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AGRIBUSINESS

Bachelor's Thesis

POULTRY PRODUCTION AND PROCESSING IN CZECH REPUBLIC

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ABSTRACT

The absolute and most fundamental aim of this bachelor's thesis is to compare and understand the production and processing measures of broiler parent combination and their offspring for the desirable breeding type for commercial breeders of broiler chickens COBB 500 and ROSS 308 in that order.

The data was obtained from Mezinárodní testování drůbeže, státní podnik (International poultry testing, state enterprise) in Ústředice. Parent testing of COBB 500 and ROSS 308 consisted of parent rearing periods of up to 154 days of age respectively. The fattening test was made in two sets of 35 days and 42 days in that order.

Testing evidence results suggested that ROSS 308 chickens obtained a quite substantial live body mass/weight compared to COBB 500 on due ending course of the set rearing period in parent testing. However, lower feed consumption per head/day was realized in COBB 500 hybrids with reference to this period respectively. In addition to that, lower feed consumption was observed per day/head in COBB 500 hybrids during the laying period. Despite the deduced observations though, a higher egg number/hen housed was laid by ROSS 308 hens but the live hatched chickens per laying hen were higher in COBB 500 hens.

Higher live body mass/weight and lower feed consumption per kg gain hybrids were realized in ROSS 308 at the fattening test period of 35 days of age. On the other hand, roosters of both hybrid combinations COBB 500 and ROSS 308 gained a higher live body mass/weight and lower feed consumption per kg gain. 2.3 % of chickens died during the fattening period in each hybrid combination.

Higher carcass yield, breast, and thighs muscle mass were in this work determined in ROSS 308 hybrids. This is because ROSS 308 hybrids successfully attained a higher live body/weight of at least about 14 g during a prolonged fattening testing period of 42 days of age. Higher live body mass/weight however and lower feed consumption was determined in cocks obviously in comparison with hens in both genotypes.

In that order, 4.6 % of COBB 500 chickens and 5.4 % of ROSS 308 chickens died during the fattening period due to improper ventilation yet a very imperative factor to

animal welfare at large. genotypic difference between COBB 500 and ROSS 308 was at 0.2 % in slaughter yield, 7 g in breast mass, and 9 g in thighs weight respectively.

Keywords: COBB 500; ROSS 308; live body mass/weight; slaughter yield; cocks; hens; carcass.

ABSTRAKT

Cílem bakalářské práce je porovnat a porozumět produkčním a zpracovatelským opatřením kombinace rodičů brojlerů a jejich potomků pro žádoucí typ chovu pro komerční chovatele brojlerových kuřat COBB 500 a ROSS 308.

Údaje byly získány z Mezinárodního testování drůbeže, státního podniku v Ústrašicích. Testování rodičů hybridů COBB 500 a ROSS 308 se sestávalo z období odchovu rodičů do věku 154 dnů a snášky. Byly provedeny dva výkrmové testy ukončené ve 35 dnech, resp. ve 42 dnech.

Výsledky testů naznačily, že kuřata ROSS 308 vykázala vyšší živou hmotnost ve srovnání s kuřaty COBB 500 v období odchovu v rodičovském testu. Nižší spotřeba krmné směsi byla realizována u hybridů COBB 500 v tomto období. Kromě toho byla pozorována nižší spotřeba krmné směsi na den u hybridů COBB 500 během období snášky. Vyšší počet vajec byl vykázan u slepic ROSS 308, ale počet vylíhlých kuřat na 1 nosnici byl vyšší u slepic COBB 500.

Vyšší živá hmotnost a nižší spotřeba krmné směsi na 1 kg přírůstku hybridů byly dosaženy u ROSS 308 ve výkrmovém testu do období 35 dnů věku. Na druhou stranu kohoutci obou hybridních kombinací COBB 500 a ROSS 308 měli vyšší živou hmotnost a nižší spotřebu krmné směsi na kg 1 přírůstku. V každé hybridní kombinaci uhynulo během období výkrmu 2,3 % kuřat.

U hybridů ROSS 308 byla zjištěna vyšší jatečná výtěžnost a vyšší hmotnost prsní a stehenní svaloviny. Bylo tomu tak proto, že hybridi ROSS 308 dosáhli vyšší živou hmotnost o 14 g během prodlouženého období testu výkrmnosti ve věku 42 dnů. U kohoutků však byla zjištěna vyšší živá hmotnost a nižší spotřeba krmné směsi ve srovnání se slepičkami obou genotypů.

Během období výkrmového testu uhynulo 4,6 % kuřat COBB 500 a 5,4 % kuřat ROSS 308 v důsledku nesprávné ventilace, což je velmi důležitý faktor pro dobré životní podmínky zvířat obecně. Diference mezi hybridy COBB 500 a ROSS 308 byla 0,2 % v jatečně výtěžnosti, 7 g v hmotnosti prsní svaloviny a 9 g v hmotnosti stehenní svaloviny.

Klíčová slova: COBB 500; ROSS 308; živá hmotnost; jatečná výtěžnost; kohouti; slepice; jatečně opracované tělo.

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Content

1	Introduction.....	9
2	Literature review	10
2.1	Types of chicken.....	10
2.2	Stocking.....	11
2.3	Feeding.....	12
2.4	Energy supply & lighting mode	14
2.5	Ventilation	16
2.6	Temperature.....	17
2.7	Air composition	18
2.7.1	Ammonia.....	18
2.7.2	Carbon dioxide.....	21
2.7.3	Hydrogen sulphide.....	21
2.8	Welfare.....	23
2.8.1	Capturing and loading.....	24
2.8.2	Transportation and Unloading	25
3	Materials and methodology.....	28
4	Poultry production in Czech Republic.....	29
4.1	COBB 500	29
4.2	ROSS 308.....	29
4.3	Breeding chicken.....	30
4.4	Feed and fattening of offspring in 32 days.....	34
4.4.1	Indicators within 32 days	34
5	Results and Feedback	37
5.1	Hatchability	37
5.2	Growing period	37
5.3	Carcass analysis	39
5.4	Feed and fattening of offspring in 35 days.....	41
5.4.1	Indicators within 35 days	41
5.4.2	Indicators of slaughtered meat yield up to 35 days.....	43
5.5	Feed and fattening of offspring in 42 days.....	46
5.5.1	Indicators within 42 days	46
5.5.2	Indicators of slaughtered meat yield up to 42 days.....	48

6	Conclusion	52
7	Sources	53
7.1	Attached literature.....	53
7.2	Internet sources.....	55
7.3	List of Figures.....	56
7.4	List of Tables	57

1 Introduction

Chicken is one of the highly nutritious and excellent sources of protein, the addition of it to one's diet improves muscle growth, weight loss and bone health, Ergo the term *Poultry Production and Processing in the Czech Republic*, which according to the *Czech statistics office (CZSO 2021)*, it reports poultry meat as the second most consumed from pork being the topmost in consumption in the country.

Over recent years, however, poultry meat has been on the increase in demand. The assumption to this cause is its affordability to consumers as well as its nutritiousness and rich protein composition.

The goal of this work is to compare, contrast and understand the production and processing measures of broiler parent combination and their offspring for the desirable breeding type for commercial breeders of broiler chickens COBB 500 and ROSS 308 in that order.

To explain and understand the production and processing measures of poultry in the Czech Republic, an assessment will be conducted at Mezinárodní testování drůbeže, státní podnik (International poultry testing, state enterprise) in Ústřední a reputable international testing plant for parent broilers in the Czech Republic.

2 Literature review

2.1 Types of chicken

Technically, chickens fall under two main categories namely, organic and inorganic. From the two main categories, other branches do fall under it as well. Just as they differ for instance; Organic chickens are qualified by their upbringing, which includes feeding, antibiotics, supplements, and environmental exposure. Whereas the opposite is true for a regular chicken rather inorganic or non-organic chicken.

According to the *Farm animal welfare compendium (2013)*, chickens that are grown for the purpose of meat are called Broilers rather Broiler chickens. The belief is that they originate from the subcontinent of Indian Jungle fowl. Despite the technique of fast-growing and increased weight in broilers for commercial activities, the demand for poultry meat has continued to grow over the years which is quite an advantageous attribute to the poultry industry.

The two main broiler chickens now world-leading are COBB 500 and ROSS 308. The two are characterized by the excellent growth rate, most feed efficiency and low cost of production in live weight. Despite being a plus to the industry, the increased production of broiler chickens in recent years does not seem to meet the demand ratio for broiler meat. The graph below illustrates the ratio of production to demand for broiler meat in the Czech Republic in the last 10 years.

