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Investigating the Laying Performance and Egg Quality of Chicken by Supplementation of Stinning Nettle in Nepal

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Abstract: ***The effects of stinging nettle (Urtica dioica) on productive performance in layer chicken have been demonstrated in a pilot study conducted at the National Animal Health and Research Center (NAHRC), Khumaltar, Lalitpur. A total of 50 - day - old female chicks and 10 male chicks of the Hyaline strain were divided into two groups; control (C) and treatment (T) comprising of 25 female chicks and 5 male chicks in each group. The treatment (T) group received commercial layer feed along with shade - dried nettle powder from eight weeks onwards at a 1% level daily up to 16 weeks. From 17th weeks onwards treatment group received 7% nettle once a week up to 20 weeks while the control (C) group received only commercial layer feed. In both groups, the amount of commercial feed offered to chickens was based on the standard feeding norms. Daily egg production was recorded to determine weekly laying performance. Egg quality parameters such as eggshell thickness and egg albumen height were measured by using micrometer screw gauze and tripod micrometer, respectively. Blood samples were collected on the 8th week of post - vaccination against Newcastle disease (ND) and antibody against ND viruses was measured by the hemagglutination inhibition (HI) method. Egg quality was assessed by measuring Haugh Unit in both treatment and control groups. Haugh Unit of the opened eggs was also calculated from both groups. Available data until 20 weeks of the trial revealed a higher number of egg production in the treatment group than in the control group by 19.7 %. The albumin height was significantly (p<0.001) higher in T (6.54±0.23) mm group than in C (5.76±0.22) mm group. The eggshell thickness was significantly higher in the T group (0.40±0.23) mm than C (0.37±0.22) mm group. The treatment group had a higher level of antibody titer against ND virus (64 - 512) on 4HAU as compared to the control group (32 - 128). Haugh unit was relatively higher in T (82.43±2.29) group than in C (75.69±1.44) group. These findings indicated that nettle supplementation increases egg productivity, improves the egg quality and immune status and enhances laying performances.***

Keywords: Chicken, egg quality, Haugh Unit, nettle, laying performances

1. Introduction

Poultry industry is rapidly growing in Nepal. In the last decades, a greater number of people are adopting this business. The country is gradually shifting towards an intensive farming system from backyard farming. The number of layer hens consistently increased from 6.68 million in 2003/04, 12.35 million in 2015/16, 12.52 million in 2018/19 and now decreased 10.13 million in 2021/22 (MOALD, 2021/22). Conversely, the duck layer population experienced a decrease from 0.21 million in 2003/04 to 0.18 million in 2015/16 which again raised to 0.19 million in 2018/19. The number of pigeons and other birds was reported to be 1845234 and 57313 respectively (Statistical Information on Nepalese Agriculture 2018/2019). Nepal's per capita chicken consumption is well above India (2.3kg) and Bangladesh (1.4kg), but below Sri Lanka (4.9kg) and Pakistan (4.3kg). The CBS survey shows Nepal's poultry industry has an annual turnover of Rs33.72 billion, producing chicken meat worth Rs20.52 billion, eggs worth Rs9.13 billion, and chicks worth Rs3.60 billion. Sales of chicken manure amount to Rs 453.72 million annually, (CBS report 2018/19). Hen egg production showed a drastic increase from about 560 million in 2003/04 to 1534.68 million in 2018/19. Duck egg production decreased from 15.53 million in 2003/04 to 13.06 million in 2010/11 which again achieved 15 million in 2018/19. So the total egg production in 2018/19 is 1549 million (Statistical Information on Nepalese Agriculture 2018/2019).

Therefore, it is obvious that the poultry industry has an important to contribute nation's economy. The demand for eggs and chicken meat has risen steadily over years. Nepal has varied land topography and climate where poultry farming exists in all the regions in small numbers due to small landholdings (Pradhanang et al., 2015). This is due to the rise in income level and of people changing food habits. This will further create more markets and opportunities for further expansion of this sector (Neupane et al., 2009). The hen and duck population in Nepal is about 75.70 million and 0.41 million respectively with 12.52 million laying hens yielding 1534 million eggs and 0.19 million laying duck yielding 15 million eggs (Statistical Information on Nepalese Agriculture 2075/2076, 2018/2019). In 2020 alone, ND outbreaks in many places of our country mainly Chitwan and Kathmandu valley. Similarly, the endemic diseases have seriously affected the industry that decreased production. The import of inferior chicks through illegal channels from India in the domestic market has created a low productive performance. This has created an imbalance between production and consumption. Herbal preparations are more affordable than chemical drugs. In recent years, some drug companies are claiming to have developed immunomodulators to be used in commercial poultry farms. Many herbal preparations are presumed to have immunomodulatory effects with no or less side effects. The goal of the present study was nettle fed to layers of poultry diet and its effect on chicken productivity parameters, egg quality was investigated.

