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EFFECT OF DIETARY HABARACHAD (*Lepidium sativum*) SEEDS POWDER AND GERMINATED ON PRODUCTION ANDREPRODUCTION PERFORMANCEAND BLOOD BIOCHEMICAL OF GIMMIZAH LAYING HENS

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ABSTRACT: The research sought to assess the impacts of incorporating Habarachad (*Lepidium sativum*) seeds powdered (HR) and germinated into the diets of Gimmizah laying hens on their production performance, reproductive outcomes, and blood biochemical parameters. A total of 189 hens and 21 cocks, aged 32 weeks, were assigned to seven dietary treatments, including a control group and diets supplemented with varying levels of HR (0.5,0.75,1g/kg feed) and GHR (0.5,0.75,1g/kg feed). The results revealed significant improvements in feed conversion ratio (FCR), egg mass, and egg production, particularly in groups supplemented with germinated Habarachad seeds. Germination increased the bioavailability of nutrients, reducing feed intake while enhancing productivity. Reproductive performance, including hatchability, was highest in the group receiving 0.75 g GHR/kg diet. Blood biochemical analysis indicated improved lipid profile, increased the activity of antioxidant enzymes, and enhanced immune indices IgG and IgM in groups supplemented with GHR. These findings suggest that Habarachad, particularly in germinated form, is a promising natural feed additive for improving the productivity and health of laying hens.

Key words: Germinated habarachad, *Lepidium sativum*, laying hens,blood biochemical.

INTRODUCTION

The poultry industry needs to put an emphasis on improving productivity and enhancing quality with the goal to accommodate the expanding demands of contemporary society and a growing worldwide population. Due to increasing competition among livestock species for these substances, the usage of conventional feed additives beginning from plant or animal sources has become an important concern, resulting in higher offering for livestock products and feed components. Finding original, easily accessible feed additives is essential for preserving the poultry industry, especially in developing countries (El-Deek et al., 2020).

Nutraceuticals are biologically active substances found in products, which can be incorporated into poultry diets to offer both nutritional and health benefits (Alagawany et al., 2021a, and 2021b). The growing popularity of medicinal plants in treating various ailments is due to their pharmacological, nutritional, functional, and bioactive properties. One such plant is garden cress *(Lepidium sativum)*, Also referred to as peppergrass, or Habarachad (HR) locally, this plant is indigenous to Egypt, Europe, and the Middle East, yet it is grown all over the world (Poy et al., 2015 and Beshara et al., 2023). Recently, garden cress (GC) seeds have gained global attention as a source of nutraceuticals. Garden cress seeds are rich in protein, fat, vitamins, minerals, fiber, and phytochemicals, these seeds have an impact on the growth, productivity, immunological response, and overall health of birds (Deshmukh et al., 2017; Al-Sayed et al., 2019; Lotfi et al., 2021).

Garden cress seeds have been shown to offer numerous health benefits, such as boosting immune function, improving bird growth, and enhancing productivity due to their antioxidant and antibacterial properties (Achilonu et al., 2018; Al-Sayed et al., 2019; Mathewos et al., 2019). Additionally, these seeds have been found to reduce cholesterol and triglyceride levels (Diwakar et al., 2010) and it can improve blood lipid profiles by reducing LDL and increasing HDL levels (Chauhan et al., 2012a,b). Phytochemical analysis reveals that garden cress contains several secondary metabolites, including phenolic compounds (flavonoids and tannins), sterols, saponins, glycosinolate, sulfur glycosides, and terpenoids (Dannehl et al., 2012),as well as significant amounts of tocopherols, xanthones, tannins, anthraquinones, and anthocyanidins, are among the phenolic compounds present in HR seeds (Chatoui*et al.,* 2016).Studies also indicate that garden cress possesses anti-inflammatory, anti-bacterial, and anti-parasitic properties (Agarwal and Verma, 2011). As a member of the super food family, HR seeds are significant for improving the medicinal and nutritional value of formulated and blended food items. Including vital fatty acids, amino acids, and minerals like iron, potassium, calcium, and phosphorus, potential sources of macro and micronutrients are present in HR seeds (Azene et al., 2022).

Additionally, germination process of HR increases the bioavailability of vitamins, minerals, and proteins in seeds, making them more accessible for absorption. Also improves enzyme content, aiding digestion and allowing chickens to derive more nutrients from the same amount of feed. Moreover, germination reduces antinutritional factors like phytates and tannins present in raw seeds, thereby enhancing nutrient absorption and promoting better gut health in chickens (Kanika Bhatia, 2024).

Research has shown that adding garden cress seeds to poultry diets enhances feed conversion, egg production, and egg quality (Kanika Bhatia, 2024).Garden cress seeds have also been demonstrated to enhance growth performance and economic efficiency when added to broiler diets (Hassan and Shoukary, 2019).Thus, the current study's objective is to ascertain the impact of feeding laying hens on habarachad (*lepidium sativum*) seeds powder and germinated on the production and reproduction performance of Gimmizah laying hens.

