DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

POULTRY DIVISION

REPORT OF THE DOMINION POULTRY HUSBANDMAN

F. C. ELFORD

FOR THE YEAR 1926

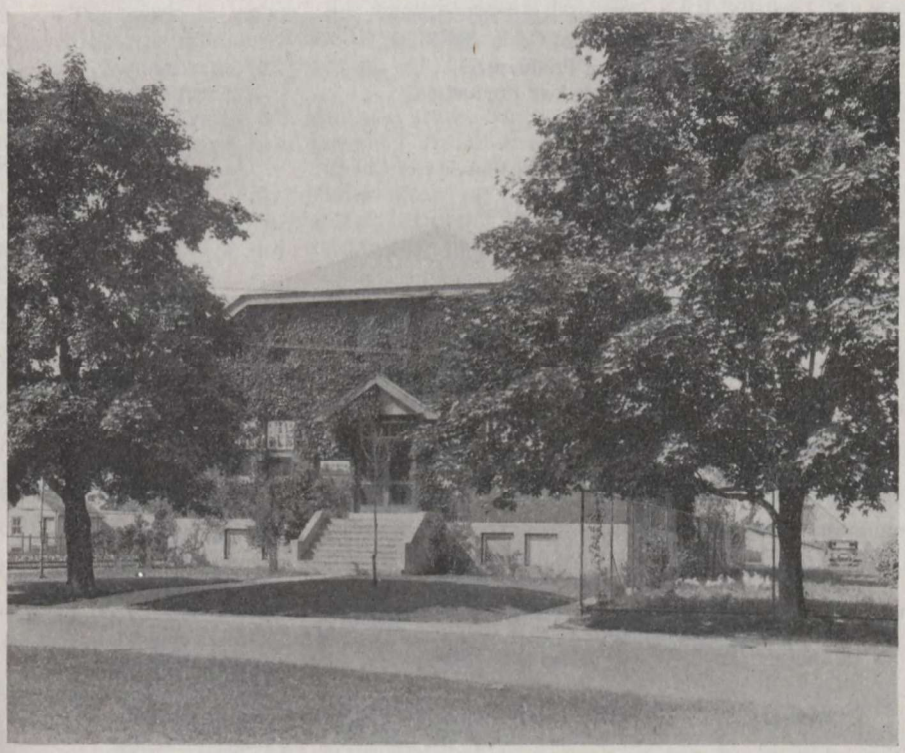

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TABLE OF CONTENTS

POULTRY DIVISION

REPORT OF THE DOMINION POULTRY HUSBANDMAN F. C. ELFORD

General Conditions

An unusually cold and backward spring hindered early hatching, and pullets did not have the general average maturity at the time they went into winter quarters. As a result new-laid eggs were not as plentiful and prices were good.

The regulations imposed last year upon the importation of day-old chicks meant a fewer number of chicks being brought in from the United States. According to Customs figures not quite one-half the number that were reported for 1925 came in during 1926.

The outstanding feature in the dressed poultry trade was the price of Christmas turkeys; from 45 cents to 70 cents was paid on Canadian markets. The crop was reported as large as usual but apparently a larger proportion found their way to United States markets.

Work of the Division

The work in general has been quite satisfactory. All through the system hatching was not as successful as usual. As a rule, however, young stock grew well. The demand for breeding cockerels with pedigrees is increasing each year, and at higher prices.

The egg-laying contests still prove very popular as a medium for registration. The demand from breeders for space is greater, in most contests, than the space available.

The practice adopted a few years ago, of resting and cleaning the permanent yards upon the central plant at Ottawa is being strictly adhered to. An illustration of the cultivated yards appears in this report which shows the thoroughness of this method.

Fresh land for the rearing of chicks continues to be a problem at Ottawa. This year through the kindness of the Tobacco Division, a small strip of alfalfa used in a tobacco rotation was obtained, and upon this the chicks were brooded after they left the brooder house and before they were put upon range. An illustration of this is given to show the ideal conditions such a patch of alfalfa provides for young chicks.

During the year Mr. W. W. Lee, who for the past year has been in charge of the experimental work, resigned and H. S. Gutteridge, a graduate of the University of British Columbia, was appointed to the vacancy. Mr. Gutteridge is responsible for that part of this report that deals with experimental work.

As usual Mr. George Robertson supervised the breeding work, including the experiments in that line, and he has prepared that part of this report. Mr. A. G. Taylor has charge of egg-laying contests and registration and has prepared the report upon these. Mr. McConnell is responsible for the poultry survey conducted by the Division and, in co-operation with the Division of Extension and Publicity, for the Exhibits.

The work on poultry diseases conducted by the Health of Animals Branch in co-operation with this Division has grown during the year. A brief report of the work prepared by C. H. Weaver, Pathologist is included in this Report.

Preparations for the World's Poultry Congress added much to the work of the divisional staff during the year. The General Director of the Congress is the Dominion Poultry Husbandman.

BREEDING

In this branch of the work steady progress is being made. On most of the farms high egg producing lines have been established and more attention is now being paid to the improvement in size, type and colour in the birds.

The most notable instance of high production from the Farm flocks during the past year was that of the Agassiz Farm's Barred Rocks in the British Columbia contest where they made a World's record for a ten-bird Barred Rock pen of 2,461 eggs and an individual record for Barred Rocks with a bird giving the great production of 326 eggs which averaged 27 ounces to the dozen.

An equally, if not more striking production is that made at the Kapuskasing Farm in northern Ontario where a flock of Barred Rocks averaged 217 eggs with individual production close to the 300-egg mark. At Kapuskasing the temperature in winter is very low and a few years ago it was thought impossible to get high production there.

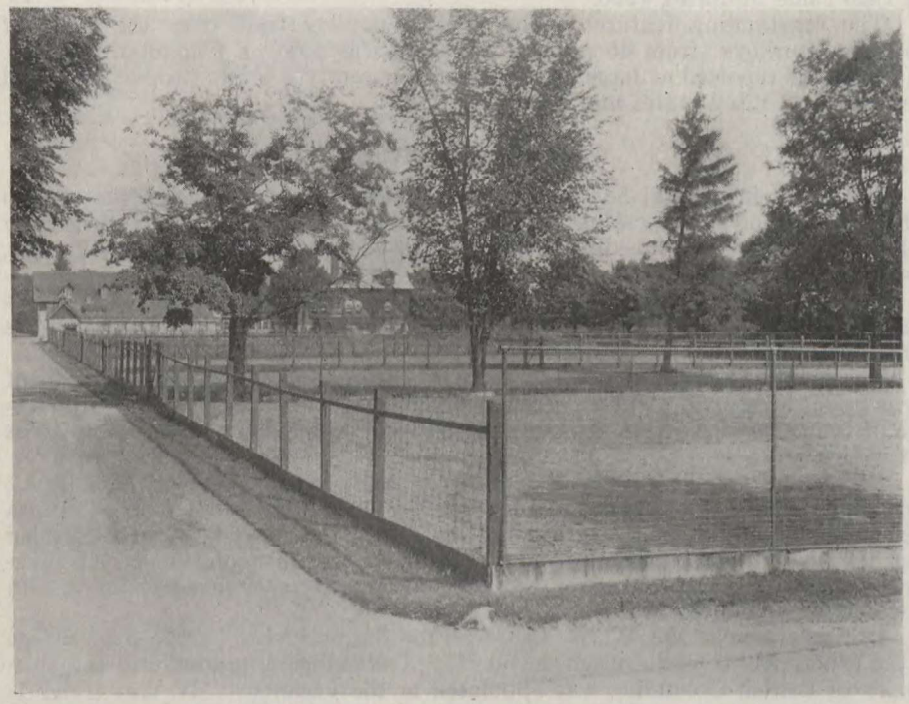


FIG. 1.—Cleaning runs with alfalfa and tobacco.

During the past season the demand for hatching eggs and breeding males has greatly exceeded the supply, and the reports received from purchasers indicated that they had given excellent results.

The death of the Leghorn hen C. 370 is worthy of note as the blood of this hen permeates our whole Leghorn flock. She had wonderful vitality. She was eight years old last spring, when from her were set 32 eggs every one of which was fertile and from which twenty-four strong vigorous chicks were hatched of which 23 were alive at wing-banding age—three weeks.

One of the outstanding features in the rearing of the chicks during the past year was the greatly reduced mortality. As stated in our report for 1925, the test for *Bacterium pullorum* had been applied to our flock and had given quite a heavy reaction.

The removal of all reactors and the breeding only from such birds as had successfully passed the test may not have been entirely responsible for the reduced mortality, but at any rate it is rather significant that the mortality was reduced by fifty per cent.

The stock was again blood-tested this year and showed a reaction of only 1.2 per cent in the case of the hens and 3.5 in the case of pullets as compared with the test of last year of 19.8 for the hens and 23 per cent for the pullets.

Quite extensive breeding has been carried on with water-fowl and a number of breed tests have been conducted, reports to which will be found elsewhere.

Khaki Campbells a breed of ducks comparatively new to Canada have been added to the stock. These ducks have a great reputation in England as egg-producers, so a few hatching eggs were imported to try the ducks out in comparison with the varieties already popular in Canada.

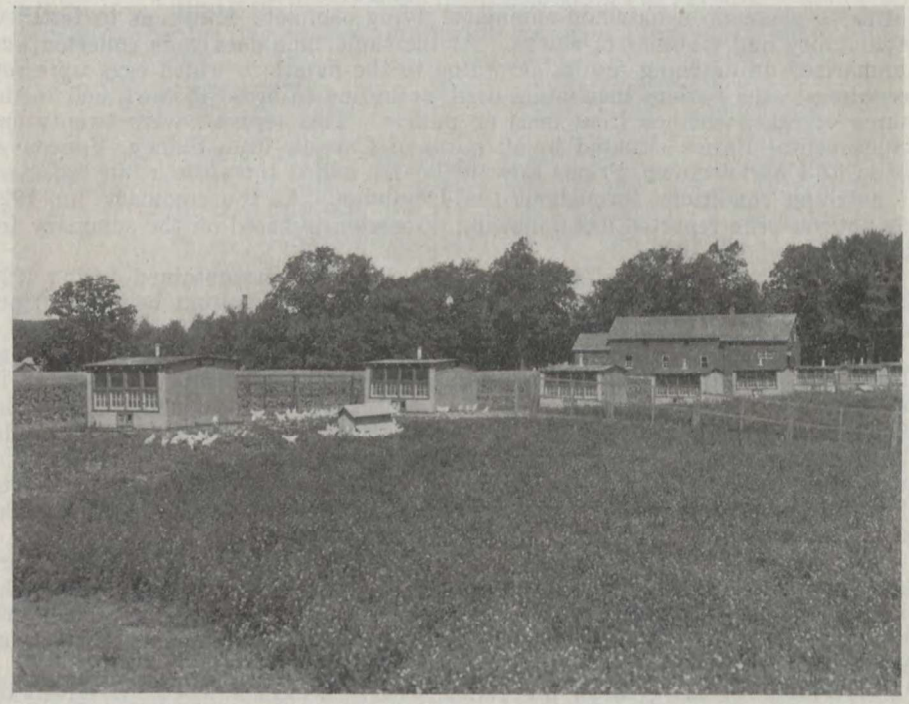


FIG. 2.—Brooding and rearing chicks on alfalfa paddocks.

EXPERIMENTAL WORK

The experimental work of this division has been arranged, in as far as is possible, with a view to seeking out that information which is of greatest value to the practical poultryman. As a result investigation has tended to turn more towards the practical end of poultry husbandry rather than to its more scientific aspects. Experiments embracing incubation, brooding, rearing, marketing, feeding, breeding and egg production, all have their place in the experimental plan. More recently projects covering more advanced investigation with vitamine feeds and ultra-violet light have been carried on and experimental work of this nature will be emphasized to a greater extent in the future.

In going over the subject matter of this report it will be well to bear in mind that as many of the experiments here reported are not yet complete, the data given must be considered only as an interim report and no final conclusions should be drawn. Where it is considered that a project has been caried on over a sufficient period of time and where results obtained justify doing so, definite conclusions have been drawn and constitute the final report on the experiment.

Wherever possible the report includes a summary of each experiment covering the years it has been in progress. In order to make the results obtained as valuable as possible, a brief statement of the results from the various branch Farms is included in the report on each experiment.

HATCHING SUMMARY

It has been the custom for some years past, in conjunction with the branch Farms to make up a hatching summary giving complete details as to fertility, hatchability and viability of chicks. At the same time data were collected and summarized on hatching results according to the month in which eggs were set, according to the various incubators used, according to breed of fowl, and to the source of eggs, whether from hens or pullets. This report covers twenty-one Experimental Farms situated in all parts of Canada from Sidney, Vancouver island, to Charlottetown, Prince Edward Island, and is therefore a fair reflection of hatching conditions throughout the Dominion. As the summary for 1925 has not yet been reported, the following discussion is based on the summary for that year and for 1926.

With regard to fertility, more favourable results were obtained during 1925 than during 1926, the average fertility over the entire system being 82.0 per cent and 78.7 per cent respectively.

The hatchability as indicated by the percentage of fertile eggs hatched was also slightly better in 1925, the comparative figures being 49.5 per cent and 47.4 per cent. An extremely late spring during 1926 in Ontario, Quebec and the Maritime Provinces undoubtedly had considerable influence upon the hatchability, as supplies of fresh greenfeed were lacking and free range was out of the question until quite late in the spring. A difference of 3 per cent in favour of 1925 is shown in viability of chicks up to time of wing-banding (three weeks of age), no doubt at least partly due to the same cause.

With regard to the best month for hatching, the summaries for both years indicate that the chicks hatched during February, March and April showed the highest percentage of viability to three weeks of age. The percentage decreased slowly from February to June showing a drop of about 7 per cent over the five-month period.

During 1925 the greatest percentage of fertile eggs hatched was given by the Jubilee incubators followed closely by the Bluebird, Imperial, and Tamlin (equal), Jewel Hot Air and Queen. In 1926 the order was as follows: Jubilee, Queen, Cyphers, Bluebird, and Tamlin.

The hatchability according to breeds as indicated by the percentage of fertile eggs hatched was in the following order during 1925: Rhode Island Reds, White Leghorns, White Wyandottes, and Barred Rocks. Livability of chicks was best for Rhode Island Reds and Leghorns, and poorest for Wyandottes.

During 1926 hatchability was best for Rhode Island Reds and Wyandottes, and poorest for Barred Rocks. Viability was best for Reds and Leghorns, and poorest for Barred Rocks.

During both years hatchability and viability were considerably better with hens than with pullets.

A hatching summary will be made each year and a brief discussion presented in the annual report.

DURATION OF FERTILITY

During 1924 and 1925 experiments were conducted to determine how long the fertility of one male would last after the introduction of a different male into the breeding pen. Results of these experiments were published in the annual report for those years.

During 1926 the experiment was repeated. As in previous experiments White Leghorn males were mated to Barred Rock females which had previously been mated to Barred Rock males and were giving upwards of 80 per cent fertility. The effect of the White Leghorn and Barred Rock mating would be evidenced by the appearance of white chicks, since such a mating invariably produces white offspring, the white of the Leghorn being a dominant characteristic.

Table 1 shows in detail the results obtained.

TABLE 1.—DETAIL OF RESULTS OBTAINED—DURATION OF FERTILITY

Hen No.	Days																														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
J 1	.	R	R	.	D	W	W	.	W	W	D	.	W	.	W	W	W	W	.	.	.	.	.	.	.	.	.	.	.	.	.	.
J 71	I	.	R	.	.	W	D	.	W	.	.	W	W	.	.	.	W	W	.	W	I	.	.	.	.	W	.	W	W	.	I	D
J 74	.	.	R	R	.	W	D	.	.	W	W	W	.	.	D	W	.	W	W	.	D	W	.	.	.	W	.	W	.	W	.	W
J 85	R	R	.	R	R	R	D	R	W	W	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
J 89	.	.	.	I	.	.	D	.	I	D	D	.	.	I	I	.	I	D	I	.	.	D	.	.	D	W	D	.	I	.	W	.
J 94	I	R	.	I	W	W	.	W	W	W	.	D	.	.	D	.	W	.	W	W	D	.	.	W	.	.	.	W	.	I	.	W
J 98	.	.	.	W	.	W	D	.	W	D	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
J 109	D	R	W	W	.	D	W	D	W	.	.	W	.	W	.	W	W	.	W	W	W	W	.	W	W	W	I	.	W	W	.	.
J 140	.	.	.	R	I	I	I	.	.	.	.	.	W	W	.	.	.	I	I	.	W	W	.	.	.	.	W	.	.	W	.	W
J 154	I	I	.	.	I	D	I	D	I	D	.	W	.	I	.	I	W	I	.	I	I	.	W	D	D	.	I	.	W	.	W	W
J 5	I	I	.	I	I	W	I	W	.	W	W	W	I	D	W	W	W	.	D	W	W	W	W	.	I	.	.	.	W	W	.	.
J 78	.	I	.	I	I	W	W	.	W	.	D	W	W	W	I	.	W	W	D	W	I	.	W	W	D	W	.	I	W	W	.	W
J 99	I	.	.	I	I	I	I	I	.	I	W	I	.	W	W	.	I	I	I	I	I	I	I	.	I	I	W	I	I	W	.	W
J 158	.	I	I	I	.	.	.	I	I	I	.	.	I	.	D	.	W	W	.	.	W	.	W	.	D	.	W	W	W	W	.	.
J 162	.	I	D	I	.	.	.	.	.	I	D	.	.	.	D	D	.	.	.	D	I	W	.	.	.	.	.	W	W	W	.	D
J 164	.	I	.	.	.	W	W	W	W	W	W	.	W	I	W	.	W	W	.	W	W	W	D	D	.	.	.	.	.	.	.	.
J 196	.	I	.	I	.	I	I	.	.	.	I	I	I	.	I	.	I	.	I	I	W	.	W	.	I	.	.	W	.	D	.	I
J 274	R	I	.	W	W	W	W	W	W	I	W	.	W	.	W	W	I	W	W	W	.	W	W	I	W	W	W	.	.	W	W	W
J 279	D	.	I	.	D	.	D	.	D	.	D	.	.	.	D	W	.	.	D	.	W	.	W	.	.	W	.	W	W	.	I	.

Key:—R. indicates a Barred Rock chick, I indicates an infertile egg. D indicates a dead embyro. W a crossbred chick. J 1 to J 154 mated to a cockerel. J 5 to J 279 mated to a 3-year male.

NOTES on table 1.—In 1924 the results of the Leghorn-Rock mating became apparent on the third day after mating, the effect of the previous Barred Rock mating ceasing after the seventh day.

In 1925 the effect of the Leghorn-Rock mating did not appear until the fourth day and the effect of the original Barred Rock mating was evidenced until after the twelfth day.

A study of the table above will show that the effect of the Leghorn-Rock mating was apparent on the second day in one case and was becoming more generally apparent on the third day. The effect of the previous Barred Rock mating was evident until the eighth day in one case although such evidence ceased in all other instances after the third day. It is quite probable that the Leghorn male did not mate with the one Rock hen for several days after the commencement of the experiment.

The males used for the experiment were of good breeding and quite vigorous, one being in its third year and one a cockerel. Although fertility was not so good from the old male the result of the previous Rock mating was not in evidence for a greater number of days than in the case of the younger male.

This experiment will be continued next year and results published in the annual report.

ULTRA-VIOLET RAYS IN INCUBATION

In keeping with experimental work being carried on to determine the effect of ultra-violet rays on fertility, hatchability and growth of chicks, an experiment was started in the spring of 1926 to determine the effect, if any, of exposing eggs under process of incubation to ultra-violet rays.

A Miller's Ideal incubator was set on June 17 with 480 eggs, 120 to the tray. One tray of the four was subjected to the rays from a mercury arc Ultra-violet ray lamp for a period of ten minutes daily.

