Assessment of Improved Brooding Medium for Increasing Hatchability of Eggs by Deshi Broody Hens

Ananta Kumar Das[1], Sudipta Mukherjee[2] and Ajoy Kumar Singh[3]

1. SMS, 2. Programme Coordinator, Howrah Krishi Vigyan Kendra (BCKV), Jagatballavpur, Howrah, West Bengal,
3. Director, ATARI, Zone II, ICAR, Salt Lake, Kolkata-700 097

Corresponding author e-mail: drsudiptamukherjee@rediffmail.com

Paper Received on November 12, 2015, Accepted on December 05, 2015 and Published Online on December 10, 2015

ABSTRACT

This study aimed to assess improved brooding materials for increasing hatchability of eggs by deshi broody hens. Investigation was carried out in three villages of Jagatballavpur block, Howrah district (WB) to identify the farmers' practice which exists moreover using approximate 500 gm rice husk spread on to a bamboo basket but results in poor hatchability and drew intervention as Technology Option-1 and Technology Option-2 formulated taking 100 gm chopped paddy straw and 250 gm husk spread on to a gunny bag set in a bamboo basket; and 1 kg saw dust, 250 gm husk and 50 gm chopped paddy straw spread on to a bamboo basket, respectively. A total of 300 hatchable eggs of Rhode Island Red (RIR) chicken and defined brooding materials were provided to the 30 numbers of deshi broody hen keepers for setting 10 numbers of eggs under each broody hens under three different defined technology options each covering 10 numbers of individual brooding units during the end of January, 2014. Candling was done to discard unfertile eggs on 7th and 14th day of the setting, investigated for dead embryo in shell if any and accordingly maintained records for each step of hatching. Per cent dead embryo in shell, fertility, total egg set (TES) and fertile egg set (FES) basis hatchability and benefit cost ratio (BCR) were calculated under each broody hens and these calculated data was analyzed by Least Squares Analysis of Variance (Harvey, 1990) taking technology options as fixed effect in the statistical model followed by CD Test at 5 per cent level of probability of significance to assess the critical differences among the least squares means under different defined technology options. Least squares analysis of variance elucidates that all the traits varied significantly among the three defined technology options but CD test ($p<0.05$) clarified that technology option-1 and 2 did not differ significantly for percent dead embryo in shell and fertile egg set basis percent hatchability. Similarly, farmers' practice and technology option-1 did not differ significantly for percent fertility. This investigation suggested that technology option-2 was the best for all the traits studied followed by technology option-1 and farmers' practice.

Key words: *Brooding medium; Broody hens; Bead embryo in shell; Fertility; Hatchability; Benefit cost ratio;*

There are many ways of hatching day-old chicks or ducklings. One is practiced by the broody hens or ducks by nature under rural conditions. A broody hen or duck can hardly hatch 10-15 eggs depending on the size of body and egg. Surprisingly little is known about the efficiency of improved brooding medium used for incubation of eggs. Commercial hatcheries and research institutes use electric incubators equipped with automatic devices for hatching eggs. Despite of huge demand of farmers for quality chicks and ducklings, the hatchery operation in most of the developing countries is not still well organized. It may be due to some identified constraints of initial high investment for set-up of hatchery and poultry breeding farm, non-availability of hatchable eggs either from farmers' door or poultry breeding farm which may be organized at each corner of the block, shortage of electricity, irregular or intermittent electric supply, frequent power break-down, lack of stand-by generators to combat a situation arising from power failure, lack of adequate training of personnel and inadequate supply of day-old chicks or ducklings from hatchery to the rural area. This situation

has received the attention of the poultry scientists and also of some non-governmental organizations, who are working hard to improve the economic condition of the people through poultry rearing. By the way they developed rice husk incubator which is less risky, less expensive and capable of hatching huge eggs at a time but labour-intensive and could be used in remote areas where there is a high demand for day-old chicks, cheap labour, lack of electricity and inadequate facilities to transfer day-old chicks from commercial hatcheries to chick rearing units. But broody hens were more efficient than rice husk or electric incubators in producing day-old chicks (*Roy et al., 2004*) but in 10-15 numbers in a single brooding. The present on-farm trial has been undertaken aiming to improve the efficiency of natural incubation by broody hens incorporating improved brooding medium.

METHODOLOGY

Interventions undertaken: Investigation was carried out in three villages of Jagatballavpur block, Howrah district (WB) to identify the farmers' practice for setting of natural incubation of eggs by indigenous local broody hens which was found to exist moreover using approximate 500 gm rice husk spread on to a bamboo basket but results in poor hatchability and drew intervention as Technology Option-1 and Technology Option-2 formulated taking 100 gm chopped paddy straw and 250 gm husk spread on to a gunny bag set in a bamboo basket; and 1 kg saw dust, 250 gm husk and 50 gm chopped paddy straw spread on to a bamboo basket, respectively.