2. Materials and Methods

This study was carried out at the National Animal Health Research Center, Khumaltar, Lalitpur

Experimental setup

Layer chicken (Breed)
A total of 60 chicks (50 female and 10 male) of Hyaline strain were purchased from Avinash Hatchery, allocated randomly into two groups, each group comprising 25 female and 5 male chickens. The birds were divided into two groups namely;

- Control (C) receiving only a layers diet (Pellet).
- Treatment (T) receiving a pellet layers diet + Nettle (from 8th week onwards at 1% daily level up to 16 weeks.

From 17th weeks onwards treatment group received 7% nettle once weekly up to 20 week).

Feeding schedule
The adult birds after 20 weeks were fed commercial pellet layers ration at the rate of 150 gm per bird per day. During the day time no additional light was provided, but at night time one CFL bulb was provided for light in each room. Water sanitized with water guard (chlorine) was given ad libitum. The birds were fed with commercially available feed as starter, grower, developer and layers feed in the age group of 1 - 4 weeks, 5 - 10 weeks, 10 - 16 weeks, and >16 weeks respectively on the standard feeding norms.

Nettle supplementation
Nettle was supplemented at 1% level daily from 8th to 16th week of age. From 17th week onward 7% nettle was supplemented once weekly until the end of trial. Assessment of egg production

Assessment of egg quality
The eggs were collected daily and a total number of eggs laid was recorded on weekly basis for 4 weeks only due to lack of time.

Eggshell thickness
Ten eggs were collected from both groups to measure eggshell thickness by using micrometer screw gauze. Three readings were taken from the single shell of three different parts namely apex, base, and middle part.

Egg albumen height
Ten eggs from each group were broken and the content was poured into a Petri dish and albumen height was measured by using a tripod micrometer (spherometer) as described by Haugh (1973).

Calculation of the Haugh Unit
With the available data of albumen height and egg weight, the Haugh unit was calculated to determine the quality of opened egg, using standard formula as given by HU= 100 log [H+ 7.57 - 1.7 W.37] (Card &Neschiem, pp, 291 - 295, 11th edition).

Assessment of immune status
Blood samples (0.5 - 1ml) of five birds from each treatment and control group were randomly collected from wing vein using 22 gauge needles on 8th week of post vaccination with Newcastle Diseases Virus. The syringes with blood were kept in inclined position for 24 hours. Then the syringe was kept in refrigeration for 2 hours. Clear serum separated in the upper portion of syringe was poured in sterile serum containing vials and was stored in the freezer. The serological tests followed were Hemagglutination (HA) and Hemagglutination Inhibition (HI) tests as described by OIE Manual (2004).

Preparation of blood smears and differential leucocytes counts
Thin blood smear was prepared from the blood samples from both treatment and control groups collected on 28 days post - vaccination. The smears was stained with Giemsa stain and allowed to dry. After complete drying the slides were observed for differential leukocytes count.

Data Analysis
The experimental values were statistically processed and then the comparisons between means were done, using t - test, included within the MS - Excel software program.

3. Results and Discussion

Egg production The treatment group started to lay eggs one day earlier than the control group. The egg production data was recorded for four weeks. The egg - laying performance of the control and treatment groups is presented in figure 1. The increment in egg production in the treatment group was 19.71% as compared to the control group (255 versus 213). Khanal et, al (2009) has also indicated positive response of nettle on the performance of ready to cull hens that had a significant increase in production after nettle supplementation. Improvement inegg - laying performance may be attributed to the presence of a high amount of calcium, phosphorus, vitamins and non - specific immunomodulators in the nettle that might activate the gene responsible for egg - laying (Khanal, et., al 2008). Poudel (2009) and Regmi (2010) also reported that the supplementation of nettle on chickens significantly increased egg production.

Assessment of Egg quality

Parameters:

Albumin Height
The thickness of albumen height measured by Triphoid micrometer (Spherometer) showed higher albumen height in the egg of nettle supplemented birds than in the eggs of control group. A similarresult was also obtained by Poudel (2009) and Regmi (2010) with better response in 10% nettle supplemented groups.

