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Studies on organoleptic and nutritional properties of Kadaknath birds in different agro-climatic zones

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ABSTRACT

The present research investigations were focused on assessment of breed conservation strategies under in situ and ex situ environmental conditions along with alterations in organoleptic and nutritional qualities closely related to the managemental aspects of the habitat in which Kadaknath birds dwell. A total of 48 live Kadaknath male birds of 20 weeks of age were procured. Out of these 24 were procured from government poultry farm, Jhabua and 24 from Jaiv Vividhata Prabhandhan Samiti. Birds were randomly divided into four groups each containing six birds. The hot carcasses were kept in refrigerator at 4 ± 1°C. Next day carcasses were deboned and lean meat was collected and stored at -20°C till further use. The experiment was designed to compare the changes in various quality parameters of meat raised under different agro-climatic zones and various managemental conditions. Birds of two agro-climatic zones Sagar and Jhabua were divided into four groups each having six birds. The different meat quality parameters studied were sensory attributes, pH, moisture, protein, fat, total ash, thiobarbituric acid (TBA) and free fatty acid (FFA) values. In the present study the organoleptic and nutritional qualities did not differ significantly ($p > 0.05$) in the groups reared under different agro-climatic zones. On the basis of above findings it is concluded that different agro-climatic conditions of Madhya Pradesh did not cause any difference in carcass characteristics of Kadaknath birds.

Keywords: Kadaknath bird; sensory attributes; organoleptic properties; nutritional properties

INTRODUCTION

Kadaknath, locally known as Kalamasi is a native breed of poultry inhabiting Jhabua, Alirajpur and Dhar districts in western parts of Madhya Pradesh. There are three main varieties of Kadaknath breed like Jet Black, Pencilled and Golden Kadaknath. In all the three varieties most of the internal organs exhibit intense black coloration which is due to the deposition of melanin pigment in the connective tissue of organs and in the dermis (Rao and Thomas 1984). It tolerates extreme climatic conditions of summer heat and cold winter stress and thrives very well under minimal management inputs like poor housing, no healthcare or supplementary feeding while exhibiting appreciable degree of resistance to diseases compared to exotic breeds of fowl (Thakur et al 2006). A Kadaknath bird lays around 80-90 eggs annually and is not a good brooder. This is the only breed of poultry having black flesh which is considered not only a delicacy of distinctive taste but also of higher iron content. The present investigations were focused on assessment of breed conservation strategies under in situ and ex situ environmental conditions along with alterations in organoleptic and nutritional qualities closely related to the managemental aspects of the habitat in which these birds were dwelling.

MATERIAL and METHODS

The work was conducted in Department of Livestock Products Technology, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh.

A total of 48 live Kadaknath male birds of 20 weeks of age were procured. Out of these 24 were procured from government poultry farm, Jhabua and 24 from Jaiv Vividhata Prabhandhan Samiti, Sagar and brought to the Department of Livestock Products Technology for further study. Birds were randomly divided into four groups each containing six birds. Slaughtering and dressing were carried out following standard procedure under humane conditions. The hot carcasses were kept in refrigerator at 4 ± 1°C. Next day carcasses were deboned and lean meat was collected and stored at -20°C till further use.

The experiment was designed to compare the changes in various meat quality parameters of Kadaknath meat raised under different agro-climatic zones and various managemental conditions. Birds of two agro-climatic zones Sagar and Jhabua were divided into four groups each having six birds. The different meat quality parameters studied were sensory attributes, pH, moisture, protein, fat, total ash, thiobarbituric acid (TBA) and free fatty acid (FFA) values and *Escherichia coli* and *Salmonella* counts. All the chemicals and media used in the investigations were of analytical grade.

Organoleptic properties

Cooking of Kadaknath meat: Kadaknath birds were procured from their in situ tract in Jhabua district of Madhya Pradesh and ex situ tract in Sagar district of Madhya Pradesh, sacrificed humanely, cleaned, deboned and chilled. Meat cubes were formed with deboned meat of breast region and cooked at 80°C.

Sensory evaluation of the product: An experienced panel of judges was formed for evaluation of the product for various sensory attributes like appearance, colour, texture, flavour, juiciness and overall acceptability using a 8-point descriptive scale (Keeton 1983) where 8= extremely desirable and 1= extremely undesirable.

