THE EFFECT OF RESERPINE ON THE REPRODUCTIVE PERFORMANCE OF TURKEYS

By

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INTRODUCTION

It is the major purpose of this thesis to focus attention on some of the experimental attempts to define the action of reserpine in turkeys. Research work has been conducted to determine the sedative or tranquilizing effect and the hypotensive activity of reserpine. Many different levels of tranquilizers have been administered to mammals and avians to produce sedation or a tranquil condition.

A drop in body temperature due to these drugs may indicate that heat stress could be tolerated to an increased degree. Research workers have found some tranquilizers to be helpful in reducing heart rate and blood pressure in mammals and avians. Recent work indicates that heart rate and blood pressure in avians reflect indirectly the activity of the sympathetic nervous system. A reduction in blood pressure has been found to reduce aortic rupture in growing turkeys. Different stress factors have been imposed on the domestic turkey in confinement as compared to wild turkeys. Diseases caused by crowded conditions and high energy rations may be associated with stress. Various experiments have been conducted to determine the protective effects of tranquilizers to many different kinds of stress. Death losses from social disturbances among turkey toms and cannibalism in young turkeys have been reduced by tranquilizers. Since most work has been conducted with growing turkeys, no information is available on tranquilizers to determine their effects on the reproductive system of the turkey.

Turkey breeders will lay only a small number of eggs in the spring unless they are subjected to superimposed conditions. Since the economic return from a turkey hen is relatively small, the highest possible production and hatchability are desired. This study was conducted to determine the effects of different levels of reserpine on the reproductive performance of turkey breeders.

REVIEW OF LITERATURE

Reserpine is an indole alkaloid, obtained from the roots of the Rauwolfia shrub, Rauwolfia vomitoria. Rauwolfia may be found in the sub-tropical and tropical parts of India, the East Indies, Africa, and Central and South America. Since ancient times the roots of the Rauwolfia shrub have been used for the treatment of a variety of illnesses by the medicine men of India. The drug was used in the treatment of excited and mentally disturbed persons. With these results in mind the alkaloid was isolated and pharmacologically characterized by Mueller et al. (1952).

Approximately 500 mental cases were observed by Ayd (1957) over a two year period. The initial daily dosage ranged from 0.1 milligram to 0.5 milligram injected intramuscularly for anxiety-tension and related disorders. Reserpine has proven beneficial in reducing tension in the schizophrenic person. The most favorable use of reserpine has been on the hypomanic and manic states. The prompt administration of adequate doses of this drug in the early stages of either of these conditions can circumvent hospitalization. Reserpine has been disappointing as a treatment for depressions.

Miltown, a substituted propanediol, was used by Pennington (1957) on a large number of hospitalized patients. The average dosage was approximately eight, 400-milligram tablets in twenty-four hours. Individuals with epileptic furor and manic stimulation were changed to quiet

individuals capable of cooperation. Depressions and hyperactivity were not effectively controlled.

Twenty-two mentally retarded, hospitalized female patients who presented problems of management were treated with trifluoperazine, a phenothiazine derivative, for six weeks. The oral drug dosage ranged from 10 to 20 milligrams daily. A favorable response was observed in seven patients while fifteen patients were not benefited by the drug, Rudy et al. (1958).

Current therapeutic dosage levels of reserpine administered orally in the human being generally range from 0.1 to 5.0 milligrams daily. Wilkins and Malitz (1960) found that these levels of treatment were effective in relieving fear, anxiety, tension, and hallucinations. These levels of drug were established by testing animals for toxicity and acute chronic effects at graded dosage levels.

Since tranquilizers are effective in the treatment of the emotionally disturbed patient, it would seem logical that they could be used on nervous or excitable animals. The drug may possibly produce a calming effect and conserve energy which could then be used for the production of meat and eggs. Calming of animals could lead to easier handling and treatment for different diseases. With some of these results in mind, studies were conducted in the animal and poultry fields.

Plummer et al. (1954) found that within 60 to 90 minutes of receiving a single intravenous dose, 250 to 300 micrograms of reserpine per kilogram of body weight, that a majority of the dogs tested showed mild sedation. Reserpine caused a slow drop in the mean arterial blood pressure upon intravenous administration of 300 to 500 micrograms of reserpine per kilogram of body weight. The effects of the drug disappeared within 36 to 48 hours.

Considerable larger doses were found by Plummer et al. (1954) to produce a calming effect in the monkey. The lowest effective intravenous dose in the monkey was between 0.5 and 1.0 milligram of reserpine per kilogram of body weight. These results occurred, as with the dog, after approximately one hour. All observed effects of reserpine, including sedation, reduced emotional response and peripheral autonomic alterations, and circulatory changes were observed. Those animals tested, which included the guinea pig, dog, rabbit, cat, mouse, rat and monkey, exhibited the characteristic of sedation and reduction in spontaneous activity.

Troughton et al. (1955) found that the administration of chlorpromazine was very useful for a premedicant to anaesthesia in domestic animals. In cats and dogs 2.5 milligrams per kilogram of body weight administered intramuscularly, are necessary for sedation effects. Cattle and horses require 1.5 milligrams per kilogram of body weight administered intramuscularly for sedation purposes. Chlorpromazine has been used effectively against tetanus in dogs and spasmodic colic in horses. Healthy dogs received doses of 5 milligrams per kilogram of body weight daily for 30 days without any unusual effects.

Lessin and Parkes (1957) used the body temperature of mice to determine the sedative action of reserpine. All drugs were injected intraperitoneally at the rate of 0.2 milligram per 20 grams of body weight. The first visible sign after injection of reserpine is a ptosis of the eyelids which occurs after 10 to 20 minutes. After 30 to 120 minutes, sedation commenced and body temperatures dropped to a temperature of 20 degrees centigrade. Mice given reserpine and kept at an ambient temperature of 32 degrees centigrade for periods up to four hours showed no sedation.

Reserpine, which seems to act on the central nervous system, has been shown by Cranston (1958) to affect the reproductive system of mice. The drug mixed in the diet and fed ad libitum at levels of .0075 and .001 percent caused a 68 to 100 percent decrease in the number of estrus cycles. No severe weight loss was observed in the mice. A fairly prompt return of cycles occurred after the treatment was removed.

A dosage of two international units of pregnant mare serum (Gonadogen) was given subcutaneously while on treatment, which induced estrus in most mice. This trial indicated that reserpine may have caused a decrease in the secretion of gonadotropin.

Adult female rats were injected with 0.2 milligrams of reserpine per kilogram of body weight for two successive periods of 15 days, at an interval of 25 days by Khazan et al. (1960). Reserpine caused a state of diestrus in the rats after three to five days of treatment. In infantile male rats, doses of 0.05 and 0.2 milligrams of reserpine per kilogram of body weight delayed testicular descent.

Khazan et al. (1960) injected one group of 20 rats subcutaneously with 0.05 milligrams of reserpine per kilogram of body weight and another group of 20 rats with 0.2 milligrams. Twenty rats served as controls. Vaginal openings were complete at 44 days of age in 60 percent of the controls. At the 0.05 milligram dosage level, the state of vaginal opening was similar to that of the controls. At the 0.2 milligram dosage level, there was only 60 percent vaginal opening after 52 days.

In two lamb feeding trials Jordan and Hanke (1958) fed chlorpromazine and trifluoroperazine at levels of 11.1 milligrams and 4.4 milligrams per lamb daily. None of the tranquilizers had any visible depressing or tranquilizing effect on the lambs.

A total of 136 Yorkshire, Berkshire, and Yorkshire x Berkshire pigs was used by Pond (1960) in two experiments. This study was conducted to determine the effect of tranquilizers on rate of gain and efficiency of feed utilization when added to the feed continuously through the growing-fattening period of swine. In the first trial no significant difference was obtained by the addition of 28.4 or 56.8 milligrams of reserpine per pound of feed. However, there was a tendency for higher gains in the treated pigs for the first 13 days of the test. In the second trial no significant difference was obtained by the addition of 14.2, 28.2, or 56.8 milligrams of reserpine per pound of feed. A slight depression in the growth rate of pigs receiving the highest levels was not accompanied by change in temperature or blood cholesterol level.

Khazan et al. (1960) administered reserpine to male pigeons at the rate of 0.2 milligrams per kilogram of diet. This treatment caused a severe atrophy of the testes. Histological sections of the testes showed impaired spermatogenesis.

Various factors causing fright in geese resulted in the loss of eggs and body weight. Wilgus (1960) found that geese were highly sensitive to reserpine. The drug was administered at the rate of 0.0625 grams per ton of feed and produced the desired sedative effects in geese without weight loss. All the geese recovered rapidly from the effects of reserpine.

The tranquilizing drug, meprobamate, has been shown to have a muscle-relaxant action on mammals. A study was conducted by Babcock and Taylor (1957) to learn whether the drug would produce similar effects in the chicken. White Leghorn cockerels were used because of their excitable nature. The birds were divided into eight groups of ten birds each. The following levels of meprobamate were used: 0.2, 0.4, 0.6, 1.0, 1.4, 1.8,

and 2.2 percent. Due to space limitations only one control group was used. Feeding meprobamate to White Leghorn cockerels produced no visible effect other than growth inhibition at the 1.8 and 2.2 percent levels.

Garren and Hill (1957) fed Miltown and Sparine to five groups of White Leghorn males with 20 birds per group. Group one was used as the control group. Miltown was fed to groups two and three at levels of 125 and 250 milligrams per pound of ration. Similar levels of Sparine were given to groups four and five. Neither Miltown nor Sparine lessened the nervous, flighty characteristic of the Leghorns. Loss of weight was caused by these drugs.

Chlorpromazine and reserpine were found to be effective in prolonging survival in chickens at high temperatures by Van Matre et al. (1957). In chicks seven weeks old and older, 25 to 50 milligrams of drug per kilogram of feed provided protection against high temperatures. Both drugs afforded protection in the maintenance of egg production and shell quality following heat stress.

An attempt was also made by Weiss (1959) to determine if reserpine would furnish protection against high lethal temperatures in laying hens. Four trials were run with approximately 20 birds per trial. Reserpine was administered orally at a level of 1.6 milligram per kilogram of feed. When the temperature was increased to 105 degrees Fahrenheit with 70 percent relative humidity, the respiratory rate increased over 200 percent. In four of five trials, survival time was measured directly. In these four trials, a 17 percent increase in survival time was obtained in three trials. The one trial that did not indicate an increase in survival time was winter-acclimatized. The research indicated that treated birds have

an increased respiratory rate without causing further stress on the cardiovascular system. Therefore, this would improve heat tolerance of the reserpine-treated birds. Reserpine did not affect egg production or body weight.

