

- (2014) Effects of *in-ovo* injection with selenium on immune and antioxidant responses during experimental necrotic enteritis in broiler chickens. *Poultry Science*, **93**(5): 1113-21.
- Levkut, M., Revajova V., Levkutova M., Sevcikova Z., Herich R., Borutova R. and Leng L. (2009) Leukocytic responses of broilers following dietary contamination with deoxynivalenol and/or treatment by dietary selenium supplementation. *British Poultry Science*, **50**: 181-187.
- McMurray, D.N. (1984) Cell-mediated immunity in nutritional deficiency. *Progress in Food and Nutrition Science*, **8**(3-4): 193-228.
- OIE, 2012. New castle Disease, chapter 2.3.14. pp-7 - 8. http://www.oie.int/fileadmin/Home/fr/Health_standards/tahm/2.03.14_NEWCASTLE_DIS.pdf
- Percival S.S. (1998) Copper and immunity. *American Journal of Clinical Nutrition*, **67**(suppl): 1064S - 8S.
- Sajadifar S., Miranzadeh H. and Moazeni M. (2013) Effect of Zinc on Humoral and Cell-Mediated Immunity of Broilers Vaccinated Against Coccidiosis. *Iran Journal of Parasitology*, **8**(3): 474-480.
- Selim S.A., Gaafar K.M and El-ballal S.S. (2012) Influence of *in-ovo* administration with vitamin E and ascorbic acid on the performance of Muscovy ducks. *Emirates Journal of Food and Agric*, **24**(3): 264-271.
- Smirnov A., Tako E., Ferket P and Uni Z. (2006) Mucin gene expression and mucin content in the chicken intestinal goblet cells is affected by *in-ovo* feeding of carbohydrates. *Poultry Sci.*, **85**: 669-73.
- Smits J.E., Bortolotti G.R. and Tella J.L. (1999) Simplifying the phytohaemagglutinin skin-testing technique in studies of avian immunocompetence. *Funct. Ecol.*, **13**:567-572.
- SPSS, Statistical Package for the Social Sciences. Version 17.0 software for Windows.
- Viriden W.S., Yeatman J.B., Barber S.J., Zumwalt C.D., Ward T.L., Johnson A.B. and Kidd M.T. (2003) Hen mineral nutrition impacts progeny livability. *Journal of Applied Poultry Research*, **12**: 411-416.

Indian Vet. J., October 2020, 97 (10) : 14 - 16

Effect of Azolla Feeding on Milk Production in Dairy Cows

P.Suresh Kumar

Veterinary College and Research Institute, Tirunelveli - 627358, Tamil Nadu.

(Received : August, 2021 31/21 Accepted : September, 2021)

Abstract

The study was conducted to know the effect of using Azolla (*Azolla pinnata*) as feed ingredient in dairy cows. The Azolla (*Azolla pinnata*) was cultivated by farmer in different sized plastic tubs in water. Animals were divided randomly into two equal groups; one group was fed on commercial concentrate feed (SKM) without Azolla supplementation and another group was fed with Azolla in commercial concentrate feed (SKM) at the ratio of 1:1 (1.5 kg Azolla

+ 1.5 kg commercial concentrate feed (SKM). All the animals were monitored daily for milk yield during the period of supplementation. The animals were maintained under proper managemental conditions. Animals were duly vaccinated and dewormed. Animals were milked twice daily (5 am and 5 pm) by full hand milking. Milk yield was measured by milk measuring pails. Register was maintained for recording for individual cows performance. Azolla fed group showed a significant ($P < 0.005$) increase upto 10.43 % in milk production.

¹Corresponding author : Email : sureshkumar19742017@gmail.com

Key words: Azolla, dairy cows, milk production, feeding.

Azolla (*Azolla pinnata*), is a floating water fern and its use for feeding cattle in India has been slow and sporadic due to poor yield, storage difficulties and labour difficulties. It is most economical and efficient feed substitute for livestock to increase milk and meat production. Azolla is rich in protein, essential amino acids, carotenoids, vitamins, growth promoters and minerals. It contains 20.0 to 25.5% protein, 3.1% fat, 34.9% carbohydrates, 8.5 to 11.7% cellulose and essential amino acids. Carbohydrates and oil contents are very low in Azolla. High protein and low lignin content contribute for its better digestibility by livestock. Azolla may serve as a valuable protein supplement for many species viz, sheep, goat, pig, rabbits and poultry apart from dairy cows.

Materials and Methods

A study was conducted on crossbred dairy cows (n = 14) in the third stage of lactation at Perali village of Perambalur district. The Azolla (*Azolla pinnata*) was cultivated by farmer at home in different sized plastic tubs filled with water. Animals were divided randomly into two equal groups; one group was fed on commercial concentrate feed (SKM) without Azolla supplementation. Another group was fed with Azolla mixed with commercial concentrate feed

(SKM) in the ratio of 1:1 (1.5 kg Azolla + 1.5 kg concentrate). All the animals were monitored daily for milk yield during the period of supplementation. The animals were maintained under proper managemental conditions. Animals were duly vaccinated and dewormed. Animals were milked twice daily (5 am and 5 pm) by full hand milking. Milk yield was measured by milk measuring pails. Register was maintained for recording performance of individual cows. The data was statistically analysed. (Snedecor and Cochran, 1994).

