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THE COMPARATIVE VALUE OF CORN, GRAIN SORGHUM, WHEAT
AND BARLEY IN BROILER RATIONS

by

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Abstract

The bulk of the Lebanese poultry industry is dependant on imported feed concentrates which are diluted with locally available cereals according to the recommendations of feed companies. The prices of the local cereals are subject to annual and seasonal fluctuations. Corn, though normally expensive, is the favored feed of broiler growers. Hence, the comparative feeding value of corn, sorghum, wheat, barley and their various combinations has been studied in an attempt to reduce total production expenses. The evaluation of these cereal rations was based chiefly upon rate of gain, feed conversion and overall economics. The results under the conditions of this experiment wherein broilers were raised to six weeks of age, establishes the fact that corn, sorghum and wheat are equally acceptable while barley proved to be the poorest cereal in broiler feeding. Tables were compiled, based upon relative monetary value of different rations, which permits the choice of the most economical cereal grain under fluctuating prices.

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Introduction

The metamorphosis of the world's poultry industry from the backyard raising of a few scavenger birds into a highly intensive assembly line like operation is due to a myriad of inter-related factors. The mass migration of rural communities into towns and cities during the industrial revolution was accompanied by an eventual increase in the average per capita income and standards of living. New industries were created when the problem of feeding these newly formed urban communities was solved. This necessitated the changing of prevalent practices of livestock management, the discovery of new methods of food processing, transportation, packaging, preservation and storage.

The modern poultry industry as we know it now thus originated with the industrial revolution. Poultry breeders have evolved a number of highly productive and economical strains. Nutritionists, on the other hand, have made tremendous strides over the past three decades in evaluating the nutritive requirement of poultry, discovering unknown essential feed ingredients, synthesizing many of the vitamins and determining the nutritive value of the cereals, grasses, animal, vegetable and industrial by-products.

The overall poultry industry of Lebanon is still in its infancy. However, there exist many commercial poultry projects where management, feeding, disease control, and marketing practices are comparable with those of most developed countries. The apparent popularity and success of commercial poultry raising in Lebanon is due to a number of relevant factors ; namely :-

a. A relatively high standard of living accompanied by a considerable

segment of middle class people who are willing and can afford to pay premium prices for quality products.

- b. The existence of a large number of luxury hotels, restaurants and clubs that cater to tourists and transit travellers.
- c. A relatively large number of foreigners residing in Lebanon.
- d. A large number of service organisations, air-lines, oil companies, and other concerns which maintain regional offices in Beirut.
- e. Adequate refrigeration and freezing facilities for storage.
- f. Efficient internal and external transport facilities.
- g. Ready availability of trained personnel, veterinarians, vaccines and medicinals.
- h. The relative expense of land and shortage of water for irrigation along with the excellent climatic conditions of Lebanon make the poultry industry more attractive than many other phases of agriculture.
- i. Ready capital is to be found.

A number of hatcheries are operating in Lebanon with a combined out-put of more than a million chicks per year. Also, a considerable number of day-old chicks are being imported from European countries and the United States of America. Such importations are a reflection of demand being greater than hatchery out-put plus a feeling of bias among some broiler growers against anything locally produced. Leghorns are preferred for egg production while various crosses are sought by broiler operators. Depending on prevailing weather conditions, chicks are generally kept in battery brooders or under oil hovers for a period of two to four weeks. Broilers are usually slaughtered at about six weeks of age when they attain an average live weight of 800 grams. They are normally

processed and packaged at the farms and sold on contract basis. Hence, the producers are very particular to slaughter as soon as the birds reach this limit in order to economise on feed. Also it is note-worthy that most Lebanese consumers prefer broilers cooked whole or in halves and a six-week old bird meets this rather exacting requirement.

Basically the commercial poultry industry of Lebanon is dependant upon imported feed concentrates from the United States of America or European countries. These imports are diluted with local grains according to the recommendations of the respective manufacturer. A continuous effort is being made to lower the cost of poultry production. This is usually concentrated in the formulation of cheaper and more efficient rations, since feed frequently represents more than 50% of the total cost of poultry production. A mixed-feed company has been recently established in Beirut which imports feed supplements and scientifically combines them with local feed ingredients. Their product is marketed as a complete ration either in the form of pellets or mash and is daily increasing in popularity. It is fresh, cheap and requires no grinding and mixing on the farm.

The availability and cost of local cereals is subject to annual and seasonal fluctuations. Only limited information is available as to the comparative value of corn, grain sorghum, wheat and barley in broiler feeding. Corn, though relatively more expensive, constitutes the bulk of most broiler rations and is preferred to all other cereal grains. This study was conducted in order to evaluate the relative efficiency and the economy of the locally available cereal grains and their combinations when mixed with imported feed concentrates in broiler rations.

Review of literature.

The study of the comparative feeding value of the different cereal grains in broiler nutrition has been somewhat limited in the United States of America . Lesser attention has been paid to it in Europe and the problem has apparently been over-looked in the Middle East. Therefore, most of the work herein reviewed was undertaken in the United States of America and includes chiefly experiments with broilers but some coverage is given to laying hens.

A Comparative feeding value of corn and grain sorghum.

Haywang and Morgan, (15) reported that milo and hegari could be used to replace one-half or all of the yellow corn in chicken rations that were not deficient in anyway. Payne (19) demonstrated, two years later, that a good quality kafir or milo could be substituted for white or yellow corn in the ration of growing chickens or laying hens which were adequately supplemented with other nutrients. Hammond (13) concluded that hegari or yellow milo was equal in feeding value to corn when used as the grain source in a balanced formula for laying hens. Couch and Crawford (4) reviewed an extensive study conducted by Adolph and Grau in which milo and corn found to be of equal value in feeds for laying hens when criteria of egg production, egg weight, mortality, culling and feed efficiency were used to evaluate the results obtained. The same investigators (5) relate a recently completed study by Harms et al. with broiler chickens in batteries with raised screen floors. Results obtained with these experiments indicate that feed formula should contain 15% corn and that milo may be used to make up the remainder of the grain portion

of the ration . Incidentally, milo is usually not used as the only grain in the formulation of the poultry rations because it lacks xanthophyll.

Ewing (6) reported an experiment conducted to determine whether or not corn is essential in the starting and growing ration. At the conclusion of ten months laying, birds raised on a ration containing no corn showed no significant difference in mortality when compared with the birds of the same age and breeding which had been on the conventional ration containing corn. German et al. (11) ascertained that ground milo and ground yellow corn were of equal value when used at the rate of 70% of a chick starter mash, provided the rations were adequately supplemented with minerals and vitamins. The same authors related that where adequate carotene was supplied by good quality alfalfa leaf meal, milo satisfactorily replaced an equal weight of corn in rations for broilers.

