REVIEW ARTICLE

Review on Slow and Fast Growing Chicken Varieties Physicochemical Qualities

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10.18805/ag.R-1863

Abstract

India is the fourth largest chicken producer after China, Brazil, and the USA. The per capita consumption of chicken has gone up from 400 gm–2.5 kg per year, and human nutritionists recommend 10 kg chicken per year. To feed billions of Indian population, there is a lot of scope for the chicken industry to enhance the production. At the same time, many studies revealed that genotype significantly affects functional properties as well as the nutritional characteristics of chicken. The fast-growing chicken strains appear to be more attractive both for industrial and consumer use whereas from a nutritional point of view meat from slow growing chicken strains appears healthier (less fat and higher content of n^{-3} PUFA) and thus might better fit with the consumer's prospect. In acceptability for meat quality, slow growing chicken showed the better sensory quality of the chicken breast meat. Thus, for the demand of customer's for the higher quality of chicken meat, it is suggested to use slow growing chicken in alteration to fast-growing broilers. This review deals with the effects of genotypes (slow growing and fast growing broilers) on physicochemical and organoleptic traits of chicken.

Keywords: Fast growing chicken, Genotypes, Organoleptic traits, Slow growing chicken.

Agricultural Reviews (2019)

Introduction

In India, tremendous technical work has gone into broiler production in the fields of genetics, nutrition, breeder management, housing, and disease management. The broiler growing period has slowly come down to less than 40 days. The genetic improvement by selective breeding is giving steady perfection in broiler growth and feed efficiency 0.75 days reduction and 75 gm less feed per kg of chicken every year (APEDA, 2016). At the same time, the slow-growing multicolored chicken with tougher meat fetches better price compared to broilers whose meat is becoming tender every year. The slow-growing chicken area is developing as a "niche market" with better returns. The Indian government started promoting backyard poultry. Improved varieties are bred for "Low technology input birds" purpose, which is genetically more efficient in production compared to "native chicken". According to Project Directorate on Poultry Research, Hyderabad (2016–2017) annual report rural chicken varieties like Vanaraja, Gramapriya, and Srinidhi developed by the directorate have reached the nook and corner of the country. The birds are performing extremely well in low input system and can alleviate protein hunger and malnutrition in rural and tribal areas. The magnitude of native breeds of poultry birds for the rural economy in developing and underdeveloped countries mostly in Asia and Africa is very high. The native breed chickens are the reservoir of genomes and major genes for improvement of high yielding exotic germplasm for tropical adaptability and disease resistance (Padhi, 2016). Umaya Suganthi (2014) suggested it is essential to conserve the precious genetic resources, and every effort from the government and the public needs to be taken to conserve them for the present and future. In addition, newer genomic tools could be applied to utilize the potential of native chickens for the betterment of mankind. Although slower growing birds have a more significant impact on the environment, the economy and the birds, themselves—the chicken industry has developed its products to meet ever-changing consumer preferences. Adapting and offering consumers more choices of what they want to eat has been the main catalyst of success for a variety of chicken producers. According to (Comert *et al.,* 2016) genotype is the main factor to affect carcass characteristics of slow and fast growing broiler female chickens; however, organic rearing system positively impacts the chicken meat quality.

Similarly, Katekhaye, 2017 and Katekhaye *et al.,* 2017 reported significant effects of genotypes (Shrinidhi and Vanaraja) in two improved chicken varieties carcass characteristics, physicochemical qualities, fatty acid profile. Aseel native slow growing chicken meat was firm in texture due to high collagen content and interlocking connective tissue between the muscle fibers. The texture and acceptability of Aseel meat were higher than broiler (Rajkumar *et al.,* 2016).

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How to cite this article: Katekhaye, A. (2019). Review on Slow and Fast Growing Chicken Varieties Physicochemical Qualities. Agri Revs, 40(2):150-156.

Source of support: Nil

Conflict of interest: None

Submitted: 12/01/2019 **Accepted:** 00/00/2019

Selection on high growth rates, particularly of the pectoral muscle, applied to commercial broilers could be primarily associated with increased pH when the body weight of the birds reaches about 40–60% of their growth potential and possibly also with impaired water retention of meat during cooking. This situation resembles the recently described white-stripping defect of poultry meat. However, within each of the investigation chicken lines, no unfavorable correlations of growth curve parameters with breast meat quality were detected (Muth and Zarate, 2017).