MATERIALS AND METHODS

This study was conducted at El-Sabahia Poultry Research Station, Alexandria, Egypt, under the supervision of the Animal Production Research Institute (APRI), Agricultural Research Center.

Birds, Management, and Experimental Design:

A total of 189 laying hens and 21 cocks of local Egyptian strain (Gimmizah), at 32 weeks of age, were weighed and randomly assigned to seven experimental groups (30 birds per group, consisting of 27 hens and 3 cocks). Each group was further divided into three replicates (9 hens and 1 cock per replicate). All birds were housed under similar hygienic and managerial conditions and had continuous access to feed and fresh water throughout the experimental period (32-44 weeks of age).

The birds were fed basal diet supplemented with Habarachad (Garden cress) seed powder (HR) or germinated (GHR).The dietary treatments were as follows:

T1. Basal diet (control group) without supplementation.

T2. Basal diet supplemented with 0.5 g HR /kg diet.

T3. Basal diet supplemented with 0.75 g HR /kg diet.

T4. Basal diet supplemented with 1 g HR /kg diet.

T5. Basal diet supplemented with 0.5 g GHR /kg diet.

T6. Basal diet supplemented with 0.75 g GHR /kg diet.

T7. Basal diet supplemented with 1 g GHR /kg diet.

The basal diet (Table 1) was formulated and calculated according to the Feed Composition Table for Animal and Poultry Feedstuffs in Egypt (2001). All birds received vaccinations and veterinary care as per standard procedures.

Measurements:

- Egg number (EN) and Egg weight (EW) were recorded daily and Egg mass (EM) was calculated by multiplying egg number and average egg weight.
- Feed intake (FI) was measured weekly, and feed conversion ratio (FCR) was calculated as g of feed required per g of egg mass.
- Fertility and hatchability percentages were determined based on daily collection of hatching eggs at 38, 40, and 42 weeks of age.
- At the end of the experiment, (at 09.00 AM), two blood samples (3 ml, each) were withdrawn from the brachial vein, (one with anticoagulant to separate plasma and the other one without to separate serum) of three hens / replicate. Samples of serum and plasma were stored at (-20°C) until analysis measuring the activity of serum aspartate amino transferase (AST), serum alanine amino transferase (ALT), plasma total protein, albumin, globulin (was calculated by substration total protein from albumin), glucose, total lipids, triglycerides, cholesterol, HDL, LDL, calcium, phosphorus, IgG, IgM, total antioxidant capacity (TAC), and malondialdehyde (MDA)), using commercial suitable kits.
- **Statistical Analysis:**
- Data were analyzed using one-way ANOVA (SAS Institute, 2004). Treatment differences were assessed using Duncan’s multiple range test (Duncan, 1955).

The following model was used:

$Y_{ij} = \mu + T_i + e_{ij}$.

Where: Yij = an observation, μ = overall mean, Ti = effect of i^{th} treatments and eij = experimental random error

RESULTS AND DISCASSION

Egg production performance:

The addition of both Habarachad seed powder (HR) and germinated (GHR) to the diet significantly increased egg number, egg production percentage, and egg mass compared to the control group (Table 2). The highest egg production was observed in the group supplemented with 1 g of GHR/kg of diet (T7).While the low level (0.5 g/kg diet) of HR recoded best results compared to control group and the two other groups of HR, the improvement in results of production performance increases as the level of GHR increased compared with all treatments. This is due to that germination process is known to increase the nutritional value of grains by improving digestibility and bioavailability of nutrients.

Considering the egg number results of Table 2 showed that there was a clear significant difference (P≤0.05) in egg number among the treatments during the period from 32-36 weeks. The group fed with 0.50 g HR/kg diet (T2) produced the highest egg number (117.33), significantly higher than most other treatments. However, the 1 g GHR/kg diet group (T7) showed significantly lower egg numbers. This suggests that lower or higher levels of HR supplementation may have varying effects on egg production, with a moderate supplementation level yielding the best results through this period. There were significant differences in egg number between groups (T1and T7) during the period from 36-40 weeks. Same trend could be observed as egg numbers increased in the 40-44 week period for groups that were supplemented with HR, particularly at higher doses of GHR. This might be suggested the effect of supplementation during later stages of production. Same results were obtained for egg production.

There were no significant differences in overall egg weight among treatments. The results indicated that the different levels of Habarachad supplementation did not significantly influence the weight of the eggs produced (Table 2).Studies have shown that various plant-based additives, such as herbs, spices, or plant powders, can enhance poultry health and production**.** Azouz (2020) found that fenugreek and/or turmeric supplementation could improve egg production and egg quality, similar to how Habarachad might function, which aligns with the results of this study, where the 0.50 g Habarachad/kg diet (T2) showed significantly higher egg production in the 32-36 weeks period.