Franklin (8) stated that the replacement of one-half to two third of the corn made no significant difference in weight gain and feed efficiency when sorghum replaced all corn. Gooderl (12) ascertained that, in three years of study in which trials were started each year using 160 white leghorn pullets and 160 Rhode Island Red pullets, the egg production with yellow corn in scratch and mash averaged 162.8 and 159.0 eggs in the two respective breeds. When yellow corn was replaced by millet the egg production of the two breeds averaged 174.4 and 152.8. The feed consumption was somewhat greater for both breeds when millet replaced the corn. The hatchability of fertile eggs in both breeds was definitely improved. Harms et al. (14) found a decrease in body weight of broilers as yellow corn was replaced with milo. The substitution of milo for corn in the ration of broilers did not

significantly affect feed efficiency. However, there was a trend for a decrease in feed utilization, when milo was used.

B Comparative feeding value of corn and wheat.

Whitson et al. (21) pointed out that when chickens were grown to ten weeks of age on rations consisting of a single grain along with the necessary supplements, wheat proved to be superior in most cases to corn, oats, barley and milo as judged by the rapidity of growth. However, the samples of wheat which supported rapid growth were lower in protein content than most of the other grain. Heuser (16) observed that a laying ration composed largely of wheat gave better results than a laying ration composed largely of corn. Also, rations containing wheat resulted in higher feed consumption.

C Comparative feeding value of corn and barley.

Arscott (3) summarised the results of three experiments in which wheat or barley replaced corn in the presence or absence of 3% added animal fat. The data showed that the addition of fat brought about an improvement in growth and feed conversion. Arscott et al. (2) demonstrated in another experiment that barley may replace up to one-half of the ground grain component of high energy rations if such rations are supplemented with 4 to 8% fat. Arscott (1) concluded that barley may replace one-half to three-fourths of ground corn effectively when 3 and 6% fat was added and compared with corn without added fat. Fry et al (9) have recently demonstrated that rations containing water-treated barley supported chick growth equal to that given by a feed containing corn. Also, feed efficiency obtained with treated barley

rations was significantly better than corn.

Fry et al. (10) found that the depressed growth and reduced feed efficiency, while feeding barley as a corn substitute, was due to a deficiency of available energy. Peterson and Zweigart (20) concluded that barley was as efficient as corn when used as the grain in laying rations.

Reports of tests covering corn versus oats, oats versus wheat and various other combinations are frequently encountered in the literature. When all these experiments are considered collectively, instead of individually, they may be summarised in this one statement : All the common grains are inter-changeable in poultry rations. One precaution is, however, necessary in using other cereal grains as a substitute for corn and this pertains to the carotene content of corn. Provisions must be made to supply this important vitamin precursor through some other source such as alfalfa products, fish meal, liver oil or green grasses (7).

Material and methods.

This experiment was conducted at a commercial broiler plant, owned and operated by Hassan Shuman, which is situated at the village of Hezzine some eight kilometers to the north-east of the American University Farm, in the Beka'a plain of Lebanon. At this broiler farm, approximately one thousand birds per week are started in double-decked brooders with mesh bottoms. The batteries are arranged in two rows in a well insulated hallway (see figure 1 and 2). The brooders are routinely cleaned and / or specially prepared in advance of the arrival of each new batch of chicks. With the exception of restricting feed for the first twenty four hours and certain other minor discrepancies which tend to cause rather high early mortality, basic management practices are judged to be acceptable.

While it was originally planned to superimpose this experiment upon the exact husbandry practices being followed by the plant management, as the experiment progressed certain limited changes were implemented to the benefit of both commercial operation and scientific study. The experimental design was a randomised block with three replications involving 600 birds in each case (ie., a total of 1800 birds). Since, it was not possible to start more than 600 birds at a time, this number of chicks was started weekly for three consecutive weeks giving a total time element of eight weeks devoted to the entire feeding period. However, at the termination of the nutrition phase, an additional four days were required to collect certain slaughter data on selected birds. The experiment involved six treatment groups (replicated three times) as shown in Table 1. The variables concerned were corn, sorghum, wheat, barley,

