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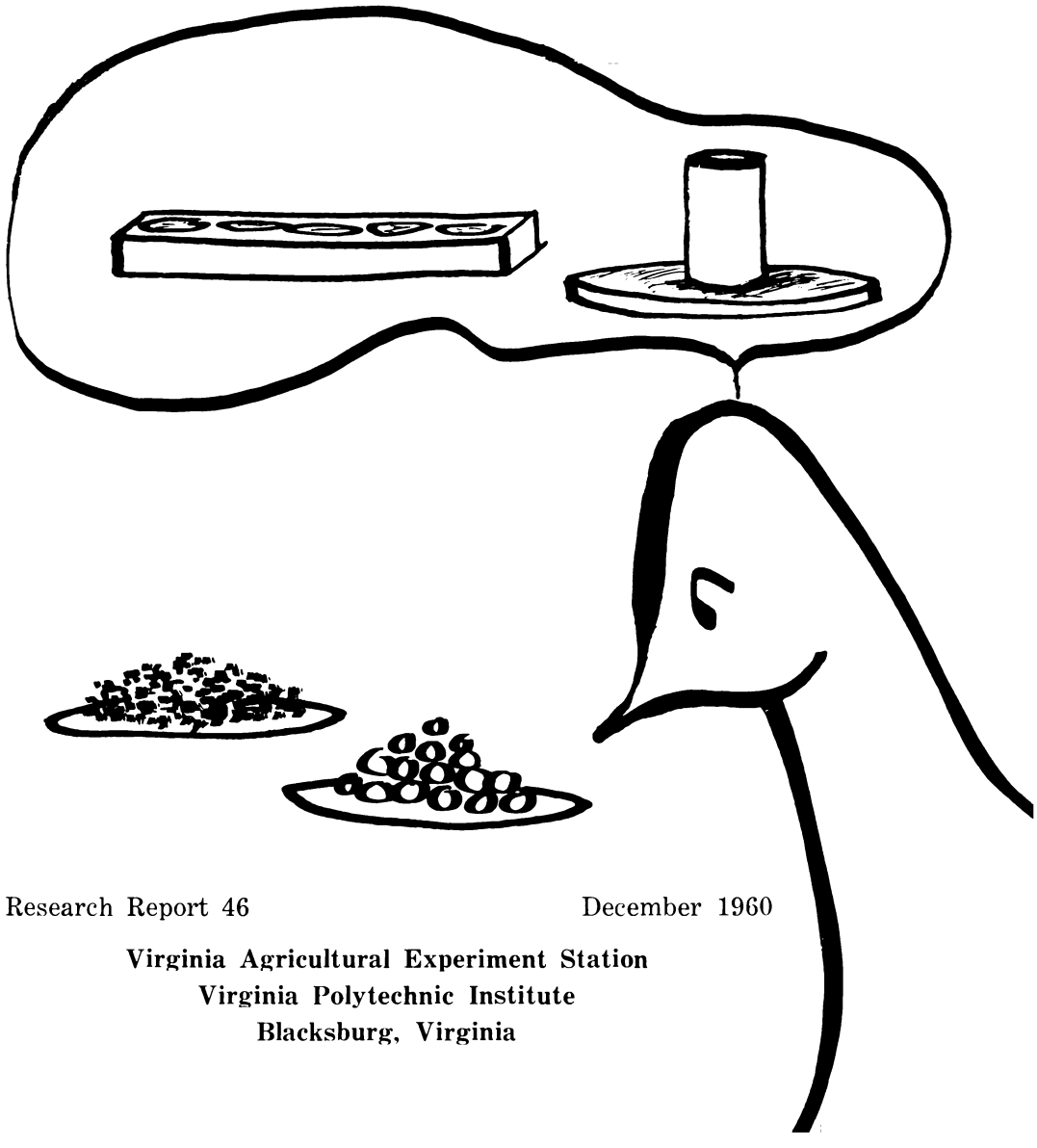

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INFLUENCE OF FEEDER TYPE AND FORM OF FEED ON THE PERFORMANCE OF BROILER CROSSES

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SUMMARY

An experiment involving 2560 chickens was conducted to determine the effect of feeder types (tube and trough), form of feed (mash and crumbles), sex and crossbred on broiler performance.