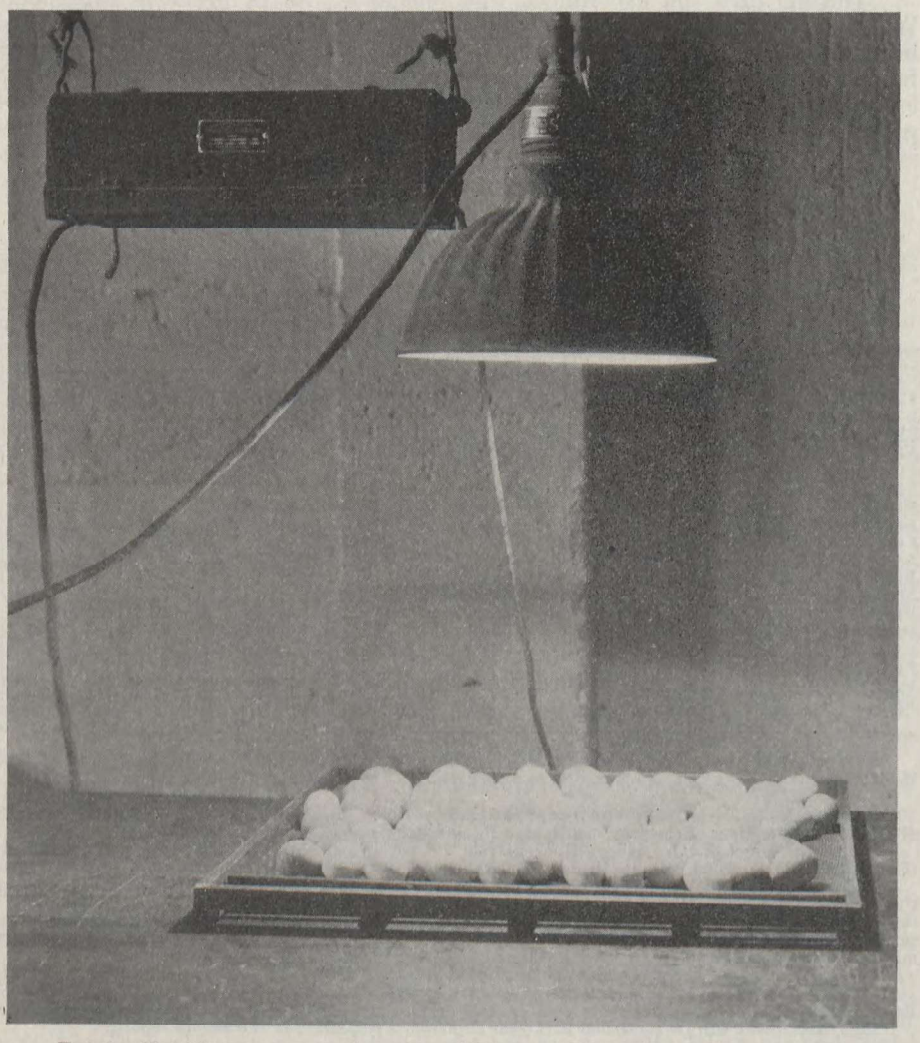


FIG. 3.—Hatching eggs exposed to ultra-violet rays from a Cooper-Hewitt quartz mercury arc lamp.

While the incubator was in operation it was noticed that the evaporation of water from the heater was very great, some having to be added daily, and that a correspondingly heavy evaporation was taking place from the eggs, the air-cell appearing much too large. Table 2 shows in detail the hatching results obtained.

TABLE 2.—DETAIL OF HATCHING RESULTS—ULTRA-VIOLET RAYS

Treatment	Total number set	Fertile	Blood rings	Dead germs	Dead in shell	Hatched	Per cent fertile	Percent fertile hatched	Per cent total hatched	Per cent fertile dead in shell
No special treatment....	360	264	11	56	89	108	73·3	40·9	30·0	33·7
Ultra-Violet Rays.....	120	33	.....	13	31	43	72·5	50·0	36·0	35·6

NOTES.—A study of the table shows that a greater percentage of fertile eggs was hatched from the tray under Ultra-Violet Ray treatment than from the check trays. The percentage of chicks dead in shell, however, was slightly greater and was no doubt a direct result of too great evaporation, as mentioned above. The fact that the chicks from the tray under treatment were not so strong as the controls and that their down was badly stuck together would tend to support this contention. The results being somewhat indefinite, the experiment will be continued during 1927.

MOISTURE IN THE INCUBATOR

In order to determine the best method of supplying moisture to eggs under process of incubation an experiment was carried on at the Central Farm in which moisture was supplied in varying amounts by three different methods.

Cyphers incubators, under exactly similar room conditions and with the same degree of ventilation, were set at two different periods with the following variations in the supply of moisture. One incubator was supplied with moisture in the regular method, namely, by the insertion of moisture trays beneath the eggs; another received moisture by means of pads made of thin boards wrapped to a depth of about three-quarters of an inch with cheesecloth dipped in warm water from time to time and suspended above the eggs; in a third incubator a combination of these two methods was used. As a check on these an incubator was run through the hatch without a supply of moisture of any kind .

The average relative humidity in the different incubators was as follows:—

	Per cent
No moisture	43
Moisture trays only	56
Moisture pads only	63
Moisture trays and pads	71

The object in placing the pads above the eggs was to have the moisture supply where the air was hottest and where a greater amount of moisture would be absorbed. The moist air then being cooler would settle slowly through the eggs to the bottom of the machine and thus more dry air would be constantly coming in contact with the pad. That this is what actually happened is demonstrated by the fact that there was a 7 per cent greater relative humidity in the machine equipped with pads alone than in that with trays under the eggs.

Table 3 shows hatching results in detail from all machines for both hatches and also an average of the two.

TABLE 3.—MOISTURE IN THE INCUBATOR

Treatment	Total No. eggs set	Infertile	Blood rings	Dead germs	Dead in shell	Total hatched	Per cent fertile	Per cent fertile hatched	Per cent total hatched	Per cent fertile dead in shell
No moisture...	200	49	3	27	36	85	75·5	56·3	42·5	23·8
" ...	200	53	8	11	44	84	73·5	57·1	42·0	29·9
Total.....	400	102	11	38	80	169	74·5	56·7	42·2	26·9
Moisture pans and pads.....	120	26	3	10	19	62	78·3	65·9	51·7	20·2
" "	100	26	1	14	12	47	74·0	63·5	47·0	16·2
Total.....	220	42	4	24	31	109	76·4	64·8	49·1	18·4
Moisture pads only.....	100	26	1	20	10	43	74·0	58·1	43·0	13·5
" "	120	29	.....	14	30	47	75·9	51·6	39·1	32·9
Total.....	220	55	1	34	40	90	75·0	54·9	49·9	24·2
Moisture pans only.....	100	24	0	12	12	52	76·0	68·5	52·0	15·8
" "	120	24	3	7	18	68	80·0	89·6	56·7	18·7
Total.....	220	48	3	19	30	120	78·2	69·8	54·5	17·4

NOTES.—The best hatchability, as judged by percentage of fertile eggs hatched and obtained from the incubator in which moisture was supplied in the usual method by moisture trays.

In considering successful results from a moisture standpoint, it is necessary to take into account the percentage of chicks dead-in-shell, and in this respect the incubators with moisture trays and pads and with trays alone are outstanding. The chicks from these machines were hatched on the twentieth day and were more lively and better fluffed out than were those from the other incubators.

No conclusions may yet be safely drawn from this experiment and it will be continued during 1927.

STARVATION PERIOD FOR CHICKS

In the spring of 1925 an experiment was carried on with a view to determining the time that should elapse before giving chicks their first feed after incubation. Since no clear and definite results were obtained at that time the same experiment was repeated in 1926.

Four lots of fifty chicks were placed in the experimental brooder house under identical conditions except for the order of feeding.

Lot No. 1 was fed immediately upon entering the brooder after incubation.

Lot No. 2 fed after 24 hours in the brooder.

Lot No. 3 fed after 36 hours in the brooder.

Lot No. 4 fed 48 hours after entering the brooder.

The same ration was fed to all four lots, they were weighed at the beginning and end of the experiment (three weeks' duration) and careful account kept of all feed consumed.

TABLE 4.—DETAIL—STARVATION PERIOD FOR CHICKS

Lot No.	Number of chicks	Mortality	Per cent mortality	Feed consumed		Total gain in weight	Gain per pound of feed consumed
				Mash	Grain		
				lb.	lb.	lb.	oz.
1.....	50	2	4	23·4	4·0	8·3	4·8
2.....	50	2	4	23·1	4·0	8·0	4·7
3.....	50	2	4	20·4	4·0	7·7	5·1
4.....	50	3	6	18·0	4·0	6·7	4·8

NOTES.—It will be noted that the total gain in weight during the three week period diminished correspondingly with the length of time during which no feed was given. On the other hand the gain per pound of feed consumed was greater for the latest fed pens showing that they made greater use of this feed than did those receiving feed soon after hatching. With regard to mortality nothing definite may be said, pen 4 being the only one in which any increase is noted.

In view of the fact that such indefinite results have been obtained this experiment will be continued next year when a more complete report will be submitted.

VITAMINE FEEDS AND VARIED RATIONS

With a view to ascertaining the best sources of vitamines for brooder chicks an experiment has been carried on during the past three years at the Central Experimental Farm. In 1925 several pens were added to this experiment and various types of rations were tested out from a growth-producing and economy standpoint. These experiments were fully reported in the annual reports for 1923, 1924 and 1925.

During the past year (1926) the experiment was continued, one hatch of 560 chicks being divided into 14 pens of 40 each, due allowance having previously been made for mortality incident to incubation. The feeding of special rations commenced at the first feeding and the chicks were kept confined during the entire three weeks of the experiment, the variation in the ration being the only difference in the treatment accorded all pens.

Accurate record was kept of the daily weight of the chicks, mortality, feed consumed, their condition, and anything worthy of note in the different pens. All dead birds were examined by the Poultry Pathologist and if possible the cause of death determined. At the end of each week their condition as indicated by general appearance was noted down, the following symbols being used: E, Excellent; VG, Very good; G, Good; VF, Very fair; F, Fair.

Except where otherwise stated a basal mash of the following formula was fed: Equal parts by weight of shorts, middlings, corn meal, oat flour, one half part of beef and bone meal and ½ pound of salt for every 100 pounds of mash. The basal ration was completed by the feeding of a commercial chick scratch mixture fed by hand night and morning after the tenth day of the experiment; grit, greenfeed, charcoal and both milk and water to drink. The dry mash was constantly before the chicks in hoppers and greenfeed consisting of chaffed green clover and alfalfa was fed once daily.

Another ration used, known throughout the experiment as Wisconsin ration, consisted solely of dry mash mixture of the following formula: 80 parts of yellow corn meal, 20 parts of middlings, 5 parts of raw bone meal, 5 parts of pearl grit and 1 part of common salt with both milk and water to drink. No scratch grain, moist mash or greenfeed was given.

The following is the arrangement of pens and the special treatment given to each:—

1. Basal ration.
2. Basal ration (replace half the beef and bone meal with milk powder).
3. Basal ration (replace beef and bone meal with milk powder).
4. Basal ration (no animal feed in mash, semi-solid buttermilk ad. lib.).
5. Basal ration (semi-solid buttermilk ad. lib.).
6. Winconsin ration.
7. Basal ration. Larro yeast (1 oz. to 10 lb. mash).
8. Basal ration. Fleischmann's yeast (1 oz. to 10 lb. mash).
9. Basal ration. Crude cod-liver oil (4 teaspoonfuls to 50 chicks).
10. Basal ration. Refined cod-liver oil (4 teaspoonfuls to 50 chicks).
11. Basal ration. (No animal feed in mash) plus raw liver (chopped enough to moisten mash).
12. Basal ration. (No animal feed in mash) plus crude cod-liver oil and raw liver). (2 teaspoonfuls oil and about ½ quantity raw liver given in pen 11).
13. Basal ration. Plus Larro yeast and crude cod-liver oil (same proportions as to pens 7 and 12 respectively).
14. Basal ration. Plus Fleischmann's yeast and crude cod-liver oil (same proportions as to pens 8 and 12 respectively).

TABLE 5.—DETAIL—VITAMINE FEEDS AND VARIED RATIONS

Pen	Ration	Number of chicks at beginning	Average weight	Number of chicks end first week	Average weight	Condition	Number of chicks end of second week	Average weight	Condition	Number of chicks at end of experiment	Average weight	Condition	Total mortality	Percentage mortality	Average gain per chick	Average per cent gain per chick	Average cost of feed per chick alive at end
			oz.		oz.			oz.			oz.			p.c.	oz.	p.c.	cts.
1	Basal ration	40	1·45	40	1·90	V.G.	38	2·53	V.G.	35	3·60	V.G.	5	12·5	2·15	1·48	0·90
2	Basal ration—replace one-half beef and bone meal with milk powder	40	1·32	34	1·19	V.G.	30	3·17	V.G.	30	4·33	V.G.	10	25·0	3·00	2·27	1·28
3	Basal ration—replace beef and bone meal with milk powder	40	1·45	40	2·18	V.G.	38	3·13	V.G.	33	4·27	V.F.	7	17·5	2·49	1·72	1·36
4	Basal ration—no animal feed in mash. Semi-solid buttermilk ad lib	40	1·25	37	1·89	V.G.	37	2·84	V.G.	35	3·49	V.F.	5	12·5	2·24	1·29	2·06
5	Basal ration—semi-solid buttermilk ad lib	40	1·22	36	1·83	V.G.	34	3·12	V.G.	33	4·45	V.G.	7	17·5	3·23	2·65	1·95
6	Wisconsin ration	40	1·28	36	1·75	V.G.	33	2·7	V.G.	33	4·24	V.G.	7	17·5	3·0	2·34	0·84
7	Basal ration plus Larro yeast (1 oz. to 10 lb. of mash)	40	1·12	37	1·78	E.	35	2·66	V.G.	35	3·77	E.	5	12·5	2·57	2·29	1·08
8	Basal ration—plus Fleishmann's yeast (1 oz. to 10 lb. of mash)	40	1·17	38	1·79	V.G.	36	2·72	V.G.	36	3·92	E.	4	10·0	3·0	2·56	1·25
9	Basal ration—plus crude cod-liver oil (4 teaspoonfuls to 50 chicks)	40	1·12	38	1·83	V.G.	38	2·66	V.G.	38	3·63	V.G.	2	5·0	2·3	2·05	1·22
10	Basal ration—plus refined cod liver oil (4 teaspoonfuls to 50 chicks)	40	1·28	36	1·75	V.G.	36	2·36	V.G.	36	3·16	V.G.	4	10·0	2·0	1·56	1·22
11	Basal ration—no animal feed in mash plus raw liver chipped enough to moisten mash	40	1·33	39	1·8	V.G.	39	2·69	V.F.	36	3·45	F.	4	10·0	2·16	1·62	1·41
12	Basal ration—no animal feed in mash plus crude cod oil and liver (2 tea-spoonfuls oil plus half quantity raw liver as to pen 11)	40	1·17	38	1·68	V.G.	38	2·52	E.	38	3·66	V.G.	2	5·0	2·48	2·12	1·37
13	Basal ration—plus Larro yeast plus crude cod oil. Proportions as in pens 7 and 12 respectively	40	1·35	40	2·0	E.	40	2·7	E.	40	2·63	E.	0	0	2·28	1·66	1·23
14	Basal ration—plus Fleishmann's yeast and crude cod oil. Proportions as to pens 8 and 12 respectively	40	1·35	38	1·79	V.G.	37	2·54	V.G.	36	3·39	V.G.	4	10·0	2·04	1·51	1·34

NOTES.—Taking the various rations into consideration (pens 1–6) the greatest percentage gains were made by pen 5 receiving the basal ration plus semi-solid butter milk ad lib. followed by pen 6 receiving the Wisconsin ration. The chicks of this last pen made most economical gains, it costing only 0·84 cents per chick as compared with 0·90 cents for the basal ration. Economical gains were also made by pen 2 with the basal ration, substituting half beef and bone meal with milk powder.

With regard to the feeds under experiment as sources of vitamines, the greatest percentage gains were made by pen 8 receiving the basal ration plus Fleischmann's yeast followed by pen 7 with the basal ration and Larro yeast. It will also be noted that such gains were made at a very reasonable cost per chick.

High percentage gains were made at a reasonable cost by pens 12 and 9, both receiving crude cod-liver oil and the former also raw liver with no meat and bone meal in the mash. The mortality in these pens was quite low being excelled only by pen 13 receiving both crude cod-liver oil and Larro yeast.

Leg weakness was not prevalent during the experiment except in the case of pen 11 receiving the basal ration minus its meat and bone meal and wet mash with raw liver. The chicks of this pen, having neither meat meal, yeast or cod liver oil, were forced to rely almost solely on the raw liver for both minerals and vitamines.

Fourteen chicks suffering from leg weakness in varying stages of severity were, on the completion of the experiment, fed refined cod-liver oil. The entire fourteen were in good condition and gaining weight after seven days of treatment.

Table 6 shows the details of the experiment for three years and the average for that time.

TABLE 6.—DETAILED SUMMARY—THREE YEARS—VITAMINE FEEDS AND VARIED RATIONS

Ration	Year	Number of chicks at beginning	Average weight	Number chicks end of first week	Average weight	Condition	Number chicks end of second week	Average weight	Condition	Number chicks at end	Average weight	Condition	Total mortality	Per cent mortality	Average gain per chick	Average per cent gain per chick	Average cost of feed per chick alive at end
			oz.		oz.			oz.			oz.			p.c.	oz.	p.c.	cts.
Basal ration	1924	40·0	1·3	35·0	1·94	E	35·0	3·14	VG	34·0	4·94	G	6·0	15·0	3·64	280	1·8
	1925	50·0	1·28	50·0	2·16	VF	50·0	3·67	VG	48·0	5·23	VG	2·0	4·0	3·95	309	1·6
	1926	40·0	1·45	40·0	1·9	VG	38·0	2·53	VG	35·0	3·6	VG	5·0	12·5	2·14	148	0·90
Average	.....	43·3	1·34	41·7	2·0	.....	41·0	3·11	.....	39·0	4·59	.....	4·3	10·5	3·25	243	1·4
Larro yeast	1924	40·0	1·37	40·0	2·07	G	40·0	3·2	VG	40·0	4·45	VG	.....	.....	3·08	225	1·9
	1925	50·0	1·28	50·0	2·28	VG	49·0	3·88	E	49·0	5·35	VG	1·0	2·0	4·07	318	2·2
	1926	40·0	1·12	37·0	1·78	E	35·0	2·66	VG	35·0	3·77	E	5·0	12·5	2·57	229	1·08
Average	.....	43·3	1·26	42·3	2·04	.....	41·3	3·25	.....	41·3	4·19	.....	2·0	4·8	3·24	257	1·73
Fleischmann's Yeast	1924	40·0	1·32	39·0	2·05	VF	38·0	3·21	VG	37·0	4·68	G	3·0	7·5	3·36	254	2·1
	1925	50·0	1·22	49·0	2·14	G	49·0	3·71	VG	49·0	5·1	VG	1·0	2·1	3·88	318	2·0
	1926	40·0	1·17	38·0	1·79	VG	36·0	2·72	VG	36·0	3·92	E	4·0	10·0	3·0	256	1·25
Average	.....	43·3	1·24	42·0	1·99	.....	41·0	3·21	.....	40·7	4·57	.....	2·7	6·5	3·41	275	1·78
Refined cod-liver oil	1924	40·0	1·37	39·0	2·13	VF	39·0	3·41	VG	39·0	5·13	VG	1·0	2·5	3·76	274	2·3
	1925	50·0	1·18	47·0	2·04	VF	46·0	3·61	G	45·0	5·04	G	5·0	10·0	3·86	327	1·9
	1926	40·0	1·28	36·0	1·75	VG	36·0	2·36	VG	36·0	3·16	VG	4·0	10·0	2·0	156	1·22
Average	.....	43·3	1·28	40·7	1·97	.....	40·3	3·13	.....	40·0	4·44	.....	3·3	7·5	3·21	250	1·81

TABLE 6.—DETAILED SUMMARY—THREE YEARS—VITAMINE FEEDS AND VARIED RATIONS—*Concluded*

Ration	Year	Number of chicks at beginning	Average weight	Number chicks end of first week	Average weight	Condition	Number chicks end of second week	Average weight	Condition	Number chicks at end	Average weight	Condition	Total mortality	Per cent mortality	Average gain per chick	Average per cent gain per chick	Average cost of feed per chick alive at end
			oz.		oz.			oz.			oz.			p.c.	oz.	p.c.	cts.
Raw liver	1924	40·0	1·3	38·0	2·03	VG	38·0	3·29	G	38·0	4·76	VF	2·0	5·0	3·46	266	1·8
	1925	50·0	1·18	46·0	1·96	F	45·0	3·18	VF	41·0	4·54	F	9·0	18·0	3·36	285	1·7
	1926	40·0	1·33	39·0	1·8	VG	39·0	2·69	VF	36·0	3·45	F	4·0	10·0	2·16	162	1·41
Average	.....	43·3	1·27	41·0	1·93	.....	40·7	3·05	.....	38·3	4·25	.....	5·0	11·0	2·99	235	1·14
Cod-liver oil and raw liver	1924	40·0	1·22	36·0	1·72	F	36·0	2·97	G	36·0	5·06	VF	4·0	10·0	3·84	315	2·7
	1925	50·0	1·22	46·0	1·8	F	46·0	3·98	F	45·0	4·13	F	5·0	10·0	2·91	239	1·7
	1926	40·0	1·17	38·0	1·68	VG	38·0	2·52	E	38·0	3·66	VG	2·0	5·0	2·48	212	1·37
Average	.....	43·3	1·20	40·0	1·73	.....	40·0	3·16	.....	39·7	4·20	.....	3·7	8·3	2·9	242	1·92
Cod-liver oil and Larro yeast	1924	40·0	1·3	39·0	1·87	F	39·0	3·05	VF	39·0	4·62	F	1·0	2·5	3·32	255	2·5
	1925	50·0	1·28	49·0	1·98	VF	48·0	3·21	VF	47·0	4·57	VF	3·0	6·0	3·29	257	1·9
	1926	40·0	1·35	40·0	2·0	E	40·0	2·7	E	40·0	3·63	E	.....	.....	2·28	166	1·23
Average	.....	43·3	1·31	42·7	1·95	.....	42·3	2·99	.....	42·0	4·27	.....	1·3	2·8	2·96	266	1·88
Cod-liver oil and Fleischmann's yeast	1924	40·0	1·21	38·0	1·82	F	38·0	2·76	VF	38·0	4·26	G	2·0	5·0	2·99	235	2·7
	1925	50·0	1·2	47·0	2·09	VF	47·0	3·43	VF	46·0	4·89	VF	4·0	8·0	3·69	308	2·0
	1926	4·00	1·35	38·0	1·79	VG	37·0	2·54	VG	36·0	3·39	VG	4·0	10·0	2·14	151	1·3
Average	.....	43·3	1·27	41·0	1·9	.....	40·7	2·91	.....	40·0	4·18	.....	3·3	7·7	2·94	231	2·01

NOTES.—Taking average percentage gains into consideration the pens range themselves into the following order: Those receiving Fleischmann's yeast, Larro yeast, refined cod-liver oil, basal ration, crude cod-liver oil plus raw liver, and raw liver.

