DIFFERENTIAL EFFECTS OF RESERPINE
BY SEXES IN BREEDING TURKEYS

By

JOE MELVIN JONES

Bachelor of Science

Oklahoma State University

Stillwater, Oklahoma

1964

Submitted to the faculty of the Graduate School of
the Oklahoma State University
in partial fulfillment of the requirements
for the degree of
MASTER OF SCIENCE
May, 1966

DIFFERENTIAL EFFECTS OF RESERPINE

BY SEXES IN BREEDING TURKEYS

Thesis Approved:

J. C. Gilbreath
Thesis Adviser

John W. West
Head of the Department

J. H. Boggs
Dean of the Graduate School

ACKNOWLEDGEMENTS

The author wishes to express his sincere appreciation to Dr. J. C. Gilbreath, Associate Professor of Poultry Science, for his guidance and assistance in the conducting of this experiment. Dr. Gilbreath's suggestions and constructive criticisms have been of great value in the preparation of this manuscript.

Dr. John W. West, Professor and Head of the Department of Poultry Science, has contributed both cooperation and constructive criticism in making this thesis possible.

Recognition is extended to Dr. Robert D. Morrison, Professor of Mathematics and Statistics, for his invaluable guidance in the statistical analyses.

The author also wishes to express his appreciation to M. A. Maloney for his assistance in the collection of data and to CIBA Pharmaceutical Products, Inc., who supplied the tranquilizing drug, reserpine, which was used in this research.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
REVIEW OF LITERATURE	3
Physiological Effects	3
Body Weight and Feed Efficiency	5
Reproductive Performance	8
Egg Quality	12
EXPERIMENTAL PROCEDURE	14
Trial I	14
Trial II	20
RESULTS AND DISCUSSION	25
Trial I	25
Trial II	48
SUMMARY AND CONCLUSIONS	71
Trial I and Trial II	71
BIBLIOGRAPHY	73

LIST OF TABLES

Table		Page
I.	All-Mash Turkey Starter and Grower Rations Used in Trial I and Trial II	15
II.	All-Mash Turkey Breeder Ration Used in Trial I and Trial II	17
III.	Average Female Body Weight, Trial I	27
IV.	Average Bird-Day Feed Consumption for Females, Trial I	30
V.	Average Percentage Egg Production, Trial I	33
VI.	Average Percentage Fertility, Trial I	36
VII.	Average Percentage Hatch of Fertile Eggs, Trial I	39
VIII.	Average Percentage Hatch of Total Eggs Set, Trial I	41
IX.	Average Egg Weight, Trial I	44
X.	Average Shell Thickness, Trial I	46
XI.	Average Female Body Weight, Trial II	50
XII.	Average Bird-Day Feed Consumption for Females, Trial II	53
XIII.	Average Percentage Egg Production, Trial II	56
XIV.	Average Percentage Fertility, Trial II	59
XV.	Average Percentage Hatch of Fertile Eggs, Trial II	61
XVI.	Average Percentage Hatch of Total Eggs Set, Trial II	64
XVII.	Average Egg Weight, Trial II	67
XVIII.	Average Shell Thickness, Trial II	69

LIST OF FIGURES

Figure		Page
1.	Male Body Weight as Influenced by Reserpine, Trial I	26
2.	Female Body Weight as Influenced by Reserpine, Trial I	28
3.	Female Feed Consumption as Influenced by Reserpine, Trial I	31
4.	Percentage Egg Production as Influenced by Reserpine, Trial I	34
5.	Percentage Fertility as Influenced by Reserpine, Trial I	37
6.	Percentage Hatch of Fertile Eggs as Influenced by Reserpine, Trial I	40
7.	Percentage Hatch of Total Eggs Set as Influenced by Reserpine, Trial I	42
8.	Egg Weight as Influenced by Reserpine, Trial I	45
9.	Egg Shell Thickness as Influenced by Reserpine, Trial I	47
10.	Male Body Weight as Influenced by Reserpine, Trial II	49
11.	Female Body Weight as Influenced by Reserpine, Trial II	51
12.	Female Feed Consumption as Influenced by Reserpine, Trial II	54
13.	Percentage Egg Production as Influenced by Reserpine, Trial II	57
14.	Percentage Fertility as Influenced by Reserpine, Trial II	60
15.	Percentage Hatch of Fertile Eggs as Influenced by Reserpine, Trial II	62

LIST OF FIGURES (Cont'd)

Figure		Page
16.	Percentage Hatch of Total Eggs Set as Influenced by Reserpine, Trial II	65
17.	Egg Weight as Influenced by Reserpine, Trial II	68
18.	Egg Shell Thickness as Influenced by Reserpine, Trial II	70

INTRODUCTION

During the past several years there has been a great deal of research work with tranquilizing drugs in the area of turkey production. This work was motivated by recent production methods which have allowed the expression of various environmental stresses in the form of aortic rupture. Several workers have reported that reserpine serves as an anti-stress agent, thereby aiding in the prevention and control of aortic rupture in turkeys.

In more recent years, several workers have reported that along with its advantageous effects, reserpine is also responsible for a decrease in reproductive efficiency. This seems to be especially true in turkeys. Although many workers have reported a decline in reproductive efficiency due to reserpine, several questions remain to be answered. Why is this reproductive failure observed; and is a single sex responsible for a greater part of this reduction in reproductive efficiency?

The project reported in this thesis was designed with several objectives in mind. These objectives were to determine:

1. The effect of reserpine on female body weight.
2. The effect of reserpine on female feed consumption.
3. The effect of reserpine on days to female sexual maturity.
4. The effect of reserpine on percentage egg production.
5. The differential effects of reserpine by sexes on percentage fertility.
6. The differential effects of reserpine by sexes on percentage hatch of fertile eggs.

7. The differential effects of reserpine by sexes on percentage hatch of total eggs set.

8. The effect of reserpine on egg weight.

9. The effect of reserpine on egg shell thickness.

It should be pointed out that the primary objectives of this study were to determine if a differential response, by sex, does exist in relation to percentage fertility and percentage hatch of fertile eggs.

Although the results obtained from this experiment are not entirely conclusive, a great deal of new information has been obtained. The knowledge obtained from this study has also contributed both in design and technique to future experiments in hopes that more conclusive answers can be obtained.

LITERATURE REVIEW

According to Schlittler and MacPhillamy (1954) the roots of the Rauwolfia plant have been used for medicinal purposes for over 300 years. This plant was studied in 1582 by a German botanist, Leonard Rauwolf. In his writings, Rauwolf stated that the medicinal uses of this plant included treatment for snake bite, dysentery, insomnia and insanity. The plant was later classified in the family apocynaceae and genus Rauwolfia, after Rauwolf.

Mueller et al. (1952) reported the isolation of an alkoloid from the Rauwolfia root. This alkoloid, given the generic name reserpine, has been extracted from the roots of Rauwolfia serpentina and from Rauwolfia vomitoria.

Several species of Rauwolfia have been indentified by Bein (1956). These species have been found in the tropical and sub-tropical areas of India, Africia, the East Indies, Central and South America.

In a review of reserpine, Earl (1956) characterized the physical properties of the drug. Reserpine is a pale yellow powder, soluble in acetic acid, ascorbic acid, citric acid or in mixed solvents. It has a melting point of 262-263 degrees C.

Physiological Effects

Using dogs as an experimental animal, Plummer et al. (1954) stated that sedation was observed within 60 to 90 minutes after an intravenous dose of 250 and 300 micrograms of reserpine per kilogram of body weight. It was also observed that reserpine did not inhibit movement, sensitivity to touch or sound and that there was no personality change. Large doses of 300 and 500 micrograms per kilogram of body weight resulted in a gradual decrease in arterial blood pressure. In the same study, oral administration of reserpine at 25 micrograms per kilogram of body weight did not reduce blood pressure in either dogs or monkeys.

Sturkie (1959) administered intramuscular injections of reserpine into capons. Dosages ranging from .006 to .75 milligram per kilogram of body weight resulted in reduced systolic blood pressure. Levels between .10 and .75 caused a significant reduction in heart rate.

Brodie _et al_. (1956) administered intravenous injections of reserpine into rabbits at 5 milligrams per kilogram of body weight. A negative relationship was observed between brain serotonin and reserpine in the brain. The author therefore suggested that the observed effects of reserpine was a result of the release of serotonin from the brain.

The hypotensive action of reserpine was shown by Ringer (1959), using Broad Breasted Bronze turkeys. In this study reserpine was administered at levels between 0.1 and 4.0 p.p.m. in the diet. The results indicated a negative linear relationship between treatment level and blood pressure.

Schneider and Earl (1954) observed the effects of reserpine on mulatto monkeys. Reserpine was administered intravenously at levels of 0.5 and 1.0 milligram per kilogram of body weight and orally at 25 to 50 milligrams per kilogram of body weight. Sedation occured within 30 to 45 minutes after injection and lasted from 12 to 24 hours. The monkeys appeared relaxed and were easy to handle. There were no signs of mental depression and sleep was not induced. It was also observed that a 4.5 to 5.5° F. reduction in body temperature accompanied the sedation.

Early observations on the hypotensive action of reserpine led to the incorporating of the drug into poultry rations. It was felt that reserpine might be beneficial in the prevention of death losses due to heat stress and aortic rupture. Barnett (1960) reported that reserpine administered at 0.8 and 1.6 mg. per pound of diet reduced mortality that was due to artifically induced aortic rupture. In the same report, Barnett stated that reserpine at levels of .45 and 1.5 mg. per pound of diet sucessfully reduced mortality in field outbreaks of aortic rupture.

A series of two experiments was conducted by Waibel (1960) in an attempt to produce laboratory cases of dissecting aneurysm. Broad Breasted Bronze and Lancaster White turkeys were used in this study. After mortality due to dissecting aneurysm became apparent, reserpine was administered at levels ranging from 0.2 to 2.2 p.p.m. in the diet. All levels of the drug seemed to reduce mortality.

Morrison (1960) reported that in a flock of 1,800 male turkeys 12 weeks of age, death losses due to aortic rupture was about 15 birds per day. Reserpine was administered in the diet at a level of 0.2 p.p.m. Within 72 hours death loss due to aortic rupture was negligible. In a later outbreak of aortic rupture, reserpine at a level of 1.0 p.p.m. in the diet was effective in reducing mortality.

A ten-year review of field outbreaks of aortic rupture in turkeys was presented by Patrias (1960). He reported that reserpine at a level of 0.2 p.p.m. appeared to be adequate for the prevention of aortic rupture and that 1.0 p.p.m. controlled outbreaks of aortic rupture.

Body Weight and Feed Efficiency

Reserpine administered to Large White turkey poults at 0.00 and 0.25 mg. per kg. of diet showed a highly significant depression in body weight and feed conversion at three and at six weeks of age (Anderson and Smyth, 1960). At ten weeks of age the poults receiving the drug had partially overcome the depressed growth, with body weights approaching those of the controls. An increase in reserpine level from 0.25 to 0.50 mg. per kg. of diet at 10 weeks of age caused a significant reduction in body weight gain. There was, however, a slight increase in feed conversion.

When 18-week-old turkeys received reserpine at levels of 0.0, 0.5 and 1.0 mg. per kg. of diet, a significant decrease in growth was observed by both levels of reserpine (Carlson, 1956). There was also an indication that at the 0.5 mg. level the females were more adversely affected than the males. Both levels of reserpine were detrimental to feed efficiency in both sexes.

Gilbreath et al. (1959) administered reserpine at levels of 0.0 and 2.0 mg. per kg. of diet to seven-month-old White Leghorn females for 28 weeks. The birds had attained 70 percent egg production when treatment began. Body weight records indicated that reserpine caused a reduction in body weight, although the observed difference was not significant at the 5.0 percent level of probability. In the same study, average daily feed consumption was significantly lower for the treated females. In a similar study, Weiss (1960a) reported that reserpine administered at levels up to 2.0 mg. per kg. of diet did not affect body weight.

Five-week-old Broad Breasted Bronze turkeys were fed reserpine at levels ranging from 0.0 to 4.0 p.p.m. (Speckman and Ringer, 1961). All levels significantly reduced blood pressure but only levels above 3.0 p.p.m. reduced body weight gains.

Slinger et al. (1962) administered reserpine at levels of 0.0 and 0.2 p.p.m. to turkeys during the 9-week to 23-week growing period. Results of this study showed a significant reduction in both body weight gains and feed efficiency due to reserpine treatment.

Anderson and Smyth (1959) conducted a study in which White Leghorn chicks received reserpine at levels of 0.0 and 0.5 mg. per kg. of diet. One group was treated from three weeks of age until the study was terminated. A second group began receiving the drug at 19 weeks of age. Body weight from three to ninteen weeks of age was not affected by either level of reserpine. From three to nine weeks of age, reserpine increased feed efficiency, while the reverse was true from nine to 19 weeks of age. At 31 weeks of age, all birds were subjected to heat stress. The birds receiving reserpine at 19 weeks of age gained weight, while the controls and the group treated from three to 19 weeks lost weight.

In a study with Broad Breasted Bronze turkeys, Carlson (1960) administered levels of 0.0 and 0.5 mg. of reserpine per pound of diet. Continuous treatment began when the poults were 12 weeks of age. Body weight from 12 to 16 weeks of age was not affected by reserpine treatment. However, at 26 weeks of age, the reserpine treated birds showed a marked reduction in body weight. There was also an indication that, between 12 and 16 weeks of age, feed efficiency had been reduced by reserpine treatment.

Friars et al. (1964) administered reserpine at dietary levels of 0.0 and 0.25 p.p.m. to Small White turkeys. The birds received treatment from the 9th to the 19th week of age, and another group was treated at the 1.0 p.p.m. level during the 12th and 15th weeks of age. A reduction in feed efficiency was observed in both the continuous and the intermittent treatments. Continuous reserpine treatment depressed male growth during the 13 through 16 week growing period, but this significant effect was not observed in the females until the 17 through 19 week period.

In a growth and feed efficiency study, Morrison (1962) administered reserpine to turkey poults at levels of 0.0, 0.2, 0.4 and 1.0 p.p.m. in the diet. Treatment began when the poults were eight weeks of age and was continued until 20 weeks of age. Although reserpine depressed growth rate, the difference was not statistically significant. Feed efficiency was reduced by the reserpine treatment. This difference was statistically significant during the 16 to 20 week growing period.

Hewitt (1959) fed reserpine to young pheasants at a rate of zero and 2 grams per ton of diet. The results of this study showed that reserpine significantly reduced rate of gain. Feed consumption was also slightly reduced.

A study by Rudolph et al. (1962) showed that graded levels of reserpine caused a significant linear decrease in body weight gain. In this study, Broad Breasted Bronze turkeys received reserpine over a 20-week period, beginning at 24 weeks of age. Reserpine was administered at levels of 0.0, 0.5, 1.0 and 2.0 mg. per kg. of diet.

The results of a study conducted by Burger et al. (1959) showed that the reserpine mother liquor administered at low levels stimulated poult growth and that high levels depressed growth rate. In this study reserpine was administered at levels of 0.0, 1.0, 10.0 and 25.0 mg. per kg. of diet. By 38 days of age, the poults treated at the 10.0 and 25.0 mg. levels had recovered body weight and were about equal to the controls.

Reproductive Performance

The addition of seven milligrams of serpasil per kilogram of diet caused a 17 percent reduction in egg production in pheasants (Hewitt and Reynolds, 1957). In the same study fertility was lowered by 8.5 percent. There was also a slight reduction in hatchability of fertile eggs.

Aulerich et al. (1964) fed reserpine to young male mink in an attempt to prevent fighting in colony breeding pens. Reserpine was administered so that the males received .00, .04, .06 and .08 milligrams per mink per day. These levels resulted in sedation, however, and fertility was reduced. Examination of testicular development showed that the testes of the treated males were smaller than those of the control males. The data also indicated that testicular development and reserpine level were inversely proportional. Microscopic examination indicated a reduction in spermatogenesis in the treated males. Further study led these workers to suggest that reserpine acts to delay rather than to inhibit spermatogenesis.

Results similar to these were reported earlier by Kazan et al. (1960). In this study reserpine at a level of 0.2 mg. per kg. of diet delayed testicular descent in young male rats. Levels above 1.0 mg. per kg. of diet caused a degeneration of testicular tissue in mature male rats. Working also with young female rats, reserpine at the 0.2 mg. level delayed vaginal opening. Using mature normally cycling female rats, reserpine was found to cause an interruption of estrus. Ovaries were removed from both the treated and the untreated females. Mature follicles were not present in the treated females.

Van Matre et al. (1957) administered reserpine to White Leghorn hens. Artificial heat stress was induced following treatment. The results of this study indicated that reserpine was beneficial in reducing mortality and in maintaining egg production. In a similar heat stress study, Burger (1960) reported that reserpine at a level of 10.0 p.p.m. aided in maintaining percentage production. Levels of 2.5 and 5.0 p.p.m. did not appear to affect egg production of birds subjected to heat stress.

Parker (1960) conducted a series of egg production tests using White

Leghorn hens. Reserpine was fed at levels of 0.0 and 0.5 p.p.m. The results of these tests showed a positive relationship between treatment and egg production. Reserpine exhibited its most beneficial effects at temperatures above 90 degrees F.

Significant differences in ovarian weight, due to reserpine were reported by Rood et al. (1958). In this study reserpine was administered at levels of 0.0, 0.1 and 1.0 p.p.m. to White Rock cross females at four weeks of age. At 56 days of age, one-half of each group was slaughtered. The birds receiving reserpine at the 1.0 p.p.m. level had a significantly higher ovarian weight. At 77 days of age, a difference in ovarian weight was not observed.

Gilbreath et al. (1959) administered reserpine at levels of 0.0 and 2.0 mg. per kg. of diet to White Leghorn females at seven months of age. Although egg production was relatively high throughout the study, reserpine significantly reduced percentage egg production.

The addition of 2.0 p.p.m. of reserpine to a turkey breeder ration resulted in a reduction in egg production, fertility and hatchability (Greene et al., 1961). The drop in egg production was first observed during the third month of production. Reduced fertility and hatchability were observed in the eggs produced during the first 28 days of production.

Friars et al. (1964) administered reserpine at a level of 0.25 p.p.m. to Broad Breasted Bronze turkeys. The birds received continuous treatment from nine to 19 weeks of age and intermittent treatments at 12 and 15 weeks of age. There was no observed treatment effect on percentage fertility. Both continuous and intermittent treatment depressed hatchability of fertile eggs.

