



Research Article

EFFECT OF FEEDING AZOLLA (*Azolla pinnata*) MEAL ON FEED INTAKE AND FEED CONVERSION EFFICIENCY OF VANRAJA POULTRY BIRDS

MOHAMMAD JAWAD TAWASOLI¹, KAHATE P.A.², SHELKE R.R.³, CHAVAN S.D.⁴, SHEGOKAR S.R.⁵

Department of Animal Husbandry and Dairy Science, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, 444104, India

*Corresponding Author: Email - pakahate@rediffmail.com

Received: July 18, 2018; Revised: July 25, 2018; Accepted: July 26, 2018; Published: July 30, 2018

Abstract: The present investigation entitled "Effect of feeding Azolla (*Azolla pinnata*) meal on feed intake and feed conversion efficiency of Vanraja poultry birds" was carried out to assess the feeding effect of Azolla meal on feed intake and feed conversion efficiency of vanraja poultry birds production. One hundred and fifty day old chicks were procured and equally distributed into five treatment groups T₁, T₂, T₃, T₄, and T₅ with 30 numbers of chicks in each treatment. Azolla (*Azolla pinnata*) meal was added in experimental ration at different levels. The dietary treatments consisted of without supplementation (T₁), supplemented with 3, 6, 9 and 12 per cent azolla meal in treatment T₂, T₃, T₄ and T₅, respectively. The average total weekly feed consumption gram/bird during the experimental period at the end of seventh week was recorded as 629.7, 600.02, 670.00, 584.83 and 614.25 g. For T₁, T₂, T₃, T₄ and T₅ treatments groups, respectively. The cumulative feed consumption at seventh week of age was 2612.8, 2653.04, 2723.1, 2440.5 and 2653.8 g, in T₁, T₂, T₃, T₄ and T₅ treatments groups, respectively. The average weekly feed efficiency at seventh week age was 2.77, 2.66, 2.53, 2.36 and 2.85 under treatments T₁, T₂, T₃, T₄ and T₅, respectively. The cumulative feed efficiency of various groups at seventh week from T₁ to T₅ was 2.73, 2.64, 2.49, 2.33 and 2.63, respectively.

Keywords: Azolla meal, feed intake, feed conversion efficiency (FCR), Vanraja Poultry bird

Citation: Mohammad Jawad Tawasoli, *et al.*, (2018) Effect of Feeding Azolla (*Azolla pinnata*) Meal on Feed Intake and Feed Conversion Efficiency of Vanraja Poultry Birds. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 10, Issue 14, pp.- 6733-6736.

Copyright: Copyright©2018 Mohammad Jawad Tawasoli, *et al.*, This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Introduction

Modern intensive poultry industry demands more rapid growth in a confined housing environment which leads to greater susceptibility to stress in broilers. Poultry industry has made a tremendous and remarkable progress evolving from a small scale backyard venture to the status of commercial, full fledge, self-sufficient and most progressive agro based industry [10]. Enterprise particularly because of the small capital investment, increased returns, and quick turn over, comparatively less risk involved, low land requirement, easy to production and high feed efficiency. Due to increasing demand for poultry meat, short supply of mutton and limited acceptability of beef and pork in some countries as considering of religious and cultural points like India. The poultry production is under rapid expansion in the world. Poultry are much more prolific than other livestock and through careful scientific breeding policies; they have become efficient converters of vegetables protein into high quality animal protein food for human consumption. The importance of backyard poultry is well recognized by Government of India and special programs are formulated for its promotion. Hence, efforts have been diverted into producing dual purpose native hybrids with improved production profiles. These hybrids are readily accepted by the rural farmers owing to their phenotypic appearance of the local birds. Hence, the introduction of Vanraja has generated new opportunities for poultry production in rural areas. These breeds grown fast and require low input like feed, management, health care, housing etc. and sustain different vagaries of climatic and environmental changes [9]. Aquatic plants pieces accumulate secondary plant compounds and therefore offer greater potential than many other types of leaf protein sources [5]. Among the aquatic plants floating fern *Azolla pinnata* can be used as unconventional high potential feed resource and it contains almost all essential amino acids, minerals such as iron, calcium, magnesium, potassium, phosphorus, manganese *etc.* apart from appreciable quantities of vitamin A precursor beta carotene and vitamin B12. *Azolla* have symbiotic relationship with the nitrogen-fixing blue-green algae. It is

this unique symbiotic relationship that makes *Azolla*, a wonderful "super plant" with high protein content, as it can readily colonize areas of fresh water and grow at great speed doubling its biomass every two to three days. It is also found to contain probiotics and biopolymers [6]. Thus, *Azolla* appears to be a potential source of nutrients. Vanaraja is a dual-purpose chicken variety developed by the Project Directorate on Poultry in Hyderabad, India.

