increase in body weights for the other cross.

Feed efficiencies for all treatment combinations were similar. The experimental average was 2.40 $\pm$ .01 lbs. feed/lb. gain. Liveability for all groups was 98.1 percent with nonsignificant differences among treatment combinations, according to chi-square analysis.

Table 5.—Mean body weights at 9 weeks of age for significant interactions[1] by sex

		Feeder space allowed[2]	
		1.5 + 3.0	1.8 + 3.75
Water space allowed[3]		(*gm.*)	(*gm.*)
0.5	♂♂	1637	1622
	♀♀	1308	1284
	Combined	1474	1449
1.0	♂♂	1618	1630
	♀♀	1309	1307
	Combined	1462	1472
Cross I	♂♂	1631	1609
	♀♀	1313	1294
	Combined	1472	1451
Cross II	♂♂	1624	1643
	♀♀	1303	1296
	Combined	1464	1469

[1]Significant interactions were water x feed and cross x feed.
[2]1.5 inches to 3 weeks and 3 inches thereafter, 1.8 inches to 3 weeks and 3.75 inches thereafter.
[3]Linear inches per chick started.

DISCUSSION

The results of these experiments indicate that broiler weight is affected by feeder space allowances. In both experiments birds allowed 1.5 linear inches of feeder space to 3 weeks of age and 3 linear inches thereafter were the heaviest at 9 weeks of age. These findings agree with those of Krueger *et al.* (1957) but are not consistent with those of McCluskey and Johnson (1959). This inconsistency may have been a result of the latter authors' procedure of filling feeders more frequently when feeder space allowances were reduced. In the experiments reported here birds allowed smaller amounts of feeder space were fed the same number of times per day as birds provided with additional feeder space.

An increase of feeder space beyond 3 inches did not result in greater body weights. It should be noted that in the literature cited the maximum amount of feeder space allowed was 3 inches. In both experiments reported in this paper, the lower body weights obtained at feeder space allowances of more than 3 inches are surprising and require further study to ascertain why this consistent effect has occurred.

The lack of sex x feeder interactions in both experiments substantiate the findings of Krueger *et al.* (1957) that both sexes respond similarly to varying amounts of feeder space to 9 weeks of age.

Significant water x feeder interactions for body weight were obtained at both 3 and 9 weeks of age in Experiment II indicating that feeder space requirements vary according to the amount of water space provided. Evidence of genetic x environment interactions were also indicated in Experiment II. The cross x feeder interaction at 3 and 9 weeks of age showed that broilers from different gene pools responded differently to changes in feeder space allowances.

The results obtained in this study indicate that interrelationships exist among management procedures and between management procedures and genetic factors. Cognizance of these relationships is important in efficient broiler production.

SUMMARY

Two experiments involving 4480 broilers were conducted to study the effects and interrelationships of sex, feeder space, water space, and cross on broiler performance to 9 weeks of age.

In these experiments broilers provided with 1.5 linear inches of feeder space to 3 weeks of age and 3.0 linear inches thereafter had the largest body weights at 9 weeks of age.

Both sexes responded similarly to varying amounts of feeder and/or water space.

Significant water x feeder and cross x feeder interactions were obtained at 3 and 9 weeks of age.

Differences in feeder and/or water space within allowances used had little, if any effect on liveability or feed conversion.

REFERENCES

Krueger, W. F., J. L. Skinner and J. H. Quisenberry (1957). Response of broilers to varying amounts of feeder space. Tex. Agr. Expt. Sta. Prog. Rpt. 1947.

McCluskey, W. H. and L. E. Johnson (1958). The influence of feeder space upon chick growth. Poultry Sci. 37:889-892.