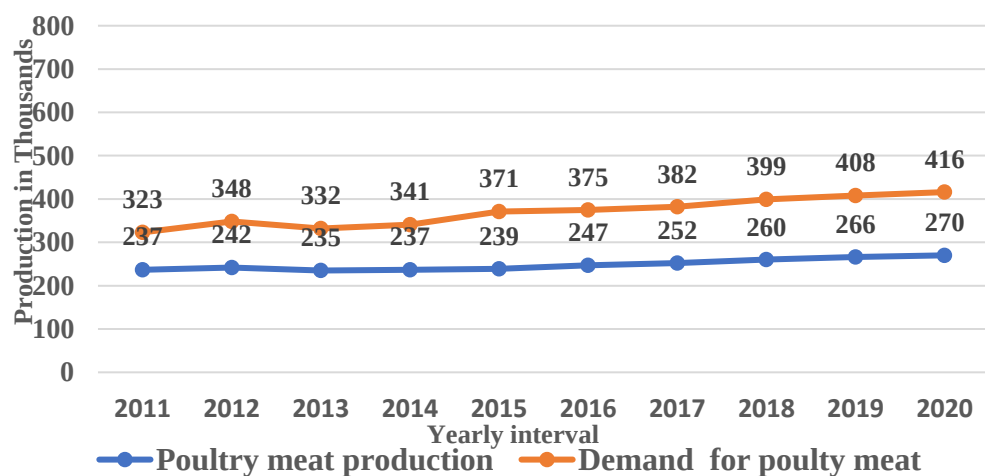


Figure 2.1. Annual production and demand for poultry meat 2011-2020.

2.2 Stocking

Producers of poultry meat do not primarily get to select the genotype of their production in a particular year a season. However, breeding companies have it as their primary task. Generations of broiler chickens that are sold out three or four cycles generally would have been produced in low and specifically selected precisely by the breeding companies.

As opposed to stocking broiler chickens in other parts of the world that are warmer, the Czech Republic being part of the European region has a whole different set of alignment. These differences are of course influenced by climate, weather, and standards of living of respectively. Due to cold weather and climate, Czech Republic intensive broiler farmers grow their chickens in closed sheds. The lighting is controlled, ventilation is controlled and so is the temperature. Various reports evidently state the difference in the stocking densities from country to country i.e. According to the report from Compassion in World Farming Trust by *Turner et al. (2005)*. The welfare of broiler chickens in the European Union. EU ranges its stocking density between 22 and 42 Kg/m² (11 and 25 birds per m²) at the very time countries such as Germany were stocking at 30 and 37 Kg/m².

Despite these differences despite looking biased, there are measures put considering chickens' welfare. However, if these measures are not looked at respectively, overcrowding seems to be the predominant challenge which in turn is most likely to cause diseases outbreaks and spreading easily across the housing shed and limited movements.



Figure 2.3. Big intensive modern day indoor chicken farm.

2.3 Feeding

As poultry meat remains one of the most important parts of human beings' source of food and one of the cheapest sources of protein. Growth is a profound aspect of every living organism, there are a lot of factors that influence the growth of living organisms, particularly broiler chickens in this context.

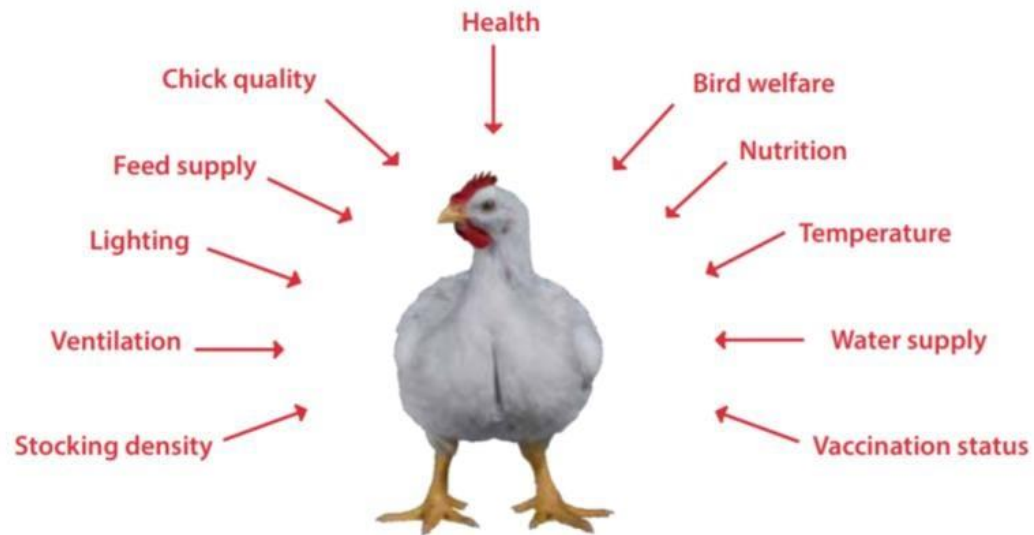


Figure 2.4. Factors influencing quality and growth of broiler chickens.

With no further argument, it is true to say that how you feed Broiler chickens has a direct influence on their weight gain and health, which particularly means the diet that chickens are supplied with contains all components important for their growth. Despite the challenges that might be faced, farmers are advised to at least consider those aspects.

According to Broiler breeder production by *Leeson and Summers (2000)*. Feeding schedules or programs are of such profound pertinence because it helps to have a regulated and effective influence on the biological processes such as nutrient absorption as well as growth rate during the early days of broiler life circle. The life circle being 5-6 weeks, market weight is usually achieved by commercial breeders. Nutrients such as amino acids rather protein, calcium and energy are of a challenge to breeders.

Broiler chicken's diet comprises three main phases which are starter, grower, and finisher. Starter diet or feed though varies from breeder to breeder and is affected by other factors. This diet is administered to the chicks for 10-days which therefore can be pushed to 14-days in the case that the desired weight for that age is not met. The grower will then take 14-16 days and finally Finisher after day 25 of age and it varies of course, especially for profitability reasons and as well if the market weight has already been met.

According to *De Jong et al. (2012)*. A scientific report updating the EFSA opinions on the welfare of broilers and broiler breeders. Supporting Publications of (2012): EN-295. Report for the European Food Safety Authority (EFSA). www.efsa.europa.eu/publications.htm. Ideally, if broilers were left to just feed to their diet without a proper plan. The birds would be subjected to rapid growth and weight gain, which in turn would make it extremely very difficult for them to maintain their health status.

The feed comprises elements such as proteins, carbohydrates, macro minerals and vitamins, which are obtained from their dietary ingredients which include Wheat, soya, full-fat soya, maize, limestone, phosphate, salt, oils and fat, sunflower meals, and other additives such as mycotoxin binders and enzymes.

Intake of some nutrients and vaccines is through various techniques depending on the technology available to the farmer. Below is an illustration of such an example of a drinking system for chicks.



Figure 2.5. Shows broiler chick drinking system.

2.4 Energy supply & lighting mode

Energy as to humans is of great importance, so is to animals and plants respectively. However, sources of these energy supplies differ as it is dependent on what exactly is the energy needed for. Energy sources for the chicken farmers will therefore always differ depending on what is convenient for the farmer.

As for the Czech Republic, most farmers still have a stack to using electricity and gas even though at least the evidence suggests that over the years there has been an increase in the switch to renewable sources and green energy to reduce carbon emissions such as biogas and solar rather called photovoltaic panels to self-sustain energy supply to their farms adding a commercial and economic advantage to their production despite the challenges according to *Vitásek and Bednárová.,(2016)*. Czech Farmers take the slow lane to renewable energies.

According to a review by *Patel et al. (2016)*. *Advances in Life Science* 5(4) 2016. Significance of Lighting in poultry production (Lighting program for broiler birds). The review suggests that the lighting plot for broiler chickens is set to archive a controlling interest in feed consumption and stimulation. Although the pattern differs from place to place according to the latitude location of that region. For instance, a similar experiment was tried by *Lesson and Lopez (2000)* on the Mexico lighting effect on egg production, results showed variations in the maturity and reproductive activities amongst birds with different lighting patterns holding the 20° latitude constant.

Considering that the Czech Republic has more of its poultry production in intensive indoor farming it fairly makes sense that the two main programs used are 1.) Intermittent Lighting of 2hr ON/OFF and 2.) Continuous lighting except for 1hr OFF. According to the review by *Patel et al. (2016)*. presents an illustration suggesting an example or at least an ideal lighting program for poultry featuring several birds respectively. The selection of these birds includes broilers, layers, duck and geese, pullets, and pheasant breeders. The table stipulates the bird type and the lighting duration and intensity.

Table 2.1. Lighting schedule and intensities.

Bird Types	Lighting
Young chickens (1-5 days)	24 hrs. constant lighting at 40 lux minimum with 5-60min blackout training
Young chickens (6-10 days)	23 hrs. constants lighting at 30 lux
Pullets	15 hrs. constants lighting at 5 lux
Layers	15 hrs. constants lighting at 10 lux
Broilers	23 hrs. constant lighting at 40 lux, 1-5 days. then 23 hrs. at 3-5 lux or alternate 2 hrs. light at 5 lux and 2 hrs. dark
Duck & Geese	15 hrs. constants light at 10 lux
Pheasant Breeders	15 hrs. constants light at 10 lux from the beginning to end of the breeding season (about April)

Note:

Lux is a unit of illumination and measures the amount of light per square meter. 50 lux is about the brightness of an average lounge room.