Nutritional qualities

Moisture: Moisture was determined as per Anon (1984) method:

$$\text{Moisture} = \frac{\text{Fresh weight (g)} - \text{Dry weight (g)}}{\text{Fresh weight (g)}} \times 100$$

Protein: The protein content was determined by micro-Kjeldhal method as given by Anon (1984). Nitrogen content in sample was calculated as follows:

$$\text{N (\%)} = \frac{\text{Sample titre} - \text{Blank titre} \times \text{Normality of HCl} \times 14 \times \text{Volume made up}}{\text{Aliquat of digest taken} \times \text{Weight of sample taken}}$$

Per cent nitrogen was converted to per cent protein by multiplying with 6.25.

Fat (ether extract): For estimation of fat Soxhlet method (Anon 1984) was used. Per cent fat in dried sample was calculated as follows which was converted into wet basis by multiplying by the moisture factor:

$$\text{Fat (\%)} = \frac{\text{Weight of fat (g)}}{\text{Weight of sample (g)}} \times 100$$

Total ash: Per cent total ash was calculated by the method of Anon (1984):

$$\text{Total ash (\%)} = \frac{\text{Weight of residue (g)}}{\text{Weight of sample (g)}} \times 100$$

Physico-chemical properties

pH: For determination of pH the samples from each sample were blended with distilled water five times the weight of the sample to get uniform suspension and the pH was recorded by using a digital pH meter by immersing the electrode of pH meter into aliquot of the sample.

Thiobarbituric acid (TBA) value: Thiobarbituric acid value was estimated as per the procedure given by Tarladgis et al (1960). The TBA value as mg of malonaldehyde per 1000 g of sample was calculated using following formula:

TBA value (mg of malonaldehyde/1000 g of sample)= OD of sample x 7.8

Free fatty acid (FFA): Free fatty acid value was determined by modified AOCS method as given by Koniecko (1979) and calculated by the formula given as under:

$$\text{Per cent FFA as oleic acid} = \frac{\text{N x ml of NaOH used in titration x 0.282}}{\text{Fat weight}} \text{ x } 100$$

RESULTS and DISCUSSION

The findings of the present study are given in Table 1 (Figs 1-3).

Organoleptic properties

All the sensory attributes did not differ significantly ($p > 0.05$). When Kadaknath meat cube samples were served to sensory panelists no significant difference was observed between T1 and T2. The mean scores for appearance on 8-point descriptive scale were 6.70 and 6.67 for T1 and T2 respectively. Colour or appearance is an important quality attribute considered by the consumers. Poultry skin and muscle colour are affected by a variety of factors including age, environment and feed.

The reason behind the apparent indifference in appearance score might be due to the same condition of rearing or it is assumed as bird's adaptation to different environmental conditions. Similarly the mean scores for flavour, juiciness, texture, mouth coating and overall acceptability did not differ significantly.

Nutritional qualities

Chicken contains about 16.44-23.31 per cent protein, 0.37-7.20 per cent fat, 0.19-6.52 per cent ash and 72.8-80.82 per cent moisture content (Al-Najdawi and Abdullah 2002, Van Heerden et al 2002, Wattanachant et al 2004a, Chuaynukool et al 2007). The data show that the mean values of moisture content in T1 and T2 were 73.92 and 73.47 respectively. The moisture content did not differ significantly ($p > 0.05$) in T1 and T2 groups. Souza et al (2011) reported similar physico-chemical characteristics and proximate composition of the meat while evaluating differences between two strains of indigenous broilers and Cobb$^{(r)}$ strain under intensive rearing system. Haunshi et al (2013) explained that Kadaknath birds tend to accumulate higher abdominal fat and hence more water retention in thigh and breast muscles.

Table 1. Sensory scores, nutritional qualities and physico-chemical qualities of samples procured from Jhabua and Sagar (n= 6)

Parameter	Jhabua (T1)	Sagar (T2)
Sensory attributes		
Appearance	6.70 ± 0.07	6.67 ± 0.06
Flavour	7.41 ± 0.09	7.22 ± 0.08
Juiciness	5.92 ± 0.11	5.84 ± 0.06
Texture	6.24 ± 0.08	6.31 ± 0.12
Mouth coating	7.61 ± 0.05	7.50 ± 0.04
Overall acceptability	7.03 ± 0.05	6.98 ± 0.07
Nutritional qualities		
Moisture	73.92 ± 0.21	73.47 ± 0.21
Protein	18.61 ± 0.13	18.46 ± 0.09
Ether extract	4.91 ± 0.06	4.94 ± 0.04
Total ash	0.95 ± 0.01	0.94 ± 0.01
Physico-chemical qualities		
pH	5.74 ± 0.01	5.72 ± 0.02
TBA (mg malonaldehyde/kg)	0.49 ± 0.01	0.50 ± 0.01
FFA (%)	0.85 ± 0.01	0.85 ± 0.01

