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Effect of feeding Azolla (*Azolla pinnata*) leaf powder on growth performance of turkey poults

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Abstract

Four different treatments were given out to 128 day-old straight run turkey poults: T₁-basal diet (control), T₂ - 2.5% of basal diet replaced with ALP, T₃ - 5% of basal diet replaced with ALP, T₄ - 7.5% of basal diet replaced with ALP. The findings of the present investigation showed that the average weekly weight gain of T₃ was significantly higher ($p < 0.01$) as compared to rest of the treatment groups and significantly lowest body weight gain was observed in T₁ (control). Significantly better feed conversion ratio was found to be in the 5% (T₃) Azolla-fed treatment group. Based on the results, it can be said that azolla meal can be substituted up to 5% of the total diet of young turkeys without having any negative effects. Four different treatments were given out to 138-day-old straight-run turkey poults.

Keywords: Azolla, growth, body weight and feed conversion ratio

Introduction

For a variety of reasons, small poultry farmers have recently been interested in exploring alternatives to corn and soybean. The main factors driving this trend are health issues relating to either naturally occurring isoflavones (phytoestrogens) or their status as genetically modified organisms (GMOs). Second, finding substitute feed sources is necessary because of the recent spike in the price of corn and soy, as well as the local scarcity of these two items. Since the cost of the feed makes up almost 75% of the overall cost of producing a turkey, switching to traditional feedstuffs will lower the price of turkey feed and boost the profit margin in the turkey industry. Maize is primary input to engage 50 to 60% diet of turkey and maize is also required in starch industry as primary source. Thus, the turkey diligence of the country required a homogenous supply of nutrients. This can be brought out successfully by use of unconventional feed resources like azolla and other green feeding or by replacing a definite amount of their diet or under alternative feeding system.

Due to their wide range of applications in animal and human poultry food, aquatic plants are receiving a lot of attention in animal nutrition research. One of the fastest-growing and most prevalent floating plants is the azolla. Many Azolla species are now utilized as feed additives for livestock, including pigs, chickens, and fish, either in dried flakes or fresh form. Azolla contains significant levels of protein and vital amino acids, but it also contains a wealth of other elements like minerals, vitamins, and colours. The application of Azolla meal to boost the poultry output is inconsistent. However, numerous studies have shown that adding particular doses of Azolla to broiler rations encourages feed intake, body weight gain, feed conversion rate, and.

Methods and Materials

Experimental site

The experiment was managed in the Department of Animal Production's poultry farm at the Rajasthan College of Agriculture's MPUAT Udaipur, which is situated in a dry area at latitude 24.57 north and longitude 73.70 East and rises 598 meters above mean sea level. In the recent decades, the average maximum and minimum temperatures were 38.3 °C and 11.6 °C, respectively, while the average annual rainfall was 937 mm.

Experimental details

128-day-old turkey pouts were used in this study, which was conducted at the poultry farm run by the Department of animal production at the Rajasthan College of Agriculture in Udaipur. The chicks were divided randomly in four treatment groups, consisting of 32 pouts in each treatment group with four replication of 8 pouts in each.

Observations

Body weight

Weekly body weight of individual Turkey poult in various treatment groups was recorded from day old to eight weeks. Weekly body weights of pouts were recorded using electronic weighing machine.

Body weight gain

The weekly body weight gain of Turkey pouts was calculated by subtracting live weight of previous week from that of current week in grams.

Weekly body weight gain (g) = Current week body weight (g) – Previous week body weight (g)

Feed intake

The feed intake was measured in each treatment group on two consecutive days at weekly intervals during 1 to 8 weeks age. Total feed offered and residue thereof was weighed to attain feed intake.

Feed intake (g) = Feed offered during the current day (g) – Feed leftover at the next day (g)

Feed conversion ratio (FCR)

Feed conversion ratio was estimated at weekly intervals as well as for the entire growth period *i.e.* from 1 to 8 weeks of age. Feed conversion ratio was calculated by using following formula.

$$\text{Feed Conversion Ratio} = \frac{\text{Feed consumption per bird per week (g)}}{\text{Body weight gain per bird per week (g)}}$$

Statistical analysis

The experimental design was conducted in completely randomized design (CRD) and the data pertaining to various parameters obtained during the present study were analyzed by analysis of variance described by Snedecor and Cochran, (1994) [20].