Although the experiment has not yet been carried on over a sufficient period of time to justify definite conclusions it would appear that yeast and cod-liver oil tend to increase the efficiency of the basal ration the latter being a potent factor in the prevention of rickets.

The experiment will be continued during 1927.

THE EFFECT OF SUNLIGHT UPON GROWTH OF CHICKS

During 1925 an experiment was carried on to determine the effect of sunlight upon growing chicks. In 1926 this experiment was continued and its scope somewhat widened to include the effect of sunlight through glass-substitute and of ultra-violet rays as supplied by a mercury-arc ultra-violet-ray lamp.

Ten pens of chicks, hatched on August 6, 1926, were carefully culled to allow for incubator mortality and started on experiment on August 9. The chicks were carried in the experimental brooder house in ten pens, forty-five to the pen, and over a period of three weeks.

The following is a detailed plan of the experiment:—

Pen No. 1—Basal ration plus direct sunlight.
Pen No. 2—Basal ration plus direct sunlight plus crude cod-liver oil.
Pen No. 3—Basal ration plus indirect sunlight.
Pen No. 4—Basal ration plus indirect sunlight plus crude cod-liver oil.
Pen No. 5—Basal ration plus sunlight through glass-substitute.
Pen No. 6—Basal ration plus sunlight through glass-substitute plus crude cod-liver oil.
Pen No. 7—Basal ration plus no sunlight.
Pen No. 8—Basal ration plus no sunlight plus crude cod-liver oil.
Pen No. 9—Basal ration plus ultra-violet light.
Pen No. 10—Basal ration plus ultra-violet light plus crude cod-liver oil.

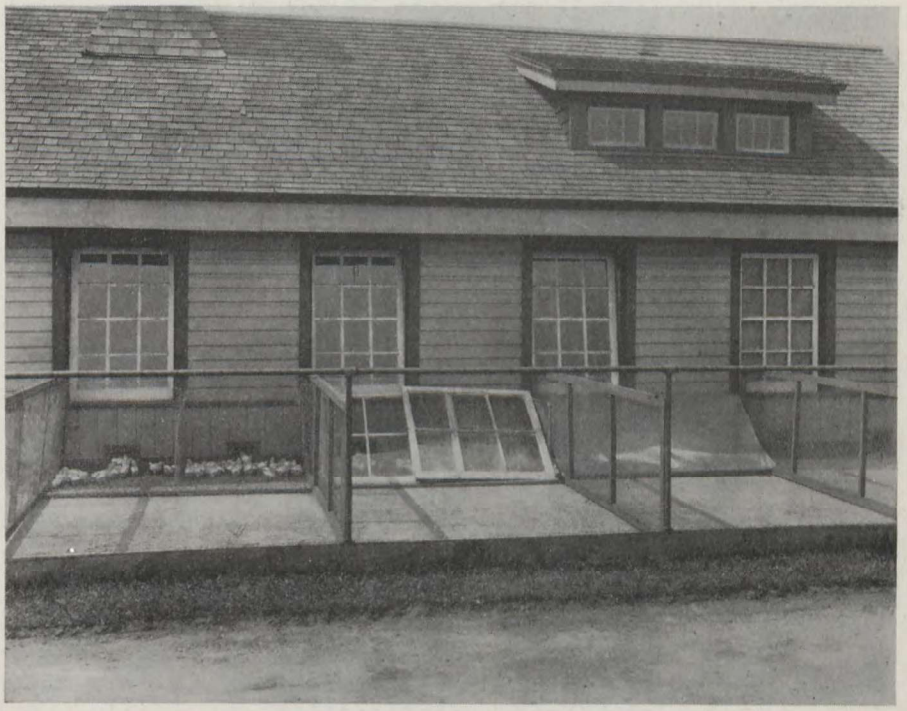


FIG. 4.—Chicks undergoing varied treatment with sunlight. (Left to right)—Chicks receiving sunlight direct; sunlight through window glass; sunlight through glass-substitute; and receiving no sunlight. Note that sunlight is shut out entirely by brown wrapping-paper in window on the extreme right.

Direct sunlight was obtained by removing the windows entirely from pens 1 and 2. Indirect sunlight refers to sunlight through common glass which is considered to filter out the ultra-violet rays of the sun. The chicks receiving sunlight through a glass-substitute were allowed out into a very small run on cement completely closed in with this material. In the case of those pens receiving no sunlight, sunlight was excluded by closing the pen in with brown wrapping-paper, using a strong electric light in order that the chicks might see to eat. The chicks receiving the ultra-violet-ray treatment were exposed to the rays from a mercury-arc ultra-violet-ray lamp, suspended 2 feet above them and burning for a period of 10 minutes daily.

The basis of the whole experiment rests upon the supposition that the ultra-violet rays of the sun are essential to proper growth and assimilation in chicks. These rays have been considered indispensable to proper bone formation and therefore to be preventative of rickets. In pens 1 and 2 they are supplied by the sun direct; in pens 3 and 4 they are supposedly filtered out by glass; in 5 and 6 they are supposedly allowed through by the glass-substitute, in 7 and 8 they are entirely lacking, and in pens 9 and 10 they are supplied by the Uviaric lamp. Cod-liver oil, being a good source of the anti-rachitic vitamine is considered to be of great value in the prevention or rickets and it was therefore fed to a duplicate pen receiving each sunlight treatment as outlined above. Table 7 gives detailed results of the experiment:—

TABLE 7.—EFFECT OF SUNLIGHT ON GROWTH OF CHICKS

Pen	Special treatment and feed	Number of chicks at beginning	Average weight	Number of chicks end first week	Average weight	Condition	Number of chicks end second week	Average weight	Condition	Number of chicks end third week	Average weight	Condition	Number of chicks end fourth week	Average weight	Condition	Number of chicks end fifth week	Average weight	Condition	Number of chicks end sixth week	Average weight	Condition	Total mortality	Per cent mortality	Average gain per chick	Average per cent gain per chick
			oz.		oz.			oz.			oz.			oz.			oz.			oz.			p.c.	oz.	
1	Basal ration plus direct sunlight	45	1·47	43	2·16	G	43	3·42	G	41	4·83	VF	39	6·69	G	39	7·97	G	38	9·29	G	7	15·55	7·82	531·9
2	Basal ration, plus direct sunlight plus cod-liver oil	45	1·47	44	2·20	G	44	3·52	VG	44	4·73	VG	44	4·86	G	44	7·07	G	43	8·60	G	2	4·44	7·13	485·0
3	Basal ration, plus sunlight through glass	45	1·47	44	2·25	G	43	3·58	G	42	4·90	G	41	6·24	F	38	7·26	F	34	9·41	VF	11	24·4	7·94	540·1
4	Basal ration, plus sunlight through glass, plus cod-liver oil	45	1·47	43	2·14	VG	42	3·59	VG	42	4·95	G	42	6·52	G	42	7·79	G	42	8·88	G	3	6·66	7·41	504·1
5	Basal ration, plus sunlight through glass-substitute	45	1·42	45	2·11	G	44	3·50	G	44	4·75	G	42	5·90	G	42	7·83	G	40	9·55	G	5	11·11	8·13	572·5
6	Basal ration, plus sunlight through glass-substitute plus cod-liver oil	45	1·38	45	2·00	G	44	3·23	VG	43	4·35	G	42	6·21	G	41	7·92	G	41	9·09	G	4	8·88	7·71	558·7
7	Basal ration, plus no sunlight	45	1·38	44	2·00	G	42	3·24	G	42	4·00	F	39	5·18	P	38	6·13	P	32	7·35	VP	13	2·88	6·33	458·6
8	Basal ration, plus no sunlight, plus cod-liver oil	45	1·47	44	2·05	G	44	3·14	G	41	4·29	G	40	5·90	F	39	7·77	F	39	9·31	F	6	13·33	7·84	533·3
9	Basal ration, plus ultra violet rays	45	1·47	44	2·23	G	42	3·52	G	42	4·66	G	37	5·51	G	33	7·15	G	31	7·77	F	14	31·11	6·30	428·6
10	Basal ration, plus ultra violet rays, plus cod-liver oil	45	1·38	42	2·02	VG	42	3·05	G	41	4·14	G	40	5·32	VG	37	8·00	G	35	8·46	G	10	22·22	7·08	513·0

NOTES.—The greatest percentage gains were made by the chicks receiving sunlight through glass-subetitute followed closely by those receiving sunlight through glass-substitute plus crude cod-liver oil.

The lowest percentage gains were made by the chicks exposed to ultra-violet rays and without cod-liver oil. While those receiving neither sunlight nor cod-liver oil made slightly greater gains than the last mentioned chicks they were very unthrifty in appearance and showed a slight trace of opthalmia, a nutritional disease.

In no case was there any sign of leg weakness.

With regard to the use of cod-liver oil in this experiment, no beneficial results, as evidenced by percentage gains were shown except in the case of the pens receiving the arc lamp treatment and those with no sunlight whatsoever. It may, perhaps, be significant that increased gains should be made through its use in the pens receiving no sunlight in any form.

The greatest percentage mortality occurred in pens 9, 7 and 3 receiving ultra-violet rays from the lamp, no sunlight, and sunlight through glass respectively.

The results as shown by the above table are indefinite and no conclusions may be drawn until the experiment has been continued for several years.

VITAMINE FEEDS FOR REARING

During 1924-25 a certain number of chicks which had been used in the experiment " vitamine feeds and rations for brooder chicks " (See annual report for those years) were carried over and used for a further experiment to determine the value of vitamine feeds during the rearing period. This was again done during 1926 and seven pens of birds, twenty-five to the pen were carried over on the same feeds used during the brooding period the proportions only being changed in keeping with the greater size of the chicks.

It was found to be impossible to separate the cockerels and pullets with any surety and as a result the pens were made up with as nearly equal numbers of cockerels and pullets as possible in each. At seven weeks of age these cockerels were removed and the experiment continued for three weeks with pullets only. As a result two tables are given one for a seven-week period covering cockerels and pullets and the other covering the experiment with pullets only.

All pens were looked after by the same attendant and were accorded the same treatment except for the special feeds under consideration. The birds were weighed weekly and their general condition noted. At the end of the seven-week period and after the completion of the experiment all feed was weighed back and consumption calculated. Mortality was noted daily.

The standard basal ration as described in the experiment " vitamine feeds and varied rations " in this report was fed in all but pen 2, which received " Wisconsin ration " also described in the experiment mentioned.

The arrangement of pens and the special feed given were as follows:—

Pen 1—(Control) Basal ration.

Pen 2—Wisconsin ration.

Pen 3—Basal ration plus crude cod-liver oil (2 tablespoonfuls 1 ounce per pen per day, gradually increased to ½ tablespoonful per bird per day.

Pen 4—Basal ration plus refined cod-liver oil (as for pen 3).

Pen 5—Basal ration plus raw liver (enough to moisten the wet mash); no beef meal in mash.

Pen 6—Basal ration plus Larro yeast (1 pound to 100 pounds of dry mash).

Pen 7—Basal ration plus Fleischmanns yeast (½ pound to 100 pounds of dry mash).

The cost of the different feeds was: Basal mash $2.13 per cwt.; Basal mash without meat meal $2 per cwt.; Wisconsin ration $1.98 per cwt.; Fleischmanns yeast 98 cents per pound; Larro yeast 60 cents per pound; crude cod-liver oil $1 per gallon; refined cod-liver oil $2.40 per gallon; raw liver 5 cents per pound.

The following tables are worked out on the basis of one bird because of the fact that after the removal of the cockerels the number of birds varied in different pens:—

TABLE 8.—DETAIL—VITAMINE FEEDS FOR REARING

First Period

Pen	Special feed	Number of chicks	Beginning	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	Total gain	Per cent gain	Per cent mortality	Special feed consumed	Value	Value total feed consumed	Pounds of feed per pound of gain	Condition at beginning	Condition at end of experiment
			oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	p.c.	p.c.	oz.	c.	c.			
1	Basal ration (control)	25	3·80	5·21	7·22	9·82	13·04	15·30	18·82	22·25	18·45	485·5	8·0	.....	.....	12·6	5·45	VG	VG
2	Wisconsin ration	25	4·36	6·08	8·62	11·33	14·80	12·33	20·21	24·50	20·14	461·9	4·0	.....	.....	8·4	3·48	VG	VG
3	Basal ration and crude cod-liver oil	25	3·68	4·56	6·70	10·00	12·25	15·00	18·17	21·46	17·78	483·2	4·0	6·35	4·31	14·9	4·69	VG	VG
4	Basal ration and refined cod-liver oil	25	3·40	4·64	6·68	9·44	12·44	15·36	18·84	23·08	19·68	578·8	4·0	6·35	10·80	24·1	4·99	VG	VG
5	Basal ration and raw liver	25	3·72	5·42	7·71	10·83	14·17	16·40	20·66	24·08	20·36	547·3	4·0	24·5	7·59	19·59	4·00	G	VG
6	Basal ration and Larro yeast	25	3·84	5·76	7·92	10·40	13·44	16·00	18·64	21·52	17·68	460·4	.....	0·56	2·07	13·97	6·05	E	E
7	Basal ration and Fleischmann's yeast	25	4·04	5·84	8·12	10·88	14·44	17·68	21·48	24·92	20·88	516·8	.....	0·23	1·38	13·38	5·08	VG	E

Second Period

Pen	Special feed	Number of chicks	7th week	8th week	9th week	10th week	Total gain	Per cent gain	Per cent mortality	Special feed consumed	Value	Value total feed consumed	Pounds of feed per pounds of gain	Condition at beginning	Condition at end of experiment
			oz.	oz.	oz.	oz.	oz.	p.c.	p.c.	oz.	c.	c.			
1	Basal ration	11	20·00	22·90	26·18	28·58	8·58	42·9	.....	.....	.....	7·55	3·61	VG	VG
2	Wisconsin ration	9	22·44	25·88	28·55	31·55	9·11	45·9	.....	.....	.....	6·16	2·47	VG	VG
3	Basal ration and crude cod-liver oil	10	20·80	24·00	26·80	30·10	9·30	44·7	.....	5·30	3·60	12·45	3·60	VG	VG
4	Basal ration and refined cod-liver oil	8	20·00	22·50	26·30	29·14	9·14	45·7	12·5	5·30	9·01	19·58	2·10	VG	VG
5	Basal ration and raw liver	12	22·66	25·66	28·66	31·25	8·59	32·9	.....	10·5	3·25	11·46	4·25	VG	VG
6	Basal ration and Larro yeast	15	20·26	23·73	27·00	30·27	10·01	49·4	.....	0·12	0·44	9·84	3·86	E	E
7	Basal ration and Fleischmann's yeast	8	20·62	24·00	26·88	29·50	8·88	43·6	.....	0·02	0·12	6·63	3·04	E	E

NOTES.—(All figure on the basis of 1 bird.)

During the first period the greatest percentage gains were made by pen 4 receiving refined cod-liver oil followed by the chicks receiving raw liver, Fleischmann's yeast and the basal ration. The lowest percentage gains were made by the chicks receiving the Wisconsin ration and Larro yeast.

The highest mortality was recorded in pen 1 receiving the basal ration followed by pens 2, 3, 4 and 5 each having one-half as great mortality. The pens on yeast recorded no mortality whatever.

Over the entire ten weeks greatest percentage gains were made by pen 4 receiving refined cod-liver oil followed by the raw liver and Fleischmann's yeast pens in the order named.

Table 9 shows an average of three years of experiments with vitamine feeds.

TABLE 9.—SUMMARY OF THREE YEARS' EXPERIMENTS WITH VITAMINE FEEDS IN REARING

(First seven-week period cockerels and pullets.) Average weight by weeks in ounces.

Year	Special feed	Number of chicks	Beginning	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	Total gain	Per cent gain	Per cent mortality	Special feed consumed	Value	Value total feed consumed	Pounds of feed per pound of gain	Condition at beginning	Condition at end
			oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	p.c.	p.c.	oz.	c.	c.			
1924	Basal ration	25·0	5·32	7·08	9·60	12·04	15·42	19·42	22·67	24·83	19·51	368·0	4·0	.....	.....	10·7	5·5	G	E
1925	Basal ration	27·0	5·12	6·96	9·85	12·44	14·74	19·08	22·78	24·85	19·70	383·0	.....	.....	.....	12·4	3·6	VG	E
1926	Basal ration	25·0	3·80	5·21	7·22	9·82	13·04	15·3	18·82	22·25	18·45	485·5	8·0	.....	.....	12·6	5·45	VG	VG
	Average	25·7	4·75	6·41	8·89	11·43	14·40	17·88	21·42	23·98	19·22	412·0	4·0	.....	.....	11·9	4·85	.....	.....
1924	Larro yeast	25·0	5·08	6·60	9·04	11·00	14·50	18·29	22·00	25·17	20·09	395·0	4·0	0·5	3·0	14·5	5·6	VG	VG
1925	Larro yeast	27·0	4·56	6·33	8·56	11·88	14·16	18·80	22·00	23·64	19·08	418·0	7·4	0·4	2·5	15·3	3·7	VF	VG
1926	Larro yeast	25·0	3·84	5·76	7·92	10·4	13·44	16·00	18·64	21·52	17·68	460·4	.....	0·5	2·1	13·9	6·0	E	E
	Average	25·7	4·49	6·23	8·51	11·9	14·03	17·69	20·88	23·44	18·45	424·0	3·8	4·7	2·5	14·6	5·1	.....	.....
1924	Refined cod-liver oil	25·0	5·68	8·48	10·84	13·36	16·96	21·04	24·96	28·96	23·28	410·0	.....	6·0	8·0	20·3	5·3	E	E
1925	Refined cod-liver oil	27·0	5·19	6·82	8·52	11·26	13·52	17·04	19·78	22·18	16·99	327·0	.....	2·4	3·8	15·6	3·9	E	E
1926	Refined cod-liver oil	25·0	3·40	4·64	6·68	9·44	12·44	15·36	18·84	23·08	19·68	579·0	4·0	6·35	10·8	24·1	4·9	VG	VG
	Average	25·7	4·76	6·65	8·68	11·35	14·31	17·81	21·19	24·74	19·98	439·0	1·3	2·9	7·4	20·0	4·7	.....	.....
1924	Raw liver	25·0	5·08	6·72	8·88	11·60	14·88	18·84	22·40	25·28	20·20	397·0	.....	21·0	4·5	14·3	4·1	VG	VG
1925	Raw liver	27·0	4·29	5·33	7·30	9·96	13·22	17·18	20·74	23·65	19·36	452·0	14·8	24·5	5·4	17·4	3·3	F	VF
1926	Raw liver	25·0	3·72	5·42	7·71	10·83	14·17	16·40	20·66	24·08	20·36	547·0	4·0	24·5	7·6	19·6	4·0	G	VG
	Average	25·7	4·36	5·82	7·96	10·79	14·09	17·47	21·3	24·3	19·97	465·0	6·3	23·3	5·8	17·1	3·8	.....	.....
1925	Wisconsin ration	27·0	4·19	5·56	7·08	8·96	11·43	14·0	17·43	20·14	15·95	381·0	22·2	.....	.....	7·0	3·6	VF	VF
1926	Wiseonsin ration	25·0	4·36	6·08	8·62	11·33	14·80	17·33	20·21	24·50	20·14	462·0	4·0	.....	.....	8·4	3·48	VG	VG
	Average	26·0	4·27	5·82	7·85	10·14	13·11	15·66	18·82	22·32	18·04	421·0	13·1	.....	.....	7·7	3·54	.....	.....
1925	Crude cod-liver oil	27·0	4·78	6·42	8·77	11·54	14·00	18·31	21·77	23·81	19·03	398·0	3·7	3·4	1·8	15·2	3·9	G	E
1926	Crude cod-liver oil	25·0	3·68	4·56	6·70	10·00	12·25	15·00	18·17	21·46	17·78	483·0	4·0	6·35	4·31	14·9	4·7	VG	VG
	Average	26·0	4·23	5·49	7·73	10·77	13·12	16·65	19·97	22·63	18·4	440·0	3·8	4·38	3·05	15·0	4·3	.....	.....
1925	Fleischmann's yeast	27·0	5·19	6·59	8·85	11·56	13·78	17·52	20·89	22·81	17·62	339·0	.....	0·18	1·2	12·6	3·5	G	G
1926	Fleischmann's yeast	25·0	4·04	5·84	8·12	10·88	14·44	17·68	21·48	24·92	20·88	516·8	.....	0·23	1·38	13·38	5·00	VG	E
	Average	26·0	4·61	6·21	8·48	11·22	14·11	17·60	21·18	23·86	19·25	428·0	.....	0·20	1·29	12·99	4·25	.....	.....