Materials and Methods

The present research work was carried out in the Department of Animal Husbandry and Dairy Science, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS) during the year 2017-18. 150 day old chicks of Vanraja breed were procured from hatchery. They were randomly and equally distributed in to five dietary treatments consisted of on basal control as standard ration (T₁), Standard ration + 3 % *Azolla* meal (T₂), Standard ration + 6 % *Azolla* meal (T₃), Standard ration + 9 % *Azolla* meal (T₄) and Standard ration + 12 % *Azolla* meal (T₅). The diet was fed ad libitum to experimental birds as per the treatments given as above. All the chicks were fed with ground maize for first two days of age. For the experiment, a commercial starter (0-3 weeks) and finisher (4-7 weeks) crumbles were used as per treatment during experimental period of seven weeks. The vaccination programme of experimental birds was scheduled weekly. Before arrival of Vanaraja chicks the pens, waterer (Drinker), feeders, brooders floor were cleaned, washed, disinfected and fumigated. All the experimental chicks were reared on deep litter system of rearing with use of saw dust as a litter material in a well-ventilated house with identical management and environmental conditions. Proper brooding of chicks was done by providing sufficient heat and light by using electric bulbs in each group for first three weeks of age. Afterwards, sufficient artificial light was provided during night hours throughout the experimental period. Fresh, clean and cool drinking water was provided to the experimental birds ad-libitum. The experimental chicks were weighted individually at weekly interval up to the seven weeks using electronic balance.

Table-1 Average weekly live body weight of Vanaraja birds (g/bird)

| Treatments | Initial weight | 1 st week | 2 nd week | 3 rd week | 4 th week | 5 th week | 6 th week | 7 th week |
|----------------|----------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| T ₁ | 33.20 | 90.50 | 142.6 | 263.87 | 456.75 | 642.94 | 764.25 | 991.30 |
| T ₂ | 32.65 | 90.50 | 145.4 | 266.39 | 485.01 | 671.87 | 810.11 | 1036.04 |
| T ₃ | 33.45 | 90.88 | 154.7 | 281.45 | 499.22 | 710.52 | 863.6 | 1128.59 |
| T ₄ | 31.94 | 92.10 | 148.8 | 274.10 | 491.47 | 691.56 | 831.6 | 1079.22 |
| T ₅ | 32.95 | 91.18 | 148.0 | 269.41 | 487.62 | 674.94 | 827.01 | 1042.40 |
| 'F' test | NS | NS | Sig. | Sig. | Sig. | Sig. | Sig. | Sig. |
| SE(m)+ | 0.419 | 0.657 | 1.168 | 2.436 | 4.754 | 2.338 | 11.72 | 12.057 |
| CD (at 5%) | -- | -- | 3.681 | 7.676 | 14.98 | 7.367 | 36.93 | 37.992 |

Sig: Significant, NS: Non Significant

Table-2 Average weekly feed consumption of Vanaraja Birds (g/bird)

| Treatment | 1 st week | 2 nd week | 3 rd week | 4 th week | 5 th week | 6 th week | 7 th week | Treatment Mean |
|------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------|
| T1 | 72.44 | 157.26 | 305.43 | 487.68 | 510.91 | 449.38 | 629.70 | 373.26 |
| T2 | 73.70 | 156.56 | 308.28 | 537.76 | 494.43 | 482.29 | 600.02 | 379.01 |
| T3 | 72.04 | 175.75 | 305.57 | 510.06 | 515.61 | 474.06 | 670.00 | 389.01 |
| T4 | 74.29 | 132.80 | 295.93 | 492.08 | 452.96 | 407.60 | 584.83 | 348.64 |
| T5 | 74.19 | 154.24 | 299.83 | 517.51 | 473.62 | 520.11 | 614.25 | 379.11 |
| Week Mean | 73.332 | 155.322 | 303.008 | 509.018 | 489.506 | 466.688 | 619.76 | |
| 'F' test | NS | S | NS | S | S | S | S | |
| SE (m)± | 5.7735 | 5.4848 | 5.48 | 5.48 | 5.48 | 5.485 | 5.485 | |
| CD (at 5%) | -- | 17.282 | -- | 17.28 | 17.28 | 17.507 | 17.506 | |

