



Assessment of a New Backyard Poultry Strain “Kaveri” in Farmer’s Situation, Rural Odisha, India

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ABSTRACT

Backyard poultry plays an important role in livelihoods of Indian farmers. Research and Development efforts on developing improved strains to enhance productivity have enhanced farmer’s income. Scaling up of improved strains is based on adaptive trials conducted by extension agencies for location specificity and feasibility. The present study is a first time report in India on the performance of newly released Kaveri poultry in the backyard production system through an on farm trial by Krishi Vigyan Kendra-Khordha, the farm science centre of Indian council of agricultural research at the district level. Kaveri birds have characteristic features like low early chick and laying mortality, excellent flock uniformity, early sexual maturity, withstanding predators, laying brown colour eggs etc. The participatory trial was organised at 30 farmer’s fields administering participatory approach by providing 300 chicks to the farmers. The biggest gain of Kaveri poultry in the trial was the body weight, which was recorded to be 3200 gm in male and 2800 gm in female birds at the end of 12 months study period compared to the 1750 gm and 1250 gm respectively with the local strains. Kaveri chicks exhibited superiority in their liveability with a mortality rate of 15% during the critical period of the first 10 weeks of their life compared to the most popular backyard improved strain Vanaraja in which it is up to 24% in the backyard system. Majority of the farmers perceived that this strain can withstand predation which scores better than the other improved strains. The study concluded that Kaveri is suitable for backyard farming system and is highly profitable. Attempts were taken in 2016 to link the results of the strain assessment to the mainstream extension at the district for larger adoption of rural communities.

Key words: Backyard poultry, Kaveri, Rural Odisha

INTRODUCTION

Interestingly, rearing poultry birds in the backyards, one of the age old practices in India, is a promising option for rural livelihoods. Today in India poultry is one of the fastest growing sectors that support protein requirements for millions. Trends in the poultry sector provide a striking example of how sector growth does not necessarily go hand in hand with poverty reduction (Mehta et al., 2003; Samanta et al., 2015; Patra and Singh, 2016). Family poultry (or the ‘traditional scavenging’ system), which is based almost entirely on native birds, has been by-passed by the poultry revolution, all the growth virtually occurring in the large-scale ‘confined and intensive’ (or

industrial) sub-sector. By contrast, traditional poultry keeping appears to be a stagnant low-productive sub-sector. The composition of native birds within the poultry strains has dropped from 50% about 30 years ago to about 10% at present (Rangnekar and Rangnekar, 1999).

Livestock and poultry rearing is an imperative factor for improving the nutritional security of the rural poor in India. Rural farmers usually rear desi type chicken having low egg and meat production potential. Most of the backyard poultry production comprises of rearing indigenous birds with poor production performances (Pathak and Nath, 2013; Chakravarthi et al., 2014; Reetha et al., 2016; Patra and Singh, 2016). However, over the

period of time improved strains have been introduced by extension and development agencies. Vanaraja is an example of a superior stock developed by the project directorate on poultry, Indian Council of Agricultural Research (ICAR), Hyderabad for backyard farming in rural and tribal areas of India. It is a choice dual purpose coloured bird and has significantly contributed to the overall economy of the rural people in terms of eggs and meat (Bhattacharya et al., 2005). Development organizations under government of India also have developed improved strains like Kalinga Brown, Chabro, Coloured Cross (Kaveri) etc. (INFPD/FAO/IFAD, 2012).

The potentiality of indigenous birds in terms of egg production is only 50 to 60 eggs/ bird/ year and meat production is also very low (KVK-Khordha, 2015; Patra and Singh, 2016). However, the backyard poultry production can be enhanced by adopting improved strains of chicken that can promise better production of meat and egg. Backyard poultry is a handy and promising enterprise to improve the socio-economic status of farmers in rural areas with low-cost initial investment and high economic return along with guarantee for improving protein deficiency among the poor (Chakrabarti, 2014). Rearing backyard poultry in rural Odisha is a popular livelihood activity and mostly owned by scheduled tribes (63%), scheduled caste (17%) and the rest are from other castes comprising of 20% (Sethi, 2007).