Burger (1959) administered reserpine at the rate of 0.0, 2.5, and 5.0 milligrams per kilogram of diet to 121 Leghorn x New Hampshire cross-bred layers for 14 days. Artificial thermal stress was applied at the end of this period for three hours at a temperature of 104 degrees Fahrenheit. After being subjected to the stress condition, mortality in the control pen was 24 birds while that of the treated birds on levels of 2.5 and 5.0 milligrams per kilogram of diet was twelve birds each. After being exposed to the stress condition, production for the first week was seven percent higher in the treated hens. This indicated that reserpine not only depressed mortality but the survivors laid more eggs. Tranquilization of the birds caused an increase in floor eggs.

Carlson (1959), in replicate groups of 17 to 19 White Leghorn hens per group, added reserpine at a level of 2.0 milligrams per pound of feed. It was concluded that reserpine had no effect on egg production or feed efficiency. The drug fed at a level of 1.0 milligram per pound of feed exhibited no effect on shell thickness.

Anderson and Smyth (1959) carried on a complete life cycle study of 525 White Leghorn females. These pullets were equally divided into three groups and the treatment groups were referred to as A, B, and C. Group A served as the control group. Group B received 0.5 milligram of reserpine per kilogram of diet until the end of the experiment. Group C received a control ration until 19 weeks of age. At this time 0.5 milligram of reserpine per kilogram of feed was administered for the remainder

of the experiment. During peak production the temperature was raised 20 degrees Fahrenheit over a period of five days to test the effects of thermal stress on caged layers. The control birds lost weight, while the treated birds showed a small gain in body weight. Feed consumption in the treated group was approximately 1.8 pounds less per bird at the end of 38 weeks. There was a considerable reduction in acute osteoporosis in the groups which received reserpine. Reserpine caused no differences in body weight to 19 weeks, shell thickness, egg production, or hatchability.

Commercial strain pullets, seven months of age and laying at a rate of approximately 70 percent, were randomly distributed into sixteen pens of fifty birds per pen. A single treatment of 2.0 milligrams of reserpine per kilogram of feed was used. Eight treatments and eight control pens were randomly assigned. Data were secured for seven four-week periods after treatment started. No significant difference between the two groups was found in morality, body weight and egg quality. The treated birds consumed less feed and produced somewhat fewer eggs than the controls. Statistical analysis of the data indicated there was an increase in shell thickness due to reserpine. This work was reported by Gilbreath (1959).

Sturkie (1959) used intramuscular injections of reserpine ranging from .006 to .75 milligram per kilogram of diet on caponized chickens. The first effects of reserpine occurred within 1.5 to 2.0 hours and lasted approximately 24 hours. Maximum results occurred four hours after injection of the drug. As the tranquilizer level was increased from .006 to .75 milligram per kilogram of diet, a significant decrease in

systolic pressure was observed. Heart rate was significantly reduced as the level of drug was increased from 0.1 to .75 milligram.

Reserpine did not stop feather pulling in broilers when fed at a level of 1.8 milligrams per pound of feed. These studies were carried on in Arkansas with over 50,000 broilers by Couch (1959).

Many different levels of reserpine and chlorpromazine have been fed to poultry. A study was conducted by Burger et al. (1959) to establish acute and chronic toxicity levels of these drugs. White Leghorn chicks were started on treatment at four days of age and the trial was concluded at the end of 24 days. There were four replicates per group with six to ten birds per replicate. A dosage of 16 grams of chlorpromazine per kilogram of diet killed all the chicks within 24 days. A significant growth depression was not evident at levels below 250 milligrams per kilogram of ration. A growth stimulation was observed when chlorpromazine was administered at levels of 100 milligrams per kilogram of diet. Significant growth depression was obtained with reserpine at a level of 50 milligrams per kilogram of diet. Mortality reached 96 percent after 21 days of treatment with a level of 500 milligrams of reserpine per kilogram of feed. A growth stimulation was evident when reserpine was administered at the level of 0.5 milligram per kilogram in the poultry ration.

Reserpine was injected in daily doses of 5, 10, 25, 50 and 100 micrograms into the yolks of eggs of White Plymouth Rock hens by Adams and Hirchinson (1959). The drug was injected on the day before incubation and was continued daily until the sixth day. A growth retardation was noted. Surviving embryos usually had average body weights amounting to 70 percent of that of the control embryos.

Drye et al. (1959) ran three trials to determine the effects of reserpine on New Hampshire and White Leghorn males on range. Reserpine

was administered at levels as high as 25 milligrams per kilogram of diet. No difference was found between breeds as to their susceptibility to drug action. Reserpine did not appear to have any effect on growth, feed consumption, mortality, or social conduct of the males.

Losses in body weight and egg production are characteristics of high temperatures in the summer. Weiss (1960a) subjected 30 White Leghorn hens to 95 degrees Fahrenheit for six consecutive weeks. Reserpine was administered at the rate of two milligrams per kilogram of feed to half of the birds. The humidity was kept at 60 percent during the trial. For one week respiratory rate was higher in the treated birds and then fell below that of the control birds. This may indicate an improvement in the efficiency of the respiratory heat loss mechanism. By this process a greater heat load could be eliminated with less muscular effort. Results from this trial indicate that energy saved through this process could be used to increase production, body weight, and shell quality.

Weiss (1960b) fed reserpine at levels up to two milligrams per kilogram of feed to White Leghorn hens for 32 weeks. Birds from five trials were subjected to 105 degrees Fahrenheit heat stress at the end of the treatment period. No extreme tranquilization was noted at these doses. Body temperature, respiratory rate, heart rate, and blood pressure were slightly but consistently depressed. When summer-adapted birds that had been previously treated with reserpine were subjected to the heat stress, survival time was increased approximately 23 percent. Increased heat elimination through greater respiratory activity increased heat tolerance in reserpine-treated birds.

Burger (1960) initiated a trial using twelve different lines of chickens to study alteration of responses to thermal stress by reserpine.

An insulated house was divided into twelve pens and heat stress was applied by releasing live steam. Four hens from each line were assigned to each pen. All eggs were pedigreed and measurements taken each day to determine egg size, shell thickness and Haugh units. Reserpine was administered orally at levels of 2.5, 5.0, and 10.0 parts per million. Reserpine reduced egg production and caused an increase in the number of floor eggs. The drug caused a reduction in mortality at high temperatures but did not alter egg quality.

Parker (1960) administered reserpine to White Leghorn chickens under semi-arid conditions in Arizona. Reserpine was fed at the rate of 0.5 parts per million to half of the layers, while the other half receiving no drug served as controls. This trial was carried on during the summer months, starting in July and terminating in October. Results indicated that reserpine caused a linear increase in egg production at temperatures above 90 degrees Fahrenheit.

Burger and Lorenz (1960) conducted an experiment to determine the effects of reserpine-free mother liquor and chlorpromazine on adult White Leghorn cocks subjected to heat stress. The drug was fed to treated birds at levels of 100 and 250 parts per million for 19 days. The birds were then subjected to lethal temperatures of 103 to 109 degrees Fahrenheit. Pretreatment of the adult males with either drug significantly delayed death. Chlorpromazine depressed the average heart rate under prestress conditions.

The exact amount of floor space per layer may vary in different parts of the country due to management and climatic conditions. Parker (1960) carried on an experiment to determine the effects of reserpine under crowded conditions. There were three different groups of birds,

crowded-medicated, crowded-control, and non-crowded and non-medicated. Results indicated that the crowded-medicated birds produced 7.87 percent more eggs than the crowded-control group and 4.94 percent more than the non-crowded birds.

Cannibalism and feather picking are two of the more troublesome problems in raising game birds. Hewitt (1957) conducted an experiment with two-week-old pheasants for a period of two weeks. Seventy-eight birds were divided into three groups and placed in crowded brooding conditions. Reserpine was administered at the rate of five and seven milligrams per kilogram of diet. The experiment was terminated after eleven days of continuous feeding of reserpine. Collective weights and feather scores were recorded in each group. Picking and scalping were effectively reduced, therefore decreasing cannibalism. No after effects were noted when reserpine was administered at levels of five and seven milligrams per kilogram of diet.

A test of the effects of tranquilizers on egg production in pheasants was conducted by Hewitt and Reynolds (1957). Reserpine was administered to fifteen pens of breeder pheasants at the rate of five grams per ton of diet. A second series of fifteen pens received 25 grams of reserpine residue, as the "mother liquor", per ton of diet. A series of 68 pens received no treatment and was used as the control. Seven hens and one cock pheasant were placed in each pen. Eggs were collected daily, and records were kept on fertility and hatchability. Statistical analysis of the results indicated that both reserpine and reserpine residue reduced egg production, fertility and hatchability. There were no differences in feed consumption among experimental and control pens.

In an extensive research program, Hewitt and Reynolds (1957) distributed 3,159 day-old pheasant chicks to 38 different 4-H Club members. Reserpine-treated feed was administered to half of the birds at the rate of five grams per ton of feed. It was concluded that reserpine at five grams per ton of feed would not prevent feather picking. However, feather picking was greatly reduced by reserpine, when used under good rearing conditions.

Carlson and Morgan (1958) distributed 200 Ring-Necked pheasants randomly into eight groups. The chicks were started in battery brooders and at three weeks of age were removed to floor pens. At eight weeks of age the pheasants were moved to wire-net enclosures where they remained until the trial was completed. Reserpine was fed at a rate of 2.0 milligrams per pound of feed continuously and at 4.0 milligrams per pound of feed starting three days prior to moving to wire enclosures. A feather score was taken at twelve weeks. Individual weights were taken at three, eight, and twelve weeks of age. Reserpine fed continuously throughout the trial did not show any reduction in feather picking. Reserpine fed at both levels also appeared to cause a reduction in body weight.

Hewitt (1959), in a test involving 400 adult male pheasants, found that by the addition of reserpine to the feed the birds were much easier to handle. The pheasants were divided into two groups, half on treatment and half on control. The birds were held in eight pens, 50 to a pen, and the treated birds were fed an average of 40 milligrams of reserpine on the day before shipment.

Reserpine has been effective in reducing flightiness in wild turkeys. Secord, in work reported by Earl (1956), injected 0.2 milligram of reserpine per kilogram of body weight intramuscularly, which permitted the turkeys to be transported alive from the hatchery to the releasing grounds

without harm. Previous mortality had been approximately 30 to 40 percent due to moving.

Carlson (1956), in work with growing turkeys, used two levels of reserpine, 0.5 and 1.0 milligram per kilogram of diet. The turkeys were divided into three groups with nine toms and approximately eight hens per pen. The experiment lasted for eight weeks. It was determined in this experiment that reserpine was detrimental to growth and feed efficiency. A suppression of their desire to fight was evident.