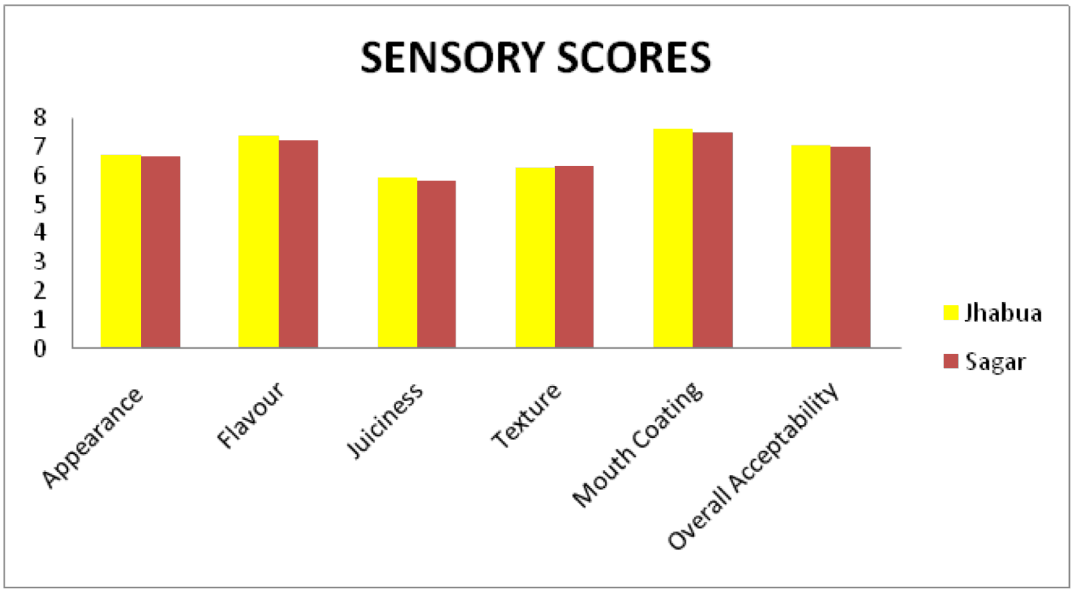

Fig 1. Sensory scores of samples procured from Jhabua (T1) and Sagar (T2)

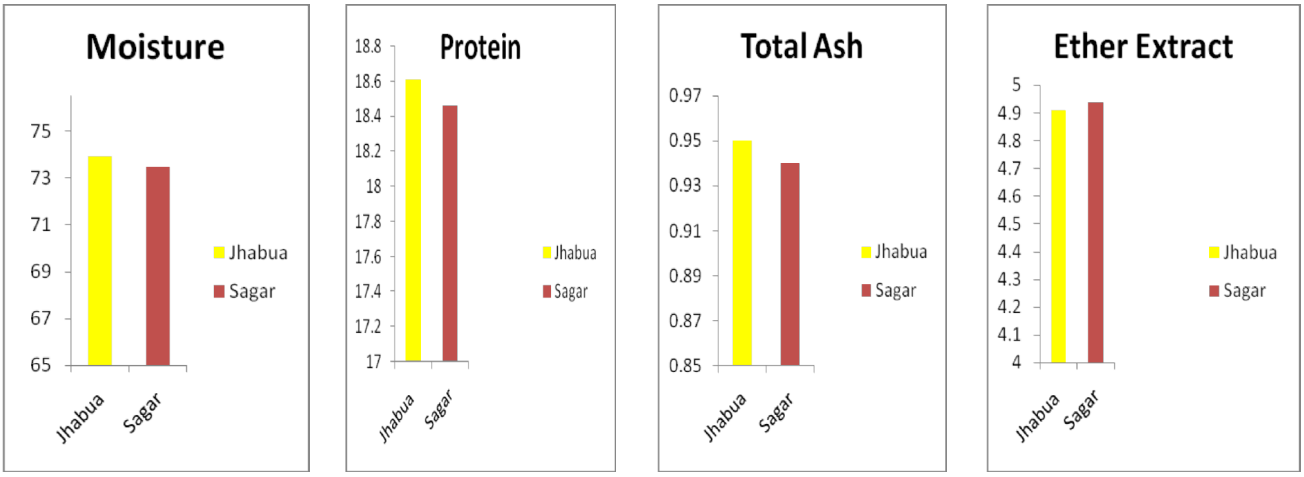

Fig 2. Nutritional qualities of samples procured from Jhabua (T1) and Sagar (T2)

