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Comparative study of growth and production performance of Kroiler, Vanraja and *desi* birds under extensive system of rearing in cold, arid area of Kargil, Ladakh

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Kargil and Leh district together formed the greater Ladakh region and is called as cold desert characterized by a very harsh climate and a short/limited agriculture season. People remain isolated from rest of the country for about six months in a year and face difficulty towards food security as opined by Chumikchan 2016 "As winter is about to set in, scarcity fear of basic food items looms large" in this part of country. Under these conditions reduced importance of the subsistence base for staple foods is reflected in current consumption patterns causing seasonal shortfalls and low dietary diversity leading to a phenomenon described as 'hidden hunger' (Dame and Nüsser 2011). Compared to agriculture, role of livestock including poultry in achieving the food security in this particular region goes beyond its traditional role. But when the Indian poultry industry has made tremendous and remarkable progress and reached 3rd in egg production and 7th in chicken meat production in the world (Watt Executive Guide, 2015); picture is far worse in the cold, arid parts of Himalaya, where it is a backyard venture constraints by several factors, viz. lack of hatcheries, day-old chicks and poultry feed in this particular region (Biswas *et al.* 2010). Even though, backyard poultry farming is indicative of the traditional domestic poultry with low input that are typically maintained by rural families (Akinola and Essien 2011) which are improved or unimproved genetic stock, relatively raised in small numbers extensively or semi extensively (Pederson 2002) and are classified as dual purpose (Majumder 1989), and could not make a headway in this particular region. Except very few farmers who have established small scale broiler farms, in cities like Leh and Kargil, they practice 'backyard' level with few local birds, which otherwise can prove to be a useful contribution to dietary protein intake and incomes of resource poor households (Acamovic *et al.* 2005, Rajkumar *et al.* 2010) particularly during lean (harsh winter) period. Further, no literature is available regarding the performance of present improved popular variety of backyard poultry in this part which otherwise already proved to be better compared to local birds including other Himalayan region, viz. Sikkim. With this background it was felt imperative to carry out a research activity to ascertain growth and production performance of Kroiler, Vanraja and local birds (of Kargil) under extensive system of rearing in cold arid area of Kargil Ladakh.

Present Study was carried out in Kargil district of Ladakh Union Territories (Erstwhile Kargil district of Jammu and Kashmir). KVK Kargil has been in operation for several years and fulfilling its mandate for the socio-economic upliftment of farmers of rural area. As part of front line demonstration (FLD) and to popularize the improved breed of poultry under backyard poultry farming, the KVK distributed Vanraja and Kroiler among the tribal families in two blocks namely Kargil and GM Pore which were chosen purposively because of more existence of backyard poultry, facilitating better comparison among the different breeds under investigation. From such blocks, three (3) villages were selected (Kaksar, Akchamal and Minji representing Kargil and Chaskore, GM Pore and Trespone representing GM Pore block) for the present investigation. Accordingly data were collected from 594 (198 each from *Desi*, Kroiler and Vanraja birds) birds across the blocks. However, to calculate the productive performance of the birds, only 95 birds were used. Data obtained from the experiments were analyzed statistically following the standard methods of Snedecor and Cochran (1994) using SPSS 20.0

Body weight gain: Genetic variation always has a effect on body weight gain in birds (Mohammed *et al.* 2007, Devi and Reddy 2005, Chatterjee *et al.* 2007) as observed in the present study. Table 1 indicated a highly significant difference between improved variety (Vanraja and Kroiler) and the *Desi* birds belonged to male sex across the different age group. Contrary to this, body weight gain of female birds and overall body weight gain including both the sexes differ significantly among all the three breeds of birds across the different age.

Significant difference of body weight gain between *Desi* and improved breed (either Kroiler or Vanraja) is quite justified and reported by several previous researchers (Islam *et al.* 2014, Sree *et al.* 2017 and Singh *et al.* 2018) while compared with Vanraja, but Kroiler found to gain

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Table 1. Body weight gain of birds at different age in cold desert (N=594)

Sex	Body weight gain (kg) in different breeds		
At six months of age			
	Kroiler	Vanraja	Desi
Male birds	2.001^{b}±0.026	1.956^{b}±0.021	0.720^{a}±0.018
Female birds	1.821^{c}±0.029	1.618^{b}±0.021	0.535^{a}±0.016
Total	1.911^{c}±0.020	1.787^{b}±0.019	0.628^{a}±0.014
Independent sampled t-test	T (196)=4.642 P=0.001	T (196)=11.364 P=0.001	T (196)=7.636 P=0.001
At one year of age			
Male	4.636^{b}±0.054	4.559^{b}±0.053	1.594^{a}±0.020
Female	3.224^{c}±0.020	2.729^{b}±0.051	1.365^{a}±0.018
Total	3.930^{c}±0.058	3.644^{b}±0.075	1.480^{a}±0.016
Independent sampled t-test	T (196)=24.158 P=0.001	T (196)=24.555 P=0.001	T (196)=8.308 P=0.001
At two year of age			
Male	5.002^{b}±0.043	4.920^{b}±0.040	2.003^{a}±0.018
Female	3.672^{c}±0.049	3.222^{b}±0.029	1.739^{a}±0.023
Total	4.337^{c}±0.058	4.071^{b}±0.065	1.871^{a}±0.017
Independent sampled t-test	T (196)=20.330 P=0.001	T (196)=34.508 P=0.001	T (196)=9.054 P=0.001

significantly higher body weight compared to Vanraja birds in the present investigation at different age contrary to the findings of Bhonsle, (2009) which might be due to effect of different climatic condition and rearing methods as reported by Islam *et al.* (2017) who find highly significant difference of body weight gain in Vanraja birds from first week itself, in different agro-climatic zone of Sikkim.