TABLE 10.—SECOND THREE WEEK PERIOD (PULLETS ONLY)—VITAMINE FEEDS FOR REARING

Special feed	Number of chicks	7th week	8th week	9th week	10th week	Total gain	Per cent gain	Per cent mortality	Special feed consumed	Value	Value total feed consumed	Pounds of feed per pound of gain	Condition at beginning	Condition at end
		oz.	oz.	oz.	oz.	oz.	p.c.	p.c.	oz.	c.	c.			
Basal ration	9·0	21·8	24·9	28·4	31·0	9·2	42·0	.....	.....	.....	7·6	8·2	VG	VG
Basal ration	24·0	24·46	27·54	30·33	32·5	8·04	33·0	.....	.....	.....	6·4	4·1	E	E
Basal ration	11·0	20·0	22·9	26·18	28·58	8·58	43·0	.....	.....	.....	7·5	3·6	VG	VG
Average	14·7	22·09	25·11	28·30	30·69	8·61	39·0	.....	.....	.....	7·2	5·3	.....	.....
Larro yeast	10·0	22·8	25·6	28·2	31·2	8·4	37·0	.....	0·17	1·05	9·05	7·6	E	VG
Larro yeast	15·0	22·47	25·6	27·73	30·53	8·06	36·0	.....	0·13	0·8	10·3	5·3	E	E
Larro yeast	15·0	20·26	23·73	27·00	30·27	10·01	49·0	.....	0·12	0·44	9·84	3·86	E	E
Average	13·3	21·84	24·98	27·64	30·66	8·82	41·0	.....	0·14	0·76	9·73	5·59	.....	.....
Refined cod-liver oil	8·0	26·5	29·5	32·5	34·5	8·0	30·0	.....	6·5	9·0	16·0	8·0	.....	VG
Refined cod-liver oil	22·0	22·0	23·95	27·14	29·1	7·91	36·0	.....	1·3	1·8	8·5	4·2	VF	G
Refined cod-liver oil	8·0	20·0	22·5	26·3	29·14	9·14	46·0	12·5	5·3	9·01	19·58	2·9	VG	VG
Average	12·6	22·8	25·32	28·65	30·91	8·35	37·0	4·2	4·4	6·6	14·69	5·0	.....	.....
Raw liver	17·0	22·8	26·3	28·7	32·0	9·2	40·0	5·9	10·5	2·3	7·5	4·7	VG	VG
Raw liver	13·0	22·0	24·77	27·85	30·62	8·54	39·0	.....	10·5	2·1	12·0	5·4	VF	VG
Raw liver	12·0	22·66	25·66	28·66	31·25	8·59	38·0	.....	10·5	3·25	11·46	4·25	VG	VG
Average	14·0	22·49	25·58	28·4	31·29	8·78	39·0	2·0	10·5	2·55	10·32	4·78	.....	.....
Wisconsin ration	15·0	19·53	23·0	26·33	29·0	9·47	48·0	.....	.....	.....	2·8	2·0	VF	F
Wisconsin ration	9·0	22·49	25·88	28·55	31·55	9·11	46·0	.....	.....	.....	6·16	2·47	VG	VG
Average	12·0	21·01	24·44	27·44	30·27	9·29	47·0	.....	.....	.....	4·48	2·23	.....	.....
Crude cod-liver oil	19·0	23·32	26·32	29·56	32·55	9·23	40·0	.....	.....	1·0	8·4	3·9	E	G
Crude cod-liver oil	10·0	20·8	24·0	26·8	30·1	9·3	44·7	.....	5·3	3·6	12·45	3·6	VG	VG
Average	14·7	22·06	25·16	28·18	31·32	9·26	42·3	.....	3·3	2·3	10·42	3·7	.....	.....
Fleischmann's yeast	23·0	22·12	25·32	28·09	30·95	8·83	40·3	4·3	0·06	0·4	7·4	3·9	G	E
Fleischmann's yeast	8·0	20·62	24·00	26·88	29·5	8·88	44·0	.....	0·02	0·12	6·63	3·04	E	E
Average	15·5	21·37	24·66	27·48	30·22	8·85	42·0	2·1	0·04	0·18	7·01	3·47	.....	.....

Notes.—Over a period of three years the greatest percentage gains were made by the pen receiving raw liver followed by crude cod-liver oil, refined cod-liver oil, Fleischmann's yeast, Larro yeast, and the basal ration in the order named. Over a two-year period there was no mortality in the pens receiving Fleischmann's yeast and over a three-year period only 1·3 per cent mortality in the pens receiving refined cod-liver oil.

The most economical gains as seen by pounds of gain per pound of feed consumed were made by the pens receiving Wisconsin ration, Fleischmann's yeast, crude cod-liver oil and raw liver. The least economical were made by Larro yeast and on the basal ration.

This experiment will be continued next year, in order to get more complete data. The results up to the present time are merely tentative and should in no way be considered as conclusive.

FEEDING EXPERIMENTS FOR WINTER EGG PRODUCTION

In pursuance of the procedure of past years a group of experiments was conducted at the Central Farm in an endeavour to determine the most suitable feeds for birds in their pullet year both from the standpoint of egg production and of fertility and hatchability. The experiments conducted during the season of 1925-26 were five in number and contrasted various substitutes for greenfeed, different feeds as sources of vitamines; home-mixed and commercial grain and mash, semi-solid and fresh buttermilk and ultra-violet ray treatment with ordinary sunlight conditions.

The experiments were conducted in the experimental house and consisted of fifteen pens each housing fifteen pullets of as nearly identical breeding as possible, for the most part pen-sisters, that is, birds from the same male.

The standard ration used consisted of a commercial scratch grain and a mash made up of equal parts of bran, middlings, corn meal, ground oats, one-half part meat meal, and 1 pound of salt for 100 pounds of mash.

The following are the prices paid per hundred weight based on an average of six months (November 1, 1925 to April 30, 1926) during which time the experiment was in progress; Grain $2.36; Mash $2; Clover $1; grit 87 cents, oyster shell $1.20; and buttermilk 3 cents per gallon.

The average selling price of eggs per dozen for the six months was as follows; November 75 cents, December 90 cents, January 80 cents, February 60 cents, March 57½ cents, April 50 cents.

The grain was fed in the usual way, night and morning, grit, shell, charcoal and dry mash (unless otherwise stated) being constantly before the birds. Green clover and sprouted oats were the sources of greenfeed and were fed once a day. A small amount of moist mash was fed at noon, and unless otherwise indicated, both milk and water were before them at all times.

Details of any special feeds given or treatment accorded the birds are given under the separate heading of each experiment.

In order to determine the effect of the various treatments upon fertility and hatchability all pens were mated during the breeding season, at first in the regular way and also for a second period during which the males were alternated daily in order to minimize in as far as was possible the error due to individual variation in the males. The fertility and hatching results are included in the summary tables. No birds were substituted during the experiment and consequently the tables are worked out on an average basis per bird, the consumption of feed being calculated on the basis of the number of birds alive at the end of each month. Pen No. 5 in the experiment "Home-Mixed vs Commercial Grain and Mash" was used as a control pen for all experiments in this series:—

HOME-MIXED VS COMMERCIAL GRAIN AND MASH

The object of this experiment was to test the comparative values of these feeds both as to economy and egg production.

The cost of the grain mixtures per hundredweight was, for the home-mixed standard ration $2.35 and for the Royal Purple mixture $2.60; for the mashes the cost was; home-mixed standard $2 and Royal Purple $3.

Table 11 gives detailed figures for this experiment including the hatching summary.

TABLE 11A.—DETAIL—COMMERCIAL VS. HOME-MIXED GRAIN AND MASH

Pen and special feed	Total mortality	Weight gain or loss	Scratch grain	Value	Mash	Value	Green feed	Value	Grit	Value	Shell	Value	Milk	Value	Condition	Total value feed	Eggs laid	Value	Feed cost per dozen	Profit over cost of feed
		lb.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	lb.	c.		c.	c.	c.
Royal Purple grain and mash.	2	3	25·3	65·5	21·8	65·4	24·9	24·9	0·76	0·69	1·73	2·07	3·30	11·52	E	170·0	72·4	421·8	28·2	251·9
Home-mixed grain and mash.	2	3	24·7	56·9	20·3	40·3	25·0	25·0	0·96	0·86	2·02	2·41	3·31	11·56	VG	136·8	77·0	441·2	21·3	304·4

TABLE 11B.—HATCHING SUMMARY

Pen and feed	Mating period	Eggs set	Fertile	Hatched	Per cent fertile	Per cent fertile hatched	Per cent total hatched
Home-mixed grain and mash	Ordinary	37	28	0	75·7	0	0
	Males alternated	42	31	9	73·8	29·0	21·4
	Total	79	59	9	74·7	15·2	11·4
Royal Purple grain and mash	Ordinary	31	28	4	90·3	14·3	12·9
	Males alternated	50	42	16	84·0	38·1	32·0
	Total	81	70	20	86·4	28·6	24·7

NOTES.—Table 11 illustrates definitely that in the experiment under consideration home-mixed grain and mash gave greater and more economical production. The birds on the home-mixed feeds produced 4·6 more eggs per bird at a cost of 6·9 cents less per dozen and showed a profit over cost of feed greater by 52·5 cents.

An experiment relative to the comparative values of home-mixed and commercial feeds was also carried on at the Central Farm during 1921, 1922, 1923 and 1925 and in every case excepting 1923, where profits over cost of feed were equal, hatchability being much better for the home-mixed feeds, a considerable economy was gained in using home-mixed feeds, Both fertility and hatchability were poorer from the pen receiving home-mixed grain and mash in this experiment.

Results obtained on the branch Farms bear out in every respect the findings of this experiment. At Nappan, the profit over cost of feed using Ful-o-pep grain and mash, a commercial feed mixture, was $2.24 per bird, while with the home-mixed feeds a profit over cost of feed of $2.25 was obtained. A four-year summary of these experiments at Nappan showed a profit of 33 cents per bird in favour of the home-mixed feeds.

At Lennoxville the profit over cost of feed was $2.22 and $2.64 for the commercial and home-mixed feeds respectively a considerable difference in favour of the latter.

At Cap Rouge, on the other hand and as an exception to the general rule, a greater profit by 25 cents per bird was made with commercial feeds over the home-mixed, the direct opposite of results obtained there during 1922.

As results at the Central Farm have consistently been in favour of home-mixed feeds and since the experiment is being carried on at several branch Farms it will not be continued at Ottawa during 1927.

ULTRA-VIOLET RAYS FOR EGG PRODUCTION

In order to determine if possible the effect of ultra-violet rays upon the metabolism of the hen and its resultant effect upon condition, egg production and hatching results a pen of fifteen birds was subject to treatment with the rays from November 1 to April 30 or during the season of least sunshine.

The apparatus used for the production of ultra-violet rays was a Uviaric Poultry Treater, consisting of a quartz mercury arc lamp equipped for operation on either a 110- or 220-volt alternating current. It was suspended at a distance of 6 feet above the floor to flood an area of 40 square feet and was used for a period of one hour daily commencing on December 12, 1925.

It has been claimed that ultra-violet rays would increase productivity by the stimulation of biological processes and by their lethal effect upon bacteria.

Table 12 shows the amount and cost of feed consumed, eggs laid and their value, and profit over cost of feed both for the treated and control pens.

TABLE No. 12A.—ULTRA-VIOLET RAYS FOR EGG PRODUCTION

Pen and special feed	Total mortality	Weight, gain or loss	Scratch grain	Value	Mash	Value	Green feed	Value	Grit	Value	Shell	Value	Milk	Value	Condition	Total value feed	Eggs laid	Value	Feed cost per dozen	Profit over cost of feed
																cts.		cts.		cts.
Ultra-violet rays	5	−0·58	24·8	57·0	19·6	39·1	32·5	32·5	0·93	0·82	1·88	2·24	4·32	15·0	VG	146·66	82·8	472·9	21·3	326·2
Control	2	0·3	24·7	56·9	20·3	40·3	25·0	25·0	0·96	0·86	2·02	2·41	3·31	11·56	VG	136·8	72·0	441·2	21·3	304·4

TABLE 12B

Treatment	Mating period	Number set	Fertile	Hatched	Per cent fertile	Per cent fertile hatched	Per cent total hatched
Ultra-violet rays	Regular	24	22	7	91·7	31·8	29·2
	Males alternated	19	14	6	73·7	42·9	31·6
	Total	43	36	13	83·7	36·1	30·2
Control	Regular	37	28	0	75·7	0	0
	Males alternated	42	31	9	73·8	29·0	51·6
	Total	79	59	9	74·7	15·3	11·4

NOTES.—Of the mortality in this pen, four birds died or were killed as a result of cannibalism and one from intestinal worm infestation. The average production per bird was greater, however, for the pen receiving the treatment than for the control pen. Fertility and hatchability were also better in the treated pen. The results obtained are as yet very inconclusive and the experiment will be continued next year when special attention will be paid to mortality and its cause.

VITAMINE FEEDS FOR WINTER EGG PRODUCTION

In an endeavour to determine the best and most economical forms in which to supply vitamines to mature birds with the object of increasing egg production, fertility, and hatchability, an experiment was carried on during 1924-25 in which four sources of the antirachitic and antineuritic vitamines were used. Of these four feeds, refined and crude cod-liver oil were considered to be rich in the antirachitic vitamine, and Larro yeast and Fleischmann's yeast in the antineuritic vitamine. In the winter of 1925-26 this experiment was repeated, the same feeds being used and fed in the same manner. All pens received the basal ration that has been previously discussed and received the special feeds in the following order and proportions:—

Pen 1—Basal ration plus crude cod-liver oil ($1 per gallon); 2 teaspoonfuls (¼ ounce) for 15 birds daily in wet mash.

Pen 2—Basal ration plus refined cod-liver oil ($2.40 per gallon); same proportion as above.

Pen 3—Basal ration plus Larro yeast (60 cents per pound); 1 tablespoonful (½ ounce) for 15 birds daily in wet mash.

Pen 4—Basal ration plus Fleischmann's yeast (96 cents per pound); 1½ tablespoonfuls (1⅛ ounce) for 15 birds daily mixed in wet mash. After being mixed, the wet mash for this pen was allowed to stand for 4 hours before feedings.

Table 13 gives detailed figures for the experiment and the hatching summary.

TABLE 13A.—DETAIL VITAMINE FEEDS FOR EGG PRODUCTION

Pen and special feed	Total mortality	Weight, gain or loss	Scratch grain	Value	Mash	Value	Green feed	Value	Grit	Value	Shell	Value	Milk	Value	Special feed	Value	Total value feed	Eggs laid	Value	Feed cost per dozen	Profit over cost of feed
		lb.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	c.		c.	c.	c.
1. Crude cod-liver oil....	2	+0·3	25·1	57·8	19·8	39·3	25·2	25·2	0·77	6·97	2·20	2·59	3·35	11·6	3·16	2·15	141·7	90·8	524·3	18·7	382·6
2. Refined cod-liver oil..	4	+0·2	28·0	64·3	22·0	43·6	28·3	28·3	1·53	1·37	2·11	2·52	3·77	13·2	3·53	5·94	159·2	102·7	582·5	18·6	423·3
3. Larro yeast.....	2	+0·06	26·7	61·5	22·0	43·7	27·1	27·1	1·55	1·38	2·71	3·25	3·58	12·6	6·67	24·4	203·2	88·9	521·0	27·4	317·8
4. Fleischmann's yeast...	2	−0·6	25·8	59·4	20·4	40·4	26·0	26·0	1·21	1·09	1·66	1·99	3·44	12·0	14·4	8·66	227·5	72·4	416·4	37·7	190·0
Control.....	2	+0·3	24·7	56·8	20·3	40·3	25·0	25·0	0·96	0·86	2·02	2·41	3·31	11·56	.....	.....	136·8	77·0	441·2	21·3	304·4

TABLE 13B.—HATCHING RESULTS

Pen	Treatment	Mating period	Number set	Fertile	Hatched	Per cent fertile	Per cent fertile hatched	Per cent total hatched
1	Crude cod-liver oil.....	Ordinary.....	37	34	2	91·9	5·9	5·4
		Males alternated....	57	45	14	79·0	31·1	24·6
		Total.....	94	79	16	84·0	20·2	17·0
2	Refined cod-liver oil.....	Ordinary.....	41	22	0	63·6	0	0
		Males alternated....	53	41	10	77·4	24·4	19·0
		Total.....	94	63	10	67·0	15·9	10·6
3	Larro yeast.....	Ordinary.....	39	34	11	87·2	32·4	28·2
		Males alternated....	66	46	16	69·7	34·8	15·2
		Total.....	105	80	27	76·2	33·7	25·7
4	Fleischmann's yeast.....	Ordinary.....	33	22	3	66·6	13·7	9·1
		Males alternated....	54	42	6	77·7	14·3	11·1
		Total.....	87	64	9	73·6	14·1	10·4

NOTES.—A study of table 13 shows that the greatest production was made by birds receiving refined cod-liver oil followed by those receiving crude cod-liver oil and Larro yeast, respectively. The most profitable gains as indicated by profit over cost of feed were made by each pen in the same order. It will also be noted that the first three pens made greater profits over cost of feed than the control pen. The mortality in the refined cod-liver oil pen was the greatest. The deaths in that pen were due to peritonitis, intestinal worms and two were killed by their pen-mates. In pen 1, deaths were caused by tumor and intra-abdominal ovulation, in pen 3 by roup and cannibalism; in pen 4 by intestinal worms and cannibalism. Slight weight gains were made by all but pen 4 on Fleischmann's yeast.

With regard to hatching results the pens range themselves in the following order of merit: Larro yeast, crude cod-liver oil, refined cod-liver oil, and Fleischmann's yeast.

TABLE 14.—SUMMARY OF TWO YEARS' EXPERIMENT WITH VITAMINE FEEDS

Special treatment	Year	Cost of special feed	Total cost feed	Eggs laid	Value	Feed cost per dozen	Profit over cost of feed	Eggs set	Fertile	Hatched	Per cent fertile	Per cent fertile hatched	Per cent total hatched
		c.	c.		c.	c.	c.						
Crude cod-liver oil	1925	2·0	126·0	75·0	427·0	20·2	301·0	30·0	29·0	18·0	96·7	62·1	60·0
	1926	2·1	142·0	90·8	524·0	18·7	383·0	57·0	45·0	14·0	79·0	31·1	24·6
Average		2·0	134·0	82·9	475·0	19·4	342·0	43·5	37·0	16·0	80·4	43·3	36·8
Refined cod-liver oil	1925	3·6	137·0	71·5	426·0	22·9	289·0	26·0	24·0	22·0	92·3	91·7	84·6
	1926	5·9	159·0	102·7	582·0	18·6	423·0	53·0	41·0	10·0	77·4	24·4	19·0
Average		4·8	148·0	87·1	504·0	20·7	356·0	39·5	32·5	16·0	82·3	49·2	40·5
Larro yeast	1925	37·5	162·0	81·3	475·0	23·9	313·0	25·0	24·0	15·0	96·0	62·5	60·0
	1926	24·4	203·0	88·9	521·0	27·4	318·0	66·0	46·0	16·0	69·7	34·8	15·2
Average		30·9	182·0	85·1	498·0	25·6	315·0	45·5	35·0	15·5	76·9	44·3	34·1
Fleischmann's yeast	1925	86·2	212·0	78·4	470·0	32·4	258·0	35·0	34·0	17·0	97·1	50·0	48·6
	1926	86·6	227·0	72·4	416·0	21·3	190·0	54·0	42·0	6·0	77·7	14·3	11·1
Average		86·4	219·0	75·4	443·0	26·8	224·0	44·5	38·0	11·5	85·4	30·3	25·8

NOTES.—A study of the summary table shows that, as regards profit over cost of feed the pens come in the same order as during this year's experiment, namely, refined cod-liver oil, crude cod-liver oil, Larro yeast and Fleischmann's yeast. A greater number of eggs was laid over the two-year period by the Larro yeast pen than that with crude cod-liver oil, but at a greater cost per dozen.

The order of hatchability over the two years was refined cod-liver oil, Larro yeast, crude cod-liver oil, and Fleischmann's yeast.

This experiment is being continued during 1926–27 and no conclusions will be drawn from the experiment up to date.

At the Experimental Farm at Summerland, B.C., a similar experiment was carried on in which 2 per cent of cod-liver oil fed in the dry mash was contrasted with a control pen on a standard ration. A difference in average production of 11 eggs per bird resulted and a profit over cost of feed of 15 cents per bird in favour of the pen fed crude cod-liver oil. A gain was secured of 9 ounces per bird as contrasted with 2-ounce gain for the control pen.

SEMI-SOLID VS. FRESH BUTTERMILK

This experiment, carried on during the season of 1924-25, was again repeated during the past season. Its object was to compare the economy of using fresh buttermilk valued at 3 cents per gallon or 30 cents per hundredweight with a commercial product known as semi-solid buttermilk, costing $3.50 per hundredweight. As the latter food is recommended for use without any mash, tests were made both with and without mash for both the fresh and semi-solid products.

The basal ration included scratch grain, grain feed, grit, oyster shell, etc. The following is the arrangement of the pens:—

Pen 12—Basal ration without mash; semi-solid buttermilk in its original state (14 ounces per day per 15 birds).

Pen 13—Basal ration with dry mash; semi-solid buttermilk as per pen 12; and moist mash at noon.

Pen 14—Basal ration without mash; fresh buttermilk ad lib.

