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Current knowledge regarding slow-growing broiler chickens' behaviour and welfare and their comparison with fast-growing broiler chickens

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Abstract: Growing consumer interest in slow-growing broiler (SGB) chickens is primarily motivated by heightened animal welfare standards and superior sensory meat characteristics compared to conventional fast-growing broilers (FGB). This review provides a comprehensive overview of current knowledge about SGB hybrids compared with conventional FGB. Utilising a systematic review of contemporary scientific literature, this review evaluates the comparative advantages and limitations of SGB production systems. Key findings indicate that SGB hybrids demonstrate significant benefits in welfare parameters, including a higher propensity for natural behaviours and a reduced incidence of metabolic disorders. Furthermore, these strains exhibit enhanced resistance to specific bacterial and parasitic pathogens and produce meat with distinct quality profiles. Conversely, the primary drawbacks of SGB production include poorer feed conversion ratios and diminished growth potential, culminating in substantially higher production costs. From a sustainability perspective, life cycle analyses suggest that SGB systems impose a greater environmental footprint per kilogram of meat produced due to extended fattening periods. Ultimately, the market viability and wider adoption of slow-growing hybrids remain contingent upon consumer willingness to subsidise these economic and environmental trade-offs through premium pricing.

Keywords: economic efficiency; ethology; genotypes comparison; growth rate; poultry meat

INTRODUCTION

In recent years, the European poultry industry has undergone a paradigm shift driven by mounting pressure to improve animal welfare, ensure environmental sustainability, and enhance transparency across the production chain. A focal point of current academic and public discourse is the transition from conventional fast-growing broiler (FGB) genotypes to alternative rearing systems, specifically those utilising slow-growing broiler (SGB) strains. The classification of broiler genotypes is primarily governed by the average daily gain (Baxter et al. 2021). The scientific literature mentions precise

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division into fast-growing (daily gain>35 g/d), medium-growing (20–35 g/d) and slow-growing (<20 g/d) broiler chickens (Dal Bosco et al. 2012). High growth rates have been consistently associated with poorer welfare indicators in recent literature (Zhou et al. 2024; van der Eijk et al. 2025a), whereas the adoption of SGB strains often results in reduced economic efficiency (Lusk et al. 2019). Consumer opinion is largely shaped by these two competing factors: the willingness to pay a premium for higher meat quality and improved animal welfare, versus the economic necessity of affordable FGB products. The success of systematic SGB breeding depends on navigating these two perspectives. However, this issue is multifaceted, and the present review aims to comprehensively describe the current situation, portfolio of hybrids and comparative behaviour, advantages and disadvantages of SGB and FGB genotypes from the perspectives of both the producer and the consumer, based on an analysis of current scientific literature.

CURRENT STATUS OF SLOW-GROWING BROILER CHICKEN FARMING IN EUROPE

The implementation of the European Chicken Commitment (ECC) standards plays a significant role. The ECC represents a set of minimum welfare standards for broiler meat production, created by non-profit organisations in collaboration with poultry welfare experts. The commitment is primarily intended for food chains, retailers, and processors who voluntarily commit to sourcing meat from suppliers only from farms that meet these standards. A key element of the ECC is the requirement to use SGB chickens, for which the maximum average daily weight gain is limited (typically ≤50 g/d, in some specifications ≤45 g/d). This requirement addresses long-documented issues with fast-growing hybrids, particularly the increased incidence of musculoskeletal disorders, cardiovascular diseases, and reduced ability to exhibit natural behaviours. The use of SGB is considered a key prerequisite within the ECC for improving the overall welfare of broiler chickens. It is important to emphasise that the ECC is not a legislative instrument of the European Union, but a voluntary market standard. Other ECC requirements include a maximum stocking density of 30 kg/m^2 in the poultry house; thinning is discouraged. Enrichment, including natural light, perches, and two pecking substrates per 1 000 birds. Slaughterhouse: Use controlled atmospheric stunning using inert gas or a multi-phase system ("CAS stunning") (van Horne and Vissers 2022; Open Wing Alliance 2025). To increase production per unit of floor space, farmers can use thinning, which involves partially removing chickens from the house before the end of the fattening period.

Official statistics on the number of SGB chicken flocks are largely unavailable, as the hybrid breed is not subject to mandatory registration; therefore, the following numbers are mostly estimates, with data drawn from project websites such as BroilerNet or the websites of premium brands like Label Rouge.

The integration of SGB chickens into production systems varies significantly across European countries. The Netherlands is among the leaders in this field as early as 2021, SGB accounted for approximately 40–45% of total production. The Dutch poultry sector has long-standing experience with these systems across the entire production chain, from parent stock farms to slaughter (van Horne and Vissers 2022). Currently, SGB production in the Netherlands accounts for 55–60% of total broiler production (Khire and Ryba 2025).

At the opposite end of the spectrum are a number of countries where the proportion of slow-growing chickens is negligible. Poland, currently the largest producer of chicken meat in the European Union, clearly prefers FGB. Although nearly 1.3 billion chickens were slaughtered in 2024, the share of SGB is only around 1–1.5% (FAOSTAT 2024). The situation is similar in Sweden, where less than 1% of producers raise SGB (BroilerNet 2023), and in Finland, where broiler production is highly centralised and still based exclusively on FGB (Hogel 2023). Countries with limited but existing production of SGB include Spain, Portugal, and Italy. In Spain, slow-growing chickens account for approximately 5–8% of production, with further growth limited primarily by higher market prices. In Portugal, chicken meat consumption is the highest in Europe, but production is highly concentrated, and SGB account for only about 1% of the flocks (BroilerNet 2023). In Italy, approximately 8.5% of producers were engaged in SGB production in 2024, suggesting a diversification of production approaches rather than a systematic transformation of the sector (UnaItalia 2025). France occupies