Egg mass results are in line with that of egg production. However, the highest egg mass was found in the T7 group (33.67 g/h/d), which suggests that higher supplementation at later stages of production can positively affect egg mass. Supplementing laying diets with GHR increased egg production and egg mass probably due to that the germination process can improve digestibility and bioavailability of nutrients of HR (Kanika Bhatia, 2024**)**. In line with these findings, data obtained herein indicates that higher levels of Habarachad (T7) improved egg mass in the 40-44 week period, suggesting that germinated grains may also support productivity during later stages of laying in. Amina et al. (2022) observed that adding Garden cress seed oil supplements to laying hens positively influenced egg production and egg mass. In our results, the 1g GHR/kg diet (T7) improved egg mass significantly in the 40-44 week period.

Feed intake and feed conversion ratio:

As shown in Table 3, feed intake was significantly lower in the group receiving 1 g of GHR/ kg diet compared to other groups, with a corresponding improvement in feed conversion ratio (FCR) indicating greater feed efficiency. However, the inclusion of

1g GHR /kg diet significantly improved feed conversion ratio (FCR) by 9.87% compared with the control group followed by those supplied with 0.75g, 0.5g GHR /kg and 0.5g HR /kg diet (6.75% , 3.12% and 2.86 , respectively).

The improved FCR observed in Treatment T7 could be attributed to the optimization of metabolic pathways or the balance of nutrients in the feed. Also, germination reduces antinutritional factors like phytates and tannins present in raw seeds, thereby enhancing nutrient absorption and promoting better gut health in chickens resulting in the overall health and FCR of chickens. The result agrees with Amina et al. (2022) who achieved improvement in FCR by using Garden cress seed oil supplements to laying hens. This aligns with the results of Treatment T7, which include a better FCR in the 36-40 and 40-44 week periods. The findings of non-significant differences in feed intake and FCR in the 32-36 week range, but significant differences later on could be related to the maturity of the hens. As hens approach peak egg production and face changing nutritional needs, the effects of dietary additives become more evident. This is consistent with findings from Azouz (2020) who suggested that the age and physiological state of hens significantly influence how they respond to dietary interventions, including herbal supplements.

Reproductive performance:

The overall hatchability data showed that all treatments recorded the best hatchability of total and fertile eggs compared to the control, however T6 (0.75g GHR) showed the highest value while T1 showed the lowest one (Table 4). Fertility percentages were consistently high and showed no significant differences across treatments, with values ranging from 94.67% (T1) to 97.67% (T6). In the 44-week age groups, significant differences in hatchability of total eggs and fertile eggs were observed, with T6 exhibiting higher hatchability values compared to T1. This finding may be attributed to the potential positive effects of herbal supplements on reproductive health, including improvements in egg quality. Garden cress has antioxidant properties and health promoting (Qusti et al., 2016).Egg quality and hatchability could be enhanced by reducing oxidative stress and improving oocyte maturation. This could explain the higher hatchability seen in T6, which might have contained a more beneficial composition of GHR compared to other treatments.

Fertility rates were high and did not differ significantly between treatments. This indicates that while Habarachad might affect hatchability, it does not significantly influence fertilization rates (Table 4). The fertility in laying hens is typically robust and less susceptible to changes in dietary supplements compared to hatchability or egg quality, which are more sensitive to environmental and nutritional factors.

The data on chick weight did not show significant differences between treatments at any age, which suggests that Habarachad supplementation did not have a substantial impact on chick development. Since no significant differences were found in chick weight herein, it suggests that the treatments might not have had a major effect on the egg's nutritional composition or embryo growth in the early stages.

Blood biochemical:

Table (5) summarized the effect of dietary Habarachad seed powder or germinated supplementation on plasma biochemical traits, the data provided reports the plasma biochemical parameters of hens supplemented with Habarachad powder (T1 to T7). The biochemical parameters measured included total protein, albumin, globulin, liver enzymes (AST and ALT), calcium, phosphorus, lipid profiles, glucose, oxidative stress markers (TAC and MDA), and immunoglobulin levels (IgG and IgM). The results are analyzed in terms of statistical significance (P≤0.05) and show interesting patterns regarding the impact of Habarachad seed powder (HR) and germinated (GHR) on various plasma markers.

Liver enzymes activities and immune response:

Table 5 displays the serum liver enzymes' biological composition and activities. According to the results, utilizing Habarachad seeds in both forms improved liver enzymess, including aspartate amino transferase (AST) and alanine amino transferase (ALT), however the differences were not statistically significant when compared to the control group. This improvement was also observed when using germinated Habarachad (GHR) compared to the Habarachad seed powder (HR) or control group. According to Youssef et al. (2014) in rats and Amina et al. (2022) in laying hens, GC oil may lower AST and ALT levels in hypercholestromic rats compared to control. These findings were consistent with their findings.