Pen 15—Basal ration with dry mash; fresh buttermilk ad lib.

Tables 15A and 15B give details regarding quantities and value of feed consumed, eggs laid, their value, profit over cost of feed, weight, gain or loss, mortality during the experiment and a complete hatching summary.

TABLE 15A.—DETAIL—SEMI-SOLID VS. FRESH BUTTERMILK

Pen and special feed	Total mortality	Weight, gain or loss	Scratch grain	Value	Mash	Value	Green feed	Value	Grit	Value	Shell	Value	Milk	Value	Condition	Total value feed	Eggs laid	Value	Feed cost per dozen	Profit over cost of feed
		lb.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	lb.	c.		c.		c.	c.	c.
12. Semi-solid without mash		+0·3	35·7	82·1	.....	.....	24·0	24·0	1·73	1·56	2·14	2·55	10·2	35·4	E	145·61	82·6	485·6	21·2	340·0
13. Semi-solid with mash	4	+0·2	29·7	68·2	13·2	26·4	30·0	30·0	1·44	1·28	2·27	2·71	13·1	45·8	VG	174·39	87·4	511·9	23·9	337·5
14. Fresh without mash	7	+0·3	35·4	81·3	.....	.....	26·5	26·5	1·35	1·09	1·94	2·32	33·8	10·21	G	121·42	72·5	408·5	20·1	287·1
15. Fresh with mash	3	+0·07	26·4	60·7	16·7	33·3	26·6	26·6	0·95	0·85	1·61	2·03	31·3	9·39	VG	132·87	71·3	422·0	22·3	289·2
Control	2	+0·3	24·7	56·9	20·3	40·3	25·0	25·0	0·96	0·86	2·02	2·41	3·31	11·56	VG	136·8	77·0	441·2	21·3	304·4

TABLE 15B

Pen	Mating period	Eggs set	Fertile	Hatched	Per cent fertile	Per cent fertile hatched	Per cent total hatched
12	Ordinary	43	37	18	86·0	48·7	41·9
	Males alternated	38	29	11	76·3	37·9	28·9
	Total	81	66	29	81·4	43·9	35·8
13	Ordinary	42	31	14	73·8	45·2	33·3
	Males alternated	62	52	26	83·9	50·0	41·9
	Total	104	83	40	79·8	48·2	38·4
14	Ordinary	9	6	0	66·6	0	0
	Males alternated	15	12	1	80·0	8·3	6·7
	Total	24	18	1	75·0	5·5	4·2
15	Ordinary	33	23	11	70·0	47·8	33·3
	Males alternated	52	45	16	86·5	35·6	30·8
	Total	85	68	27	80·0	39·7	31·7

NOTES.—The deaths recorded in the above table were from the following causes: In pen 12 intestinal worms and one bird from cannibalism; in pen 14, six birds from cannibalism and one intestinal worms; in pen 15, two deaths from avitamosis and one from tumor. No satisfactory explanation can be given for the deaths due to cannibalism in pen 14.

The greatest average production was obtained from pen 13 receiving semi-solid buttermilk with mash. As regards profit over cost of feed, however, pen 12—semi-solid buttermilk without mash is slightly superior. On the other hand those birds receiving fresh buttermilk produced eggs at the lowest cost per dozen losing out on the number of eggs laid. It will be noted that pen 12, making the greatest profit over cost of feed also had the lowest mortality.

With regard to the hatching summary, the table shows the pens to be in the following order with regard to percentage fertility: Pens 12, 15, 13 and 14. Hatchability as indicated by the percentage of fertile eggs hatched was best in pen 13 followed by pens 12, 15 and 14 in the order named.

TABLE 16.—SUMMARY OF SEMI-SOLID VS. FRESH BUTTERMILK—TWO YEARS

Pen	Special Treatment	Year	Cost of special feed	Total cost of feed	Eggs laid	Value	Feed cost per dozen	Profit over cost of feed	Eggs set	Fertile	Hatched	Per cent fertile	Per cent fertile hatched	Per cent total hatched
			c.	c.		c.	c.	c.						
12	Semi-solid without mash	1925	43·0	120·0	58·5	355·0	24·6	235·0	90	76	39	84·4	51·3	43·3
		1926	35·4	146·0	82·6	486·0	21·2	340·0	81	66	29	81·4	43·9	35·8
	Average		39·2	133·0	70·5	420·0	22·9	287·0	171	142	68	83·4	47·9	39·7
13	Semi-solid with mash	1925	49·0	188·0	68·1	409·0	33·1	221·0	123	102	45	82·9	44·1	36·6
		1926	45·8	174·0	87·4	512·0	23·9	337·0	104	83	40	79·8	48·2	38·4
	Average		47·4	181·0	77·7	460·0	28·5	279·0	227	185	85	81·5	45·9	37·4
14	Fresh without mash	1925	5·2	093·0	70·8	419·0	15·7	326·0	103	88	33	85·4	37·5	32·0
		1926	10·2	121·0	72·5	408·0	20·1	287·0	24	18	1	75·0	5·5	4·2
	Average		7·7	107·0	71·6	413·0	17·9	306·0	127	106	34	83·4	32·1	26·7
15	Fresh with mash	1925	3·4	127·0	72·9	437·0	20·9	310·0	135	104	71	77·0	68·2	52·6
		1926	9·4	133·0	71·3	422·0	22·3	289·0	85	68	27	80·0	39·7	31·7
	Average		6·4	130·0	72·1	429·0	21·6	299·0	220	172	98	78·2	57·0	44·6

NOTES.—Over a period of two years the most economical production as shown by profit over cost of feed was made by pen 14 receiving fresh buttermilk to drink, but no mash followed closely by pen 15 receiving fresh buttermilk and dry mash.

The greatest number of eggs was laid by the birds of the pen with both mash and semi-solid buttermilk but at a considerably greater cost per dozen.

With regard to per cent of fertile eggs hatched the pen with fresh buttermilk with mash gave the best results, followed by semi-solid buttermilk without and with mash in the order named.

As it is not considered that this experiment is of sufficiently vital importance to warrant its being carried on for a longer period of time, it will not be repeated during 1927.

From the experiment, as so far conducted, the conclusion may be drawn that semi-solid buttermilk may be economically used as a substitute for fresh buttermilk. As profit over cost of feed is slightly in favour of fresh buttermilk in this experiment one would not be justified in using the semi-solid substitute except when fresh buttermilk is not available or when the former may be purchased at as cheap a rate as was done for this experiment, that is for 3½ cents per pound.

SUBSTITUTE FOR FRESH GREENFEED

In continuation of experiments carried on during 1923, 1924, and 1925 relative to fresh greenfeeds and a substitute for them, and experiment along the same lines was carried on during 1926 in which raw and cooked potatoes were contrasted with sweet clover and alfalfa meal as to their value for egg production, fertility, and hatchability.

The pens were four in number and received the basal ration, their feed differing only in respect to the green and succulent feeds fed. The following is the arrangement of the pens:—

Pen 8—Basal ration without greenfeed plus sweet clover meal ($2 per cwt.); one-half pound for 15 birds daily fed in the wet mash.

Pen 9—Basal ration without greenfeed plus adfalfa meal ($2 per cwt.); one-half pound for 15 birds daily fed in the wet mash.

Pen 10—Basal ration without greenfeed plus raw potatoes ($1 per cwt.); ad lib. hung on nails and also finely chopped mixed in the wet mash—equal quantities of mash and potatoes.

Pen 11—Basal ration without greenfeed plus raw and cooked potatoes. Raw fed ad lib. hung on nails and also cooked mixed as for pen 10 with wet mash.

The potatoes used in the experiment were small and culled potatoes, hence their low value. Detailed results of this experiment with hatching summary are given in tables 17A and B.

TABLE 17A.—DETAIL—SUBSTITUTES FOR GREENFEED

Pen and special feed	Total mortality	Weight gain or loss	Scratch grain	Value	Mash	Value	Green feed	Value	Grit	Value	Shell	Value	Milk	Value	Condition	Total value feed	Eggs laid	Value	Feed cost per dozen	Profit over cost of feed
		lb.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	lb.	c.	lb.	c.		c.		c.	c.	c.
8. Sweet clover meal	1	.....	24·8	57·0	21·2	42·1	10·3	20·6	0·60	0·54	1·88	2·23	3·22	11·24	VG+	133·71	90·5	537·2	17·7	403·3
9. Alfalfa meal	2	+0·1	26·2	60·3	23·2	46·0	9·6	19·2	1·30	1·18	2·30	2·77	3·42	11·94	E	141·39	96·6	563·5	17·6	422·1
10. Raw potatoes	2	+0·1	26·0	59·8	23·2	46·0	19·0	19·0	0·77	0·68	2·25	2·69	3·36	11·74	VG+	139·91	95·0	519·2	17·6	379·2
11. Raw and cooked potatoes	.....	.....	24·7	56·8	20·0	29·7	18·0	18·0	1·0	0·88	1·80	2·12	3·18	11·1	VG	128·6	84·2	493·7	18·3	365·0
Control	2	+0·3	24·7	56·9	20·3	40·3	25·0	25·0	0·96	0·86	2·02	2·41	3·31	11·56	VG	136·8	77·0	441·2	21·3	304·4

TABLE 17B.—HATCHING RESULTS

Pen	Special feed	Mating period	Number set	Fertile	Hatched	Per cent fertile	Per cent fertile hatched	Per cent total hatched
8	Sweet clover meal	Ordinary	44	33	3	75·0	9·1	7·0
		Males alternated	76	58	22	76·3	38·0	29·0
		Total	120	97	25	75·8	27·4	20·8
9	Alfalfa meal	Ordinary	35	14	11	40·0	71·1	2·9
		Males alternated	64	47	22	74·4	46·8	34·4
		Total	99	61	23	61·7	37·7	23·2
10	Raw potatoes	Ordinary	42	11	4	26·2	36·4	9·5
		Males alternated	68	53	23	77·9	43·4	33·8
		Total	110	64	27	58·2	42·2	24·5
11	Raw and cooked potatoes	Ordinary	42	30	2	71·4	66·6	47·6
		Males alternated	70	53	18	75·7	33·9	25·7
		Total	112	83	20	74·1	24·7	17·8

NOTES.—The following is the order of production for the four years: Alfalfa meal, raw potatoes, sweet clover meal, and raw and cooked potatoes. The feed cost per dozen of eggs for the birds on alfalfa meal and raw potatoes was the same, but the profit over cost of feed was considerably greater for the former due to the fact that production was higher during the season of high egg prices. The above was also true in the case of pen 8 over pen 10, feed cost per dozen being practically the same but profit over cost of feed being higher.

It will be noted that these pens all excel the control pen in production and therefore have a smaller feed cost per dozen and a greater profit over cost of feed.

The birds in pens 9 and 10 were in "excellent" and very good plus condition respectively throughout the experiment, and also were the only pens to make a gain in weight.

As judged by percentage of fertile eggs hatched pen 10 with raw potatoes leads followed by those being fed alfalfa meal, sweet clover meal and raw and cooked potatoes, in the order named. As the substitution of these feeds and especially of potatoes for fresh greenfeed is of considerable importance to the average poultryman the experiment will be continued, when it is hoped that a more definite comparison of the value of the dried green feeds and of raw and cooked potatoes will be obtained.

FEEDS FOR FERTILITY, HATCHABILITY, AND VIABILITY OF CHICKS

In view of the poor hatches throughout Canada during the past few seasons and to the fact that a late spring during the past two seasons seemingly still further decreased fertility, hatchability, and viability, an experiment was carried on at the Central Farm and at most of the branch Farms in an effort to attain better hatching results through supplying mineral and vitamine feeds in the best possible forms and thus duplicating free range and good weather conditions to as great an extent as possible.

At the Central Farm twenty-five pens of birds were used, the following feeds being given:—

1. Basal ration—4 pens, one pen Rock hens, one of Rock pullets, one of Leghorn hens and one of Leghorn pullets.
2. Basal ration plus crude cod-liver oil (1 teaspoonful for 4 birds daily). Four pens.
3. Basal ration plus raw liver (½ ounce per bird daily). Four pens.
4. Basal ration plus bone meal (5 per cent of mash by weight). One pen of Rock hens and one pen of Leghorn hens.
5. Basal ration plus cod-liver oil and raw liver (half of quantities given to preceding groups). One pen of Rock hens and one of Leghorn hens.
6. Bone meal plus crude cod-liver oil and raw liver (5 per cent bone meal, 1 teaspoonful of cod-liver oil per 8 birds daily and ¼ ounce of raw liver per bird daily). One pen of Leghorn pullets, one of Rock pullets, one of Rock hens, and six pens of Leghorn hens.

The eggs from all pens were incubated and careful account kept of fertility and hatchability. As all birds were pedigreed the mortality of chicks to three weeks of age was also taken into consideration.

It was originally intended that the birds should be mated in the regular breeding-pens during the first period and later that the males should be alternated daily in order to minimize error due to individual variation. This was not done, however, and as a result in the case of any *very extreme* variation in fertility it was taken for granted that it was attributable to the male and the results from that pen were not included in the experiment.

Table 18 shows detailed results from all pens.

TABLE 18.—DETAIL—FEEDS FOR FERTILITY, HATCHABILITY AND VIABILITY OF CHICKS

Special Feed	Period	Eggs set	Fertile	Hatched	Per cent fertile	Per cent fertile hatched	Per cent total hatched	Dead in three weeks	Per cent mortality in three weeks
Basal ration	Regular mating	492	335	206	68·9	61·5	41·8	10	4·8
Crude cod-liver oil	"	577	298	185	51·7	62·1	32·1	20	10·8
Raw liver	"	677	390	227	57·6	58·2	33·5	12	5·3
Bone meal	"	370	330	180	89·2	54·5	48·7	12	6·6
Cod-liver oil and raw liver	"	461	310	226	67·2	74·8	49·0	5	2·2
Bone meal and crude cod-liver oil and raw liver	"	1,912	1,544	1,140	80·8	73·8	59·6	89	7·8

NOTES.—Taking percentage fertility into consideration considerably the highest was obtained from the birds receiving bone meal followed by those with bone meal plus cod-liver oil plus raw liver. It will be noted that there is considerable difference between the birds receiving bone meal and those getting other feeds. The order of fertility for the remaining feeds was the basal ration, cod-liver oil and raw liver, raw liver and crude cod-liver oil.

With regard to hatchability the highest percentage of fertile eggs hatched is credited to the birds receiving cod-liver oil and raw liver with the bone meal and cod-liver oil and raw liver pen following very closely.

There is again a considerable gap between the two leading feeds and those next in order of quality, the order of the latter being cod-liver oil, the basal ration, raw liver and bone meal.

The viability of chicks as shown by mortality up to three weeks of age is considerably the best for the birds receiving cod-liver oil and raw liver. The basal ration, raw liver, bone meal and bone meal and cod-liver oil and raw liver pens are next in this respect in the order named.

This experiment will be continued next year when both the regular mating period and alternation of males will be carried out.

As was mentioned before, the experiment was also carried on at several of the branch Farms and a brief discussion of the results obtained will be given here.

Complete returns from this experiment from six branch Farms would suggest that both fertility and hatchability were increased by the feeding of vitamine feeds to breeders.

In every case but one the feeding of crude cod-liver oil gave a higher percentage fertility than was given by the control pens on the basal ration. In all cases but two the birds receiving raw liver also gave a greater percentage fertility than did those getting the basal ration, while the feeding of bone meal, although not giving such noticeably favourable results, produced higher fertility than control ration in most cases.

With regard to hatchability, as indicated by percentage of fertile eggs hatched, the same applies and to a greater extent. In all cases both cod-liver oil and raw liver pens gave a higher percentage of fertile eggs hatched than did the control pens, while wherever bone meal was fed a slightly higher percentage of fertile eggs was hatched.

In considering mortality of chicks to three weeks of age, however, mortality was equally low in the case of the control pen and lower in some cases than in the pens receiving vitamine feeds.

When combinations of the different vitamine feeds were fed both fertility and hatchability were increased in most cases.

This experiment will be continued both at the Central Farm and branch Farms for some time and no definite conclusions should yet be drawn.

EXPERIMENTAL WORK AT THE BRANCH FARMS

Several experiments have been mentioned in this report as being carried on at the branch Farms as well as the Central Farm. Besides those mentioned there was a considerable number which have been carried on at the branch Farms only and a brief summary of results obtained in these experiments will be given here.

HULLESS VS. COMMON OATS FOR LAYING PULLETS

An experiment was carried on at Rosthern and Brandon concerning the comparative values of hulless oats and common oats for laying pullets, in which one pen of birds received hulless oats in both grain and mash, while one pen received common oats fed in the same manner. The results obtained show a difference in profit over cost of feed of 28 cents and 24 cents, and in average production, of 7 and 1.7 eggs per bird respectively in favour of the use of hulless oats.

CORN VS. NO CORN FOR LAYING PULLETS

An experiment along the same lines, conducted at Brandon, and contrasting a ration including corn in both scratch and mash with a ration without corn, gave profit over cost of feed of 10 cents in favour of the cornless ration, the egg production being equal.

BEEF SCRAP VS. CANNERS MEATS VS. ALFALFA

At the same Farm canners meats, beef scrap and alfalfa leaves as sources of protein for egg production showed respectively a profit over cost of feed of $1.03, $1.06 and $1.02.

DRY VS. WET MASH FOR EGG PRODUCTION

A comparison of dry and wet mash in egg production showed a profit over cost of feed of 33 cents in favour of dry-mash feeding at Cap Rouge for an increase in production of eight eggs per bird. A considerably greater increase was given at La Ferme but in favour of wet mash.

SKIM-MILK OR BUTTERMILK VS. MEAT SCRAP VS. RAW MEAT VS. MILK POWDER VS. GREEN BONE

Five pens of twenty birds each fed respectively powdered skim-milk (in water ad lib.), green bone (1 pound per day per 20 birds in troughs), raw meat (ad lib.), skim-milk (ad lib.), and meat meal (20 per cent in mash and ad lib. in hoppers), gave profits over cost of feed of 71 cents, 33 cents, 27 cents, 29 cents and 11 cents per bird, at the Cap Rouge Station, the experiment covering a period of four months.

ROOTS VS. CLOVER VS. SPROUTED OATS VS. EPSOM SALTS

In an endeavour to test the relative values of mangels, alfalfa and clover leaves, and sprouted oats as green and succulent feeds and to ascertain if Epsom Salts is a suitable substitute for these an experiment was carried on at five branch Farms.

An average of the five experiments shows that the greatest profit over cost of feed was derived from alfalfa and clover leaves. Mangels and sprouted oats gave equally good results taking an average of the five Farms, while the results obtained from the use of Epsom Salts were the poorest on the average throughout. Epsom Salts was fed at the rate of ½ to 1½ ounces per 15 birds, in the drinking-water or mixed with the wet mash.

FISH MEAL VS. BEEF SCRAP OR BEEF MEAL

The comparative value of meat scrap and fish meal was the subject of an experiment covering which four branch Farms have submitted a report. The two feeds were fed in the same percentage in the dry mash of the basal ration. In only one case was a greater production and profit over cost of feed obtained from the use of fish meal than from meat scrap.

SKIM-MILK OR BUTTERMILKS VS. MEAT SCRAP

Meat scrap and buttermilk, the former mixed in the dry mash of the basal ration and the latter fed in drinking vessels ad lib., were contrasted on three different branch Farms. In every case a considerably greater profit was obtained from meat scrap than from buttermilk, production of eggs being slightly superior with buttermilk in one case only.

Details of these experiments may be obtained from the Annual Report for 1926 of the Experimental Station concerned or from their records. In most cases these experiments will be continued and no conclusions should be drawn until sufficient work has been done to firmly establish the findings.

EXPERIMENTAL WORK WITH WATERFOWL

During the past four or five years experimental work relative to the feeding of waterfowl has been carried on at the Duck Plant of the Central Farm. This work was continued during the past season and its scope broadened considerably in that daily weighings of birds were made with the object of plotting a growth curve of each breed to serve as an indication of their comparative value as meat producers.

DUCK-FEEDING—COSTS AND GAINS

The stock used in these experiments consisted of May- and June-hatched birds of the following breeds: Pekin, Rouen, Coloured Muscovies, Cayuga, Indian Runner, Khaki Campbell and White Crested. All birds were hatched on the Farm plant and were under similar management throughout the experiment.

The ration fed during the first five weeks consisted of a mash mixture of 30 pounds each of bran, shorts and cornmeal with 10 pounds of beef scrap costing $1.73 per hundred. After the fifth week the mash was changed to a mixture of bran 15 pounds, shorts 20 pounds, corn meal 50 pounds, and beef meal 15 pounds, costing $1.91 per hundred.

The mash was fed five times daily, moistened with water and sprinkled with coarse sand.

During the period of feeding of the first mash, greenfeed was fed in large amounts, but was decreased gradually after that time until at the end of the eighth week the birds were receiving none. During the second period they had constant access to water in small runs.

For the feeding experiment the ducks were weighed weekly and the feed consumption calculated on the number of birds alive at the end of each week.

For the experiment on comparative growth, the ducks were weighed daily and the consumption of feed was not taken into consideration.

Table 19 gives details for the feeding experiment for these breeds which completed the test, while table 20 shows a summary of the results including costs and profits, both tables being calculated on the basis of one bird. In computing costs no allowance was made for greenfeed.