Established in 1977, Krishi Vigyan Kendra (KVK), Khordha, the farm science centre of ICAR works under Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar. The KVK works for the mandated Khordha district in which the present adaptive trial was conducted.

The district has got about 39702 ha of high land, 43499 ha of medium land, 14130 ha of cultivable and 15457 ha of barren land. Animal rearing is one of the major components of existing farming systems of the district. Agro-climatic situation of the district is conducive for rearing cows, buffaloes, sheep, goat, poultry and ducks. Cattle are found in almost all the rural households predominantly for milk and draft purpose. As per the 2012 livestock census report the district has 10675 backyard poultry population, mostly the native strains. Since its inception KVK has been working on its mandatory activities like On-Farm Trials (OFT), Front Line Demonstrations (FLD) and vocational trainings for the animal growers on the latest technologies and improved practices (Ananth et al., 2016). The KVK has successfully assessed and demonstrated backyard poultry strains viz., Vanaraja, Chabro, Gramapriya, CARI Devendra, Rhode Island Red-OR, Kalinga Brown, Aseel, White Leghorn, Black Rock and Coloured broiler. In addition to that KVK

also works on feed management in dairy, mineral supplementation, popularisation of duck farming and many other technologies relevant to dairy, sheep, goat and poultry farming (Ananth et al., 2016). In 2015 and 2016, KVK identified a new poultry strain Kaveri from Central Poultry Development Organisation (CPDO), Bhubaneswar (KVK-Khordha, 2015). The colour pattern of this bird is multicolour with single comb and yellow colour shank and skin. These birds have characteristic features like low early chick and laying mortality, excellent flock uniformity, early sexual maturity, withstanding predators, laying brown colour eggs etc. as reported by CPDO, 2014. The organisation also recommended it as a suitable bird for rural backyard poultry farming. Predation is one of the serious constraints in backyard poultry and withstanding to any predator is the key feature of this strain to be considered for adding in to the backyard poultry production system (CPDO, 2014). The characteristics of the strain as indicated by CPDO is presented in table 1.

The above characteristics might have been reported from the studies under the intensive (confined) poultry production system. However, by understanding the potentiality of the strain KVK conducted an OFT in 2015 and 2016 to assess its suitability and performance in the backyard farming system to feed into the mainstream extension. This paper is based on the results of the OFT conducted by KVK with the following objectives.

To assess the strain in terms of production and feasibility to backyard farming system.

To assess the farmers perception towards adoption of the introduced strain.

To elicit key recommendations and observations of the strain.

The study was conducted in 2015 and 2016 with the financial assistance from ICAR, New Delhi, India.

Table 1. Characteristic features of Kaveri poultry listed by Central Poultry Development Organisation, Odisha, India, 2014

| Serial No. | Characteristics | Values |
|------------|--------------------------|------------|
| 1. | Body weight at 6 week | 750g |
| 2. | Body weight at 20 week | 2000-2200g |
| 3. | Age at sexual maturity | 183d |
| 4. | Hen house egg production | 120 |
| 5. | Hen day egg production | 140 |
| 6. | Egg weight | 55g |
| 7. | Feed consumed/bird/day | 135g |
| 8. | Liveability | 93% |

MATERIALS AND METHODS

Khordha is one of the 31 districts of Odisha, India. Its headquarter bearing the same name is situated near the capital city Bhubaneswar in 85° 37'30"E and 20° 11'N. The district as a whole is divided into two geographical regions viz. South Eastern coastal plains and North Eastern ghats comprising of 10 blocks and 1567 villages with a total agrarian population of 122000. The present OFT was conducted in Tangi block of the district involving 30 farmers from one village. The sample size of the study was 10 chicks/unit comprising of 300 chicks for the study.

The creation system for this study was normally due to low egg production from native birds and other improved strains and most importantly due to high predation in the backyard system. Hence, look out for a new strain was a demand from farmer's perspective. The sanity of animals was taken care and there were no issues pertaining to the community within which it was promoted. The farmers under the study were randomly selected and were approved by KVK-Khordha for conducting the study. In the whole process of the study a veterinarian of KVK-Khordha was responsible to undertake the study from designing and to implement. Farmers who are progressive and innovators, possessing land and traditional poultry units were selected to try out the strain. The trial was conducted with farmers' rearing practice of traditional strains (T1) and recommended practice of improved strain Kaveri (T2). Un-sexed day old chicks were supplied to the farmers free of cost along with initial chick feed, vitamins and vaccines. A pre tested interview schedule was used to collect data on mortality rate, age at sexual maturity, vaccination schedule, disease incidence, body weight, eggs laid and income. Simple percentage analysis was employed to analyse the data pertaining to egg production and body weight gain.

