

Comparative Evaluation of Fertility and Hatchability of Different Crosses of Chicken with White Leghorn for Backyard Poultry

B. H. Ahmed, F. Saleem* and S. Zahid

Poultry and Wildlife Program, National Agricultural Research Centre, Islamabad, Pakistan

ABSTRACT

The major contribution of backyard poultry consumption in improving per capita nutrients level is well documented. Further improvement would be possible by crossbreeding with the highly producing breeds like white with the locally used in backyard poultry which is low producer. Fertility and hatchability are important parameters that should be studied before finalizing the cross breeding program for backyard poultry. A study was, therefore, conducted to compare the hatching parameters of five different breeds of chicken crosses. A total of 1,500 hatching eggs from each group namely A, B, C, D and E and the male for breeding with white leg horn used are of different breeds i.e Naked Neck (NN), Fayumi (FY), Rhodes Island Red (RIR), Aseel (AL) and Desi (DI) respectively. In each group, one cock of each breed of the chicken kept for breeding with white leg horn. namely A,B,C,D and E i.e Naked Neck, fayumi, RIR, Aseel and Desi respectively. The fertility and hatchability from fertile eggs was higher in Group A followed by group C, B, E and D. The dead in germ was same except for group D. Dead in shell was more for the group D and followed by E,C,A and B. No abnormal chick was observed in any of the group. The average chick weight was more in Group C and least was observed in group E. It is concluded that cross breeding locally available naked Neck chickens with white leghorn produces a better breed to local ecotype for back yard poultry in terms of egg traits, hatchability and fertility. Such superiority can be exploited to upgrade the genetic potential of local ecotype and thus improve backyard poultry production. It is further suggested that the productive performance of these crosses should be analyzed before the final conclusion of best cross for backyard poultry in same ecotype.

INTRODUCTION

Provision of adequate food for population and assuring them an environment free from hunger and malnutrition is the responsibility of all civilized government. The 15-20% of the world population is not getting sufficient food to meet minimum nutritional requirements for a healthy and productive life (Anonymous, 1998). The poor nutritional status is prevalent due to lack of sufficient energy and protein in the food or due to insufficient availability of food. A balanced diet is essential for good physical and mental health, vigor and productive capacity of the people.

In all nutrients Proteins play an important role in the formation of balanced human diet. There are mainly two sources of proteins i.e. animals and plants. The human diet in Pakistan is deficient in animal proteins, as approximately 66% Pakistanies are deficient in proteins (Maqbool, 2002). The requirement of proteins is 102.7 g per person per day, while only 69.61 g per person per day is being used in the country. The main sources of animal proteins in Pakistan are beef, mutton, milk, poultry meat and eggs (Anonymous, 2003)

There are two type of poultry raring Commercial poultry farming and the backyard or rural poultry. The term backyard chicken designates rearing of chicks on small

*Corresponding Address:
drfarrukhrana@yahoo.com

scale (10-12 birds) for family use and up to some extent for generation of cash income (Qureshi, 1985). Bessei (1989) and Farooq and Mian (2001) reported that chicken kept on small farms under extensive management system considerably contributed to the cash income of the rural families in most of the third world countries. Prior to the establishment of commercial poultry sector in Pakistan, household chicken was the only source of eggs and poultry meat supply (Mian, 1994). The commercial poultry sector has been expanded rapidly during the last three decades by importing and rearing highly productive birds, yet rural poultry is still a significant source of egg and meat in the country. Such birds are expected to produce high number of eggs if properly managed and introduction of high producing blood through cross breeding. However, mortality rates would be high and egg production would be poor if the chicken are not properly vaccinated and managed. Naila et al. (2001) reported higher mortality in non-vaccinated flocks, while Farooq et al. (2002) reported poor production performance of backyard chicken under poor management condition.

The high yielding birds are naturally lack of immune-competence against the common poultry disease, as much of the nutrients are divert for the growth and less is available for immunity. On the other hand the desi/rural have well adapted to the environment and got the immunity against prevailing diseases. The intensive poultry population concentrated in relatively small area is always a constant threat for disease outbreaks quite often. Concentration of heavy poultry population in small area also causes environmental pollution. There are serious arguments for the large scale intensification of poultry rearing from the economical and environmental points of view.

