

Original Research Article

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## Growth performance and survivability of CHABRO - Black strain at high altitude

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### Article Info

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### Abstract

There is no native chicken breed available for backyard rearing at high altitude of Leh-Ladakh region, due to the prevalent extreme climate, hypobaric-hypoxia and cold stress. Hence, commercial as well as backyard poultry rearing of various poultry breeds are not profitable in high altitude of Leh-Ladakh region, as it is causing economic loss due to their poor growth and survivability. A study was undertaken to assess the growth performance and survivability of dual-purpose CHABRO-black strain (CPDO, Chandigarh) at high altitude i.e. of Leh-Ladakh region. Two hundred and forty (240) unsexed day old chicks of dual-purpose CHABRO-black line strain were inducted at Leh: a high altitude region of height of around 11,500 feet above mean sea level. Weekly body weight of the birds was recorded till the 19<sup>th</sup> week. Feed conversion ratio (FCR) and mortality were recorded during the growing phase i.e. up to 8<sup>th</sup> week. The result indicated that one kilogram in body weight gain was attained at around 60 days of age, which showed slower rate as compared to their weight gain in low altitude region. Feed conversion ratio was found to be in range of 1.5-3.0 during the growing phase. Further, mortality was found to be 3.5% during the first week of induction of these chicks at high altitude and thereafter, mortality was completely reduced after three weeks. Pattern of mortality was because of ascites and impaction. This study revealed that CHABRO-black strain chicken is having good growth performances and survivability at high altitude. However an elaborative study is required on growth and production parameters, mortality, genetic adaptability etc. to better understand their economics and acceptability by local population of Leh-Ladakh.

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### Introduction

High Altitude comes between the ranges of 1,500-3,500 meters which is 4,900-11,500 feet above mean sea level (MSL). Thus, Leh-Ladakh, India is a high altitude region, as it is situated at 3500 meter MSL and has

harsh climatic conditions characterized by low oxygen (hypoxia), atmospheric pressure (hypobaric), relative humidity and temperature. Such extreme environment is challenging for poultry farming in Leh-Ladakh, and therefore commercial poultry farming in this region remain scares and less encouraging (Biswas et al.,

2010). Besides it, there are other factors like non-availability of native chicken germplasm (Swati, 2020), poor egg hatchability (Bharti, 2019), non-availability of poultry ration and day old chicks (Biswas et al., 2011) which makes unsuccessful poultry farming in this region. But the demand for fresh chicken meat is huge among the local people and service personnel's deployed in this region. Therefore, this supply-demand gap is fulfilled through procurement of live birds or chicken meat from low altitude areas of Delhi, Punjab and Haryana (DIHAR Annual Report 2018). However, this exercise again faces difficulties during winter season due to inclement weather and closing of road for six months. In spite of it, some progressive farmers manages to keep their poultry stocks by bringing DOC via air flight from lowland area but in this process, high rate of mortality (~15%) among birds were observed and were not even cost effective (Chuskit et al., 2021). Therefore, attempts are taken to establish high altitude adapted chickens by rearing different breeds of chickens from lowland for number of generations. DIHAR (Defence Institute of High Altitude Research) a premiere DRDO organization in Leh working on agro-animal cultivation and production, is working for development of high altitude adapted lines breeding stocks for future poultry production. For this, pure line of Red Cornish, White Rock, Black Rock, Kadaknath, etc. were kept for several years to develop new breeding lines through line breeding and selection based on their growth performance and survivability. In present study, Chabro-Black stain was procured from CPDO, Chandigarh to evaluate their growth and survivability in Leh-Ladakh, and whether this strain can be used for backyard poultry rearing. This study will further help to understand whether crossbred chickens or pure line would be suitable in Leh.

## Materials and methods

### Experimental birds

A total of two hundred and forty (240) unsexed day old chicks of dual-purpose CHABRO-black line strain were obtained from CPDO (Central Poultry Development Organization), Chandigarh and were air-lifted to DIHAR, Leh, a high altitude area (3500 meters above mean sea level). The birds were reared in deep litter intensive system in modified poultry house. The birds were fed with the ready-made poultry ration and were provided adlib fresh water throughout the trial. All the chicks were vaccinated with LaSota strain vaccine. The

study was performed in the month of June when the temperature of Leh remains pleasant and ambient for chicken rearing was recorded in range between 20-25°C. The work has been approved by the Institutional Animal Ethical Committee (IAEC).

### Body weight

To study their growth performances and survivability, average body weight was recorded every week upto 19<sup>th</sup> week.