Results revealed that dietary supplementation of HR or GHR in layer diets had no significant effect on total protein, albumin (A) and globulin (G), or the A/G ratio when compared to those fed the control diet. Alharbi and Hanan (2017) discovered no effect of garden cress seeds (CS) on the serum globulin levels of diabetic rats administered CS, which is in agreement to these results. In contrast, Hassan and Shoukary (2019) found that compared to birds on a basal diet, the total serum protein and globulin levels were higher in birds fed CS diets (0.5, 1, and 1.5 g/kg). When CS was added to the broiler diet, it had no effect on the serum albumin levels.

The results in Table 5 indicated that feeding birds on the diet containing HR or GHR led to a significant increase in plasma IgG and IgM compared to those fed on the basal diet. The data also showed that laying hen fed the diet containing GHR significantly increased the level of IgG compared to those fed diet containing HR. Moreover, it was noted that there was a linear relationship, as increasing the feed content of GHR led to a significant improvement of both IgG and IgM level (T7 having the highest IgG and IgM levels).The significant increase in immunoglobulin (IgG and IgM) in hens supplemented with HR or GHR suggests an enhancement of the immune response which can boost immune function in poultry by increasing the production of antibodies and improving resistance to infections.

Antioxidant activity:

Table 5 showed the biochemical values for the lipid peroxidation state (malondialdehyde, MAD) and serum total antioxidant capacity (TAC) of Gimmizah laying hens. The results showed that feeding hens on a diet containing GHR brought about a notable rise in the level of TAC compared to feeding birds on a diet containing HR, as well as feeding on the control diet. At the same time, TAC significantly increased when birds were fed a diet containing HR as opposed to the control diet. The level of TAC also grows in a linear fashion when the level of Habarachad in both forms increases. On the other hand, it was observed that diet containing HR or GHR decreased MDA level in contrast to those that were given the control diet. In addition, there were no significant differences except for T2 (0.50g HR) in the effect on the level of MDA, whether by feeding the two forms of Habarachad seeds. In this connection, results demonstrated by Vlaicu and Panaite, (2022) reported that the presence of phenolic chemicals, which are well-known as natural antioxidants that give most high antioxidant activity, is the primary cause of garden cress seeds' antioxidant activity. The significant increase in TAC and the decrease in MDA levels indicate that Habarachad supplementation may enhance the antioxidant capacity of hens and reduce oxidative stress. This is consistent with research by Amina et al. (2022)**,** who reported that garden cress oil is abundant in antioxidants, which helps lessen oxidative damage and enhance poultry health in general. Reduced oxidative stress can improve the reproductive performance and longevity of hens.

Plasma lipid profile:

The plasma lipid profile including total lipids (TL), triglycerides (TRG), cholesterol (CHL), high-density lipoprotein (HDL), low-density lipoprotein (LDL), and the HDL/LDL ratio, was found to be significant (Table5). When GHR (0.75 and 1 g GHR) was added to the layers (T6 or T7), it was shown that the levels of TL, TRG, CHL, and LDL significantly decreased. On the contrary, there was a significant increase in HDL and the ratio HDL/LDL compared to the other treatments. Supplementing basal diet with GHR led to a decrease in TL, TRG, CHL and LDL by a percentage of 26.6%, 34.2%, 29.2 % and 48.4%, respectively, compared to control group. In comparison to the control group, it also resulted in a notable rise in HDL and HDL/LDL levels, which increased by 25.5% and 61.4%, respectively. However, triglycerides and cholesterol levels were lower in the group that fed diet containing HR than in the group of control, which may indicate that the HR-containing diet had hypocholestrolemic effects. Additionally, a lower LDL, or bad cholesterol, may be caused by the inhibition of HMG-CoA reductase activity, a crucial enzyme that controls the synthesis of cholesterol (Ciftci et al., 2010).

The lipid profile may have improved as a result of consuming dietary HR by decreasing cholesterol production or -hydroxy –methylglutaryl-CoA reductase, the enzyme that mediates the first stage of cholesterol production and is the rate-limiting enzyme (Althnaian, 2014).By lowering levels of total serum cholesterol and TG, HR have been found to enhance blood lipids (Diwakar et al., 2010; Althnaian, 2014and Amina et al., 2022).The significant reduction in total lipids, triglycerides, and cholesterol, along with an improvement in the HDL/LDL ratio, implies that taking supplements of Habarachad may improve cardiovascular health and lipid metabolism. These results are consistent with recent research investigating the potential of plant-based supplements to decrease cholesterol.