Fertility and hatchability are major determinant of profitability in the hatchery

enterprise (Peter et al, 2008) and it became more vital as for as parent stock are kept to produce high producing crossbred. Wolc and clori, 2009 describe that the fertility and hatchability are susceptible to genetics and environmental factors arising from various source and there are several factors that influence hatchability of eggs like pre-incubation storage time, fertility and incubation condition such as temperature, humidity, ventilation, position, egg turning and candling. Zelleke et al. (2005) concluded that both sexes are responsible for the poor fertility in Rhode Island Red. Other factors that can have considerable influence on hatchability include nutrition of the breeding hen, genetic constitution of the embryo, disease, egg size, age and shell quality King' ori (2011). Egg weight, fertility, hatchability and late embryonic mortality varied greatly between feed regimes (Lariviere et al., 2009). Brillard (2003) described that hen ability to mate successfully, store sperm, ovulate and egg cell and finally produce a suitable environment for the formation and development of the embryo all factors that affect in production of fertile eggs in other hand (Wilson et al., 1979; Brillard, 2003) and Gheisari et al. (2011) mention fertility also depends on the ability of cock to mate successfully, quantity of semen deposited.

The experiment was designed to evaluate fertility and hatchability of different crosses of the chicken Asel, Fayumi, Necked neck, Desi and RIR cocks with White leghorn hens to produce high producing crossbred for backyard poultry.

MATERIALS AND METHODS

The study was carried out at Poultry and Wildlife Program at National Agricultural Research Centre, Islamabad. The experiment was divided into five groups namely A, B, C, D and E and in which the male for breeding with white leg horn used are of different breeds, i.e., Naked Neck (NN), Fayumi (FY),

Rhodes Island Red (RIR), Aseel (AL) and Desi (DI) respectively. In each group one cock of each breed of the chicken kept for breeding with white leg horn. The selection has been done in the male flock of above mentioned five breeds and also for 30 White leghorn laying hens of same age and size for each group. The birds were housed in two sides open concrete house filled with saw dust. All birds expose natural daylight and the artificial light up to 16 hours. All birds were given standard commercial layer feed and water according to the age and need of the birds i.e., 100gms /bird at the age of laying. The groups were provided with laying nests filled with straw dust for laying eggs. A total of 1500 hatching eggs were collected, 300 eggs from each group in triplicate. Selection of hatching eggs was done on their uniform size, good shape and clean shell. The average weight of hatching eggs was calculated in grams by using digital balance. All eggs cleaned with the disinfectant before transport to hatchery. At hatchery all eggs were fumigated with potassium permanganate and formalin and set in a same incubator which was already disinfected. Candling was done on 7th and 14th day of incubation for the identification and removal of infertile and dead embryos. On 21st day the number of hatched chicks

including the normal, abnormal chicks, dead chicks in shell and after hatch counted separately according to the groups. Digital balance was used to measure the average weight of day-old chicks.

RESULTS

The different hatchability traits as influenced by breeding of different cocks of the chicken kept for breeding with white leg horn that were five breeds i.e Naked Neck (NN), Fayumi (FY), Rhodes Island Red (RIR), Aseel (AL) and Desi (DI) is presented in table 1. The average weight of eggs (g) was highest for Naked Neck (NN) (59.1) followed by RIR and Aseel (59.1) and Fayumi (57.9) and least being Desi (50.1). The average weight of day old chicks (g) was highest for RIR (36.1) followed by Aseel 35.9, naked neck (NN) (34.6), Fayumi (33.4) and least being Desi (30.2). Hatchability from fertile eggs (%) was higher for naked neck (90.6%) then the RIR (87%), Fayumi (84.6%), Desi (82.6%) and least 55% in Aseel. The dead in germ was highest in Aseel (5.4%) and followed (4.6%) in Desi and rest was same as 2.4%. there was no abnormal day old chick was observed in any treatment.

Table 1 Effects of different crosses of white leghorn layer on the different hatchability traits

Variable	WLHxNN	WLHxFayumi	WLHxRIR	WLHxAseel	WLHxDesi
Average egg weight (g)	59.3	57.9	59.1	59.1	50.1
Average chick weight (g)	34.6	33.4	36.1	35.9	30.2
Fertility (%)	90.6	84.6	87	55	82.6
Hatchability from fertile eggs (%)	85.3	84.6	83.9	57.5	76.2
Dead in germ	2.0	2.0	2.0	2.3	2.0
Dead in shell	2.4	2.4	2.6	5.4	4.6

DISCUSSION

The result of the study showed that the differences in breed on the different hatchability parameters. As these characteristics are genetically controlled