Results indicated that both rate of growth and feed conversion were affected by form of feed with crumbles giving better results than mash. A sex x form-of-feed interaction was present for body weight with a greater response to crumbles obtained from the males than from the females. Both crossbreds responded similarly to form of feed; however, a crossbred x feeder-type interaction was present as well as a form-of-feed x feeder-type interaction. Interactions between these environmental factors and between them and genotypes indicate the need for finding the combination of management practices best suited for the specific source of stock used in a broiler operation.

INTRODUCTION

Broiler production in recent years has become more and more competitive and highly specialized. The increasing rate of growth of broilers due to genetic and nutritional improvements requires constant reappraisal of management practices to determine the optimum conditions that can be economically maintained.

Siegel *et al.* (1959) found, that with twice-daily feedings, the optimum feeder space allotment for broilers was 1½ inches per chick to 3 weeks of age and 3 inches thereafter. These findings substantiated those of Krueger *et al.* (1957). Contrariwise, McCluskey and Johnson (1958) and Reed and Ringrose (1960) reported, respectively, that 1 inch and ½ inch of feeder space per chick was optimum when feed was continuously available.

Studies on the form of feed used have also produced varying results. Stewart and Upp (1951) found that the form of feed did not affect growth and feed converison to 12 weeks of age in White Plymouth Rock chicks. Combs *et al.* (1956) also found no appreciable difference in average weight or feed conversion of broiler chicks fed either pellets or mash to 8 weeks of age. Lanson (1954) and Lanson and Smyth (1955) reported, however, that White Plymouth

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Rock broiler chicks fed entirely on pellets or pellets as one-third of the total feed were superior in body weight and feed conversion to those fed mash. Lonsdale *et al.* (1957) reported that the feeding of a mash-crumbles-pellet diet resulted in a significantly heavier chicken than the feeding of a mash diet although feed conversion was not improved.

Few studies have been reported that compare tube and trough type feeders. Lanson *et al.* (1956) found little or no difference in growth rate or feed consumption between tubes and troughs (tubes —1.37 in. and 1.47 in. per chick; troughs—2.85 in. and 3.45 in. per chick) when mash was fed during the first 3 weeks, and pellets thereafter. Quarles and Siegel (1959) in a preliminary study using males from two commercial broiler crossbreds found that at 3 weeks of age, body weights of birds fed from tubes were significantly greater than those fed from troughs. There was no significant difference, however, in performance at 9 weeks of age between broilers fed from either tubes or troughs. Mash was fed in their test and both broiler crossbreds responded similarly to each type of feeder.

The conflicting results obtained in these reports might possibly have been due to differences in the responses of the different stocks used. Siegel *et al.* (1959) found that birds from different gene pools responded differently to changes in feeder space allotment. Johnson and Abplanalp (1960) obtained a significant strain x feed interaction for live weight in meat type pullets. If these types of gene x environment interactions exist, blanket management recommendations are not applicable to all broiler-type chickens. With the decreasing margin of profit that is facing the broiler grower it is necessary to look for the combination of management practices best suited to the particular operation and stock being used.

The experiment presented in this report was designed to determine the effects of and interactions between feeder types, form of feed, sex and crossbred on broiler performance.

EXPERIMENTAL PROCEDURE

Treatments consisted of both sexes of two commercial crossbreds receiving two feeder type treatments (tubes and troughs) with two forms of feed (mash and crumbles) per feeder type. Chicks were wing-banded and 80 males and 80 females from each crossbred were randomized into each pen. The experiment which was replicated twice utilized sixteen 10 ft. x 16 ft. pens and involved a total of 2560 chicks.

Three hanging tube feeders, 14½-inch diameter, were utilized per pen until the broilers were 3 weeks of age and 6 tubes were pro-

vided thereafter. Birds fed from troughs were allowed 1½ linear inches per chick started to 3 weeks of age and 3 inches thereafter.