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a unique position, having long supported alternative production systems through quality labels, particularly Label Rouge. In 2023, approximately 84 million poultry were raised in France under this label. The French poultry sector is highly structured and dominated by a few large producers, which allows for more efficient implementation of more demanding production standards (Federation Label Rouge 2023). A somewhat different trend can also be observed in Denmark, where the share of SGB reached 37% in 2023 but fell to 31% in 2024 due to inflation and lower consumer demand for more expensive products (Sandoe 2024). The United Kingdom is an example of a country where ambitious welfare goals, embodied in the ECC, have not yet been fully achieved. Although the share of SGB was approximately 11% in 2018–2019, the planned expansion of production did not materialise in the following years (BroilerNet 2023). In Central Europe, conventional farming systems have historically predominated in the Czech Republic; however, interest in SGB chickens has gradually increased in recent years. The number of chickens delivered to farms for testing and production of SGB rose from approximately 2.3 million in 2023 to more than 4.2 million in 2025, with a further increase planned for 2026. This trend indicates a gradual adaptation of the sector, although SGB currently represent only a minority of total production below 1% (MTD Ustrasice 2025).

AVAILABLE GENOTYPES OF SLOW-GROWING BROILER CHICKENS

The current portfolio of genotypes comprises broilers from breeding companies such as Aviagen, Hubbard, Cobb, and Sasso (Hendrix Genetics). SGB chickens are divided into medium-growing (daily gain of 20–35 g) and slow-growing (daily gain below 20 g) strains (Dal Bosco et al. 2012). In this review, the genotypes are not subclassified into medium- and slow-growing, and both subgroups are collectively considered SGB (Table 1). An evaluation of the performance characteristics among selected SGB genotypes reveals a distinct trade-off between growth efficiency and production longevity, primarily driven by commercial breeding objectives and compliance with the ECC welfare criteria. Genotypes from Aviagen and Hubbard demonstrate faster growth rates and better feed efficiency, rendering them highly suitable for ECC-compliant

Table 1. Genotypes of slow-growing broiler chickens with characteristics available on breeding companies' websites

Genotype	Company	Liveweight at 56 days (g)	Feed conversion ratio at 56 days	Maximum length of fattening (days)	References
Rustic Gold	Aviagen	2 989	1.84	56	Aviagen (2026a)
Rustic Rowan	Aviagen	2 526	1.79	56	Aviagen (2026b)
JA757	Hubbard	2 581	1.97	70	Hubbard (2023a)
JA787	Hubbard	2 891	1.98	70	Hubbard (2023b)
JA987 K	Hubbard	2 463	2.10	98	Hubbard (2016)
REDBRO	Hubbard	3 170	1.91	63	Hubbard (2026)
Cobb-Sasso 150	Cobb/Sasso	2 491	2.02	91	Granja Avicola Llorens (2016)
C451	Sasso	2 364	2.15	91	SASSO (2023)
C431	Sasso	2 532	2.09	91	SASSO (2023)
XL451	Sasso	2 143	2.32	91	SASSO (2023)
XL431	Sasso	2 279	2.26	91	SASSO (2023)
XL51N	Sasso	1 822	2.50	91	SASSO (2023)
XL31N	Sasso	1 990	2.42	91	SASSO (2023)
X851	Sasso	1 738	2.28	91	SASSO (2023)
X831	Sasso	1 965	2.33	91	SASSO (2023)
MBX51	Sasso	2 253	2.24	91	SASSO (2023)
MBX31	Sasso	2 406	2.16	91	SASSO (2023)
XR51	Sasso	2 143	2.32	91	SASSO (2023)
XR31	Sasso	2 279	2.26	91	SASSO (2023)

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production systems. For instance, the Hubbard REDBRO and Aviagen Rustic Gold achieve the highest 56-day live weights (3 170 g and 2 989 g, respectively) while maintaining efficient feed conversion ratios (FCRs) of 1.91 and 1.84. Conversely, the Sasso portfolio prioritises slow growth over immediate metabolic efficiency. These genotypes yield significantly lower live weights at 56 days, with the Sasso X851 lagging at 1 738 g, and exhibit elevated feed requirements, peaking at an FCR of 2.50 for the Sasso XL51N. While the efficient Aviagen broiler hybrids reach their maximum performance objectives within a 56-day fattening window, the less efficient Sasso SGB and the Hubbard JA987 K (FCR = 2.10) sustain prolonged, robust growth. This enables maximum fattening periods extending beyond 81 days, making these specific hybrids highly compatible with traditional, extensive, or certified organic free-range production frameworks.

SEARCH STRATEGY FOR ADVANTAGES AND DISADVANTAGES OF SLOW-GROWING BROILER CHICKENS

The sections "Advantages of Slow-growing Broiler Chickens" and "Disadvantages of Slow-growing Broiler Chickens" were developed through a systematic evaluation of literature indexed in the Web of Science. A schematic representation of the article search and selection process is shown in Figure 1. The primary search string utilised was "broiler slow grow", followed by a secondary search using 'chicken slow grow', covering publications from 2015 to the present. The literature search was conducted in April 2026. The use of these keywords was based on the review by Nicol et al. (2024). These keywords captured articles containing the terms: slow-growing, slow-growth, slower-growing, and slower-growth. Consequently, this approach made it possible to identify articles concerning slow-growing broiler chickens without restricting the scope to specific areas. The number of hits shown for April 2026 was as follows, broiler slow grow: 595 and for chicken slow grow: 677.

Articles were selected based on their ability to provide a direct comparison between FGB and SGB, specifically identifying statistically significant advantages or disadvantages across several key parameters: growth performance, meat quality, health, disease resistance, welfare, economic efficiency, sustainability, consumer perception, and environmental impact. To maintain focus, articles reporting results redundant with previously included studies (e.g. typical differences in growth performance and feed efficiency favouring FGB) were excluded.