(Merat, 1990, Islam et al., 2002). The results of this experiment are in line with the fact that fertility and hatchability performance of eggs are genetically depended on genetic factors. (Islam et al., 2002) also in agreement with that fertility and hatchability are inter

related traits and varies among breeds and (Malago and Baitilwake, 2009) also concluded that Fertility was influenced by crossing two divergent strains. In the present study, fertility and the hatchability trade affected by the difference in cross breeding. In this study dead in germ found to be no significantly different but the late embryonic mortality or the dead in shell in different crosses observed this is in agreement with the finding by Durmus et., (2010) who reported fertility late period embryonic mortality dead in shell hatchability of the fertile eggs and early embryonic mortality differs between genotypes. Also Fairchild et al., (2002) who also reported that egg fertility and embryonic mortality among factors that affect hatchability. The current study also had significant affect on the day old chick weight. This is in agreement with Raju et al., (1997) who reported that day old chicks weight increased significantly with increase in egg weight and could be due to difference in genetic makeup of chicken. The late embryonic mortality is not uncommon and may be due to non-genetic factors. For example Weis (1991) observed from his study on guinea fowls that the highest embryonic mortality occurred before hatching. A number of factors including egg age (Tarongoy et al 1990), storage condition (Brah and Sandhu 1989), age of flock (Rogue and Soares 1994; Buhr 1995), system of husbandry and rearing technology (Weis 1991), mating system (Gebhardt-Henrich and Marks 1991), incubation relative humidity and eggs turning angle (Permsak 1996) have been shown to influence the hatchability of poultry eggs. Improved management of eggs during incubation may therefore help to increase the hatchability of eggs.

Conclusion

The breed had significant effect on the different hatchability parameters namely fertility and hatchability. In present it has been observed that cross of White leghorn

and Naked Neck found best in fertility and hatchability with minimal dead in shell and dead in germ percentage. It observed that there was no abnormal chick found in any of treatment group. It is concluded that cross breeding locally available naked Neck chickens with white leghorn produces a better breed to local ecotype for backyard poultry in terms of egg traits, hatchability and fertility. Such superiority can be exploited to upgrade the genetic potential of local ecotype and thus improve backyard poultry production but it is suggested that the productive performance of these crosses should be analyzed before the final conclusion of best cross for backyard poultry in same ecotype.

REFERENCES

- Anonymous. 1998. Food for all. World Food Programme, United Nations, Rome, Italy.
- Anonymous. 2003. Economic Survey of Pakistan, Ministry of Finance, Planning and Development, Government of Pakistan, Islamabad.
- Bessei, W. 1989. The problems of extension in rural poultry production in developing countries. *European Poultry Science*, 53: 1-7.
- Brah, G. S., and J. S. Sandhu. 1989. Preincubation storage of guinea fowl eggs in cooling cabinet vs. room: Effect on hatchability components. *Tropical Agriculture (Trinidad and Tobago)*, 66: 265-268.
- Buhr, R. J. 1995. Incubation relative humidity effects on allantoic fluid volume and hatchability. *Poultry Science*, 74: 874-884.
- Brillard. J. P. 2003. Practical aspects of fertility in poultry. *World's Poultry Science Journal*, 59:441-446.
- Durmus, I., H. Goger, S. E. Demirtas and S. Yurtogullari. 2010. Comparison of rapid and slow feathering egg layers

- with respect to egg production and hatchability parameters. *Asian Journal of Animal and Veterinary Advances*, 5:66-71.
- Elibol, O., S. D. Peak and J. Brake. 2002. Effect of flock age, length of egg storage and frequency of turning during storage on hatchability of broiler hatching eggs. *Poultry Science*, 81: 945-950.
- Fairchild, B. D., V. L. Christensen, J. L. Grimes, M. J. Wineland, and L. G. Bagley. 2002. Hen age relationship with embryonic mortality and fertility in commercial turkeys. *Journal of Applied Poultry Research*, 11: 260-265.
- Farooq, M. and M. A. Mian. 2001. Contribution of backyard chicken to household economy produced by non member and member farmers of Women in Development under Sarhad Rural Support Program in Charsadda, Pakistan. A case study. *Journal of Rural Development and Administration*, 33: 89-97.
- Farooq, M., N. Gul, N. Chand, F. R. Durrani, A. Khurshid, J. Ahmed, A. Asghar, and Zahir-ud-Din. 2002. Production performance of backyard chicken under the care of women in Charsadda, Pakistan. *Livestock Research for Rural Development*, 14:1.
- Gebhardt-Henrich, S. G. and H. L. Mark. 1991. The effect of switching males among caged females on egg production and hatchability in Japanese quail. *Poultry Science*, 70:1845-1847.
- Gheisari, A. A., P. Ghayor, S. Eghbal-Saeid, M. Toghiani and A. A. Najafi. 2011. Effect of different dietary levels of rapeseed meal on reproductive performance of iranian indigenous breeder hens. *Asian Journal of Animal and Veterinary Advances*, 6: 62-70.
- Islam, M. S., M. A. R. Howlider, F. Kabir and J. Alam. 2002. Comparative assessment of fertility and hatchability of Barred Plymouth Rock, White Leghorn, Rhode island Red and White Rock hen. *International Journal of Poultry Science*, 1: 85-90.
- Jayarajan, S. 1992. Seasonal variation in fertility and hatchability of chicken eggs. *Indian Journal of Poultry Science*, 27: 36-39.
- Maqbool, A. 2002. Marketing of commercial poultry, poultry meat and eggs in Faisalabad City. M. Sc. Thesis University of Agriculture, Faisalabad, Pakistan.
- Mian, M. A. 1994. Poultry production. In: "Animal Husbandry", National Book Foundation, Islamabad, Pakistan.
- Malago, J. J., and M. A. Baitilwake. 2009. Egg traits, fertility, hatchability and chick survivability of Rhode Island Red, local and crossbred chickens. *Tanzania Veterinary Journal* 26: 24-36.
- King'ori, A. M. 2011. Review of the factors that influence egg fertility and hatchability in poultry. *International Journal of Poultry Science*, 10: 483-492.
- Lariviere, J. M., C. Michaux, F. Farnir, J. Detillux, V. Verleyen and P. Leroy. 2009. Reproductive performance of the ardennaise chicken breed under traditional and modern breeding management systems. *International Journal of Poultry Science*, 8: 446-451.
- Mebratu, G. 1997. Experiences from an FAO Poultry Development Project in Ethiopia. In: Sustainable Rural Poultry Production in Africa. Sonaiya, E. B. (Ed.). International Livestock Research Institute, Addis Ababa, Ethiopia, pp: 57-65.