Minerals Profile (Calcium, Phosphorus, Ca/P Ratio):

According to Singh et al. (2018), anti-nutritional chemicals are substances that lessen the body's absorption of macro- and micronutrients and obstruct metabolic processes and nutrient absorption. Habarachad seeds contain anti-nutritional substances like lectins, amylase inhibitors, phytin phosphorus, oxalates, tannins, protease inhibitors, saponins, and phytic acid. The majority of these substances, including phytin, phosphorus, and oxalates, are found in HR, or raw garden cress seeds (Azene et al., 2022). This information shows the importance of germination of garden cress seeds to eliminate anti-nutrients and achieve maximum benefit from them. The results in Table 5 showed that there were no significant differences in the blood calcium level as a result of feeding laying diet containing HR or GHR but it was found a significant increase compared to those fed the basal diet. Additionally, the ratio of calcium to phosphorus in the blood plasma of chickens fed a meal containing GHR at varying doses was found to significantly rise compared to those fed diet T1, T2 and T3, while there were no significant differences in the blood phosphorus ratio. A significant difference was found in the Ca/P ratio, with

T6 showing the highest ratio (3.76) and T1 the lowest one (3.24), indicating that Habarachad supplementation may influence calcium and phosphorus metabolism.

Regarding how CS affected the concentration of calcium and phosphorus in the blood, the findings concur with those of Hassan et al. (2019), who showed that adding CS to broiler meals at levels of 0.5, 1, and 1.5 percent had no discernible impact on the levels of these nutrients.

Blood glucose concentration:

It is suggested that glucose is the most significant monosaccharide involved in energy metabolism according to its effective role. The findings demonstrated that, in comparison to provide the control diet to the laying hens, adding GHR to the diet significantly decreased blood glucose levels by 34%, 36.8%, and 32.4% for T5, T6, and T7, respectively. However, compared to feeding a control diet, feeding birds a diet containing HR enabled their blood glucose levels for dropping significantly by 18.3% (T3). These findings correspond with research by Amina et al. (2022) who observed that feeding laying hens garden cress oil decreased blood glucose levels.

According to Campbell (2012), normal birds exhibit blood glucose levels between 200 and 500 mg/dL. The HR groups' blood glucose levels in this particular study are slightly below this range. No stress or abnormal glucose level-related problem is suspected, nevertheless, since the level is not beneath the normal range of 150 mg/dL (Brar et al. 2000).In accordance with the beneficial effects of flavonoids in medicinal plants, the glucose content in groups that consumed HR may have decreased. Several flavonoids have characteristics that are comparable to those of insulin, enabling them to lower blood glucose levels. Habarachad has several medicinal properties, such as anti-inflammatory and anti-diabetic (Shail et al., 2016). According to Nasef and Khateib (2021), garden cress seeds are important for controlling blood glucose levels and enhancing renal function impairments associated with diabetes. When integrated into a regular diet, they can contribute to avoiding diabetes mellitus and associated consequences, such as nephropathy. Furthermore, since garden cress seeds are abundant in plant-based proteins, fiber, minerals, and lipids, they have cardio- and immune protective properties (Rabail et al., 2022).

CONCLUSION

The inclusion of Habarachad especially in their germinated form has positive effects on the productivity, health, and immune response of laying hens. It improves egg production, feed efficiency, hatchability, and biochemical parameters, suggesting that Habarachad could be a valuable feed additive in poultry diets. The best result was obtained by using 0.75 to 1 g/kg diet of germinated Habarachad.

Table (1): Ingredients and calculated analysis of the layer basal diet

Ingredients	**%**
Yellow corn	64.00
Soy bean meal (44 %)	22.50
Corn gluten meal (60%)	1.58
Wheat bran	1.68
Di-calcium phosphate	1.40
Limestone	8.14
premix [1]	0.30
Sodium chloride	0.30
DL- Methionine (99%)	0.10
Total	100
Calculated Analysis [2]	
Crude protein %	16.10
ME (Kcal / kg)	2730
Crude fiber %	3.30
Ether extract %	2.87
Calcium (%)	3.43
Av. Phosphorus (%)	0.39
Methionine %	0.40
Lysine	0.84
Methionine + Cystine %	0.68
Price (LE/kg diet) [3]	5.02

1-Each 3 kg of vitamins and Minerals premix contains 100 million IU vitamin A; 2 million IU Vit.D3;10 g vitamin E; 1 g Vit.K3 ; 1 g vitaminB1; 5 g vitamin B2 ;10 mg vitamin B12 ; 1.5 g vitamin B6; 30 g Niacin ;10 g Pantothenic acid ;1g Folic acid;50 mg Biotin ; 300 g Choline chloride; 50 g Zinc; 4 g Copper; 0.3 g Iodine ; 30 g Iron; 0.1 g Selenium; 60g Manganese ;0.1 g Cobalt; and carrier $CaCO_3$ to 3000 g.

2- According to Feed Composition Tables for animal and Poultry feedstuffs used in Egypt (2001).