A definite reduction in percentage egg production was observed by

Gilbreath et al. (1960). In this study White Leghorn pullets received continuous reserpine treatment at levels of 0.0, 1.5, 2.0 and 2.5 mg. per kg. of diet. The reduction in egg production was observed only during the first 28 days of production. This led the author to suggest that this reduction may have been expressing a delay in onset of sexual maturity.

Rudolph (1961) fed reserpine to Large White turkeys at levels of 0.00, 0.25, 0.50 and 1.00 mg. per kg. in an all-mash turkey breeder ration. Treatment began when the birds were 27 weeks of age. The results of this Trial showed that as the level of reserpine increased there resulted a linear decrease in percentage fertility and percentage hatch of total eggs set. In another trial of the same study, Broad Breasted Bronze turkeys received reserpine at the above levels beginning at 26 weeks of age. The treatment period was 20 weeks in duration; however, data were also collected for an 18-week post-treatment period. During the treatment period, reserpine caused a decrease in percentage egg production, percentage fertility and percentage hatch of total eggs set. After treatment was discontinued, differences between treatment groups were not observed.

The results of a study involving the oral administration of reserpine to mature Broad Breasted Bronze turkeys was reported by Casey et al. (1963). Reserpine was administered at levels of 0.0, 0.5, 1.0 and 2.0 p.p.m. for 26 weeks beginning when the birds were 24 weeks of age. All levels of treatment resulted in a marked delay in the onset of sexual maturity. There was also an increase reduction in fertility as the level of reserpine was increased. A negative relationship was also observed between treatment level and percentage hatch of fertile eggs. In a separate trial of this study, reserpine was administered between 12 and 24 weeks of age. Data collected and analyzed for onset of sexual maturity and egg production did not indicate any residual effects of reserpine.

Egg Quality

Reserpine was administered to laying pullets at levels ranging from 0.0 to 1.0 mg. per pound of diet (Couch, 1959). Reserpine did not exhibit any observed effect on egg weight. In a similar study, Van Matre et al. (1957) reported that oral administrations of reserpine aided in maintaining egg quality during periods of heat stress.

Eoff et al. (1961) fed reserpine to White Leghorn pullets. Treatment levels of 0.25 and 0.50 mg. per pound of diet resulted in a significant increase in egg weight. A comparison of the 0.0 mg. level and the 1.0 mg. level showed a significant reduction in egg weight.

Measurements taken on egg weight and shell thickness were reported by Carlson (1959). The results of this study, involving oral administration of reserpine to laying hens, indicated that reserpine had no effect on either variable.

White Leghorn females were fed reserpine at levels of 0.0 and 0.5 mg. per kg. of diet (Anderson and Smyth, 1959). During a period of artificial heat stress, reserpine maintained egg weight while the eggs from the untreated females became smaller. Egg shell thickness was not affected by reserpine treatment.

Barrett (1959) reported that reserpine fed at levels ranging from 0.0 to 1.0 mg. per lb. of diet had no effect on average egg weight.

In a study reported by Gilbreath (1959), reserpine caused in increase in egg weight and egg shell thickness. In this study, White Leghorn females received reserpine at levels of 0.0 and 2.0 mg. per kg. of diet.

Results on egg weight and shell thickness have been reported by

Burger (1960). In this study reserpine was administered orally to 12 strains of mature hens at levels of 0.0, 2.5, 5.0 and 10.0 p.p.m. Neither Egg weight nor shell thickness was affected by reserpine treatment at high temperatures.

Weiss (1961) conducted a study in which White Leghorn hens received reserpine at levels of 0.0 and 0.2 mg. per bird per day. Temperature was maintained at 95 degrees F. Reserpine appeared to maintain both egg weight and shell thickness.

Rudolph (1961) reported that no difference in egg weight was observed either during or after reserpine treatment. The average shell thickness of eggs from treated birds exhibited a marked decrease when treatment was discontinued. In this study Broad Breasted Bronze females received oral levels of reserpine as 0.0, 0.5, 1.0 and 2.0 mg. per kg. of the diet.

Mature Broad Breasted Bronze turkeys received reserpine at levels of 0.0, 0.5, 1.0 and 2.0 p.p.m. of the diet (Casey, 1963). The results of the study indicated that reserpine had no effect on egg weight or shell thickness.

EXPERIMENTAL PROCEDURE

These experiments were conducted during the 1963-1964 and the 1964-1965 breeding seasons. Both trials were designed to measure differential effects, by sex, of reserpine on reproductive efficiency in turkeys. Reserpine was administered at levels of 0.0 p.p.m. and 2.0 p.p.m. in a breeder ration beginning at 26 weeks of age. A different strain of turkey was used in each trial. However, the experimental design of both trials was identical. Both experiments were conducted on the Oklahoma State University Turkey Farm at Perkins, Oklahoma.

Trial I, 1963-1964

The experimental birds used in this study were from a strain of Broad Breasted Bronze turkeys maintained by the Oklahoma Agricultural Experiment Station.

On June 3, 1963, 320 female and 100 male poults were hatched and subsequently housed in 12' x 16' brooder houses. Females were housed 80 per house, in four houses, with the 100 males being brooded in a single house.

All birds were wing banded and males were de-snooded at four days of age. The poults were vaccinated against Newcastle disease at four days of age using the wing-web method of vaccination.

A series of all-mash starter-grower rations was fed _ad libitum_ from one day to 24 weeks of age. The composition of these rations is shown in Table I. Three 36" trough type feeders and three, two and one-half gallon waterers were provided in each brooding house.

The female poults were wingnotched (tenotomized) at four weeks of age to prevent flying while in the breeding pens.

TABLE I

ALL-MASH TURKEY STARTER AND GROWER RATION USED IN

TRIAL I AND TRIAL II

Ration number	SMT 601-3	SMT 602-3	GMT 603-3	GMT 604-3	GMT 605-3	GMT 607-3	GMT 608-3
Age fed	1-4 Weeks	5-6 Weeks	7-8 Weeks	9-12 Weeks	13-16 Weeks	17-20 Weeks	21-24 Weeks
Ingredients				Percent			
Fat (Tallow)	8.0	8.0	9.0	7.5	6.8	4.5	3.8
Ground yellow corn	27.65	31.0	43.0	52.9	57.6	72.7	38.7
Oat mill feed	5.0	5.0	2.4	2.0	1.8	1.2	1.0
Corn gluten meal	5.0	5.0	3.6	3.0	2.7	1.8	1.5
Alfalfa meal (17% protein)	2.0	2.0	1.8	1.5	1.4	0.9	0.8
Fish meal (60% protein)	10.0	8.0	10.8	9.0	8.1	5.4	4.5
Blood meal (80% protein)	3.0	3.0	3.0	2.5	2.3	1.5	1.3
Meat and bone scrap (50% protein)	7.0	6.0	4.2	3.5	3.2	2.1	1.8
Soybean oil meal (50% protein)	24.0	22.7	16.0	12.0	10.5	6.0	4.5
Dried whey	2.0	2.0	1.8	1.5	1.4	0.9	0.8
Dried condensed fermented corn extractives[1]	3.0	3.0	1.8	1.5	1.4	0.9	0.8
VMC-60[2]	0.5	0.5	0.6	0.5	0.45	0.3	0.3
VC-60A[3]	0.25	0.25	---	---	---	---	---
Salt	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Di-calcium phosphate	1.0	1.0	1.2	1.0	0.9	0.6	0.5
Calcium carbonate	1.0	2.0	1.2	1.0	0.9	0.6	0.5
dl-Methionine	0.1	0.1	0.1	0.1	0.09	0.06	0.05
Histostat	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TM-10 (Terramycin supplement)	0.1	0.1	0.1	0.1	0.1	0.1	0.1

[1] Dried condensed fermented corn extractives--C.F.S. No. 3, Clinton Corn Processing Company, Clinton, Iowa.

[2] VMC-60-vitamin-mineral concentrate adds the following per pound of finished ration: vitamin A, 8,000 U.S.P. units; vitamin D_3, 1,200 I.C.U.; vitamin E, 6 I.U.; vitamin K, 3 milligrams; vitamin B_{12}, 0.008 milligrams; riboflavin, 4 milligrams; niacin, 32 milligrams; panthothenic acid, 8 milligrams; choline chloride, 500 milligrams; manganese, 27.7 milligrams; iodine, .86 milligrams; cobalt, .59 milligrams; iron, 21.8 milligrams; copper, 1.65 milligrams; and zinc, 22.7 milligrams.

[3] VC-60A-vitamin concentrate adds the following per pound of finished ration: pyridoxine, 8 milligrams; biotin, 0.3 milligrams; thiamin, 12 milligrams; folic acid, 2 milligrams; inositol, 50 milligrams; para-amino-benzoic acid, 4 milligrams; and ascorbic acid, 10 milligrams.

At seven weeks of age all birds were transferred from the brick brooders into a single 48' x 48' pole shed. Feed and water were supplied ad libitum from two 8' bulk feeders, eight 36" trough type feeders and ten automatic waterers, 12" in diameter.

Poults were vaccinated against fowl pox at nine weeks of age using the "thigh stick" method of vaccination.

From 12 to 24 weeks of age all birds were reared on a single 200' x 500' bermuda grass range. Feed and water were provided ad libitum from six 8' bulk feeders and ten automatic waterers, each 12" in diameter. Portable shades and a roosting arear were also provided.

On November 19, 1963, at 24 weeks of age, the birds were removed from range and placed in breeding pens. Using a table of random numbers and corresponding wing band numbers, 192 females were randomly assigned to one of 16 female breeding pens. Twelve females were assigned to each pen.

Sixty males were randomly selected and divided into two equal groups of 30 males per group. They were then placed in a single straw loft house where each group had a pen area of 15' x 30'. Each male pen consisted of a roosting area, two 3-gallon waterers and two 5' bulk feeders.

The female breeding pens were 50' x 100'. A single 12' x 16' house was located in each breeding pen. Each house contained a nesting area, roosting area, one hanging bulk feeder and one automatic water 12" in diameter.

At the time the birds were housed in the breeding pens they began receiving an all-mash breeder ration, (Table II). Reserpine was not incorporated into the diet until the birds were 26 weeks of age.

On December 3, 1963, the 16 female pens were randomly assigned to

TABLE II

ALL-MASH TURKEY BREEDER RATION USED IN

TRIAL I AND TRIAL II

Ingredients	Percent
Fat (Tallow)	8.0
Ground yellow corn	27.7
Ground yellow milo	20.0
Oat mill feed	6.5
Alfalfa meal (17% protein)	2.5
Wheat shorts	5.0
Soybean oil meal (50% protein)	7.5
Fish meal (74% protein)	5.0
Meat and bone scrap (50% protein)	4.0
Yeast culture	1.0
Dried fish solubles	1.5
Distillers solubles (CFS-3)[1]	1.5
Di-calcium phosphate (18% phosphorous)	4.0
Calcium carbonate	3.0
Salt	0.5
Fluidized Pex (Whey liquid Pex)	1.0
dl-Methionine	0.1
Fermacto[2]	0.4
Lecithin	0.25
VMC-60[3]	0.5
Vitamin E (10,000 I.U./gm)	6 gms.
NF-180[4]	9.1 gms.
Histostat 50[5]	22.7 gms.

1 Distillers solubles--C.F.S. No. 3, Clinton Corn Processing Company, Clinton, Iowa.

2 Fermacto--a dried extracted streptomyces fermentation residue. Borden Company, Feed Supplements Department, New York 17, New York.

3 VMC-60-vitamin mineral concentrate adds the following per pound of finished ration: vitamin A, 8,000 U.S.P. units; vitamin D_3, 1,200 I.C.U.; vitamin E, 6 I.U.; vitamin K, 3 milligrams; vitamin B_{12}, 0.008 milligrams riboflavin, 4 milligrams; niacin, 32 milligrams; panthothenic acid, 8 milligrams; choline, 500 milligrams; manganese, 27.7 milligrams; iodine, .86 milligrams; cobalt, .59 milligrams; iron, 21.8 milligrams; copper, 1.65 milligrams; and zinc, 22.7 milligrams.

4 NF-180--furazolidone (n-(5-nitro-2 furfurylidene)-3-amino-2-oxozolidone).

5 Histostat 50-a product of Dr. Salsbury's Laboratories used in the prevention of blackhead; active ingredients: 4-Nitrophenylarsonic acid.

one of four treatment combinations. The statistical design of this experiment was a completely randomized design with a factorial arrangement of treatments. Females in eight of the female breeding pens received 2.0 p.p.m. of reserpine, in the ration, while the females in the remaining eight pens received only the breeder ration.

One group of males received the breeder ration plus 2.0 p.p.m. of reserpine. The other group of males received the breeder ration with no reserpine.

By treating one half of each sex, it was possible to have four different treatment combinations. There were four female pens in each treatment combination and each pen served as an experimental unit. The four treatment combinations were as follows: in treatment A, non-treated males were mated with non-treated females; treatment B consisted of non-treated males and treated females; in treatment C, treated males were mated with non-treated females; and in treatment D, treated males were mated with treated females.

Initial body weights were taken when treatment began and were recorded on a pen average basis. Birds were weighed at 28-day intervals throughout the study and body weights were recorded as a pen average. Feed consumption records were also recorded on a pen basis every 28 days, starting when treatment began.

Males began receiving artificial lighting when reserpine treatment began, at 26 weeks of age. Females were lighted at 28 weeks of age. Artificial lighting supplemented natural sunlight so that both sexes received 14 hours of continuous light per 24-hour period.

When a female became broody, she was removed from the breeding pen until she started back into production. Both mortality and broodiness records were maintained throughout the treatment period in order to calculate the number of hen-days per pen. Average bird-day feed consumption and percentage egg production were calculated using the number of bird-days per pen as the denominator.

Percentage egg production was calculated, by pens, every 28 days beginning January 12, 1964. The first egg was laid on this date. Egg records were placed in each house and eggs were marked as to pen number when they were collected.

Days to sexual maturity were calculated for each pen. The Criterion for determining sexual maturity was the first day that the females in a pen reached 25 percent egg production. The number of days from hatching to the day 25 percent egg production was attained was the number of days to sexual maturity.

Mating began the day the first egg was laid, January 12, 1964. Natural mating was used throughout the entire experiment.

Sixteen males were randomly selected from each group of 30 males every Monday, Wednesday and Friday. They were then placed with the females, two males per female pen, from 11:00 a.m. until 3:00 p.m. Males were marked to assure that they would be placed in the proper female pen. Males were removed from the female pens in the same order that they were distributed. This procedure allowed all males equal time in the female pens.

During the four-hour breeding periods, neither males nor females were allowed access to feed. Water was supplied outside each house.

Eggs were set at 14-day intervals beginning February 10, 1964 until the last setting on June 15, 1964.

Percentage fertility, percentage hatch of fertile eggs and percentage hatch of total eggs set were calculated. Percentage fertility was determined by breaking out those eggs which had not hatched after 28 days of incubation. The dead embryos, the unhatched poults and the hatched poults were then totaled and counted as fertile eggs.

Percentage hatch of fertile eggs and percentage hatch of total eggs set were not calculated for periods 7 and 10 due to an incubator failure resulting in high embryonic mortality. It was possible however, to obtain reliable fertility information.

Egg weight and shell thickness measurements were taken at 28-day intervals beginning March 12, 1964 and ending June 3, 1964. One day's eggs, from all pens, were individually weighed to the nearest gram. Each egg was then broken out and shell thickness, including the inner shell membrane, was measured to the nearest 10^{-3} inches using a convex anvil micrometer.

Trial II, 1964-1965

The experimental birds used in this trial were a commercial strain of large white turkeys obtained from a hatchery in Moundridge, Kansas.

On June 5, 1964, at one day of age, 240 female and 100 male poults were housed in 12' x 16' brooding houses on the University turkey farm. Females were brooded 80 per house, while the 100 male poults were brooded in a single house.

Feed and water were supplied <u>ad libitum</u> from three 36" trough type feeders and three, two and one-half gallon waterers. The feeding regime in this trial was identical to that in trial I, as shown in Table I.

At four weeks of age all birds were wing banded in order to facilitate randomization at 24 weeks of age. On that same day all birds were vaccinated with B_1 type Newcastle-bronchitis vaccine. The intranasal method of vaccination was used, placing one drop of vaccine into one nostril of each bird.

Two days following vaccination the poults in all four houses showed signs of respiratory difficulty. They were immediately treated with Medic-Aid, a product of Dr. Salsbury's Laboratories, Charles City, Iowa.

Following consultation with a poultry pathologist in the College of Veterinary Medicine, it was decided that the birds had chronic respiratory disease. Since bronchitis is not a naturally occuring disease in turkeys, the introduction of a foreign protein resulted in extreme stress and high mortality.

Four days following vaccination, Tylan (a Purina product) was added to the drinking water along with the Medic-Aid. An extra amount of stress additive, Terramycin supplement, was incorporated into the ration, making a total of four pounds per ton. This was continued until the study was terminated. The birds received Tylan for ten consecutive days, but Medic-Aid treatment was continued until the birds were eight weeks old.

When the poults were seven weeks of age they were moved from the brick brooding houses into a single 48' x 48' pole shed. Feed was supplied ad libitum from eight 36" trough type feeders and two 8' bulk feeders. Water was available at all times from 12 two and one-half gallon waterers. Automatic waterers were not used until the birds were eight weeks of age.

At eight weeks of age all birds were vaccinated against fowl pox. The "thigh stick" method of vaccination was used.

All females were wing notched (tenotomized) at nine weeks of age in order to prevent flying while in the breeding pens.

Beginning about September 15, 1964 cannibalism became a severe problem.

Whole bales of green alfalfa hay were placed in the pole shed, one bale per 100 birds. The hay seemed to have reduced cannibalism and by October 1, 1964 cannibalism was negligible.

On November 19, 1964, at 24 weeks of age, all birds that appeared to be unsatisfactory for normal reproduction or that were otherwise unfit to continue in the experiment were culled. After culling, 76 males and 183 females were retained to continue in the experiment.

Using a table of random numbers and corresponding wing band numbers, 176 of the 183 females were randomly assigned into 16 breeding pens. Eleven females were assigned to each pen.

Of the 76 males, 60 were randomly assigned into two equal groups of 30 males each. Each group was then placed in a 30' x 15' pen in a single straw loft house.

Both the male and female breeding pens were the same as those used in trial I.

Males began receiving artificial lighting at 26 weeks of age. The females were lighted at 28 weeks of age. This lighting regime supplemented natural lighting so that the birds received 14 hours of continuous light per day.

All birds were placed on the breeding ration at 24 weeks of age. Reserpine treatment was started two weeks later.