Sources: *Significance of Light in Poultry Production. A Review by Patel et al. (2016).*

2.5 Ventilation

The optimism of all contributing factors to a good healthy and conducive environment for all living organisms be it plants, animals, humans, and the like is particularly critical. According to Poultry Housing in Hot Climate.

Czarick III and Fairchild (2008). Confirms to say that if the optimum body temperature of about 39.4°C and 40°C of a bird is exceeded, chances are that the bird is not expected to present high-level performance. The conclusion was stated that if the actual thermoneutral zone of a bird, which was defined as a maintainable internal body temperature a bird can hold without exhausting extra energy in a provided environmental temperature range.

The Czech Republic being in a cold region with four seasons respectively spring, summer, winter, and autumn. With intensive indoor poultry farming, it is only therefore right to assume that there is a technique needed to support the breeding. As such, *Cao et al, (2017)*. Summer Ventilation of Poultry Houses for Chicken Fattening in CFD Modelling. DOI:10.22616/ERDev2017.16. N091. They suggest that the challenges of huge pollutants the chickens produce due to mass gain measure per m² can be mitigated simply by creating a profound ventilation system despite having an adverse impact on technical appliances in the poultry house.

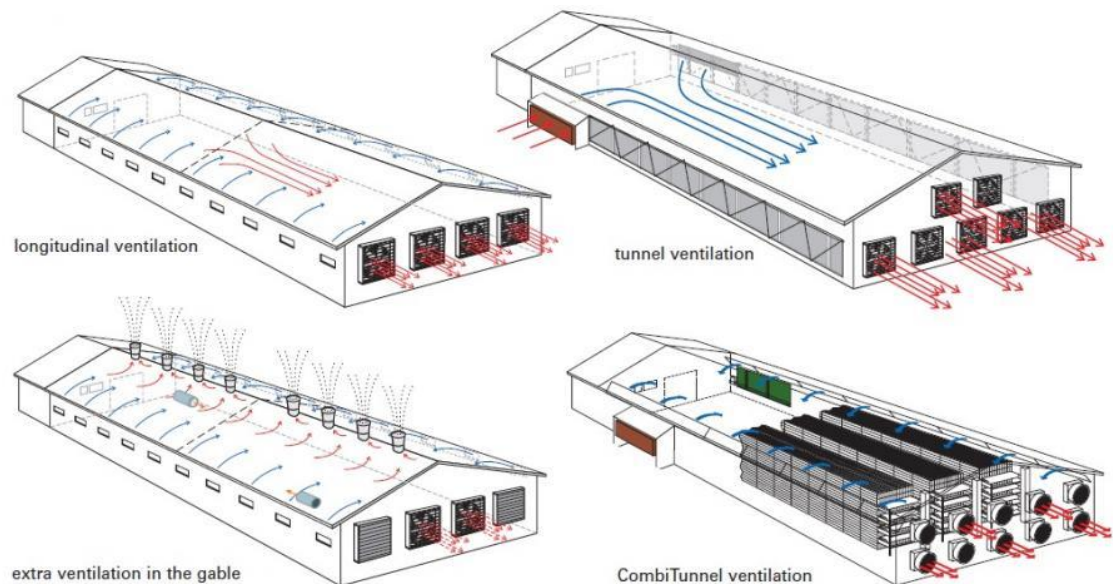


Figure 2.7. Modern ventilation system i.e., Czech Republic Markovice Big Dutchman.

2.6 Temperature

Relatively, how cold or warm the bird's condition exposure is extremely very important. The condition particularly influences performance, productivity, fertility, feed intake and quality production respectively. However, the narrow range is often laid out to create a balance rather an optimum between the too cold and too hot restrictions for the bird to avoid the negative impact it has on the birds.

Referentially, *Etches et al. (2008)*. Poultry Production in Hot Climates. ISBN 9781845932589. Says that there is less or no heat loss and gain in chickens that are uprightly fed. The literature suggests that heat storage extension cannot be realized because the birds will only maintain the maximum limits at an approximation of 41.5°C and a minimum of about 40.5°C.

The approximation translates that exposure to temperature increased environment or high energy-requiring activities, birds might lose or gain heat by 1 to 2°C respectively. With this cause, it is therefore paramount to acknowledge that in times of thermal stress, alteration in the normal behaviour of birds is observed.

This altering happens because it helps birds return or maintain body temperature. However, the effect of this is that stressed chickens by heat keep distance from each other, have a reduced intake of feed, increased intake of water but with limited time intervals, less walk and standing activities.

Etches et al. (2008) On the other hand explain that over the years, it has been found that birds tend to select a conducive environment over one that is extremely exposed to excess. In as much as that sounds obvious, it requires a bird to have learnt to actualize an acquired skill of preference in terms of conducive and favourable environmental conditions.

In a separate study on young broilers instead by *Morrison and McMillan (1986)* it was examined that shifting ambient temperature causes a prompt response in birds provided with an external heat source of an infrared light bulb.

Different mechanisms take place to create a balance in the internal body environment of an organism particularly chickens in this case. The process by which the internal environment is kept optimal is called homeostasis.

The balance is archived in the case of temperature birds lose some feathers; they can initiate a panting mechanism as it rises carbon dioxide loss hence the reduction is CO₂ pressure from the lungs.

However, the challenge of temperature balance is quite subjective from place to place. As such most commercial breeders somehow find a way to hybrid their stock to have more heat resistant breeds in their poultry houses. This helps them reduce on costs to make their housing temperature extra balanced because they have birds self-regulate themselves.

2.7 Air composition

Air is simply a combination of atmospheric gases. Which means that it comprises all kinds of gases in their impure state and though very important in its natural state to different things such as plants, humans and animals, air hygiene is of great importance to all. However, birds grown outdoors on a free range have a more hygienically upright air composition which is unlike broiler chickens grown indoors by intensive poultry farmers, especially in the case of European regions like the Czech Republic. *Wathes.(2004). Measuring and Auditing Broiler Welfare.*

2.7.1 Ammonia

Being a colourless gas and a compound of nitrogen and hydrogen symbolised as (NH₃), *Wathes et al. (2004)*. Continues to confirm that ammonia is an abundant pollutant in the poultry house respectively. From the basic knowledge of chemistry, Ammonia is self-formed by birds in the poultry house. It is said that about 80% Uric acid, 10% Ammonia and 5% Urea is excreted from nitrogen in excess and unutilized. According to *Karimi et al. (2019)*, ammonium is formed as ammonia gas which reacts with moisture, causing harm to birds via the very corrosive solution though basic in its nature.

Adverse effects it has includes trachea paralysis and damage to cilia epithelial cells, corrosion in the bird's respiratory tract. Due to this effect, most countries have however limited the balance of ammonia exposure about to 20-25ppm despite other intensive

houses easily cross above limit, especially in winter. As such The EU directive council issued a directive in 2007 which stipulated less than 20ppm NH₃ concentration exposure over an 8-hour period or 35ppm over a 10-minute period within the production cycle (*Council Directive 2007/43/EC*).

Nevertheless, over the years since the discovery of these effects, there has also been work put in to curb the scourge. The measures put in include, improving the digestibility of nutrients via additives in feed, temperature adjustments, which improves the reaction of ammonia gas with moisture, ventilation adjustment and stocking density regulation to reduce excessive emission of ammonia produced by birds in turn reducing anaerobic processes and ration composition and diet management which helps reduce wet waste from chickens and odour.

The figure below shows the mean concentration of some gases in poultry houses from an assessment among some European countries carried out by *Groot Koerkamp et al. (1998)*.