FIG. 5.—Typical Indian Runner ducks.

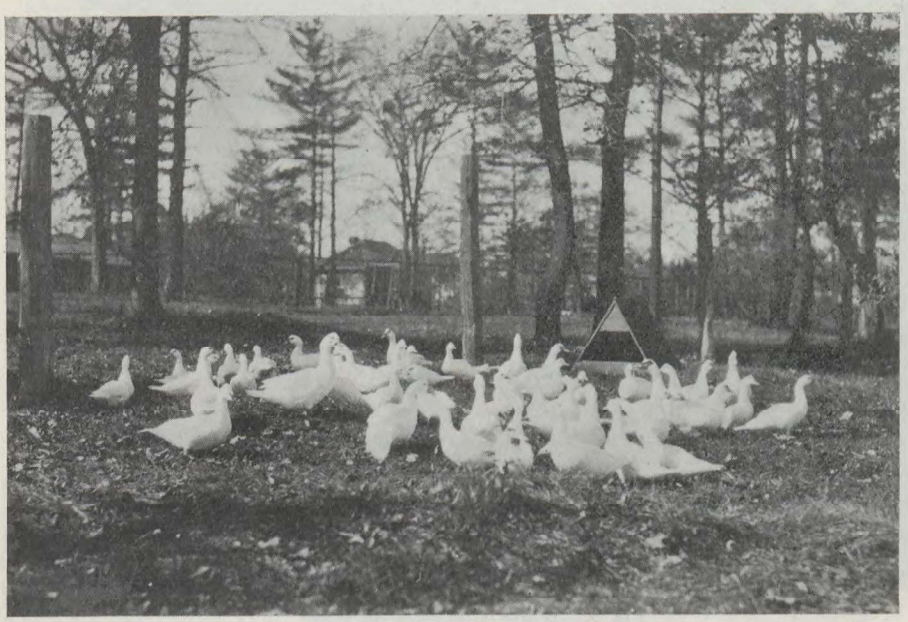


FIG. 6.—Pekin ducks on experiment.

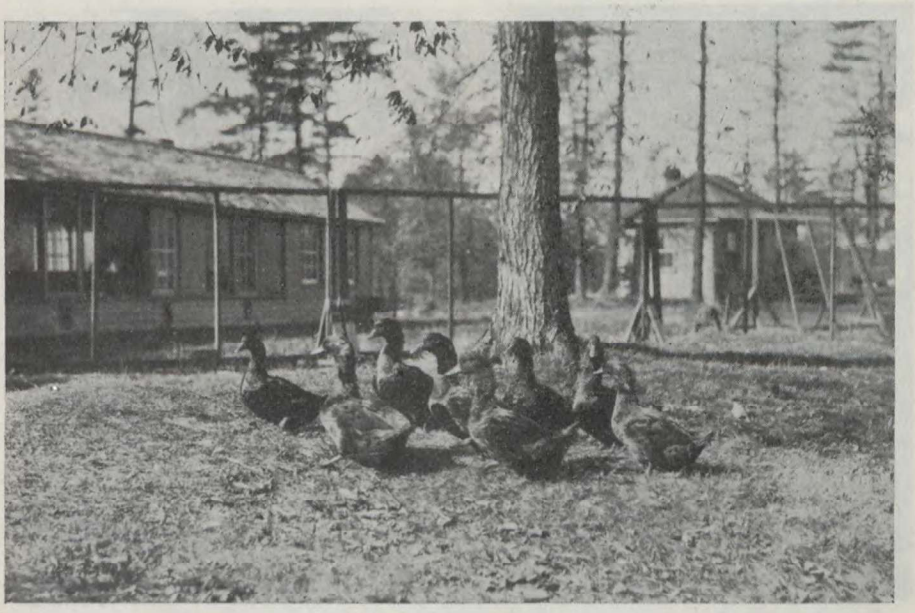


FIG. 7.—Cayuga breeders.

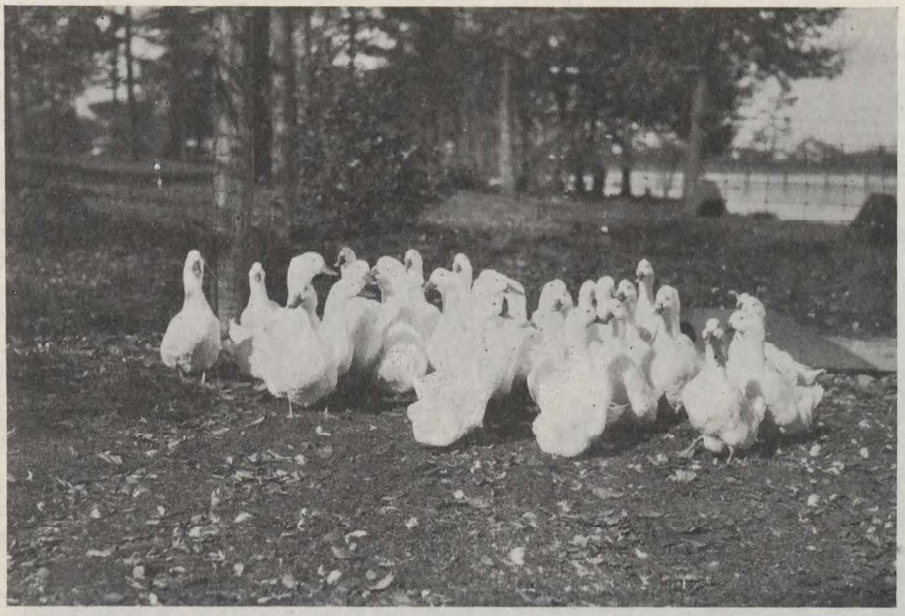


FIG. 8.—White Muscovies on range.

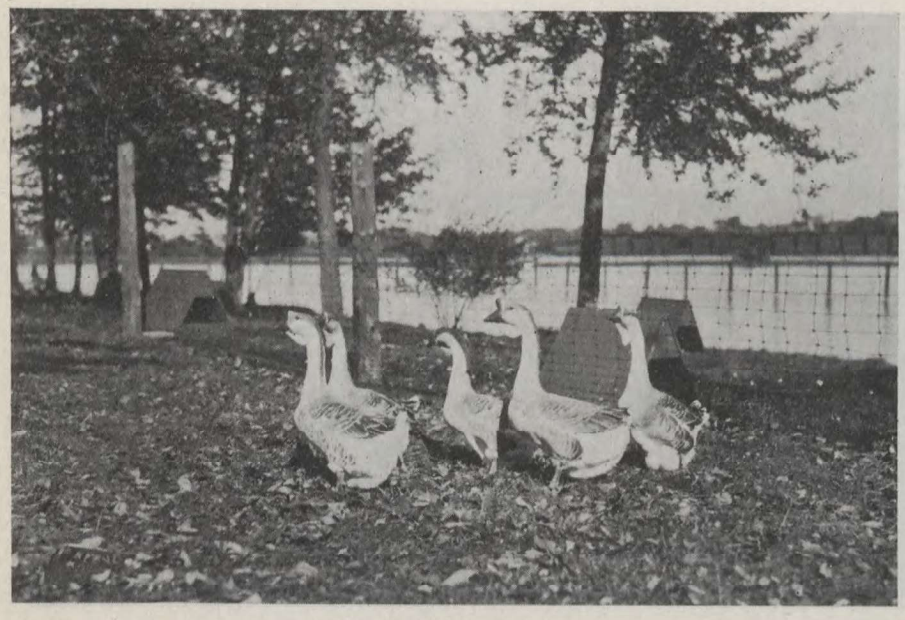


FIG. 9.—African geese.

TABLE 19.—DETAIL—DUCK-FEEDING EXPERIMENT

Weeks	Pekins					Pekins					Coloured Muscovy				
	Number of birds	Average weight	Average gain	Average feed consumed	Pounds of feed per pound gain	Number of birds	Average weight	Average gain	Average feed consumed	Pounds of feed per pound gain	Number of birds	Average weight	Average gain	Average feed consumed	Pounds of feed per pound gain
		lb. oz.	lb. oz.	lb. oz.	lb. oz.		lb. oz.	lb. oz.	lb. oz.	lb. oz.		lb. oz.	lb. oz.	lb. oz.	lb. oz.
Beginning	55	0 01·6				29	0 1·9				14	0 1·5			
1	54	0 43·5	0 01·9	0 04·0	2 1·7	29	0 4·2	0 2·3	0 4·5	1 15·3	14	0 3·1	0 1·6	0 7·4	4 10·0
2	54	0 07·8	0 04·3	0 10·5	2 7·1	29	0 10·8	0 6·6	0 11·2	0 11·2	14	0 7·4	0 4·3	0 9·7	2 4·1
3	53	0 14·2	0 6·4	0 01·4	2 11·5	29	1 3·3	0 8·5	1 6·8	2 10·9	14	0 11·4	0 4·0	0 15·1	3 12·4
4	53	1 08·2	0 10·0	1 4·5	2 0·8	29	1 13·8	0 10·5	2 3·0	3 5·3	14	0 15·4	0 4·0	1 4·3	5 1·2
5	53	2 04·7	0 12·0	1 11·8	2 5·1	29	2 9·4	0 11·6	2 8·0	3 7·2	13	1 6·5	0 7·1	1 7·4	3 4·7
6	53	3 00·9	0 12·7	2 9·9	3 4·8	29	3 3·9	0 10·5	2 2·5	3 4·6	12	1 14·7	0 8·2	1 11·7	3 6·0
7	53	3 09·2	0 8·3	2 5·1	5 5·8	29	4 1·2	0 13·3	2 15·0	3 8·6	11	2 5·9	0 7·2	2 1·1	4 9·5
8	53	4 0·0	0 6·8	3 5·1	7 12·9	27	5 1·2	1 0	3 9·0	3 9·0	10	3 3·2	0 13·3	3 1·2	3 11·2
9	52	5 2·9	1 2·9	4 0·5	3 6·6	27	5 9·3	1 8·1	4 0	2 10·5	10	4 3·2	1 0·0	3 8·0	3 8·0
10	51	5 7·5	0 4·6	3 15·4	1 6·0	25	6 3·7	0 10·4	4 8·0	6 15·8	10	5 4·8	1 1·6	4 15·2	4 8·0
Total			5 5·9	21 11·6	3 4·6			7 1·8	24 4·0	3 5·0			5 3·3	20 1·1	3 13·9

TABLE 20.—SUMMARY OF DUCK-FEEDING EXPERIMENT

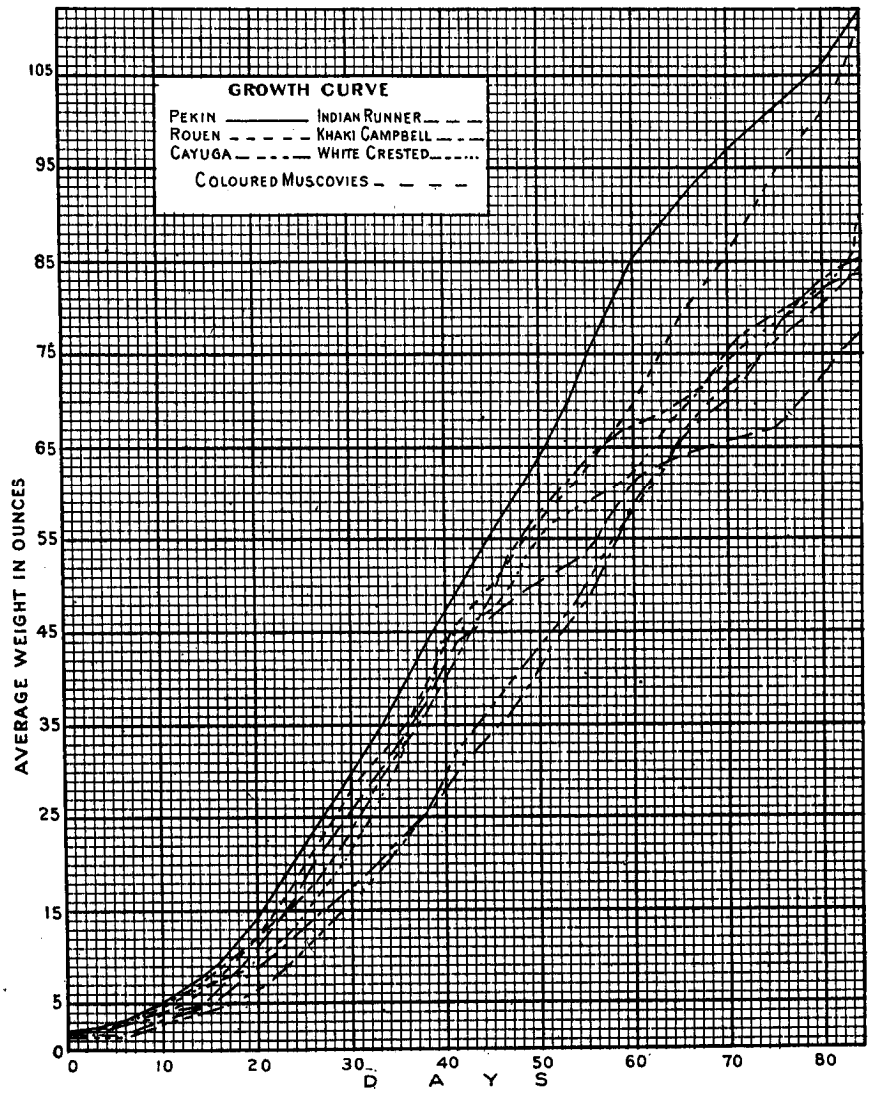
Breed	Number at beginning	Number at end	Average weight at beginning	Average weight at end	Average gain	Average feed consumed	Pounds feed per pound gain	Average cost of feed	Original value per duckling	Average final value at 35 cents pound	Average profit over cost of feed and duckling
			lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	cts.	cts.	$ cts.	$ cts.
Pekins	84	76	0 1·8	5 13·6	5 11·8	22 15·8	4 0·1	42·6	25	2 5·6	1 38·0
Coloured Muscovies	14	10	0 1·5	5 4·8	5 3·3	20 1·1	3 13·7	37·5	25	1 87·6	1 25·1

NOTES TABLES 19 AND 20.—A study of the above table shows that the Pekin ducklings made the greatest gains at a slightly greater feed cost and returned a greater profit over cost of feed per bird by 12·9 cents than did the Coloured Muscovies.

A slight amount of leg weakness was experienced with the Pekins and was controlled by the feeding of cod-liver oil. Practically all mortality was due to sunstroke.

COMPARATIVE RATE OF GROWTH OF DIFFERENT BREEDS

The birds used for this experiment were weighed daily individually while the test was in progress. Graph No. 1 was calculated on the basis of the average weight per bird each day.



GRAPH NO. 1.—The outstanding feature is the demonstration of the superiority of the Pekins. They attained the greatest weight during the seven weeks and were consistently the heaviest through the whole period.

The next in order of weight gains are the Rouens which reached almost as great a final weight although not gaining quite so rapidly as the Pekins.

It will also be noted that the Indian Runner ducks, although essentially an egg breed gained almost equally as rapidly as the other varieties, with the exception of the Pekins and Rouens, up to nine weeks of age, at which time maturity had practically been reached.

Of the seven breeds charted, four completed the experiment within 5 ounces of the 84-ounce point on the chart or an approximate gain of 1 ounce per day.

It might be noted here in connection with the fine showing made by the Rouens that their egg production is so poor as to be incomparable with that of the Pekins, while their fertility, hatchability, and viability of ducklings is very low.

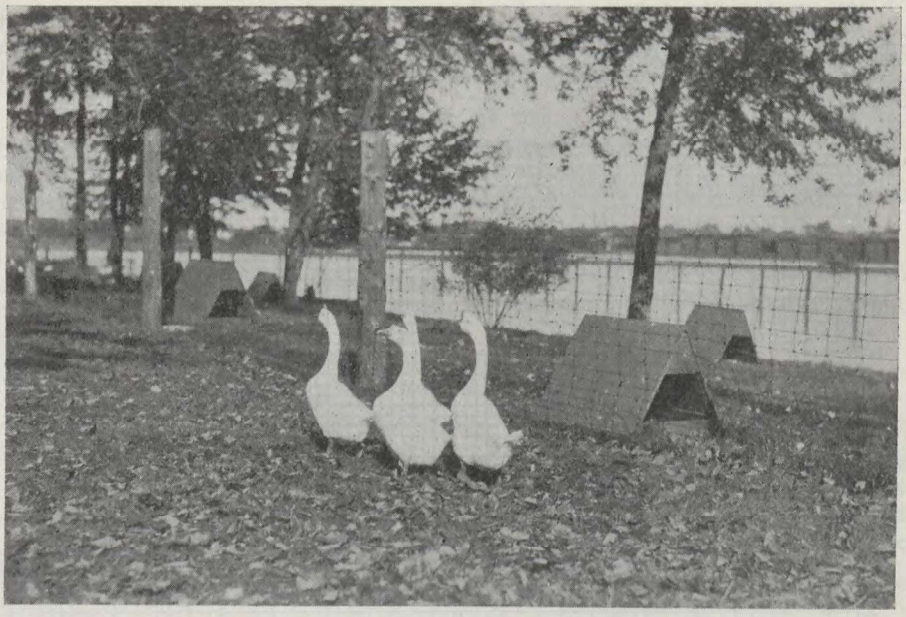
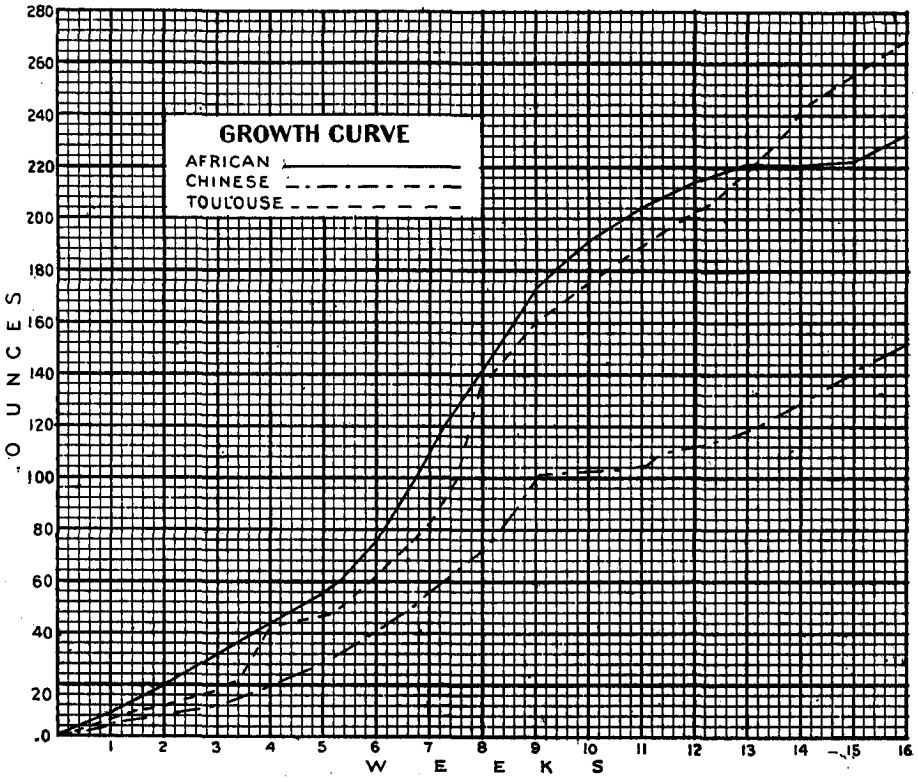


FIG. 10.—Chinese geese.

FIG. 11.—Toulouse geese.

COMPARATIVE GROWTH RATE OF GEESE

In order to gain a basis of comparison of the different breeds of geese with regard to weight gains three lots of goslings, from African, Chinese and Toulouse geese were weighed once weekly for sixteen weeks. The weights obtained are shown in graph number 2.



GRAPH NO. 2.—The greatest weight was reached by the Toulouse geese followed closely by the African. Chinese geese, a much smaller breed, made considerably the lowest gains. It should be noted that the African geese made the most rapid gains up to the age of thirteen weeks.

WORK WITH POULTRY DISEASE*

(In co-operation with Health of Animals Branch). Report prepared by Dr. C. H. WEAVER, Pathologist, Health of Animals Branch.

AUTOPSY REPORT

During the year a total of 1,285 specimens were received for examination, coming as heretofore from the general public, the Experimental Farms' flocks and the egg-laying contests. This is an increase of 378 over the previous year.

In table 21 is given a summary of the findings of these examinations tabulated under several disease headings and by month, together with their totals.

*Report for the year ending October 31, 1926.

The disease Roup has ceased to provide the major number of specimens as was once the case, this year again showing a further slight reduction. The decrease may be partially due to rise and fall characteristic in nature, but it is believed in greater part due to the system of medicinal prophylaxis more or less generally used throughout the area from which most of the specimens of this laboratory are derived.

Intestinal Parasitism gave a total of 379 specimens which tends to emphasize the prevalence of the malady. Many specimens in this class were submitted for laboratory diagnosis where the disease in question was suspected, hence a greater geographic distribution is represented than in many other disease conditions.

Para-typhoid infections (*Bacillus pullorum* mainly) with 155 cases is a considerable increase over the preceding period, but here the increase is due mainly to improved laboratory technique resulting in a higher number of positive diagnoses.