A total of 52 scientific articles were selected. The findings are summarised in the accompanying ta-

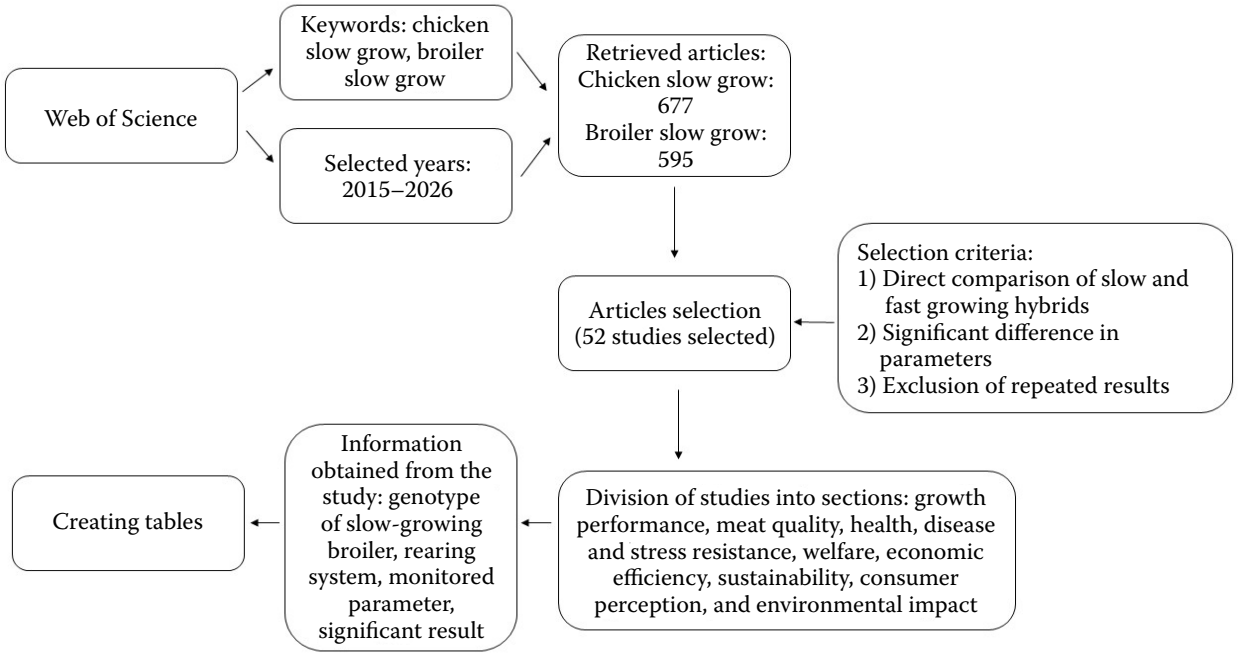

Figure 1. Schematic representation of the selection of literature sources for the section on the advantages and disadvantages of slow-growing broiler chickens

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bles, which specify the SGB genotype, the tested parameter, and significant outcomes. The FGB control groups typically consisted of commercial genotypes such as Ross 308, Cobb 500, Hubbard Flex, and Arbor Acres broilers.

ADVANTAGES OF SLOW-GROWING BROILER CHICKENS

The advantages of SGB genotypes are multifaceted, encompassing significant improvements in animal welfare, physiological health, meat quality, and production resilience. When compared to FGB strains, SGB genotypes such as the Hubbard JA57 and JA787 consistently demonstrate superior welfare indicators (Table 2), including enhanced feather condition and a significantly lower prevalence of hock burns and severe footpad dermatitis (Cavusoglu and Petek 2019; Abdourhamane and Petek 2023; Abdourhamane and Petek 2024). These physiological improvements correlate with more diverse behavioural repertoires; for instance, the Ranger Classic genotype exhibits higher levels of locomotive, foraging, and comfort behaviours while demonstrating reduced fear responses and increased engagement with environmental enrichments (van der Eijk et al. 2022). Furthermore, SGB hybrids like the Hubbard REDBRO Mini display lower anxiety levels across various housing environments and body weights, contributing to a more stable affective state (Ulans et al. 2024).

From an immunological perspective, reduced growth rates offer a robust defence against common avian stressors and pathogens (Table 3). On-farm mortality rates are significantly lower

Table 2. Advantages of slow-growing broiler chickens in welfare parameters and behaviour

Tested genotype of SGB or type of study	Rearing system	Tested parameter	Significant outcome	References
Hubbard JA57	deep litter and slatted floor pens in climate-controlled barn	welfare parameters evaluation	significantly better welfare parameters (occurrence of hock burns, foot pad dermatitis, and feather condition)	Cavusoglu and Petek (2019)
Ranger Classic	littered floor boxes in climate-controlled barn	ethology observation	significantly more locomotor, comfort, and foraging behaviours; reduced fear reactions; and better use of enrichment	van der Eijk et al. (2022)
Hubbard JA57	deep litter floor pens in climate-controlled barn	welfare parameters	lower rates of post-mortem-evaluated foot pad dermatitis and hock joint lesions	Abdourhamane and Petek (2023)
Hubbard JA57	deep litter floor pens in climate-controlled barn	pre- and post-mortem welfare indicators	expression of more health-based indicators of positive welfare	Abdourhamane and Petek (2024)
Data collected on farm level	not specified	economic model to produce an all-things-considered estimate of the welfare effects	a decrease in high-intensity negative affective states	Khire and Ryba (2025)
Rowan Ranger	littered floor boxes in climate-controlled barn	welfare assessment comparison of fast and middle growth hybrids	observed lesser extent of worsened welfare parameters and later during fattening	Wilhelmsson et al. (2019)
Hubbard REDBRO Mini	littered floor boxes in climate-controlled barn	affective state (anxiety) level	reduced anxiety compared to FGB across different housing conditions and body weights	Ulans et al. (2024)
Hubbard JA787	littered floor boxes in climate-controlled barn	incidence of FPD	the risks of mild/moderate FPD and severe FPD were 2.8 and 5.8 times lower for SGB respectively	Forseth et al. (2025)