It is believed that aortic rupture is caused by high blood pressure in turkeys. This condtion seems to be more prevalent in the larger strains of turkeys. Ringer (1959) fed reserpine to turkeys ranging from five weeks to 22 weeks of age. Reserpine was fed for four weeks at levels 0.1, 0.2, 0.3, and 0.4 milligram per kilogram of diet to ten birds at each level. It was found that the 0.1 and 0.2 levels had a tendency to increase body weight. When the drug was administered at the 0.3 milligram level, growth rate was suppressed, and at the 0.4 milligram level there was a reduction in body weight. Blood pressure in the turkey was significantly reduced with levels as low as 0.1 milligram of reserpine per kilogram of diet.

During a field outbreak of aortic rupture, reserpine was used at a level of 1.5 milligrams per pound of feed by Couch (1959). The drug was administered to 5,000 turkey toms at sixteen weeks of age. Mortality was reduced from fifteen turkey toms per day to approximately zero.

Carlson (1959) divided a flock of 3,000 Empire White turkeys into two groups which had been showing a high incidence of dissecting aneurysms. Dissecting aneurysms occurred as early as the fifth week. During the thirteenth week reserpine was mixed in the feed at the rate of 0.5 milligram per pound of feed, when mortality was high. The treatment was

continued for eleven days. During that time mortality was completely stopped in the treated pens. However, fourteen died from dissecting aneurysms in the untreated pens during the same period. The results indicate the possibility that reserpine was responsible for the control of the situation.

"Reserpine mother liquor" is a crude Rauwolfia preparation from which approximately 90 percent of the reserpine content has been removed. This compound was administered by Burger et al. (1959) to 85 Broad Breasted Bronze poults at seven days of age. When the compound was administered at levels of 0.5 to 10.0 milligrams per kilogram of diet, it produced a slight increase in growth to 38 days of age. "Reserpine mother liquor" fed at 1.0 milligram per kilogram of diet produced a significant increase in growth.

Field trials have been run to determine the effects of reserpine on turkey flocks showing signs of aortic rupture. It would appear that large-type turkeys are more susceptible to aortic rupture than small-type turkeys. In four field trials Waibel (1960) fed reserpine at the rate of 0.2 and 0.25 parts per million. Dissecting aneurysms were controlled to a certain extent when the drug was fed at these low levels.

Aortic rupture has been found to occur as early as the fifth week in turkeys and to continue throughout the entire growing period. This condition has occurred under many different management conditions. Morrison (1960) fed reserpine at the rate of 0.2 parts per million and successfully controlled aortic rupture. The level of 1.0 part per million reduced mortality within 24 hours. In most cases, where treatment was discontinued, death losses were negligible for two weeks.

Recent studies indicate that two factors are causing massive internal hemorrhage in growing turkeys. Extremely high blood pressure in fast growing birds and degeneration of the arterial walls result in severe death losses. Barnett (1960) subjected Broad Breasted Bronze poults to dietary beta-aminopropionitrile, which caused hemorrhage in turkey poults identical to that described in the field. The incidence of artificially induced aortic rupture was reduced when reserpine was administered at levels of 0.8 to 1.6 milligrams per pound of diet.

Observations during the past several years indicate that the incidence of internal bleeding in turkeys is increasing each year. It is very uncertain what causes this condition. Patrias (1960) conducted several field studies to determine the effect of various levels of reserpine on internal bleeding in turkeys. In large commercial flocks it was concluded that 1.0 part per million in the diet was adequate to control outbreaks of internal bleeding. It was found that debeaking was not necessary when the drug was administered at the 1.0 part per million level, due to its tranquilizing or sedative effect. Reserpine administered at the level of 0.2 parts per million served as an adequate preventative.

Carlson (1960) administered reserpine to Empire White and Broad Breasted Bronze turkeys at the rate of 0.5 milligram per pound of diet. In three different field trials, losses from dissecting aneurysm were completely eliminated. Since no feed conversion or comparative growth rate data were obtained in the field trials, it was decided that a controlled study should be conducted. Broad Breasted Bronze turkey toms were fed reserpine at the recommended level of 0.5 milligram per pound of diet. The data indicated that reserpine had no influence on growth to 16 weeks of age. However, average weights were less at 26 weeks of age.

EXPERIMENTAL PROCEDURE

Three separate trials were conducted to determine the effect of reserpine on the reproductive performance of turkey breeders. Two different varieties were used to determine if a genetic difference existed.

Trial I

On September 9, 1958, twenty White Holland female turkeys, twenty-two weeks of age, were selected randomly from the range. The hens were randomly placed in individual cages, 2' x 2' x 2½' in dimensions. Feed and water were supplied ad libitum. The birds were fed and watered individually each day.

Trial I was conducted in order to determine a response level for reserpine in turkey hens. Reserpine, in a corn starch base, was administered at levels of 0.0, 1.0, 2.0, 4.0, and 8.0 milligrams per kilogram of diet. Each treatment was randomly assigned to four different birds. The birds were fed an all-mash standard grower diet as shown in Table I. The diet was recommended by the Poultry Science Department of Oklahoma State University.

The trial was started September 12, 1958 and terminated September 22, 1958. Body weights were recorded each day from a hanging dial-type scale graduated in ounces.

Body temperatures were obtained at the same time each day while the birds were hanging by their feet. The temperature was calculated

TABLE I

COMPOSITION OF TURKEY GROWER DIET
USED IN TRIAL I

Ingredients	Percent
Ground yellow corn	84.27
Pulverized oats	0.60
Corn gluten meal	0.90
Alfalfa meal (17% protein)	0.50
Fish meal (60% protein)	2.70
Blood meal (80% protein)	0.80
Meat and bone scrap (50% protein)	1.10
Soybean meal (44% protein)	4.50
Dried condensed fermented corn extractives[1]	0.50
Dried whey	0.50
Fat (feed grade tallow)	2.30
Di-calcium phosphate	0.30
Calcium carbonate	0.30
Salt	0.50
VMC-60[2]	0.20
dl-Methionine	0.03
	100.00

[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; managanese, 27.7 milligrams; iodine, 0.86 milligrams; cobalt, 0.59 milligrams; iron, 21.8 milligrams; copper, 1.65 milligrams; and zinc, 22.7 milligrams.

by inserting a veterinary thermometer, graduated in 0.2°F., into the vent. Daily feed consumption records were recorded to determine feed and drug intake.

Trial II

Large type White turkeys were used. The turkeys were the same strain as those used in Trial I. They were obtained from a hatchery that supplied turkeys to commercial turkey producers. Five hundred females and one hundred males were brooded in a 48' x 48' pole shed, which provided 3.8 square feet of floor space for each poult. The flock was moved to range at eight weeks of age. The birds were supplied with six self-feeders, each eight feet in length. Ample watering space was provided with six automatic pan-type waterers. Artificial shades and roosts were available at all times.

The experiment was begun October 15, 1958 in sixteen 12' x 16' houses that opened into 50' x 100' pens. The turkeys were housed at the age of 27 weeks in these sixteen mating pens at the rate of twenty-four hens and two males per pen. Feed and water were supplied ad libitum during the trial. Each pen was equipped with one 5.5-foot feeder, and one automatic waterer containing three linear feet of watering space. During cold weather an electrical heating element was applied to the water to keep it warm.

The mating pens were arranged in four rows. The rows consisted of five, five, three, and three pens. Therefore, a completely randomized statistical design was used. All data were recorded and analyzed as pen means. Four replications of treatments, 0.0, 0.25, 0.50, and 1.0 milligram of reserpine per kilogram of all-mash diet were used. Treatment was

begun October 15, 1958 and discontinued June 24, 1959.

The composition of the turkey breeder ration used is shown in Table II. Each hen was considered to be sexually mature at the time of her first egg. Egg production was not appreciable until after artificial lighting was started. On January 21, 1959 the turkeys were given twelve hours of light per day for two weeks and fourteen hours per day thereafter. High and low temperatures were recorded each day.

Two hatches of approximately 2,200 eggs each were made. The poults were hatched on May 14 and June 29, 1959. Each hatch was made from the two-week egg production period immediately prior to the setting date. All eggs were candled on the fourteenth day of incubation, and any eggs not exhibiting normal development were broken out for macroscopic examination. The broken-out eggs were classified as being fertile if any embryo development was observed; all others were called infertile.

A total of 3,977 eggs was used to obtain egg weight and shell thickness data. The eggs used were those laid during the period from April 22 through May 5 and from June 16 through July 1, a total of thirty days. Each egg was weighed to the nearest gram, broken, and thickness of the shell with attached membrane obtained with a convex anvil micrometer to the nearest 10^{-3} inches. The egg data were summarized as pen means of the total eggs broken for each pen.

Each pen of turkeys was trapnested from five nests, each of which was 2' x 2' x $1\frac{1}{2}$' in dimensions, throughout the experiment. Egg production was calculated as percentage egg production per pen.

Pen feed consumption values were obtained bi-weekly. The feed consumption data were adjusted for mortality on the basis of the average bird-day feed consumption for that particular pen. This was done by

TABLE II

COMPOSITION OF TURKEY BREEDER RATION
USED IN TRIAL II

Ingredients	Percent
Ground yellow corn	23.32
Ground milo	20.75
Ground oats	10.38
Alfalfa meal (17% protein	2.59
Wheat shorts	5.19
Soybean meal (50% protein)	7.78
Fish meal (60% protein)	5.19
Meat and bone scrap (50% protein)	4.15
Yeast culture	1.04
Dried fish solubles	1.56
Dried condensed fermented corn extractives[1]	1.56
Liquid whey	1.04
Fat (feed grade tallow)	6.22
Di-calcium phosphate (18% phosporus)	2.08
Calcium carbonate	3.11
Salt	0.52
Trace mineral mix[2]	0.05
Vitamin concentrate (VC-55)[3]	0.52
Vitamin E concentrate	0.02
NF-180[4]	0.02
dl-Methionine	0.05
Fermacto[5]	0.78
Coliver[6]	2.08
	100.00

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

[2]Trace mineral mix--adds per pound of ration: manganese, 27.5 milligrams; iodine, 0.8 milligrams; cobalt, 0.59 milligrams; iron, 8.3 milligrams; copper, 1.65 milligrams; zinc, 1.52 milligrams.

[3]VC-55-vitamin concentrate adds the following per pound of finished ration: vitamin A, 2,000 I.U.; vitamin D_3, 1,000 I.C.U.; riboflavin, 1.5 milligrams; pantothenic acid, 2 milligrams; niacin, 10 milligrams; choline chloride, 150 milligrams; vitamin B_{12}, 1.5 micrograms; procaine penicillin, 1 milligram; and menadione, 1.5 milligrams.

[4]NF-180--furazolidone (N-(5-nitro-2 furfurylidene)-3 amino-2-oxozolidone).

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

[6]Coliver--a cold process cod liver extract manufactured by the Silmo Chemical Company, Vineland, New Jersey.

adding to the actual feed consumption the product of any days lost, times that pen's bird-day feed consumption.