This trial, like the first trial, was a completely randomized experiment with a factorial arrangement of treatments. One-half of the males and one-half of the females received reserpine at a level of 2.0 p.p.m. in the breeder ration. Using a factorial arrangement it was possible to have four different treatment combinations with four female pens in each treatment. As in the previous trial, treatments were as follows: A, non-treated males x non-treated females; B, non-treated males x treated females; C, treated males x non-treated females; and D, treated males x treated females.

When treatment began all birds were weighed in order to have a measure of initial body weight. Body weights were taken at 28-day intervals throughout the study and recorded on a pen average basis. Feed consumption records were kept when treatment began and recorded on a bird-day per pen basis at 28-day intervals.

Accurate mortality records were maintained throughout the study. When a female became broody she was removed from the breeding pen and placed in confinement until she started back into production. Both mortality and broodiness were recorded so that at the end of each 28-day interval the number of bird-days per pen could be calculated.

Average bird-day feed consumption and percentage egg production were calculated using the number of bird-days per pen as the denominator.

Egg production was recorded daily by pens beginning January 1, 1965 even though the first egg was not laid until January 5, 1965. Egg recording sheets were placed in each house and eggs were marked as to pen number when they were collected.

Days to sexual maturity were calculated on a pen basis. A pen was said to be sexually mature the first day that 27.3 percent egg production was recorded for that pen. The number of days from hatching to the day 27.3 percent egg production was attained was the criterion used for calculating days to sexual maturity.

Mating saddles were placed on the females on January 14, 1965 in order to prevent back injury during natural mating.

Mating began January 18, 1965. Sixteen males from each of the two male groups were selected at random each Monday, Wednesday and Friday. They were then placed with the females, two males per breeding pen, from 11:00 a.m. until 3:00 p.m. Males were removed from the female pens in the same order that they were put in. This allowed all males equal time with the females.

From the day mating began all eggs were saved and incubated at 14 day intervals. This was continued until the trial was terminated. Eggs were incubated for 28 days, at which time all poults were counted. The remaining eggs were then broken out and checked for fertility. The healthy poults, poults that did not complete pipping and the dead embryos were totaled and counted as fertile eggs. It was then possible to calculate percentage fertility, percentage hatch of fertile eggs and percentage hatch of total eggs set. These percentages were all calculated and recorded on a pen basis.

Hatchability records were not available for the eighth incubation period due to an incubator failure. Since this malfunction did not occur until the 15th day of incubation, it was possible to obtain fertility information.

Egg weight and shell thickness measurements were taken at 28-day intervals beginning January 27, 1965. One day's eggs, from all pens, were individually weighed to the nearest gram. Each egg was then broken out and shell thickness, including the inner shell membranes, was measured to the nearest 10^{-3} inches using a convex anvil micrometer. Both egg weight and shell thickness were averaged and recorded by pens.

RESULTS AND DISCUSSION

Trial I

Reported in this section are the results obtained when broad Breasted Bronze turkeys received reserpine at levels of 2.0 p.p.m. and 0.0 p.p.m. Treatment began at 26 weeks of age and continued throughout the breeding season. Those variables analyzed were: body weight of females, days to sexual maturity, feed consumption of females, percentage egg production, percentage fertility, percentage hatch of fertile eggs, percentage hatch of total eggs set, egg weight and egg shell thickness.

Body weight measurements for both the treated and the non-treated males were recorded and are presented in Figure 1. Since male body weights were recorded on a pen average basis, and there was only one pen in each treatment, it was impossible to calculate experimental error. Therefore, no statistical analysis was performed on male body weights. As seen in Figure 1, the treated males failed to reach a mature body weight as early in the breeding season as did the untreated males. They did, however, reach a higher mature body weight during the periods in which the untreated males were losing weight.

The average body weights of the treated females were compared to the average body weights of the non-treated females using the analysis of variance method of comparison. The results of these comparisons indicate a lower body weight for the treated females (Table III and Figure 2). The observed differences in average body weight were found to be statistically significant in periods two, three, four and seven. Over all periods, the difference due to treatment was significant at the 99.0 percent level of probability. Figure 2 indicates that the greatest treatment effect occured

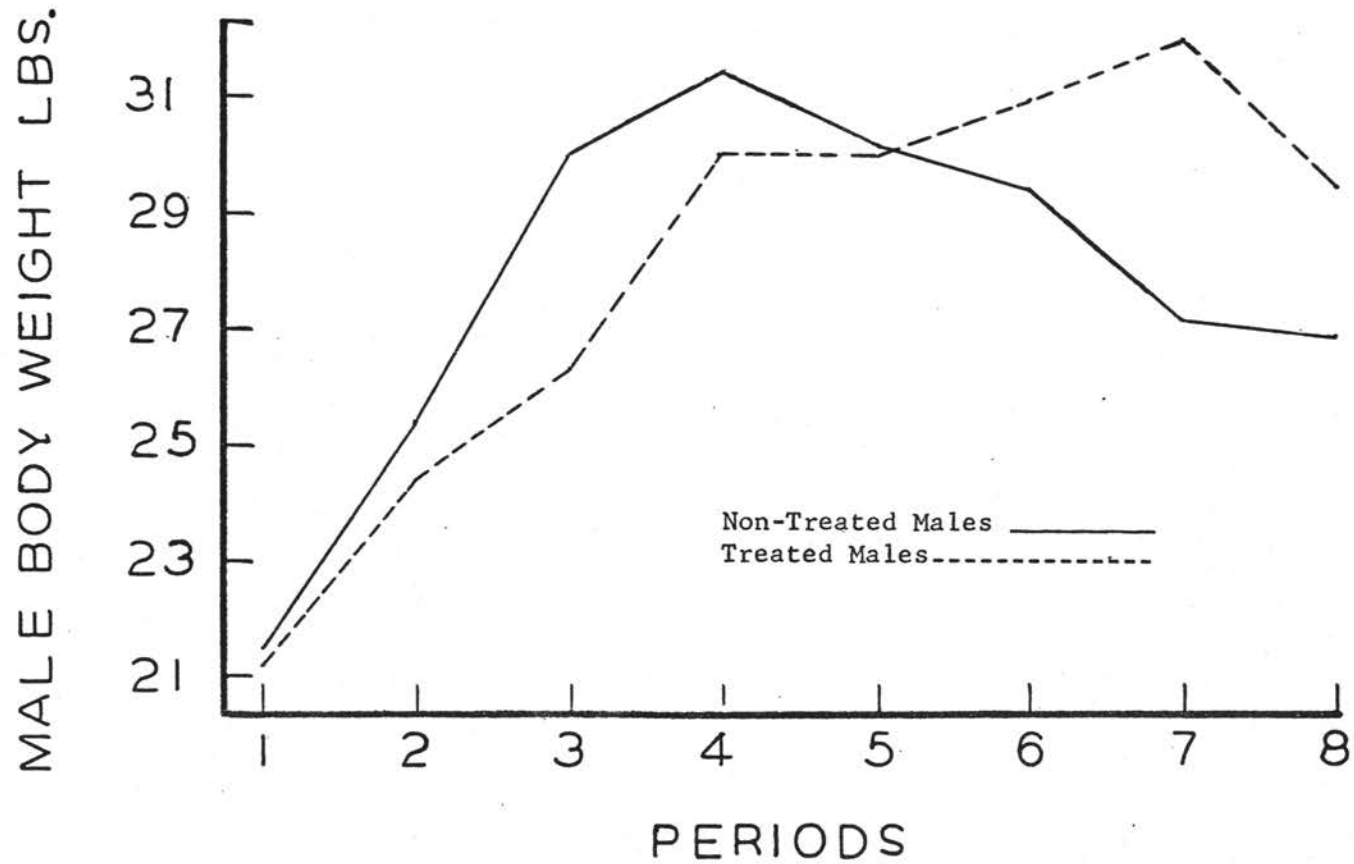

Figure 1. The Influence of Reserpine on Male Body Weight, Measured at 28-Day Intervals.

TABLE III

BODY WEIGHT OF FEMALES

Trial I

Treatment	Periods 1	2	3	4	5	6	7	8	Over-all Period Treatment Means
A	14.69	15.44	17.21	17.03	16.39	15.53	15.22	15.17	15.84
B	14.93	14.80	16.06	16.25	16.24	16.08	14.76	15.14	15.50
C	14.64	15.36	17.12	16.89	16.51	15.72	15.07	15.35	15.87
D	14.54	14.67	15.94	16.24	16.09	14.94	14.06	14.66	15.14
Difference[1] (AC–BD)	00.14	01.33**	02.33**	01.43*	00.57	00.23	01.47*	00.72	01.07**

[1] The average body weight of females in treatments A and C (non-treated were compared to the average body weight of females in treatments B and D (treated), using the analysis of variance method of comparison.

* Observed treatment difference significant at the 95.0 percent level of probability.

** Observed treatment difference significant at the 99.0 percent level of probability.

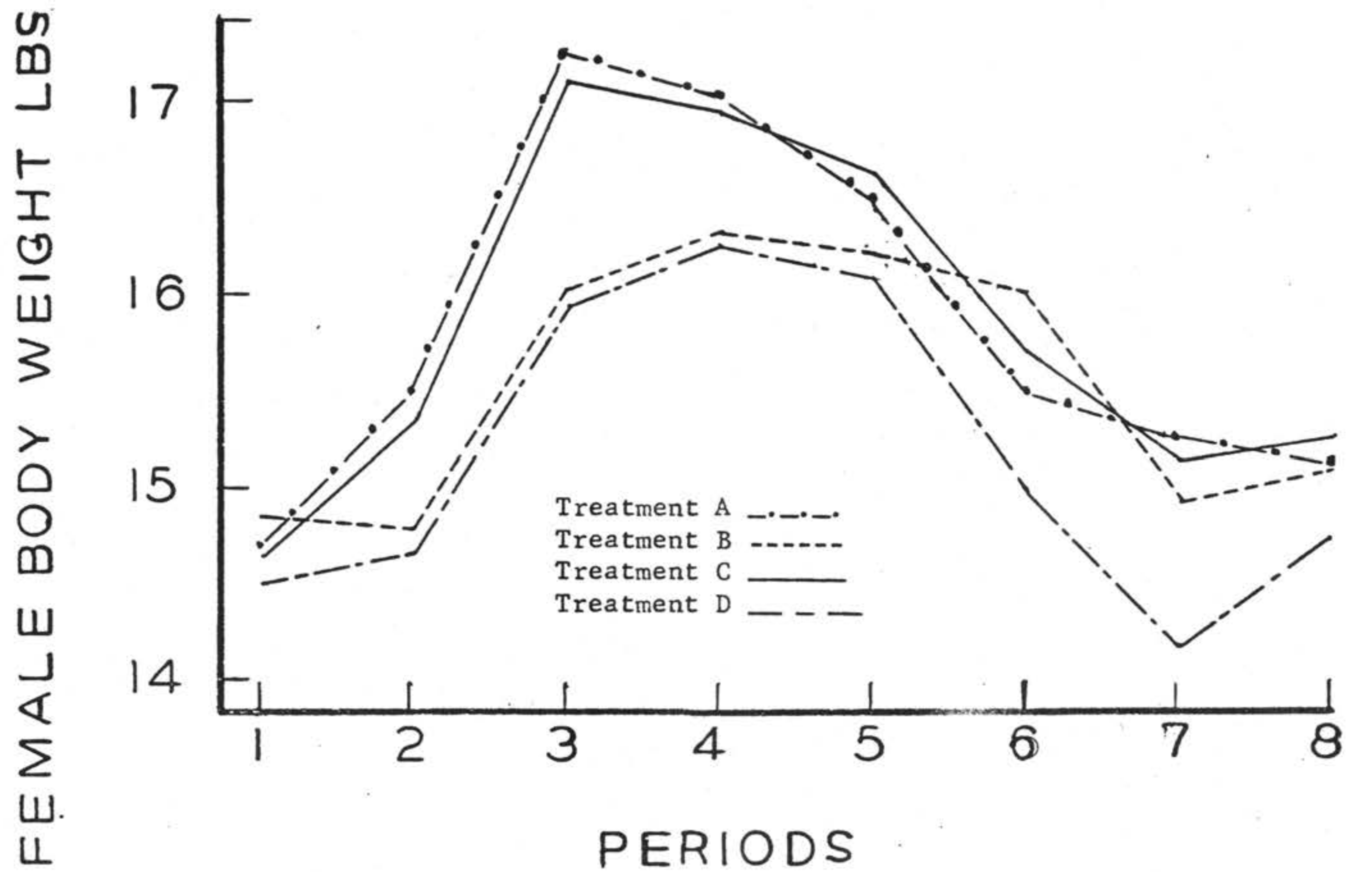

Figure 2. The Influence of Reserpine on Female Body Weight, Measured at 28-Day Intervals. (Treatments A & C = Non-Treated Females; Treatments B & D = Treated Females)

during the first half of the breeding season, and that during the last half of the breeding season treatment difference was not as marked.

It should also be observed that the untreated females attained an average mature body weight of 17.16 pounds, in period three, while the treated females reached an average mature body weight of only 16.25 pounds some 28 days later. From period three to period eight, the untreated females lost 11.1 percent of their mature body weight, while from period four to period eight the treated females lost only 8.3 percent of their mature body weight. This may indicate that although reserpine reduced mature body weight, it may have aided in maintaining body weight during the warmer part of the breeding season.

A difference in body weight due to periods was significant at the 99.5 percent level of probability. Treatment by period interaction was also computed and found to be significant at the 95.0 percent level of probability. This interaction can be seen in Figure 2, periods six, seven and eight. This treatment by period interaction is no doubt associated with the difference in percentage body weight loss during the latter part of the breeding season.

Average bird-day feed consumption data were collected, analyzed and is shown in Table IV and in Figure 3. Using the analysis of variance method of comparison, the average bird-day feed consumption of the treated females was compared with that of the untreated females. As seen in Figure 3, average bird-day feed consumption was higher for the treated females. These differences were statistically significant during periods three, four and five. The difference observed in period two was significant at the 92.5 percent level of probability. The difference observed over all periods was significant at the 99.0 percent level of probability.

TABLE IV

AVERAGE BIRD-DAY FEED CONSUMPTION

Pounds Per Bird Per Day

Trial I

Treatment	Periods							Over-all Period Treatment Means
	1	2	3	4	5	6	7	
A	.59523	.60268	.49851	.43786	.40845	.40008	.43714	.48285
B	.60074	.69494	.63021	.59449	.51669	.38660	.44000	.55195
C	.59523	.56547	.50744	.43750	.47321	.40550	.43415	.48835
D	.59523	.63392	.64806	.64194	.47777	.40996	.40865	.54507
Difference[1] (AC-BD)	.00551	.16071	.27232*	.36107**	.11280*	.00902	.02264	.12582**

[1] The average bird-day feed consumption for females in treatments A and C (non-treated) was compared to the average bird-day feed consumption for females in treatments B and D (treated), using the analysis of variance method of comparison.

* Observed treatment difference significant at the 95.0 percent level of probability.

** Observed treatment difference significant at the 99.0 percent level of probability.

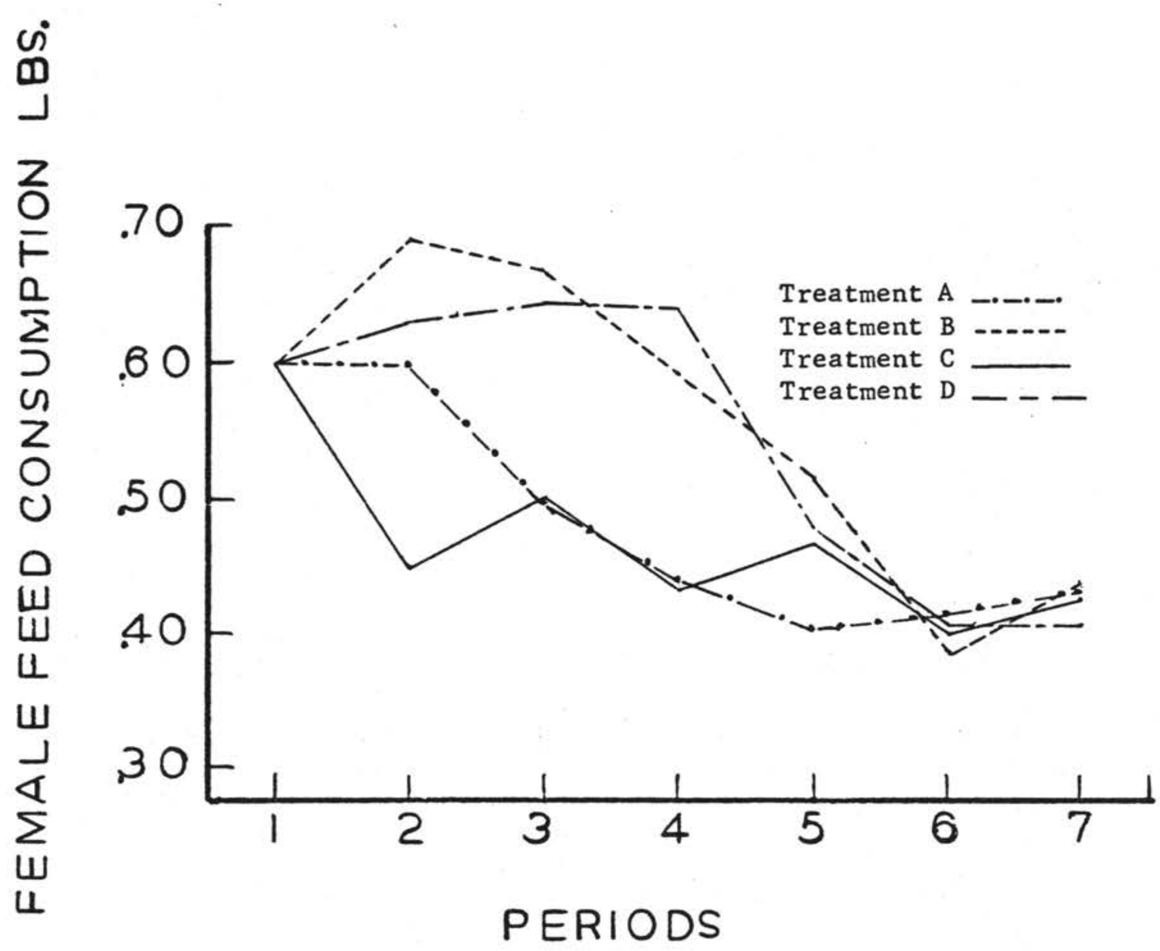

Figure 3. The Influence of Reserpine on Average Bird-Day Feed Consumption, Measured at 28-Day Intervals. (Treatments A & C = Non-Treated Females; Treatments B & D = Treated Females)

A difference in bird-day feed consumption due to periods was significant at the 99.9 percent level of probability. Treatment by period interaction was significant at the 95.0 percent level of probability. This interaction occured during the last 56 days of treatment, as can be seen in Figure 3.