Results and Discussion

Milk yields of dairy cows fed with or without Azolla, recorded at 15 days interval is shown in Table 1. There was significant ($p < 0.05$) increase in milk production of dairy cows supplemented with Azolla. Increase in milk production started after one week of Azolla supplementation, which further increased upto next four weeks of time and thereafter it became constant at that level. Milk yield increased by 10.43 % after Azolla supplementation in dairy cows. All the treated animals were apparently healthy during the course of supplementation. There was no adverse effect on palatability of Azolla mixed feed by the animals. The results of present study agreed with Pillai *et al.* (2005) who reported that fresh Azolla increased 10-15% milk production in dairy cattle and saved 20-25% of commercial

Table 1. Fortnightly milk production performance of dairy cows fed without and with Azolla for 12 weeks

Period	Milk production / cow (Litre)	
	Group -I (n =7) Fed on commercial concentrate feed (SKM) without Azolla (3 Kg)	Group -II (n =7) Fed with Azolla mixed with commercial concentrate feed (SKM) in the ratio of 1:1 (1.5 kg Azolla + 1.5 kg concentrate)
0-15 days	114.00 ± 0.06	117.98 ± 0.70
15-30 days	115.17 ± 0.02 ^b	126.18 ± 0.05 ^a
31-45 days	116.87 ± 0.13 ^b	130.21 ± 0.08 ^a
46-60 days	116.83 ± 0.09 ^b	130.22 ± 0.08 ^a
61-75 days	116.81 ± 0.10 ^b	129.60 ± 0.09 ^a
76-90 days	116.14 ± 0.10 ^b	129.50 ± 0.13 ^a
Average	115.97 ± 0.50	127.28 ± 0.83

Values bearing different superscripts in column differed significantly ($P < 0.05$).

regular feeds. Increase in milk production might be due to high protein and minerals content of Azolla with low lignin content that contribute for better digestibility and nourishment. Azolla is an efficient livestock feed and is rich in protein, essential amino acids, carotenoids, vitamins, growth promoters and minerals (Basak *et al.*, 2002). The observation in the present study is also in accordance with Khare *et al.*, (2014) who reported that when Azolla replaced mustard oil cake in lactating cow, there was significant ($p < 0.05$) increase in milk yield. Present finding in the value of milk production is lower than the observation of Gauri *et al.*, (2012) who observed an increase of 15-20%. The result indicated that Azolla may serve as a valuable protein supplement for dairy cows.

References

- Basak, B., Pramanik, M.A.H., Rahman, M.S., Tarafdar, S.U. and Roy, B.C. (2002) Azolla (*Azolla pinnata*) as a feed ingredient in broiler ration. *International Journal of Poultry Science*, 1: 29-34.
- Gauri-Mahadevappa, D., Sanganal-Jagadeesh, S., Gopinath, C.R. and Kalibavi C.M. (2012) Importance of Azolla as a sustainable feed for livestock and poultry - A review. *Agricultural Reviews*, 33: 93-103.
- Khare A, Baghel R P S, Gupta R S, Nayak S, Khare V, Patil A, Sharma R, Tomar R and Singh V P (2014) Milk production of indigenous cattle fed supplements of mustard oil cake or azolla meal (*Azolla filliculoides*).
- Pillai, P.K., Premalatha, S. and Rajamony, S. (2005) Azolla: A sustainable feed for livestock. *LEISA India*, 21(3): 26-27.
- Snedecor, G.W. and Cochran, W.G. (1994) *Statistical Methods* (8th edn.). Iowa State University Press, Ames, Iowa, USA.

Indian Vet. J., October 2020, 97 (10) : 16 - 19

Diagnosis and Therapeutic Management of *Craspedorrhynchus spathulatus* Infestation in the Captive Population of *Milvus migrans*) at Zoological Garden, Thiruvananthapuram, Kerala, India

Khan Sharun¹, M. Vysakh Mohan, Bindu Lakshmanan and Jacob Alexander

Kerala Veterinary and Animal Sciences University, Pookode, Kerala.

(Received : September, 2021 49/21 Accepted : October, 2021)

Abstract

The chewing louse of genus *Craspedorrhynchus* (Phthiraptera: Ischnocera: Philopteridae) comprises of several species that are restricted to the avian order Falconiformes and Accipitriformes found worldwide. The morphological features of this genus includes large, highly chitinised trapezoidal head, medially and laterally interrupted marginal carina, five segmented antennae with tapered apical end, pre-marginal and ventral carinae surpassing the anterior dorsal plate, three pairs of

legs terminating into tarsal claws, and well chitinised lateral abdomen. Treatment with the synthetic pyrethroid, cypermethrin, eliminated the lice infestation. The present study reports and documents the morphological characteristics and therapeutic management of *Craspedorrhynchus spathulatus* (Giebel, 1874) chewing lice identified in the captive population of black kites (*Milvus migrans*) housed at the Zoological Garden, Thiruvananthapuram, Kerala, India.

Key words: Black Kite, Chewing lice, *Craspedorrhynchus*, *Milvus migrans*, Phthiraptera

Chewing lice (Phthiraptera) are consid-

¹Corresponding author : Email: sharunkhansk@gmail.com