In this study effect of genotypes on physicochemical, the sensory and fatty acid profile of meat was investigated. There were very fewer attempts of research on the genotypic effect on physicochemical qualities of meat. Knowing the effect of genotypes on qualities of poultry meat is of great importance because designing healthier chicken meat for nutrition-conscious consumers.

Genetic Control of Poultry Meat Quality

The comparison of genotypes suggests that poultry meat quality traits are under genetic control. According to the report by Le Bihan-Duvale (2004) heritability values and genetic correlations of meat traits have first been measured in an experimental line of chickens selected for improved breast meat yield and decreased fat deposition. Study of Schreurs *et al*. (1995) indicated differences in tenderness to endogenous proteolytic activity during aging. They further found that fast-growing birds show little proteolytic activity than slow-growing birds like White Leghorns. It was reported that slow-growing birds had higher µ-calpain and m-calpain and lower calpastatin than fast-growing birds, there were 12 fold differences in the µ-calpain content. The selection for growth performance, body weight, and size has resulted in changes in the expression profiles of the somatotropic genes in chickens.

Consequently, the somatotropic axis genes and their regulatory sequences are likely to be promising candidate biomarkers to understand selection response for growth rate and meat yield and to improve these traits in chickens (Jia *et al.,* 2018). Berri *et al*. (2001) stated that the meat from the genotypes with greater muscle mass showed a decreased content of heme pigments (Iron ppm) and a decreased level of glycogen store. As a result, those genotypes showed paler breast meat (less redness and greater lightness) with higher ultimate pH values.

Fletcher (2002) reported that older birds (slow growing) are more mature at the time of harvest and have more cross-links of collagen. Duclos *et al*. (2007) recorded pH_{15min}, pHu (ultimate pH), luminance, redness, yellowness, water loss, glycolytic potential, cooking loss and toughness of cooked meat and reported high heritability values ranging from 0.35 to 0.57. In addition, highest genetic correlations between pHu (ultimate pH) and luminance (-0.91), pHu (ultimate pH) and drip loss (-0.83) and luminance and drip loss (+0.81) were observed. The glycolytic potential was negatively correlated to the pHu (ultimate pH), with a value close to -1. Luminance, exudates, cooking loss, and toughness were negatively correlated with pHu (-0.65 to -0.89), whereas only luminance and exudates were negatively correlated with pH_{15} (about -0.5). No correlation was observed between pHu (ultimate pH) and pH_{15min}, suggesting a distinct genetic control of these two parameters. The genetic studies suggested that pHu (ultimate pH) was a highly heritable character and was highly correlated with several meat quality traits (color, texture, and water holding capacity).

Tumova and Teimouri (2009) reported that histochemical and biochemical characteristics of skeletal muscle are primarily the result of genetics and environmental factors such as gender, muscle type, postnatal nutrition, breed, hormone, growth promoters, *etc*. Chicken genotypes play an important role in the fatty acid composition of meat. This finding assumes great importance because designing healthier chicken meat for nutrition-conscious consumers. Slow growing strains for egg-type lines poses higher efficiency Eicosapentaenoic and Docosahexaenoic acid deposition because of a specific gene determinism (*FADE* gene) involved in elaborating long-chain n^{-3} and n^{-6} and intake of pasture containing ALA, antioxidants, and phytoestrogens. However, fast-growing strains, selected for meat traits, had a different hormonal profile and deposition of EPA and DHA affected by the estrogen level (Dal Bosco *et al*., 2012). Suriani *et al.* (2014) study recorded indigenous chicken are the slow growth rate, and this affected the meat properties where it has a tough texture and more tasty after cooked compared to broiler meat. Also, the study indicated broiler meat rich in moisture and cholesterol and lower in protein content as compared to spent hen and indigenous Manado chicken. Observed SFA content was quite low, and MUFA, PUFA, omega^{-6}, and omega^{-3} fatty acid content was higher in broiler as compared to spent hen and indigenous Manado chicken.

Relation between Genotypes and pH

It is generally accepted that muscle pH determines certain physicochemical properties of meat such as color, water holding capacity, microbial stability, thermal loss as well as tenderness of heat-treated meat (Poltowicz, 2000 and Le Bihan-Duvale, 2004). The muscle pH is a direct reflection of muscle acid content. High final pH produces dark, firm, and dry (DFD) meat with poor storage quality due to a faster rate of off-odor production and accelerated microbial growth (Allen *et al*., 1997).

Genotypic effect on pH in slow-growing chickens had higher pH as compare to fast-growing chickens (Castellini *et al*., 2002 and Alvarado *et al*., 2005).