Sig: Significant, NS: Non Significant

Table-3 Average weekly Cumulative feed consumption of Vanaraja Birds (g/bird)

| Treatment | 1 st week | 2 nd week | 3 rd week | 4 th week | 5 th week | 6 th week | 7 th week | Treatment mean |
|----------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------|
| T ₁ | 72.4 | 229.7 | 535.13 | 1022.8 | 1533.7 | 1983.1 | 2612.8 | 1141.38 |
| T ₂ | 73.7 | 230.2 | 538.54 | 1076.3 | 1570.73 | 2053.0 | 2653.0 | 1170.79 |
| T ₃ | 72.0 | 247.8 | 553.4 | 1063.4 | 1579.0 | 2053.1 | 2723.1 | 1184.54 |
| T ₄ | 74.3 | 207.1 | 503.0 | 995.1 | 1448.1 | 1855.7 | 2440.5 | 1074.83 |
| T ₅ | 74.2 | 228.4 | 528.3 | 1045.8 | 1519.4 | 2039.5 | 2653.8 | 1155.63 |
| Week mean | 73.3 | 228.6 | 531.7 | 1040.7 | 1530.2 | 1996.9 | 2616.6 | |
| 'F' test | NS | S | S | S | S | S | S | |
| SE(m)± | 5.774 | 0.450 | 0.450 | 0.450 | 0.450 | 0.349 | 0.450 | |
| CD (at 5%) | -- | 1.418 | 1.4189 | 1.4189 | 1.4189 | 1.157 | 1.418 | |

Sig: Significant, NS: Non Significant

Table-4 Average weekly overall feed conversion efficiency of Vanaraja poultry Birds (feed required per kg BW)

| Treatment | 1 st week | 2 nd week | 3 rd week | 4 th week | 5 th week | 6 th week | 7 th week | Treatment Mean |
|----------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------|
| T ₁ | 1.26 | 3.02 | 2.52 | 2.53 | 2.74 | 3.70 | 2.77 | 2.65 |
| T ₂ | 1.27 | 2.85 | 2.55 | 2.46 | 2.65 | 3.49 | 2.66 | 2.56 |
| T ₃ | 1.25 | 2.75 | 2.41 | 2.34 | 2.44 | 3.10 | 2.53 | 2.40 |
| T ₄ | 1.23 | 2.34 | 2.36 | 2.26 | 2.26 | 2.91 | 2.36 | 2.25 |
| T ₅ | 1.27 | 2.71 | 2.47 | 2.37 | 2.53 | 3.42 | 2.85 | 2.52 |
| Week mean | 1.26 | 2.73 | 2.46 | 2.39 | 2.52 | 3.32 | 2.63 | |
| 'F' test | NS | S | NS | NS | S | NS | NS | |
| SE(m)± | 0.104 | 0.800 | 0.048 | 0.611 | 0.809 | 0.278 | 0.212 | |
| CD (at 5%) | -- | 0.252 | -- | -- | 0.255 | -- | -- | |

Sig: Significant, NS: Non Significant

Weekly feed consumption was calculated by the amount of feed offered at the beginning of week, minus left over at the end of week and cumulative feed consumption was worked out for all the treatment groups. Weekly feed efficiency was calculated by using following formula

$$FE = \frac{\text{Feed consumption (g) during the week}}{\text{Gain in body weight (g) during the week}}$$

Azolla Meal Production

Fresh *Azolla* culture was spread over the water in the tank, after maturation of *Azolla*, harvested and collection. The harvested *Azolla* was washed with brine solution and dried in the shed. After drying the *Azolla* was grinded in form of powder with the help of grinder. Then powder was kept air tied in the polythene bags until used for experimental trial.

Statistical Analysis

The data denoted on feed consumption and feed efficiency was analyzed by Completely Randomized Design [2].

Results and Discussion

In present investigation with an objective to study the effect of feeding *Azolla* meal was recorded during the period of experiment, data obtained was analyzed statistically, presented and discussed in the light of finding of earlier researchers.