TABLE 21.—AUTOPSY REPORT FOR THE POULTRY YEAR 1926

Disease	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Total
Roup and chicken pox	3	....	2	....	....	1	....	....	....	....	....	....	6
Roup only	12	10	8	2	5	2	3	5	6	....	3	5	61
Pox only	....	....	....	....	....	1	....	....	....	....	....	....	1
Diseases incident to egg production	2	5	3	1	10	2	8	18	9	5	5	6	74
Hemorrhage	3	7	2	....	3	3	3	6	5	5	1	4	40
Peritonitis	5	2	5	3	5	13	12	7	15	8	9	13	77
Paralysis or blindness or both	1	....	1	....	2	....	1	2	....	....	....	1	18
Parasitism-intestinal	25	26	34	12	8	22	7	20	43	17	84	81	379
Distented burse of fabrious	....	....	....	....	....	....	....	....	....	....	....	....	....
Tuberculosis	1	....	2	....	2	5	....	....	1	1	7	4	23
Luckemia	2	3	2	1	1	1	3	3	2	3	5	....	24
Vent gleet	1	1	2	....	2	....	....	1	....	....	....	1	11
Tumor	4	4	1	7	3	4	3	6	5	1	2	....	40
Heat prostration	....	....	....	....	....	....	....	1	....	....	....	....	1
Cannibalism	2	1	2	4	15	14	19	4	2	3	1	4	71
Visceral gout	....	....	1	....	....	1	2	2	1	2	3	3	13
Avitamosis	2	7	3	3	7	4	3	4	3	8	5	1	44
Digestive and liver trouble	3	2	3	4	2	4	5	4	2	2	....	2	33
No apparent cause and decomposed specimens	5	3	3	....	....	7	7	16	15	11	7	4	68
Prolapsus	....	....	....	2	....	....	....	....	....	....	....	....	13
Percarditis	2	....	....	....	....	....	....	....	....	....	....	....	2
Para-typhoid infections	4	5	....	3	1	21	20	50	11	1	18	21	155
Miscellaneous	4	4	3	12	6	8	20	26	9	13	3	4	111
	81	80	77	54	73	113	116	175	129	80	153	154	1,285

PARA-TYPHOID INFECTIONS

SEROLOGICAL TESTS

Experimental flock testing for the detection of carriers of *Bacillus pullorum* infection has been somewhat increased, and the information gained by the number of reactors in one instance in particular may throw some light on the cause of poor incubation and brooding results in the flock in question. The additional subsequent tests in other flocks previously reported adds to the value of the information so obtained.

TABLE 22.—DETAIL—FLOCKS UNDER TEST—PARA-TYPHOID

Flock	First Test			Second Test			Third Test		
	Birds	Reactors	%	Birds	Reactors	%	Birds	Reactors	%
A	386	133	34·4	585	23	3·9	683	67	9·8
B	1,742	360	21·2	1,450	50	3·4	.....	.....	.....
C	340	96	28·2	.....	.....	....	.....	.....	.....
D	175	32	18·2	.....	.....	....	.....	.....	.....
E	547	120	21·9	461	48	10·4	.....	.....	.....
F	744	217	29·1	1,162	76	6·5	.....	.....	.....
Totals	3,934	958	24·3	3,658	197	5·4	.....	.....	.....

Table 22 is a tabulation of the flocks under test. The column headings under first, second and third tests refer to the flocks rather than the individuals comprising the flocks. Consequently many birds in the second column have had but a single test, and some in column three have had one, some two, and others three tests. It is worthy of note that in the case of every flock the second test has shown a marked decrease in the number of reactors. Only one flock has had the third test, viz., flock A. In this case there is an increase in the number of reactors over the second test, which may be due to an increase in the disease incidence despite the test. This seems hardly probable, however, for among the birds which had received three tests no reactors were found. This flock is located several hundred miles from the laboratory and it was only this year that a system of handling the blood was developed that would give a high percentage of blood specimens with serum in a satisfactory state for testing. Flock E is a commercial flock with a heavy infection where the disposal of reacting pullets would mean considerable financial loss. As the birds above the pullet year are the greatest offenders in the spread of infection to the chicks, only birds above this minimum age are being tested to determine the practical usefulness of the test when so applied.

The effect upon the chick mortality by the removal of the reactors is indicated by the following:—

Flock A, Annual percent mortality.....	78 previous to test.
	58 " "
	33·6 following test.
	39·1 " "
Flock B, Annual per cent mortality.....	20·6 previous to test.
	33·4 " "
	20·5 " "
	10·8 following test.

Definite figures on chick mortality are not available on the two commercial flocks E. and F.

SEROLOGICAL EXAMINATIONS

Month	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Total
Number of specimens.....	266	74	150	809	5	210	45	78	753	.....	1,580	2,223	6,498

PATHOGENICITY TESTS

In order to learn of the disease-producing properties of the *Bacilllus pullorum* upon chicks with and without chilling, the following experiment was undertaken.

A lot of day-old Leghorn-Rock cross-bred chicks from pullorum-free stock was divided into three lots. The brooding and feeding arrangements for the different lots were identical and the spread of infection between pens was controlled by appropriate means.

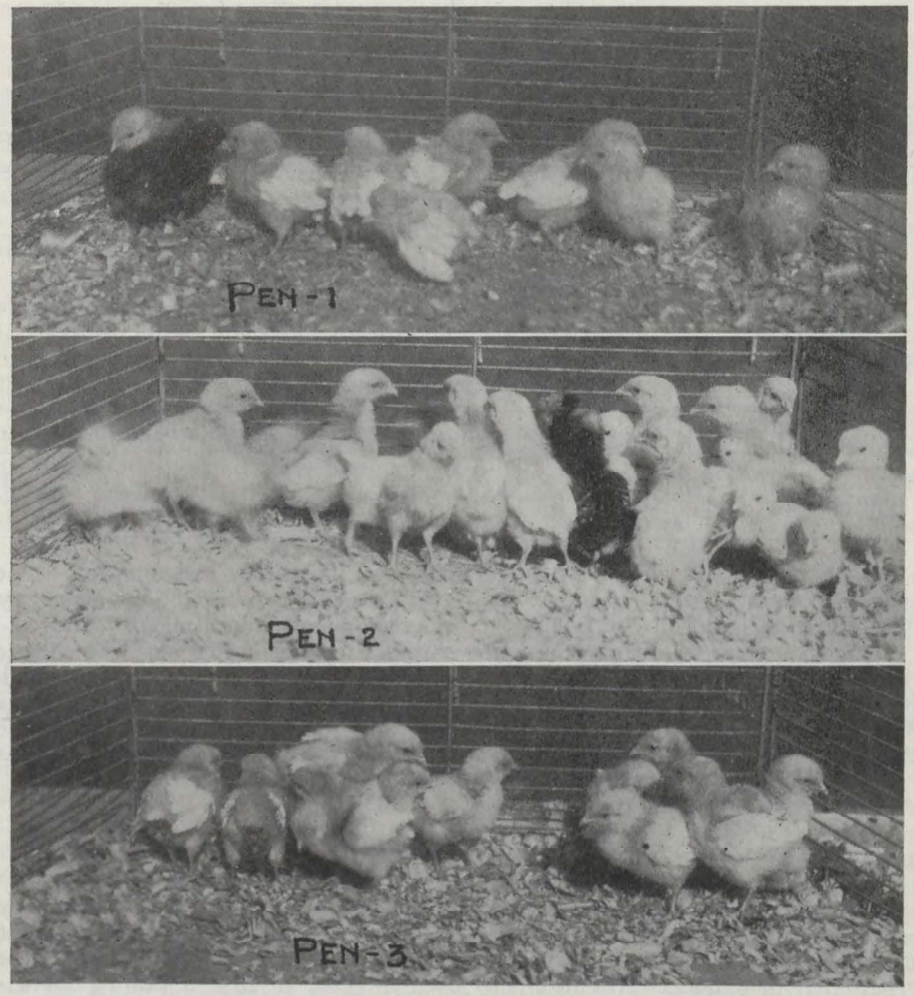


FIG. 12.—Bacillary White Diarrhoea—Artifical infection by culture feeding.
Pen 1. Fourteen days after feeding a culture of the *Bacillus pullorum* and chilling.
Pen 2. Control pen; did not receive culture and were not chilled. Photo taken same date as pens 1 and 3.
Pen 3. This pen received the same culture as pen 1, but were not chilled. Fourteen days after culture feeding.

Pen No. 1, consisting of 21 chicks, was given a 24-hour broth culture of *B. pullorum* in their first fountain of drinking water, and in addition the brooder heat was turned off four hours following the placing of the chicks under the hover. They were left without heat supply for five hours, and although the weather was quite warm at the time, the chicks nevertheless were visibly chilled. Pen No. 2, 21 chicks, received no culture or chilling and were held as control pen against the other two pens. Pen No. 3, 20 chicks, received the same culture and in the same manner as pen No. 1, but in this case the chicks were not chilled.

SUMMARY OF MORTALITY AND WEIGHT GAINS OF REMAINING CHICKS AT THE END OF 14 DAYS

Pen Number	Mortality	Per cent	Initial weight	Weight at 14 days	Gain
			oz.	oz.	oz.
1	12	57	1·26	1·88	0·62
2	None	.....	1·26	2·66	1·4
3	6	30	1·26	1·85	0·59

SUMMARY OF MORTALITY AND WEIGHT GAINS OF REMAINING CHICKS AT THE END OF TWENTY-EIGHT DAYS

Pen Number	Mortality	Per cent	Weight at 28 days	Gain
			oz.	oz.
1	19	90·47	2·00	0·74
2	None	.....	4·26	3·00
3	18	90·00	2·00	0·74

DAILY MORTALITY

Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Mortality	Per cent
Pen 1	..	..	..	..	1	2	..	..	3	1	..	2	3	..	1	..	..	1	..	1	2	2	..	..	..	..	..	..	..	..	..	19	90·47
" 2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0	.....
" 3	..	..	..	..	..	1	1	1	2	..	..	..	1	..	..	2	1	2	..	2	2	..	..	..	3	..	..	..	..	..	..	18	90

Each chick after death was submitted to laboratory examination. The lesions encountered were characteristic of *Bacillus pullorum* infection (Bacillary white diarrhoea) and in every case the organism was isolated in pure culture.

Conclusions are warranted in so far as this experiment goes that the culture was pathogenic for chicks; the organism was capable of causing very high mortality and reduced growth in the remaining chicks; the chilling had the effect of hastening the course of the disease, but the mortality was due to the infection rather than the chilling, since the mortality became equal in pens 1 and 3 before the conclusion of the experiment . (See fig. 12).

INTESTINAL PARASITISM

The work with this disease has progressed along the lines of prevention by breaking the life-cycle of the parisites. Each year's work has brought to light new lines for thought as to possible avenues by which the malady may be perpetuated in a flock. Attention has been directed to first obtaining knowledge of these connecting links, and secondly to appropriate means of breaking them. This year has suggested new possibilities, the working out of which has not been completed.

ROUP AND FOWL POX

For some years it has been known that chicken pox is due to a virus so small as to be indiscernible with even the high-power microscopes and that this virus can be removed from the affected tissue of the bird by a suitable filter leaving behind all other forms of organisms such as the common bacteria. The disease can be reproduced by inoculation of this filtered virus. On the other hand the condition known as Roup has been a debatable question as to cause.

In a previous report evidence was given to show that a bacterial organism was associated with these Roup cases which when isolated in pure culture and suitably inoculated into other fowl was capable of producing a disease distinguishable from the original natural infection case. The organism could again be removed in pure form from the inoculated fowl.

Establishment of the cause of disease is essential to the development of suitable means of control either through biologics or medicinal agents, hence the effect on this phase of disease study. It becomes evident that Roup and Pox from the causative standpoint represent two diseases, one being due to a filterable virus the other to bacterial agency. This may account for the failure of Pox vaccine to prevent or control the trouble under our conditions, which should not be the case as one attack of Pox usually renders immunity over a considerable period, consequently a potent vaccine should give immunity against natural infection

Control work on the local plant and contests using medicinal agents has shown that a line of treatment effectual against the bacterial infection failed to have a desired effect on the virus disease and vice versa. Clinical evidence indicated that either diseases may occur independently one of the other and that at times the two diseases may co-exist in the flock or the individual bird.

Experimental work was undertaken to ascertain whether or not the two diseases actually exist in the one individual, the results of which will be given as a description of the accompanying photographs of Roup and Pox cases. These illustrations are also used in order that poultrymen may have a clear understanding of these diseases should there be a desire to make use of the lines of treatment here recommended. (Figs. 13 A, B, C, D, E.)

Fig. 13A shows a case of Pox complicated with Roup. The disease products were macerated in normal saline and the fluid filtered through an unglazed porcelain filter, the fluid after filtering being free of bacteria as shown by the absence of growth in laboratory media. This filtrate was inoculated into specimen shown in fig. 13 B by scratching the comb and moistening the scarified area with the fluid. The lesions on the comb developed as a result of the inoculation. It is well to note that five days elapsed before the disease appeared. The original material left behind from filtration (residue) was mixed with saline solution and the supernatant fluid was inoculated into a rabbit. The rabbit succumbed to a bacterial infection with an organism of the Pasteurella group; which was recovered in pure culture. A culture of this bacillus when inoculated into mucous membrane of the eye-lid of a fowl (fig. 13 C) produced the condition represented in that subject. In this case the disease developed in fourteen hours. The bacillus was recovered in pure culture from the lesions produced as a result of inoculation.

Fig. 13 E represents a Roup case without the presence of Pox virus. Such a case will yield a bacterial culture capable of reproducing the disease, but we have not been able to produce Pox from such material.

TREATMENT

Whether the outbreak is one of Roup or Pox or the two combined due consideration should be given to hygenic conditions, making the birds as comfortable as possible. A liberal physic should be administered for which Epsom Salts may be given at the usual rate of one pound to a hundred birds. All birds comprising a flock unit should receive treatment, not merely those showing sickness, in order to catch the disease at its inception. *(Continued on page 52.)*

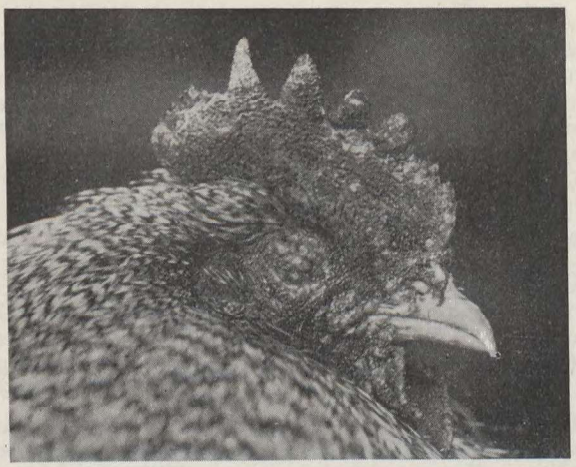


FIG. 13A.—Natural infection case of Chicken Pox complicated with Roup.

FIG. 13B.—Chicken Pox; artificial infection due to inoculation with the filterable virus of Pox. Period of incubation, 5 days.

FIG. 13C.—Roup affecting the left eye due to inoculation with a culture of bacterial organism. Period of incubation 14 hours.

FIG. 13D.—Same case as in Fig. 13C. Note the prostration which, in serious cases, is maintained until death.

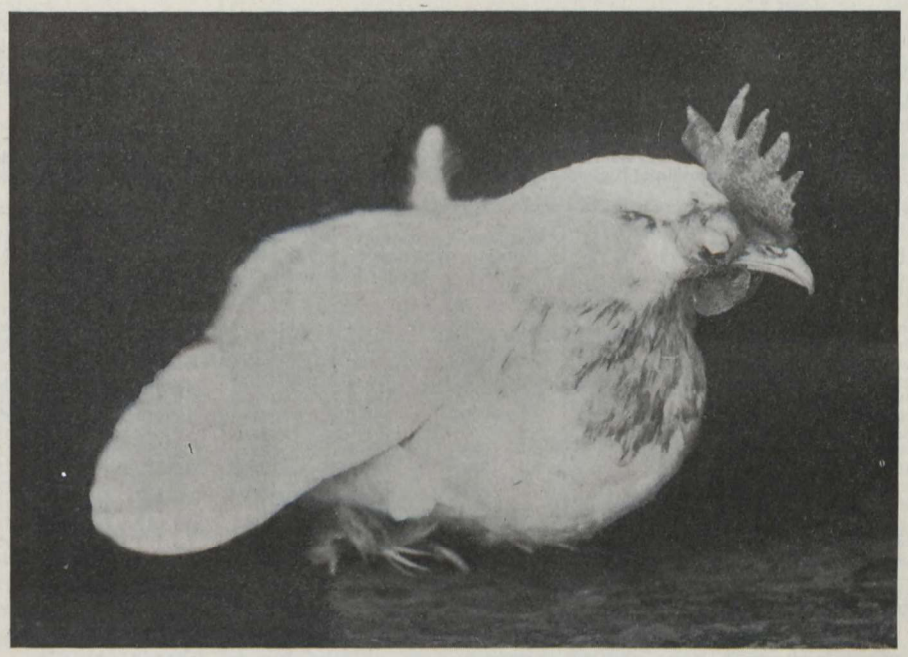


FIG. 13E.—Natural infection case of Roup; may be reproduced with culture of bacterial organism isolated from the caseous pus in the eye. Absence of Pox virus. Requires different treatment from Pox.

ROUP.—It seems evident that infection in this disease usually takes place by way of the mucous membranes of the mouth, throat or eyes. If treatment is instituted early and directed towards controlling the organisms before or shortly after infection has taken place, the disease may fail to develop or the damage done to the tissues be very slight. The medicinal agent to be used should have high germicidal properties and must be non-irritating. Argyrol in a 10 per cent solution is recommended and should be dropped into the eyes, nostrils and mouth, 5 to 6 drops per bird is sufficient. Unless treatment has been delayed, one treatment usually suffices, but may in certain individuals need to be repeated after 2 to 3 days.

POX.—Where virus infection exists some individuals will show nodule, scab-like, formation usually about the head. These scabs should not be removed as this opens up avenues of infection to bacterial organisms. The local treatment should be soothing, but should tend to dry up the lesions and at the same time destroy the virus which is always present in the scabs. A mixture of alcohol (95 per cent) and glycerine, equal parts, has been found satisfactory. It should be applied to face, comb and wattles by the use of a cotton swab, and may be repeated at from 3 to 5 day intervals till the scabs disappear.

Where Pox is complicated with Roup a combination of treatments should be applied.

CANADIAN NATIONAL EGG-LAYING CONTEST, REGISTRATION AND INSPECTION

During the year 1926, thirteen egg-laying contests were conducted by this division. The Canadian Contest, international in its scope, is conducted at Ottawa while the remaining twelve contests are provincial in scope.

TABLE 23.—Name of contest and number of birds; average production per bird; average points per bird; leading pen and production of highest registered bird in each. November 1, 1925 to October 30, 1926

Contest	Number birds	Average eggs per bird	Average points per bird	Leading pen, number of points	Highest registered bird eggs
Canadian	800	174·4	168·7	2,490·2	282
Prince Edward Island	200	169·8	163·0	2,056·5	282
Nova Scotia	270	156·6	153·3	1·929·8	253
Nova Scotia Southern	200	171·6	170·2	2,152·7	258
New Brunswick	200	183·3	185·5	2,448·5	270
Quebec Eastern	200	144·9	141·1	1,919·2	235
Quebec Western	200	161·1	156·0	2,080·3	253
Ontario	600	171·9	163·1	2,270·8	255
Manitoba	230	176·5	191·2	2,381·2	275
Saskatchewan	260	154·3	155·5	2,216·5	273
Alberta	260	176·5	175·8	2,522·5	312
British Columbia	460	230·9	249·6	3,047·5	335
Vancouver Island	340	215·8	230·3	2,771·6	312
Total	4,220	Ave. 179·5	180·2	.....	.....

NOTE.—Ten birds constitute a pen.

TABLE 24.—NUMBER OF BIRDS AND AVERAGE PRODUCTION OF ALL CONTESTS 1925–26

Variety	Number of birds	Average production
White Leghorn	2,010	187·7
Barred Plymouth Rock	1,390	178·4
White Wyandotte	340	179·0
Single Comb Rhode Island Red	270	151·0
Ancona	80	162·8
White Plymouth Rock	30	128·1
Buff Orpington	20	113·6
Chantecleir	20	91·7
Black Leghorn	10	213·8
Rose Comb White Lehgorn	10	150·1
Rose Comb Rhode Island Red	10	143·5
Single Comb Brown Leghorns	10	129·5
Single Comb Buff Leghorn	10	119·9
Black Minorcas	10	104·1
Total	4,220	Average 179·5

The Canadian National Egg-Laying Contests have been in operation for seven years and a survey of the work is interesting and encouraging. Table 25 gives the number of birds entered in each year, together with the average production.