Table (2): Effect of dietary Habarachad seed powder and germinated supplementation on egg production performance of Gimmizah laying hens at different laying periods

Age \ Treatment	Control	HR			GHR			SME	P value
	T1	T2	T3	T4	T5	T6	T7		
Egg number / hen									
32-36	114.33^{ab}	117.33^{a}	110.33^{abc}	107.33^{bc}	103.33^{c}	105.67^{bc}	103.00^{c}	4.751	0.0151
36-40	93.00^{b}	102.33^{ab}	101.00^{ab}	98.00^{ab}	101.33^{ab}	103.67^{ab}	110.33^{a}	6.594	0.1452
40-44	96.00^{b}	98.67^{b}	103.33^{b}	98.67^{b}	107.00^{ab}	104.67^{ab}	116.00^{a}	6.191	0.0236
32-44 (overall)	101.11^{b}	106.11^{ab}	104.89^{ab}	101.33^{b}	103.89^{ab}	104.67^{ab}	109.78^{a}	3.274	0.0785
Egg production%									
32-36	0.68^{ab}	0.70^{a}	0.65^{abc}	0.64^{bc}	0.62^{c}	0.63^{bc}	0.62^{c}	0.027	0.0205
36-40	0.55^{b}	0.61^{ab}	0.60^{ab}	0.58^{ab}	0.60^{ab}	0.62^{ab}	0.65^{a}	0.038	0.1442
40-44	0.57^{b}	0.59^{b}	0.62^{b}	0.59^{b}	0.64^{ab}	0.63^{ab}	0.69^{a}	0.037	0.0245
32-44 (overall)	0.61^{b}	0.63^{ab}	0.62^{ab}	0.60^{b}	0.62^{ab}	0.63^{ab}	0.65^{a}	0.020	0.1490
Egg weight (g)									
32-36	49.41	48.70	49.47	50.03	49.17	50.03	49.37	1.322	0.8808
36-40	52.69^{ab}	51.30^{b}	51.58^{b}	53.67^{a}	52.13^{ab}	53.13^{ab}	52.49^{ab}	1.066	0.1616
40-44	54.11	52.03	52.08	54.60	52.80	53.89	52.50	1.317	0.1558
32-44 (overall)	52.07	50.67	51.05	52.77	51.36	52.35	51.46	1.119	0.3052
Egg mass(g/h/d)									
32-36	33.64^{ab}	34.05^{a}	32.48^{ab}	31.95^{ab}	30.24^{b}	31.49^{ab}	30.27^{b}	1.811	0.1250
36-40	29.17^{b}	31.27^{ab}	31.02^{ab}	31.28^{ab}	31.44^{ab}	32.79^{ab}	34.47^{a}	2.213	0.2068
40-44	30.93^{b}	30.55^{b}	31.97^{b}	32.03^{b}	33.63^{ab}	33.57^{ab}	36.26^{a}	1.835	0.0273
32-44 (overall)	31.25^{b}	31.96^{ab}	31.82^{ab}	31.75^{ab}	31.77^{ab}	32.62^{ab}	33.67^{a}	1.125	0.2526

a,b,c :means in the same row and bearing different superscripts are significantly different (P≤0.05).
SEM= standard error mean; HR= Habarachad, GHR= germinated Habarachad
T2: HR 0.5g/kg diet, T3: HR 0.75g/kg diet, T4: HR 1g/kg diet,
T5: GHR 0.5g/kg diet, T6: GHR 0.75g/kg diet, T7: GHR 1g/kg diet.

Table (3): Effect of dietary Habarachad seed powder and germinated supplementation on feed intake and feed conversion ratio of Gimmizah laying hens at different laying periods

Age \ Treatment	Control	HR			GHR			SME	P value
	T1	T2	T3	T4	T5	T6	T7		
Feed intake (g/ hen/day)									
32-36	120.33	118.67	120.67	117.00	114.67	112.67	113.00	4.152	0.1434
36-40	119.00^{bc}	119.00^{bc}	122.67^{a}	121.33^{ab}	120.67^{abc}	119.00^{bc}	117.67^{c}	1.662	0.0339
40-44	118.33^{ab}	118.00^{b}	120.00^{a}	118.00^{b}	120.00^{a}	118.33^{ab}	118.00^{b}	0.900	0.0358
32-44(overall)	119.16^{ab}	118.48^{bc}	121.28^{a}	118.90 ^{abc}	118.40^{bc}	116.78^{bc}	116.25^{c}	1.424	0.0149
Feed conversion ratio (Feed g / egg mass g)									
32-36	3.58	3.51	3.72	3.67	3.78	3.59	3.74	0.194	0.5895
36-40	4.09^{a}	3.84^{ab}	3.98^{ab}	3.90^{ab}	3.85^{ab}	3.65^{ab}	3.41^{b}	0.302	0.2052
40-44	3.87^{a}	3.87a	3.76^{a}	3.69^{ab}	3.57^{ab}	3.52^{ab}	3.26^{b}	0.248	0.0901
32-44(overall)	3.85^{a}	3.74^{ab}	3.82^{a}	3.75^{a}	3.73^{ab}	3.59^{ab}	3.47^{b}	0.145	0.0693

a,b,c :means in the same row and bearing different superscripts are significantly different (P≤0.05).
SEM= standard error mean; HR= Habarachad, GHR= germinated Habarachad
T2: HR 0.5g/kg diet, T3: HR 0.75g/kg diet, T4: HR 1g/kg diet,
T5: GHR 0.5g/kg diet, T6: GHR 0.75g/kg diet, T7: GHR 1g/kg diet.