Average daily feed consumption per bird was calculated for the 36 week period. Individual body weights were obtained to the nearest ounce at the beginning of treatment and each four-week interval thereafter.

Trial III

The experimental turkeys used in this trial were a commercial strain of Broad Breasted Bronze. Five hundred hens and one hundred toms were brooded in four, 12' x 16' brick brooders with 1.3 square feet of brooding space per bird. At four weeks of age the poults were moved to a 48' x 48' pole-type shed allowing 3.8 square feet of floor space for each bird. All poults were vaccinated against fowl pox when they were placed on range at eight weeks of age. The management procedure for ranging was the same as in Trial II.

The trial was begun November 17, 1959 at the Oklahoma Agricultural Experiment Station near Perkins, Oklahoma when the turkey hens were 26 weeks of age. At this time reserpine was administered in an all-mash breeder diet at the levels of 0.0, 0.5, 1.0, and 2.0 milligrams per kilogram of diet. Turkeys in each pen were provided feed ad libitum using one cylinder-type feeder which allowed 6.5 linear feet of feeder space. The composition of the turkey breeder ration used is shown in Table III. Pan-type automatic waterers were used to provide water ad libitum for each pen.

Four replicates of each of the treatments, 0.0, 0.5, 1.0, and 2.0 milligrams of reserpine per kilogram of diet, were randomly distributed among sixteen 12' x 16'houses that opened into 50' x 100' pens. The

sixteen pens were divided into rows consisting of five, four, four, and three pens, respectively. A completely randomized statistical design was used. Twenty-four females were randomly assigned to each pen. The toms that were used were held in a separate pen without treatment until January 1, 1960, when two males were randomly assigned to each pen. The original assignment of males was maintained throughout the study.

The separate pen of breeding males was given fourteen hours of light per day beginning December 1, 1959. The females were similarly lighted starting December 15, 1959. Fourteen hours of light per day was continued until the study was terminated. A daily record of the temperature was kept by means of a recording thermometer.

Body weights, on a pen basis, were determined every four weeks throughout the trial starting November 17, 1959 and continuing through July 25, 1960. Pen feed consumption data and body weight data were obtained every 28 days. Soluble Hepzide was mixed in the drinking water for one week starting April 5, 1960 for the control of an outbreak of blackhead, at levels recommended by Merck and Company. Mortality data were recorded throughout the trial. All dead birds were examined post-mortem by a veterinarian and the cause of death recorded. The feed consumption data were adjusted for mortality on the basis of the average bird-day feed consumption for each pen. Feed conversion was calculated by the same procedure as in Trial II.

During the egg production period the hens were provided with five nests per pen. Eggs were dated and numbered on a pen basis throughout the experiment. The first egg production was observed on January 25, 1960. Two preliminary settings were made and discarded after fertility was measured. Regular settings were then made at two-week intervals starting February 22, 1960 and continuing through the final hatch date of September 5, 1960.

TABLE III

COMPOSITION OF TURKEY BREEDER RATION
USED IN TRIAL III

Ingredients	Percent
Ground yellow corn	26.07
Ground milo	19.68
Ground oats	9.84
Alfalfa meal (17% protein)	2.46
Wheat shorts	4.92
Soybean meal (50% protein)	7.38
Fish meal (70% protein)	4.92
Meat and bone scrap (50% protein)	3.94
Yeast culture	0.98
Dried fish solubles	1.48
Dried condensed fermented corn extractives[1]	1.48
Liquid whey	2.21
Fat (feed grade tallow)	5.90
Di-calcium phosphate (18% phosphorus)	1.97
Calcium carbonate	2.94
Salt	0.49
Trace mineral mix[2]	0.05
Vitamin concentrate (VC-59)[3]	0.49
Vitamin E concentrate	0.02
NF-180[4]	0.02
dl-Methionine	0.05
Fermacto[5]	0.74
Molasses (black strap)	1.97
	100.00

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

[2]Trace mineral mix--adds per pound of ration: manganese, 27.5 milligrams; iodine, 0.88 milligrams; cobalt, 0.59 milligrams; iron, 8.3 milligrams; copper, 1.65 milligrams; zinc, 1.52 milligrams.

[3]VC-59--vitamin concentrate adds the following per pound of finished ration: vitamin A, 8,000 I.U.; 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; pantothenic acid, 8 milligrams; and choline chloride, 500 milligrams.

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

[5]Fermacto--a dried extracted streptomces fermentation residue. Borden Company, Feed Supplements Department, New York 17, New York.

Fertility was determined by candling all eggs after one week of incubation.

Eggs were collected for two days each month starting February 25, 1960; egg collection was discontinued July 27, 1960. Each collection of eggs was weighed to the nearest gram, then broken. The shell, along with attached membrance, was measured with a convex anvil micrometer to the nearest 10^{-3} inches. These egg data are presented as average egg weight and average shell thickness per bird, for each pen. Each measurement was taken by the same person to minimize human error.

As soon as treatment effects appeared to be definitely established, all drug levels were removed on April 4, 1960. This was done in order to study any possible recovery trends.

RESULTS AND DISCUSSION

Trial I

The experimental units were a random sample of the population, in order that results might be relevant to other samples of the same population.

Graded levels of reserpine were administered to turkey hens in order that any possible treatment effects could be established.

The summary and analysis of Trial I are presented in this discussion. Data on average daily feed consumption, average body weight gain, and average body temperature are presented in Tables IV, V, VI, VII, VIII and IX.

Results in Table IV indicate that as the level of reserpine increased the feed consumption decreased. Reserpine administered at the rate of 8.0 milligrams per kilogram of diet reduced feed consumption 2.8 ounces per bird per day below that of the control group. The analysis of variance showed a highly significant F-value for a linear decrease in average daily feed consumption at the 0.5 percent level as shown in Table V.

When feed consumption was reduced, there was a significant linear decrease in average body weight gain. A definite loss in weight was noted (see Table VI) at the level of 8.0 milligrams of reserpine per kilogram of diet. The control birds receiving no reserpine gained approximately 15.2

ounces during the eleven-day period. The analysis of variance of body weight gain data is shown in Table VII.

A gain in average body temperature was noted throughout the various treatment levels as the trial progressed. However, no statistical significance was established. No explanation is available for the apparent increase in body temperature at levels of 1.0 and 4.0 milligrams of reserpine per kilogram of diet above the other levels of treatment as indicated in Table VIII. This result caused a quadratic effect (see Table IX), which does not indicate a relationship between the graded levels of reserpine.

TABLE IV

AVERAGE DAILY FEED CONSUMPTION
Trial I

Replication	Mg. of reserpine per kg. of diet				
	0.0	1.0	2.0	4.0	8.0
	Ounces				
1	9.4	7.6	8.4	6.8	6.0
2	8.6	8.7	8.5	6.6	6.2
3	7.7	8.6	7.6	8.4	5.7
4	9.2	8.3	6.2	5.6	5.5
Treatment mean	8.7	8.3	7.7	6.9	5.9

TABLE V

ANALYSIS OF VARIANCE OF AVERAGE
DAILY FEED CONSUMPTION
Trial I

Source	d.f.	S.S.	M.S.	F.
Total	19	31.45		
Treatment	4	21.26	5.32	7.82
Linear	(1)	20.59	20.59	30.28***
Quadratic	(1)	0.62	0.62	0.91
Cubic	(1)	0.01	0.01	0.02
Quardic	(1)	0.04	0.04	0.06
Error	15	10.19	0.68	

***Significant at the 0.5 percent level.

TABLE VI

AVERAGE BODY WEIGHT GAIN
Trial I

Replication	Mg. of reserpine per kg. of diet				
	0.0	1.0	2.0	4.0	8.0
	Ounces				
1	16.0	14.0	10.0	4.0	0.0
2	13.0	14.0	14.0	1.0	-5.0
3	15.0	15.0	12.0	11.0	-2.0
4	17.0	15.0	4.0	2.0	-4.0
Treatment mean	15.2	14.5	10.0	4.5	-2.8

TABLE VII

ANALYSIS OF VARIANCE OF AVERAGE
BODY WEIGHT GAIN
Trial I

Source	d.f.	S.S.	M.S.	F.
Total	19	1023.20		
Treatment	4	878.70	219.68	24.33
Linear	(1)	864.90	864.90	95.78***
Quadratic	(1)	8.14	8.14	0.90
Cubic	(1)	4.28	4.28	0.47
Quardic	(1)	1.38	1.38	0.15
Error	15	144.50	9.03	

***Significant at the 0.5 percent level.

TABLE VIII

AVERAGE BODY TEMPERATURE GAIN
Trial I

	Mg. of reserpine per kg. of diet				
Replication	0.0	1.0	2.0	4.0	8.0
	Degrees Fahrenheit				
1	0.8	1.4	1.4	0.7	0.6
2	0.8	1.5	1.3	1.6	0.8
3	0.7	1.6	0.9	1.7	1.1
4	1.0	0.7	0.1	1.7	1.4
Treatment mean	0.83	1.30	0.93	1.43	0.98

TABLE IX

ANALYSIS OF VARIANCE OF AVERAGE
BODY TEMPERATURE GAIN
Trial I

Source	d.f.	S.S.	M.S.	F
Total	19	3.81		
Treatment	4	1.18	0.30	1.67
Linear	(1)	0.02	0.02	0.11
Quadratic	(1)	0.56	0.56	3.11
Cubic	(1)	0.01	0.01	0.06
Quardic	(1)	0.59	0.59	3.28
Error	15	2.63	0.18	

Trial II

Data and calculations on average body weight gain, average daily feed consumption, days to sexual maturity, percentage egg production, percentage of fertile eggs, percentage hatch of fertile eggs set, percentage hatch of total eggs set, average egg weight, and average egg shell thickness are presented in Tables X through XXVII. Analysis of variance was computed to determine the linear, quadratic, and cubic effects of feeding progressive levels of reserpine to turkey breeder hens. The abbreviated "Doolittle" method was employed to obtain the linear, quadratic, and cubic treatment effects.

Results indicate that reserpine caused a linear reduction in average body weight gain at the 0.5 percent level of probability. The lowest average body weight gain of 0.59 pounds per hen occurred at the level of 1.0 milligrams of reserpine per kilogram of diet, while the control birds gained an average of 0.91 pounds. The increased average body weight gain at 0.25 milligrams of reserpine per kilogram of diet above the control group may indicate that the drug could possibly stimulate growth rate at very low levels, as shown in Table X and XI.

No significant linear, quadratic, or cubic effect of reserpine were observed on average daily feed consumption, as shown in Table XII and XIII. A linear trend in days to sexual maturity may be seen in Table XIV. The analysis of variance in Table XV did not show a significant linear effect caused by the graded levels of reserpine. A non-significant reduction in percentage egg production may be detected in Table XVI. The statistical analysis of the data indicated that egg production was not significantly influenced, as observed in Table XVII.

