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Growth performance of Pratapdhan chicks supplemented with fresh Azolla in backyard system under the arid condition of Rajasthan#

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Abstract

The objective of this study was to assess the effect of supplementation of fresh Azolla (Azolla pinnata) intervention on body weight gain in Pratapdhan chicks kept under the backyard system in arid conditions of western Rajasthan. The study was undertaken with 60 beneficiaries of Scheduled caste (SC) farmers, for this purpose; they were equally divided into three experimental groups with 20 Pratapdhan chicks each. The experiment group (T_0) treated as a farmer practice; only kitchen waste feed was offered to chicks while the T_1 birds were given T_0 + 1kg mash grains / 20 birds/day was provided. The T_2 group birds were fed along with T_1 + fresh Azolla pinnata offered @200g kg^{-1}fed to the chicks up to 20 weeks of their age. Based on the results of the study, it could be concluded that 20% of Azolla could be included in the feeding practice of chicks in backyard poultry systems. Conducting farmer's participatory trials is an effective approach to creating awareness and acceptance towards the Azolla technology. This is a valuable green feed supplement for poultry birds, especially under the backyard production system.

Keywords: *Arid ecosystem, Azolla feeding, body weight gain, Pratapdhan*

The poultry sector is an important segment in the agrarian economy of India and has provided sustenance to the rural population since time immemorial. However, with changing global scenario and increasing demand for quality food products, it has become imperative to enhance animal production both quantitatively and qualitatively. Poultry is one of the most important sectors

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in the livestock industry that provides nutritious meat and egg for human consumption within the shortest possible time (Tailor, 2017). Adoption of poultry rearing in rural households can ensure the availability of eggs and chicken in rural and underdeveloped areas, which will help in reducing the incidence of protein deficiency in vulnerable groups in rural areas. The poultry industry has transformed itself from age-old backyard farming into a dynamic agriculture-based industry (Rao *et. al.* 2005). It is necessary for the sustainability of any venture, there should be a synergy of activities between crop and livestock. The feed cost is considered the single largest production cost and constitutes up to 65-70% of the total cost of poultry production (Banerjee, 1992). The incorporation of non-conventional feed or feeds of plants origin in poultry diet is one way to economise the cost of production, in order to increase the productive and economic performance of poultry birds (Abeke *et.al.,* 2008). Maurice *et.al.* (1984) reported that the inclusion of aquatic plants at low levels in the poultry diet had shown better performance, especially when they supply part of the total protein. The utilization of Azolla (*Azolla pinnata*) as an unconventional feed ingredient for poultry feeding had been tested with beneficial consequences reported by many workers (Basak *et al.*, 2002; Alalade and Lyayi, 2006). Azolla is a free-floating aquatic fern of the family Azollaceae and order Pteridophyta. It is rich in protein, minerals, vitamins etc and is an emerging unconventional feed and protein supplement for animals like ruminants, pigs, poultry and fish (Patil *et. al.,* 2013). Incorporation of Azolla in the poultry ration can replace about 20% of commercial feed (Subudhi and Singh, 1978). Reports also suggested that Azolla can be included up to 15-20% of poultry diets without affecting their feed consumption (Soren and Kumar, 2020; Patil *et. al.,* 2013). A number of reasons, including human population pressure on the land, scarcity of nutrient-rich concentrate feeds and the economic need to match livestock production system with available resources, justify the increased use of non-conventional resources for animal feeding (Banakar *et. al*., 2017). The arid regions of Rajasthan are characterized by low and erratic rainfall, low levels of economic activity, high incidence of land degradation and a high level of rural poverty. Livestock in these regions helps in moderating risks provides resilience, diversifies livelihood, and can be migrated or liquidated during calamities. However, livestock production systems in these areas are characterized by low productivity, low fertility, and a shortage of feed resources – especially green forage (Patidar *et.al.,*2014). Hence, the present study was undertaken to evaluate the utilization of *Azolla* in the feeding practice of *Pratapdhan* chicks and its effect on growth performance in the backyard system in the arid condition of Rajasthan.

Materials and methods

Pratapdhan birds (3-4 weeks old), a fast weight gainer and high egg-producing strain were procured from AICRP on poultry breeding, Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur under the Indian Council of Agricultural Research, New-Delhi sponsored Scheduled Cast sub-Plan (SC-SP project) for Entrepreneurship. Pratapdhan poultry birds are dual purpose, it developed by BNR cross developed from BN cross (PB-2 x Native) x RIR (Tailor,2017). The participants were trained on all aspects of rural poultry farming before the distribution of 20 chicks (Comprising 16 females and 4 males) to 60 selected respondents. Close monitoring by regular field visits of project staff members for technical backstopping. This trial was designed with a view to augmenting the poultry weight by supplementation of Azolla in the poultry feed in the backyard system. The quantity of 200g feed Azolla leaf was included in the diet for poultry.

Cultivation of Azolla

The size of the bed depends upon different factors like the number of animals or birds, quantity of supplemented feed required and availability of resources. For the front-line demonstration of the Azolla unit, a kutcha bed was made on farmers' land at a preferably shady place nearby the poultry unit. Approximately 2kg fresh Azolla culture and about 30-40g DAP (Di Ammonium Phosphate), to avoid reddish discolouration, for an area of 12 X 6 X 01 feet, could produce 2-3kg Azolla biomass per day after 15-20 days of inoculation. The selected site was levelled and cleaned, to ensure the

same water level at all corners of the bed. After the inoculation of culture, the Azolla beds were covered with a net to partial shed and sieved fertile soil mixed with farm yard manure was spread uniformly in the bed. Biogas slurry was also used instead of cow/buffalo dung. The bed was emptied after every 5-6 months and it could be reinstalled with fresh soil and Azolla culture, for later use.