TABLE 25.—BIRDS ENTERED IN CONTESTS—BY YEARS

Contest year	Total number of birds	Average production per bird
1919–20	1,610	122·5
1920–21	2,480	137·0
1921–22	2,590	146·3
1922–23	3,000	164·3
1923–24	3,710	169·6
1924–25	4,100	172·2
1925–26	4,220	179·5

The first year the laying contests were conducted (1919-20) there were 1,160 birds in seven contests. In the 1925-26 contest there were 4,220 birds, while the number of contests had been increased to thirteen. The number of birds has steadily increased each year since the work started and the average production has also increased each year. In 1919-20 the contest birds averaged 122.5 eggs while in 1925-26 the average was 17.9 eggs. It should also be stated that during the 1925-26 contest, quite a number of eggs were disqualified as being under-weight, 20 ounces per dozen being the minimum weight recognized, whereas in the earlier contests this regulation was not in force.

This increased production has been secured by the successful working of a number of factors. We believe the outstanding ones are as follows:—

1. Better selection of the contest pen.
2. Pullets of the right age and development.
3. Advanced methods of breeding.
4. Improved contest management.

In the first instance, poultry breeders soon learned that there was a very marked difference in the birds which they were breeding, and in order to make the best showing possible, careful selection was exercised in selecting the individual birds. The careful breeder made notes on various birds and then followed the weekly and yearly reports to verify his observations.

Pullets should be old enough to commence laying soon after the contest starts, and poultrymen soon started hatching their chicks so that they would come into laying about the beginning of November. This was especially true in Eastern Canada, where many pens in the earlier contests were found undeveloped at the time the contest started.

Beyond question the factor which was responsible for the greatest increase in egg-yield was advanced methods of breeding. The use of male birds bred from high-producing dams on females with known records, the recording of the chicks hatched and the carrying out of a systematic form of pedigree breeding have greatly assisted breeders in improving the quality of their stock along egg-producing lines.

The management of the various laying contests has also assisted in increasing the production of the birds. Better methods have been adopted for receiving the birds and caring for them during the contest year. Generally speaking the class of poultryman responsible for the general care of the birds is better than when the contests started, and where no change has been made in the man, the experience gained has been of assistance to him in this work.

Most poultrymen are interested in such questions as the profit to be made per bird, and the number of eggs a bird should lay to maintain herself. A careful review of the production costs in the contests show that it takes the income of about 85 eggs to feed each hen for a year. This would mean, not figuring labour or housing, that the amount of eggs laid over that number would serve as the profit. Granted then that seven dozen eggs are necessary to maintain a hen, the birds in the 1919-20 contest would have to their credit the difference between 85 eggs and 122 eggs, equal to 37 or say three dozen. Calculated at 40 cents per dozen (which is a conservative estimate) these three dozen eggs would leave a profit of $1.20 per bird. The increasd production which has taken place since the contests started is from 122 eggs to 179 eggs per bird, a difference of 57 eggs or nearly five dozen eggs per bird. Calculated at the same figure (40 cents per dozen) these five dozen eggs are worth $2 which when added to the former profit of $1.20 per bird equals $3.20 net income which is a handsome profit. Contest birds are more heavily fed than many flocks. In the average farm flock it will not take as many as 85 eggs to pay for one bird's feed.

1926-27 CONTESTS

The 1925-26 laying contest ended October 30, and another series of egg-laying contests started November 1, 1926. No change was made in the contest accommodation which remains practically the same as the previous year. A new building to house the laying contest was erected at the Indian Head Experimental Farm so that the present Saskatchewan Egg-laying Contest is housed in a continuous house rather than under the colony-house system.

The rules and regulations have also been changed permitting contestants to send in two spares with each pen. Previous to the 1926-27 contest this rule applied only to the Canadian contest at Ottawa. At present there are 4,310 birds in 431 pens and 862 spare birds making a total of 5,172 as compared with 4,360 last year.

The contests are primarily for registration purposes and it is desired to encourage breeders who are paying particular attention to egg-size in their poultry breeding operations. To accomplish this end, all birds are now credited with points as well as with the number of eggs laid. Points are allotted as follows:—

	Points
27-ounce eggs	1.3
26-ounce eggs	1.2
25-ounce eggs	1.1
24-ounce eggs	1.0
23-ounce eggs	0.9
22-ounce eggs	0.8
21-ounce eggs	0.7
20-ounce eggs	0.6

Eggs weighing less than 20 ounces to the dozen are disregarded entirely, and eggs weighing 27 ounces to the dozen are scored as being 27-ounce eggs.

REGISTRATION

During the year 981 birds were registered in Canada. Registration was granted to all birds which laid 200 eggs or over, providing the birds were typical of the breed, free from standard disqualifications and that the eggs laid averaged 24 ounces or over to the dozen. Birds of the Mediterranean breeds which laid eggs with tinted shells were not granted registration. There were 1,551 birds which laid 200 eggs or over during the year but 570 of these failed to measure up to the required standard so far as breed character, size of egg, stubs or down on feet or legs, foreign colour in lobes or plumage, etc. The distribution by contests is as follows:—

TABLE 26.—REGISTRATION

Contest	Number birds in contest	Number laying 200 eggs or over	Qualified for registration	Disqualified		
				Small eggs	Stubs or down	Other causes
Canadian	800	284	144	121	3	16
Prince Edward Island	200	62	27	35	.....	.....
Nova Scotia	270	44	26	18	.....	.....
Nova Scotia Southern	200	65	38	27	.....	.....
New Brunswick	200	80	55	25	.....	.....
Quebec East	200	27	13	14	.....	.....
Quebec West	200	45	18	27	.....	.....
Ontario	600	182	95	83	2	2
Manitoba	230	67	54	12	.....	1
Saskatchewan	260	54	29	23	.....	2
Alberta	260	88	48	32	.....	8
British Columbia	460	330	266	51	6	7
Vancouver Island	340	223	168	46	4	5
	4,220	1,551	984	514	15	41

The 1925 report of the Poultry Division shows a total of 284 breeders interested in registration work with poultry. Of this number 46 breeders have sold or transferred their birds to other breeders or have gone out of the business during the year. This leaves 238 breeders who have carried on work with registered birds during the breeding and hatching season of 1926. To this list has been added 100 new breeders this past season, making a total of 338 poultry-breeders now owners of registered birds in Canada. The distribution of breeders and registered birds is shown in table 27.:—

TABLE 27.—DISTRIBUTION OF BREEDERS AND REGISTERED HENS

—	Breeders			Registered Hens		
	Hatching season 1926	New breeders 1926	Total	Living from previous year	Registered 1926	Total
Prince Edward Island	10	4	14	53	27	80
Nova Scotia	17	22	39	59	64	123
New Brunswick	15	9	24	84	65	149
Quebec	26	8	34	88	33	121
Ontario	49	24	73	344	190	534
Manitoba	12	5	17	50	59	109
Saskatchewan	13	6	19	24	29	53
Alberta	27	8	35	111	51	162
British Columbia	69	14	83	422	455	877
Total	238	100	338	1,235	973	2,208

The table shows that there are in Canada at present 2,208 registered hens. The previous annual report of this division showed 1,767 registered hens at the

beginning of 1926, but during the twelve months 532 have died or have been sold and lost track of, leaving 1,235 birds living from previous years. There were 981 birds registered from all contests in Canada during 1926, but eight of these birds were from England and were returned to their owner at the close of the contest. This leaves 973 registered birds remaining in Canada from the 1926 laying contest which when added to the 1,235 living from previous years makes a total of 2,208 registered birds distributed throughout the various provinces.

The work of registration with poultry continues to grow. In 1922 this registration work started with 59 breeders working with 257 birds. These were confined largely to the province of Ontario. In 1923 the number of breeders had increased to 126 with 807 hens. During the third year, 1924, the number of breeders was again increased to 263 with 1,420 birds, while in 1925 a further increase takes place and we find 284 breeders with a total of 1,767 registered birds. This last year, the fifth year of registration, we have 338 breeders handling 2,208 registered hens. The distribution of breeders is now quite general throughout the various provinces.

REPORTS

Weekly reports were sent out from each office where a contest was held giving the production of each bird and each pen for the week. These were sent to all contestants and interested parties, not only in Canada, but to the United States as well. Copies were also sent to various poultry-breeders and contest managers in England, France, Australia, New Zealand and South Africa.

A report of eggs laid was also compiled each four-weekly period and sent to the Canadian and American poultry press.

At the completion of the 1925-26 egg-laying contest a registration chart was sent out to each breeder giving him important information in connection with the performance of his birds while in the contest. This chart gave the pen and bird number, the wing-label numbers if she was the daughter of a second-generation registered hen, the breeder's mark and tattoo mark if the bird was duly registered, the body weight of the bird, the number of eggs, points secured, and average weight of eggs laid, and disqualifications if such were present. Such information should be of value to breeders in determining the worth of a bird not only from her egg producing ability, but from the standpoint of size of egg and size of bird as well.

INSPECTION

During the year 1926 five registration inspectors have been employed in the work of inspection of registered stock for the purpose of:—

1. Identifying (by means of breeders' registered tattoo marks) as qualified registered stock, the females mated for the season's hatchings.
2. Approving as to the standard quality and fitness the males mated to registered females.
3. Examining trap-nests and hatching-records and instructing breeders as to the best methods of handling same.
4. Checking up and identifying the sealing of bands on all chicks within a given time after hatching.
5. Examining and labelling those pullets that are qualified to enter a contest and to pass and tattoo qualified cockerels from registered matings.
6. Inspecting new breeders desirous of entering laying contests and tattooing all qualified females in the contests at the completion of the contest year.
7. Giving advice and instructions, when desirable, to the breeders in the carrying on of their pedigree breeding work.

The successful breeders realize that intelligent breeding work is essential if good results are to be obtained, and it is very gratifying to know that the fullest co-operation exists between the breeders and the inspector in working towards this end. Even at this early date (the fourth year of registration), the calibre of the breeder and his work is making its appearance by the consistent performance of his stock in the laying contests.

TABLE 28.—NUMBER OF REGISTERED HENS MATED AND CHICKS HATCHED, 1926

—	Hens mated 1926	Chicks wing-banded	Chicks wing-labelled
Prince Edward Island	36	182	32
Nova Scotia	46	360	134
New Brunswick	84	559	100
Quebec	89	865	186
Ontario	334	3,992	534
Manitoba	50	281	24
Saskatchewan	23	146	38
Alberta	87	591	134
British Columbia	367	4,743	1,065
Totals	1,116	11,719	2,247

During the 1926 hatching season 1,116 registered hens were mated to registered or approved males and produced 11,719 chicks, an average of 10.4 chicks per hen. This was 2.1 chicks less than that produced the previous year from registered birds. Of this number 2,247 pullets were wing-labelled as suitable to enter laying contests.

Egg-laying contests are now firmly established in every province in Canada and with the assistance given to breeders through registration inspection rapid progress is being made in poultry breeding work. While much has been accomplished in the past we look with optimism to even greater achievements in the near future.

FIELD WORK IN QUEBEC

The activities in the province of Quebec have been modified somewhat during the past two years. The French correspondence is kept up as is also the Monthly Report Form service. The visits to the branch Farms are continued and even increased where found advisable. The survey work, except in the immediate vicinity of the branch Farms and the district around La Ferme in northern Quebec, has been discontinued.

The fullest co-operation possible is entered into with the provincial activities and Mr. Roy, Inspector for Quebec, has taken exhibits to fairs, and assisted at short courses and meetings throughout the province.

FARM, EGG AND POULTRY ACCOUNTS

In 1915 an effort was made by this division to encourage poultry-keepers to keep records and accounts. For this purpose special sheets, called "Farm, Egg and Poultry Accounts," were prepared and forwarded to those requesting them. The blanks were supplied as long as they were returned to this office once a month. In addition to sending these out, upon request a survey was made with two groups of farmers in May of 1915. One group was in the vicinity of Merrickville, Ont., and the other group in the vicinity of Cap Rouge, Que.

The venture was so encouraging, that to date, farmers, back-lotters, smallholders and numerous other classes from coast to coast are keeping records on the simple monthly form supplied by the Poultry Division, a facsimile of which is shown. From these monthly sheets yearly balances are compiled.

Name..... .....

Address..... .....

Province..... .....

FARM, EGG AND POULTRY ACCOUNT

Copies free to those who return duplicate each month to the

POULTRY DIVISION, EXPERIMENTAL FARM, OTTAWA

Breed.....

No. of matured females.....

Month.....19....

Receipts									Expenditures				Remarks
Date of month	Eggs laid	Eggs sold, eaten or used for hatching	Price per doz.	Total Value $ c.		Poultry sold or eaten	Price per head or per lb.	Total Value $ c.	Weight and kind of feed purchased or taken from farm	Value $ c.	Eggs for hatching stock and appliances purchased	Value $ c.	In this column note number of chicks alive at end of month, also water fowl and turkeys, if any
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
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21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													Total receipts $.....
Total.....													" expenditure $.....
													Profit or loss $.....

Use the back of this form for correspondence, if necessary—Fold at dotted lines—Seal and mail one copy—No stamp required.

Keeping this record simply means keeping an account of the number of birds. This record does not interfere in any way with any special or practical method of care or management. But the poultryman is expected to cull diligently. He may buy and sell whenever he sees fit, providing that a record is kept of the change in the number of hens in the flock. The egg yield must be noted each day and credited to the flock at market prices, whether used in the house, in the incubator, or sold. The other columns of the sheet are to be filled in at time of the transactions. A duplicate copy is to be mailed to the Poultry Division promptly at the end of each month.

In acknowledgment of the receipt of the monthly report the Poultry Division forwards a monthly letter of hints, stressing some subject of importance for the month. Should the report contain correspondence or questions, the replies are attended to in the course of a few days and a personal letter goes forward. Only those who return this monthly report receive these monthly letters of suggestions. With a monthly record of all receipts and expenditures it is not difficult to summarize and balance them at the end of the year.

The following tables show that poultry properly cared for are a profitable investment in any part of Canada:—

TABLE 29.—SMALL RETURNS

Address of Poultry-Keeper	Date	Birds				Average number eggs per bird	Feed cost per dozen eggs	Average market price per dozen eggs	Total value of eggs
		Number at start	Number at end	Average number	Breed				
							cts.	$ cts.	$ cts.
1. Bolton, Ont.	Nov. 1, 1925 to Oct. 31, 1926	300	160	246·2	Mixed....	62·3	29	34	442·04
2. Woodstock, Ont	" "	161	100	143·8	Mixed....	99·9	28	33	398·55
3. Pt. Hammond, B.C.	" "	300	276	276·0	S.C.White Leghorn.	139·8	23	27	876·41

Address of Poultry-Keeper	Value poultry, etc., sold	Feed bought	Eggs and stock bought	Total		Flock profit	Average profit per bird	Total appliances, etc., purchased
				Receipts	Expenditure			
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1. Bolton, Ont.	80 51	360 93	57 00	522 55	417 93	104 62	0 16	0 85
2. Woodstock, Ont.	74 27	335 40	75 00	472 82	410 40	62 42	0 43	.....
3. Pt. Hammond, B.C.	83 71	759 60	.....	960 12	759 60	200 52	0 72	.....

REMARKS.—1. Bolton, Ont. Twenty-six miles from good market (Toronto). Small profits. Cause: bad management, viz., cheap chickens bought; several breeds kept; poor feeding judgment; late mailing reports.

2. Woodstock, Ont. Several breeds kept. Better returns expected. Better judgment exercised when buying stock. First-class day-old chickens purchased.

3. Pt. Hammond, B.C. Neglect to cull flock, hence small profits.

TABLE 30.—SEVERAL GOOD PROVINCIAL RETURNS—STATEMENT 1925–26

Address	Date	Birds		Average number	Breed	Average number eggs per bird	Feed cost per dozen eggs	Average market peices per dozen eggs	Total value of eggs
		Number at start	Number at end						
							cts.	cts.	$ cts.
1. Sydney Forks, C.B., N.S.	Nov. 1, 1925 to Oct. 31, 1926	1,130	647	982	S.C. White Leghorn.	109	23	41	3,754 64
2. Rexton, N.B.	" "	39	36	37·7	Barred Plymouth Rock.	169	13	29	156 29
3. Montreal, P.Q.	" "	100	55	77·0	Rhode Island Red.	154·9	26	62	625 90
4. Canning P.O., Ont.	" "	88	66	74·6	Barred Plymouth Rock.	201·9	18	35	437 88
5. Portage la Prairie, Man.	" "	200	78	155·0	Barred Plymouth Rock.	97·7	12	26	328 64
6. Saskatoon, Sask.	" "	40	24	34·0	Barred Plymouth Rock.	96·7	32	37	101 90
7. Calgary, Alta.	" "	58	22	52·0	Barred Plymouth Rock.	182·4	27	42	337 06
8. Kelowna, B.C.	" "	190	88	143·5	White Wyandotte	141·6	25	36	614 23

Address	Value poultry, etc., sold	Feed bought	Eggs and stock bought	Total		Flock profit	Average profit per bird	Total appliances, etc., purchased
				Receipts	Expentures			
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1. Sydney Forks, C.B., N.S.	403 90	2,323 11	362 45	4,158 54	2,685 56	1,472 98	1 49	.....
2. Rexton, N.B.	40 46	69 55	.....	196 75	69 55	127 20	3 37	0 75
3. Montreal, P.Q.	204 30	362 92	.....	830 20	362 92	467 28	6 06	75 00
4. Canning P.O., Ont.	107 51	231 97	3 65	545 39	235 62	309 77	4 15	6 48
5. Portage la Prairie, Ont.	187 74	150 57	25 00	516 38	175 57	340 81	2 19	.....
6. Saskatoon, Sask.	100 90	89 15	15 00	202 80	104 15	98 65	2 90	17 25
7. Calgary, Alta.	78 80	219 90	132 00	415 86	351 90	63 96	1 23	3 90
8. Kelowna, B.C.	267 65	437 60	78 00	881 88	515 60	366 28	2 55	95 65

REMARKS.—1. Sidney Forks, C.B., N.S. Flock paid for buying and rearing chickens. Otherwise profit $2.04 per bird.
2. Rexton, N.B. Thirty bushels "culled" potatoes fed, evidently with good results.
3. Montreal, P.Q. Flock paid for rearing of chickens. Back-yard flock. Trap-nested. Appliances bought; incubator $48; brooder $12; egg-cartons $15.
4. Canning P.O., Ont. Evidently good producing strain. Eggs slightly under weight.
5. Portage la Prairie, Man. Result of culling. Improvement on breeding noted. $25 paid for two cockerels for 1926 breeding season. Pays to breed good stock.
6. Saskatoon, Sask. Exhibited at shows. Prize-money, sale of cockerels and breeding stock increased the profits.
7. Calgary, Alta. Hatching eggs and chickens bought, $132, included in expenditures. Good profit for flock.
8. Kelowna, B.C. Cost of chickens and feed included in expenditures. Good profit for breed.

It is especially advisable that all the monthly sheets be gone over and studied at the end of the year, to note particularly from what item the greatest income has been derived, whether from market or hatching eggs, market poultry or breeding stock and to study the expenses with relation to the receipts. A record properly kept not only affords pleasure, but is a guide for future operations.

DEMONSTRATIONS AND EXHIBITS AT FAIRS AND POULTRY SHOWS

As in the past, the demand for exhibits arranged by the Extension and Publicity Division of the Central Experimental Farm, Ottawa, has increased to such an extent that in many cases the dates overlapped. Consequently it was found advisable to prepare additional exhibits.

This year's exhibits consisted of suitable legends. One panel demonstrated to the public the steady growth of the Canadian National Egg-Laying Contest from the beginning to date.

On one of the tables were displayed poultry-runs with titles to each, demonstrating that yearly rotation of poultry-yards kept down disease. The other tables displayed useful models of appliances and bulletins.

When the exhibit was illuminated suitable transparencies were displayed. An Attract-o-scope was placed in the middle section of the exhibit. Killing and plucking demonstrations were given at the various shows.

This and similar exhibits were displayed at the Central Canada Exhibition, Ottawa, Canadian National and Royal Shows, Toronto, and various fairs in the Maritime Provinces, Quebec, Ontario and the Western Provinces. Also the Ontario winter shows at Peterboro, Chatham, Kitchener, Beamsville, Windsor, Newmarket, Picton and Essex. In the province of Quebec, at Three Rivers, Quebec and Montreal.

A small exhibit for juniors was staged at the Boy's Hobby Show in Ottawa.

THE WILD GEESE EXPERIMENT

In May of this year ten geese were forwarded from Jack Miner, Kingsville. Five of these left in August and the other five in December. Eight young wild geese were raised and are doing well.

The efforts to establish a flight line so far have not proved successful. However, now that the Farm has been set apart as a Wild Game Sanctuary, success in this line may be more easily attained. We are indebted to the Parks Branch of the Department of the Interior for their hearty co-operation in this work.

NEW PROJECTS UNDERTAKEN DURING 1926

Project P. 104—Feeds for fertility, hatchability and viability (b) Supplementary feeds.

Project P. 150—Egg preservatives—Barral Compound vs. Columbus Powders vs. waterglass.

Project P. 162—Animal protein vs. vegetable protein plus a suitable mineral mixture for egg production.

Project P. 179—The influence of ultra-violet light on egg production.

Project P. 181—The use of ultra-violet rays in incubation.

Project P. 182—The effect of ultra-violet rays on growing chicks.

Project P. 186—*Bacillus pullorum* infection of fowl.

Project P. 189—Glass-substitute in poultry houses.

Project P. 190—The comparative value of grainless, gritless and greenfeed-lacking rations for egg production.

Project P. 192—The influence of various feeds upon the interior quality of eggs.

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