It should be noted that although the treated females had a higher average bird-day feed consumption, the average body weight of the treated females was much lower than that of the untreated females.

A marked delay was observed in the number of days to sexual maturity for all pens of females receiving reserpine. The average number of days to sexual maturity (25 percent egg production) for the treated females was 245 days, while the untreated females attained sexual maturity in 227 days. This difference of 18 days was significant at the 99.0 percent level of probability.

An analysis of percentage egg production (Table V) shows that a significant difference in percentage egg production was observed in period one. The treatment difference in period two was significant at the 90.0 percent level of probability. Figure 4 shows the marked difference in percentage egg production for period one. The significant difference in percentage egg production observed in period one may have been due to the effect of reserpine on sexual maturity as was previously noted. From period two until the study was terminated, reserpine did not seem to affect percentage egg production. The marked difference in period one might also account, in part, for the significant difference observed in the over-all period analysis. Differences in percentage egg production due to periods were found to be significant at the 95.0 percent level of probability. Treatment by period interaction was not statistically significant.

Percentage fertility, percentage hatch of fertile eggs and percentage

TABLE V

PERCENTAGE EGG PRODUCTION

Trial I

Treatment	Periods 1	2	3	4	5	Over-all Period Treatment Means
A	38.9	49.9	40.4	37.9	44.8	41.44
B	15.3	35.5	36.9	40.5	30.3	31.49
C	41.5	50.5	41.2	41.6	39.7	42.88
D	17.1	44.7	47.2	42.1	38.8	37.83
Difference[1] (AC-BD)	48.0*	20.2	02.5	03.1	15.4	15.00*

[1] The average percentage egg production for females in treatments A and C (non-treated) was compared to the average percentage egg production for females in treatments B and D (treated), using the analysis of variance method of comparison.

* Observed treatment difference significant at the 95.0 percent level of probability.

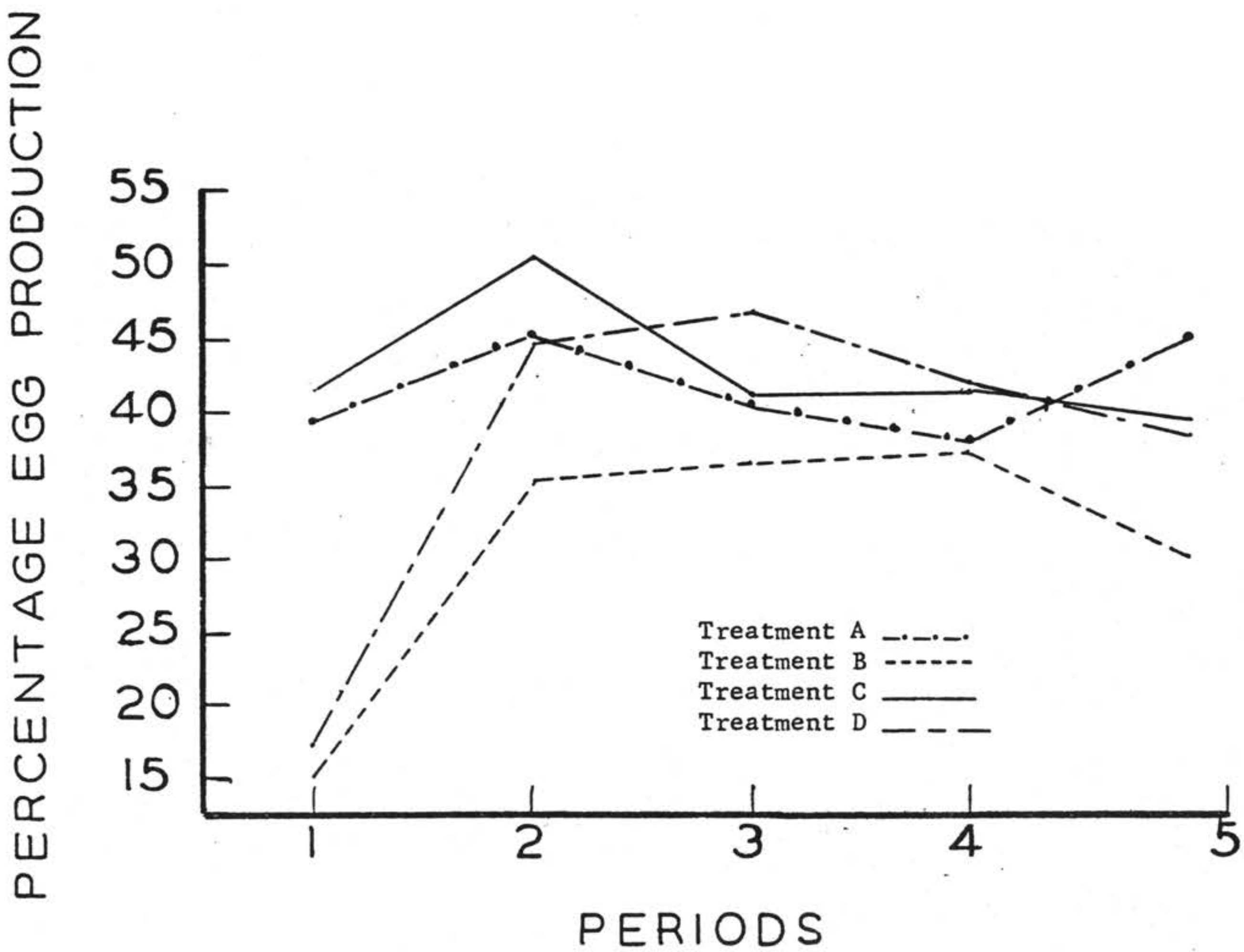

Figure 4. Percentage Egg Production as Influenced by Reserpine, Measured at 28-Day Intervals. (Treatments A & C = Non-Treated Females; Treatments B & D = Treated Females)

hatch of total eggs set were analyzed using the analysis of variance method of testing for treatment effect. Since there were four different treatment combinations, it was possible to make linear comparisons using three degrees of freedom. In the case of the above variables, three sets of orthogonal comparisons were made so that treatment A could be compared to treatment B, treatment A to treatment C and treatment B compared to treatment C.

Treatment D was not used in any of the comparisons, although observations from treatment D are presented in the graphs. It was the main purpose of these analyses to determine the effect of reserpine on each sex, and to determine if there existed a significant difference in response when one sex was treated, compared to the response when neither sex was treated. For these reasons treatment D was not used for comparison.

A summary of percentage fertility is presented in Table VI and in Figure 5. Unlike the analysis of previous variables, comparisons or percentage fertility were conducted so that treatment B was compared to treatment C, treatment A was compared to treatment B and treatment A was compared to treatment C. The results of these comparisons show that during the latter part of the breeding season treatment C had a significantly higher percentage fertility than did treatment B. Although the difference between treatment B and treatment C was not statistically significant in periods two, three and four, there may be a real treatment difference.

In a comparison of treatment A to treatment C, significant differences in percentage fertility were observed in periods one, two, three and four. As can be seen in Figure 5, treatment A maintained a higher percentage fertility in all but period six. The failure of the observed differences in the remaining periods to be statistically significant was probably due

TABLE VI

PERCENTAGE FERTILITY

Trial I

Treatment	Periods 1	2	3	4	5	6	7	8	9	10	Over-all Period Treatment Means
A	23.3	41.8	65.8	71.6	63.4	62.8	72.4	76.8	64.9	54.9	60.60
B	9.8	9.6	13.3	28.8	26.1	27.6	19.7	24.3	27.7	25.7	21.49
C	.5	10.4	31.5	42.9	48.9	65.4	56.0	59.5	64.8	41.9	42.50
D	.9	11.0	16.9	42.8	16.0	18.7	19.5	33.8	34.5	17.2	19.67
Difference[1] B-C	09.3	00.8	18.2	14.1	22.8*	37.8**	36.3**	35.2*	37.1**	16.2	21.01
Difference[2] A-B	13.5*	32.2**	52.5**	42.8*	47.3**	35.2**	52.7**	52.5**	37.2**	29.2*	39.11*
Difference[3] A-C	22.8*	31.4**	34.3	28.7*	24.5	02.6	16.4	17.3	00.1	13.0	18.10

[1] The average percentage fertility in treatment B (non-treated males X treated females) was compared to the average percentage fertility in treatment C (treated males X non-treated females), using the analysis of variance method of comparison.

[2] The average percentage fertility in treatment A (non-treated males X non-treated females) was compared to the average percentage fertility in treatment B (non-treated males X treated females), using the analysis of variance method of comparison.

[3] The average percentage fertility in treatment A (non-treated males X non-treated females) was compared to the average percentage fertility in treatment C (treated males X non-treated females) using the analysis of variance method of comparison.

* Observed treatment differences significant at the 95.0 percent level of probability.

** Observed treatment differences significant at the 99.0 percent level of probability.

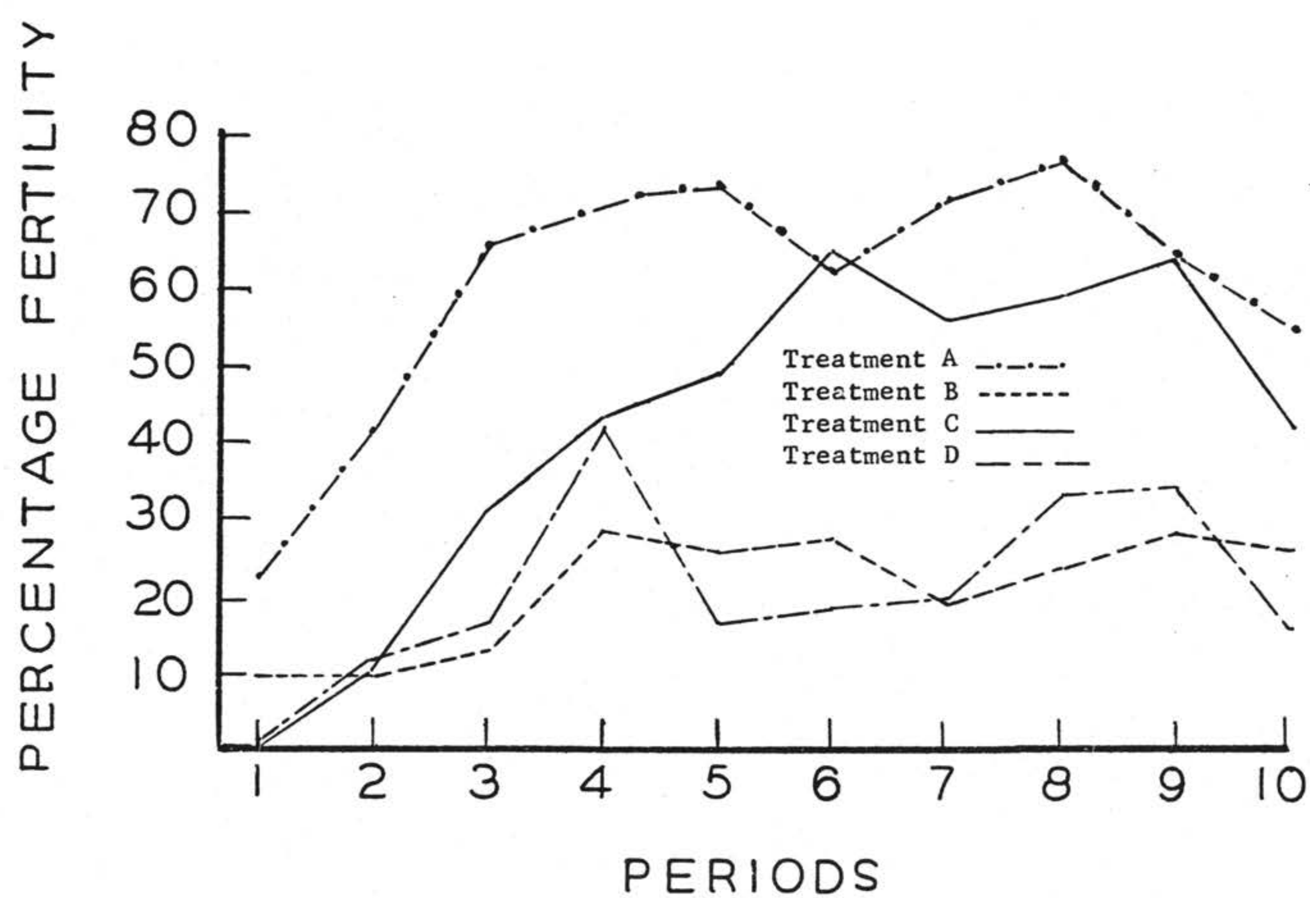

Figure 5. Percentage Fertility as Influenced by Reserpine, Measured at 14-Day Intervals. (A = M&F Non-Treated; B = F Treated; C = M Treated; D = M&F Treated)

to the greater within-treatment variation.

In a comparison of treatment A to treatment B, significant differences in fertility were observed in all periods. An over-all period analysis indicates a statistically significant difference in percentage fertility for the treatment A, treatment B comparison.

The series of three linear comparisons failed to reveal any statistically significant treatment differences in percentage hatch of fertile eggs (Table VII). Large within-treatment variation and a low number of fertile eggs could have been responsible for the failure to observe significant treatment differences. It can be seen in Figure 6 that all treatments varied from period to period and that no consistent pattern was followed.

The failure to obtain reliable information in periods seven and ten greatly reduced the value of these results. If this information had been available, it might have been possible to detect some pattern of response.

Comparisons of the three different treatment combinations for percentage hatch of total eggs set are found in Table VIII. Since percentage fertility greatly influences percentage hatch of total eggs set, the results obtained in these comparisons are very similar to those obtained in the analysis of percentage fertility. During periods four, five, six, eight and nine, treatment C had a statistically significantly higher percentage hatch of total eggs set than did treatment B. As indicated in Figure 7, treatment C was superior to treatment B during period three. The reverse, however, was observed in periods one and two.

A comparison of treatments A and B (Table VIII) indicates that in all periods percentage hatch of total eggs set was significantly lower for treatment B. The combined period analysis indicated a significant treatment

TABLE VII

PERCENTAGE HATCH OF FERTILE EGGS

Trial I

Treatment	Periods 1	2	3	4	5	6	8	9	Over-all Period Treatment Means
A	45.8	73.0	75.2	75.3	82.3	67.3	86.5	77.4	74.91
B	50.0	99.9	65.2	36.4	64.6	66.7	65.3	61.5	63.74
C	99.9	52.0	72.6	70.4	84.9	81.2	87.5	79.0	71.50
D	00.0	26.3	68.3	63.2	73.3	72.7	70.5	75.4	55.11
Difference[1] B–C	49.9	47.9	07.4	34.0	20.3	14.5	22.2	17.5	07.76
Difference[2] A–B	04.2	26.9	10.0	38.9	17.7	00.6	21.2	15.9	11.17
Difference[3] A–C	54.1	21.0	02.6	04.9	02.6	13.9	01.0	01.6	03.41

[1] The average percentage hatch of fertile eggs in treatment B (non-treated males X treated females) was compared to the average percentage hatch of fertile eggs in treatment C (treated males X non-treated females), using the analysis of variance method of comparison.

[2] The average percentage hatch of fertile eggs in treatment A (non-treated males X non-treated females) was compared to the average percentage hatch of fertile eggs in treatment B (non-treated males X treated females), using the analysis of variance method of comparison.

[3] The average percentage hatch of fertile eggs in treatment A (non-treated males X non-treated females) was compared to the average percentage hatch of fertile eggs in treatment C (treated males X non-treated females), using the analysis of variance method of comparison.

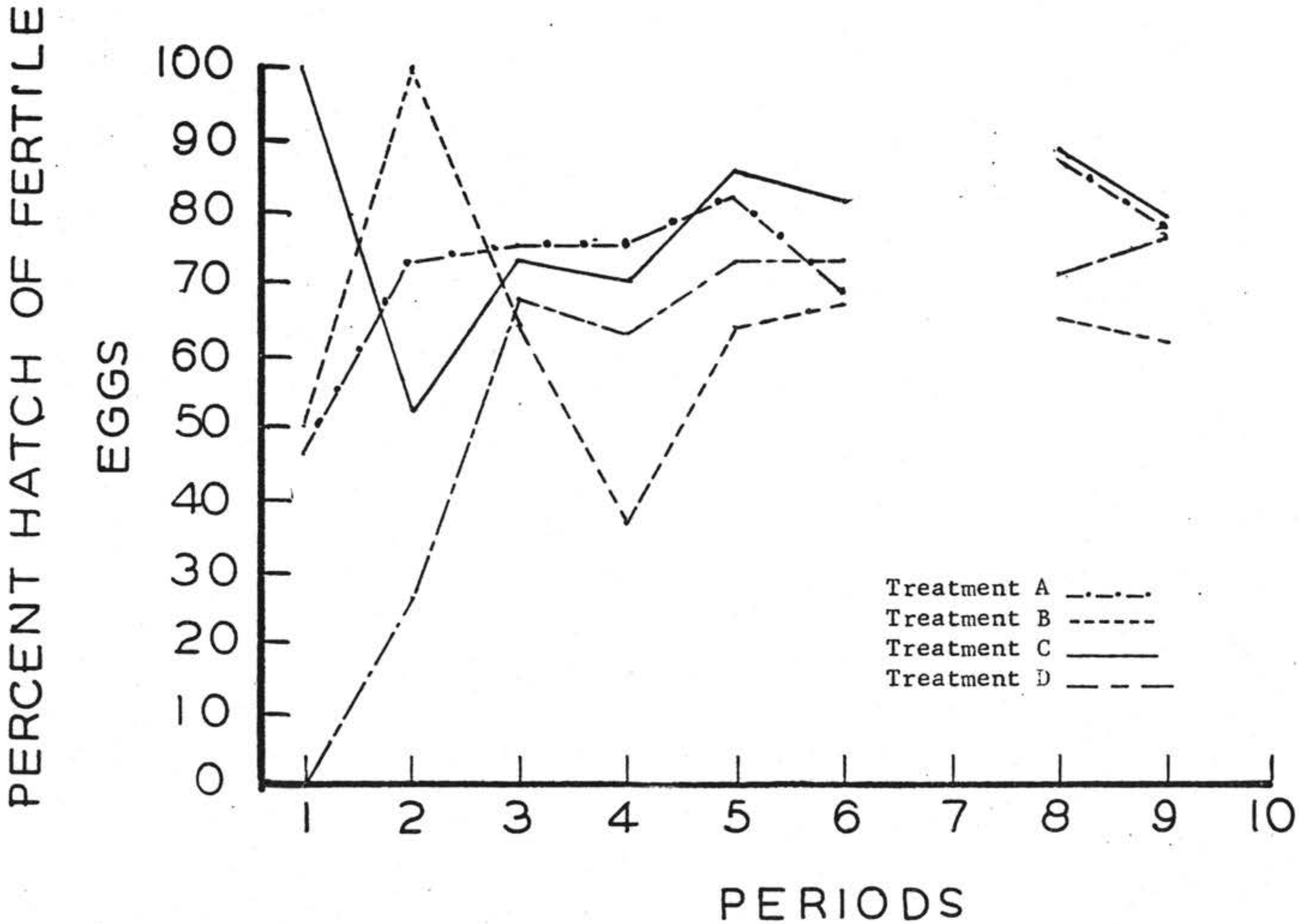

Figure 6. Percentage Hatch of Fertile Eggs as Influenced by Reserpine, Measured at 14-Day Intervals. (A = M&F Non-Treated; B = F Treated; C = M Treated; D = M&F Treated)

TABLE VIII

PERCENTAGE HATCH OF TOTAL EGGS SET

Trial I

Treatment	Periods								Over-all Period Treatment Means
	1	2	3	4	5	6	8	9	
A	10.7	30.5	49.5	54.0	60.4	42.3	66.5	50.2	44.82
B	4.9	9.6	8.7	10.5	16.8	18.4	15.9	17.0	12.98
C	0.5	5.4	22.8	30.2	41.5	53.1	52.0	51.2	30.25
D	0.0	3.0	11.5	27.1	11.7	13.6	23.8	26.0	12.53
Difference[1] B–C	04.4	04.2	14.1	19.7*	24.7**	34.7**	36.1*	34.2**	17.27
Difference[2] A–B	05.8*	20.9**	40.8*	43.5**	43.6**	23.9*	50.6*	33.2*	31.84
Difference[3] A–C	10.2*	25.1**	26.7	23.8**	18.9	10.8	14.5	01.0	14.57

[1] The average percentage hatch of total eggs set in treatment B (non-treated males X treated females) was compared to the average percentage hatch of total eggs set in treatment C (treated males X non-treated females), using the analysis of variance method of comparison.