Results and Discussion

Growth performance

In Table 1, body weight information is displayed. The mean body weight during entire experimental period was significantly higher in T₃ followed by T₄, T₂ and significantly lowest body weight was observed in T₁. Overall body weight gain (day-old to 8th weeks) was 858.43±3.34, 966.02±15.32, 1168.35±20.34 and 1066.87±6.15 g per pouts in T₁, T₂, T₃ and T₄, respectively. Table 2 contains information on weekly body weight gain. Overall body weight gain was observed significantly higher in T₃ (1168.35±20.34 g) followed by T₄ (1066.87±6.15 g), T₂ (966.02±15.32 g) and lowest in T₁ (858.43±3.34 g). The findings of the current study are closely related with the findings of Yadav *et al.* (2022) [22] who found highest body weight on 5% inclusion of Azolla in diet of Narmadanidhi birds and reported that beyond this level of dietary inclusion of Azolla depression the body weight and body weight gain. Abdelatty *et al.* (2020) [1] Azolla leaf meal (ALM), a novel dietary protein source, was found to increase BW gain in broiler chicken diets by up to 5% without having any significant adverse effects. Comparable outcomes were also reported by Ara *et al.* (2015) [4] who reported using Azolla in their diets up to 5% enhance the body weight but beyond this level slowly depression in growth performance was noted. Tawasoli *et al.* (2020) [21] reported that beneficial outcome of feeding 6% Azolla meal on body weight and BW gain than above level. Hassen *et al.* (2019) [10] stated that 50 g/kg addition of AZM in the chicken diet showed positive results in body weight. Saikia *et al.* (2014) [16] reported 5% Azolla meal showed comparable body weight gain and stated that Azolla meal up to 10% can be added to the broiler's feed without endangering health or performance.

On the contrary, Sherif *et al.* (2022) [19] and Samad *et al.* (2020) [17] figured out that inclusion of Azolla meal up to 16% can improve body weight. AL-Shwilly *et al.* (2022) [4] observed the addition of Azolla meal up to 45% in broiler feed has a good effect with no harmful effect on broiler body. Balaji *et al.* (2009) [6] and Dhumal *et al.* (2009) [9] indicated that consuming dried Azolla in amounts up to 5% levels has no significant differences with regards to the body weights and weekly weight gain. Acharya *et al.* (2015) [3] observed that Azolla supplementation had no significant difference in terms of absolute body weight gain. Similarly, Bhattacharyya *et al.* (2016) [8] observed non-significant difference in term of body weight gain up to 5.5% inclusion of Azolla in broilers diet.

Table 1: Effect of feeding Azolla leaf powder on weekly body weight (g/poult)

Week/Treatment	T ₁	T ₂	T ₃	T ₄	S.Em±	CD at 5%
1	65.64±0.40 ^c	67.77±0.44 ^b	75.02±0.20 ^a	73.39±1.31 ^a	0.67	2.06
2	110.95±0.57 ^d	122.79±1.09 ^c	143.11±1.16 ^a	133.28±0.38 ^b	0.74	2.28
3	169.86±1.52 ^d	204.36±2.21 ^c	239.62±1.86 ^a	221.14±0.51 ^b	1.23	3.78
5	372.28±4.65 ^d	411.74±2.02 ^c	485.30±4.66 ^a	455.94±1.99 ^b	3.44	10.61
6	511.53±8.82 ^d	568.39±6.34 ^c	638.36±2.99 ^a	589.14±2.66 ^b	5.58	17.21
7	699.47±6.71 ^d	779.62±9.52 ^c	903.18±15.67 ^a	843.73±13.78 ^b	3.74	11.54

Means with the same superscripts in a particular row do not differ significantly ($p < 0.05$) from each other.

Table 2: Effect of feeding Azolla leaf powder on weekly body weight gain (g/poult)

Week/Treatment	T ₁	T ₂	T ₃	T ₄	S.Em±	CD at 5%
1	16.15±0.66 ^d	19.30±0.92 ^c	27.61±0.58 ^a	23.78±1.44 ^b	0.86	2.66
2	45.31±0.82 ^d	55.02±1.40 ^c	68.09±1.00 ^a	59.89±1.51 ^b	1.12	3.46
3	58.91±1.45 ^d	81.57±3.18 ^c	96.51±1.26 ^a	87.86±0.53 ^b	1.41	4.34
4	80.11±0.82 ^c	90.25±2.63 ^b	114.36±1.79 ^a	109.64±3.66 ^a	2.13	6.57
5	122.30±3.76	117.13±2.98	131.32±5.54	125.17±2.76	3.89	NS
6	139.25±8.20	156.65±8.32	153.06±7.09	133.20±2.34	6.71	NS
7	187.94±14.00 ^c	211.23±3.87 ^b	264.82±17.90 ^a	254.59±11.28 ^a	6.36	19.60
8	208.45±7.94 ^c	234.88±10.43 ^c	312.58±4.18 ^a	272.75±13.90 ^b	8.88	27.37
Overall gain	858.43±3.34 ^d	966.02±15.32 ^c	1168.35±20.34 ^a	1066.87±6.15 ^b	10.13	31.22