Liu and Niu (2008) recorded significant ($p < 0.05$) differences in pH_{24h} in breast meat of three native breeds namely White Luoyang (WL) 6.02, broiler strain Arbor acres (AA) 5.65 and their Cross (F_1) 6.05 when slaughtered at 15, 5, 8 weeks age, respectively. Lichovnikova*et al*. (2009) noted that regardless of age (two age groups 49 days and 90 days), genotypes of layer males significantly ($p \leq 0.01$) affected the $pH_{24h.}$ Whereas Isabrown genotype recorded higher $pH_{24}$of 5.77 at 49 days age and pH_{24h} of 5.73 at 90 days of age than Ross

308 genotype of pH_{24} of 5.66 at 49 days and 5.63 at 90 days age. However, no significant (p ≥0.01) effect was observed on $pH_{0.5hr}$, pH_{1hr}, $pH_{1.5hr}$and $pH_{2hr.}$ Kumar *et al*. (2011)[a] compared the physic-chemical properties in Black turkey, White turkey, spent hen broiler and recorded significantly (p <0.01) higher pH in dark meat than white meat in Black turkey and Broiler spent hen. They further reported that the pH of white meat of broiler spent hen was significantly lower (p <0.01) than dark meat and white meat of the Black and White turkey.

Relation between Genotypes and Water Holding Capacity

Tang *et al*. (2009) recorded significant (p ≤0.05) difference in WHC of four genotypes and found that WHC was lowest for fast-growing broilers, intermediate for layers and highest for local native Chinese breeds. They further recorded significantly (p ≤0.05) higher pH in slow-growing chicken muscle than fast-growing chicken muscle probably due to a lower rate of post mortem glycolysis, which was partly responsible for its relatively higher water holding capacity.

Various studies (Castellini *et al*., 2002; Fanatico *et al*., 2005 and Santos *et al*., 2005) stated that slow-growing genotype had poorer water holding capacity than fast-growing ones which could be attributed to the slow growing of birds and the tissue being less mature metabolically at harvest than the fast-growing birds. On the contrary Berri*et al*. (2005) pointed out slow-growing birds had better water holding capacity when slaughtered under conditions which minimized the struggle. Slow growing birds are more susceptible to stress than fast-growing birds, and also active birds such as slow-growing birds are more prone to shackling stress, which leads to rapid breast muscle acidification Debut *et al*. (2004). Kumar *et al*. (2011)[a] recorded significant (p <0.01) difference in WHC of turkey meat than the meat from spent broiler hen. However, WHC of dark meat and white meat of Black and Beltsville white turkey did not differ (p >0.01) significantly. They recorded WHC in broiler spent hens dark meat as 15.71 and 10.71%. While studying the physicochemical properties from broiler chickens of different origin Kokoszynski*et al*. (2013) reported significantly (p ≤0.05) higher water holding capacity in breast muscle in Hubbard F15 chicken (65.2%) and lower in Hubbard Flex (57.9%) but difference was non-significant (p >0.05) in thigh muscles water holding capacity of the different chicken varieties. Sharma *et al*. (2012) recorded no significant (p ≥0.05) difference in WHC of Aseel and Lavender meat at 8, 12, 16 weeks of age but with the increase in age of birds a significant (p ≤0.05) decrease in WHC of meat was observed in both the species. The recorded values of WHC were 82.77, 76.21, 71.38 (%), respectively in Aseel slaughtered at 8, 12 and 16 weeks of age.

Relation between Genotypes and Muscle Fiber Diameter

The size and number of muscle fiber are factors that influence muscle mass and meat quality. Investigation of Duclos *et al*. (2007) stated that as the fiber size increased, both the glycogen reserve at depth (glycolytic potential) and the postmortem glycolytic activity of muscle decreased. Guan *et al*. (2013) study noted that fast-growing genotype had significantly (p ≤0.05) larger fiber diameter than slow-growing chicken genotypes. They further reported fiber diameter of the indigenous chickens was shorter than that of AAB (commercial broiler Arbor Acres Broiler). Further, they recorded a fiber diameter of 47.67 and 48.31 µm for breast and leg muscles, respectively. Khoshoii *et al*. (2013) observed more fiber diameter in native chickens than those of the Ross commercial broiler. These differences might be due to the genetic factors, method of breeding, and feeding of birds.