Birds were fed a commercial broiler starting ration to 6 weeks of age and a finishing ration thereafter. Both rations contained a coccidiostat. Chicks were not debeaked nor were they vaccinated. Water and floor space allowances on a per chick started basis were ½ linear inch and 1 square foot, respectively.

Individual body weights were obtained in grams at 3 and 9 weeks of age. Feed consumption, to 3, 6 and 9 weeks was measured on a pen basis.

RESULTS AND DISCUSSION

Analyses of variance of 0-3, 3-9 and 0-9 week body gains are summarized in Table 1. The within subclasses variance has been used as the error term in testing all main effects and interactions among them. In no instance were second and third order interactions significant.

Highly significant differences in body weight between sexes, with males weighing more than females, and crossbreds with Crossbred A weighing more than B were found throughout (Table 2). As shown in Table 1 the interactions between these variables (sex and crossbred) were not significant for any of the growth periods studied.

Body weight differences were highly significant at 3 weeks of

Table 1.—Analyses of variance of body weights.

Source of variation	0-3 wks. Df	0-3 wks. MS	3-9 wks. Df	3-9 wks. MS	0-9 wks. MS
Between subclasses	31	48,583**	31	1,906,378**	2,455,458**
Between replicates	1	18,904**	1	1,471	9,778
Between treatment combinations	15	65,694**	15	3,843,502**	4,865,039**
Replicate-treatment combinations	15	33,451**	15	96,247**	208,923**
Within treatment combinations					
Sex	1	867,213**	1	55,478,428**	70,238,100**
Feeder types	1	9,113**	1	70,156**	30,011
Form of Feed	1	5,303*	1	1,225,598**	1,402,640**
Crossbreds	1	58,519**	1	219,207**	495,000**
1st order interactions					
Sex-feeder type	1	27	1	1,036	1,175
Sex-form of feed	1	6,358*	1	319,828**	438,340**
Sex-crossbred	1	833	1	14,806	10,955
Feeder type-form of feed	1	29,808**	1	613	22,653
Feeder type-crossbred	1	40	1	156,696**	164,094**
Form of feed-crossbred	1	3,456	1	58,161	26,157
2nd & 3rd order interactions	5	949	5	21,601	29,292
Within subclasses	2,478	1,179	2,441	17,599	23,319

*P ≤ .05.
**P ≤ .01.

age in favor of birds fed from tube-type feeders (Table 2). Contrariwise, from 3 to 9 weeks of age, there was a highly significant difference in body weight with the broilers fed from troughs being the heavier. This cancelling effect resulted in no significant difference in body weight between feeder types for the 0-9 week growing period. These findings are consistent with the preliminary observations of Quarles and Siegel (1959). The 0-9 week results reported here are also in accord with those of Lanson *et al.* (1956) who found no difference in body weight of broilers fed from either tubes or troughs during the entire growing period. Lanson *et al.*, however, did not report growth rates prior to market age.

At 3 weeks of age the chicks fed crumbles weighed significantly more than those fed mash. The difference increased with age and was highly significant for the 3-9 and 0-9 week growth periods (Table 2). This influence of form of feed on body weight is in accord with the findings of Lanson (1954), Lanson and Smyth (1955), and Lonsdale *et al.* (1957) who reported significant differences in body weight due to form of feed. It is not, however, in agreement with the results reported by either Stewart and Upp (1951) or by Combs

Table 2.—Mean gains in body weight and differences between means for main effects[1].

Main effect	Period (wks.) 0-3	3-9	0-9
	(*gms.*)	(*gms.*)	(*gms.*)
Sex			
Male	290	1300	1591
Female	253	1000	1254
Diff.	37**	300**	337**
Feeder type			
Trough	269	1149	1418
Tube	273	1138	1411
Diff.	−4**	11**	7
Form of feed			
Crumbles	273	1166	1439
Mash	270	1121	1391
Diff.	3*	45**	48**
Crossbred			
A	276	1153	1429
B	266	1134	1401
Diff.	10**	19**	28**

[1]For analysis see Table 1.
*P $\leq$ .05.
**P $\leq$ .01.

et al. (1956) who found no appreciable difference due to form of feed.

