The effect of Gonadotroph in releasing hormone (GnRH) in the reproductive traits of layer chickens

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Abstract:

The study aimed to evaluate the effect of GnRH on the reproductive traits of fully mature layers chicks (31week). The study involved (36) chicks, shiefers breed , which were divided randomly in to three equal groups (n=12).The groups were treated with weekly intramuscular (I.M) injection in the thigh muscle for five successive week as indicated below:- (T1) control group :0.2 ml distilled water , T2 group:- 0.1 ml GnRH and T3 group :0.2ml GnRH . The study showed a high significant difference ($p<0.01$) in the reproductive trait of T2 group (78%) as compared to T1 and T3 group .The T1showed a slight increased than T3 group 68.86% ,65.98% respectively . Blood sample have been collected, directly from the heart, serum was separated for estimation of LH hormone by ELISA.

There was no significant differences in LH level among the three variant groups .

It was concluded from this study that GnRH have an effect in improvement of reproductive trait of layer chicks.

تأثير محفز GnRH على الكفاءة الانتاجية للدجاج البياض

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الخلاصة:

تهدف الدراسة الى تقييم تأثير محرر محفزات القند Gonadotropic Releasing Hormone (GnRH) على الكفاءة الإنتاجية للدجاج البياض المكتمل البلوغ (31) أسبوع.

اشتملت الدراسة على (36) دجاجة عرق شيفرز قسمت عشوائيا إلى ثلاث مجاميع متساوية (n=12) عوملت المجاميع ولمدة خمسة أسابيع متتالية بالمعاملات المدونة أدناه وبطريقة الحقن العضلي في منطقة الفخذ و كما يلي :

المجموعة الأولى (السيطرة) (T1) : ماء مقطر وبجرعة قدرها 0.2ml

المجموعة الثانية (T2): GnRH وبجرعة قدرها 0.1ml

المجموعة الثالثة (T3) : GnRH وبجرعة قدرها 0.2ml

أظهرت النتائج تفوقا ملحوظاً للمجموعة الثانية على مجموعة السيطرة (T1) والمجموعة الثالثة (T3) حيث بلغ المعدل الإنتاجي فيها 78% خلال فترة المعالجة ، في حين أظهرت مجموعة السيطرة(T1) تفوقاً بسيطاً على المجموعة الثالثة حيث بلغ المعدل الإنتاجي لكل منها 68.86% و 65.98% على التوالي.

تم سحب عينات الدم من القلب مباشرةً و عزل المصل وتم قياس مستوى الهرمون اللوتيني LH بطريقة ELISA

لوحظ عدم وجود أي فرق معنوي في مستوى إل LH للمجاميع الثلاثة .

وقد أستنتج من الدراسة أن GnRH له تأثير في تحسين الكفاءة الإنتاجية للدجاج البياض .

Introduction:

In birds , the secretion of luteinizing hormone (LH) is controlled by gonadotrophin releasing hormone (GnRH) (1,2,3,4) .Poultry similar to other vertebrates (including non domestic birds) , reproductive activities are strictly controlled by the hypothalamic-pituitary-gonadal axis (5).

Although little information available concerning the effect of GnRH therapy on local chicken strains (6) , our study have directed toward the use of such releasing hormone in the effect of reproductive traits of laying hens in order to support our native animal resources with medical agent that may increase the income rather than searching for an alternate of nutritional sources.

Another important point is that super ovulation is now used widely in animals especially in mammals but for chicken it is rarely reported (7). The study was designed to know the effect of GnRH on reproductive traits of laying hens and the measurements of LH level.

Material and Methods:

The study was conducted during the year of 2010 at June up to September of the same year, Thirty six 12 wk –old laying hens were housed in individual boxes under ambient temperature and were provided 16 h of light , 8 h of night . Birds were fed ad libitum with commercial layer feed at (31) week age, they were divided into 3 groups (n=12)randomly (T1 , T2, T3), the control group(T1) was injected with 0.2 ml distilled water (D.W) intramuscularly (I.M) in the deep gluteal muscle for 5 successive week , while T2 and T3 were injected with GnRH at a dose of 0.1 ,0.2 ml respectively as the same period and time of the control group(T1) (Table -2-).

Egg production was estimated weekly according to hen day parameter (H.D) for all groups during hormonal therapy for (5) week and post hormonal therapy for (4) week according to the following equation :-

$$HD=\frac{\frac{\text{No.of egg Produced/WK}}{7}}{\text{No of birds present in the box}}\times 100$$

Receptal solution: receptal® solution have been used as inject able solution presented in (10ml) vial of a chemical entitly of Buserelin acetate 4-2 mg (corresponding to 4.0 mg buserellin) , purchased from intervet international B.V manufactured in the European Union.

Hormonal assay:

This have been done by ELISA test to evaluate the level of LH in the circulating blood .

Serum : Blood have been collected directly from the heart , five samples from each group were taken randomly .

The first time was at the third day of the fifth week hormonal treatment , while the second time was at the fourth week post hormonal treatment .