Effect of *Azolla* meal on average weekly overall live body weights of Vanaraja poultry birds

The data obtained in respect of average weekly live body weight of vanaraja poultry birds from day old to seven weeks age in all treatment groups are statistically analyzed, tabulated and presented in [Table-1]. It was observed from present study that, the average live body weight of Vanaraja poultry birds at day old stage were 33.20, 32.65, 33.45, 31.94 and 32.95 for the treatments T₁, T₂, T₃, T₄ and T₅ respectively. The initial body weights of Vanaraja poultry birds were statistically non-significant in all dietary treatments indicating that the treatments were homogenous in nature. The corresponding average live body weights at the end of seventh week of age were 991.30, 1036.04, 1128.59, 1079.22 and 1042.40 g T₁, T₂, T₃, T₄ and T₅ treatment, respectively. The significant difference in weekly body weight was found from third week and onward.

The trend of significantly better growth was recorded in T₃ (1128.59) and followed by T₄ (1079.22) groups during seventh week. This indicated that the beneficial effect of feeding 6% *Azolla* meal than above level. This might be due incorporation of *Azolla* meal in feeding Vanraja birds. The findings observed by various research workers are also reported [8] was studied that 5% *Azolla* meal is better by increasing body weight of Giriraja birds. The addition of *Azolla* in diet resulted in significantly higher body weight as compared to that of control group. Similar results were also reported [3] feeding potential of Aquatic Fern-*Azolla* at the rate of 5 % *Azolla* in Broiler Chicken Ration, [4].

Effect of *Azolla* meal supplementation on average weekly feed consumption of Vanraja poultry birds

The feed consumption of experimental chicks was recorded at weekly interval throughout the experimental period. The average weekly feed consumption of Vanraja chicks are recorded, analyzed, tabulated and presented in [Table-2].

The pattern of feed intake at first week of age for T₁, T₂, T₃, T₄ and T₅ were 72.44, 73.70, 72.04, 74.29 and 74.19 g/bird, respectively. The average feed consumption of bird at 7th week age for treatments T₁, T₂, T₃, T₄ and T₅ were 629.70, 600.02, 670, 584.83 and 614.25 g respectively. The higher feed consumption was observed in treatment T₃ followed by T₅, T₂, T₁ and T₄. The significant difference in weekly feed consumption was found from second week onward. The trend of more feed consumption was recorded in T₃ (670 g) compare to other treatments T₁ (629.70 g), T₅ (614.25 g), T₂ (600 g) and less feed consumption was observed in treatment T₄ (584.83 g) per week in groups during second to seventh week. It can be concluded that the supplementations of *Azolla* meal have beneficial effect on growth performance and reduced the feed consumption. Average weekly feed consumption as treatment mean was calculated as 373.26, 379.01, 389.0, 348.64 and 379.14 g per week /bird for the treatment T₁, T₂, T₃, T₄ and T₅ respectively at the end of experimental period. Similar results was reported by researcher Like [8], [4] and [1] reported that feeding of *Azolla*, garlic powder and coriander powder supplementation was immured the feed consumption.

Effect of feeding *Azolla* meal on average weekly cumulative feed consumption of Vanraja

The data recorded on average weekly cumulative feed consumption per bird from first to seventh weeks in different treatments were analyzed, tabulated and presented in [Table-3]. The cumulative feed consumption at seventh weeks of age were 2612.80, 2653.04, 2723.10, 2440.50, 2653.80 g in T₁, T₂, T₃, T₄ and T₅ treatments, respectively. The cumulative feed consumption of Vanraja poultry birds for the treatment groups T₄ was lesser as compared to rest of groups. The significant difference in cumulative weekly feed consumption was found from second week onward. The significant cumulative feed consumption was recorded in T₁ (2612.8), T₂ (2653.04), T₃ (2723.10), T₄ (2440.50) and T₅ (2653.80) groups during second to seventh week. [7] reported that the feeding 10 % *Azolla* combination with commercial feed to poultry birds indicated that increased cumulative feed intake and improved body growth, also [8] is reported that the average consumption was observed feed consumption was higher at 7th week by adding 5% *Azolla* meal. Similar results were reported [4] and [1] added garlic powder and coriander powder in ration for better performance, respectively.