Harvesting and preparing of Azolla as supplemented feed

Usually, Azolla attained lush growth and was available for harvest in 15-20 days after stalling the culture. Daily harvested the floating Azolla plants using plastic trays having holes of 1sq.cm mesh size to drain the excess water, and were washed further to avoid the off smell and small plants. Fresh Azolla was mixed with feed in a 1:1 ratio before providing it to the birds. A sample of Azolla was collected and analyzed according to AOAC (2007).

Experimental design

A total of 60 beneficiaries of the project were selected for the present study which was equally divided into 3 groups; 20 farmers each 20 chicks each in each group. For this purpose, 3 groups of respondents were identified:

T_0: Kitchen waste feed offered to chicks only as farmer practice.

T_1: Grazing in the backyard + 1kg mash grains/ 20 birds/day/was supplemented.

T_2: T_1+ Azolla was provided @200g kg-1 feed to the birds.

Poultry Unit

Night shelters of about 8 X 4 X 4 cubic feet dimensions for birds were constructed by partner farmers themselves using locally available resources. During the daytime, birds were roaming the premise of the household. Both sides of the shelter were made of chicken wire mesh and a door of wire mesh in the iron frame was made on the side of the shelter so that any predator could not harm birds, especially at night. Four weeks old pratapdhan chicks were provided to the beneficiaries at the beginning of the Azolla feeding trial.

Experimental diet for chicks

Experimental diets were prepared using local feed ingredients as per the protocol of the experiment design. The experimental diets were formulated and adjusted at par with NRC (1994) recommendations. The duration of the experiment was 16 weeks. The composition of the diets is shown in Table 1.

Performance indicators

Body weight and weight gain at weekly intervals were calculated on an experiment protocol basis.

Weight gain (g) = Average final weight (g) – Average initial weight (g).

Results and discussion

The proximate analysis of the Azolla showed that it contained 7.24% dry matter, 21.02% crude protein, 3.35% ether extract, 11.22% crude fibre, 13.34% ash, 39.02% nitrogen-free extract and 83.74% organic matter

Table1. Composition of experimental diets

Feed ingredients	Experiment group diet (g) (T_1)	Experiment group diet (g) (T_2)
Pearl millet grains	550	450
Rice polish	190	170
Full-fat soybean (Processed)	60	50
Sesame oil cake	180	110
Azolla leaf	-	200
Bone meal	15	15
Common salt	5	5

Table 2. Impact of fresh Azolla supplementation on body weight gain of Pratapdhan strain

No of Weeks	T0 (n=20)	T1 (n=20)	T2 (n=20)
Body weight at 4th week(g)	183.1 ± 8.27	175.4±9.35	191.3 ±10.49
Body weight at8th week (g)	465.3 ± 9.58	510.3 ±10.39	520.3 ±11.19
Body weight at12th week (g)	833.9 ±12.79	869.7 ±13.47	879.6 ±8.26
Body weight at16th week (g)	1024.3±6.69	1042.5 ±8.83	1114.9±8.21
Body weight at 20th week (g)	1039.5±11.90[a]	1121.51±12.25[a]	1241±14.10[b]
Pooled mortality at 20th week (%)	8.56	5.89	4.98

Means with different superscripts differ significantly at P<0.05

on dry matter basis. The chemical composition of Azolla in the present study was similar to Banakar *et. al.* (2017).

The result of dietary supplementation of fresh Azolla on weekly live weight gain of pratapdhan birds is depicted in Table 2. Analysis of data revealed that the average weight gain of the three treatment groups at weekly intervals did not differ significantly until the 20th week of age. There was a significant difference at (P<0.05) in the body weight gain between the treatment groups from the 20th week of age. Lower feed intake has been observed in Azolla fed group (T_2) compared with the rest group during the trial. Lower feed intake might be attributed to the inability of chicks to eat bulky *Azolla* and the high content of crude fibre in Azolla (Bacerra *et.al*.1995). Chatterjee *et.al.* (2020) reported a decrease in feed consumption with an increased level of Azolla in the diet of growing ducks which was in consensus with the observations of this study. The beneficial effect of Azolla feeding might be due to its low lignin content and a potential source of nitrogen that improves feed conversion ratio (FCR) without any adverse effect on poultry. The results on body weight gain are in consonance with the observation of Basak *et.al*. (2002), Khatun *et al*. (2008), Rai *et. al.* (2012) and Subramanian (2021). Joysowal *et. al.* (2018) documented that *Azolla* is an unconventional feed of low price that reduced the feed cost, and could be used as poultry feed. Hence, supplementation of fresh Azolla feeding to the chicks under the backyard system as done in this study also has an economic impact on poultry farming.

Conclusion

Rural poultry production systems, particularly semi ranged based technology, can be a viable tool for poverty alleviation among resource-poor farmers. It could be inferred that on the basis of the results of the present study, *Azolla* can be used as a source of protein and other essential nutrients for augmenting the daily weight gain (ADG) of chicks, thus, paving way for sustainable backyard poultry production for the doubling of farmers' income in the arid ecosystem. There is a need for providing capacity building and extension programmes to rural youth, which can go long way in making backyard poultry a tool for rural employment.

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Conflict of interest

All authors declare that they do not have any conflict of interest for the given research work.

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