[2] The average percentage hatch of total eggs set in treatment A (non-treated males X non-treated females) was compared to the average percentage hatch of total eggs set in treatment B (non-treated males X treated females) using the analysis of variance method of comparison.

[3] The average percentage hatch of total eggs set in treatment A (non-treated males X non-treated females) was compared to the average percentage hatch of total eggs set in treatment C (treated males X non-treated females) using the analysis of variance method of comparison.

* Observed treatment differences significant at the 95.0 percent level of probability.

** Observed treatment differences significant at the 99.0 percent level of probability.

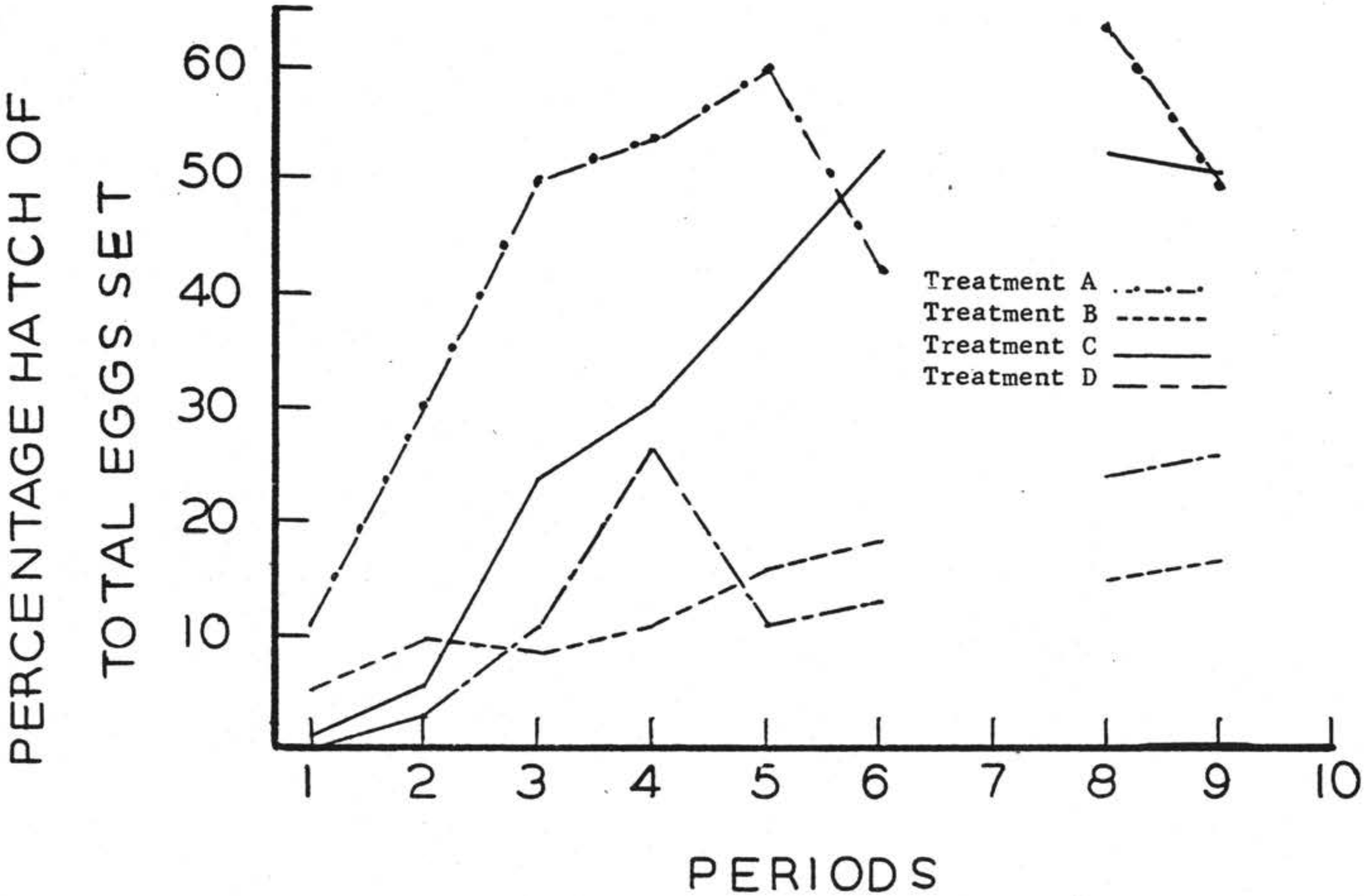

Figure 7. Percentage Hatch of Total Eggs Set as Influenced by Reserpine, Measured at 14-Day Intervals. (A = M&F Non-Treated; B = F Treated; C = M Treated; D = M&F Treated)

difference at the 90.0 percent level of probability.

A significant difference in percentage hatch of total eggs set was observed during the early periods of the breeding season in a comparison of treatment A and treatment C. Figure 7 indicates that reserpine may not have been as detrimental to percentage hatch of total eggs set when administered to the males as when administered to the females.

A difference in egg weight due to reserpine treatment was observed only in period one, as indicated in Table IX and Figure 8. This difference, as the difference observed in percentage egg production, may also reflect the delay in onset of sexual maturity of the treated females. Since the first eggs produced are normally the smallest eggs produced, the delay in onset of sexual maturity would allow a greater percentage of early eggs from the treated females to be measured in period one.

It can be seen in Table X that a significant difference in egg shell thickness due to the reserpine treatment was observed only in period two. Figure 9, however, indicates that the treated females tended to produce eggs with thicker shells, although the differences were not statistically significant.

Differences due to periods were found to be significant at the 95.0 percent level of probability for both egg weight and egg shell thickness. There were, however, no statistically significant treatment-by-period interactions for either variable.

TABLE IX

EGG WEIGHT IN GRAMS

Trial I

Treatment	Periods 1	2	3	4	Over-all Period Treatment Means
A	78.5	81.4	84.1	84.6	82.15
B	72.4	78.0	83.1	83.8	79.33
C	77.7	76.0	85.9	82.2	80.44
D	78.6	79.3	80.8	87.0	81.43
Difference[1] (AC-BD)	05.2*	00.1	06.1	04.0	01.83

[1] The average egg weight of the females in treatments A and C (non-treated) were compared to the average egg weight of the females in treatments B and D (treated), using the analysis of variance method of comparison.

* Observed treatment difference significant at the 95.0 percent level of probability.

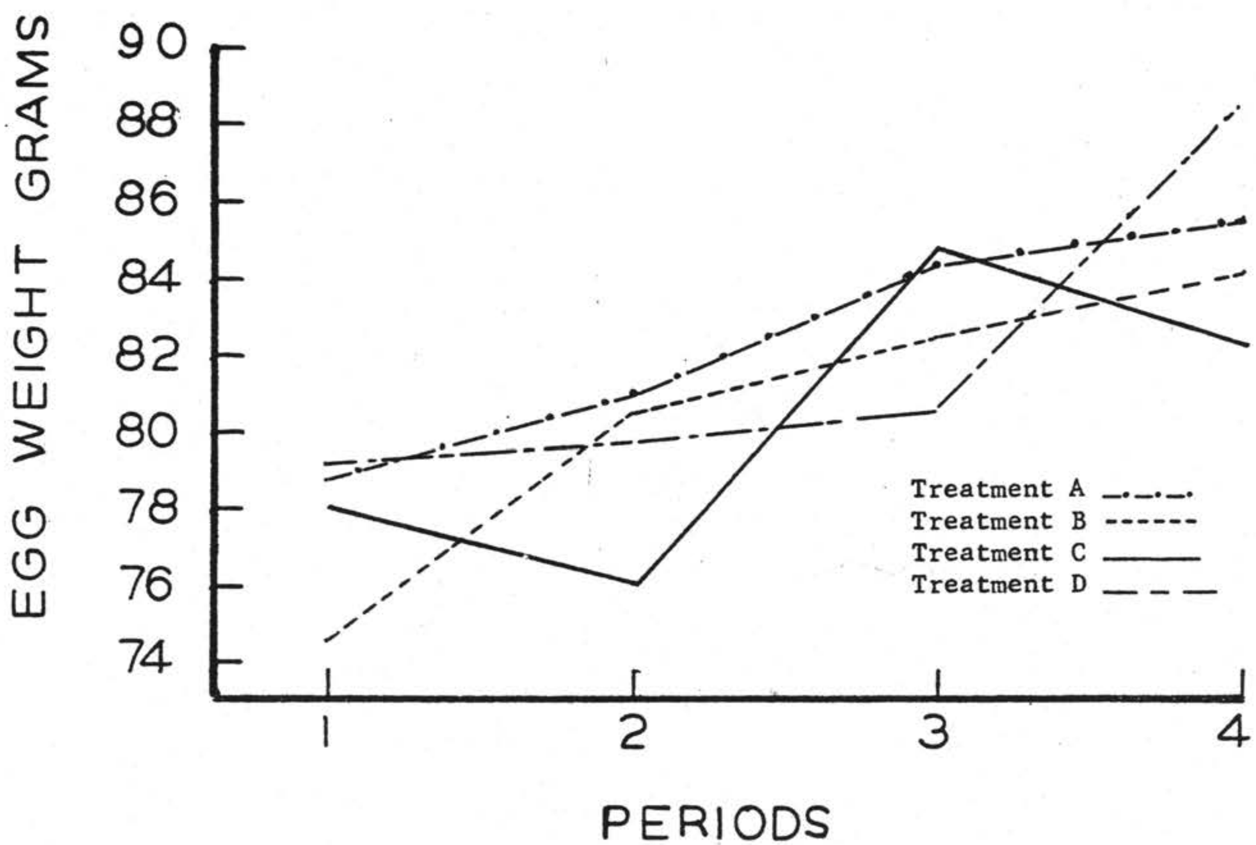

Figure 8. Egg Weight as Influenced by Reserpine. (Treatments A&C = Non-Treated Females; Treatments B&D = Treated Females)

TABLE X

SHELL THICKNESS IN INCHES

Trial I

Treatment	Periods 1	2	3	4	Over-all Period Treatment Means
A	.0155	.0148	.0152	.0150	.0151
B	.0157	.0161	.0158	.0141	.0154
C	.0160	.0153	.0158	.0148	.0154
D	.0159	.0160	.0147	.0153	.0154
Difference[1] (AC-BD)	.0001	.0020*	.0005	.0004	.0003

[1] The average egg shell thickness of the females in treatments A and C (non-treated) were compared to the average shell thickness of females in treatments B and D (treated) using the analysis of variance method of comparison.

* Observed treatment difference significant at the 95.0 percent level of probability.

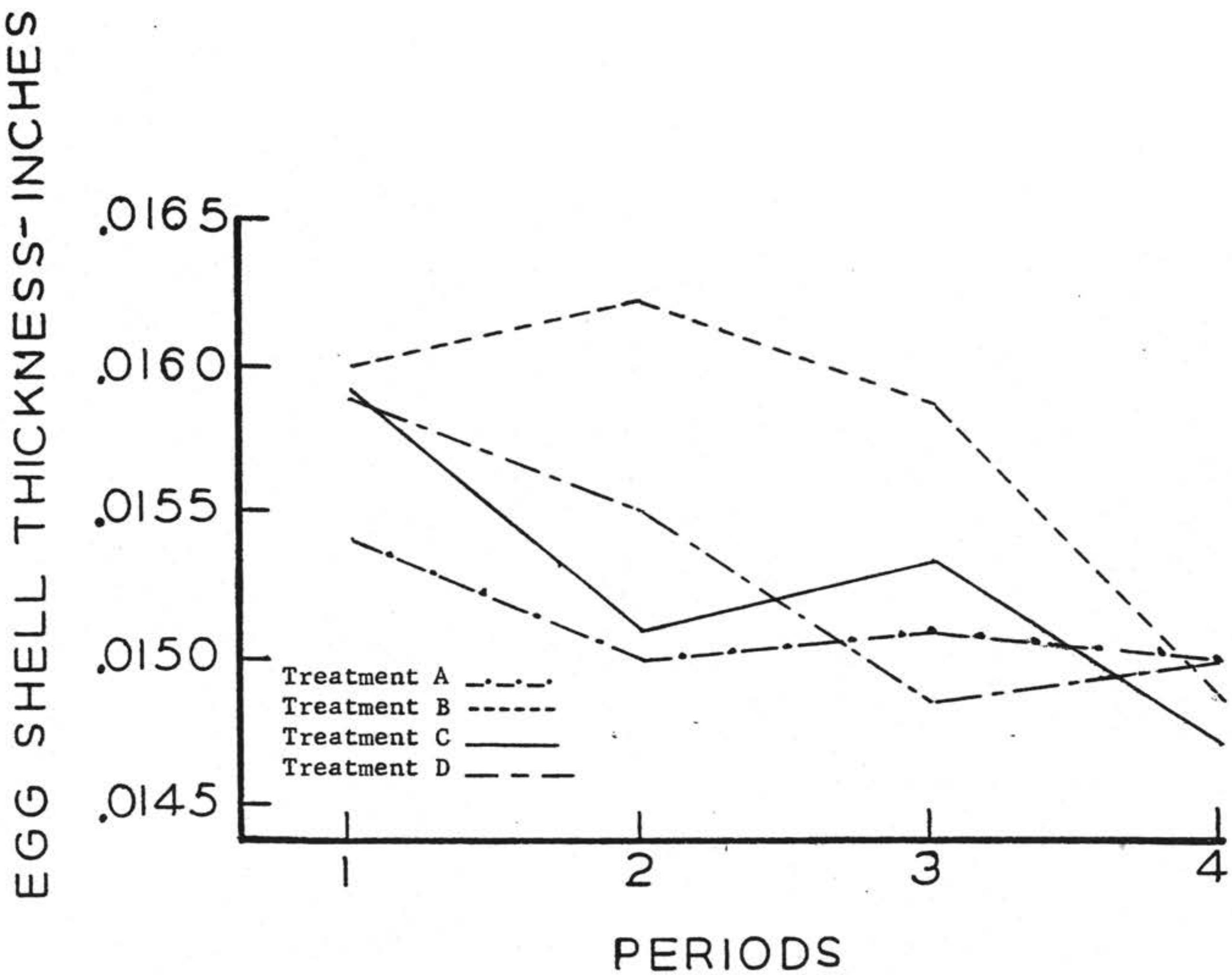

Figure 9. Egg Shell Thickness as Influenced by Reserpine. (Treatments A&C = Non-Treated Females; Treatments B&D = Treated Females)

RESULTS AND DISCUSSION

Trial II

In trial two, Large White turkeys received reserpine at levels of 0.0 p.p.m. and 2.0 p.p.m., from 26 weeks of age until the end of the breeding season. Analyses were conducted in an attempt to determine the effect of reserpine upon body weight of females. Feed consumption of females, days to sexual maturity, percentage egg production, egg weight and egg shell thickness. Other analyses were conducted in order to determine if reserpine exhibited a differential effect, by sex, upon percentage fertility, percentage hatch of fertile eggs and percentage hatch of total eggs set.

Body weight measurements of males were taken at 24-day intervals, beginning the day that treatment started. These weights were recorded on a treatment-pen basis and are presented in Figure 10. No statistical analysis was performed on male body weight due to the method of collecting and recording the data.

It can be seen in Figure 10 that the treated males did not attain a mature body weight as high as that attained by the untreated males. It should be noted, however, that during periods four through seven, the treated males did not exhibit a loss in body weight, as did the untreated males.