TABLE X

AVERAGE BODY WEIGHT GAIN
Trial II

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.25	0.50	1.0
	Pounds			
1	1.01	1.30	0.92	0.51
2	0.74	0.89	0.76	0.37
3	0.83	1.09	0.70	1.10
4	1.05	0.97	0.56	0.38
Treatment mean	0.91	1.06	0.74	0.59

TABLE XI

ANALYSIS OF VARIANCE OF AVERAGE BODY WEIGHT GAIN
Trial II

Source	d.f.	S.S.	M.S.	F
Total	15	1.09		
Treatment	3	0.51	0.17	3.54
Linear	(1)	0.35	0.35	7.29***
Quadratic	(1)	0.02	0.02	0.42
Cubic	(1)	0.14	0.14	2.92
Error	12	0.58	0.05	

***Significant at the 0.5 percent level.

TABLE XII

AVERAGE DAILY FEED CONSUMPTION
Trial II

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.25	0.50	1.0
	Pounds			
1	0.52	0.53	0.55	0.57
2	0.53	0.53	0.54	0.54
3	0.52	0.56	0.53	0.54
4	0.54	0.53	0.54	0.52
Treatment mean	0.528	0.538	0.540	0.543

TABLE XIII

ANALYSIS OF VARIANCE OF AVERAGE DAILY
FEED CONSUMPTION
Trial II

Source	d.f.	S.S.	M.S.	F
Total	12	10.69		
Treatment	3	2.33	0.78	1.11
Linear	(1)	0.47	0.47	0.68
Quadratic	(1)	1.66	1.66	2.39
Cubic	(1)	0.19	0.19	0.28
Error	12	8.36	0.70	

TABLE XIV

DAYS TO SEXUAL MATURITY
Trial II

Replication	Mg. of reserpine per kg. of diet			
	0.0	0.25	0.50	1.0
	Days			
1	313	304	307	320
2	298	308	299	312
3	309	303	309	306
4	308	304	313	305
Treatment mean	307	305	307	311

TABLE XV

ANALYSIS OF VARIANCE OF DAYS TO SEXUAL MATURITY
Trial II

Source	d.f.	S.S.	M.S.	F
Total	15	457.74		
Treatment	3	74.24	24.75	0.77
Linear	(1)	46.86	46.86	1.47
Quadratic	(1)	20.00	20.00	0.63
Cubic	(1)	7.38	7.38	0.23
Error	12	383.51	31.96	

TABLE XVI

PERCENTAGE EGG PRODUCTION
Trial II

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.25	0.50	1.0
	Percent			
1	24.1	23.0	23.1	25.0
2	28.1	24.7	27.3	25.8
3	27.6	29.5	25.8	26.3
4	25.6	26.2	27.0	24.5
Treatment mean	26.4	25.9	25.8	25.4

TABLE XVII

ANALYSIS OF VARIANCE OF PERCENTAGE
EGG PRODUCTION
Trial II

Source	d.f.	S.S.	M.S.	F
Total	15	47.88		
Treatment	3	1.82	0.61	.16
Linear	(1)	1.65	1.65	.43
Quadratic	(1)	0.07	0.07	.02
Cubic	(1)	0.10	0.10	.03
Error	12	46.06	3.84	

A significant linear effect was apparent for percentage of fertile eggs at the five percent level of probability, as observed in Table XVIII and XIX. Percentage of fertility was reduced 25.6 percent below the control level when 1.0 milligrams of reserpine per kilogram of diet was administered. Reserpine apparently had no significant influence upon percentage hatch of fertilie eggs set, as shown in Tables XX and XXI. Table XXII and XXIII show a significant cubic and linear effect at the five percent level of probability on percentage hatch of total eggs set. A significant quadratic effect on average egg weight was found at the one percent level of probability, as noted in Table XXIV and XXV. Average egg shell thickness was not significantly changed by feeding graded levels of reserpine to turkey breeders, as noted in Tables XXVI and XXVII.

TABLE XVIII

PERCENTAGE OF FERTILE EGGS
Trial II

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.25	0.50	1.0
	Percent			
1	82.1	68.7	79.5	26.4
2	92.8	76.2	75.3	54.2
3	73.3	68.7	74.2	77.9
4	79.7	41.2	74.6	67.3
Treatment mean	82.0	63.7	75.9	56.4

TABLE XIX

ANALYSIS OF VARIANCE OF PERCENTAGE
OF FERTILE EGGS
Trial II

Source	d.f.	S.S.	M.S.	F
Total	15	4016.03		
Treatment	3	1602.11	534.04	2.66
Linear	(1)	935.77	935.77	4.65*
Quadratic	(1)	0.91	0.91	0.01
Cubic	(1)	665.43	665.43	3.31
Error	12	2413.92	201.16	

*Significant at the 5 percent level.

TABLE XX

PERCENTAGE HATCH OF FERTILE EGGS SET
Trial II

Replication	Mg. of reserpine per kg. of diet			
	0.0	0.25	0.50	1.0
	Percent			
1	63.4	58.0	65.6	60.3
2	58.3	66.3	60.7	65.5
3	63.5	67.6	68.6	61.9
4	75.4	49.2	69.0	63.9
Treatment mean	65.2	60.3	65.9	62.9

TABLE XXI

ANALYSIS OF VARIANCE OF PERCENTAGE
HATCH OF FERTILE EGGS SET
Trial II

Source	d.f.	S.S.	M.S.	F
Total	12	513.43		
Treatment	3	78.35	26.12	.720
Linear	(1)	0.66	0.66	.018
Quadratic	(1)	0.07	0.07	.002
Cubic	(1)	77.62	77.62	2.141
Error	12	435.08	36.26	

TABLE XXII

PERCENTAGE HATCH OF TOTAL EGGS SET
Trial II

Replication	Mg. of reserpine per kg. of diet			
	0.0	0.25	0.50	1.0
	Percent			
1	52.0	39.8	52.1	16.1
2	54.1	50.6	45.7	35.5
3	46.5	46.5	50.9	48.2
4	60.1	20.3	51.5	43.0
Treatment mean	53.2	49.1	50.1	35.7

TABLE XXIII

ANALYSIS OF VARIANCE OF PERCENTAGE
HATCH OF TOTAL EGGS SET
Trial II

Source	d.f.	S.S.	M.S.	F.
Total	15	2097.32		
Treatment	3	842.10	280.70	2.68
Linear	(1)	403.07	403.07	3.85*
Quadratic	(1)	1.23	1.23	0.01
Cubic	(1)	437.80	437.80	4.19*
Error	12	1255.22	104.60	

*Significant at the 5 percent level

TABLE XXIV

AVERAGE EGG WEIGHT
Trial II

Replication	Mg. of reserpine per kg. of diet			
	0.0	0.25	0.50	1.0
	Grams			
1	91.06	90.15	85.84	92.62
2	89.81	89.05	89.69	90.80
3	89.04	88.90	90.58	89.35
4	91.28	90.39	86.52	91.13
Treatment mean	90.30	89.62	88.15	90.98

TABLE XXV

ANALYSIS OF VARIANCE OF AVERAGE EGG WEIGHT
Trial II

Source	d.f.	S.S.	M.S.	F.
Total	15	44.16		
Treatment	3	17.41	5.80	2.60
Linear	(1)	1.02	1.02	0.46
Quadratic	(1)	13.99	13.99	6.27**
Cubic	(1)	2.40	2.40	1.08
Error	12	26.75	2.23	

**Significant at the 1 percent level

TABLE XXVI

AVERAGE EGG SHELL THICKNESS
Trial II

Replication	Mg. of reserpine per kg. of diet			
	0.0	0.25	0.50	1.0
	Inches[1]			
1	.0152	.0153	.0150	.0155
2	.0150	.0152	.0150	.0152
3	.0152	.0149	.0149	.0153
4	.0149	.0149	.0152	.0151
Treatment mean	.0151	.0151	.0150	.0153

[1]Egg shell thickness was measured to the nearest 10^{-3} inches with a convex anvil micrometer.

TABLE XXVII

ANALYSIS OF VARIANCE OF AVERAGE EGG SHELL THICKNESS
Trial II

Source	d.f.	S.S.[1]	M.S.	F.
Total	12	0.4775		
Treatment	3	0.148	.049	
Linear	(1)	0.088	.088	3.26
Quadratic	(1)	0.051	.051	1.89
Cubic	(1)	0.009	.009	0.33
Error	12	0.3295	.027	

[1]The sums of squares were multiplied by 10^6 for convenience in constructing this table.

Trial III

Data and analyses during and after treatment on average body weight gain, average daily feed consumption, percentage egg production, percentage fertile eggs, percentage hatch of fertile eggs, percentage hatch of total eggs set, average egg weight, and average egg shell thickness are summarized in Tables XXVIII through LIX. Graphic presentations in Figures 1, 2, 3 and 4 demonstrate the effects of reserpine on percentage egg production, percentage fertile eggs, percentage hatch of fertile eggs, and percentage hatch of total eggs set, by periods. An analysis of variance was calculated to determine the linear, quadratic, and cubic effects of feeding graded levels of reserpine to turkey breeders. Since the different levels of reserpine were not equally spaced, the abbreviated "Doolittle" method was used to obtain linear, quadratic, and cubic effects of the various treatments.

As the levels of reserpine increased, a reduction in the average body weight gain was observed. The lowest average body gain of 3.64 pounds per hen occurred at the level of 2.0 milligrams of reserpine per kilogram of diet, while the control birds gained an average of 3.98 pounds. The linear effect of reserpine on average body weight gain was significant at the five percent level of probability. After the treatment was removed a decrease in body weight occured, but the decrease was not statistically significant. This weight loss was possibly due to prolonged egg production. These data and the statistical analyses are presented in Tables XXVIII, XXIX, XXX, and XXXI.

TABLE XXVIII

AVERAGE BODY WEIGHT GAIN DURING TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Pounds			
1	3.45	3.88	4.13	3.78
2	4.22	4.26	3.77	3.52
3	4.17	4.50	3.77	3.48
4	4.09	3.69	3.67	3.79
Treatment mean	3.98	4.08	3.84	3.64

TABLE XXIX

ANALYSIS OF VARIANCE OF AVERAGE BODY WEIGHT GAIN DURING TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	1.432		
Treatment	3	0.440	0.147	1.77
Linear	(1)	0.352	0.352	4.24*
Quadratic	(1)	0.022	0.022	0.27
Cubic	(1)	0.066	0.066	0.80
Error	12	0.992	0.083	

*Significant at the 5 percent level.