FGB = fast-growing broilers; FPD = foot pad dermatitis; SGB = slow-growing broiler

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Table 3. Advantages of slow-growing broiler in resistance to pathogens and health

Tested genotype of SGB or type of study	Rearing system	Tested parameter	Significant outcome	References
Hubbard REDBRO	commercial littered floor farms with high welfare standards	mortality level	lower mortality, fewer culls and fewer carcasses downgraded at the abattoir	Baxter et al. (2021)
Ranger Classic	circular pens in climate-controlled room	resistance to *Eimeria maxima* infection	higher expression of CD4, CD3, IL-2, and IL-15, and a reduction in the *E. maxima* genome detected in the intestine	Giles et al. (2019)
Data collected on farms level	commercial farms	probability of antibiotic treatment	the probability of treatment in the first week of age in FGB flocks across all years (7.2%) was higher than in medium-growth broilers (2.0%) and SGB flocks (1.3%); treatment probability after the first week was similarly higher in FGB flocks (14.7%) than in medium-growth (3.2%) and SGB flocks (2.2%)	Slegers et al. (2024)
Hubbard ISA-JA-757	isolated boxes	*Salmonella* Infantis infection	reduced systemic spread of *Salmonella* Infantis to the liver and spleen	Drauch et al. (2022)
Cobb Sasso	FGB were housed in commercial farms and SGB were housed in free range system	serum levels of IgM and IgY antibodies	higher levels of the naturally occurring antibodies IgM and IgY	Sarrigeorgiou et al. (2023)
Hubbard 787	commercial farms	mortality, carcass condemnation rates	a 1.6-fold lower mortality in the first week, a 2-fold lower mortality after the first week, and a 5-fold lower rate of death on arrival, alongside lower carcass condemnation rates	Forseth et al. (2023); Forseth et al. (2024)
Slow-growing naked neck	isolated boxes	*Salmonella* Enteritidis infection	earlier development of gut microbiome stability, alongside a higher basal level of mucin gene expression, and differential nutrient transporter and interleukin gene expression that is beneficial during *Salmonella* Enteritidis infection	Santos et al. (2024)
Not specified	isolation rooms	host immune response to infectious bronchitis virus Q1 (IBV Q1)	no negative impacts on growth, a lower IBV Q1 viral load in tissues, and earlier viral clearance in SGB	Manswr et al. (2021)
ISA Dual	littered floor boxes in climate-controlled barn	preen gland size and volatile organic compounds content in secretions	larger preen glands and a lower abundance of volatile organic compounds that attract ectoparasites	Gvozdikova Javurkova et al. (2023)
Not specified	littered floor pens in climate-controlled barn.	experimental challenge with *Enterococcus cecorum*	reduced clinical signs, fewer pathological findings, and reduced extraintestinal colonisation at 44 days post-infection in SGB	Rosenbaum et al. (2025)

FGB = fast-growing broilers; SGB = slow-growing broiler

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Table 4. Advantages of slow-growing broiler chickens in meat quality parameters

Tested genotype of SGB or type of study	Rearing system	Tested parameter	Significant outcome	References
Indbro strain	deep litter system	meat composition and sensory characteristics and consumers opinion	lower saturated fatty acid content in the meat of SGB, 67% of consumers preferring meat from SGB	Devatkal et al. (2019)
Hubbard REDBRO	littered floor boxes in climate-controlled barn	prevalence of dorsal cranial myopathy	no instances of dorsal cranial myopathy	Lourenco-Silva et al. (2025)
Xueshan chicken	not specified	meat quality	higher muscle fibre density and lower glycolytic potential in the *pectoralis major*	Huo et al. (2022)
Xueshan chickens	not specified	meat quality	higher shear force, reduced pressing loss, and thicker muscle fibres with less extracellular space were observed in SGB meat; significantly lower intramuscular fat content	Weng et al. (2022)
Hubbard S757N	littered floor pens with density below 30 kg/m^2	proteomics analyses of meat	higher expression of detoxification and cytoskeletal proteins supporting robust muscle architecture alongside a higher protein content and reduced moisture retention; three times lower carcass fat content	Yigitturk et al. (2025)
HS1 chickens	free range	fat deposition	reduced fat levels in the abdominal cavity at 28 days of age	Kang et al. (2022)
Ranger Gold	littered floor boxes in climate-controlled barn	prevalence of wooden breast and bone mineral density	reduced prevalence and severity of wooden breast, alongside higher bone mineral content and bone mineral density in the tibia	Hisasaga and Makagon (2024)
Meta analyses	not specified	influence of genotype on meat quality characteristics	increased yellowness (b^*) and redness (a^*), alongside reduced cooking and drip losses; two studies involved in meta analyses describing higher fat content and 4 studies describing lower carcass fat content in SGB	Marchewka et al. (2023)
Hubbard REDBRO	littered floor boxes in climate-controlled barn	meat quality in early fed chicks	reduced incidence of the myopathies wooden breast and white striping	Smets et al. (2026)
Hubbard JA757, ISA Dual	littered floor boxes in climate-controlled barn	meat quality after low nitrogen diets feeding	higher content of dry matter and crude protein, a lower cholesterol content in the breast meat, and no negative impact on the European Performance Efficiency Factor in ISA Dual; higher abdominal fat content in SGB	Chodova et al. (2021)

SGB = slow-growing broiler

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in SGB strains. Research on the Hubbard 787 and REDBRO genotypes indicates a two-fold reduction in mortality post-initial week and a five-fold decrease in mortality during transport (Baxter et al. 2021; Forseth et al. 2023; Forseth et al. 2024). This resilience extends to disease resistance, with the Hubbard ISA-JA-757 showing limited systemic dissemination of *Salmonella* Infantis to visceral organs compared to FGB (Drauch et al. 2022). Additionally, SGB flocks exhibit lower antibiotic treatment probabilities (Slegers et al. 2024). This innate immunity is further supported by elevated natural antibody titres (IgM and IgY) in genotypes like the Cobb Sasso (Giles et al. 2019) and a more efficient immune response to parasitic challenges such as *Eimeria maxima* (Sarrigeorgiou et al. 2023).