Table (4): Effect of dietary Habarachad seed powder and germinated supplementation on reproductive performance of Gimmizah laying hens at different laying periods

Treatment / Age	Control	HR			GHR			SME	P value
	T1	T2	T3	T4	T5	T6	T7		
Hatchability of total eggs %									
36	90.33	95.00	87.33	92.33	87.33	88.33	93.33	4.690	0.3269
40	82.00^{b}	85.67^{ab}	82.00^{b}	86.33^{ab}	84.33^{ab}	92.00^{a}	86.00^{ab}	4.375	0.1701
44	61.00^{c}	77.00^{ab}	67.00^{bc}	76.00^{ab}	78.33^{ab}	82.00^{a}	77.33^{ab}	6.737	0.0231
Overall	77.78^{c}	85.89^{ab}	78.78^{bc}	84.89^{abc}	83.33^{abc}	87.45^{a}	85.55^{ab}	3.930	0.0612
Hatchability of fertile eggs %									
36	94.25^{ab}	97.56^{a}	89.57^{b}	93.63^{ab}	88.82^{b}	89.83^{b}	94.95^{ab}	3.838	0.1044
40	86.67	91.19	86.16	88.76	87.69	92.62	90.22	5.429	0.7354
44	65.31^{c}	82.20^{ab}	70.95^{bc}	81.54^{ab}	82.22^{ab}	86.02^{a}	79.20^{ab}	6.874	0.0269
Overall	82.08^{b}	90.31^{a}	82.23^{b}	87.98^{ab}	86.25^{ab}	89.49^{a}	88.12^{ab}	3.735	0.0865
Fertility %									
36	96.00	97.33	97.33	98.67	98.33	98.33	98.33	3.381	0.9596
40	94.67	94.00	95.33	97.33	96.33	99.33	95.33	3.207	0.4885
44	93.33	94.00	94.33	93.00	95.33	95.33	97.67	2.920	0.5347
Overall	94.67	95.11	95.67	96.34	96.66	97.67	97.11	2.174	0.6229
Chick weight (g)									
36	38.27	37.47	37.30	39.50	37.93	38.43	36.50	1.701	0.4924
40	38.43^{a}	36.90^{ab}	36.50^{b}	38.67^{a}	37.37^{ab}	37.63^{ab}	37.70^{ab}	0.947	0.1326
44	38.93	38.90	39.33	40.03	39.03	39.53	39.23	0.701	0.4749
Overall	38.54	37.75	37.71	39.40	38.11	38.57	37.81	0.953	0.3497

a,b,c :means in the same row and bearing different superscripts are significantly different ($P \leq 0.05$).
SEM= standard error mean; HR= Habarachad, GHR= germinated Habarachad
T2: HR 0.5g/kg diet, T3: HR 0.75g/kg diet, T4: HR 1g/kg diet,
T5: GHR 0.5g/kg diet, T6: GHR 0.75g/kg diet, T7: GHR 1g/kg diet.

Table (5): Effect of dietary Habarachad seed powder and germinated supplementation on serum biochemical of Gimmizah laying hens