### Feed conversion ratio (FCR)

Feed consumption was checked daily up to 56 days (8 weeks). Furthermore, weekly feed consumption ratio which is the ratio between feed intake and weight gain was calculated by the following formula (Albab et al., 2022).

$$\text{FCR} = \text{Feed intake (g / day)} / \text{Chicken weight gain}$$

### Mortality

Mortality of the birds was recorded up to 56 days. Mortality percentage was calculated by the number of birds that died divided by the total number of the birds multiplied by 100 weekly.

### Statistical analysis

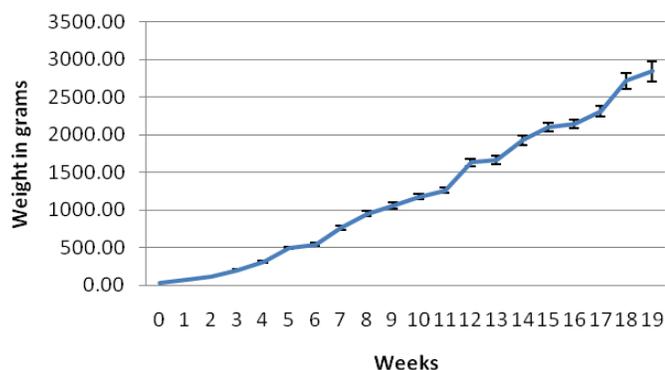
Statistical analysis was performed using SPSS Statistics Version 16.0 software. Comparisons between the weekly data were performed using one-way ANOVA. Differences were considered statistically significant at  $p < 0.05$  and the values were presented as the means  $\pm$  SD.

## Results and discussion

### Body weight

The average body weight of day old chick (DOC) in the present study was found to be 33.1 g. Average body weight of dual-purpose CHABRO-black strain at high altitude was recorded on week basis and it was found that they attained 1kg body weight in between 8-9 week i.e. around 60 days of age. Two kilograms body weight was attained at the age between 14 and 15 weeks i.e., around 100 days which shows a slower growth rate of these birds at high altitude. At the age of 19 week, the average body weight was found to be 2848.13 g.

CHABRO broilers are basically rural meat type birds which are commercially available in multiple coloured plumages and considered fit for backyard poultry farming. Our result clearly shows that the body weight of chicken at high altitude is compromised and have slow growth rate. The overall detailed average body weight of dual-purpose CHABRO-black line strain are presented in Fig. 1.



**Fig. 1:** Average body weight of CHABRO-black strain. \*Length of error bars represents the variability in body weight among birds in particular week.

Successful rearing of poultry is a huge challenge at high-altitude due to the extreme environment prevailing here and even if they grow their growth is compromised. Due to the absence of any native chicken germplasm the demand of fresh poultry meat and egg is huge in this sector. Rearing of different varieties of chicken at high altitude is under trial in order to come up with the best chicken breed to grow in this location.

CHABRO-black line broiler chicken reared at high altitude showed better survivability. The body weight of dual-purpose CHABRO-black line strain DOC on lowland was found to be 42.5 g which is higher than that found in the present study ([http://www.cpdoti.org/poultry\\_varieties.html](http://www.cpdoti.org/poultry_varieties.html)).

In lowland areas, broiler chicken attain 1kg weight at around 5 weeks only and generally acquire weight of 1.6-1.7 kg in 60 days ([http://www.cpdoti.org/poultry\\_varieties.html](http://www.cpdoti.org/poultry_varieties.html)).

There have been few reports suggesting that the normal body weight gain of parental line chicken of different exotic breeds like Red Cornish, Black Rock and White Rock; reared at high-altitude were slower as compared to birds of same breeds from plain region (Swati, 2020). Hassanzadeh et al. (2004) reported that the broiler

chickens reared at lowland grow much faster than broilers reared at high altitude. It was also reported earlier that due to inadequate supply of O<sub>2</sub> at high altitude, the physiological and the growth performances of broiler chicken were altered (Semenza, 2012; Kalia et al., 2017).

It was reported that high-altitude area with low oxygen, low pressure and low humidity with prevailing harsh environmental condition usually hampers rearing of poultry birds is common (Chuskit et al., 2021). Birds from sea-level origin when raised at high-altitude were found to have an altered physiologically; the heart-rate was decreased, the respiratory frequency and the circulating red blood cell concentrations were increased as compared with sea-level birds (Arthur et al., 1959).