Ethical approval

This research work did not involve the introduction of any intervention in/on birds, or direct collection of cells, tissues or any material from birds.

RESULTS AND DISCUSSION

Process and results of the trial

The need for an on farm trial was well conceived by KVK as poultry growers in the district used to get less egg production and low economic returns from local strains and high mortality in both native strains and the popularised improved Vanaraja strain. The new strain Kaveri was trialled out in 30 units at farmers' field (T2)

compared with the local strain (T1). Each unit comprised of 10 chicks assuming 5 male and 5 female, totalling to 300 chicks. The un-sexed day old chicks were procured from central poultry development organisation, Bhubaneswar and distributed to the selected farmers who are in the practice of rearing local poultry in their backyard. Among the participating farmers, those having recently hatched chicks of local strain were formed into control (T1) groups comprising of 10 chicks/unit for the comparison. Before the trial was initiated, the livelihood status of participant farmers were collected which formed the basis of selection and they were trained on various aspects of care and management of chicks in early life, required medication, feed supplementation, vaccination etc. In addition to that the participatory approach of the trial was also elucidated towards successful accomplishment. Upon implementation of the trial the KVK scientists regularly visited the units in intervals, recorded the observations on each parameter, provided further guidance and demonstrated vaccination technique etc. to them for further use. The trial continued for a period of 12 months and appreciably farmers accepted the vaccination and adopted the practice. The results of the trial are presented in table 2.

The biggest gain of Kaveri poultry in the trial was the body weight, which was recorded to be 3200 gm in male and 2800 gm in female birds at the end of the 12 months study period compared to the 1750 gm and 1250 gm respectively in the local strains. Studies from many states of India indicates that the improved strains had significantly higher achievement than the local chicken in terms of body weight, egg weight, egg production and age at sexual maturity (Vetrivel and Chandrakumarmangalam, 2013; Mohanty and Nayak, 2011; Yadhav and Khan, 2011; Padhi, 2016).

Kaveri chicks exhibited superiority in their liveability in the backyard system with a mortality rate of 15% during the critical period of first 10 weeks of their life compared to the most popular backyard improved strain Vanaraja, in which it is up to 24%. The other principal gain was with egg production which was 163 eggs/ bird/ year in case of Kaveri compared to the 50-60 eggs of local strains. The trial concluded that Kaveri was found to be the best strain to be popularised in the district in comparison to the analyses of different trials conducted over the years by the KVK as reflected in table 3.

The mortality up to 10 weeks was found to be 15% in Kaveri compared to 24% of Vanaraja and 9% of local strain which exhibits superiority of Kaveri over Vanaraja. The total mortality rate from day old stage to adult stage (20 weeks age) for Kaveri, Vanaraja and local strain were

recorded to be 18%, 30% and 10% respectively. From this it is inferred that next to local strain Kaveri has the potential to survive better in the backyard system than other improved strains. Similarly Kaveri birds attained sexual maturity (age at 1st lay) at an average age of 185 days compared to the 190 and 192 days of Vanaraja and local strains respectively. Although the achievement in body weight gain was little less in Kaveri, average being 3000 g compared to the average 3760 g of Vanaraja, still it scores much better in terms of egg and meat production, income generation and farmers' preference. Moreover, this dual purpose bird proves to be viable with its superior egg laying capacity (163 eggs/bird/year) compared to the 150 of Vanaraja and 60 of local strains. The comparative analysis infers that Kaveri is a suitable strain and can be promoted in large scale in the backyard poultry farming system. A comparative economic analysis of rearing Kaveri poultry during the trial is presented below in table 4.