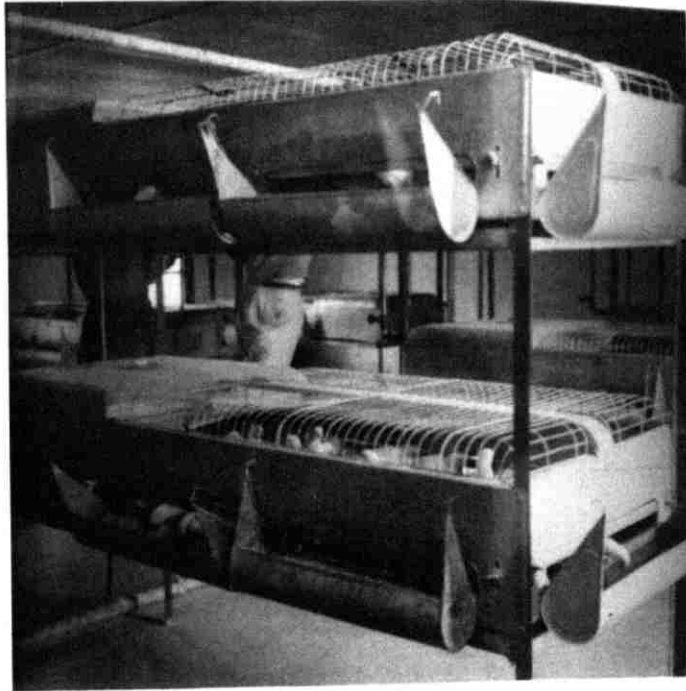


Fig. 1. Battery brooders for first 4 weeks of age

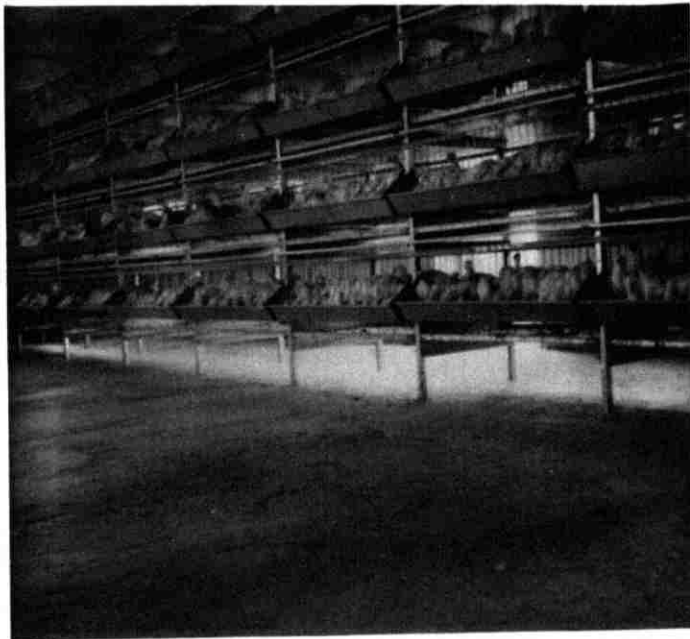


Fig. 2. Battery system after 4 weeks of age

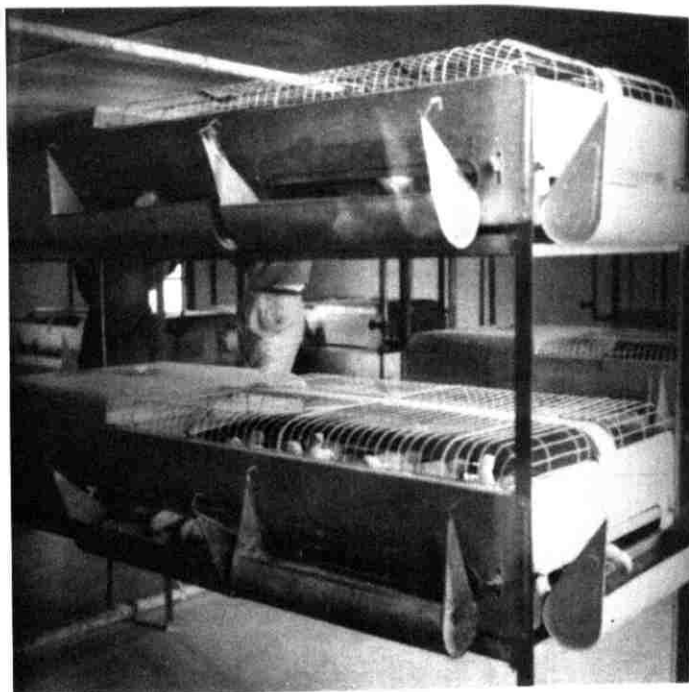


Fig. 1. Battery brooders for first 4 weeks of age

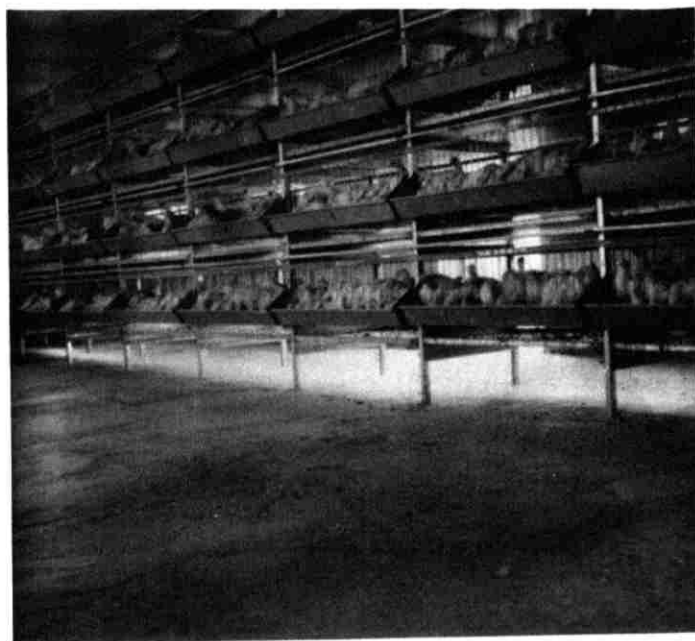


Fig. 2. Battery system after 4 weeks of age

corn-barley and sorghum-barley (see Table 2 for chemical composition) when mixed in the proportion of 60:40 with a commercial supplement to give a complete ration (chemical analysis shown in Table 3).

Table 1. Broiler rations utilizing various cereals and their combinations with a standard commercial supplement.

Ingredients	R a t i o n s					
	1	2	3	4	5	6
Provimi (Commer- cial supplement	40	40	40	40	40	40
Corn	60				30	
Sorghum		60				30
Wheat			60			
Barley				60	30	30
	100	100	100	100	100	100

N.B. Henceforth, only the cereals will be mentioned to designate a complete ration ie., 1=corn, 2= sorghum, 3= wheat, 4=barley, 5=corn-barley and 6=sorghum-barley.

The comparison of these rations was based on the rate of gain, feed consumption and feed conversion. For this purpose each group was collectively weighed on the first day and subsequent weights were taken weekly on the same day. Similarly, weighed amounts of feed for each different treatment group were placed in separate bags and fed there-from for an entire week. At the end of each week the unused balance was weighed and feed consumption calculated for each individual group. Because the number of chicks within groups varied according to the degree of mortality, feed conversion estimates were based upon the average rate of gain and the consumption at the end of six weeks.

At the termination of the feeding period, information was collected on the dressing percentage of birds fed on the different rations. Since, the average chick was not of a marketable weight at the age of six weeks, a representative sample of 25 birds was drawn from each group for slaughtering. When the selected birds, within a group, averaged 800 grams, the entire group was processed at one time to yield slaughter data.

Results and discussion.

In considering the overall results obtained in evaluating the cereal grains in broiler production, it is deemed expedient to discuss these data in terms of, (1) rate gain, (2) feed consumption and (3) feed efficiency and economics.

A. Rate of gain

Data concerning the average weekly growth rates of the six experimental groups fed on the different rations is given in Table 4 and is graphically illustrated in Figure 3. It is obvious that there was no marked difference among the groups fed on these rations during the first week. From the second week onward the barley fed group followed a different trend. As is shown in Table 4, this group is the lightest of all and bears striking resemblance to the findings of **Arscott** (3). Depressed growth while feeding barley is due to the deficiency of available energy (10).

