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Effect of dietary supplementation of giant African snail juveniles (*Achatina fulica* Ferussac) to local chicken breeds under deep litter system

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Abstract
The experiment was carried out at the Poultry Farm, University of Agricultural Sciences, Dharwad to know the effect of supplementation of juveniles of giant African snails (GAS) with normal feed of poultry and their combination in the diets of local chicken breeds and also evaluated in terms of feed intake, growth performance and egg laying capacity of the chickens. The study revealed that, significantly maximum body weight gain of chicken (825.98 g) and feed consumption (100%) were recorded in poultry feed alone treatment (60 g/bird/day) followed by poultry feed (30 g/bird/day) + snail (20/bird/day) . With respect to egg laying capacity of the chickens, the poultry feed alone treatment recorded significantly higher eggs (203) followed by poultry feed + snail (91 eggs) and least weight gain and eggs were recorded in snail alone treatment (56 eggs).

Keywords: Giant African snail, poultry, feed, chickens, diet, supplement

Introduction
Several methods have been studied to minimize the cost of poultry feed by reducing poultry mineral supplementation in poultry production. Poultry feed provide significantly to the cost of animal and it is of 60-65 per cent of the total cost of production. Higher production cost of the animal and lower outcome leads to high market rate. Reducing feeding cost is a primary issue for enhancing of poultry production. This can be achieved by use of giant African snail (*Achatina folica* Ferussac) shells and its meat to get nutrient requirements as the giant African snails were found infested many crops like cereals, commercial crops, vegetables, fruits and ornamentals. The damage was seen in most of the districts of Karnataka on field and horticultural crops. In Hubli taluka of Dharwad District severe infestation noticed all along the drainage canal covering Mavanur, Katnur and Giriyala and other villages where *Arunda donax* L. a very common weed is abundant which serves as good hiding /resting place. The problem has still intensified in this ecosystem because of congenial micro climate especially, the humid environment with sewage water leading to breeding of snails and availability of perennial crops like sapota, mango, guava and mulberry (Rafee *et al*. 2013) [1] The shells of snails contain mainly calcium and meat had higher amount of proteins.
According to David and Kompiang (1981) [2] giant African snail meal contains approximately 60 per cent protein, 2 per cent calcium, 8 per cent phosphorus, 4.35 per cent lysine, 1 per cent methionine, and 6 per cent cystine on a dry matter basis. Its Metabolizable energy (ME) was 14.2 MJ/kg (3400 kcal/kg) dry matter. In poultry dietary sources of Calcium for layers can be met out by use oyster shell and limestone powder. Both sources provide calcium in the form of calcium carbonate, and each contains about 38 per cent calcium (Lesson *et al*. 2005) [3]. Further, many researchers also opined that bio-control of snails by using ducks, chickens and other birds. However, the main purpose of the study was to utilise the available source of calcium and other essential elements through snails as well as to manage snails through chickens. Hence, the present study was undertaken to know the response of chickens to dietary (calcium) supplementation through snails (juvenile of 2-4 g weight) with poultry feed under caged condition and in turn its application in the management of snails in agricultural as well as horticulture crops.

Materials and Methods
The study on feeding potential of local chickens on juvenile snails of *A. fulica* was carried out at poultry farm, UAS, Dharwad from June to November, 2013.

Eight to 10 weeks old local poultry birds were selected for study with three treatments *Viz*., i) poultry feed alone @ 60 g/day/chicken, ii) snails alone weighing 2-4 g @ 40 snails/day/chicken and iii) both poultry feed 30 g + 20 snails/day/chicken. For each treatment five birds were selected and each bird considered as a replication. The experimental birds were housed individually in well ventilated small rooms provided with artificial lighting under deep litter system. Observations were taken daily on number of snails fed by chickens for a period of three and half months (June 2013 to September 2013) . Further, total percentage of snails fed by each chicken, weight gained and number of eggs laid from each bird was computed at monthly interval. The breaking quality of the egg was also assessed in all the three treatments by using Software- Exponent Texture analyser TA.XT+ stable micro systems, UK

Results and Discussions

Feeding potential of chickens on juvenile snails is presented in table 1 and revealed that chickens fed 100 per cent on poultry feed alone treatment followed by snail alone treatment with 90.27 per cent and only 79.96 per cent consumption was observed in snail+ poultry feed treatment.