The economics of rearing Kaveri poultry was found to be encouraging in terms of income generation as this strain achieved a better benefit-cost (B: C) ratio (gross return/gross cost). A benefit-cost ratio (BCR)/Profitability Index Rate is an indicator, used in the formal discipline of cost-benefit analysis that attempts to summarize the overall value for money of a project or proposal. In this adaptive trail the B:C ratio with Kaveri was found to be 4.28 compared to 3.81 of local strain. The gross return from a unit of 10 Kaveri birds was Rs. 6860/- comprising the sale of eggs and live birds which infers that the strain is better in terms of investment and returns. Farmers had a net profit of Rs.5260/- through sale of eggs and live birds in contrast to the gross return of Rs.3425/- and net return of Rs.2525/- from local strain. This economic analysis infers that Kaveri provides better income to the rural poultry keepers and helps in augmenting the production of nutritious food products from rural poultry sector.

Table 2. Results of the trial on Kaveri in backyard poultry system during 2014-2016 in Tangi Block of Khordha district, Odisha, India

| Serial No. | Parameter | Results | |
|------------|--|----------------------|----------------------|
| | | FP (T ₁) | RP (T ₂) |
| 1. | Chicks/Unit (No.) | 10 | 10 |
| 2. | Male-Female Ratio | 1:1 | 1:1 |
| 3. | Liveability (%) | 92 | 80 |
| 4. | Body weight (M/F) at sexual maturity (g) | 775/550 | 1950/1800 |
| 5. | Body weight (M/F) in 12 months (g) | 1750/1250 | 3200/2800 |
| 6. | Age at sexual maturity (days) | 192 | 185 |
| 7. | Monthly egg production/bird (nos.) | 5 | 14 |
| 8. | Annual egg production/unit | 280 | 652 |
| 9. | Colour of Egg | Brown | Brown |
| 10. | Annual live weight (kg) produced/unit | 14.5 | 17.15 |

FP: Farmers' practice, RP: Recommended practice, nos.: numbers

Table 3. Comparative performance of Kaveri, Vanaraja and local poultry strains under backyard farming system in Tangi Block of Khordha district, Odisha, India during 2014-2016

| Parameters | Performance of strains | | |
|---|------------------------|----------|--------------|
| | Kaveri | Vanaraja | Local strain |
| Mortality up to 10 weeks (%) | 15 | 24 | 9 |
| Mortality up to 20 weeks (%) | 18 | 30 | 10 |
| Annual Mortality Rate (%) | 20 | 31 | 10 |
| Predation losses (%) | 7.5 | 16.5 | 4.5 |
| Loss due to diseases (%) | 1.5 | 2.5 | 5 |
| Loss due to cold temperature (%) | 12.5 | 13.75 | - |
| Average age at first lay (days) | 185 | 190 | 192 |
| Average body weight at sexual maturity (20-24 weeks) in (g) | 1875 | 2100 | 662.5 |
| Average annual body weight (g) | 3000 | 3760 | 1500 |
| Average annual egg production (numbers) | 163 | 150 | 60 |
| Colour of egg | Brown | Brown | Brown |
| Average Egg weight at 40th weeks (g) | 56 | 62 | 48-50 |

Table 4. Economics of rearing Improved strain Kaveri in the backyard in Tangi Block of Khordha district, Odisha, India during 2014-2016

| Breed/ Strain | Unit size | M/F Ratio | Mortality | Survival | M/F survival | Expenses | Gross cost/ Unit (Rs) | Products | Revenue (Rs) | Gross Return /Unit (Rs) | Net Return /Unit (Rs) | B.C.R |
|-----------------------------|--------------|--------------|-----------|----------|-----------------|---|--------------------------------|---|---|-------------------------------|-----------------------------|-------|
| Native (T ₁) | 10 | 1:1 | 1 | 9 | 4+5 | Chick cost, low cost housing, household grains, medicine etc. (Rs100/bird for 9 birds) | 900 | 280 eggs (Av. 56 eggs/hen from 5 hens) 13.5 kg live wt. (Av.1.5 kg/bird from 9 birds) | 1400 (Rs 5/ egg) 2025 (Rs 150/ kg) | 3425 | 2525 | 3.81 |
| Kaveri (T ₂) | 10 | 1:1 | 2 | 8 | 4+4 | Rs100 as above + cost of supplementary poultry feed, vaccine, vitamins etc.(Total Rs 200/ bird for 8 birds) | 1600 | 652 eggs (Av.163 eggs/hen from 4 hens) 24.0 kg live wt. (Av. 3.0 kg/bird from 8 birds) | 3260 (Rs 5/ egg) 3600 (Rs 150/kg) | 6860 | 5260 | 4.28 |