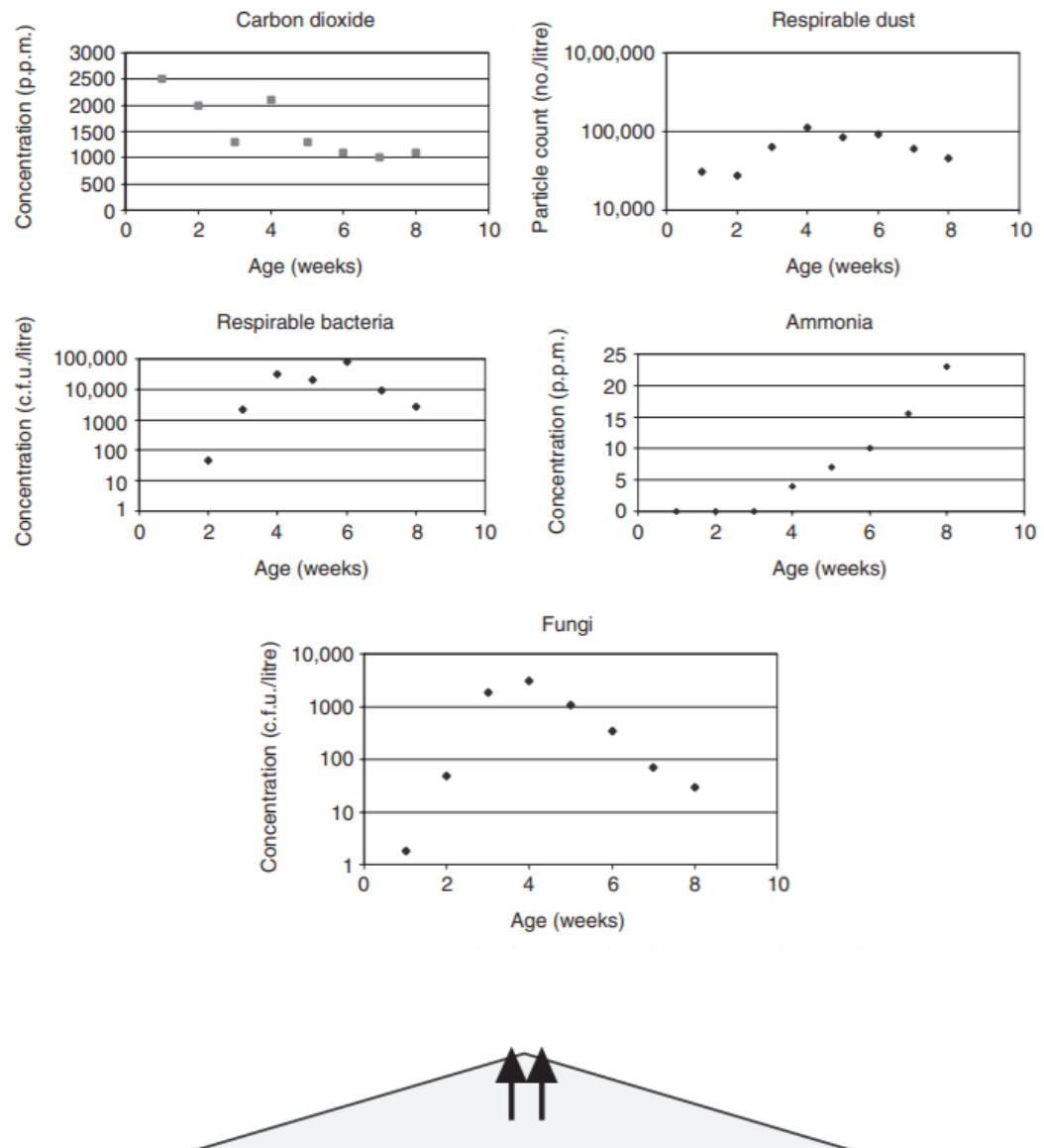


Figure 2.8. Mean concentration of some gases in poultry houses from an assessment among some European countries carried by Groot Koerkamp et al. (1998).

2.7.2 Carbon dioxide

All gases may not really be negatively impacting the chicken in the broiler house. One of such a gas is Carbon dioxide (CO_2). Poultry meat being one of the most consumed globally, at least carbon dioxide has become of great importance to the production. It appears that CO_2 has its importance at each and every stage of growth. However, in times of need such as a mechanism to have healthy chickens with quality performance and all other aspects CO_2 is used for instance, in feed intake control. CO_2 in excess levels rather high levels reduces feed intake many chickens. This means that during withdrawal period before chickens are ready for slaughter and market, the method is used to prevent chickens from growing too big with excess body weight, hence maintaining good health. Due time for slaughter CO_2 comes in handy for CAS (Controlled Atmospheric Stunning).

There are a lot of uses that Carbon dioxide has been used to as it also plays an important role in the plant's life cycle, especially in the production of oxygen which is of course important both to humans and chickens. Furthermore, in the poultry industry apart from the earlier stated uses of carbon dioxide, CO_2 has rather been being used in MAP (Modified Atmosphere Processing). This technology is being used to give an added shelf life of packaged poultry meat. According to *CO2Meter eBook (2012)*. CO_2 is Important to large-scale Poultry Farming.

2.7.3 Hydrogen sulphide

Colourless and poisonous is Hydrogen Sulphide. On a natural scale, it is naturally occurring when bacteria decompose plant and animal material, especially with low oxygen exposure. In poultry houses, however, the case is that it negatively affects humans if not properly taken care of by the keepers.

According to a review article by *Saksrithai and King (2018)*. Controlling Hydrogen Emissions during Poultry production. Journal of Animal Research and Nutrition Vol No 3: Iss no: 1: 2. The case study suggested that H_2S exposure in excess affected the performance of chickens negatively and resulted in increased feed intake causing a rise in the production cost.

The review also outlined that, water loss and PH value were observed in the thighs and chicken breasts due to a rising concentration of H_2S in the poultry house. Furthermore, for healthy broilers, it is advised to maintain the H_2S concentration of less than 2mg/kg from 0-3 weeks and 6mg/kg.

2.8 Welfare

All aspects concerning poultry farming must be aligned with animal welfare especially feed and the environment. According to *Franco et al. (2014)* Dilemmas in animal welfare. During selective evaluation and decision on the standards of how to treat animals, one tends to limbo between extremes relating to the physical and affective welfare of the animals including stress and other aspects observed.

Similarly, *Franco et al. (2014)* explain at least four dilemmas most likely to be faced. The below-discussed dilemmas are just as very similar to those in poultry farming.

- Longevity of dairy cows. The extreme lies between cutting down the lifespan of dairy cows to which it presents a dilemma between a short lifespan and having more heads of cows living in that period. Chances are that there would be a positive increase in the headcount but a probable worse welfare or rather fewer cows with a longer lifespan with a relatively better lifespan. The relation is made to broiler chickens in the case of genetically modified feed (GMF). Which could be quite detrimental to the health of the chickens but have an elevated yield on the economic side or just have the chickens have a normal feed with a controlled number of supplements and earn a relative yield (*Franco and Sant'Ana, 2014*).
- Secondly, Dairy male calves that would be slaughtered before the time at about a week of age might have tremendous, short lives, or rather boost their relative body mass in a questionable space of time with questionable conditions to produce veal, which translates to increased lifetime but questionable quality. Broilers have a lifespan of approximately seven weeks. Should there be any tempering in their upbringing to either shortening the time to live or their body mass index which is about 2.0kg, the probability is that there is a high chance to question their meat quality due to the change in the optimum terms and conditions of growth in their cycle. (*Franco et al., 2014*).
- Unfortunately for Layers though, particularly male layers chickens. Their lifetime traditionally has been that of them to be killed rather slaughtered at hatching and of which a most presented plausible auxiliary to be developed seemed to be an enhancement to shortening lifespan to extreme short existence

as opposed to finding new methods to have them be utilised for rather alternative operations. However, the slaughter supposedly is to create more room for the breeding of the hens so as they lay, unlike male layers.

- Even though most of these dilemmas include having to do with the quality and lifespan of animals that are being kept, experiments in laboratories do display dilemmas because they often are tied in the loop to reuse animals in multiple experiments and the principle of cutting down animal headcount argues between the quality of life and quantity of animals. The same is observed in poultry production, especially in Layers where the male layers suffer the consequences so as the hens (*Sant'Ana and Olsson, 2014*).

2.8.1 Capturing and loading

With increasing technology development over time, broiler production has been subjected to the trend as well, especially that involving intensive rearing of birds in huge numbers. This intensive rearing of broiler chickens is subsequently done on dispersed sites geographically. The reason for this is to ensure rather cut inconveniences of normal chickens' behaviour to humans, which in turn provides a conducive environment for their welfare (*Mitchell and Kettlewell, 2004*) – Measuring and Auditing Broiler Welfare.

However, capturing and loading of the chickens can be subjective as it depends on the technology available in that production. Capturing on the other hand takes place at slaughter weight, which obviously at the time presented with risk of injury in the process. Currently, PEER system is the newest technology used to capture and load broiler chickens as it has proven to be very effective and efficient with quite tremendous precisions in body mass calculation upon loading in transportation cargos.

The figure Below shows a PEER system machine used in intensive poultry production.



Figure 2.9. Chicken cat harvester used in PEER System model By Chickencat.eu

2.8.2 Transportation and Unloading

Having taken note that the PEER system is efficient in highly intensive poultry production, (Mitchell *et al.*, 2004). Advise to say since loading, unloading and transportation are frequently interdependent on each other, those elements are usually combined. That then allows their design and operations become major determinants of broiler welfare and productivity.

Considering that climate conditions vary from place to place, transportation containers rather vehicles are designed to meet the standard of a particular place. Which therefor suggests that as technology is developed it is particularly imperative to make those assessment to serve to the best interest of Welfare.