Relation between Genotypes and Shear Force Value

Shear force is used to assess meat tenderness, and higher shear force means tougher meat quality (Cavitt *et al*., 2004). Shear force value is highly dependent on muscle fiber diameter, as bigger, the muscle fiber diameter higher the shear force value. Lawrie (1991) stated that there is an indirect correlation between muscle fiber diameter and tenderness. From the study, it was observed that broilers (fast-growing chicken) have more shear force value than slow-growing chickens. The meat of slow-growing birds tends to be less tender than fast-growing birds. While Le Bihan-Duvale (2003) reported that fast-growing birds had more intramuscular fat in breast meat, which is usually associated with higher tenderness. Lonergan *et al*. (2003) recorded significant (p ≤0.05) difference in shear force value in the genotypes of (Broiler, F5-Leghorn, F5-Fayoumi, Leghorn, and Fayoumi) ranging from 7.22 to 12.33 kg/g. The highest value observed in Broiler was 12.33kg/g than one indigenous genotype. A significant (p <0.05) influence of breeds and their crosses were observed in shear force value (Jaturasitha*et al*., 2008). In their study, shear force values recorded in breast muscles were 51.20, 30.90, 21.90, 19.90 (N) and in thigh muscle 44.30, 35.80, 39.20, 31.10 (N) for breeds of Thai indigenous, Barred Plymouth Rock, Shanghai, Their F1 crosses, respectively. Genotype and muscle type had significant (p <0.01) effect on shear force value in the chickens. The recorded shear force value (kg) in native Chinese chicken of genotypes was Wenchang (WCH) 23.69, Xianju (XJ) 26.88, Avian (AV) 31.50, Hy-Line Brown (HLB) 29.08, Lingnanhuang (LNH) 29.76 were significantly (p <0.05) higher in fast-growing AV broiler than LNH broiler cross and is attributed to more large-fiber diameter as it is fast growing lines associated with meat toughness (Tang *et al*., 2009). Guan *et al*. (2013) reported significant (p <0.05) difference in shear force value in the breast of the genotypes. They observed the highest shear force value in broiler genotype Arbor Acre (AAB) 138.25 N than Ninghai indigenous chicken (69.83N). Petracci *et al*. (2013) observed significantly (p ≤0.001) higher Allo-Kramer shear force value (kg/g) in standard-breast-yield (SBY) commercial broiler (2.59) than high-breast-yield (HBY) (2.11).

Relation between Genotypes and Color (L*a*b*) and Myoglobin Content

The red color of meat is due to the presence of the heme protein, myoglobin. The degree of meat pigmentation is

directly related to myoglobin content. In general, myoglobin concentration within a given muscle will differ with species, age and is dependent on muscle fiber distribution (Lawrie, 1985). Wattanachant (2008) found that myoglobin content is significantly ($p \leq 0.05$) higher in *pectoralis major* muscle of broiler chicken than in indigenous. Many studies accounted that slow-growing birds have a redder meat color than fast-growing birds because the slow-growing birds are typically older (Qiao *et al*., 2001).

Bianchi *et al*. (2006) reported no effect of genotype on broiler breast meat color. No differences were found on color coordinates (L*) lightness, (a*) redness, (b*) yellowness of Ross 508 and Cobb 500. Similarly, a study by Fanatico *et al*. (2007) indicated no genotype effect on L* value, but a* value was significantly ($p \leq 0.05$) less in slow-growing birds than fast-growing birds.

Jaturasitha*et al*. (2008) reported that breast and thigh muscle color was significantly ($p \leq 0.001$) different in the four male genotypes namely: Thai native (TH), crossbred (Thai native× Barred Plymouth Rock; THB), Barred Plymouth Rock (BPR) and Shanghai (SH). In their study native SH chicken breast color had significantly ($p \leq 0.001$) higher L*(59.1) and b* (11.9) but lower a*(-0.08) values. This means that SH had paler and yellower breast whereas TH thigh had significantly ($p \leq 0.001$) higher a*(5.27) and b*(7.82) values this means a redder and yellower thigh muscle when compared with other genotypes THB, BPR. Guan *et al*. (2013) study indicated that slow-growing birds had redder meat than fast-growing birds wherein significantly ($p \leq 0.05$) higher a* value observed in Frizzle native chicken (5.61) than other genotypes and commercial broiler. However, L* value was significantly ($p \leq 0.05$) higher in Zhenning loquat chicken (54.59) than those of Ninghai chicken (50.53) and Frizzle chicken (52.51), which were higher than Ninghaixiang (47.67) and commercial broiler Arbor Acre (48.28). No significant ($p > 0.05$) difference was found between genotypes in the b* value. Kokoszynski*et al*. (2013) noticed that genetic line had significant ($p \leq 0.05$) effect on color characteristics of breast muscles of broiler chicken (commercial lines was Ross 308, Hubbard Flex and Hubbard F15) where L* (lightness) and yellowness (b*) differed significantly ($p \leq 0.05$) between three genotypes. The recorded L*, b* values in Hubbard F15 breast muscles was 60.9, 7.2, respectively, was significantly higher ($p \leq 0.05$) than Ross 308 (L*, b* was 56.8, 5.2) than Hubbard flex (L*57.1, b*5.8) chicken and this could be attributed to as heavier birds (heavy a thicker layer of breast muscles) hence darker color.