Shell thickness Measurement of shell thickness of eggs revealed that the treatment group had higher thickness (0.40±0.23mm) compared to the control group (0.37±0.22mm). Higher shell thickness in the nettle supplemented group was attributed to the higher calcium

content in the stinging nettle. The diet of hens must contain adequate calcium in a form that can be utilized efficiently (Roberts, 2004). Roland et al (1994) have stated that adequate calcium in the poultry diet enhances shell quality. Since nettle has considerably higher level of calcium in the diet, this may have enhanced the shell thickness due to more deposition of calcium carbonate in the eggshell.

Table 1: Showing parameter of egg quality

Parameter	Control	Treatment
Albumin Height (mm)	(5.76±0.22)	(6.54±0.23)
Shell thickness (mm)	(0.37±0.22)	(0.40±0.23)

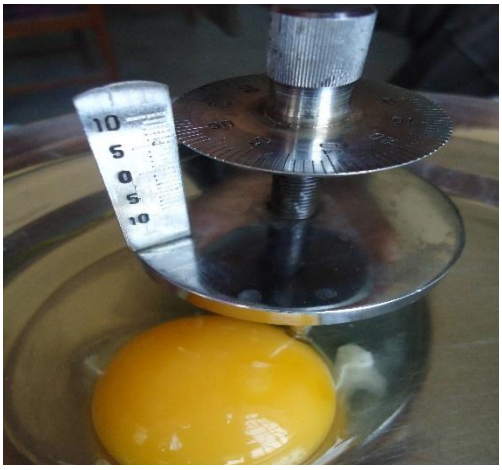

Figure 1: Showing the Measurement of albumen height using Spherometer

White blood cells pattern

The treatment group with nettle supplementation had comparatively higher proportion of lymphocytes than non - supplemented group. Table.3. Differential white blood cells in two different of groups.

	Treatment	Control
Lymphocytes	64 ± 2.38	62 ± 2.68
Heterophils	18.4 ± 4.05	18 ± 2.75
Monocytes	4.8 ± 1.01	3.6 ± 0.74
Eosinophils	6.4 ± 2.06	5 ± 1.58

A similar result was also found by Poudel (2009). Wagner et al. (1989) has also demonstrated an increased lymphocyte proliferation by nettle extract on experimental animals. Immune stimulation causes peripheral lymphocytes with more number reactive lymphocytes (Khan, 2005). Thus, it can be concluded that nettle feeding has a stimulating action on the immune system.

Figure 2: Measuring antibody titer against Newcastle disease virus

Colour of the eggs

Colour of the eggs in nettle supplemented groups was comparatively more appealing than in the non - supplemented group. White spots were seen at times on the outer surface of the shell in the control group eggs but treatment groups eggs weight.

Figure 3: Comparison of colour between control and treatment group's egg.

Calculation of Haugh Unit

The relation of Haugh unit revealed that (75.69±1.44) on control group whereas (82.43±2.29) on treatment group. Haugh Unit significance quality of the opened egg. High HU indicates a higher grade of eggs (USAD quality score for 2 - ounce eggs). ere dark brown in color.

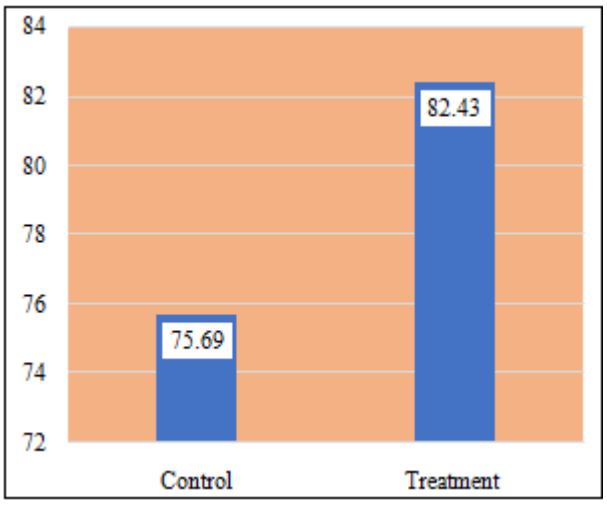

Figure 4: Showing the Haugh unit of two different groups

4. Conclusion

From the study, it can be concluded that nettle can enhance in laying performances. Nettle can also increase the calcium content of eggs and has a positive influence on egg albumen content. Egg albumen height, shell thickness, the colour of the eggs, egg size, and weekly egg production intensity all were different between the treatment and the control groups. The main component in nettle with a combination of a good amount of vitamins and minerals makes it a promising plant to enhance organic poultry farming and reduce reliance on chemical drugs. Nettle is beneficial in improving productivity, eggs quality and immunity in poultry industries.

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