- Merat, P. 1990. Pleiotropic and Associated Effects of Major Genes. In: Poultry Breeding and Genetics, Crawford, R. D. (Ed.). Elsevier, Amsterdam, The Netherlands, pp: 429-467.
- Mussaddeq, Y., S. Daud and S. Akhtar, 2002. A study on the laying performance of cross (FAYx RIR) chicken under different plans of feeding. *International Journal of Poultry Science*, 1:188-192.
- Naila, C., M. Farooq, F. R. Durrani, A. Asghar and K. Pervez, 2001. Prevalence and economic ramification of Newcastle disease in backyard chicken in Charasadda. *Online Journal of Biological Sciences*, 1: 421-424.
- Orunmuyi, M., O. O. Oni, I. A. Adeyinka and O. E. Asiribo. 2007. Genetic parameter estimates for plasma alkaline phosphatase activity and reproductive traits in two strains of rhode island chickens. *Asian Journal of Animal Sciences*. 1: 76-81.
- Peters, S. O., O. O Shoyebo, B. M. Ilori, M. O. Ozoje, C. O. N. Ikeobi and O. A. Adebambo. 2008. Semen quality traits of seven strains of chicken raised in the humid tropics. *International Journal of Poultry Science*, 7:949-953.
- Permsak, S. 1996. Effect of water spraying and eggs turning angle to efficiency of duck hatchability. Proceedings of the 34th. Kasetsart University Annual Conference, Bangkok (Thailand), 22-26.
- Qureshi, M. S., 1985. Annual Report, Poultry Research Institute, Rawalpindi, Pakistan. pp: 26.
- Raju, M. V. L. N., M. M. Chawak, N. K. Praharaj, S. V. R. Rao and S. K. Mishra. 1997. Interrelationships among egg weight, hatchability, chick weight, post-hatch performance and rearing method in broiler breeders. *Indian Journal of Animal Science*, 67:48-50.
- Rogue, L., and M. C. Soares. 1994. Effect of egg shell quality and broiler breeding age on hatchability. *Poultry Science*, 73: 1838-1845.
- Robel, E. J. 1990. Composition and method for increasing the hatchability of turkey eggs. (Monograph). *Agris*. 1993-1994.
- Tarongoy, J. J., Eduave. F and Gemota. E. K. 1990. Age as a factor of hatchability. *SWUCA-Journal of Agricultural Research (Philippines)*, V:22-26.
- Weis, J. 1991. Analysis of fertility, hatchability and egg quality indices in reproduction breeding of guinea fowls. *Acta Zootechnica Universitatis Agriculturae (CSFR)*. 47: 5-15.
- Wilson, H. R., N. P. Piesco, E. R. Miller, and W. G. Nesbeth, 1979. Prediction of the fertility potential of broiler breeder males. *World's Poultry Science Journal*, 35: 95-118.
- Wolc, A. and V. E. Olori. 2009. Genetics of hatchability-egg quality from the perspective of a chick. Assessed <http://www.cabdirect.org/abstracts/20103247216.html>
- Zelleke, G., R. P. Moudgal and A. Asmare. 2005. Fertility and hatchability in RIR and WL breeds as functionally modified by crossing them in alternate sex combination (*Gallus domesticus*). *British Poultry Science*, 46:119-123.