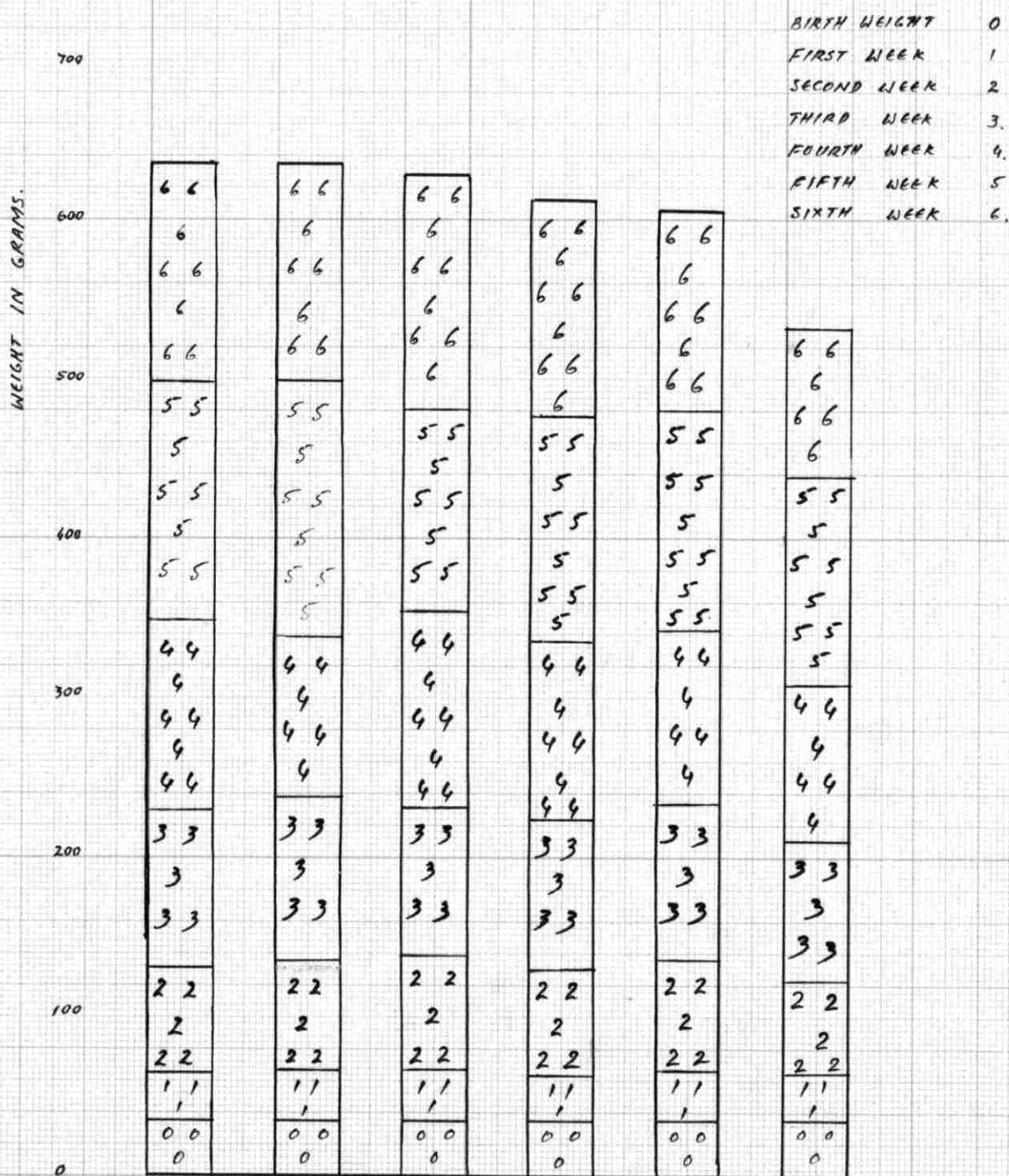
Figure 3, also, portrays that the other groups follow each other rather closely up to the fourth week of age. During the following two weeks the average weight of chicks fed on sorghum and corn is the same which confirms the findings of many authors (13,1519), but disagrees with the results reported by **Franklin** (8) that when more than two-thirds of corn is replaced by sorghum, there results a depression of gain and feed efficiency. Under the conditions of this experiment, sorghum was equal to corn when considering rate of gain. It is also clear that at the second and fourth weeks of age, an average chick fed on wheat was slightly heavier than one fed on corn.

Table 4. Average weekly weight in grams of chicks fed on six different rations containing various cereal grains and combinations.

Age in weeks	corn	sorghum	wheat	barley	corn-barley	Sorghum - barley
1	65	67	67	65	63	67
2	131	136	139	123	130	136
3	230	238	231	211	224	234
4	349	339	355	309	336	343
5	499	499	481	439	477	480
6	635	635	628	532	612	605

Table 5. Analysis of variance testing the effect of cereal grains on growth rate in broilers.

Source of variation	Degrees of freedom	Sum of square	Mean square F 5% point of F.		
			Mean square	F	5% point of F.
Replications	2	12.11	6.05	.14	4.10
Treatment groups	5	23157.78	4631.55	110.32	3.33
Error	10	419.89	41.98		
Total	17	23589.78			



BIRTH WEIGHT 0
 FIRST WEEK 1
 SECOND WEEK 2
 THIRD WEEK 3
 FOURTH WEEK 4
 FIFTH WEEK 5
 SIXTH WEEK 6.

CORN SORGHUM WHEAT CORN-BARLEY SORGHUM-BARLEY BARLEY.

FIG 3. AVERAGE WEEKLY WEIGHT OF CHICKS FED ON SIX DIFFERENT RATIENS.