Meat quality in SGB genotypes aligns more closely with consumer preferences for enhanced sensory and nutritional profiles (Table 4). Strains such as the Indbro produce meat with reduced saturated fatty acid content, which is positively correlated with consumer preference (Devatkal et al. 2019). Physiologically, SGB pectoral muscles display higher muscle fibre density and lower glycolytic potential, resulting in improved colour stability and reduced drip or cooking loss (Huo et al. 2022; Marchewka et al. 2023). Critically, SGB strains like the Hubbard Redbro ColorYield and Ranger Gold exhibit a near-total absence or significant reduction in modern myopathies such as wooden breast, white striping, and dorsal cranial myopathy which are prevalent in conventional FGB (Hisasaga and Makagon 2024; Smets et al. 2026).

The adaptability of SGB genotypes facilitates high performance across diverse and challenging rearing environments (Table 5). Strains such as the Ranger

Table 5. Significant advantages of slow-growing broiler chickens in stress resistance and adaptation to stressors

Tested genotype of SGB or type of study	Rearing system	Tested parameter	Significant outcome	References
Illinois broilers	not specified	gene expression in myocardium	reduced lipid accumulation and oxidative stress in the myocardium	Zhang et al. (2018)
Illinois broilers	colony houses	susceptibility of cardiac dysfunction under heat stress	no alteration in gene expression in the heart under heat stress, alongside a reduced susceptibility to dysfunction	Zhang et al. (2017)
Ranger Gold, Naked neck Kabir	littered floor pens in climate-controlled rooms	heat stress	a significant interaction was observed between genotype and temperature. FGB had the greatest decrease in feed intake and body weight gain compared to the two SGB genotypes under heat-stress conditions	Pontalti et al. (2025)
Hubbard JA757, ISA Dual	littered floor pens in climate-controlled barn	growth response to lowered protein levels	no negative impacts of reduced crude protein levels on feed intake, body weight gain, FCR, or carcass characteristics in ISA Dual, nor on the FCR of Hubbard JA757	Tyl et al. (2025)
crossbreed Cornish × Leghorn, Robusta Maculata, Kabir, Naked Neck	free range system	adaptability to organic system	higher adaptability to an organic rearing system, based on an adaptability index calculated from 49 different traits	Castellini et al. (2016b)
Ross Rowan Ranger	littered floor pens in climate-controlled barn	effect of silage and haylage inclusion in the diet on growth performance	no negative impacts of silage and haylage inclusion (15%) in the diet on body weight, feed intake, and FCR	Valeckova et al. (2020)

FCR = feed conversion ratio; FGB = fast-growing broilers; SGB = slow-growing broiler

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Gold and Naked Neck Kabir demonstrate superior heat stress resistance and a lower susceptibility to cardiac dysfunctions, maintaining stable cardiac gene expression under high ambient temperatures (Pontalti et al. 2025). Nutritional resilience is equally pronounced; the ISA Dual maintains growth performance even on low-protein diets (Tyl et al. 2025), while the Ross Rowan Ranger can utilise forage, such as silage, without compromising body weight (Valeckova et al. 2020). Combined with a high adaptability index for organic and extensive systems (Castellini et al. 2016b), these traits underscore the ecological and physiological resilience of slow-growing genotypes.

Psychological and affective states, measured through various behavioural assays, further differentiate the strains. In attention bias tests designed to measure anxiety, SGB chickens demonstrate lower levels of anxiety than FGB ones, exhibiting reduced vigilance in the presence of perceived threats and a shorter latency to resume feeding (Ulans et al. 2024). FGB often exhibit higher levels of fear and longer latencies to approach new stimuli compared to SGB, which tend to be more exploratory (Ulans et al. 2026). Interestingly, while vigilance levels tend to increase as both strains gain weight, FGB consistently maintain higher baseline fear responses and higher reactive thresholds throughout their development (Ulans et al. 2024).

DISADVANTAGES OF SLOW-GROWING BROILER CHICKENS

The production of SGB chickens involves significant trade-offs regarding performance efficiency, economic viability, and environmental sustainability when compared to FGB genotypes (Table 6). A primary disadvantage is the inherent reduction in growth performance and feed efficiency; genotypes such as the Ranger Classic and various Hubbard strains exhibit lower body weight gain and reduced feed intake (Dixon 2020; van der Eijk et al. 2023). This is reflected in the feed conversion ratio, which can be up to 49% to 61% worse (depending on stocking density) in certain Hubbard genotypes compared to conventional FGB strains like Ross 308 (Weimer et al. 2020). Furthermore, the lowered muscle development of SGB result in lower carcass percentage, breast yield, as observed in the Hubbard Red JA (Comert et al. 2016). These results were obtained under experimental conditions simulating conventional broiler chicken farming, meaning that SGBs cannot achieve comparable performance metrics in such settings. However, they are particularly suitable for extensive farming systems, where they demonstrate a higher degree of adaptability (Castellini et al. 2016b).

Economically, these performance gaps translate into substantially higher production costs that challenge widespread market adoption. In the United States, production costs for SGB are estimated to be 11% to 25% higher per pound (Lusk et al. 2019). Within the European Union, the economic impact is even more pronounced, with additional costs reaching 37.5% per kilogram of meat produced (Abeyesinghe et al. 2025). These increased price points often conflict with consumer behaviour, as surveys indicate that approximately 63% of consumers in US are unwilling to pay a premium for meat from slow-growing chickens. Price plays a primary role in consumer purchasing behaviour. The low price of chicken is one of the main reasons for its popularity compared to other types of meat. This low price is due to the high feed efficiency of FGB. For these reasons, the current public acceptability of meat from SGBs is problematic (Lusk 2018).