To archive good welfare, it is suggested according to *(Mitchell and Kettlewell.,2004)* that because chickens get to suffer transit stress, fan- ventilation should be considered. This in simpler terms explains that easier and more practical operations should be initiated during capturing, loading, transportation and unloading to be observed. **Figure** below shows a loading system of broilers into a transportation cage rather vehicles.



Figure 2.10. Illustrates PEER system model broiler loading for transit.

Nevertheless, welfare of animals is important as it improves animal productivity. In the same way, Chickens are to be protected from pain, suffering, given an opportunity to behave normally and giving them a conducive environment for their wellbeing. *(Jong and Swalander, 2012).*

According to *Rodenburg et al. (2013)* differences do exist between chickens with good welfare to those that do not. As such, to have good welfare requires an introduction to a trend of elevating environmental complexities profoundly designed for chickens' positivity but could be negatively impacting if not properly taken care of specially to do with hygiene and safety. The advice however is to highlight the reformation of better match between the Chickens and their breeding spaces.

These improvements include creating a beneficial hybrid non-cage system of housing to increase performance, health, and hygiene for the Chickens. This will in return optimize rearing environments for chickens very much conducive and a relatively positive yield in production as well as Broiler rather animal welfare as at large.

3 Materials and methodology

The goal for this thesis is to briefly explain and understand poultry production in the Czech Republic particularly broiler chickens.

The practical part of the thesis will include real statistical data of production and processing of poultry, comparison of the parent stock COBB 500 and ROSS 308, as well as references to some reputable authors in comparison to the testing figures from the state enterprise called Mezinárodní testování drůbeže, státní podnik (International poultry testing, state enterprise) production in the Czech Republic.

In the thesis, the general production of broiler chicken was outlined. Nevertheless, this chapter will be explaining the specified production and processing meaning the influencing factors causing the current state in production respectively and understanding the standard being used. To archive that, I had to make and few calls, send couple number of emails to some reputable producers of poultry and the international poultry testing to get real statistical data and information on their production and processing of poultry especially characteristics.

However, a direct order was issued to keep all rights concerning the wishes of the company to be observed. These expressions will reflect in coded figures of selective tested hybrid combinations as Hybrid-A and Hybrid-B

4 Poultry production in Czech Republic

The two main broiler chickens now as world leading is COBB 500 and ROSS 308. The two are characterized by excellent growth rate, most feed efficiency and low cost of production in live weight. Despite being a plus to the industry, the increased production of broiler chickens in the recent years does not seem to meet the demand ratio for broiler meat.

Abbreviations used in the Chapter

LBM	Live body mass/Live weight.
CFM	Complete feed mixture.
COMBO	Combination
CY	Carcass yield/ Slaughter yield
HYB	Hybrid

4.1 COBB 500

As stipulated by (Klesalová *et al.*, 2010). The Cobb 500 hybrid combination excels in excellent feed conversion and high growth rate. It achieves high daily gains even with lower levels of nutrients in the feed mixture, which can reduce fattening costs. However, it is more demanding on fattening conditions.

In Europe, the COBB 500 hybrid is supplied by COBB Germany Avimex, GmbH. At the age of 65 weeks, he states the following parameters: laying 179.9 eggs, of which 172.7 hatcheries, hatchability 85.1% and 147 hatched chickens per 1 hen. Fattened chickens should reach a live weight of 2.02 kg at 35 days of age with a feed conversion of 1.61 kg / 1 kg gain (Klesalová *et al.*, 2010).

4.2 ROSS 308

The Ross 308 hybrid combination is characterized primarily by low feed consumption, weight balance and high carcass weight and recovery, high thigh and pectoral muscle and low fat. The Hybrid ROSS 308 is a product of Aviagen. The producer states for them at the age of 64 weeks the following parameters: laying of 180 eggs, of which 175 hatching, hatching 84.8% and 148 hatched chickens per 1 hen. However,

for fattened chickens, the company reports a live weight of 2.02 kg at the age of 35 days with a feed conversion of 1.61 kg / 1 kg live weight (*Klesalová et al., 2010*).

In addition to the most common ROSS 308 combination, Aviagen also offers the Ross 708, Ross PM3 and Ross Rowan hybrids.

The company supplies non-European markets and the Arbor Acres and Lohmann-Indian River hybrids. The Ross 708 hybrid is used in countries where a high proportion of pectoral muscle is a priority, the Ross PM3 is a combination in which a dwarf hen suitable for cage breeding is used in the maternal position and Ross Rowan is a slow-growing hybrid (*Jedlička., 2010*).

4.3 Breeding chicken

Table below shows the parameters of fattening and mortality of chickens achieved during their rearing period. According to (*Fara et al., 2015*) he explained the details of the feeding, fattening and mortality of the chick from start to end in a particular experimental testing. The end of the rearing, both roosters COBB and ROSS is about (3.3kg) and hens reached (2,7kg) hybrid combination ROSS 308 has higher live weight.

Nevertheless, for the whole breeding period, a lower consumption of CFM (complete feed mixture) per chicken per day was observed for COBB 500 combination. It was 7.3 g (64.2 g and 71.5 g, respectively) lower for the taps and in chickens it was 2.7 g lower (60.9 g and 63.6 g, respectively) compared to CFM consumption in the ROSS 308 combination.

The total mortality however was 9 chicks (2 in cocks and 7 in hens) died during the rearing of the COBB 500 combination. The ROSS 308 combination killed a total of 19 individuals (2 of roosters and 17 of hens). In the case of roosters, the cause of death was the sudden death syndrome; in the case of hens, the reason was via selective sudden death syndrome.

Table 4.1. Indicators to Chicken fattening.

Indicators		ROSS 308		COBB 500	
		Cocks	Hens	Cocks	Hens
Live Body mass	g	3 263	2 741	3 150	2 622
CFM Consumption/day	g	71,5	63,6	64,2	60,9
Mortality	Heads(s)	2	17	2	7

Further to the observation (*Fara et al., 2015*) states to say that ROSS 308 hybrid cocks achieved a much higher live weight during breeding at a regular rearing rate than COBB 500 cocks. The largest difference was recorded at 18 weeks of age at 440 g. In the first 2 weeks, ROSS 308 hens were 13 g to about 15 g heavier. From the 3rd to the 12th week, ROSS 308 hens showed a lower live weight, on average by 33 g. From the 13th week until the end of breeding, ROSS 308 hens were once again heavier on average by 109 g. The table below shows the relationship between live body mass in chicks with age in weeks.

Table 4.2. Chick live body mass during breeding in weeks.

Age in Weeks	ROSS 308		COBB 500	
	Cocks	Hens	Cocks	Hens
1	152	150	148	137
2	327	296	318	281
3	503	387	503	431
4	625	464	695	522
5	910	623	870	650
6	1 080	707	1 040	723
7	1 240	790	1 210	810
8	1 350	843	1 300	870
9	1 560	977	1 350	1 000
10	1 750	1 073	1 620	1 113
11	1 800	1 297	1 650	1 347
12	1 920	1 367	1 740	1 393
13	2 010	1 533	1 920	1 473
14	2 190	1 670	1 970	1 600
15	2 380	1 780	2 020	1 677
16	2 520	1 887	2 260	1 757
17	2 630	1 987	2 280	1 863
18	2 810	2 067	2 370	1 923
19	2 770	2 277	2 510	2 190
20	2 963	2 413	2 680	2 283
21	3 180	2 563	2 900	2 453
22	3 260	2 741	3 150	2 622