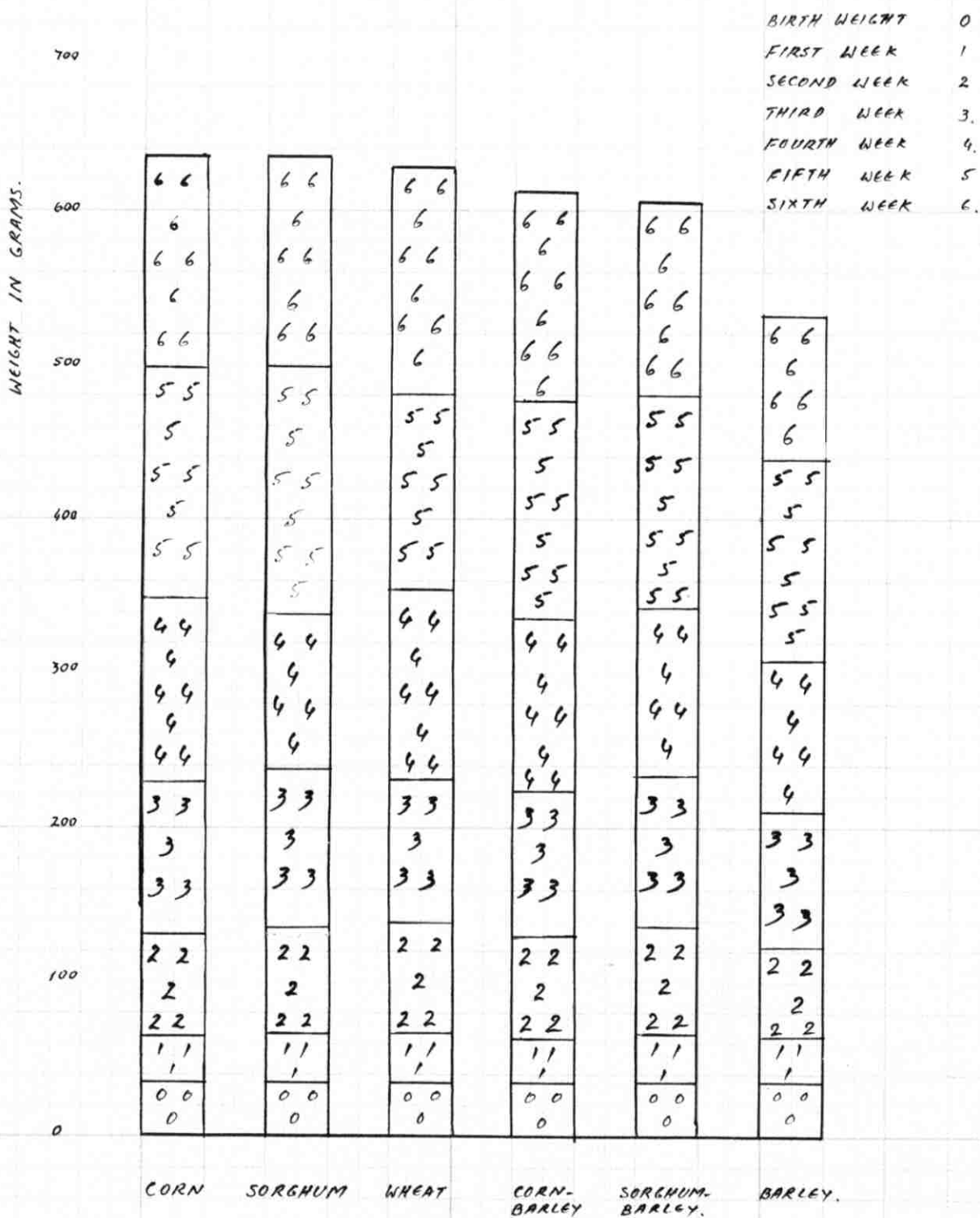


FIG 3. AVERAGE WEEKLY WEIGHT OF CHICKS FED ON SIX DIFFERENT RATIENS.

When the average weight of chicks fed on the different rations is compared to the fiber content of the rations, there is found to be an inverse relationship. Hence, the rations which were low in fiber gave better growth performance, because the efficiency of a less fibrous ration is due to the greater availability of nutrients.

The analysis of variance, (Table 5) when tested according to Li (17) at (P.05) shows that the rations exhibited a significant influence on the rate of gain. By using the Significant Studentised Range (P.05) these rations can be combined into different performance groups, Li (18). The group of chicks fed on barley was the lightest and was significantly different from all other groups. An average chick fed on sorghum-barley was 7 grams lighter than one fed on corn-barley yet they fall in one group. Considering the average weight of chicks at the age of six weeks, the chicks fed on corn-barley were not significantly different from those fed on wheat. The weight of chicks fed on corn or sorghum was the same and may be grouped with wheat. Thus, the statistically significant groups may be depicted in the following manner based on average chick weight at six weeks of age:

Barley	Sorghum-barley	Corn-barley	Wheat	sorghum	corn
<u>532</u>	<u>605</u>	<u>612</u>	628	635	635
	—————				
			—————		
			—————		

B. Feed consumption.

Feed consumption by chicks fed on different rations in itself is of no significance. It has its value in the determination of feed efficiency, a real criterion for the evaluation of rations. However, everything else

being equal, it may be beneficial to feed rations which are less consumed.

The weekly feed consumption by chicks on the different rations, irrespective of the weight gained, is given in Table 6 and is illustrated in Figure 4. It is apparent (Table 6) that the barley group consumed 117 grams more feed during the six weeks period as compared to corn (designated as the control). In general, feed consumption by the barley group was the highest, which may be due to its higher fiber content. Another extreme is the sorghum group which consumed, on an average, 53 grams less feed than the corn or control group. This confirms the findings of many authors (13,15,19) who have reported that milo could replace an equal weight of corn in broiler or layer rations. The results on feed consumption, under the conditions of this experiment, reveal that sorghum is decidedly superior to corn in broiler feeding and contradicts the report of Franklin (8). Chicks fed on corn or sorghum consumed 18 and 70 grams respectively less feed than wheat fed birds. This may be due to a higher palatability in the case of wheat and/or a comparatively higher fiber content. Feed consumption by chicks fed on corn-barley and sorghum-barley is 53 and 67 grams respectively more than the corn group.

The analysis of variance (Table 7) shows that the feed consumption by the different groups was significantly different (P.05). When these data were subjected to the Significant Studentised Range Test (P.05) it was found that the feed consumption by all of the different groups was significantly different (Table 6). The order which they follow demonstrates that rations which are higher in fiber content are consumed in the greatest quantity. Since feeds which are low in fiber are usually high in energy, the energy content of a ration may be one of the factors which control feed intake.

Table 6. Average feed consumption in grams by chicks fed on different rations containing various cereal grains and combinations.

Age in weeks	Corn	Sorghum	Wheat	Barley	Corn-barley	Sorghum-barley
1	64	71	62	73	63	71
2	124	114	121	126	127	139
3	194	195	205	207	204	214
4	273	270	274	321	296	296
5	427	395	431	433	430	425
6	501	485	508	540	516	505
Total	1583	1530	1601	1700	1636	1650

Table 7. Analysis of variance for testing the effect of cereal grains on feed consumption by broilers.