Experimental units and selection of broody hens: Thirty (30) numbers of indigenous local broody hens belong to 30 numbers of deshi poultry birds keepers were selected and grouped under 3 defined technology options including farmers' practice and replicated 10 times per group. The weight ranges of broody hens were from 900 g to 1250 g. It was assumed that the hen was ready for brooding when hens displayed typical broody sound, occupied her nest, refused to leave nest and tried to gather eggs on the nests, and these behaviors lasted at least two days. When a hen laid 6 eggs, then it was collected and put in the predetermined incubation boxes for acquainting it. Until the hen had 7 to 12 eggs, it sat irregularly. Once when the hen started sitting after laying 16-17 eggs, then all eggs were removed and replaced with selected 10 numbers of RIR hatching eggs in stipulated incubation boxes with defined brooding materials.

Brooding husbandry adopted: Before setting, all broody hens were treated with two drops of Ivomac on the skin in the neck region to remove both internal and external parasites. Although a compound layer grower ration containing ME-2536.00 Kcal/Kg and CP-16.78 per cent CP, Cal-1.15 per cent and P-0.40 per cent, fresh drinking water and dust bath were provided for the broody hens in the incubation house, even then the broody hens left their nest at least once a day and stayed outside about 20 to 30 minutes. A water container was kept in the incubation house to maintain proper humidity. The eggs were candled by torchlight on the 7th and 14th day of incubation. The fertile eggs showed a small dark spot that looked something like a "spider" on 7th day of incubation. Infertile eggs were clean and only showed the shadow of the yolk. All clear and early dead embryos were removed after candling. From the 19th days of incubation, the chicks inside the eggs started piping. They were hatched with no assistance from anyone, about 24 hours after they first cracked their shells. Each hatch was taken off on the 21st day of incubation. All the shells and dead in shells were removed immediately on completion of each batch.

Traits assessed: Per cent dead embryo in shell, fertility, total egg set (TES) and fertile egg set (FES) basis hatchability and benefit cost ratio (BCR) were calculated under each broody hens.

Statistical treatments and analysis: Data was analyzed by Least Squares Analysis of Variance (*Harvey, 1990*) taking technology options as fixed effect in the linear model: $Yij = \mu + Si + eij$; where, Yij = observation on jth individual belonging to ith technology option, μ = population mean, Si = fixed effect of ith technology option and eij = random error associated with mean zero and variance s2. Critical Difference (CD) Test at 5 per cent level of probability of significance was followed to assess the critical differences among the least squares means under different defined technology options.

RESULTS AND DISCUSSION

Least squares means (± standard errors) (Table 2) of percent dead embryo in shell, percent fertility, TES percent hatchability, FES percent hatchability and BCR in farmers' practice were 45.00 ± 6.77 per cent, 83.00 ± 3.72 per cent, 38.00 ± 5.24 per cent, 49.38 ± 6.28 per

Table 1. Least squares analysis of variance of percent dead embryo in shell and fertility, total egg set (TES) and fertile egg set (FES) basis hatchability of Rhode Island Red (RIR) chicken eggs and benefit cost ratio (BCR) when hatched out by *deshi* broody hens.

Source of variation	df	Mean sum of squares				BCR
		Dead embryo in shell (%)	Fertility (%)	Hatchability (%)		
				TES	FES	
Technology option	2	337.000**	803.333**	6043.333***	4357.492***	1.504***
Remainder	27	45.852	138.148	274.444	393.869	0.079

***p<0.01, ***p<0.001; df denotes degree of freedom for deshi broody hens each broods 10 numbers of hatchable eggs.*

Table 2. Least squares means ± standard errors of percent dead embryo in shell and fertility, total egg set (TES) and fertile egg set (FES) basis hatchability of Rhode Island Red (RIR) chicken eggs and benefit cost ratio (BCR) when hatched out by *deshi* broody hens.

Factors#	*No.	Least squares means ± standard errors				BCR
		Dead in shell (%)	Fertility (%)	Percent hatchability		
				TES	FES	
Farmers' practice	10	45.00±6.77^{b}	83.00±3.72^{b}	38.00±5.24^{c}	49.38±6.28^{b}	0.65±0.09^{c}
Technology option 1	10	16.00±6.77^{a}	82.00±3.72^{b}	66.00±5.24^{b}	80.82±6.28^{a}	1.11±0.09^{b}
Technology option 2	10	11.00±6.77^{a}	98.00±3.72^{a}	87.00±5.24^{a}	88.89±6.28^{a}	1.42±0.09^{a}

Means with different superscripts within a column differ significantly ($p<0.05$).