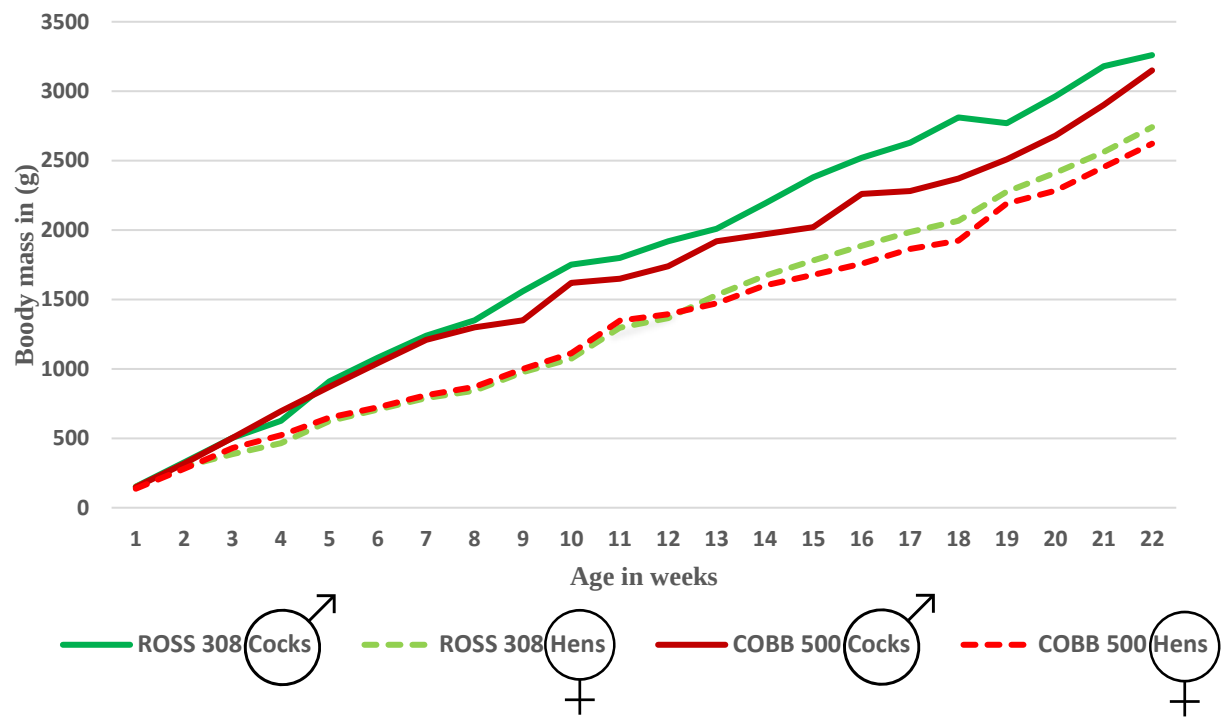


Figure 4.1. Visual chick live body mass during breeding in weeks.

4.4 Feed and fattening of offspring in 32 days

4.4.1 Indicators within 32 days

This test was performed at Mezinárodní testování drůbeže, státní podnik (International poultry testing, state enterprise) in Ústřašice.

There were 2 hybrids being examined in the test, these are the most commercially used, marked as Hybrid A and Hybrid B. Each sample consisted of 840 hatching eggs. 560 broilers were sexed and always placed 280 females (in two separate pens) and 280 males (in two separate pens).

Carcass analysis rather slaughter yield was performed on 20 cocks and 20 hens from each genotype on a 32-day period. The chickens were kept in a windowless house with full control of all the aspects concerning conducive environment.

They were kept in deep litter system. Stocking density was 17,2 broilers per square meter in that order. Manually filled tube feeders and nipple automatic drinkers were used. All the birds were submitted to the following lighting program.

Table 4.3. Lighting program exposure

Age	Hours of light	Hours of darkness
Day 1 – 7	23	1
Day 8 – 29	18	6
Day 30 – 32	23	1

The table above shows the lighting program that was used during the program respectively. During the first week (Day 1-7) chickens were exposed to 23hrs of light exposure and 1hr of total darkness exposure. On the second phase (Day 8-29) the exposure was different and in that period the exposure was increased in darkness and reduces in light exposure as 18hrs in light exposure and 6hrs of darkness. Finally in the third phase the exposure was returned to the initial arrangement for the purpose of feed control and other aspects (Day 30-32) 23hrs lighting and 1hr darkness as illustrated in the table.

Growth being the profound aspect of every living organism, there are a lot of factors that influence growth of living organism particularly broiler chickens but on this one the feed was specified from a particular producer as illustrated in the table below and the nutrient composition was tested as shown.

Table 4.4. Feed producer was ZZN Pelhřimov, a. s.

	Day	Crude protein (g/kg)	Lysine (g/kg)	ME (MJ/kg)
Starter (BR1)	1 – 10	23.36	1,30	12.40
Grower (BR2-A)	11 – 21	20.89	1.14	12.68
Grower (BR2-B)	22 – 28	19.69	1.08	12.90
Finisher (BR3)	29 – 32	18.66	1.02	13.35

Monitored parameters in growing period

- Live weight (g) – was measured on days 1 (all the birds in each pen were weighed altogether), 7 and 14 (20 % of the birds were weighed altogether). On day 32 birds were weighed individually.
- Feed conversion ratio (FCR, kg) – was calculated as feed consumption per 1 kg of live weight.
- Mortality (%) – all pens were checked twice a day. Dead chickens were registered by date and reason of mortality on the day of death.

Monitored parameters of carcass analysis

- live weight (g),
- body weight (g),
- carcass value (%),
- giblets (g),
- abdominal fat (g),
- breast (g, %) – breast muscles was weighed without skin,
- thigh (g, %) – thigh muscles was weighed with bone and skin.

Monitored effects

- hybrid – hybrid A and hybrid B,
- sex – male and female.

5 Results and Feedback

The test was run in that period with full observation of the controlled conditions set in place and results were to be tabulated below to summarise the findings and provide well oriented feedback on the tests run.

5.1 Hatchability

Simply defined as the ability to hatch or the measure of likeliness of eggs to hatch. As explained in the open statement, the testing hybrids were marked as A and B. after the sets of sexed hybrids were divided in 2, fertility and hatchability were tested, the results showed as illustrated,

Table 5.1. Fertility and hatchability of eggs.

	Fertility (%)	Hatchability (%)	
		Set	Fertilized
Hybrid A	93.5	85.6	91.6
Hybrid B	96.7	86.1	89.0

Hybrid-A was fertilized at 91.6 and displayed a fertility percentage of 93.5% and its hatchability percentage of 85.6%. On the other hand, Hybrid- B however displayed a higher fertility percentage as compared to hybrid-A. Hybrid-B hit 96.7% fertility and 86.1% hatchability Despite the lower fertilization measure at 89.0.

5.2 Growing period

The growing period was measured in 32 days and the observation and testes were carried in the first two weeks that is from day 1 to day 14.

Table 5.2. Average live weight – growing period (g).

Day	Hybrid A		Hybrid B	
	Male	Female	Male	Female
1	46.0	46.0	46,2	46,2
7	218 ± 1.3	208 ± 1.7	221 ± 2.0	201 ± 2.5
14	556 ± 6.2	520 ± 10.7	559 ± 15.0	522 ± 6.5

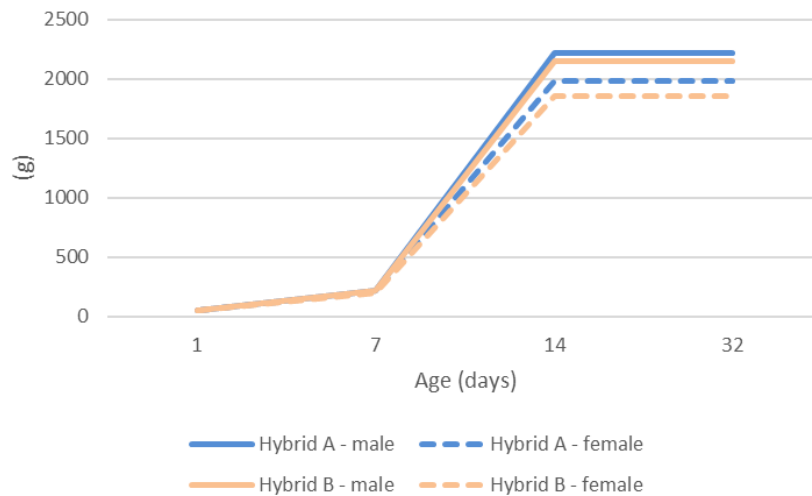
The growing period also measured the individual average live weight on individual hybrids in response to their sexes on day 32. The results are reported in the table below and a graph for both Hybrid-A and Hybrid-B in their respective sexes.

Table 5.3. Individual live weight – growing period (g).

Day	Hybrid A		Hybrid B		Probability		
	Male	Female	Male	Female	H	S	H*S
32	2 218 ± 18.3 ^d	1 981 ± 14.2 ^b	2 154 ± 13.6 ^c	1 853 ± 14.8 ^a	+	+	+

^{a-d} Means within a row with different superscripts differ significantly at $P < 0.05$.

H – hybrid, S – sex, H*S – interaction hybrid * sex.

**Figure 5.1. Average live weight – growing period.**

On most instances the feed conversion rate does influence what type of hybrid which they would have to be raising for that season of breeding. Nevertheless, the table below illustrates the conversion rates of Hybrid-A and Hybrid-B in their respective sexes.

Table 5.4. Feed conversion ratio – FCR (g)

Day	Hybrid A		Hybrid B	
	Male	Female	Male	Female
14	1 036	1 092	1 037	1 082
32	1 493	1 565	1 528	1 555

Depending on the characteristics of the hybrid being raised, some hydrides have higher mortality where others are quite moderate. The same applies for feed consumption and conversion rate. Below the table suggests that's Hybrid-A recorded 25 heads of chickens during the testing period reflecting at 4.46% and 2.86% on Hybrid-B with total of 16 heads in mortality.

Table 5.5. Mortality during growing period in 32 days.