Source of variation	Degrees of freedom	sum of square	mean square F		5% point of F
Replications	2	4.33	2.16	7.2	
Treatment groups	5	520.66	104.13	337.1	3.33
Error	10	3.01	.30		
Total	17	528.00			

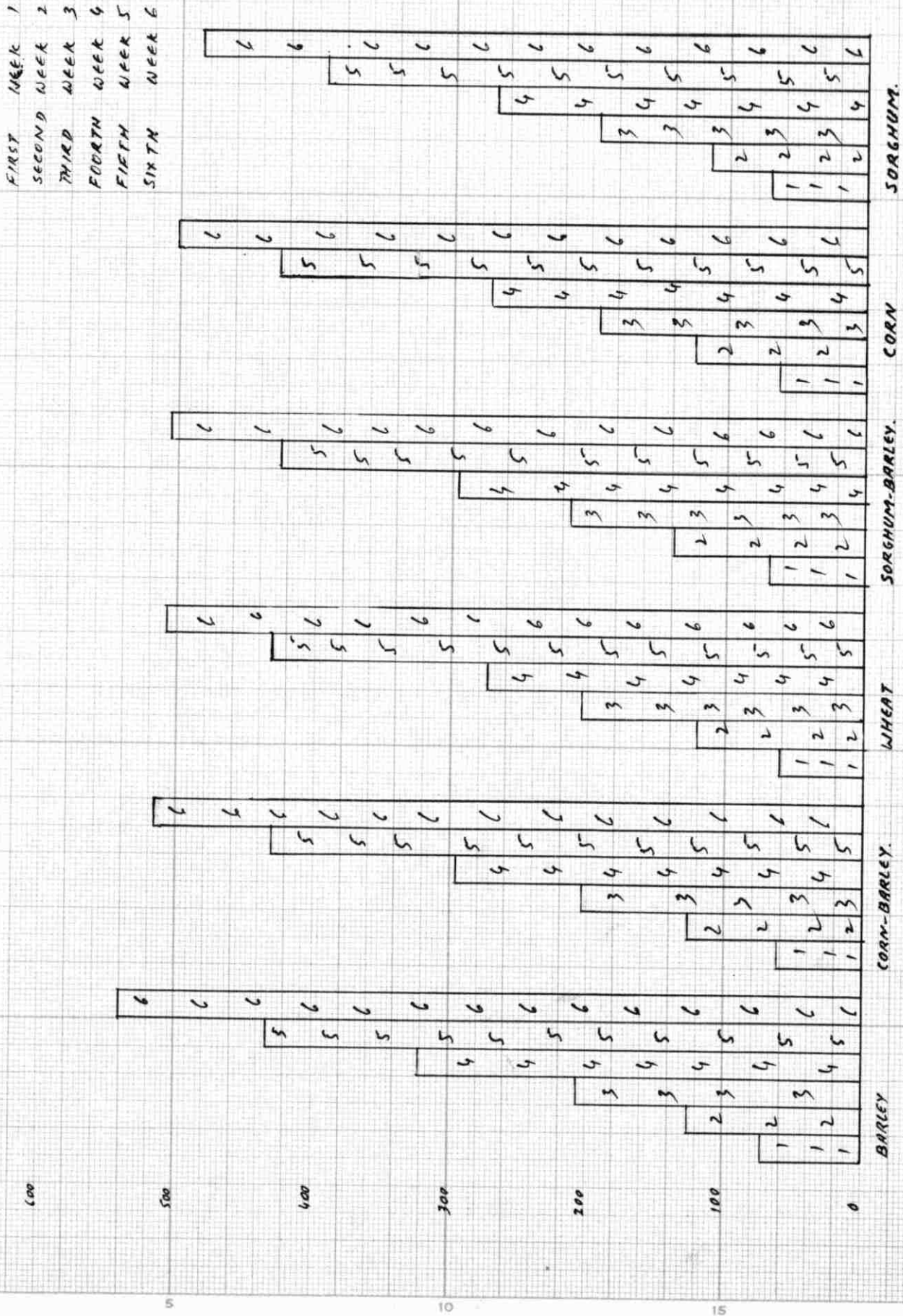


FIG 4. AVERAGE FEED CONSUMPTION BY CHICKS FED ON SIX DIFFERENT CEREAL GRAIN RATIIONS.

FIRST WEEK
SECOND WEEK
THIRD WEEK
FOURTH WEEK
FIFTH WEEK
SIXTH WEEK

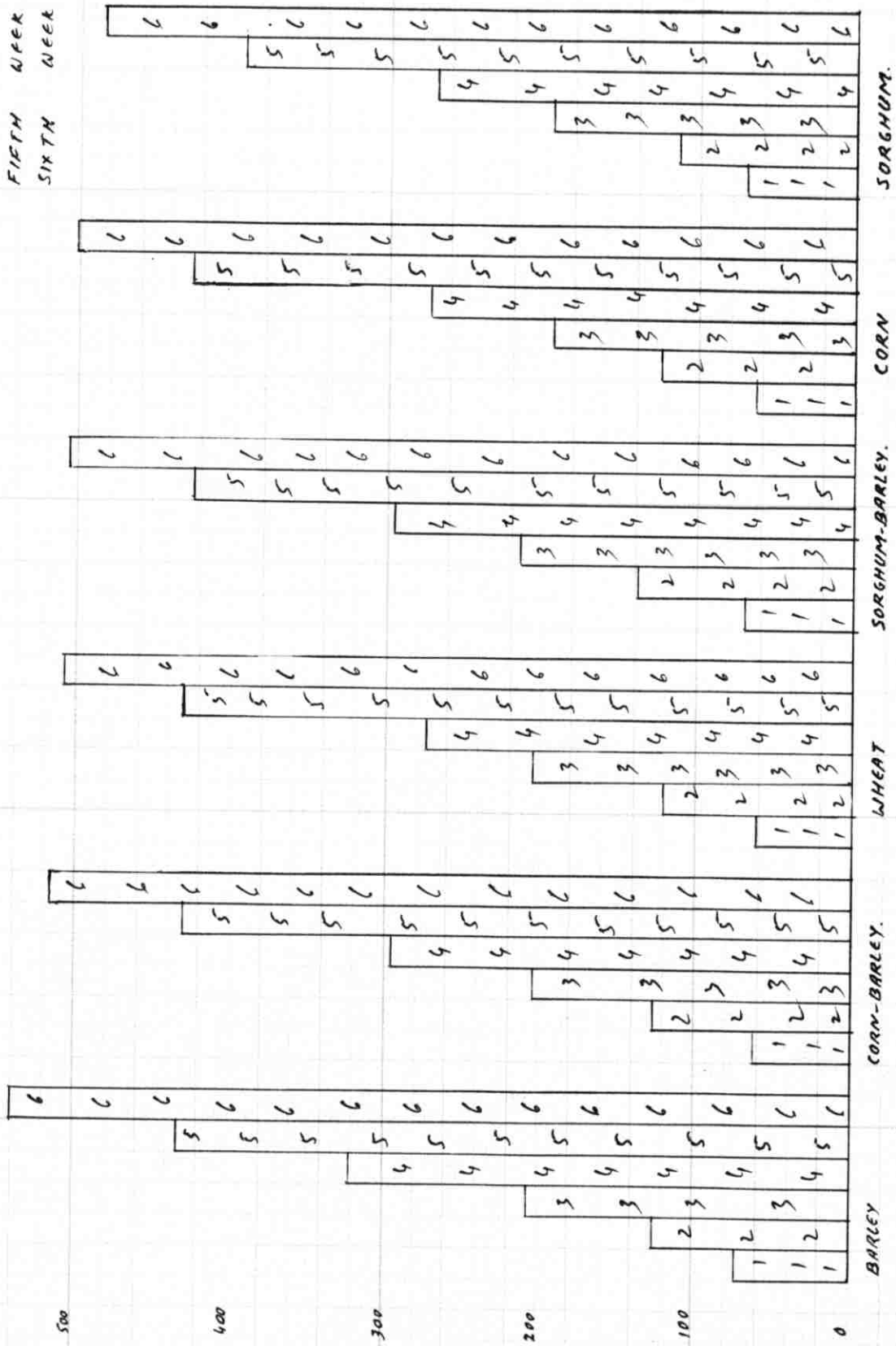


FIG 4. AVERAGE FEED CONSUMPTION BY CHICKS FED ON SIX DIFFERENT CEREAL GRAIN RATIIONS.