Chickens body weight gained with respect to differential treatments the highest body weight of 825.98 g was recorded in poultry feed alone (60 g/bird/day) followed by poultry feed (30 g/bird/day) + snail (20/bird/day) with 708.75g and lower body weight of 450.43 g was gained in snail alone (40 snails/bird/day) (table 1). The results with respect to egg lying recorded, the poultry feed alone recorded significantly more (163.0 eggs) followed by poultry feed + snail (86.0 eggs) and least egg laying was registered in only snails are fed (49.0 eggs) (table 2). The local poultry birds were preferred more of poultry feed which contains all the essential nutrients for growth and development hen compared to juvenile snails which were having high amount of protein and calcium but not all other nutrients as required by chicken dietary. Though birds preferred feeding on snails alone (90.27%) but the weight gained was below the normal and hence egg laying capacity and healthy looking of chickens were affected. The quality of eggshell measured in terms of breaking quality revealed that, breaking quality of eggshell was higher in normal feed (4.811) followed by only snail treatment (4.610) and least in snail + feed treatment (3.420) . The observations with respect to commencement of egg laying of chickens, the normal egg laying was noticed in poultry feed alone treatment while, 15 days delay in egg laying was observed in combination of poultry feed+ snail and 30 days delay when snails alone were provided as dietary food.

In the present study the chickens were fed with raw field collected small snails along with shells and poultry feed which is concurrence with reports of Creswell and Kompiang (1961) [4] who stated that raw snails have inhibitor that depressed growth of the chickens when provided snail meal more than 10 per cent in diets, while if you boil raw snails for 15-20 min absolutely overcame the negative impact on the chickens. Vahid *et al.* (2014) [5] revealed that broilers fed diets with high amount of citrus brown snail powder (1 and 1.5%) had lower growth rate and low availability of nutrients in snail meal decreased growth performance of broiler chickens (Maurice *et al*. 1984) [6], due to the negative effects of the higher levels of calcium and ash on nutrients and ME utilization (Carre, 1990) [7]. Delay in egg laying as well as reduction number of eggs laid might due to poor nutrient contents in snails which are not able to meet complete nutritional requirements of poultry birds either for growth/development or egg laying. The trial conducted by El-Deek *et al*. (2002) [8] revealed that increasing dried giant snail meal (*Theba pisana*) of more than two per cent of the diet leads to decreased productive performance and dressing percentage. However, several authors Peterson 1957 [9]; Srivastava, 1970 [10]; Shah, 1992 [11]; Srivastava, 1992 [12], Teo, 2001 [13] and Peter *et al.* 2004 [14] reported the bio control of snails by using ducks, chickens and guinea fowls (Peter *et al.* 2004 [14]. The contrasting results obtained in the present investigation may be due to artificial feeding of snails in confined area. Further, the studies at the field level are essential to assess the role of different bird's species in giant African snail management.

Table 1: Assessment of juveniles of giant African snails as dietary supplementation to local poultry breeds of chickens

Sl. No.	Treatment	Amount of feed and snails consumed by poultry bird (%)					Weight gain (g)				
		June	July	August	September	Average	June	July	August	September	Average
1	Poultry feed alone (60 g/bird/day)	100 (89.96) *	100 (89.96)	100 (89.96)	100 (89.96)	100.00 (89.96)	541.20	809.60	1004.40	948.70	825.98
2	Snail + Poultry feed (20 snails/bird/day) + (30 g feed/bird/day)	73.14 (58.77)	85.71 (66.77)	81.00 (64.13)	79.97 (63.12)	79.96 (63.20)	528.50	618.00	817.30	871.20	708.75
3	Snail alone (40 snails/bird/day)	91.71 (73.27)	89.36 (70.96)	88.57 (70.25)	91.43 (72.99)	90.27 (71.87)	394.10	383.50	470.40	553.70	450.43
	S.Em±	0.39	0.37	0.38	0.47	0.40	11.61	12.16	17.00	14.41	13.80
	C.D. (0.05)	1.66	1.62	1.66	2.05	1.75	50.16	52.54	73.44	62.26	59.60

*Figures in the parenthesis are arc sine transformed values

Table 2: Egg laying performance of chickens when fed with juveniles (2-4 g) of *Achatina fulica*

Sl. No.	Treatment	No. of eggs laid/ 5 chickens				Total No. of eggs laid/5 chickens	Delay in egg laying (days)	Mortality of chickens (%)	Breaking quality of the chicken egg
		June	July	August	September				
1	Poultry feed alone (60 g feed/bird daily)	40.0	98.0	25.0	40	203.0	-	0.0	4.811
2	Snail + poultry feed (20 snails/bird daily) + (30 g feed/bird daily)	18.0	61.0	07.0	05	91.0	15.0	0.0	3.420
3	Snail alone (40 snails/bird daily)	08.0	41.0	05.0	02	56.0	30.0	40.0	4.610

Conclusion

From present findings it can be inferred that providing only juvenile snails as a dietary supplementation to local chickens under confined condition were not suitable because of loss in body weight gain, death of the chickens well as less number of eggs laid by the bird apart from poor activity of chickens and chicken egg breaking quality was also best in poultry feed when compared to only snail and feed + snail treatments. Further studies were needed to provide calcium supplementation through giant African snail shells along with normal food.

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