Additionally, the extended rearing period required for SGB results in a larger ecological footprint, including a higher global warming potential and carbon emissions that can be two to five times higher than those of FGB (Bungsrisawat et al. 2025; Leinonen 2025).

Overall, SGB are considered healthier, but compared to FGB there were observed several examples not supporting this assumption. Compared FGB have the SGB weaker leg bone strength a structure due to probably lower load due to lower body weight. For instance, genotypes such as the Hubbard-Isa Red JA and Hubbard JA57 have demonstrated weaker tibia structures and lower bone-breaking strength compared to FGB (Suzer et al. 2019; Capar Akyuz et al. 2024). There are also specific health risks associated with SGBs, including a higher susceptibility to fowl cholera, which has resulted in 100% mortality in some commercial slow-growing flocks (Miller et al. 2025). Other strains, such as the Lohmann Dual, have shown a higher susceptibility to reinfection by mixed nematodes compared to their FGB counterparts (Stehr et al. 2019).

https://doi.org/10.17221/72/2026-CJAS

Table 6. Significant disadvantages of slow-growing broilers compared to fast-growing broilers

Tested genotype of SGB or type of study	Rearing system	Tested parameter	Significant impact	References
Ranger Classic	littered floor pens in climate-controlled barn at various stocking density	performance	a 5% lower body weight, a 22% reduction in average daily gain, an 18% lower daily feed intake, and a 5.5% poorer FCR	van der Eijk et al. (2023)
HS1 chickens	batteries with wire mesh floor	growth performance	poorer performance under *ad libitum* and restricted feeding programmes	Qin et al. (2021)
Hubbard	littered floor pens in climate-controlled barn	feed efficiency	market weight was achieved 21 days later; FCR increased by 61% at a stocking density of 29 kg/m^2 and by 49% at 37 kg/m^2	Weimer et al. (2020)
Hubbard ISA red JA	littered floor pens in climate-controlled barn	performance and intestinal histomorphometry	deteriorated performance, alongside a reduction in villus height, crypt depth, and the villus height to crypt depth ratio in the intestine	Capar Akyuz et al. (2022)
Hubbard Red JA	littered floor pens in climate-controlled barn	carcass characteristics evaluation	lower carcass, breast, and thigh-drumstick weights, with a 5% reduction in breast yield	Comert et al. (2016)
Wenchang chickens	not specified	number of myofibres in breast and thigh muscles	reduced density of myofibres in the muscles	Gu et al. (2024)
Study based on field data	not specified	cost analyses of SGB production	US production costs were estimated to be an additional 11–25% per lb (pound)	Lusk et al. (2019)
Survey	not specified	consumers' willingness to pay more for meat from slow-growing chickens	a 63% of consumers in the US are unwilling to pay more for more costly SGB meat	Lusk (2018)
Hubbard REDBRO	littered floor pens	environmental impact	a 16% increase in feed cost, and a two- to five-fold increase in carbon emissions, depending on sex	Bungsrisawat et al. (2025)
Study based on field data	not specified	environmental impacts	environmental impacts: a higher global warming potential, expressed as more than 1 kg CO_2e produced per kg of eviscerated carcass	Leinonen (2025)
Hubbard-Isa Red JA	littered floor pens in climate-controlled barn.	tibia structure and strength	weaker bone structure and reduced tibial breaking strength	Capar Akyuz et al. (2024)
Hubbard JA57	deep litter, plastic slat and free-range system	bone structure and breaking strength of 15 bones	weaker bone morphology and reduced bone breaking strength	Suzer et al. (2019)
Case study on farms	commercial farms	incidence of fowl cholera in broiler flock	higher susceptibility to fowl cholera, resulting in 100% mortality on farms housing SGB	Miller et al. (2025)

https://doi.org/10.17221/72/2026-CJAS

Table 6 to be continued

Tested genotype of SGB or type of study	Rearing system	Tested parameter	Significant impact	References
Lohmann Dual	littered floor pens in climate-controlled barn	mixed nematode infections with *Ascaridia galli* and *Heterakis gallinarum*	similar response to the primary infection as observed in FGB, but a higher susceptibility to reinfection	Stehr et al. (2019)
Hubbard Red JA57	commercial farms	slaughter performance and breast meat quality	greater body weight loss (5.2%), a higher heterophil : lymphocyte ratio (0.81) after transport, and a higher incidence of breast haemorrhages	Turgut et al. (2025)
Partridge shank broiler	cages	growth performance and meat quality	reduced growth and compromised antioxidant capacity in the breast muscles	Wen et al. (2017)
Naked neck	free range	effect of transport before slaughter on oxidative status and quality of breast meat	reduced oxidative stability and a higher malondialdehyde content in the breast muscles	Castellini et al. (2016a)

FCR = feed conversion ratio; FGB = fast-growing broilers; SGB = slow-growing broiler

Finally, while SGBs are often associated with improved meat quality, evidence suggests that meat quality and stress resilience during processing can present drawbacks. Research on the Naked Neck SGB has identified decreased oxidative stability and higher malondialdehyde content in breast muscles following transport to slaughterhouse (Castellini et al. 2016a). During slaughter, Hubbard Red JA57 birds have shown a higher incidence of breast haemorrhages and an elevated heterophil : lymphocyte ratio, indicating a significant stress response (Turgut et al. 2025). Consequently, the higher activity levels and increased reactivity of SGB may be counterproductive during pre-slaughter transport, potentially leading to a higher incidence of injuries and compromised meat quality (Castellini et al. 2016a).

In terms of sensory characteristics, SGB meat may be more favourably received by consumers, however, this depends on the location and geographical origin. For instance, in India consumers clearly prefer characteristics of meat from SGB (Devatkal et al. 2019). On the other hand, study conducted in Italy by Pellattiero et al. (2020) evaluated consumer acceptance of FGB versus SGB meat. FGB meat was rated more positively across most characteristics, and its overall acceptance was also higher.