C. Feed efficiency and economics

Table 8 illustrates that sorghum is the most efficient grain investigated and one can save 70 grams of feed (worth 0.09 L.L.) in producing each kilogram of live weight up to six weeks of age when compared with corn. Wheat is less efficient than corn as 70 grams more feed is required to produce one kilogram of live weight. Sorghum-barley is less expensive than corn-barley. However, both these rations are inferior to corn. The market price of sorghum and barley rations is generally comparable but the latter is the most expensive feed as it is less efficient. The barley group, on the average, required 710 grams more feed and was 0.23L.L. more expensive for each kilogram of live weight produced. The relative efficiency of these rations is depicted in figure 5 and is significantly different as shown in Table 10 (P.05).

The market price of cereals is always subject to fluctuations. Hence, as an aid to ascertaining the best buy in cereal grains, Table 9 has been compiled on the basis of relative monetary value of various rations as compared to the price of a ration composed of 60% corn and 40% commercial supplement. This table indicates the price limit one should not exceed for pure economic reasons. Based on this information, a commercial broiler producer can use his discretion in the purchase of different grains or rations and, thus, increase net income.

Table 8. Relative economic value of different rations in broiler feeding composed of various cereal grains.

Kind of feed	Relative nutritive value with corn as 100.	Relative monetary value with corn ration at 0.43 L.L./kilo.	Ration price (Dec. 1958) L.L./kilo	market price of cereal grains	Kilo ration/ kilo live wt.	L.L./ kilo live wt.
Corn	100	0.43	0.43	0.27	2,480	1.07
sorghum	103	0.44	0.41	0.23	2,410	0.98
wheat	97	0.42	0.42	0.25	2,550	1.07
barley	77	0.33	0.41	0.23	3,190	1.30
corn-barley	93	0.40	0.42	0.25	2,670	1.12
sorghum-barley	91	0.39	0.41	0.23	2,720	1.11

Table 9. Relative monetary value of certain rations on the basis of price of a ration composed of 60% corn and 40% commercial feed supplement. (L.L./kilo).

Corn	sorghum	wheat	barley	corn-barley (50:50)	sorghum-barley (50:50)
0.35	0.36	0.34	0.27	0.32	0.32
0.36	0.37	0.35	0.28	0.33	0.33
0.37	0.38	0.36	0.28	0.34	0.34
0.38	0.39	0.37	0.29	0.35	0.34
0.39	0.40	0.38	0.30	0.36	0.35
0.40	0.41	0.39	0.31	0.37	0.36
0.41	0.42	0.40	0.31	0.38	0.37
0.42	0.43	0.41	0.32	0.39	0.38
0.43	0.44	0.42	0.33	0.40	0.39
0.44	0.45	0.43	0.34	0.41	0.40
0.45	0.46	0.44	0.34	0.42	0.41
0.46	0.47	0.45	0.35	0.43	0.42
0.47	0.48	0.46	0.36	0.44	0.43
0.48	0.49	0.47	0.37	0.45	0.44
0.49	0.50	0.48	0.38	0.46	0.44
0.50	0.51	0.49	0.38	0.47	0.45

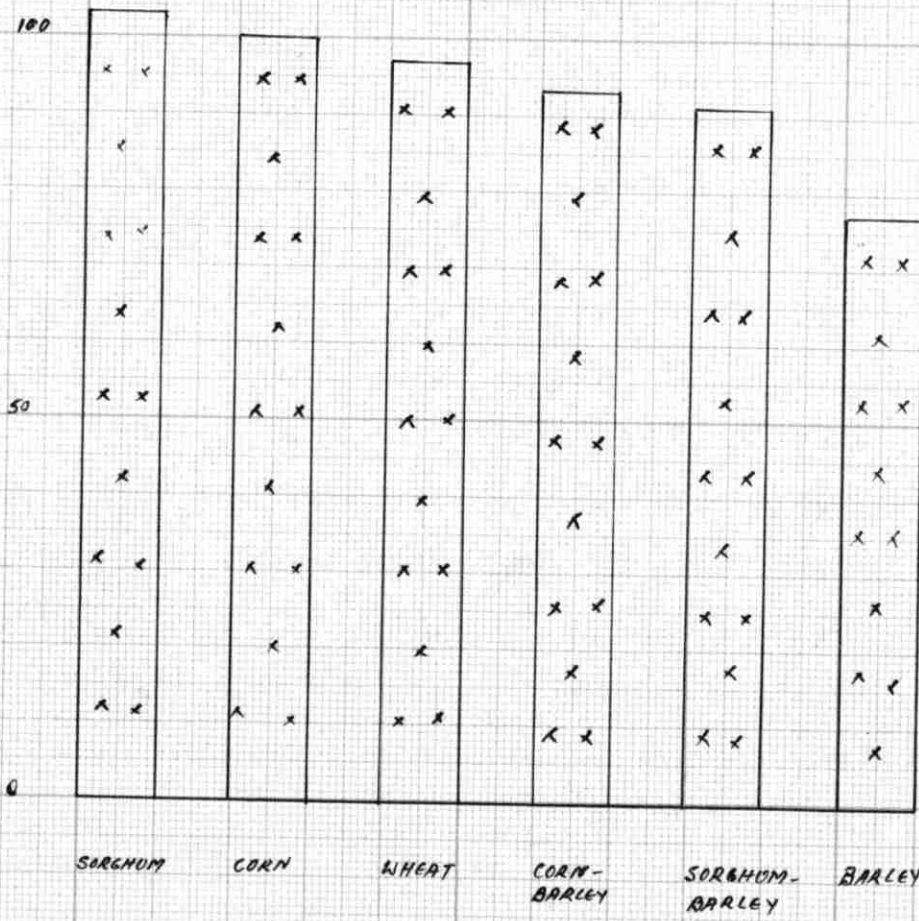


FIG. 5. THE RELATIVE FEEDING VALUE OF GRAINS IN BROILER FEEDING.