Relation between Genotypes and Cooking Loss

It refers to a reduction in the weight of meat during the cooking process. The major components of cooking losses are thawing, dripping and evaporation. During cooking the melting of fat and denaturation of proteins cause the release of chemically bound water (Vieira *et al.,* 2009).

Lonergan *et al*. (2003) found that the genotype significantly ($p \leq 0.05$) affected the cooking loss in breast meat where lowest value was recorded in Broiler (11.47%) and highest in slow-growing Leghorn (16.14%) and Fayaouni (16.26%).

Coking loss (percentage) of commercial cross of broiler strains of chickens was found higher in male bird (29.56%) than female bird (27.95%) but there was no significant ($p \leq 0.05$) difference in the four strains: Lohman, Hubbard JV, Hubbard classic and Ross (Abdullah *et al*., 2010). Petracci *et al*. (2013) observed significant ($p \leq 0.05$) difference in cooking loss of breast meat in the two commercial hybrid breeds, i.e., Standard-breast-yield (SBY) to HBY and values for cooking loss was 21.05% and 26.23%, respectively.

Relation between Genotypes and Cholesterol Content

One of the major health concerns of the consumers in eating animal products is cholesterol content. Intarapichet *et al*. (2008) recorded significantly ($p \leq 0.05$) higher cholesterol content in Broiler breast meat (53.2 mg/100 g) than other breeds studied namely 4-lines and 5-lines cross Thai hybrid native chicken meat at market weight of 1.8 kg and the recorded values of cholesterol content of both meat types were in the range of 41.50 to 78.8 mg/100 g in all the breeds. Suriani *et al*. (2014) recorded highest cholesterol content in broiler meat (374.76 mg/100 g) and lowest in indigenous Manado chicken (73.63 mg/100 g) whereas, in spent hen, cholesterol content was (281.80 mg/100 g). There was a significant effect of species in cholesterol content of breast and thigh fillet.

Relation between Genotypes and Fatty Acid of Chicken Meat

The fatty acid content of chicken is affected by the breed. Chicken genotypes play an important role in the fatty acid composition of meat (Dal Bosco *et al*., 2012). This finding assumes great importance because designing healthier chicken meat for nutrition-conscious consumers. Slow growing strains for egg types lines posses higher efficiency Eicosapentaenoic Acid and Docosahexaenoic acid deposition because of a specific gene determinism (FADE gene) involved in elaborating long-chain n-3 and n-6 and intake of pasture containing ALA, antioxidants, and phytoestrogens. However, fast-growing strains, selected for meat traits, had a different hormonal profile and deposition of EPA and DHA affected by the estrogen level (Dal Bosco *et al*., 2012). Jaturasitha *et al*. (2008) analyzed the fatty acid composition of both breast and thigh muscles of Thai indigenous (TH), Crossbred (Thai indigenous and Barred Plymouth Rock; THB), Barred Plymouth Rock (BPR) and Shanghai (SH) chickens and reported that TH chicken breast muscle had not much difference in fatty acid profile from crossbred.

In contrast, thigh muscle of TH had higher total SFA and total n-3fatty acids but lower MUFA than other genotypes ($p \leq 0.05$). THI chicken meat had higher concentrations of n-3 fatty acids group i.e., C18:3 and C22:6 than other groups ($p \leq 0.05$). The ratio of n-6: n-3 fatty acid in TH chicken thigh meat is most favorable than those of other chicken. Tang *et al*. (2009) determined fatty acid composition of leg muscle of female chicken from five genotypes Wenchang (WCH), Xianju

(XJ), Avian (AV), Hy-Line Brown (HLB), Lingnnhuang (LNH) at market ages: 16, 7, 16 and 8 weeks, respectively and found that older birds, in general, had more fatty acid constituents than younger birds, 13 kinds of fatty acids for WCH and XJ birds, 11 kinds for HLB birds and 8 kinds for LNH and AV broilers respectively. The slow-growing birds (WCH, XJ, and HLB) were similar to the fast-growing birds (LNH and AV) in most of their nonessential fatty acids except C20:4, even if they were different in the diet.