Using the analysis of variance method of comparison, the average body weights of the untreated females were compared to the average body weights of the treated females. Figure 11 shows that the

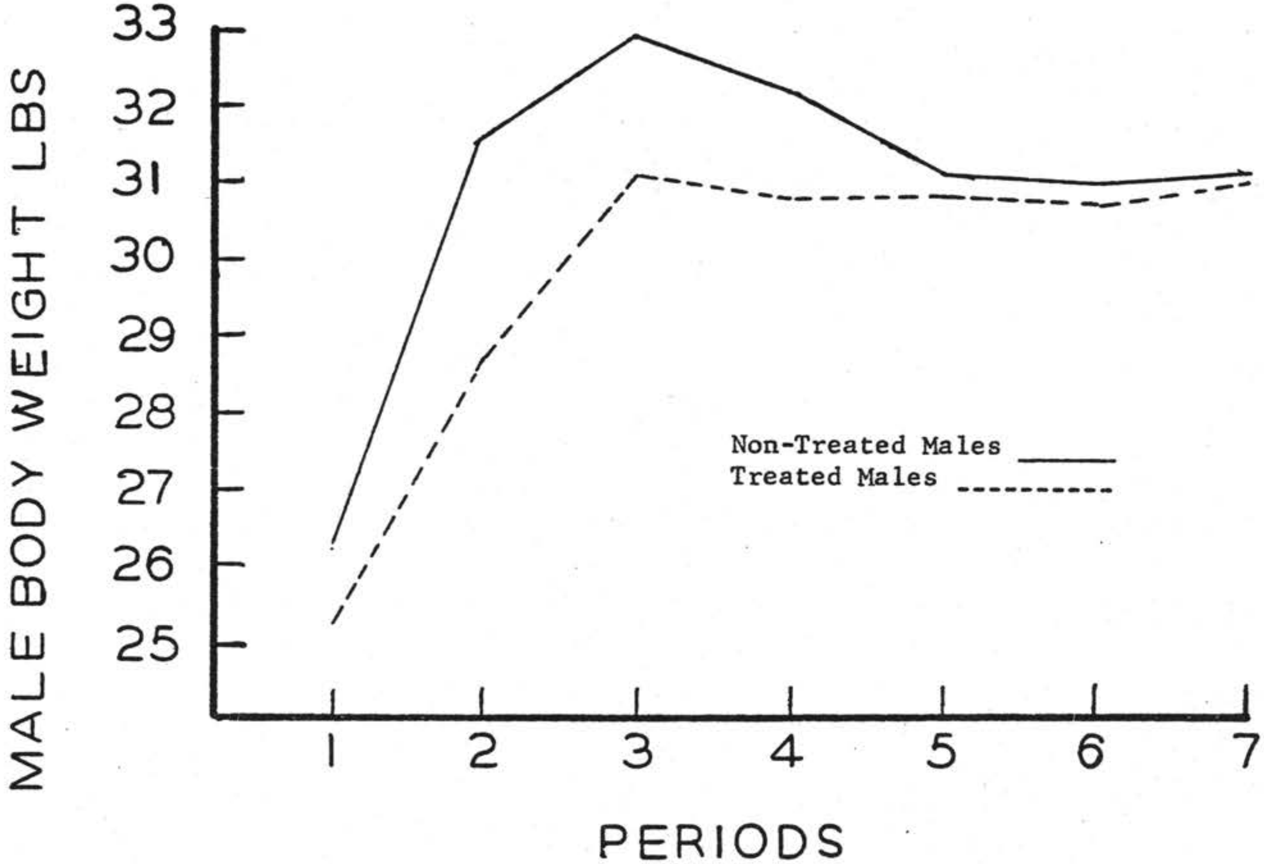

Figure 10. The Influence of Reserpine on Male Body Weight, Measured at 28-Day Intervals.

TABLE XI

FEMALE BODY WEIGHT

Trial II

Treatment	Periods 1	2	3	4	5	6	7	Over-all Period Treatment Means
A	16.25	17.95	19.07	18.66	18.39	18.07	17.57	17.99
B	16.29	17.27	18.21	17.88	17.77	18.06	17.80	17.61
C	16.57	18.32	19.42	18.59	18.21	18.01	17.72	18.12
D	16.54	17.59	18.47	17.87	17.46	17.66	17.45	17.58
Difference[1] (AC-BD)	00.01	01.41*	01.81**	01.50*	01.37*	00.36	00.04	00.92

[1] The average body weight of females in treatments A and C (non-treated) were compared to the average body weight of females in treatments B and D (treated), using the analysis of variance method of comparison.

* Observed treatment difference significant at the 95.0 percent level of probability.

** Observed treatment difference significant at the 99.0 percent level of probability.

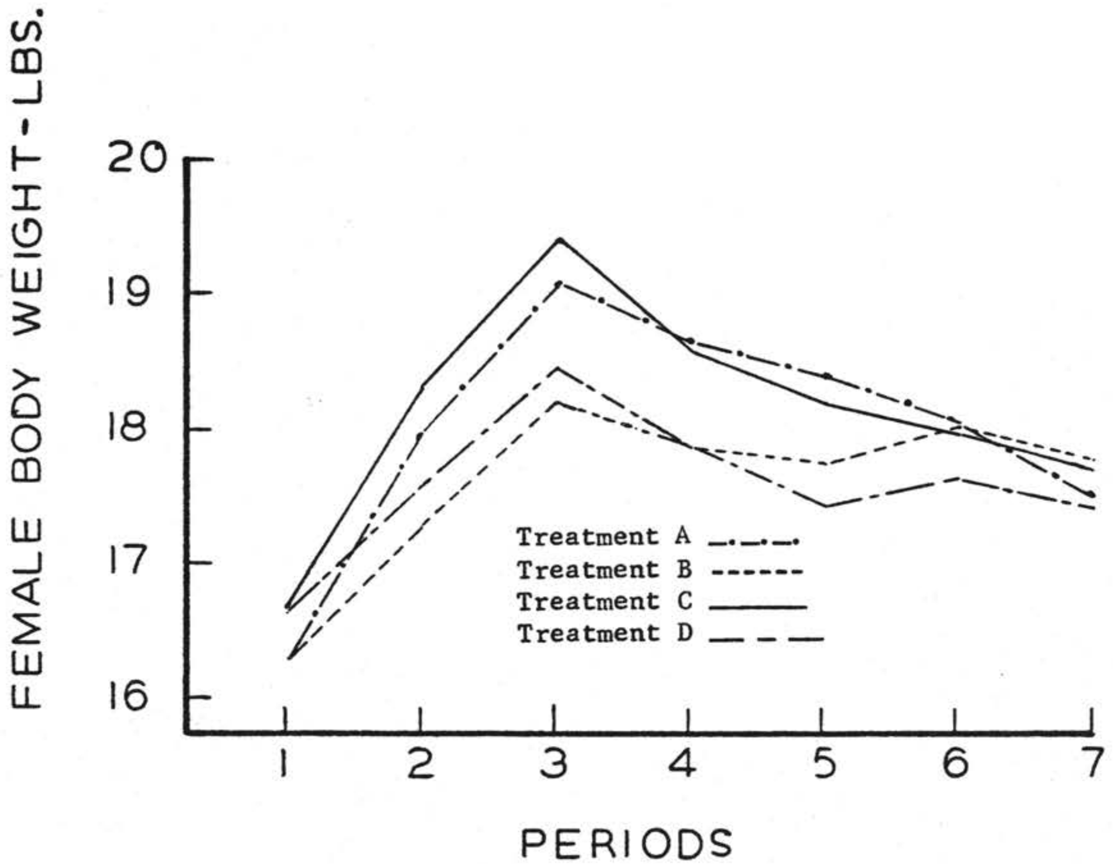

Figure 11. The Influence of Reserpine on Female Body Weight, Measured at 28-Day Intervals. (Treatments A & C = Non-Treated Females; Treatments B & D = Treated Females)

untreated females had a higher average body weight in period two, three, four, five and six. These observed treatment differences were statistically significant in periods two, three, four and five (Table XI). When an analysis of variance was computed for all periods combined, body weight differences due to treatment was significant at 90.0 percent level of probability. The difference in average body weight due to periods was found to be significant at the 99.5 percent level of probability. Treatment by period interaction was significant at the 85.0 percent level of probability.

As seen in Figure 11, both the treated and the untreated females attained their mature body weight in period three. However, from period three until the study was terminated, the percentage loss in body weight was 4.6 percent higher for the untreated females.

A comparison of the treated females to the untreated females shows a higher average bird-day feed consumption for the treated females (Figure 12). As seen in Table XII, this difference was statistically significant in periods one, two and four. Differences observed for periods three and five were significant at the 90.0 percent level of probability. A combined period analysis showed treatment difference to be significant at the 99.0 percent level of probability. Average differences in bird-day feed consumption due to periods were significant at the 99.0 percent level of probability. A test was made for period-by-treatment interaction, but no significance was found.

Here again, it should be pointed out that although the treated females had a higher average bird-day feed consumption, mature body weight was higher for the untreated females.

TABLE XII

AVERAGE BIRD-DAY FEED CONSUMPTION

Trial II

Treatment	Periods 1	2	3	4	5	6	Over-all Period Treatment Means
A	.6469	.5405	.5600	.5503	.5195	.4839	.5501
B	.6380	.5892	.5726	.5535	.5437	.5215	.5697
C	.6315	.5454	.5170	.5100	.5371	.5310	.5453
D	.7199	.6323	.5809	.6823	.6040	.5176	.6228
Difference[1] (AC-BD)	.0795*	.1356**	.0765	.1755*	.0911	.0242	.0971**

[1] The average bird-day feed consumption for females in treatments A and C (non-treated) were compared to the average bird-day feed consumption for females in treatments B and D (treated), using the analysis of variance method of comparison.

* Observed treatment difference significant at the 95.0 percent level of probability.

** Observed treatment difference significant at the 99.0 percent level of probability.

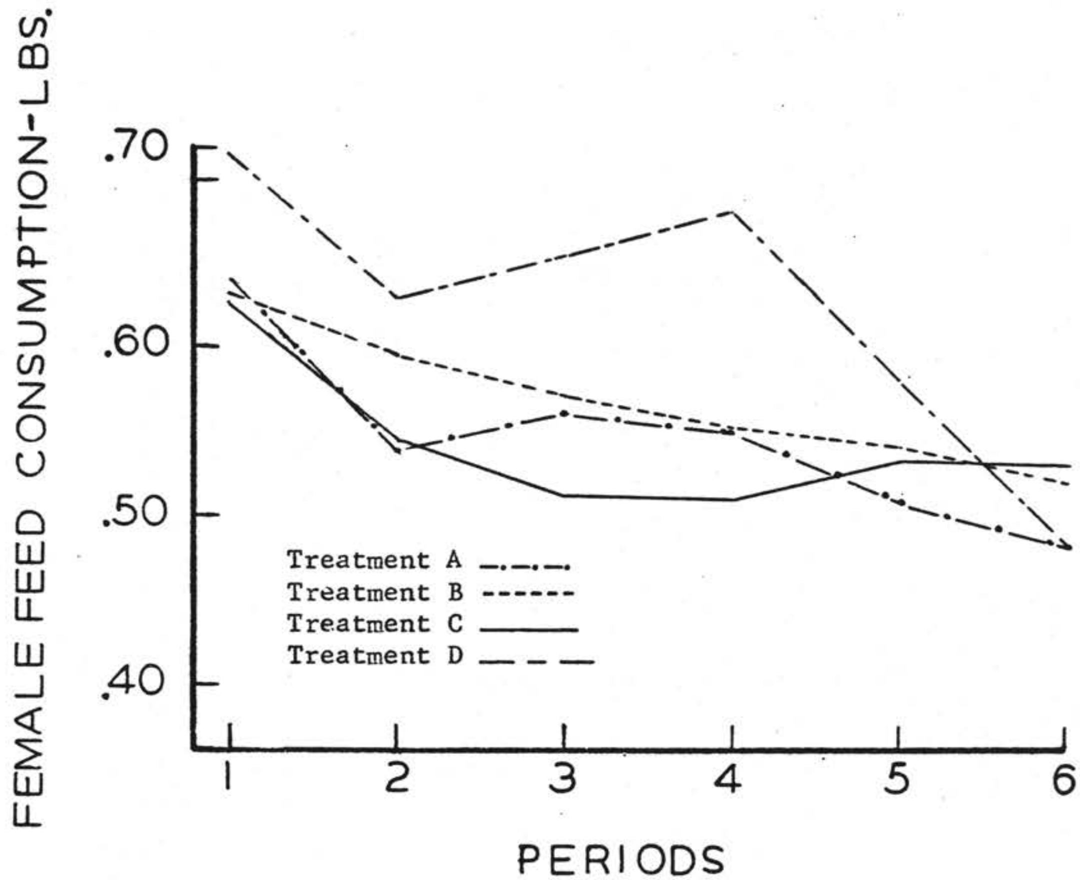

Figure 12. The Influence of Reserpine on Average Bird-Day Feed Consumption, Measured at 28-Day Intervals. (Treatments A & C = Non-Treated Females; Treatments B & D = Treated Females)

The average number of days to sexual maturity for the treated females was 226 days, while the untreated females attained sexual maturity in 224 days. This mean difference, of two days, was not statistically significant. The combined average number of days to sexual maturity for the females in both treatments was 225 days. Of the eight non-treated female pens, only two pens had an above-average number of days to sexual maturity. Five of the eight treated female pens had an average number of days to sexual maturity above 225 days.

As seen in Figure 13, the untreated females had a higher percentage egg production than the treated females in all but period five. These observed differences were statistically significant in periods one and two (Table XIII). Although the mean difference in period three was large, lower egg production and a large within-treatment variation could have prevented this difference from being significant at a high level of probability. An over-all period analysis indicated treatment effect to be significant at the 99.0 percent level of probability. Differences in percentage egg production due to periods was significant at the 99.0 percent level of probability. Treatment-by-period interaction was found to be not statistically significant.

Percentage fertility, percentage hatch of fertile eggs and percentage hatch of total eggs set were analyzed using three sets of linear comparisons. As in trial one, these comparisons were designed to compare treatment B to treatment C; treatment A to treatment B, and treatment A to treatment C. Although the responses obtained in treatment D was not used in any of the comparisons.

Presented in Table XIV are the results obtained when the comparisons were made for percentage fertility.

TABLE XIII

PERCENTAGE EGG PRODUCTION

Trial II

Treatment	Periods 1	2	3	4	5	Over-all Period Treatment Means
A	23.9	61.7	45.7	43.4	31.6	34.41
B	17.2	50.1	36.3	43.3	38.8	30.90
C	23.5	63.4	47.2	47.9	42.6	36.03
D	15.1	49.0	39.6	39.1	34.9	29.21
Difference[1] (AC-BD)	15.1**	26.0**	17.0	08.9	00.5	10.33**

[1] The average percentage egg production for females in treatments A and C (non-treated) were compared to the average percentage egg production for females in treatments B and D (treated), using the analysis of variance method of comparison.

** Observed treatment difference significant at the 99.0 percent level of probability.

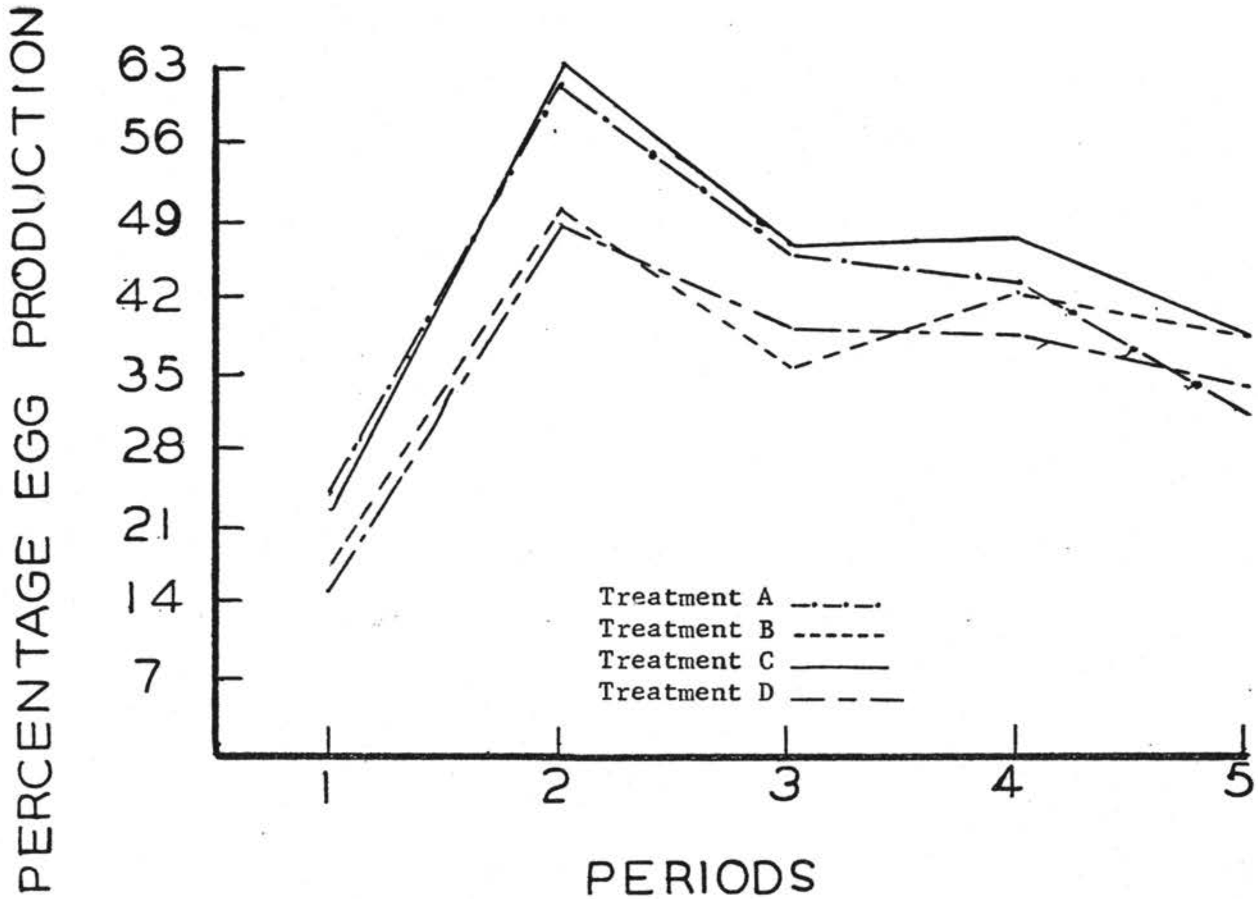

Figure 13. Percentage Egg Production as Influenced by Reserpine, Measured at 28-Day Intervals. (Treatments A & C = Non-Treated Females; Treatments B & D = Treated Females)

Figure 14 shows that, in all but periods one and two, treatment C had a higher percentage fertility than did treatment B. These observed differences were statistically significant only in period six. The failure to observe significant differences in other periods may have been due to a large within-treatment variation for both treatments. An overall period comparison of treatment B and treatment C did not indicate any significant treatment difference.

Figure 14 shows that treatment A maintained a higher percentage of fertility than did treatment B throughout the entire study. The differences observed were statistically significant in all but period one. The difference observed in a combined period analysis was significant at the 95.0 percent level of probability.