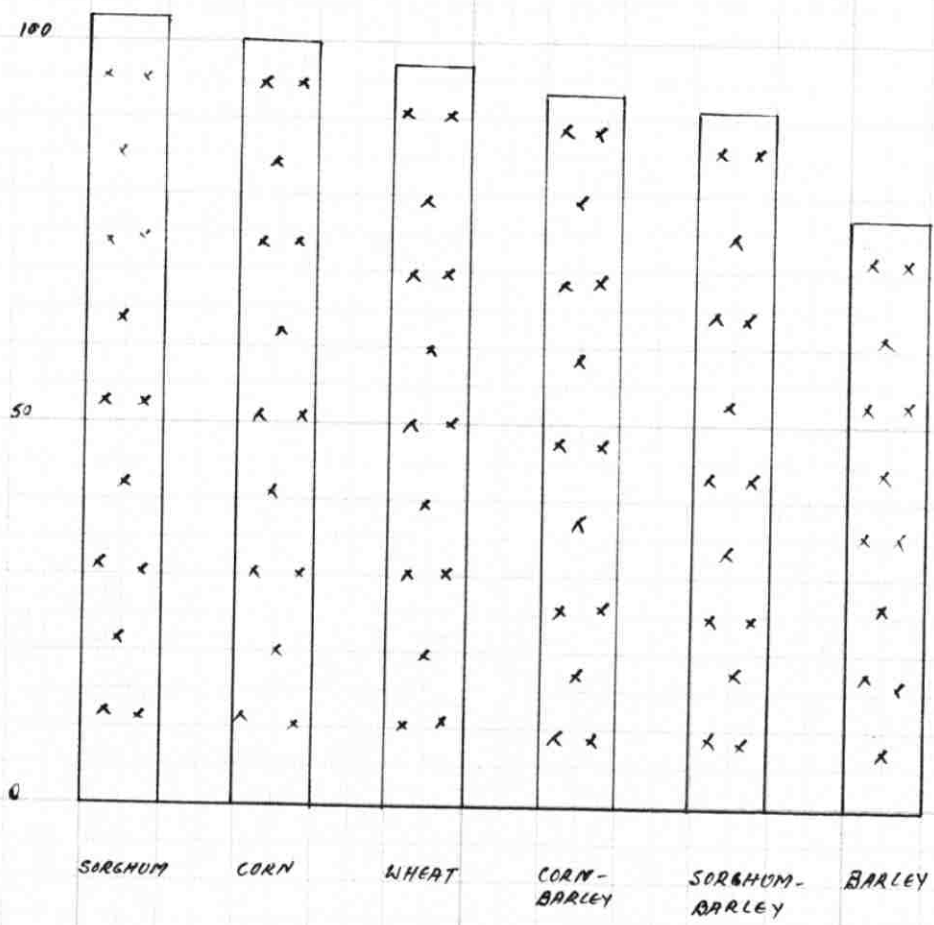


FIG 5. THE RELATIVE FEEDING VALUE OF GRAINS IN BROILER FEEDING.

Table 10. Analysis of variance of feed conversion by chicks fed on different rations.

Source of variation	Degree of freedom	sum of square	mean square	F	5% point of F.
Replications	2	0.002	0.001	0.5	4.10
Treatments	5	1.169	0.233	116.5	3.33
Error	10	0.021	0.002		
Total	17	1.192			

By using Significant Studentised Range Test (P.05), these rations fall into different groups according to their feed efficiency, which are as follows :-

Barley	Sorghum- barley	corn- barley	wheat	corn	sorghum
3.19	<u>2.72</u>	<u>2.67</u>	<u>2.55</u>	<u>2.48</u>	<u>2.41</u>

The analysis of variance of slaughter data (Table 11) shows that the various rations were not significantly different (P.05).

Mortality of the experimental chicks largely occurred during the first week which was mainly attributed to a reduced feed intake resulting from darkness prevailing in the brooders. When this condition was corrected, death losses were minimised. However, in no case was mortality judged to be associated with rations per se. Table 12 summarizes mortality data.

Table 11. Analysis of variance of slaughter data of chicks fed on different rations.

Source of variation	Degrees of freedom	sum of square	mean square	F.	5% point of F.
Replications	2	58.50	29.25	5.14	
Treatment groups	5	16.17	3.23	.56	3.33
Error	10	56.84	5.68		
Total	17	131.51			

Table 12. Mortality of chicks fed on different rations containing various cereal grains and combinations.

Replication	Number of chicks	Corn	Sorghum	Wheat	Barley	Corn-barley	Sorghum-barley	Mortality percentage
1	600	4	6	15	9	16	12	10.0
2	600	3	3	4	1	1	8	3.3
3	600	0	3	0	1	0	7	1.8
Total	1800	7	12	19	11	17	27	5.0

Conclusions and summary.

The study on the comparative value of corn, sorghum, wheat, barley and various combinations was designed after a randomise block and was conducted at a commercial broiler farm owned and operated by Hassan Shuman. There were three replications, each of six weeks duration, which were started at weekly intervals. The overall feeding period lasted for eight weeks and involved 1800 chicks. These chicks were raised on wire screen bottom battery brooders, heated by circulating hot water. The only variables being cereal grains which were mixed with commercial feed supplement in the ration of 60:40. Thus, the six different treatments were corn, sorghum, wheat, barley, corn-barley and sorghum-barley. Comparisons were based on weekly rates of gain, feed consumption, and feed conversion. Data on the last characteristic was obtained by using the average feed consumption and weight of chicks at six weeks of age.

Appropriate statistical tests indicate that the growth rate of broilers were highest when fed sorghum, corn or wheat with all three being equal, while barley gave the poorest performance. Thus, it follows that, rations high in fiber give the poorest results. Concerning feed consumption, the experimental rations (grains), follow an ascending order of sorghum, corn, wheat, corn-barley, sorghum-barley and barley. Also apparent is the fact that high fiber rations are consumed in the greatest quantity. With respect to feed conversion, sorghum, corn and wheat were the best and constitute one group. Rations containing cereal combinations were next and formed one group with barley falling in a class by itself and giving the poorest results. Treatment had no effect

on slaughter data nor on chick mortality. Based upon these findings, appropriate tables were compiled permitting the choice of the most economical rations as cereal grain prices fluctuate.

The results of this experiment refute the local opinion of the superiority of corn and establishes the concept, that under Lebanese conditions of commercial broiler production, sorghum is the most economical of the various cereal grains studied.

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