Means with the same superscripts in a particular row do not differ significantly ($p < 0.05$) from each other.

Feed intake and feed conversion ratio

The data on feed intake are tabulated in Table-3. Overall feed intake (from 1st - 8th weeks of age) ranged from 2233.54±17.67 to 2619.58±9.96 g per pout among different treatment groups. The overall feed intake was significantly highest in T₄ (2619.58±9.96 g) followed by T₃ (2526.72±11.46 g), T₂ (2448.79±12.11 g) and significantly lowest feed intake was observed in T₁ (2233.54±17.67 g). The findings of the current study closely align with Kumar *et al.* (2018) [12] who reported significant effect on feed consumption which was highest in 7.5% Azolla fed treatment. Abdelatty *et al.* (2020) [1] reported that dietary inclusion of 5 and 10% Azolla leaf meal increased the feed intake compared with control. Similarly, Paudel *et al.* (2015) [15] found that incorporation of Azolla meal up to 10% had positive effect in terms of feed intake. Joysowal *et al.* (2018) [11] revealed that all the groups fed Azolla in their diets consumed much less feed when compared to the control group. However, Abdelatty *et al.* (2021b) [2] reported no difference in feed intake between AZ10 and CON. Similarly, Samad *et al.* (2020) [17] also found no significant differences ($p > 0.05$) among 0, 5, 10 and 15% Azolla-fed treatments. Balaji *et al.* (2009) [6] reported that feed intake did not differ significantly in different treatments up to six weeks of age.

Data on feed conversion ratio have been summarized in Table 4. The overall feed conversion ratio from 1st to 8th week of age was 2.60±0.02, 2.53±0.04, 2.16±0.05 and 2.46±0.01 in T₁, T₂, T₃ and T₄, respectively. The data revealed significantly highest FCR in T₁ as compared to rest of the treatment groups except T₂. Significantly lowest feed conversion ratio was obtained in T₃ as compared to rest of the treatment groups. The difference in FCR between T₁ and T₂ and between T₂ and T₄ were non-significant. Lakshmi *et al.* (2019) [13] observed that azolla meal could be included to laying quails up to 6% as a replacement without affecting feed conversion ratio. Hassen *et al.* (2021) [10] reported that Azolla could be included in chicken diet up to 50 g/kg without any adverse effect on feed conversion ratio. Similarly, Kumar *et al.* (2018) [12] reported lowest FCR in 5% of Azolla-fed birds which were though comparable with 2.5% but significantly lower than 0, 7.5 and 10%. Naghshi *et al.* (2014) [14], Shamna *et al.* (2013) [18] and Basak *et al.* (2002) [7] showed that diets containing 5% Azolla powder significantly had better feed conversion ratio (FCR), which is closely in agreement with present study. On the other hand, Samad *et al.* (2020) [17] demonstrated that the treatments supplemented with 0, 5, 10, and 15% Azolla did not differ significantly in terms of feed conversion ratio.

Table 3: Effect of feeding Azolla leaf powder on weekly feed intake (g/poult)

Week/Treatment	T ₁	T ₂	T ₃	T ₄	S.Em±	CD at 5%
2	136.08±1.70 ^c	137.48±1.74 ^c	159.11±0.30 ^b	169.92±2.07 ^a	1.46	4.49
3	202.16±3.49 ^c	241.29±2.69 ^a	232.26±2.38 ^b	245.74±1.18 ^a	2.52	7.75
5	326.46±1.42 ^c	329.77±1.89 ^c	353.78±2.39 ^b	365.77±2.30 ^a	1.85	5.72
6	340.73±5.91 ^c	364.72±5.96 ^b	367.92±4.12 ^b	394.62±4.27 ^a	3.66	11.27
7	397.69±6.49 ^c	459.62±9.19 ^b	482.51±1.14 ^a	494.79±3.59 ^a	5.51	16.99
Overall feed intake	2233.54±17.67 ^d	2448.79±12.11 ^c	2526.72±11.46 ^b	2619.58±9.96 ^a	10.48	32.30

Means with the same superscripts in a particular row do not differ significantly ($p < 0.05$) from each other.