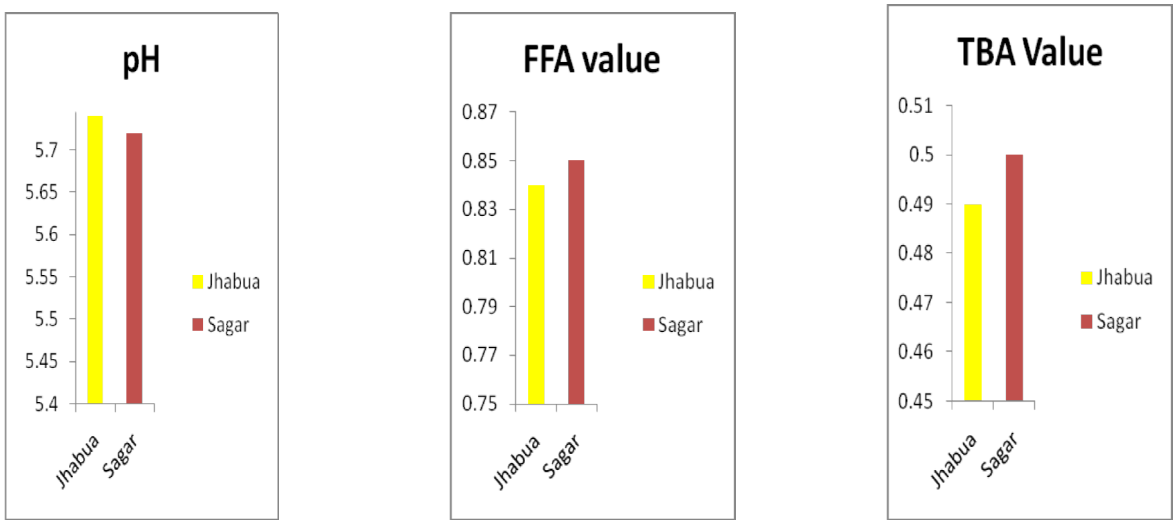

Fig 3. Physico-chemical properties of samples procured from Jhabua (T1) and Sagar (T2)

The mean values of protein content was18.61 and 18.46 in T1 and T2 respectively. The present study revealed that protein value of T1 and T2 did not differ significantly ($p > 0.05$). The results are not in unison with the findings of Haunshi et al (2013) where they reported high protein content and lower fat content in the breast muscles of Kadaknath meat. They also reported a higher fat content in leg muscles compared to breast muscles. Similarly the ash content did not differ significantly in T1 and T2 ($p > 0.05$).

Reports regarding carcass composition of native chicken breeds were little in literature to compare the present findings. Absence of differences in chemical composition among native chicken breeds as observed in the present study were also observed by Intarapichet et al (2008) between different Thai hybrid native chickens. Similar observation was made by Jaturasitha et al (2008). They also did not find any significant difference in chemical composition of breast and thigh muscles among Thai native breeds of chicken (Black boned and Thai). Moreover it is reported that rearing systems (intensive and extensive) did not affect the proximate composition of the chicken muscles.

Physico-chemical properties

The pH of T1 and T2 was 5.74 and 5.72 respectively and not significantly different ($p > 0.05$) with each other. The present results corroborate with the findings of Wattanachant et al (2004b) and Chuaynukool et al (2007) who found that the pH of Thai indigenous chicken was 5.80-5.93 for pectoralis muscle and 5.85-6.06 for biceps femoris muscle.

TBA values of T1 and T2 did not differ significantly ($p > 0.05$). It could be due to the lipid oxidation and production of volatile metabolites in the presence of oxygen. Gheisari et al (2014) reported a value of 0.066 µmol/g of chicken meat on the day of slaughter.

Similar were the results in case of free fatty acid (FFA) value. FFA values of T1 and T2 did not differ significantly ($p > 0.05$). In an study it was reported that the changes in free fatty acid (FFA) amount and composition in thiobarbituric acid reactive substances (TBARS) were simultaneously increased in breast and thigh muscles of chicken on storage at 4°C (Alasnier et al 2000). It might be due to increased oxidation during storage. However in the present study the values were comparable with that of zero day results.

CONCLUSION

The present investigations were focused on assessment of breed conservation strategies under in situ and ex situ environmental conditions along with alterations in organoleptic and nutritional qualities closely related to the managemental aspects of the habitat in which Kadaknath birds had been dwelling. The organoleptic and nutritional qualities did not differ significantly in the groups reared under different agro-climatic zones. It was concluded that different agro-climatic conditions of Madhya Pradesh did not cause any differences in carcass characteristics of Kadaknath bird.

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