A cursory look on Table 1 further reveals that irrespective of breed and age, all the breeds under investigation differ significantly (P<0.01) in terms of body weight gain between two sexes. Male birds are found to gain significantly more weight compared to female birds, similar with the findings of Panigraphy *et al*. (2016) in Vanraja and *desi* birds across 7th week, Bhonsle (2009) in Kroiler and Vanraja across 10th week of age, Sharma *et al.* (2015) in Kroiler and *Desi* chicken. Among all the breeds under investigation, Kroiler seemed to be more consistent in body weight gain in the cold desert as depicted in Fig 1. Compared to *Desi* and Vanraja birds.

Production performances: Production performances were assessed in terms of age at first egg lay, number of eggs produced per year and egg weight and presented in Table 2. Body weight is the direct reflection of growth and its influence the production and reproduction of birds as reflected in the Table 2. Kroiler bird was found to be

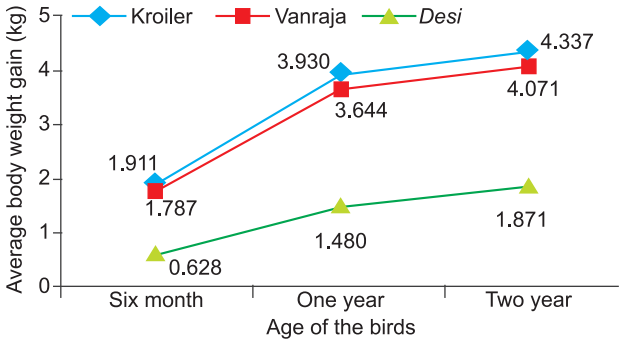

Fig. 1. Total body weight gain trend among different breeds

significantly earlier in laying of eggs compared to Vanraja and *Desi* birds. Although Vanraja bird also significantly earlier compared to *desi* birds in laying her first egg, Kroiler takes nearly half time as compared to *Desi* birds. The age at first egg lay in Vanraja is about 210 day comparatively higher than earlier findings by Sing *et al*. (2018) and Sree *et al.* (2017) who reported the figure as 181 and 152 days respectively, indicating wider gap in different condition as reported by Singh *et al.* (2017) within a region; sufficiently justifying the present value under cold desert condition. Regarding the Kroiler, it took about 180 days to lay their first egg under filed condition similar to earlier report of about 184 days by Islam *et al.* (2018). Similarly, the *desi* birds found to lay first egg lately as compared to other researchers findings namely Islam *et al*.(2014) and Singh *et al.* (2018) who found the corresponding figure is about 180 and 201 days respectively.

With respect to number of eggs produced during one year cycle (beginning from day of first egg lay), there exist a significant difference among all the varieties under study. Similar to age at first laying, Kroiler showed a better result producing higher number of eggs followed by Vanraja and *Desi* birds. Kroiler produced about 182 during 1st year of production cycle which was much higher compared to report of Bhonsle (2009) who found the corresponding figure as merely 150. Similarly, the present investigation recorded an annual egg production for Vanraja bird as 172 numbers; much higher from earlier findings of Sree *et al.* (2017), Sahu (2016) and Singh (2017) according to whom the corresponding figures were 160, 117 and 91–112 respectively. Thus the present investigation indicates a better performance for both Kroiler and Vanraja birds in cold desert region.

Table 2. Production performances of different breeds of birds in cold desert (N=95)

Different parameter	Breeds			
	Kroiler	Vanraja	*Desi*	Overall
Age at laying (months)	6.116^{a}±0.087	7.137^{b}±0.083	11.811^{c}±0.156	8.354±0.161
No of eggs per year	182.958^{c}±1.317	172.442^{b}±1.590	112.853^{a}±1.731	156.084±2.039
Weight of eggs (gm)	69.189^{b}±2.067	66.621^{b}±1.845	53.421^{a}±0.930	63.077±1.054
Live weight post laying	1.820^{c}±0.030	1.615^{b}±0.022	1.367^{a}±0.019	1.601±0.018

Figures having same superscript do not differ significantly across the rows.

Weight of eggs showed a similar trend along with age at first laying and total egg production. A significant difference also observed in this character between improved and *Desi* birds.

SUMMARY

KVK-Kargil under its FLD programme, distributed Kroiler and Vanraja birds to selected tribal families belonging to two blocks of Kargil District and that were considered for the present investigation to carry out a comparative growth and production performance of the improved supplied variety with the existing deshi birds. The results revealed that body weights gain varies significantly among Kroiler, Vanraja and *Desi* chicken across the different age and were found to be 1.91±0.02, 1.78±0.02 and 0.62±0.014 at six months; 3.93±0.05, 3.64±0.07 and 1.48±0.01 at one year and 4.33±0.05, 4.07±0.06 and 1.87±0.01 at two years of age respectively. Similar trend were also observed in respect of all production parameters, be it age at first laying, numbers of egg production or egg weight. Numbers of egg produced during first cycle reveals the figure as 182.95±1.31,172.44±1.59 and 112.85±1.73 for Kroiler, Vanraja and *Desi* birds respectively and which differ significantly among each other. The study concludes that the Kroiler and Vanraja have better adaptability under free range system of production in cold arid condition of Kargil and can be a better alternative for existing *Desi* birds to augment the production and met the nutritional demand.

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