Table 4: Effect of feeding Azolla leaf powder on the feed conversion ratio

Week/Treatment	T ₁	T ₂	T ₃	T ₄	S.Em±	CD at 5%
1	3.79±0.15 ^a	3.27±0.15 ^b	2.45±0.07 ^c	3.07±0.21 ^b	0.13	0.41
2	3.00±0.07 ^a	2.50±0.09 ^b	2.34±0.04 ^b	2.84±0.05 ^a	0.06	0.17
3	3.43±0.06 ^a	2.96±0.15 ^b	2.41±0.04 ^c	2.80±0.03 ^b	0.07	0.22
4	2.80±0.01 ^a	2.88±0.09 ^a	2.31±0.05 ^b	2.43±0.04 ^b	0.05	0.17
5	2.67±0.09 ^b	2.82±0.07 ^{ab}	2.69±0.01 ^b	2.92±0.07 ^a	0.06	0.18
6	2.45±0.16 ^b	2.33±0.09 ^b	2.40±0.13 ^b	2.96±0.08 ^a	0.11	0.35
7	2.12±0.13 ^a	2.18±0.06 ^a	1.82±0.13 ^b	1.94±0.10 ^b	0.05	0.16
8	2.62±0.12 ^a	2.52±0.11 ^{ab}	1.92±0.07 ^c	2.23±0.10 ^b	0.10	0.30
Overall FCR	2.60±0.02 ^a	2.53±0.04 ^{ab}	2.16±0.05 ^c	2.46±0.01 ^b	0.03	0.09

Means with the same superscripts in a particular row do not differ significantly ($p < 0.05$) from each other.