B.C.R: benefit-cost ratio, Rs: rupees, wt.: weight, Av.: average

Table 5. Poultry farmers' Perception on the Strain Kaveri in Tangi Block of Khordha district, Odisha, India during 2014-2016

| Perception (N=30) | | | |
|-------------------|--|-----------|---------|
| Serial | Perception | Frequency | Percent |
| 1 | Low chick mortality | 22 | 73.3 |
| 2 | Low incidence of diseases | 25 | 83.3 |
| 3 | Strain is capable to withstand predation | 27 | 89.9 |
| 4 | Suitable for backyard | 30 | 100 |
| 5 | High gain with eggs | 30 | 100 |
| 6 | High gain in body weight | 30 | 100 |

Farmer's preference and feedback on the strain

About 83.33% of farmers perceived that Kaveri experienced low incidence of diseases compared to the local strains and this may be due to the reason that farmers seldom vaccinate their local strains against some infectious diseases which account for high mortality rate during disease outbreaks. However, it is a fact that the indigenous birds although low in productivity, they are better resistant to diseases, adaptable to adverse climatic conditions and able to produce even under low input systems (Roy, 2006). About 73.33% of the farmers perceived that Kaveri has low mortality rate which reflects its superiority over other improved strains. Majority of the farmers perceived that Kaveri is a suitable strain and will be a suitable candidate for the backyard farming system. The reason for this perception may due to its high potential for egg production, fast growth rate and other characteristic features which were visible in the trial and hence there was a high response.

About 90% of the farmers perceived that Kaveri is capable to withstand predators. In the backyard system

predation is one of the frequently occurring incidences which incur huge loss to the farmers. The reason may be that the farmers who had reared other improved strains before this trial would have experienced high predation rate and heavy loss. However, local poultry birds have the capability of saving themselves from predators. Predators accounted for up to 88 percent of mortality and that coloured birds had a higher survival rate than white birds (Wickramenratne et al., 1994). Similarly another investigation proves that serious problems were identified in both locations, and particularly in the Udaipur villages, with high mortality rates in chickens and poor hatchability rates. In both locations the project found that for the period under investigation predation was a more important cause of mortality than disease (Conroyet al., 2005). A livestock development project funded by the Danish International Development Agency in Koraput district of Orissa found that predation was 'an important problem' and noted that the main predators were crows, foxes, hyenas and wild cats (Das et al., 2003). Therefore Kaveri strain is likely to

be preferred by many farmers as predation is one of the key constraints in backyard poultry farming.

CONCLUSION

Overall results of this on farm trial confirm that the poultry strain Kaveri has a coupled advantage over the other strains in terms of production and escaping predation. The result highlighting the striking factor on this strain is its capability to withstand predators. This will fetch a better score for it than the other strains for further uptake as predation is the major cause of loss in backyard poultry system. On the other hand the economic returns also show a positive trend that will be beneficial for the farmers compared to the native strains. Hence, extension efforts needs to be intensified towards promoting this strain for larger adoption with large scale demonstrations and other extension methods as the country popularised the Vanaraja strain. KVK has planned to work on this strain for a few years more to make farmers aware of this strain and also to promote through the state schemes. Hence, it could be concluded that Kaveri is a superior strain and can be promoted in backyards of rural Odisha and in other parts of India.

Competing interests

The authors declare that they have no competing interests.

Consent to Publish

The authors have full consent to publish this paper.

Author's contribution

Bijeya Kumar Banja identified the new strain under study, designed and implemented the adaptive trial. Pavanasam Natarajan Ananth worked on identification of villages, farmers and also to record the observations and worked on designing paper manuscript, data analysis and also on editions. Surendra Singh, Pragyana Ranjan Sahoo and Pallipuram Jayasankar were involved in the monitoring team for this study.

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