Farmers' Practice, Technology Option-1 and Technology Option-2 define 500 gm husk spread on to a bamboo basket; 100 gm chopped paddy straw and 250 gm husk spread on to a gunny bag set in a bamboo basket; and 1 kg saw dust, 250 gm husk and 50 gm chopped paddy straw spread on to a bamboo basket, respectively.

*No. of observations (broody hens).

cent and 0.65 ± 0.09, respectively. Corresponding estimates in Technology Option-1 were 16.00 ± 6.77 per cent, 82.00 ± 3.72 per cent, 66.00 ± 5.24 per cent, 80.82 ± 6.28 per cent and 1.11 ± 0.09; and in Technology Option-2 were11.00 ± 6.77 per cent, 98.00 ± 3.72 per cent, 87.00 ± 5.24 per cent, 88.89 ± 6.28 per cent and 1.42 ± 0.09. In a study of hatchability of chicken eggs, *Dev et al. (1993)* reported 17.1 per cent embryonic mortality in rice husk incubator and 4.6 per cent in electric incubator, whereas Roy et al., 2004 reported 4.8 per cent embryonic mortality in rice husk incubator or by broody hens and 5.5 per cent in electric incubator. *Dev et al. (1993)* reported that dead-in-shell rates in the rice husk incubator and electric incubator were 20.4 per cent and 10.1 per cent, respectively. *Roy et al. (2004)* reported that dead-in-shell rates in the rice husk incubator, by broody hens and electric incubator were 5.5 per cent, 2.0 per cent and 3.1 per cent, respectively. In the present study, percent dead embryo in shell accounts for percent embryonic mortality plus percent dead-in-shell rates and present estimates were too much higher than earlier reports; this might be due to lack of optimum conditions of temperature and relative humidity during the winter monsoon. After 12 days of incubation when chicken embryos mature rapidly, they produce enough heat due to metabolism. Sometimes lack of special care from farmers' end may cause failure to maintain this temperature in the brooding nest, though broody hens are experienced enough to maintain optimum conditions of temperature and humidity, and the electric incubator is well equipped to maintain optimum conditions. The highest percentage of hatchability of TES and FES were recorded in technology option-2 which was in agreement with the earlier findings on the highest percentage of hatchability by broody hens in rural Bangladesh (92.4%) followed by electric incubator (89.3%) and by rice husk incubator (87.9 %) (*Roy et al., 2004*). Farmers' practice and technology option-1 demonstrated poor results excepting FES percent hatchability in case of technology option-1 (Table 2). Lowest average hatchability on total egg set basis (60.8±1.56 per cent and 63.1±1.51%) in rice husk based natural incubation under broody hen in North West Frontier Province (NWFP), Pakistan was also reported by *Farooq et al. (2003 & 2000)*. In the present study, least squares analysis of variance elucidates that all the

traits varied significantly among the three defined technology options (Table 1) but CD test ($p<0.05$) clarified that technology option-1 and 2 did not differ significantly for percent dead embryo in shell and fertile egg set basis percent hatchability (Table 2). Similarly, farmers' practice and technology option-1 did not differ significantly for percent fertility (Table 2). This investigation suggested that technology option-2 was the best for all the traits studied followed by technology option-1 and farmers' practice.

CONCLUSION

The implication from the findings of the present study is that the improved brooding materials for incubation of eggs had some effect on percent dead embryo in shell, fertility, hatchability and benefit cost ratio (BCR) and package of 1 kg saw dust, 250 gm husk and 50 gm chopped paddy straw spread on to a bamboo basket may be advocated as improved brooding materials for incubation of eggs by deshi broody hens.

REFERENCES

Dev, N.C.; Hamid, M.A.; Islam, M.A. and Howlider, M.A.R. (1993). Hatchability of chicken eggs in five different incubators in Bangladesh; *Poultry Advisor,* **26**: 645-650.

Harvey, W.R. (1990). User's guide for LSMLMW, mixed model least squares and maximum likelihood computer programme. Ohio State University (Mimeograph).

Roy, B.C.; Ranvig, H.; Chowdhury, S.D.; Rashid, M.M. and Faruque, M.R. (2004). Production of day-old chicks from crossbred chicken eggs by broody hens, rice husk incubator and electric incubator, and their rearing up to 6 weeks. *Livestock Research for Rural Development,* **16** (3).

Farooq, M.; Shoukat, K.; Asrar, M.; Shah, Mussawar; Durrani, F.R.; Asghar, A. and Faisal, S. (2000). Impact of Female Livestock Extension Workers (FLEWs) on rural household chicken production in Mardan division. Livestock Research for Rural Developmen, 12 (4): http://www.cipav.org.co/lrrd/lrrd12/4/faro124.htm

Farooq, M.; Javed, K.; Durrani, F.R.; Irfanullah, K. and Chand, N. (2003). Hatching performance of backyard hens in Peshawar, *Pakistan. Livestock Research for Rural Development,* **15** (9).

• • • • •