The sex x form-of-feed interaction was shown to be significant at 3 weeks of age and highly significant for the 3-9 and 0-9 week periods as indicated by the mean body weights given in Table 3. There was no difference between females fed mash and those fed crumbles at 3 weeks of age; however, during the 3-9 week period greater gains in body weight were obtained from crumbles. The 3-week body weights of the crumble-fed males were heavier than the mash-fed males. This difference became more pronounced during the 3-9 week period.

A highly significant feeder-type x form-of-feed interaction was found to be present for the 0-3 week period (Table 3). The greatest gains from crumbles were obtained from the tubes whereas the greatest gains from mash were obtained with the use of troughs. This interaction did not exist through the 3 to 9 week period and was not significant for the entire 9-week growing period.

Table 3.—Mean body weights for interactions[1], [2].

Main effect	Period (wks.)	Sex		Feeder type		Form of feed	
		M	F	Trough	Tube	Crumbles	Mash
		(*gms.*)	(*gms.*)	(*gms.*)	(*gms.*)	(*gms.*)	(*gms.*)
Feeder type							
Trough	0-3	288	251				
Tube		292	255				
Trough	3-9	1305	1006				
Tube		1296	994				
Trough	0-9	1594	1258				
Tube		1588	1205				
Form of feed							
Crumbles	0-3	294	253	267	278		
Mash		287	253	271	268		
Crumbles	3-9	1335	1012	1172	1160		
Mash		1266	989	1126	1116		
Crumbles	0-9	1629	1265	1439	1438		
Mash		1554	1243	1398	1385		
Crossbred							
A	0-3	295	259	274	278	276	276
B		286	248	264	268	269	264
A	3-9	1312	1007	1150	1155	1180	1125
B		1288	993	1147	1121	1152	1117
A	0-9	1607	1266	1424	1434	1457	1401
B		1575	1241	1412	1389	1421	1381

[1]For analysis see Table 1.
[2]Significant and highly significant interactions are in parentheses.

The interaction between form-of-feed and crossbred was not significant (Table 3) indicating that both crossbreds responded similarly to the 2 forms of feed fed them.

Both crossbreds responded similarly in body growth to feeder types to 3 weeks of age, with greater gains being obtained when tubes were used. However, a highly significant feeder type x crossbred interaction occurred during the 3-9 week period, as indicated in Table 3, of sufficient magnitude that the interaction for the 0-9 week period was also highly significant. As shown in Table 3, the greatest growth response for Crossbred A occurred when the birds were fed from tube-type feeders whereas Crossbred B responded better to the trough-type feeders. It is of interest to note, however, that even when fed from trough-type feeders Crossbred A chickens were still heavier than the Crossbred B chickens.

Differences between treatments for feed conversion were analyzed according to analyses of variance. There was no significant difference in feed conversion between feeder type treatments or between crossbreds. Although there was no significant difference in feed conversion between forms of feed at 3 weeks of age, the crumbles gave significantly better feed conversion than did mash during the 3-9 week period and also for the overall 0-9 week period (Table 4). Differences between sexes could not be evaluated for feed conversion because males and females were intermingled in the same pen.

Table 4.—Feed conversions and differences between conversions for main effects[1].

Main effect	Period (wks.)		
	0–3	3–9	0–9
Feeder type			
Trough	1.55	2.55	2.36
Tube	1.48	2.61	2.38
Diff.	.07	−.06	−.02
Form of feed			
Crumbles	1.49	2.54	2.33
Mash	1.54	2.65	2.41
Diff.	−.06	−.08*	−.08*
Crossbred			
A	1.52	2.56	2.36
B	1.50	2.60	2.38
Diff.	.02	−.04	−.02

[1]Feed conversions = lbs. of feed consumed per lb. of live chicken.
*P $\leq$ .05.

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