Treatment / Age	Control	HR			GHR			SME	P value
	T1	T2	T3	T4	T5	T6	T7		
AST(U/L)	48.84	47.03	47.14	46.17	45.80	40.68	43.89	4.639	0.4712
ALT(U/L)	20.37	20.73	20.99	19.20	17.90	16.73	17.11	2.256	0.1613
Total protein(g/dl)	6.69	7.03	6.51	6.32	6.38	6.63	6.78	0.365	0.3001
Albumin (A) (g/dl)	3.88	3.82	3.74	3.68	3.51	3.96	3.97	0.570	0.1172
Globulin (G) (g/dl)	2.81	3.21	2.76	2.65	2.86	2.67	2.81	0.759	0.1997
A / G	1.61	1.72	1.40	1.39	1.23	1.48	1.41	0.734	0.5033
IgG(mg/dl)	16.25^{f}	19.74^{e}	22.90^{d}	24.03^{d}	25.75^{c}	27.03^{b}	28.53^{a}	0.670	0.0001
IgM(mg/dl)	11.37^{d}	11.80^{c}	11.88^{c}	12.20^{b}	12.32^{ab}	12.35^{ab}	12.50^{a}	0.124	0.0001
TAC(mg/dl)	217^{e}	237^{d}	253^{c}	275^{b}	285^{a}	290^{a}	293^{a}	5.1	0.0001
MDA(mg/dl)	3.34^{a}	2.48^{b}	1.95^{c}	1.86^{c}	1.72^{c}	1.66c	1.55^{c}	0.278	0.0001
Total lipid(g/dl)	6.43^{a}	6.16^{ab}	5.81^{abc}	5.51^{bc}	5.54^{bc}	5.15^{dc}	4.72^{d}	0.385	0.0015
Triglycerides(mg/dl)	95.5^{a}	91.2^{ab}	87.2^{b}	81.3^{c}	79.4^{c}	72.3^{d}	62.9^{e}	3.3	0.0001
Cholesterol(mg/dl)	185.0^{a}	181.7^{a}	166.0^{ab}	156.7^{bc}	156.0^{bc}	141.3^{cd}	131.0^{d}	11.63	0.0005
HDL(mg/dl)	39.00^{c}	41.33^{bc}	44.67^{abc}	46.33^{abc}	47.67^{ab}	49.67^{a}	52.33^{a}	4.226	0.0224
LDL(mg/dl)	122.67^{a}	117.33^{ab}	100.33^{bc}	92.33^{cd}	82.33^{cd}	77.67^{de}	63.33^{e}	10.33	0.0001
HDL /LDL	0.32^{f}	0.36^{ef}	0.45^{de}	0.51^{cd}	0.58^{bc}	0.65^{b}	0.83^{a}	0.065	0.0001
Calcium(Ca) (mg/dl)	20.55^{b}	22.43^{ab}	22.40^{ab}	23.48^{a}	23.83^{a}	24.41^{a}	22.90^{a}	1.134	0.0210
Phosphor(P)(mg/dl)	6.33	6.42	6.71	6.60	6.44	6.49	6.27	0.345	0.7528
Ca / P	3.24^{d}	3.50^{bc}	3.34^{dc}	3.56^{abc}	3.70^{ab}	3.76^{a}	3.65^{ab}	0.134	0.0027
Glucose	212.7^{a}	192.3^{ab}	173.7^{bc}	179.7^{ab}	143.7^{cd}	134.0^{d}	140.3^{d}	18.03	0.0007

a,b,c,d,e,f :means in the same row and bearing different superscripts are significantly different ($P \leq 0.05$).
SEM= standard error mean; HR= Habarachad, GHR= germinated Habarachad
T2: HR 0.5g/kg diet, T3: HR 0.75g/kg diet, T4: HR 1g/kg diet,
T5: GHR 0.5g/kg diet, T6: GHR 0.75g/kg diet, T7: GHR 1g/kg diet.

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الملخص العربى

تاثير إستخدام مسحوق حب الرشاد المستنبت وغير المستنبت فى العليقة على الاداء الانتاجى والتناسلى وكيمياء الدم لدجاج الجميزة البياض

قوت القلوب مصطفى السيد مصطفى ، محمد السيد عيد السيد فراج،على عبد الهادى البرلسى ،ريرى فوزى شطا ، حمدى محمد أحمد الكومى

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هدفت هذه الدراسة الى تقييم تاثير اضافة بذور حب الرشاد سواء فى شكلها المطحون أو المستنبت بمعدلات (0,75،0,5 ، 1,0 جم/كجم علف) الى علائق دجاج الجميزة البياض على الاداء الانتاجى والتناسلى والمعايير البيوكيميائية فى الدم . إستخدم فى الدراسة عدد189دجاجة و21ديك بعمر 32اسبوع قسمت إلى 7 معاملات بكل منها 27 دجاجة و 3 ديوك ثم وزعت طيور كل معاملة فى 3 مكررات بكل مكرر 9 دجاجات و ديك واحد ، وإستمرت التجربة من 32 إلى 44 أسبوع . أظهرت النتائج تحسنا كبيرا فى انتاج البيض وكتلة البيض ومعامل التحويل الغذائى ، خاصة مع استخدام البذور المستنبتة التى عززت من التوافر البيولوجى للمغذيات مما أدى إلى تقليل استهلاك العلف وزيادة الإنتاجية. كما بلغت أعلى كفاءة تناسلية، خاصةً في نسبة الفقس عند استخدام 0,75جرام من البذورالمستنبتة لكل كجم من العلف. أظهرت تحاليل الدم تحسن في مستويات الدهون، وزيادة القدرة المضادة للأكسدة، فضلا عن تعزيز الوظائف المناعية. تؤكد النتائج أن بذور حب الرشاد المستنبتة تعد اضافه طبيعيّه وفعّاله من حيث تحسين صحة وإنتاجية دجاج الجميزة البياض .