The blood was centrifuged for 10 minutes and the separated serum was kept frozen until the time of measurement .

Statistical method have been done according to (8 , 9).

Result and discussion:

The regulation and secretion of the gonadotropins , LH and FSH, is critical for normal reproductive function .The synthesis and release of these two pituitary glycoproteins are controlled by the complex interaction of multiple factors , one of the most important of which is GnRH , a hypothalamic decapeptide, GnRH is released in to the hypo physical portal circulation and transported to the anterior pituitary in a pulstile manner , where it bind to specific high affinity receptors (10,11).

Summer season have been chosen for planning the experiment since high temperature has a direct effect in decreasing egg production to 20% below itós normal level after two days of heat exposure (12) , So one could estimate the effect of GnRH in such adverse condition (35±4) which have a direct effect on the function of granulosa and theca cells by concurrent and delayed effect on the steroidogenic capacity of ovarian follicle (13).

Our investigation is to evaluate the reproductive traits started at (31) week old, since 26-28 week old is regarded as the peak level for production in layer chicks as estimated by hen day (HD) parameter .

The HD of the pretreated chicks was 75.71 (table-1-). (T2) group showed a significant increase in HD as compared to (T3) , T1 as well as pretreated group (table-2-) 78%,66.47% , 67.61% , and 75.71% respectively in spite of the difference in age reproductivity between the treated and non treated one. This give an explanation that the differences in vivo response to GnRH could not be attributed to a greater potency of GnRH but to more prolonged action, this result agreed with (14).

(T3)group showed a significant decrease (66.47%)as compared to T2 or even to T1 group , this might be explained that high dose of GnRH

may cause super ovulation and the LH surge is not enough to cause release of the ovarian follicle and the dose is not attributed to the amount of a given therapy but to its prolonged action. Table -2- showed that T2 group had a significant increase among all other groups included in the study.

Receptal which have been used is of mammalian origin could do its effect on birds because primate brain contains mammalian GnRH (mGnRH) and chicken (cGnRH)also the fetal brain of rhesus monkey contained mGnRH and cGnRH(15) ,so one could conclude that there is cross relation ship between avian and mammalian GnRH. Receptal have been used since 2009 in birds to evaluate the reproductive status by (6) . It is well known that all GnRH forms show an elevated activity on the bird pituitary (17), all these points gave us an explanation for the use of receptal.

Hormonal assay gave a special interest and unexpected results in which most birds -including the control group- were below normal or even zero level when they have been examined by ELISA test, this gave us a conclusion that these studies have to be regarded as a preliminary study for further investigations and LH level is not indicative when the classical method of bleeding is employed.

The half lives of both decapeptides in hens and cockerels ranged between 2.42 and 3.77 min. It is concluded that the interaction between LHRH -1 and 11 and the gonadotrophs is sexually differentiated in domestic fowl (16). The most critical subject in this research is the time of taken blood sample for hormonal assay , this study showed that there is no cumulative effect for the repeated doses although there is a significant differences in the reproductive traits among different doses of the treated groups as expressed by HD parameter(Table -2-) , this means that the effective dose has a prolonged action in spite of low LH level in the circulating blood, it should be taken in consideration that taken blood sample for any investigation is regarded as a main factor for decreasing egg laying as well as the release of most circulating hormones (18,19,20) and this explain why LH value below its normal level during hormonal assay because of stress effect of the procedure used in taking blood sample. This stress effect should be avoided by catheterization (21) and cannulation (22).

Egg production naturally declines with advancing duration of reproductive period as indicated by (Table -1-) and this agreed with (23,24,25,26), at the same time LH basal level increased with laying activity from below 0.5ng /ml in hens with lower laying rates to 0.5mg/ml to 1.0 mg /ml in hens with laying rates (27) .

The study concluded that GnRH have a direct effect on increasing the reproductive traits in chicken

when the effective dose is used and have an adverse effect when used in high dose .

We recommend to depend the result of this study as a key guide to be applied on highly expensive birds especially those of a short seasonal period.

Table -1- Reproductive capacity in pretreated layer expressed by Hen Day level (HD).

Age (WK)	HD
25	87.5%
26	85.3%
27	78.5%
28	75%
29	65%
30	63%
$\sum \times^{-}$	75.71%

Table -2- The response to GnRH in different groups.

Age (WK)	T1	T2	T3
31	59.73 ± 0.37 b	63.22 ± 0.44 a	59.73 ± 0.32 b
32	53.53 ± 0.64 c	78.53 ± 0.56 a	66.72 ± 1.31 b
33	70.48 ± 0.47 b	80.95 ± 0.54 a	60.81 ± 0.37 c
34	78.57 ± 0.44 b	85.7 ± 1.26 a	72.63 ± 0.33 c
35	76.18 ± 0.51 b	82.33 ± 0.88 a	71.48 ± 0.89 c

Different letters in the same column refers to the significant differences at level $P<0.05$.

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