TABLE XXX

AVERAGE BODY WEIGHT GAIN AFTER TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Pounds			
1	-0.28	-1.05	-1.00	-1.34
2	-1.70	-1.42	-1.90	-1.73
3	-1.63	-1.02	-0.34	-0.69
4	-1.80	-1.02	+0.27	-3.43
Treatment mean	-1.35	-1.13	-0.74	-1.80

TABLE XXXI

ANALYSIS OF VARIANCE OF AVERAGE BODY WEIGHT
GAIN AFTER TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	10.69		
Treatment	3	2.33	0.78	1.11
Linear	(1)	0.47	0.47	0.68
Quadratic	(1)	1.66	1.66	2.39
Cubic	(1)	0.19	0.19	0.28
Error	12	8.36	0.70	

Average daily feed consumption was not significantly affected by reserpine either during or after treatment, as shown in Tables XXXII, XXXIII, XXXIV, and XXXV.

Early egg production data indicated that the onset of sexual maturity was delayed by all levels of reserpine, as shown in Figure 1. Although the differences were small, they were significant at the ten percent level of probability. Unpublished data currently being collected and analyzed tend to substantiate these results. The reduction in production after the fourth period was thought to have been caused by below-normal seasonal temperatures. Since the hens were well into the laying season after treatment was removed, egg production was maintained at a higher level; but no significant differences were observed during this time. However, a slight non-significant linear effect was observed which may indicate that some permanent reproductive damage may possibly have resulted from reserpine treatment. Tabular data and the statistical analyses of the effects of reserpine on egg production both during and after drug treatment are shown in Tables XXXVI, XXXVII, XXXVIII and XXXIX.

Negative fertility trends were noted as the level of drug increased, as shown in Table XL. Two milligrams of reserpine per kilogram of diet showed a reduction in fertility of 66.5 percent below that of the hens receiving the control diet, over a nine-week production period. The linear reduction in fertility was significant at the 0.5 percent level of probability during treatment (see Table XLI).

TABLE XXXII

AVERAGE DAILY FEED CONSUMPTION DURING TREATMENT
Trial III

Replication	Mg. of reserpine per kg. of diet			
	0.0	0.5	1.0	2.0
	Pounds			
1	0.55	0.56	0.58	0.61
2	0.52	0.55	0.56	0.55
3	0.54	0.62	0.55	0.61
4	0.57	0.56	0.57	0.63
Treatment mean	0.55	0.57	0.57	0.60

TABLE XXXIII

ANALYSIS OF VARIANCE OF AVERAGE DAILY
FEED CONSUMPTION DURING TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	181023.43		
Treatment	3	8947.01	2982.34	0.208
Linear	(1)	760.28	760.28	0.053
Quadratic	(1)	25.37	25.37	0.002
Cubic	(1)	8161.36	8161.36	0.570
Error	12	172076.42	14339.70	

TABLE XXXIV

AVERAGE DAILY FEED CONSUMPTION AFTER TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Pounds			
1	0.47	0.47	0.45	0.43
2	0.41	0.43	0.44	0.43
3	0.46	0.48	0.43	0.43
4	0.43	0.44	0.45	0.45
Treatment mean	0.44	0.46	0.44	0.44

TABLE XXXV

ANALYSIS OF VARIANCE OF AVERAGE DAILY FEED CONSUMPTION AFTER TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	35992.92		
Treatment	3	6371.18	2123.73	0.86
Linear	(1)	1628.62	1628.62	0.66
Quadratic	(1)	4302.57	4302.57	1.74
Cubic	(1)	439.99	439.99	0.18
Error	12	29261.76	2468.48	

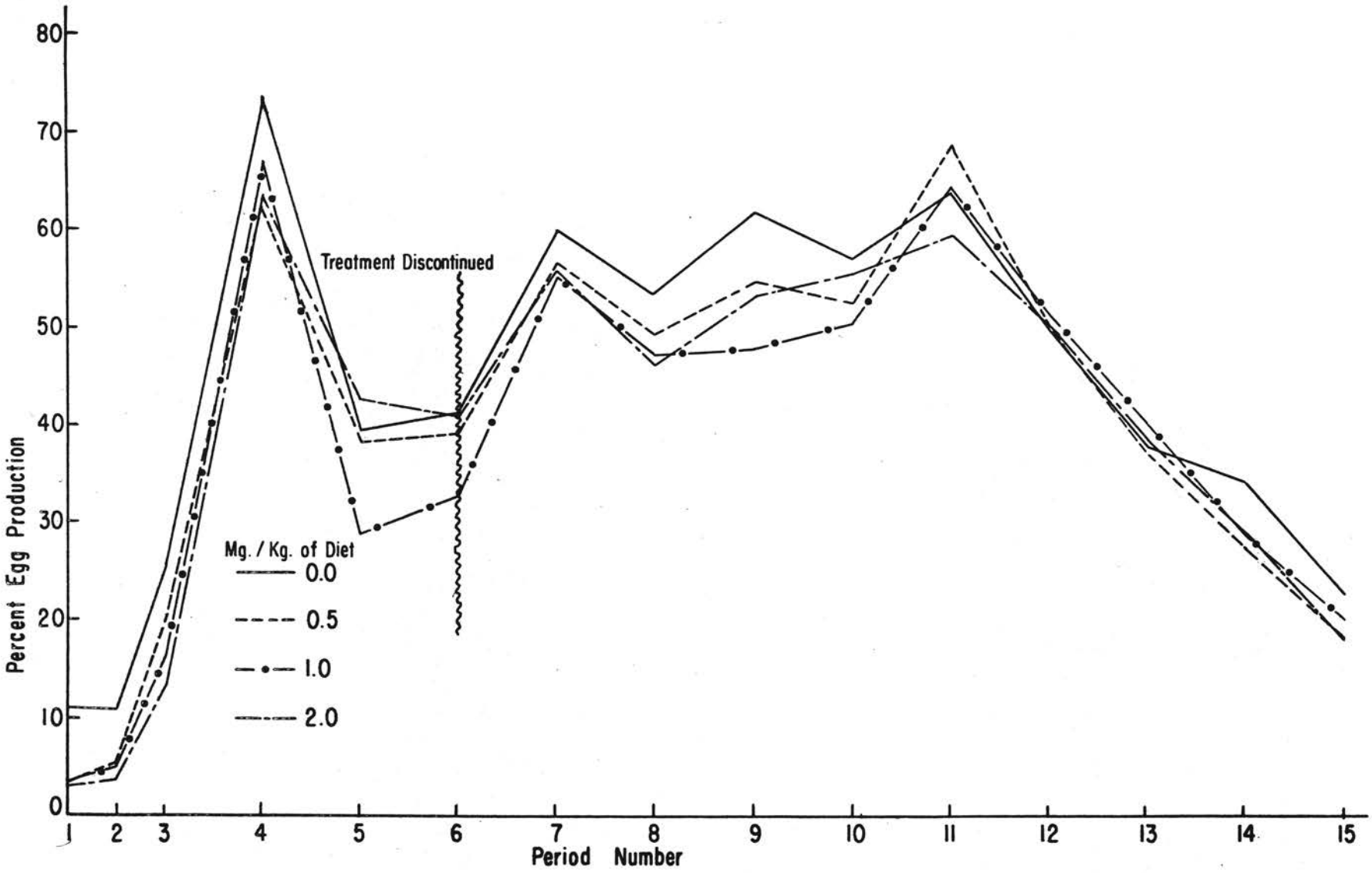

Figure 1. Egg Production in the Turkey as Influenced by Reserpine Treatment.

TABLE XXXVI

PERCENTAGE EGG PRODUCTION DURING TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Percent			
1	25.2	22.2	19.7	22.9
2	18.2	19.1	22.1	18.7
3	26.2	25.4	18.3	19.5
4	26.8	19.2	19.0	20.3
Treatment mean	24.1	21.5	19.8	20.4

TABLE XXXVII

ANALYSIS OF VARIANCE OF PERCENTAGE EGG PRODUCTION
DURING TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	139.10		
Treatment	3	45.77	15.26	1.96
Linear	(1)	26.97	26.97	3.47[1]
Quadratic	(1)	18.76	18.76	2.41
Cubic	(1)	0.04	0.04	0.004
Error	12	93.33	7.78	

[1]Significant at the 10 percent level.

TABLE XXXVIII

PERCENTAGE EGG PRODUCTION AFTER TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Percent			
1	60.7	53.0	51.7	46.6
2	44.8	49.7	53.8	50.1
3	60.9	63.4	48.9	56.1
4	57.6	52.8	51.9	51.5
Treatment mean	56.0	54.7	51.6	51.1

TABLE XXXIX

ANALYSIS OF VARIANCE OF PERCENTAGE EGG PRODUCTION
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	471.27		
Treatment	3	50.87	16.96	0.48
Linear	(1)	35.81	35.81	1.02
Quadratic	(1)	13.92	13.92	0.40
Cubic	(1)	1.14	1.14	0.03
Error	12	420.41	35.03	

TABLE XL

PERCENTAGE FERTILE EGGS DURING TREATMENT
Trial III

Replication	Mg. of reserpine per kg. of diet			
	0.0	0.5	1.0	2.0
	Percent			
1	73.5	18.4	36.7	17.9
2	63.8	1.4	39.9	3.4
3	82.1	32.9	3.3	17.1
4	95.6	26.9	16.6	10.9
Treatment mean	78.8	19.9	24.2	12.3

TABLE XLI

ANALYSIS OF VARIANCE OF PERCENTAGE FERTILE EGGS
DURING TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	13209.03		
Treatment	3	11066.72	3688.91	20.66
Linear	(1)	6467.82	6467.82	36.23***
Quadratic	(1)	3004.23	3004.23	16.83
Cubic	(1)	1594.66	1594.66	8.93
Error	12	2142.31	178.53	

***Significant at the 0.5 percent level.

The hens that were fed reserpine levels of 0.5 milligrams per kilogram of diet produced 4.3 percent fewer fertile eggs than birds receiving 1.0 milligram of reserpine per kilogram of diet. This apparent reduction in fertility was caused by infertile males in one of the replications. The fertility in males receiving reserpine at the level of 0.5 milligram per kilogram of diet was increasing, as were the other treatments, until after the third period, as illustrated in Figure 2. After the reserpine treatment was withdrawn the birds appeared to recover from the drug at a steady rate for approximately four weeks, and then a leveling trend was noted. The reserpine-treated birds appeared never to recover fully from the drug influence (see Table XLII). However, there were no significant linear, quadratic, or cubic effects due to treatment (see Table XLIII), although the controls persisted in producing more fertile eggs after treament. Orthogonal comparisons were calculated with control-versus-treated birds. The analysis of the results indicated significance at the ten percent level of probability when birds on the control diet were compared to birds that had received reserpine.

No obvious effect of reserpine was noted with respect to the percentage hatch of fertile eggs set, either during treatment or after treatment (see Tables XLIV, XLV, XLVI and XLVII). A normal seasonal trend may be seen in Figure 3, with no extreme variations among treatments.