### Feed conversion ratio (FCR)

The average chick body weight gain and their feed intake weekly are shown in Table 1. The average FCR of the chicks at high altitude during the growing phase i.e. 0 to 8 weeks was found to be in between 1.5-3, which is acceptable. The detailed of the weekly FCR is presented in Fig. 2. This feed conversion ratio is an indicative of better nutrient utilization by these birds.

**Table 1.** Weekly weight gain and feed intake of CHABRO-black strain.

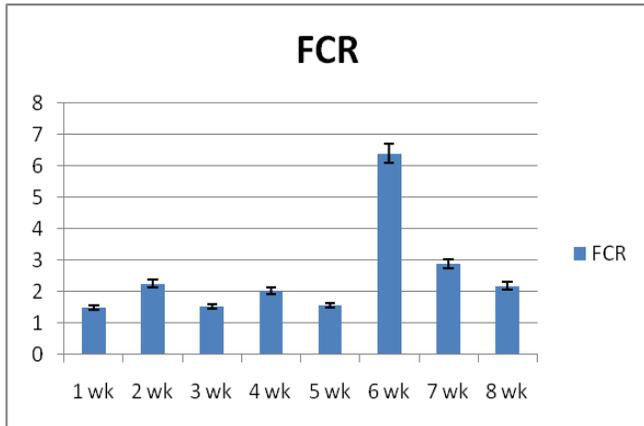
Week	Average weight gain (g)	Average feed intake/ bird (g)	FCR
1 wk	37.3	56	1.49
2 wk	46.38	105	2.26
3 wk	90.87	140	1.54
4 wk	107.60	245	2.04
5 wk	177.66	280	1.57
6 wk	48.60	315	6.4
7 wk	218.60	385	2.9
8 wk	191.60	420	2.19

### Mortality

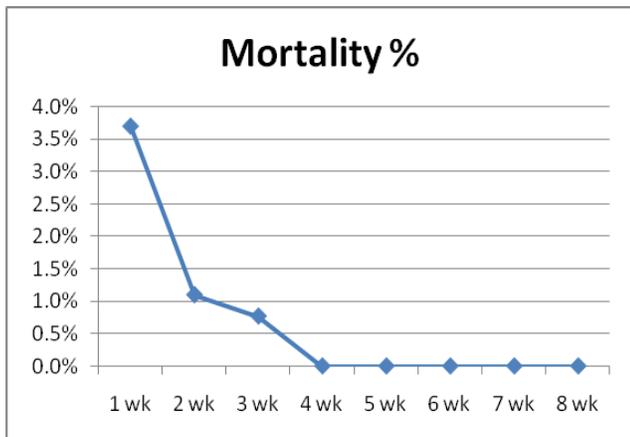
The mortality of CHABRO-black line strain was maximum during the 1st week of rearing and thereafter the mortality was significantly reduced (Fig. 3). In the present study, the maximum mortality was observed during the first three week, post-mortem finding indicated impaction and ascites. In high altitude, ascites are very common especially in the growing birds.

The impaction is mostly observed in cold condition due to poor water intake, which was commonly observed in

present study. Low humidity is a common climatic attribute in high altitude which also causes dryness in an organism and feed. Therefore, proper drinking water supply is required to reduce impaction in birds. Luke warm water should be provided to chicks at extreme temperature.



**Fig. 2:** FCR of CHABRO-black strain. \*Length of error bars represents the variability in FCR among birds in particular week.



**Fig. 3:** Mortality percentage of CHABRO-black strain.

Observation of early mortality in chicks is common as observed in the present study. Similar pattern in mortality was observed in Hansli, CSML and Hansli×CSML cross-birds under the intensive system of rearing (Ekka et al., 2016). Ascites is a common phenomenon observed in hypoxic condition especially in high altitude region. It had been reported that hypobaric-hypoxia is an important physiological cause of ascites due to greater metabolic stress for energy requirement and thereafter suppressing liver function (Buys et al., 1999; Kalia et al., 2017).

The overall health of experimental birds was normal and the body appearance was found to be fit at high-altitude harsh environment. The comb and wattle also looked normal in case of both male and female birds (Fig. 4).



**Fig. 4:** CHABRO-black male and female chicken reared in DIHAR campus.

### Conclusions

The present study revealed better growth and survivability of CHABRO-black line strain chicken at high altitude. However a comprehensive study is required to assess their suitability and acceptability for backyard poultry rearing in Leh-Ladakh.

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### Competing Interests

The authors declare that they have no competing interests

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