Effect of *Azolla* meal on average weekly overall feed conversion efficiency of Vanraja poultry birds

The data recorded on average weekly feed conversion efficiency are calculated, tabulated and presented in the [Table-4]. It is observed from [Table-4] that the average weekly feed conversion efficiency at seventh week age were 2.77, 2.66, 2.53, 2.36 and 2.85 in T₁, T₂, T₃, T₄ and T₅ treatments groups, respectively. The feed conversion efficiency was found statistically significant for 2nd and 5th weeks. The better cumulative feed conversion efficiency observed during 4th week in T₄ (2.26) and T₃ (2.34). It is showed the positive effects of supplementation of *Azolla* meal as feed additives in poultry diet. The average weekly feed conversion efficiency as treatment mean was calculated 2.65, 2.56, 2.40, 2.25 and 2.52 is treatment T₁, T₂, T₃, T₄ and T₅ respectively. The average weekly FCR as treatment

mean was found decreased in T₄ (2.25) and T₃ (2.40) over other treatment. This might be due increasing the level of *Azolla* supplementation in poultry birds. The differences was found non significant in between treatments except 2nd and 5th week. [7] reported that throughout the experiment, FCR value was lower by feeding of 10 % *Azolla* meal as protein source than control treatment to Broiler Chicken [8].

Conclusion

The results of the present investigation showed that the use of *Azolla* meal supplements was found to be beneficial in poultry bird for its encouraging results in relation to growth performance. The overall performance and economics benefits were better at 6 percent *Azolla* meal. The inclusion of *Azolla* meal as additives, increase feed conversion efficiency and as mortality was recorded zero, means it can be improved the immune system of birds. Hence, supplementation of *Azolla* meal 6% was found more beneficial to improve growth, feed conversion efficiency, and immune system of poultry birds.

Application of research: This work will be used for poultry rearing farmers and commercial poultry farming.

Research Category: Poultry Science

Abbreviations:

g/bird: Gram per bird

FCR: Feed conversion efficiency, BW: Body weight

Acknowledgements/Funding: Authors are thankful to Department of Animal Husbandry and Dairy Science, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, 444104, India.

***Research Guide or Chairperson of research: Dr Prakash A. Kahate**

University: Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, 444104, India

Research project name or number: Effect of feeding *Azolla* (*Azolla pinnata*) meal on performance of Vanraja poultry birds

Author Contributions: All author equally contributed

Author statement: All authors read, reviewed, agree and approved the final manuscript

Conflict of Interest: None declared

Ethical approval: Ethical approval taken from Department of Animal Husbandry and Dairy Science, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, 444104, India.

References:

- [1] Abdul Hafis, Shelke R. R., Chavan S.D., Kahate P.A. and Walke R.D. (2017) *Asian Journal of Animal Science*, 12(1), 01-05.
- [2] Amble V. N. (1975) *Statistical method in animal science*. Indian Society of Agriculture Statistics, New Delhi. 1st Ed. 276-292 pp.
- [3] Ara S., Adit S., Bandy M.T. and Mazdoor A. Khan (2015) *Journal of Poultry Science and Technology*, 3(1), 15-19
- [4] Bajad M. N. (2017) *M.Sc. (Unpub.) Thesis submitted to Dr. PDKV, Akola*, 39-47
- [5] Balaji K.A., Jalaludeen R.R., Churchill P.A., Peethambaran and Senthilkumar S. (2009) *Indian Journal of Poultry Science*, 44(2), 195-198.
- [6] Pillai P.K., Premalatha S. and Rajamony S. (2005) *LEISA India*, 21(3), 26-27.
- [7] Rout S.S., Pradhan C.R., Mishra S.K., Pati P.K. and Bagh J. (2017) *International Journal of Current Microbiology and Applied Science*, 6(12), 2349-2358.

- [8] Shegokar S. R. (2016) *Research Review Committee Report, Dr. PDKV, Akola* 18-21
- [9] Thiruvankadan A. K., J. Muralidharan R. Rajendran and Sarvanan R. (2010) *Report of Animal Genetics and Breeding, Veterinary College and Research Institute Orathnadu*, 56-60
- [10] Verma A.K., Pramanik P.S., Singh K.D., Panday G., Verma H.C. and Verma R.K. (2018) *International Journal of Current Microbiology and Applied Science, Sp. Issue (7)*, 1238-1243.