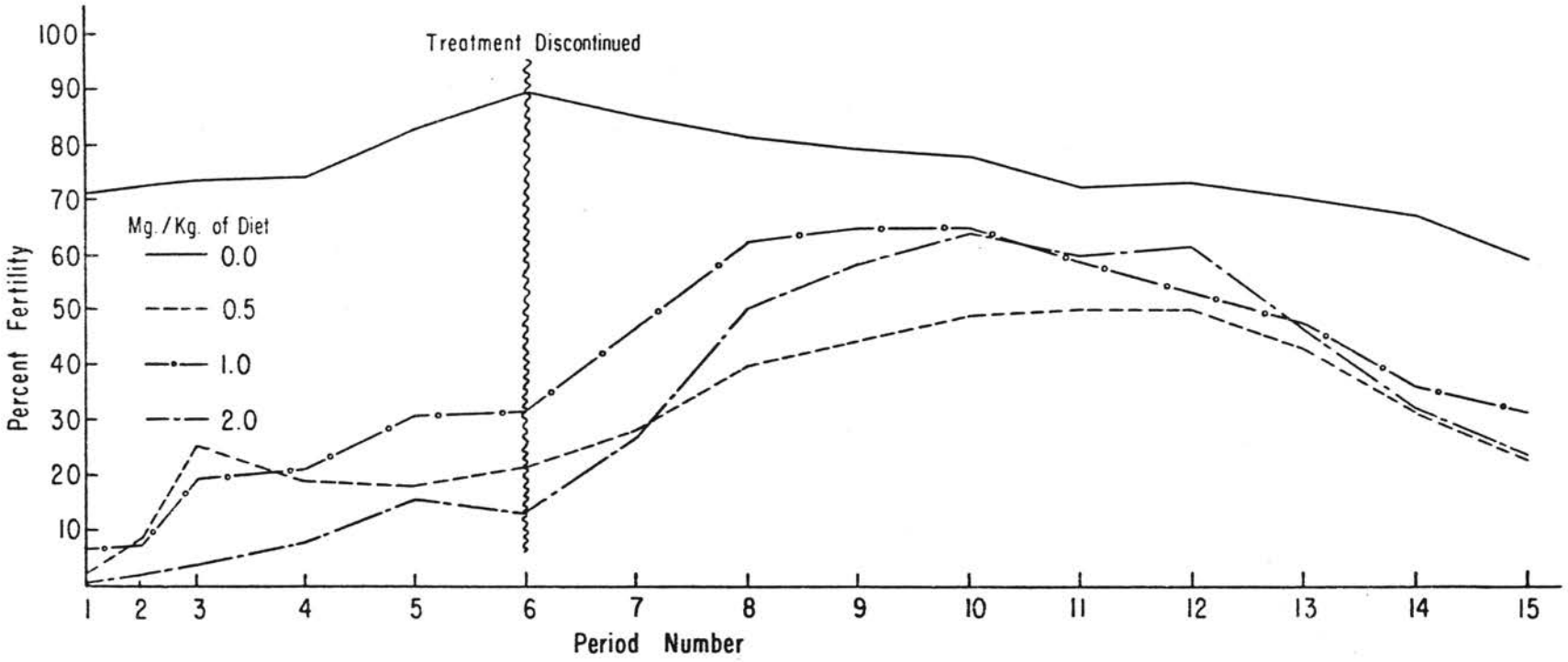

Figure 2. The Effect of Reserpine Treatment on Fertility of Turkey Eggs.

TABLE XLII

PERCENTAGE FERTILE EGGS AFTER TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Percent			
1	69.3	61.8	60.1	55.3
2	45.6	0.4	85.9	14.2
3	89.6	50.1	21.2	46.6
4	82.7	45.0	38.4	74.6
Treatment mean	71.8	39.4	51.4	47.7

TABLE XLIII

ANALYSIS OF VARIANCE OF PERCENTAGE FERTILE EGGS AFTER TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	9821.71		
Treatment	3	2278.40	759.47	1.21
Linear	(1)	559.64	559.64	0.89
Quadratic	(1)	774.35	774.35	1.23
Cubic	(1)	944.42	944.42	1.50
Error	12	7543.31	628.61	

TABLE XLIV

PERCENTAGE HATCH OF FERTILE EGGS SET DURING TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Percent			
1	80.6	76.9	80.9	86.4
2	72.0	0.0	78.8	61.9
3	78.1	81.3	43.7	72.4
4	81.1	65.9	78.0	65.1
Treatment mean	78.0	56.0	70.4	71.4

TABLE XLV

ANALYSIS OF VARIANCE OF PERCENTAGE HATCH OF FERTILE EGGS SET DURING TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	6694.38		
Treatment	3	1024.83	341.61	0.72
Linear	(1)	.006	.006	0.00
Quadratic	(1)	348.50	348.50	0.74
Cubic	(1)	676.32	676.32	1.43
Error	12	5669.56	472.46	

TABLE XLVI

PERCENTAGE HATCH OF FERTILE EGGS SET AFTER TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Percent			
1	62.4	63.9	63.9	63.7
2	69.7	22.2	65.4	51.4
3	68.6	67.7	53.0	62.8
4	74.2	62.2	61.8	74.1
Treatment mean	68.7	54.0	61.0	63.0

TABLE XLVII

ANALYSIS OF VARIANCE OF PERCENTAGE HATCH OF
FERTILE EGGS SET AFTER TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	2226.91		
Treatment	3	503.70	167.90	1.17
Linear	(1)	67.01	67.01	0.47
Quadratic	(1)	219.34	219.34	1.53
Cubic	(1)	217.34	217.34	1.51
Error	12	1723.21	143.60	

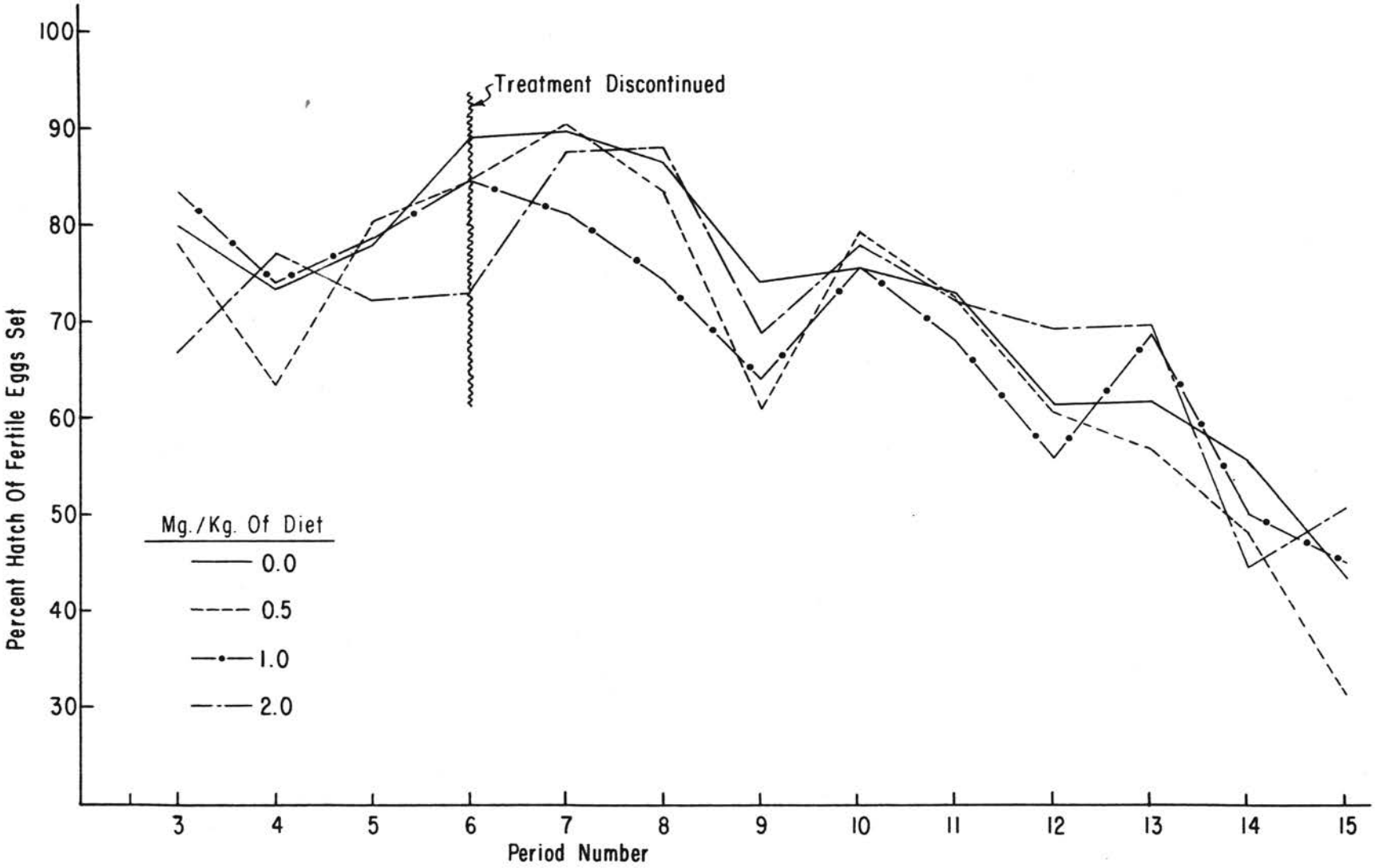

Figure 3. The Hatch of Fertile Turkey Eggs as Influenced by Reserpine Treatment.

The percentage hatch of total eggs set substantiates the results obtained from the percentage hatch of fertile eggs set (see Table XLVIII). The differences in percentage hatch of fertile eggs set were highly significant during treatment, as shown in Table XLIX. A 55.3 percentage difference was observed between the control and 2.0 milligram level of reserpine per kilogram of diet. After drug treatment was removed the differences in percentage hatch of total eggs set were not significant (see Tables L and LI). The two milligrams of reserpine per kilogram of diet showed a reduction in hatch of total eggs set of 22.2 percent below that of the hens receiving the control diet, over an eighteen-week production period. The percentage hatch of total eggs set by periods is shown in Figure 4.

Reserpine did not significantly affect average egg weight either during or after treatment, as shown in Tables LII, LIII, LIV and LV but a cubic trend was observed.

Average egg shell thickness during treatment was not significantly affected by graded levels of reserpine, as shown in Tables LVI and LVII. Results indicated that there was a significant linear reduction in shell thickness after the treatment was removed, as demonstrated in Tables LVIII and LIX.