	Mortality in the period (days)						Causes of the mortality	
	1–14		15–32		1–32		Sudden death syndrome	Culling and other causes
	N	%	N	%	N	%		
Hybrid A	12	2.14	13	2.32	25	4.46	19	6
Hybrid B	13	2.32	3	0.54	16	2.86	11	5

5.3 Carcass analysis

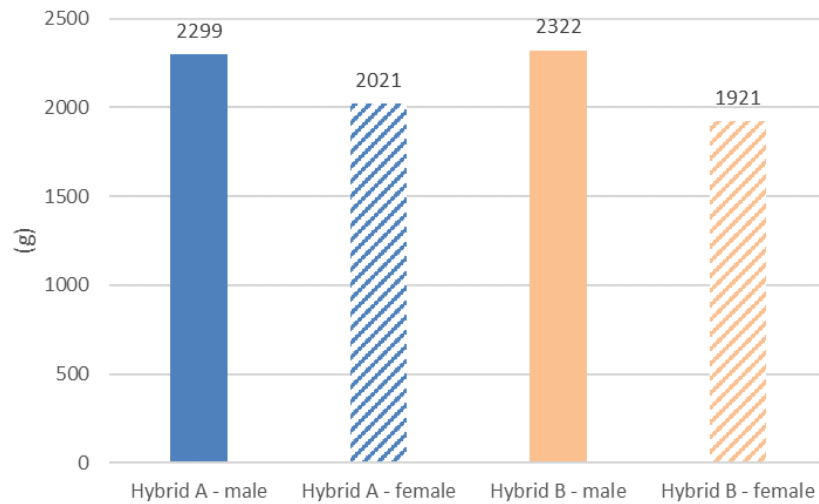
Slaughter yield was later tested at day 39 and the analysis suggested the illustrated averages as well as statistically significant figures as represented in the table. However, a summary of the data as was also expressed in the follow up graphs in average body mass/ live weight as well as the weight in thigh and breast meat.

Table 5.6. Carcass analysis – 39 days

	Hybrid A		Hybrid B		H	S	H*S
	Male	Female	Male	Female			
Live weight (g)	2 299 ± 25.2 ^a	2 021 ± 16.4 ^c	2 322 ± 6.2 ^a	1 921 ± 17.1 ^b	+	+	+
Body weight (g)	1 596 ± 9.8 ^a	1 414 ± 17.4 ^c	1 610 ± 6.8 ^a	1 337 ± 12.0 ^b	+	+	+
Carcass value (%)	69.6 ± 0.77	70.0 ± 0.43	69.4 ± 0.21	69.6 ± 0.28	-	-	-
Giblets (g)	140 ± 2.1 ^c	129 ± 1.5 ^b	146 ± 1.3 ^d	120 ± 1.3 ^a	-	+	+
Abdominal fat (g)	22.5 ± 1.35	26.0 ± 1.30	21.5 ± 1.55	24.4 ± 1.50	-	+	-
Breast (g)	516 ± 7.2 ^b	461 ± 8.8 ^a	538 ± 6.6 ^b	441 ± 6.2 ^a	-	+	+
Breast (%)	32.3 ± 0.38	32.5 ± 0.33	33.4 ± 0.31	33.0 ± 0.30	+	-	-
Thigh (g)	492 ± 6.7 ^a	428 ± 6.0 ^c	492 ± 4.5 ^a	401 ± 5.0 ^b	+	+	+
Thigh (g)	30.8 ± 0.42	30.3 ± 0.34	30.6 ± 0.29	30.0 ± 0.27	-	-	-

^{a-d} Means within a row with different superscripts differ significantly at P < 0.05.

H – hybrid, S – sex, H*S – interaction hybrid * sex.

**Figure 5.2. Average body weight – carcass analysis**

Predominantly, the figure below from the findings seems suggest that both hybrids, the high yield is highly recorded in male hybrids, unlike females. Though the differences may not seem very huge, they are economically pertinent. Hybrid-A and B in males show a difference of 22g in breast meat Hybrid-B being the leading breed and thighs

showed an equal record of 492g. On the other hand, females of Hybrid-A and B in breast meat show a difference of 20g giving an upper hand to Hybrid-A and a difference of 27g in the thigh and still Hybrid-A leading in surplus meat.

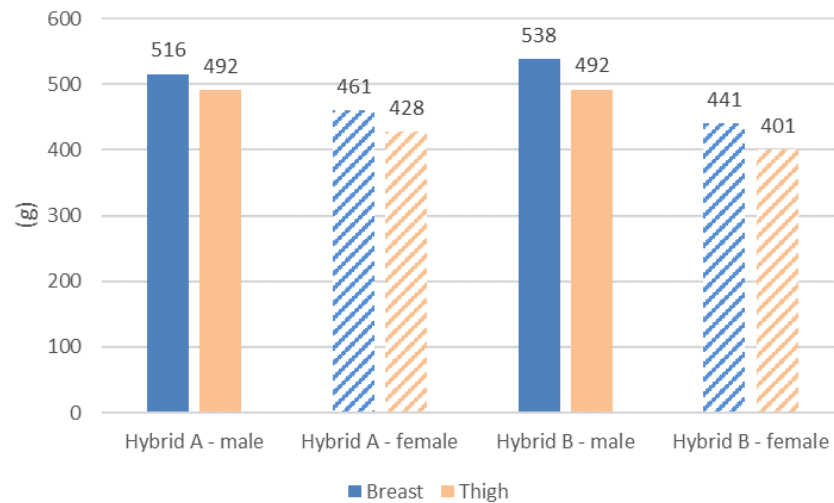


Figure 5.3. Breast and thigh weight

5.4 Feed and fattening of offspring in 35 days

In comparison to the recent examination test above, a similar test was also done years earlier to reflect a particular set of results (*Fara et al., 2015*). The test was done in 35 days and at the age of 42 days

5.4.1 Indicators within 35 days

The table below shows that ROSS 308 scores compared to the COBB 500 scores, achieved a higher live weight of 53 g and at the same time lower feed consumption per 1 kg gain of 73 g. ROSS 308 hens (2,085 g) had a live weight of only 6 g higher than COBB 500 hens (2,079 g).

Feed consumption for 1 kg live weight of ROSS 308 hens was 110 g lower than the COBB 500 hens. In both sexes, the ROSS 308 combination showed a higher live weight (29 g) and lower feed consumption (91 g), compared to COBB 500 combination. The illustration below is of live body mass and feed consumption per 1 kg of Live body mass within 35 days in (g).

Table 5.7. Live body mass and feed consumption per 1 kg of live body mass within 35 days in (g).

Hybrid	Cocks		Hens		Total	
	LBM	CFM	LBM	CFM	LBM	CBM
COBB 500	2 396	1 688	2 079	1 746	2 236	1 715
ROSS 308	2 449	1 615	2 085	1 636	2 265	1 624

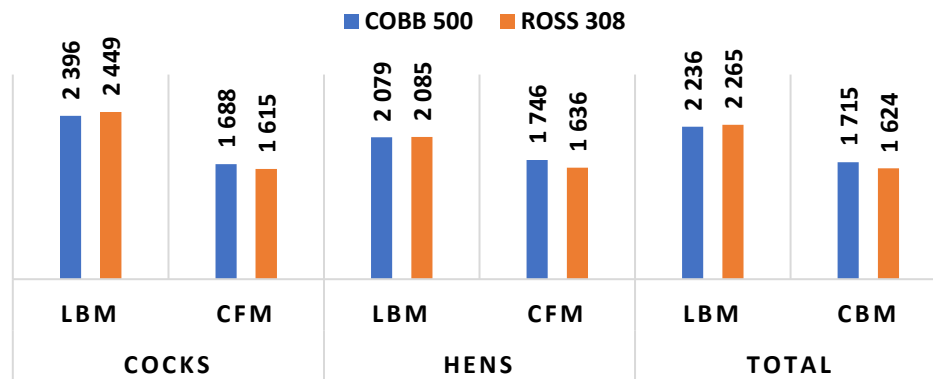


Figure 5.4. Live body mass and feed consumption within 35 days in (g)

However, during the very same entire fattening period of up to 35 days of age, mortality was also investigated and the same mortality of 43 chickens (2.3%) was recorded in both hybrid combinations. The most common cause of death was sudden death syndrome and musculoskeletal disorders. Below is the table and graphic representation of mortality in 35 days.

Table 5.8. Mortality during the fattening period to up to 35 days of age.

Hybrid	1–14 day		15–35 days		1–35 days	
	Per Chick	%	Per Chick	%	Total Chick	%
COBB 500	6	0,3	37	1,9	43	2,3
ROSS 308	16	0,8	27	1,4	43	2,3

Sudden death syndrome is displayed rather observed by the strong flapping of the wings, muscle contractions and loss of balance. In the final stage, the chickens fall on their backs or sides and die. The course from the first symptom to death is very fast, from 37 to 69 seconds. Sudden death syndrome is associated with acute cardiovascular failure caused by lethal cardiac arrhythmias and ventricular fibrillation with congested lungs. Its occurrence affects both genetics and nutrition, as well as environmental conditions (*Lichovnicková et al., 2012*).