As seen in Figure 14, the difference between treatment A and B was greater than the difference between treatment A and treatment C. The differences observed in the treatment A, treatment C comparison were, however, statistically significant in periods two, three, four, five, eight and nine. The combined period treatment difference was significant at the 90.0 percent level of probability.

Reported in Table XV are the results obtained when the comparisons were made for percentage hatch of fertile eggs. Although females receiving treatment C had a higher percentage hatch of fertile eggs than did those receiving treatment B in six of the nine periods, none of these differences was statistically significant. An overall-period comparison of treatment B and treatment C did not indicate any statistically significant differences. A graphic comparison of treatment B and C can be seen in Figure 15.

TABLE XIV

PERCENTAGE FERTILITY

Trial II

Treatment	Periods 1	2	3	4	5	6	7	8	9	10	Over-all Period Treatment Means
A	10.6	29.4	57.1	54.2	49.6	38.9	50.7	45.5	47.7	46.3	43.13
B	6.1	17.3	11.6	11.2	11.9	10.6	18.5	13.4	19.8	15.1	13.16
C	4.1	13.8	14.3	11.6	22.8	28.9	33.6	18.7	19.7	22.5	17.97
D	6.2	5.1	7.5	7.5	5.3	7.7	21.9	20.2	12.5	7.8	09.4
Difference[1] B–C	02.0	03.5	02.7	00.4	10.9	18.3*	15.1	05.3	00.1	07.4	04.81
Difference[2] A–B	04.5	12.1*	45.5**	43.0**	37.7**	28.3**	32.2*	32.1*	27.9*	31.2*	29.97*
Difference[3] A–C	06.5	15.6*	42.8**	42.6**	26.8**	10.0	17.1	26.8*	28.0**	23.8	25.16

[1] The average percentage fertility in treatment B (non-treated males X treated females) was compared to the average percentage fertility in treatment C (treated males X non-treated females), using the analysis of variance method of comparison.

[2] The average percentage fertility in treatment A (non-treated males X non-treated females) was compared to the average percentage fertility in treatment B (non-treated males X treated females), using the analysis of variance method of comparison.

[3] The average percentage fertility in treatment A (non-treated males X non-treated females) was compared to the average percentage fertility in treatment C (treated males X non-treated females), using the analysis of variance method of comparison.

* Observed treatment differences significant at the 95.0 percent level of probability.

** Observed treatment differences significant at the 99.0 percent level of probability.

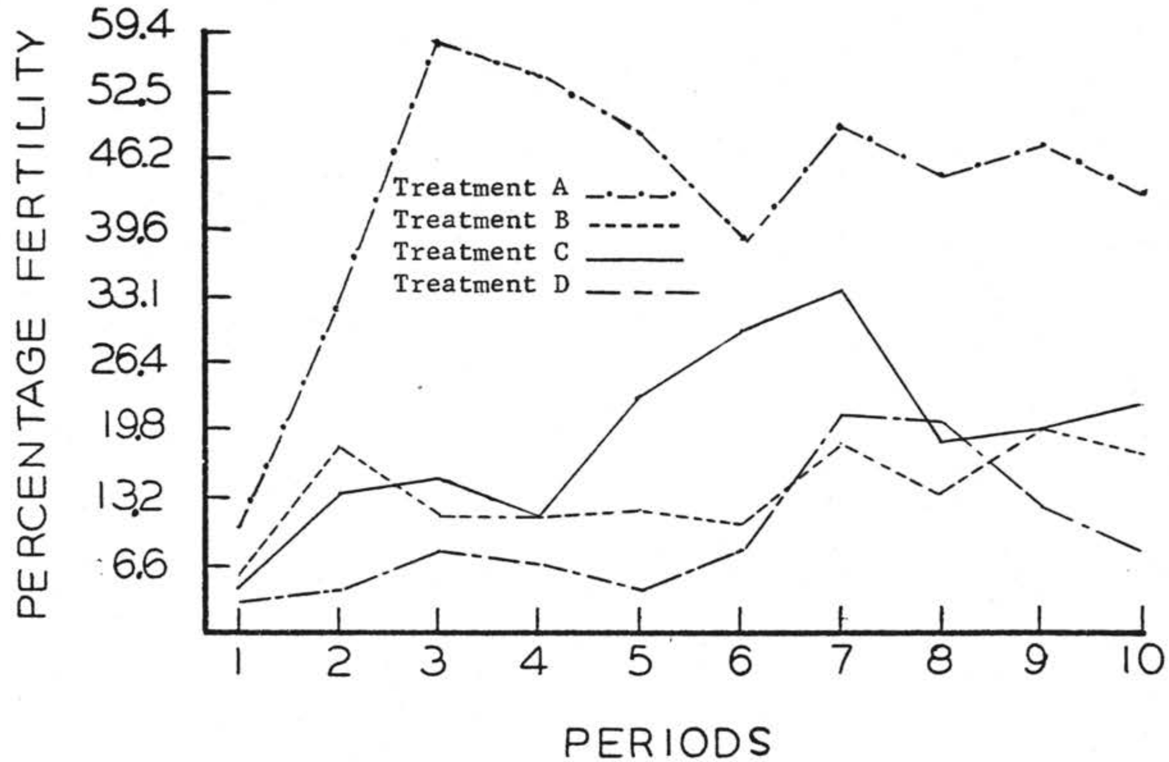

Figure 14. Percentage Fertility as Influenced by Reserpine, Measured at 14-Day Intervals. (A = M & F Non-Treated; B = F Treated; C = M Treated; D = M & F Treated)

TABLE XV

PERCENTAGE HATCH OF FERTILE EGGS

Trial II

Treatment	Periods 1	2	3	4	5	6	7	9	10	Over-all Period Treatment Means
A	46.7	52.5	60.3	55.3	52.3	55.1	58.4	56.1	56.8	56.37
B	50.0	48.3	52.6	42.9	41.7	27.8	40.0	25.0	46.1	41.61
C	42.9	53.1	44.4	47.6	46.2	58.7	50.0	44.0	37.0	48.62
D	12.5	22.2	54.4	44.4	20.0	33.3	52.0	27.3	12.5	35.78
Difference[1] B–C	07.1	04.8	08.2	04.7	04.5	30.9	10.0	19.0	09.1	07.01
Difference[2] A–B	03.3	04.2	07.7	12.4	10.6	27.3	18.4	31.1	10.7*	14.76
Difference[3] A–C	03.8	00.6	15.9	07.7	06.1	03.6	08.4	12.1	19.8*	07.75

[1] The average percentage hatch of fertile eggs in treatment B (non-treated males X treated females) was compared to the average percentage hatch of fertile eggs in treatment C (treated males X non-treated females), using the analysis of variance method of comparison.

[2] The average percentage hatch of fertile eggs in treatment A (non-treated males X non-treated females) was compared to the average percentage hatch of fertile eggs in treatment B (non-treated males X treated females), using the analysis of variance method of comparison.

[3] The average percentage hatch of fertile eggs in treatment A (non-treated males X non-treated females) was compared to the average percentage hatch of fertile eggs in treatment C (treated males X non-treated females), using the analysis of variance method of comparison.

* Observed treatment differences significant at the 95.0 percent level of probability.

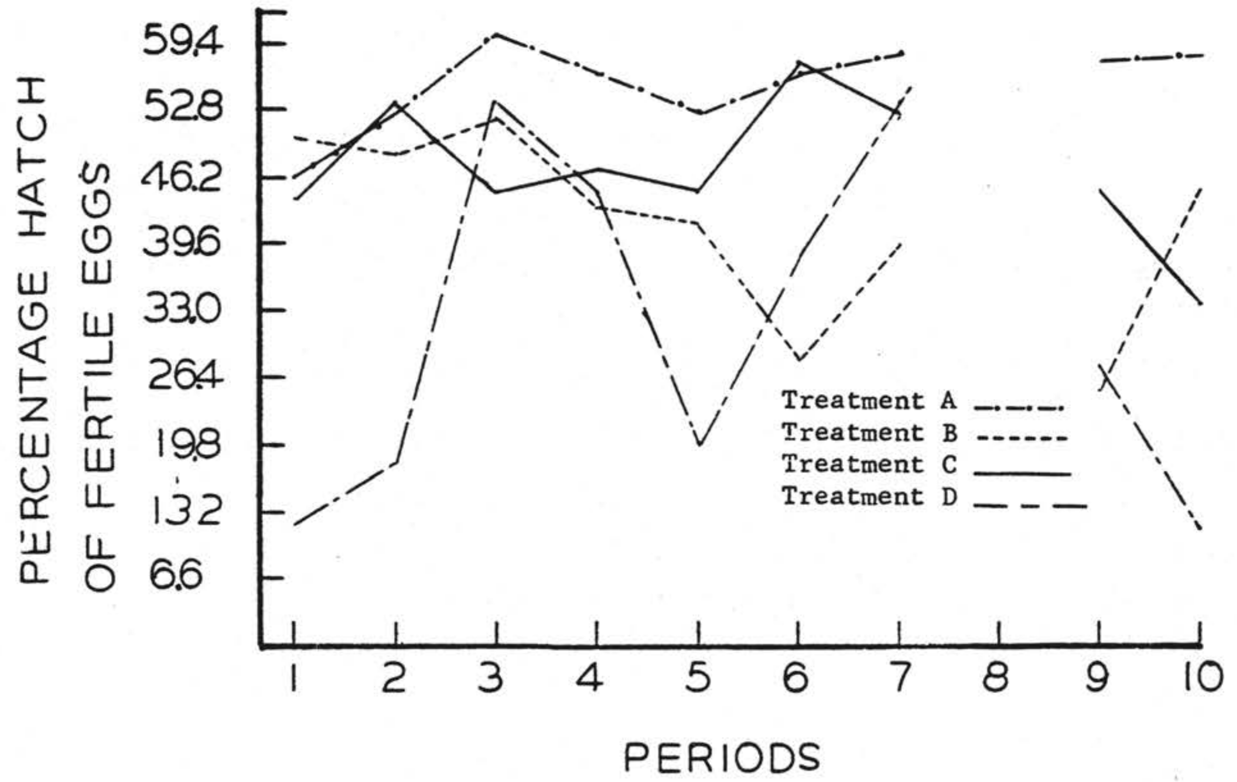

Figure 15. Percentage Hatch of Fertile Eggs as Influenced by Reserpine, Measured at 14-Day Intervals. (A = M & F Non-Treated; B = F Treated; C = M Treated; D = M & F Treated)

As seen in Table XV and in Figure 15, treatment A was superior to treatment B in all but period one. The fact that statistical significance was observed only in period ten might have been due to the large within-treatment variation. When a combined period comparison was made for treatments A and B, no statistically significant difference was observed.

A comparison of treatment A to treatment C shows percentage hatch of fertile eggs to be higher for treatment A, in seven of the nine periods. Period ten, however, was the only period in which a statistically significant difference was observed. The overall-period comparison did not indicate a significant difference due to treatment.

As can be seen in Table XV and in Figure 15, no data are presented for period eight. It was impossible to obtain reliable information during this period due to an incubator failure. Data for period eight are also excluded from Table XVI and Figure 16.

Presented in Table XVI are the results obtained when the three linear comparisons were made for percentage hatch of total eggs set. Presented in Figure 16 is a graphic illustration of the results obtained for percentage hatch of total eggs set. It can also be seen that this graph is very similar to Figure 14, which illustrates percentage fertility.

Figure 16 shows that, in seven of the nine periods observed, treatment C had a higher percentage hatch of total eggs than did treatment B. A statistical comparison of these two treatments indicated that the difference observed in period six was the only statistically significant difference. An over-period comparison did not indicate significance.

TABLE XVI

PERCENTAGE HATCH OF TOTAL EGGS SET

Trial II

Treatment	Periods 1	2	3	4	5	6	7	9	10	Over-all Period Treatment Means
A	4.9	15.5	34.4	30.0	26.0	22.6	29.6	26.7	26.3	24.19
B	3.1	8.3	6.1	4.8	5.0	2.9	7.4	4.9	6.9	05.46
C	1.8	7.3	6.3	5.5	10.5	16.9	16.8	8.7	8.3	08.70
D	0.8	1.1	4.1	2.9	1.1	2.6	11.4	3.4	1.0	03.06
Difference[1] B–C	1.3	1.0	0.2	0.7	5.5	14.0*	9.4	3.8	1.4	03.24
Difference[2] A–B	1.8	7.2	28.3**	25.2**	21.0**	19.7**	22.2*	21.8**	19.4*	18.73*
Difference[3] A–C	3.1	8.2	28.1**	24.5**	15.5**	5.7	12.8	18.0*	15.49	

[1] The average percentage hatch of total eggs set in treatment B (non-treated males X treated females) was compared to the average percentage hatch of total eggs set in treatment C (treated males X non-treated females), using the analysis of variance method of comparison.

[2] The average percentage hatch of total eggs set in treatment A (non-treated males X non-treated females) was compared to the average percentage hatch of total eggs set in treatment B (non-treated males X treated females) using the analysis of variance method of comparison.

[3] The average percentage hatch of total eggs set in treatment A (non-treated males X non-treated females) was compared to the average percentage hatch of total eggs set in treatment C (treated males X non-treated females) using the analysis of variance method of comparison.

* Observed treatment differences significant at the 95.0 percent level of probability.

** Observed treatment differences significant at the 99.0 percent level of probability.

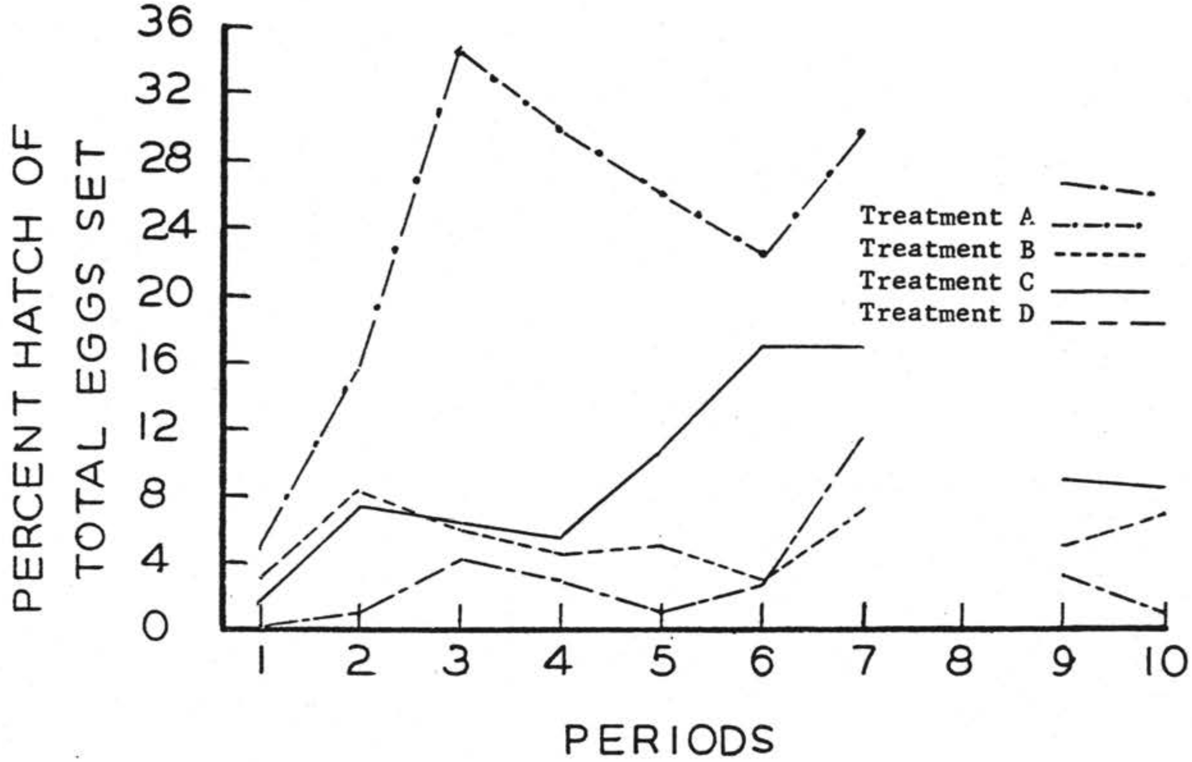

Figure 16. Percentage Hatch of Total Eggs Set as Influenced by Reserpine, Measured at 14-Day Intervals. (A = M & F Non-Treated; B = F Treated; C = M Treated; D = M & F Treated)

A comparison of treatment A to treatment B showed treatment A to have a higher percentage hatch of total eggs set, in all periods. As seen in Table XVI, these differences were statistically significant in all periods except one and two. A combined period analysis indicated treatment difference to be significant at the 95.0 percent level of probability.

When treatment A was compared to treatment C, it was found that the observed differences were statistically significant in periods three, four, five, nine and ten. Although statistically significant differences were not observed in all periods, treatment A did have a higher percentage hatch of total eggs set than did treatment C, in all periods. The difference observed in a combined period treatment analysis was significant at the 90.0 percent level of probability.

Comparison of average egg weight are shown in Figure 17 and the results of these comparisons can be found in Table XVII. The egg weights of the non-treated females were compared to the egg weights of the treated females. The differences observed were not statistically significant in any of the periods. Difference in egg weight due to periods was significant at the 99.0 percent level of probability. Treatment by period interaction was not significant.

Presented in Table XVIII and Figure 18 are the results of the comparisons made of egg shell thickness. Reserpine treatment did not seem to affect egg shell thickness. The difference in shell thickness due to periods was significant at the 95.0 percent level of probability. There was no treatment-by-period interaction observed.

TABLE XVII

EGG WEIGHT

Trial II

Treatment	Periods 1	2	3	4	5	Over-all Period Treatment Means
A	78.5	85.4	84.3	88.6	85.6	84.48
B	79.2	81.4	81.1	88.7	88.4	83.76
C	75.7	82.4	81.1	91.1	88.0	83.66
D	79.3	86.1	88.4	88.5	87.6	85.98
Difference[1] (AC-BD)	04.3	00.3	04.1	02.5	02.4	01.60

[1] The average egg weight of the females in treatments A and C (non-treated) were compared to the average egg weight of the females in treatments B and D (treated), using the analysis of variance method of comparison.