THE BEHAVIOURAL DIFFERENCES AMONG FAST- AND SLOW-GROWING BROILER CHICKENS

The behavioural divergence between FGB and SGB broiler genotypes reflects profound differences in environmental interaction, ethological expression, and stress reactivity. These variations are primarily driven by the metabolic and physiological demands of accelerated growth rates in conventional meat-type strains, which fundamentally alter the broilers activity levels and physical capabilities (Dixon 2020). While a general age-related decline in activity is observed across all broiler genotypes, the temporal onset and intensity of inactivity differ significantly by strain. FGB, such as the Ross 308 and 708, reach peak levels of inactivity significantly earlier and more intensely than their SGB counterparts (Whittle et al. 2025). Although both genotypes eventually spend approximately 60% to 70% of the photoperiod inactive, FGB reach this state at a younger age, spending a greater proportion of their time sitting and a significantly lower proportion of walking compared to SGB at the same age (Bokkers and Koene 2003; Dawson et al. 2021). In contrast, SGB like the Hubbard JA757 and Ranger Classic maintain a more active behavioural repertoire, including higher frequencies of run-

https://doi.org/10.17221/72/2026-CJAS

ning, walking, and comfort behaviours throughout an extended fattening period (de Jong et al. 2021; van der Eijk et al. 2022).

The utilisation of environmental complexity is also closely linked to the biomechanical constraints imposed by rapid weight gain. SGB make significantly better use of environmental enrichments such as perches, raised platforms, and barrier perches. Research indicates that SGB are much more likely to perch and use ramps even when these resources are provided to both strains (Dawson et al. 2021). In FGB, the use of such structures often declines as body mass increases, likely due to the increased physical effort required for locomotion and potential skeletal discomfort or lameness associated with high growth velocity (Dixon 2020). While environmental complexity can stimulate activity in both strains, the effect is typically more sustained and pronounced in SGB genotypes (Bokkers and Koene 2003).

Metabolic demands further dictate distinct feeding and foraging patterns between the fast and slow-growing strains. FGB prioritise consumption to sustain their metabolic state, allocating a larger portion of their time budgets to frequent and long-duration feeding and drinking periods (Dawson et al. 2021). Conversely, SGB allocate significantly more time to non-consumption-based foraging, such as scratching and pecking at the litter. These foraging activities are part of a broader set of comfort behaviours, including preening and dustbathing, which SGB perform more frequently than FGB chickens (Wallenbeck et al. 2016; Whittle et al. 2025). This suggests that SGB possess a greater capacity or motivation to engage in a complete ethogram of natural behaviours, whereas FGB are more restricted by their intensive focus on feed intake.

Finally, management factors such as stocking density and lighting impact behaviours differently across genotypes. While reducing stocking density from high levels like 42 kg/m^2 to 24 kg/m^2 has been shown to increase active behaviours and enrichment use in both genotypes, SGB maintain a higher overall baseline of activity regardless of the density (van der Eijk et al. 2022). Regarding lighting, both strains show specific preferences that vary by age and behaviour, though FGB generally exhibit higher overall feed intake across various lighting conditions (van der Sluis et al. 2025). Both genotypes exhibited higher activity at high light intensities and increased rest at lower light intensities. Younger birds preferred brighter light, while older birds favoured lower intensities. Preference for higher intensity also peaked at the start and end of the photoperiod. Consequently, light programmes should be tailored to hybrid, age, and time of day to establish functional behaviour zones within broiler housing (van der Eijk et al. 2025b). Furthermore, floor materials play a critical role in welfare outcomes. SGB tend to maintain better walking ability and cleaner plumage than FGB, who are significantly more susceptible to hock burns and footpad dermatitis due to the excessive time spent sitting on potentially damp litter (Cavusoglu and Petek 2019). Ultimately, the selection for rapid growth has created a behavioural trade-off where metabolic prioritisation and physical constraints limit the expression of a natural behavioural repertoire.

WELFARE OF SLOW-GROWING BROILER CHICKENS

The transition toward SGB genotypes is primarily driven by escalating societal and consumer concerns regarding the welfare standards of intensive poultry production. Conventional intensive systems typically utilise FGB genotypes, such as Ross 308 or Cobb 500, maintained at high stocking densities that exceed 38 kg/m^2, conditions which are frequently criticised for compromising animal well-being (Kwon et al. 2024). To mitigate these concerns, the industry has introduced "middle-segment" and "top-market" (e.g. organic or extensive outdoor) systems. These alternative models utilise SGB such as the Hubbard JA57, JA757, or Rowan portfolio housed at reduced stocking densities, typically ≤38 kg/m^2, to achieve superior welfare outcomes (Khire and Ryba 2025).

Moderated growth allows for more balanced physiological development. SGB generally exhibit superior musculoskeletal health, characterised by significantly better gait scores compared to their FGB counterparts (Dixon 2020; Zhou et al. 2024). Furthermore, SGB chickens tend to maintain better feather coverage and cleanliness, particularly when reared at lower stocking densities such as 30 kg/m^2 versus 40 kg/m^2 which reduces the incidence of contact dermatitis (Baxter et al. 2021; Zhou et al. 2024). SGB typically show a lower prevalence of hock burns and footpad dermatitis

https://doi.org/10.17221/72/2026-CJAS

at market weight, their longer lifespan necessitates meticulous litter management to prevent these issues from developing over time (Rayner et al. 2020).

Despite these advantages, SGB systems present specific environmental and economic trade-offs. A significant disadvantage is the extended production cycle, which increases the cumulative exposure of the birds to potential environmental stressors (Khire and Ryba 2025). Economically, the cost-efficiency of improved welfare remains a critical factor. Transitioning from conventional to middle-market or organic systems results in higher production costs due to increased feed conversion ratios, longer fattening periods, and lower stocking densities (Lusk et al. 2019; Abeyesinghe et al. 2025).