TABLE XLVIII

PERCENTAGE HATCH OF TOTAL EGGS SET DURING TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Percent			
1	59.7	15.0	29.8	7.4
2	48.6	0.0	32.3	2.3
3	64.8	27.1	4.7	12.5
4	77.6	18.1	26.4	7.5
Treatment mean	62.7	15.0	23.3	7.4

TABLE XLIX

ANALYSIS OF VARIANCE OF PERCENTAGE HATCH OF TOTAL EGGS SET DURING TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	8595.47		
Treatment	3	7248.03	2416.01	21.52
Linear	(1)	4429.01	4429.01	39.44***
Quadratic	(1)	1365.14	1365.14	12.16
Cubic	(1)	1453.88	1453.88	12.95
Error	12	1347.44	112.29	

***Significant at the 0.5 percent level.

TABLE L

PERCENTAGE HATCH OF TOTAL EGGS SET AFTER TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Percent			
1	45.4	40.5	39.0	35.2
2	33.0	0.3	56.6	9.3
3	61.8	41.0	11.6	35.7
4	62.5	26.9	34.0	33.7
Treatment mean	50.7	27.2	35.3	28.5

TABLE LI

ANALYSIS OF VARIANCE OF PERCENTAGE HATCH OF TOTAL EGGS SET AFTER TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	5017.75		
Treatment	3	1231.16	410.39	1.30
Linear	(1)	277.40	277.40	0.88
Quadratic	(1)	536.64	536.64	1.70
Cubic	(1)	417.12	417.12	1.32
Error	12	3786.59	315.55	

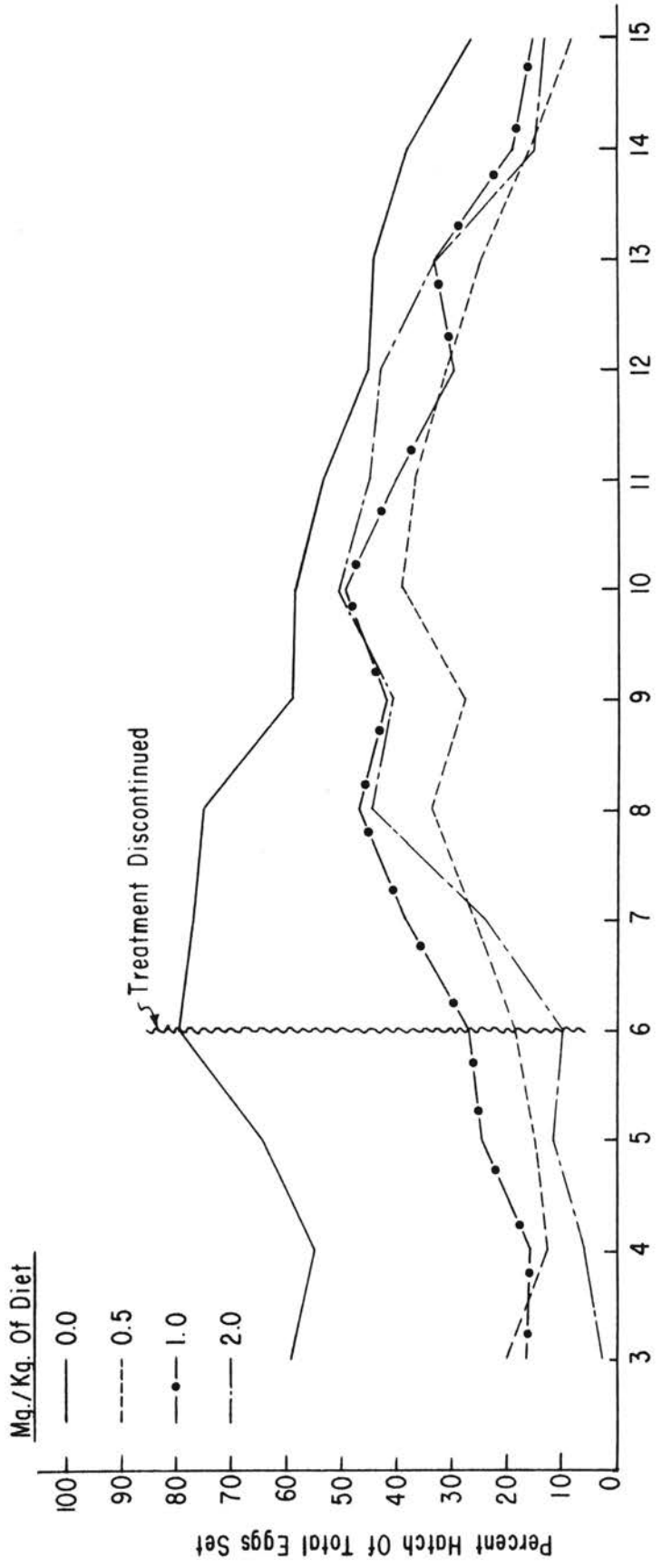

Figure 4. The Influence of Reserpine on the Hatch of Total Turkey Eggs.

TABLE LII

AVERAGE EGG WEIGHT DURING TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Grams			
1	79.3	79.9	79.6	81.0
2	81.7	82.6	79.3	80.7
3	79.6	81.3	78.6	82.4
4	80.5	79.2	80.1	82.7
Treatment mean	80.3	80.8	79.4	81.7

TABLE LIII

ANALYSIS OF VARIANCE OF AVERAGE EGG
WEIGHT DURING TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	25.62		
Treatment	3	11.03	3.68	3.02
Linear	(1)	3.04	3.04	2.50
Quadratic	(1)	3.88	3.88	3.19
Cubic	(1)	4.11	4.11	3.38
Error	12	14.59	1.22	

TABLE LIV

AVERAGE EGG WEIGHT AFTER TREATMENT
Trial III

Replication	Mg. of reserpine per kg. of diet			
	0.0	0.5	1.0	2.0
	Grams			
1	84.3	86.8	85.2	84.5
2	86.0	88.0	86.2	87.2
3	84.6	86.5	83.6	85.6
4	85.4	87.1	87.0	84.9
Treatment mean	85.1	87.1	85.5	85.5

TABLE LV

ANALYSIS OF VARIANCE OF AVERAGE EGG
WEIGHT AFTER TREATMENT
Trial III

Source	d.f.	S.S.	M.S.	F
Total	15	23.32		
Treatment	3	9.39	3.13	2.70
Linear	(1)	1.89	1.89	1.63
Quadratic	(1)	3.49	3.49	3.01
Cubic	(1)	4.01	4.01	3.46
Error	12	13.93	1.16	

TABLE LVI

AVERAGE EGG SHELL THICKNESS DURING TREATMENT
Trial III

	Mg. of reserpine per kg. of diet			
Replication	0.0	0.5	1.0	2.0
	Inches[1]			
1	.0162	.0162	.0157	.0164
2	.0161	.0164	.0162	.0158
3	.0158	.0161	.0163	.0162
4	.0162	.0160	.0161	.0157
Treatment mean	.0161	.0162	.0161	.0160

[1]Egg shell thickness was measured to the nearest 10^{-3} inches with a convex anvil micrometer.

TABLE LVII

ANALYSIS OF VARIANCE OF AVERAGE EGG SHELL THICKNESS DURING TREATMENT
Trial III

Source	d.f.	S.S.[1]	M.S.	F
Total	15	0.764		
Treatment	3	0.031	0.010	0.16
Linear	(1)	0.013	0.013	0.21
Quadratic	(1)	0.008	0.008	0.13
Cubic	(1)	0.011	0.011	0.18
Error	12	0.733		

[1]The sums of squares were multiplied by 10^6 for convenience in constructing this table.

TABLE LVIII

AVERAGE EGG SHELL THICKNESS AFTER TREATMENT
Trial III

Replication	Mg. of reserpine per kg. of diet			
	0.0	0.5	1.0	2.0
	Inches[1]			
1	.0157	.0153	.0153	.0156
2	.0158	.0158	.0157	.0155
3	.0155	.0155	.0157	.0154
4	.0159	.0158	.0155	.0153
Treatment mean	.0157	.0156	.0155	.0154

[1]Egg shell thickness was measured to the nearest 10^{-3} inches with a convex anvil micrometer.

TABLE LIX

ANALYSIS OF VARIANCE OF AVERAGE EGG SHELL THICKNESS AFTER TREATMENT
Trial III

Source	d.f.	S.S.[1]	M.S.	F
Total	15	0.584		
Treatment	3	0.157	0.052	1.44
Linear	(1)	0.148	0.148	4.11*
Quadratic	(1)	0.007	0.007	0.19
Cubic	(1)	0.002	0.002	0.06
Error	12	0.427	0.036	

[1]The sums of squares were multiplied by 10^6 for convenience in constructing this table.

*Significant at the 5 percent level.

SUMMARY AND CONCLUSIONS

Three separate trials involving the oral administration of reserpine to 788 breeder turkey hens are represented in this study. Trial I consisted of twenty females assigned to individual cages, while Trials II and III each consisted of sixteen pens of twenty-four birds per pen.

In Trial I, five treatment levels with four replicates per treatment were administered to White Holland breeder hens in individual cages. The treatments used were 0.0, 1.0, 2.0, 4.0, and 8.0 milligrams of reserpine per kilogram of diet.

Results of this trial indicate that graded levels of reserpine caused a statistically significant decrease in feed consumption and body weight gain, with no definite effect on body temperature.

Trial II consisted of sixteen pens of twenty-four White Holland breeder hens. Four treatments with four replicates per treatment were used. The treatments used were 0.0, 0.25, 0.50 and 1.0 milligram of reserpine per kilogram of diet. The study extended over a forty-week treatment period.

Results of the analyses of Trial II indicate that as the levels of reserpine added to the diet increased, there resulted a corresponding linear decrease in average body weight gain, percentage of fertile eggs, and percentage hatch of total eggs set. A significant quadratic effect

on average egg weight was calculated. No drug effect was observed on average daily feed consumption, days to sexual maturity, percentage egg production, percentage hatch of fertile eggs set and average egg shell thickness.

Trial III extended over a twenty-week treatment period and an eighteen-week post-treatment period. Sixteen pens of twenty-four Broad Breasted Bronze turkey hens and two toms per pen made up this trial. The treatments used were 0.0, 0.50, 1.0 and 2.0 milligrams of reserpine per kilogram of diet.

Results of these data indicated that graded levels of reserpine added to the diet caused a significant linear decrease in average body weight gain, percentage egg production, percentage fertility, and percentage hatch of total eggs set. Average egg shell thickness decreased significantly after the drug treatment was withdrawn.

There was no significant effect on average body weight gain, percentage egg production, percentage fertile eggs, and percentage hatch of total eggs set after treatment. Average daily feed consumption, average egg weight, and percentage hatch of fertile eggs set were not affected by reserpine either during or after drug treatment.

The most striking results that were observed in these trials were the linear reduction in fertility and average body weight gain as the levels of reserpine were increased.

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