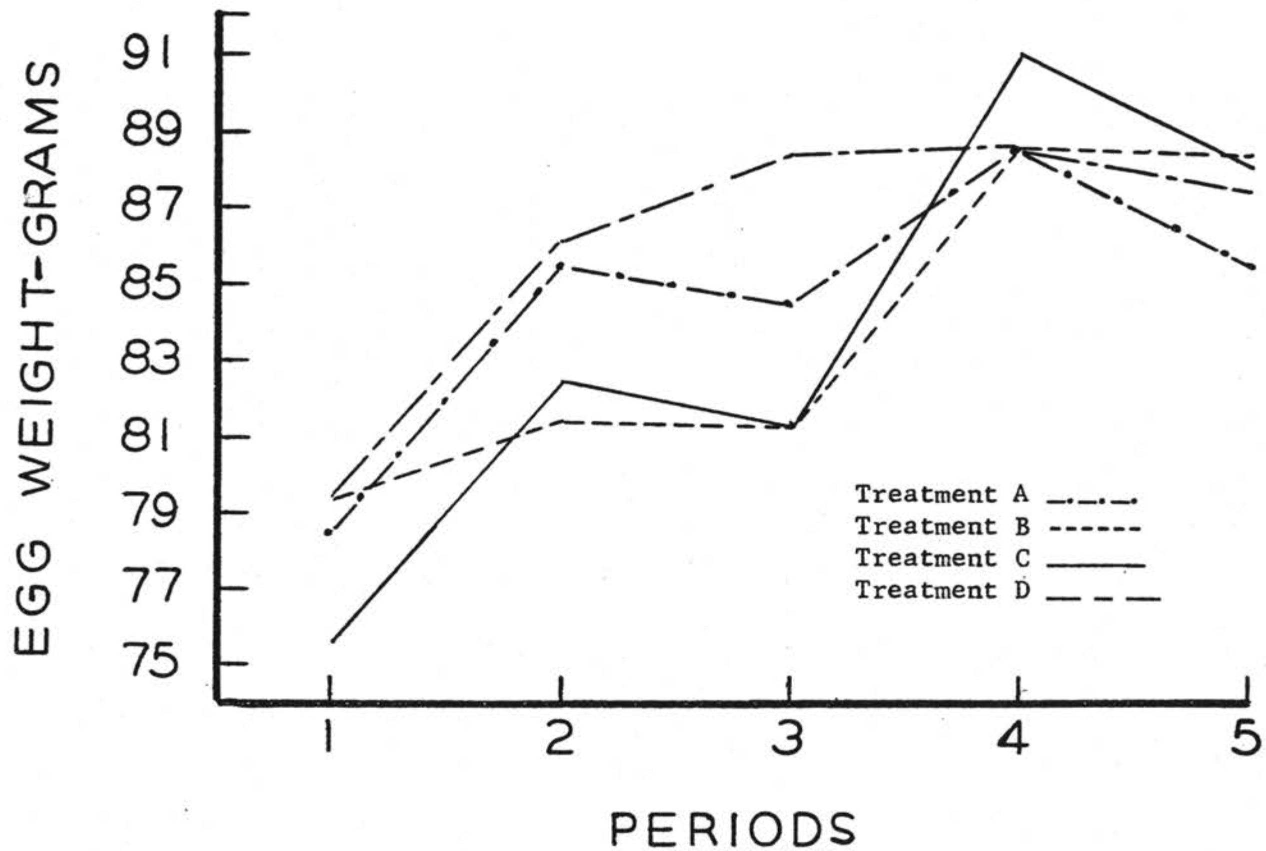

Figure 17. Egg Weight as Influenced by Reserpine. (Treatments A & C = Non-Treated Females; Treatments B & D = Treated Females)

TABLE XVIII

EGG SHELL THICKNESS

Trial II

Treatment	Periods 1	2	3	4	5	Over-all Period Treatment Means
A	.0158	.0152	.0154	.0149	.0142	.0151
B	.0155	.0145	.0148	.0148	.0140	.0147
C	.0167	.0150	.0151	.0152	.0152	.0154
D	.0158	.0157	.0177	.0151	.0145	.0157
Difference[1] (AC-BD)	.0012	.0000	.0020	.0002	.0009	.0001

[1]The average egg shell thickness of the females in treatments A and C (non-treated) were compared to the average shell thickness of females in treatments B and D (treated), using the analysis of variance method of comparison.

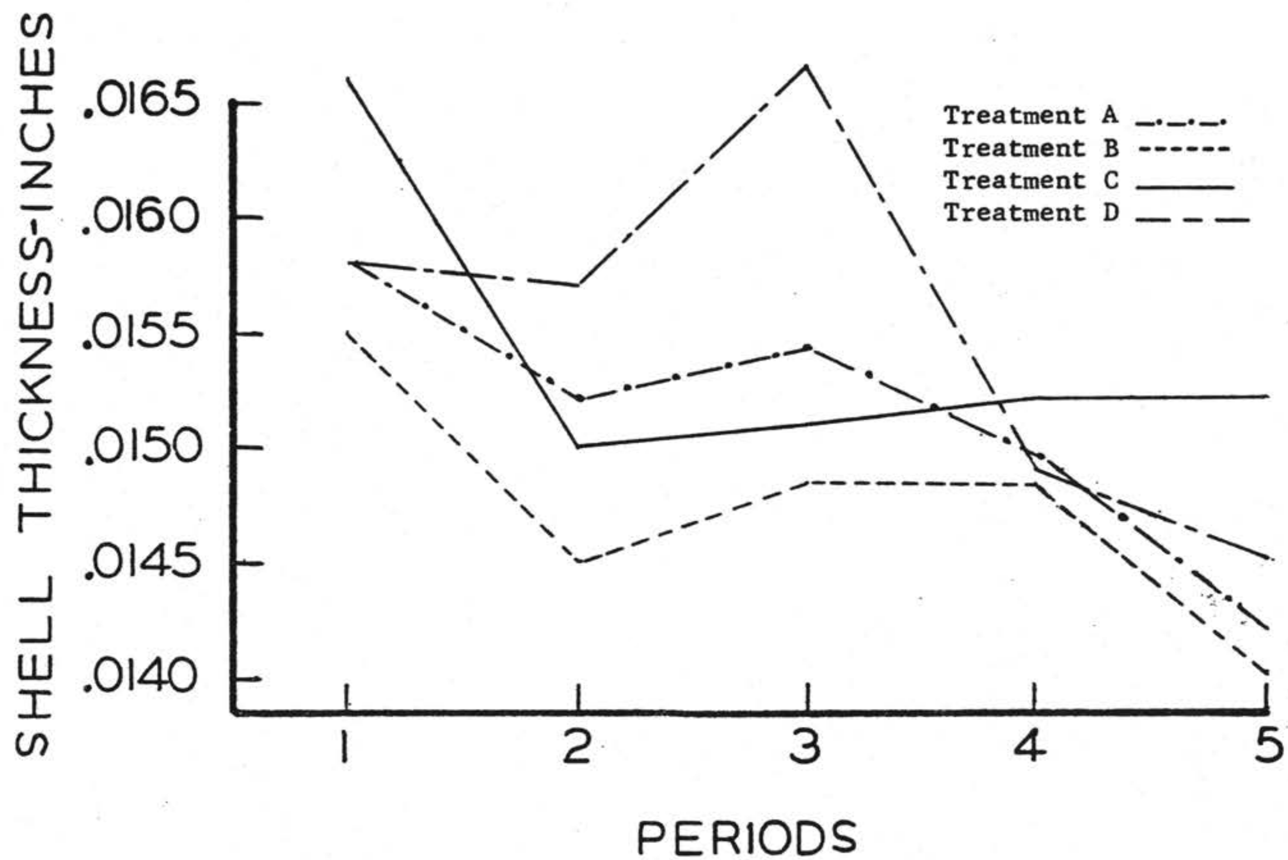

Figure 18. Egg Shell Thickness as Influenced by Reserpine. (Treatments A & C = Non-Treated Females; Treatments B & D = Treated Females)

SUMMARY AND CONCLUSIONS

Two trials were conducted in an attempt to determine the effects of reserpine on the reproductive performance of turkeys. Broad Breasted Bronze and Large White turkeys were used, respectively, in the 1963-1964 and the 1964-1965 breeding seasons. Reserpine was administered at levels of 0.0 p.p.m. and 2.0 p.p.m. so that one-half of each sex received the tranquilizer. Reserpine treatment was initiated when the birds were 26 weeks of age and was continued until the end of each breeding season.

Although no statistical analysis was performed on male body weight, reserpine did appear to suppress body weight during the early part of the breeding season, and aid in maintaining body weight during the warmer periods.

The results indicated that reserpine significantly reduced mature female body weight. It was also observed that during the latter half of the breeding season the untreated females had a higher percentage loss in body weight.

The treated females had a significantly higher average bird-day feed consumption than did the untreated females.

A comparison of body weight and feed consumption of females showed that, although the untreated females had a higher mature body weight, the treated females had a higher daily feed consumption.

The reserpine treated females required more time to reach sexual maturity than did the untreated females. In trial one this difference of 18 days was statistically significant.

In both trials, reserpine treatment resulted in a significant reduction in percentage egg production.

Comparisons made for percentage fertility indicated a marked reduction in fertility due to reserpine treatment. There was also statistical evidence indicating that reserpine was more detrimental to fertility when administered to the females than when administered to the males.

Statistically significant differences in percentage hatch of fertile eggs, due to treatment, were not observed in either trial.

Percentage hatch of total eggs set was reduced by reserpine treatment. Here again, reserpine exhibited a more detrimental effect when administered to the females than when administered to the males.

Egg weight and egg shell thickness were not affected by reserpine in either trial.

SELECTED BIBLIOGRAPHY

Anderson, D. L., and J. Robert Smyth, Jr., 1959. Effect of serpasil on caged layer-thyroid and cholesterol relationships. Conference on the use of the tranquilizing and antihypertensive agent serpasil in animal and poultry production. Rutgers University. May 7, 1959:44-50.

Anderson, D. L., and J. R. Smyth, Jr., 1960. Effects of reserpine on growth and endocrine relationships in large type white turkeys. Poultry Sci. 39:1080-1086.

Aulerich, Richard J., Gordon Shelts, Robert K. Ringer and Philip J. Schaible, 1964. Further use of reserpine in colony rearing of mink. Michigan State University Quarterly Bulletin 47:4-17.

Barnett, B. D., 1960. The effect of reserpine on artificially produced and spontaneously appearing aortic rupture. The second conference on the use of reserpine in poultry production. University of Minnesota. May 6, 1960:9-15.

Barrett, Walter E., 1959. Pharmacology of reserpine. Conference on the use of the tranquilizing and antihypertensive agent serpasil in animal and poultry production. Rutgers University. May 7, 1959:5-17.

Bein, H. J., 1956. The pharmacology of Rauwolfia. Phar. Res. 8:435-483.

Brodie, B. B., E. G. Tomich, R. Kuntgman and P. A. Shore, 1956. Possible role of serotonin in brain function and in reserpine action. J. Pharmacol. and Exper. Therap. 116:9 (abstract).

Burger, R. E., N. S. Van Matre and F. W. Lorenz, 1959. Growth and mortality of chicks and poults fed tranquilizing drugs. Poultry Sci. 38:508-512.

Burger, Ray E., 1960. Effect of reserpine on responses of the laying hen to high temperature. The second conference on the use of reserpine in poultry production. University of Minnesota. May 6, 1960:40-47.

Carlson, C. W., 1956. An effect of reserpine on growing turkeys. Proc. South Dakota Acad. Sci. 35:186-188.

Carlson, C. W., 1959. Control of a field outbreak of dissecting aneurysms and laying hen studies with reserpine. Conference on the use of the tranquilizing and antihypertensive agent serpasil in animal and poultry production. Rutgers University. May 7, 1959:29-35.

Carlson, C. Wendell, 1960. Further studies with reserpine for growing turkeys and laying hens. The second conference on the use of reserpine in poultry production. University of Minnesota. May 6, 1960:25-31.

Casey, J. M., J. C. Gilbreath and R. D. Morrison, 1963. Turkey reproduction as influenced by reserpine administered during growth. Poultry Sci. 42:637-641.

Casey, J. M., 1963. Turkey reproduction as influenced by reserpine, 72 pages. Thesis, Oklahoma State University.

Couch, J. R., 1959. Reserpine in poultry nutrition. Conference on the use of the tranquilizing and antihypertensive agent serpasil in animal and poultry production. Rutgers University. May 7, 1959:36-39.

Earl, A. E., 1956. Reserpine (serpasil) in veterinary practice. J. Amer. Vet. Med. Assoc. 129:227-233.

Eoff, H. J., R. E. Davies, T. M. Ferguson and J. R. Couch, 1961. The effects of tranquilizers on egg production and egg shell quality in caged layers. Poultry Sci. 40:1315-1321.

Friars, G. W., S. J. Slinger and W. F. Pepper, 1964. Effects of continous and intermittent reserpine and different choline treatments on the growth and reproductive performance of turkeys. Poultry Sci. 43:941-946.

Gilbreath, J. C. 1959. Egg shell quality and serpasil under naturally occurring stress conditions. Conference on the use of the tranquilizing and antihypertensive agent serpasil in animal and poultry production. Rutgers University. May 7, 1959:72-75

Gilbreath, J. C., L. F. Garvin and Q. B. Welch, 1959. Effect of orally administered reserpine on egg production and quality. Poultry Sci. 38:535-538

Gilbreath, J. C., Q. B. Welch, R. E. Waggoner and R. D. Morrison, 1960. The effects of trifluoperazine and reserpine on reproductive efficiency in chickens. Poultry Sci. 39:735-739.

Greene, D. E., R. C. Eaton, H. L. Wilcke and R. M. Bethke, 1961. Species differences in the effect of reserpine on reproductive performance, Poultry Sci. 40:1410-1411.

Hewitt, O. H., and R. E. Reynolds, 1957. Tranquilizers in rearing game birds. Proc. Cornell Nutrition Conference :53-60.

Hewitt, Oliver H., 1959. Use of serpasil in the rearing and handling of pheasants. Conference on the use of the tranquilizing and antihypertensive agent serpasil in animal and poultry production. Rutgers University. May 7, 1959:40-43.

Kazan, N., F. G. Sulman and H. Z. Winnik, 1960. Effect of reserpine on pituitary-gonadal axis. Proc. Soc. Exp. Biol. Med. 105:201-204.

Morrison, W. D., 1960. Report on field case of aortic rupture in turkeys treated with reserpine. The second conference on the use of reserpine in poultry production. University of Minnesota. May 6, 1960:57-61.

Morrison, W. D., 1962. Growth and feed utilization of turkeys as affected by reserpine. Poultry Sci. 41:1210-1213.

Mueller, J. M., E. Schlittler and H. J. Bein, 1952. Reserpine, der sedative wirkstoff aus rauwolfia serpentina benth. Experientia 8:338 (abstract).

Parker, Ernest L., 1960. Four field trials with serpasil under semi-arid conditions in central Arizona. The second conference on the use of reserpine in poultry production. University of Minnesota. May 6, 1960: 65-72.

Patrias, George, 1960. Field studies on controlling internal bleeding in turkeys, using reserpine. The second conference on the use of reserpine in poultry production. University of Minnesota. May 6, 1960: 63-64.

Plummer, A. J., A. Earl, and J. A. Schneider, 1954. Pharmacology of Rauwolfia alkaloids including reserpine. Annals N. Y. Acad. Sci. 59:8-22.

Ringer, Robert K., 1959. Influence of reserpine on early growth, blood pressure and dissecting aneurysms in turkeys. Conference on the use of the tranquilizing and antihypertensive agent serpasil in animal and poultry production. Rutgers University. May 7, 1959:21-28.

Rood, K. G., R. K. Ringer, E. W. Speckmann and L. F. Wolterink, 1958. The effect of feeding reserpine to growing birds. Quarterly Bulletin of the Michigan Agricultural Experiment Station. 41:157-162.

Rudolph, J. Warren, 1961. The effect of reserpine on the reproductive performance of turkeys, 73 pages. Thesis, Oklahoma State University.

Rudolph, J. W., J. C. Gilbreath and R. D. Morrison, 1962. The effect of reserpine on the reproductive performance of turkeys. Poultry Sci. 41:184-187.

Schlittler, E., and H. B. MacPhillamy, 1954. Chemistry of Rauwolfia alkaloids including reserpine. Annals New York Acad. Sci. 59:1-7.

Schneider, J. A., and Alfred E. Earl, 1954. Effects of serpasil on behavior and autonomic regulating mechanisms. Neurology 4:657-667.

Slinger, S. J., W. F. Pepper and I. R. Sibbald, 1962. Interrelationships between methionine, choline, sodium chloride and reserpine in growing turkeys. Poultry Sci. 41:974-982.

Speckman, E. W., and R. K. Ringer, 1961. Hemodynamic responses following reserpine feeding to turkeys. Poultry Sci. 40:1292-1298.

Sturkie, Paul D., 1959. Cardiovascular effects of reserpine on the fowl. Conference on the use of the tranquilizing and antihypertensive agent serpasil in animal and poultry production. Rutgers University. May 7, 1959:18-20.

Van Matre, N. S., R. E. Burger, and F. W. Lorenz, 1957. Resistance to heat stress following administration of tranquilizing drugs. Poultry Sci. 36:1165.

Waibel, Paul E., 1960. Some results on the effect of reserpine on the incidence of dissecting aneurysm in turkeys. The second conference on the use of reserpine in poultry production. University of Minnesota. May 6, 1960:48-53.

Weiss, Harold S., 1960a. Studies with serpasil in laying hens. The second conference on the use of reserpine in poultry production. University of Minnesota. May 6, 1960:15-24.

Weiss, H. S., 1960b. The effect of continuous treatment with reserpine on body terperature, respiratory-cardiovascular function and heat tolerance of the hen. Poultry Sci. 39:366-373.

Weiss, H. S., 1961. The effect of reserpine on immersion hypothermia in the hen. Poultry Sci. 40:64-67.

VITA

Joe Melvin Jones

Candidate for the Degree of

Master of Science

Thesis: DIFFERENTIAL EFFECTS OF RESERPINE BY SEXES IN BREEDING TURKEYS

Major Field: Poultry Science

Biographical:

Personal Data: Born: Oklahoma City, Oklahoma, June 24, 1940.

Education: Bachelor of Science degree in poultry Science from Oklahoma State University, May, 1964

Professional Experience: Manager of the Pauls Valley Livestock Auction, Pauls Valley, Oklahoma from March, 1961 to December, 1961. Part time employee of the Stillwater Water Treatment Plant from January, 1962 to September, 1963. Graduate Research Assistant, Poultry Science Department, Oklahoma State University, January, 1964 to January, 1966.

Scientific Papers: Size, shape and color pattern as criteria for identifying coturnix eggs. Poultry Science 43:1292-1294, 1964.

A case report of duplicate vents in a female turkey. Poultry Science 44:No. 5, 1965.