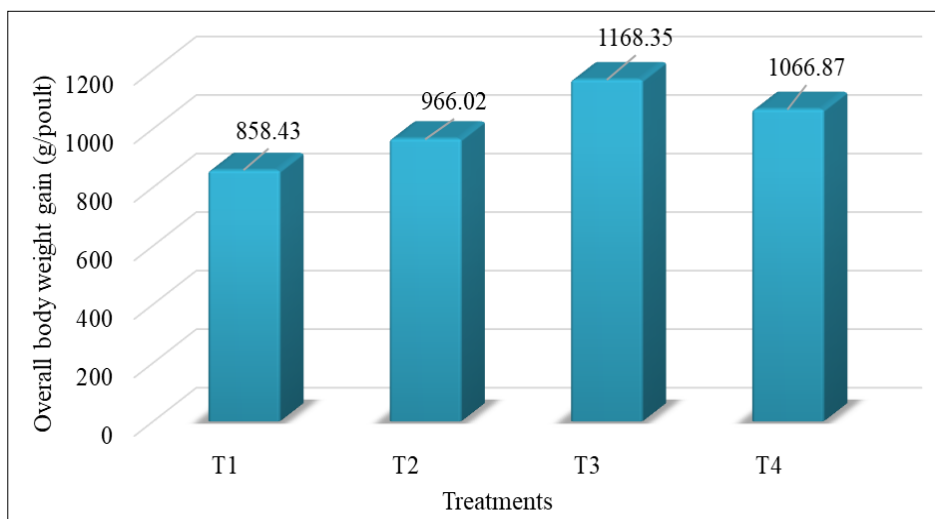


Fig 1: Effect of feeding Azolla leaf powder on overall body weight gain

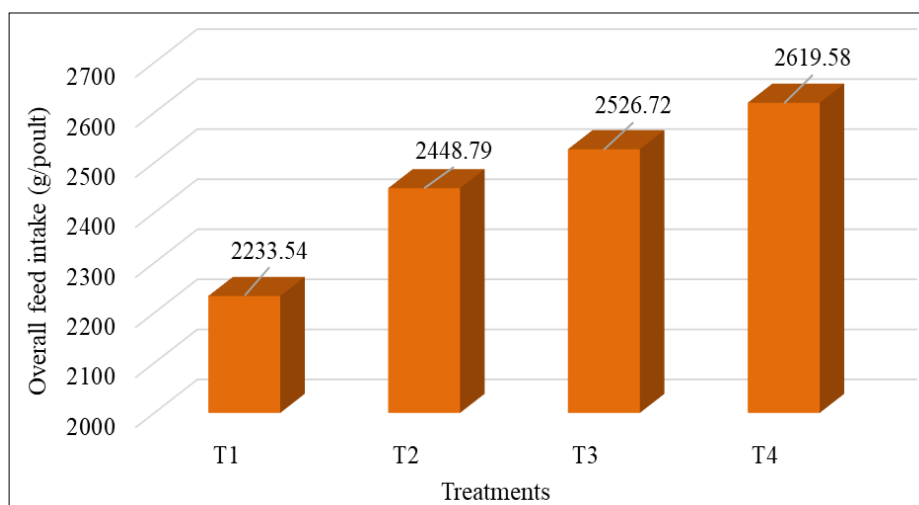


Fig 2: Effect of feeding Azolla leaf powder on overall feed intake

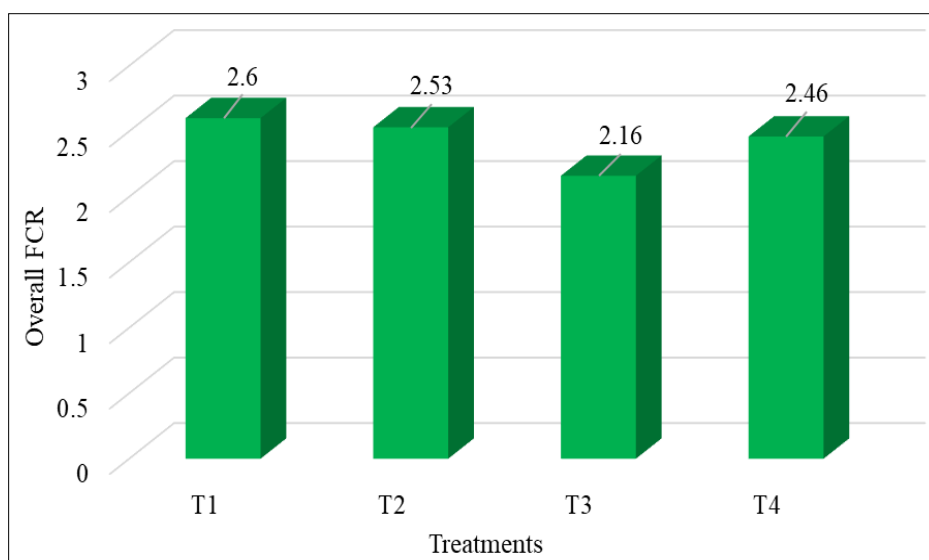


Fig 3: Effect of feeding Azolla leaf powder on overall feed conversion ratio of turkey poult

Conclusion

Thus, it may be concluded that replacement of Azolla leaf powder has positive impact in terms of the growth performance of turkey poult. Hence, the inclusion of 5% of the basal diet with Azolla leaf powder may be included in turkey poult diets.