Despite these challenges, transitioning to "middle-segment" slow-growing systems is identified as cost-efficient in markets like the Netherlands, the United States, and Brazil, provided it is coupled with lower stocking densities of ≤38 kg/m^2 and environmental enrichments that support behavioural health (Vissers et al. 2019). Additionally, quantifiable improvements are evidenced by Welfare Quality index scores, which average 736 for slow-growing systems compared to significantly lower scores (577) in conventional US and Dutch production environments (Gocsik et al. 2016). Analysis using the Pain-Track method suggests a complex welfare shift: while SGB experience a longer lifespan that increases cumulative exposure to low-intensity negative states like boredom, they benefit from a drastic reduction in the high-intensity painful states associated with rapid-growth (Khire and Ryba 2025).

FUTURE DEVELOPMENTS OF PRODUCTION SYSTEMS UTILISING SLOW-GROWING BROILER CHICKENS

Limitations of SGB production systems are clear. FGB outperform SGB in performance parameters, FGB achieving higher growth rates, better FCR, and lower feed costs. Therefore, FGB showing the highest feed efficiency and the lowest carbon emissions, pointing to their sustainable and cost-effective production. In contrast, SGB consumed more feed, and generated the higher carbon footprint, reflecting lower efficiency and greater environmental impact (Bungsrisawat et al. 2025). Therefore, SGB farming represents a supplementary component of chicken meat production and their future development is highly associated with targeting consumer preferences on higher welfare standards and their willingness to pay (WTP) for it.

Heinola et al. (2023) studied how much money different groups of people are WTP for higher welfare standards. The study reveals that consumer WTP for farm animal welfare (FAW) in Finland varies significantly across distinct segments, though improvements to stocking density and litter quality are universally valued. The largest segment, FAW Supporters, is willing to pay a combined premium of EUR 5.41 bringing a baseline EUR 4.00 chicken package up to EUR 9.41 by prioritising space, litter quality, and enrichments over foot health. In contrast, Price-Conscious Youth and Basic-Needs Focused consumers prefer basic welfare attributes but ultimately yield higher cumulative totals (EUR 13.00 and EUR 11.24, respectively) when all measures are combined, putting their valuation right in line with the EUR 12.00+ premium commanded by organic chicken in the Finnish market. While there is clear demand for animal welfare-labelled chicken, consumer expectations remain highly diverse, requiring a mix of targeted market strategies, open communication through animal protection organisations, and public policy interventions to effectively reach different segments. Lusk (2018) indicates that approximately 30% to 40% of US consumers are insensitive to price changes and may adopt SGB regardless of the premium. However, broad market shaping is challenged by a general lack of consumer knowledge regarding broiler production and the current prevalence of disadvantageous beliefs regarding the taste and safety of slow-growing labels in the US. Consequently, for these systems to achieve significant market share, substantial marketing efforts are required to align consumer perceptions with a higher price point necessitated by slower growth cycles.

The transition toward breeding SGB chickens directly advances the EU's Farm to Fork strategy by reinforcing animal welfare and enhancing the sustainability of food production. Because SGB breeding is associated with lower use of antibiotics (Slegers et al. 2024), their adoption directly addresses the strategy's strict mandate to reduce agricultural antimicrobial sales by fifty percent by 2030. Furthermore, their integration into the market supports the strategy's goal of fostering sustainable food consumption, aligning seamlessly

https://doi.org/10.17221/72/2026-CJAS

with upcoming transparent, high-welfare eco-labelling frameworks that empower consumers to make value-driven purchases (Lusk 2018). While SGB introduce resource trade-offs due to longer production cycles and higher feed conversion, these challenges can be mitigated through the strategy's ten-billion-euro Horizon Europe fund, driving targeted research into advanced breeding to ensure higher efficiencies and sustainable production (Wesseler 2022).

The situation differs in developing countries, where modern SGB genotypes are often not raised due to high costs, unavailability, and the poor quality of feeds. Indigenous breeds serve as an alternative in these countries. Indigenous breeds by requiring minimal shelter and thriving on scavenging, household waste, and insects, these resilient chickens offer an exceptionally low-cost method for converting low-value resources into high-quality animal protein (Padhi 2016).

Similarly, the potential of SGB can be observed in this property. Fiorilla et al. (2024) observed in an autochthonous Italian slow-growing breed no negative impacts of complete soybean meal replacement by local pea and field bean proteins. More efficient use of alternative local products in feed mixtures for SGB could be one way to increase sustainability and improve the environmental impact of SGB farming.

The future development of SGB breeding is increasingly defined by a transition toward holistic selection criteria that prioritise the mitigation of high-intensity negative affective states associated with FGB fattening. Production of SGB meat is limited by the fact that producing equivalent meat volumes may require farming up to 22% more individual birds in the US (Khire and Ryba 2025). Despite a decrease in demand due to higher production costs (Lusk et al. 2019), the trajectory of SGB breeding is supported by a growing market share reaching 55–60% in regions like the Netherlands (Khire and Ryba 2025) and a selection focus that integrates environmental resilience, lower stocking densities of 30 kg/m^2, and the welfare of broiler flocks to ensure sustainability of the production system (Gocsik et al. 2016). Taken together, the use of systems involving slow-growing broilers is on the rise, representing an option for consumers that is likely to find a place both in countries with modern poultry farming and in developing countries where local breeds are utilised.

CONCLUSION

In conclusion, the transition toward SGB production represents a shift from maximising physiological output to optimising holistic broiler health and ethical standards. While the biological benefits of improved musculoskeletal integrity and reduced acute pain are well-documented, they must be balanced against the realities of higher resource consumption and the potential for cumulative boredom over longer lifespans. The future of these systems is not dictated solely by veterinary or economic metrics, but by the ability of the industry to bridge the "value-action gap" in consumer behaviour. Ultimately, widespread adoption will require a transparent supply chain and strategic communication that redefines value not just in terms of price per kilogram, but through the lens of animal welfare.

Conflict of interest

The authors declare no conflict of interest.

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