Kumar *et al*. (2011)[b] investigated the influence of strain, age and sex on fatty acid composition and cholesterol content of Japanese quail meat and found mean percent values of palmitoleic acid, stearic acid, oleic acid increased significantly with age (from 5wks to 8 wks) while palmitic acid, linoleic acid content decreased. Palmitoleic acid percent was significantly (p <0.05) higher in black strain than those belonging to brown strain than that of white strain. However, brown strain meat contained significantly lower stearic acid than black and white strain meat. The linoleic acid content in the meat of white strain was also higher than black strains. Females recorded significantly (p <0.05) higher linoleic acid content than male birds. The observed overall unsaturated fatty acids content in the meat of Japanese quails 69.51, 68.78, 68.98 percent belonging to brown strain, black strain, and white strain, respectively. Suriani *et al*. (2014) studied the fatty acid profile of breast and thigh fillets of three chicken species (Indigenous Monado chicken, Broiler, Spent hen) and recorded that oleic acid was in high amount followed by palmitic acid, linoleic acid, and stearic acid. The lowest SFA content (29.29%) was found in broiler meat compared (30.32%) spent hen meat, but significantly higher (p ≤0.05) SFA content (35.40%) in indigenous Manado chicken meat. Broiler contained a significantly higher amount of MUFA and PUFA than Manado chicken. Omega 3 and omega 6 fatty acid content of broiler meat was highest and had significant (p ≤0.05) difference to Manado chicken. According to Popova *et al*. (2018) Age significantly affect the palmitic acid (C16:0) content in the breast, leading to decrease in the older chickens (p <0.01) whereas the proportion of C18:0 in both breast and thigh increased with advancing age (p <0.001). While no effect of line observed in regard to C16:0 in the muscles, the content of C18:0 in the breast significantly differed between two lines and its proportion decreased significantly with age.

Relation between Genotypes and Sensory Evaluation Score

Sensory evaluation is an analysis of product attributes perceived by the human senses of smell, taste, touch, sight, and hearing. It is an attempt to predict behavior with respect to food acceptance. People (consumers or users of the product) are used to assess the sensory characteristics and provide a response. The nine-point verbal hedonic scale has been most frequently adopted due to its usefulness, reliability, and validity. Jaturasitha *et al*. (2008) showed no significant (p ≥0.05) difference in the sensory evaluation in terms of tenderness, juiciness, flavor and overall acceptability in both thigh and breast meat among breeds (Thai native) with improved layer breeds (Barred Plymouth Rock) and their crossbred. Kokoszynski *et al*. (2013) studied the sensory properties of breast meat from broiler chickens of different origins namely Ross 308, Hubbard Flex, Hubbard F15 and reported significant (p ≤0.05) differences in Aroma and Juiciness score between Ross 308 (Hubbard flex and Hubbard F15). Rajakumar *et al*. (2013) have studied in detail organoleptic traits (appearance and color, juiciness, flavor, texture and tenderness, overall palatability) male and females of three indigenous chicken namely Chikkaballapur, Bengaluru Rural and Ramanagar at 17 weeks age of Bengaluru division and observed that Bangalore rural district male chicken (5.62) and Ramanagar male chicken (6.12) had significantly (p ≤0.05) higher appearance and color score compared to Chikkaballapuram male chicken. Flavor score showed a significant difference (p ≤0.05) between Ramanagar male chicken (5.25) and Chikkaballapur male chicken (6.00) while juiciness, texture and tenderness, overall palatability were non-significant (p >0.05) among three breeds.

Conclusion

Although many studies have reported relationships between genotypes, histochemical and biochemical characteristics and meat quality, opinion among scientists on this point remain divided. Sensory and physic-chemical properties point of view acceptability of slow-growing chicken meat is better than fast-growing broiler. Therefore, it is recommendable that slow-growing lines especially improved chicken varieties can be used in alteration to fast-growing broilers as premier quality meat. These findings provide a better understanding of the relative roles of genotypes on meat characteristics, to optimize yield and quality while following animal welfare standards.

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ISSN: 0976-0539 (Online), 0253-1496 (Print), Naas Rating: 4.37