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References

1. Abdelatty AM, Mandouh MI, Al-Mokaddem AK, Mansour HA, Khalil HMA, Elolimy AA, *et al.* Influence of level of inclusion of Azolla leaf meal on growth performance, meat quality and skeletal muscle p70S6 α abundance in broiler chickens. *Animal*. 2020;14(11):2423-2432.
2. Abdelatty AM, Mandouh MI, Mousa MR, Mansour HA, Ford H, Shaheed IB, *et al.* Sun-dried Azolla leaf meal at 10% dietary inclusion improved growth, meat quality, and increased skeletal muscle Ribosomal protein S6 kinase β 1 abundance in growing rabbits. *The Inter. Journal of Animal Biosciences*. 2021b;15(10):100348.
3. Acharya P, Mohanty GP, Pradhan CR, Mishra SK, Beura NC, Moharana B. Exploring the effects of inclusion of dietary fresh Azolla on the performance of White Pekin broiler ducks. *Veterinary World*. 2015 Nov;8(11):1293-1298.
4. AL-Shwilly HA. Azolla as a New Dietary Source in Broiler Feed: A Physiological and Production Study. *Archives of Razi Institute*. 2022 Dec;77(6):2175.
5. Ara S, Adil S, Banday MT, Khan MA. Feeding potential of aquatic fern-Azolla in broiler chicken ration. *Journal of Poultry Science and Technology*. 2015 Jan;3(1):15-9.
6. Balaji K, Jalaludeen A, Churchil RR, Peethambaran PA, Senthilkumar S. Effect of dietary inclusion of Azolla (*Azolla pinnata*) on production performance of broiler chicken. *Indian Journal of Poultry Science*. 2009;44(2):195-8.
7. Basak B, Pramanik MA, Rahman MS, Tarafdar SU, Roy BC. Azolla (*Azolla pinnata*) as a feed ingredient in broiler ration. *Int. J. Poult. Sci*. 2002 Dec;1(1):29-34.
8. Bhattacharyya A, Shukla PK, Roy D, Shukla M. Effect of Azolla supplementation on growth, immunocompetence and carcass characteristics of commercial broilers. *Journal of Animal Research*. 2016;6(5):941-5.
9. Dhupal MV, Siddiqui MF, Siddiqui MB, Avari PE. Performance of broilers fed on different levels of Azolla meal. *Indian Journal of Poultry Science*. 2009;44(1):65-8.
10. Hassen W, Tafese W, Amza N, Gudeta S, Beyene A, Muleta E. Effect of Partial Substitution of Soybean Meal (*Glycine Max*) by Mosquito Fern (*Azolla pinnata*) on Growth Performance and Carcass Characteristic of Cobb500 Broiler Chickens. *Ethiopian Journal of Applied Science and Technology*. 2019;10(2):22-8.
11. Joysowal M, Aziz A, Mondal A, Singh SM, Boda SS, Chirwatkar B, *et al.* Effect of Azolla (*Azolla pinnata*) feed on the growth of broiler chicken. *Journal of Entomology and Zoology Studies*. 2018;6(3):391-3.
12. Kumar M, Dhuria RK, Jain D, Nehra R, Sharma T, Prajapat UK, Kumar S, Siyag SS. Effect of inclusion of sun-dried Azolla (*Azolla pinnata*) at different levels on the growth and performance of broiler chicks. *Journal of animal research*. 2018;8(4):629-32.
13. Lakshmi R, Seshiah CV, Reddy PR, Nagaraja K, Kumar I. Influence of incorporation of Azolla meal on performance of laying Japanese quails. *Indian Journal of Animal Nutrition*. 2019;36(1):47-50.
14. Naghshi H, Khojasteh S, Jafari M. Investigation the effect of different levels of Azolla (*Azolla pinnata*) on the performance and carcass characteristics of cob broiler chicks. *International Journal of Farming and Allied Sciences*. 2014;3(1):45-49.
15. Paudel DR, Dhakal P, Timsina KP, Dahal A. Azolla as an economic substitute to soybean-based feed for poultry. *International Journal of applied sciences and Biotechnology*. 2015 Dec 30;3(4):619-25.
16. Saikia N, Sapkota D, Hazarika R. Effect of feeding Azolla (*Azolla pinnata*) meal to broilers: A field study in Assam. *Indian Journal of Poultry Science*. 2014;49(1):113-4.
17. Samad FA, Idris LH, Abu Hassim H, Goh YM, Loh TC. Effects of Azolla spp. as feed ingredient on the growth performance and nutrient digestibility of broiler chicken. *Journal of Animal Physiology and Animal Nutrition*. 2020 Nov;104(6):1704-11.
18. Shamna TP, Peethambaran PA, Jalaludeen A, Leo J, Muhammad AMK. Broiler characteristics of Japanese quails (*Coturnix coturnix japonica*) at different levels of diet substitution with Azolla pinnata. *Animal Science Reporter*. 2013;7(2):75-80.
19. Sherif KE, Dorra TM, Hassan IE, Mahmoud AK. Effect of dietary Azolla and Spirulina on performance of Japanese quails. *Journal of Animal and Poultry Production*. 2022 Apr 1;13(4):51-57.
20. Snedecor GW, Cochran WG. *Statistical Methods*, 8th edition, Iowa State University Press, Ames, Iowa, USA; c1994.
21. Tawasoli MJ, Kahate PA, Shelke RR, Chavan SD, Shegokar SR, Nage SP. Performance of Azolla (*Azolla pinnata*) Meal on body weight gain and dressing percentage of vanraja poultry birds. *International Journal of Current Microbiology and Applied Sciences*. 2020;9(7):4001-4008.
22. Yadav SK, Mishra AK, Gupta NM, Singh AK, Goyal G, Gaur S. Effect of Azolla Supplementation on Production Performance of Narmadanidhi Birds. *Journal of Animal Research*. 2022;12(1):131-134.