5.4.2 Indicators of slaughtered meat yield up to 35 days.

According to the following statistics Ross 308 combination had a carcass yield of 76.8%. The COBB 500 combination was 0.5% lower at (76.3%).

The slaughter analysis showed that the highest average pectoral muscle mass in the figure below was in ROSS 308 combination (547 g). It was then recorded higher by 36 g than the COBB 500 combination at (511 g).

The thigh muscle was at 515 g for the ROSS 308 and weighed 515 g for the COBB 500 22 g lower (493 g). Differences in pectoral and thigh muscle weights were evaluated as statistically and highly significant. The data is tabulated below as explained in the paragraph.

Table 5.9. Slaughter yield in 35 days of age according to a combination of COBB 500 and ROSS 308.

Indicators		COBB 500 (N = 80)		ROSS 308 (N = 80)		P
		$\bar{x}$	s	$\bar{x}$	s	
LBM	g	2 260 ^a	152	2 331 ^b	196	0,011
Slaughter yield	%	76,3	1,8	76,8	1,5	0,108
Fat	g	40 ^A	11	28 ^B	7	0,000
Breast muscles	g	511 ^A	56	547 ^B	53	0,000
	%	31,9 ^A	2,4	33,0 ^B	1,5	0,001
Thigh muscles	g	493 ^A	42	515 ^B	53	0,004
	%	30,8	1,7	31,0	1,2	0,350

NOTE:

The differences between the groups marked with different letters are statistically significant figures - ^{A, B}P <0.01, ^{a, b}P <0.05.

Following the combination, the table below evidently suggests that the cocks of the COBB 500 hybrid combination achieved a carcass yield (76.1%) 0.5% lower than the hens (76.6%). For pectoral muscle, the difference between cocks and hens was 50 g and 65 g for the thigh muscle. The differences between the sexes were evaluated as statistically and highly significant for both parameters.

Table 5.10. Slaughter yield in 35 days of age according to gender for COBB 500.

Indicators		Cocks (N = 40)		Hens (N = 40)		P
		$\bar{x}$	s	$\bar{x}$	s	
LBM	g	2 385 ^A	115	2 134 ^B	30	0,000
Slaughter yield	%	76,1	1,6	76,6	2,0	0,204
Fat	g	37	12	42	9	0,056
Breast muscles	g	536 ^A	58	486 ^B	42	0,000
	%	31,8	2,4	32,1	2,5	0,629
Thigh muscles	g	525 ^A	29	460 ^B	23	0,000
	%	31,2 ^a	1,7	30,3 ^b	1,6	0,023

NOTE:

The differences between the groups marked with different letters are statistically significant figures - ^{A, B}P <0.01, ^{a, b}P <0.05.

In the case of the ROSS 308, the carcass yield indicators in the table below which stipulate that ROSS 308 hybrid combination, roosters (77.0%) were found to have higher carcass yields by 0.5% than hens (76.5%). The body mass of the pectoral muscles was 586 g and of the hens 508 g. The difference between the roosters and hens in the thigh muscle was about 86 g. The differences were statistically and highly significant as shown in the table below.

Table 5.11. Slaughter yield in 35 days of age according to gender for ROSS 308.

Indicators		Cocks (N = 40)		Hens (N = 40)		P
		$\bar{x}$	s	$\bar{x}$	s	
LBM	g	2 504 ^A	94	2 159 ^B	87	0,000
Slaughter yield	%	77,0	1,6	76,5	1,4	0,116
Fat	g	27	5	29	8	0,114
Breast muscles	g	586 ^A	35	508 ^B	36	0,000
	%	32,8	1,3	33,2	1,6	0,162
Thigh muscles	g	558 ^A	32	472 ^B	28	0,000
	%	31,2	1,4	30,8	0,9	0,176

NOTE:

The differences between the groups marked with different letters are statistically significant figures - ^{A, B}P <0.01, ^{a, b}P <0.05.

With reference to *Marcu et al. (2014)*, they confirmed a higher live weight at 35 days ROSS 308, 2,649.7 g for roosters and 303.8 g lower for hens (2,345.9 g). The difference in carcass yield between roosters (72.3%) and hens (72.4%) was slight. They found 34.1 g (510.2 g) more pectoral muscle mass than 476.1 g in hens. They also confirmed a higher weight in the thigh muscle in cocks by 48.2 g (445.1 g) than in hens by 396.9 g. The differences were evaluated as statistically and highly significant.

5.5 Feed and fattening of offspring in 42 days

5.5.1 Indicators within 42 days

From the following evidence, the tables below explain clearly that ROSS 308 cocks achieved a higher live weight of 50 g than COBB 500 cocks and at the same time lower feed consumption per 1 kg gain of 63 g. ROSS 308 hens were found to have a lower live weight of 15 g and lower feed consumption per 1 kg gain of 140 g than the COBB 500 combination.

When evaluating selected indicators regardless of gender, ROSS 308 hybrids weighed only 14 g. The difference in feed consumption per 1 kg gain was 99 g between the hybrid combinations studied in favour of the ROSS 308 combination.

Table 5.12. Live body mass and feed consumption per 1 kg of live body mass within 42 days (g)

Hybrid	Cocks		Hens		Total	
	LBM	CFM	LBM	CFM	LBM	CBM
COBB 500	3 148	1 801	2 672	1 900	2 909	1 847
ROSS 308	3 198	1 738	2 657	1 761	2 923	1 748

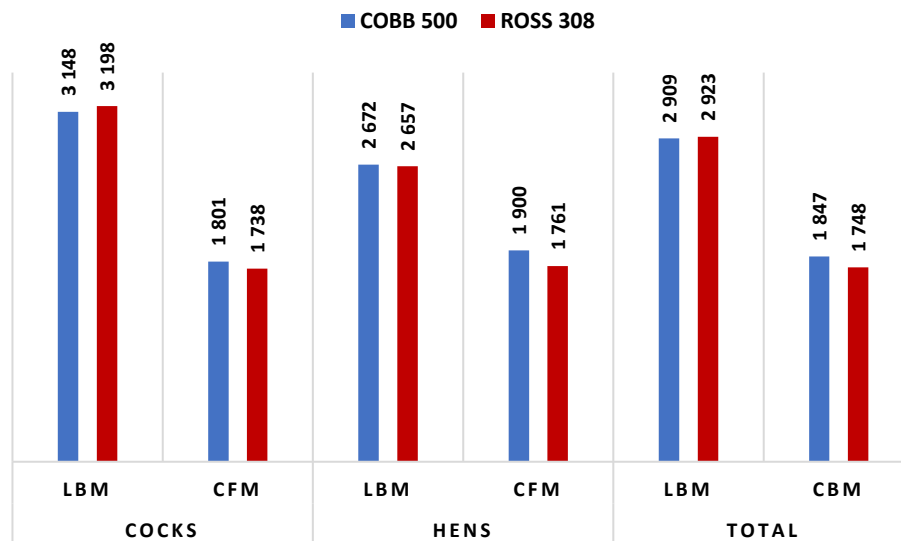


Figure 5.5. Live body mass and Feed consumption within 42 days in (g)

The table following up provides an overview of fattening and mortality within 42 days. The table also shows that the ROSS 308 combination had a higher mortality rate at (5.4%) than the COBB 500 combination (4.6%). A higher percentage of unfortunate mortality occurred during the 1st partial fattening test due to a failure of the ventilation control unit in the hall.

Table 5.13. Mortality during the fattening period to up to 35 days of age

Hybrid	1–14 day		15–42 days		1–42 days	
	Per Chick	%	Per Chick	%	Total Chick	%
COBB 500	2	0,3	34	4,4	36	4,6
ROSS 308	16	2,1	26	3,3	42	5,4

5.5.2 Indicators of slaughtered meat yield up to 42 days

For carcass yield at 42 days of age, a slight difference was found between the ROSS 308 and COBB 500 hybrid combination. For ROSS 308, carcass yield was 77.7% and COBB 500 was 0.2% lower (77, 5%).

From the slaughter analysis below, it shows that the highest average pectoral/breast muscle mass (718 g) was in the ROSS 308 combination. It was only 7 g higher than in the COBB 500 combination (711 g). The thigh muscle was 661 g for the ROSS 308 combination, and the thigh muscle weight was only 8 g lower (653 g) for the COBB 500 combination.

Table 5.14. Slaughter yield in 42 days of age according to a combination of COBB 500 and ROSS 308.

Indicators		Cocks (N = 60)		Hens (N = 60)		P
		$\bar{x}$	s	$\bar{x}$	s	
LBM	g	2 954	257	2 985	300	0,544
Slaughter yield	%	77,5	1,6	77,7	1,3	0,525
Fat	g	60 ^A	15	50 ^B	20	0,002
Breast muscles	g	711	85	718	81	0,632
	%	33,3	2,0	33,2	1,2	0,867
Thigh muscles	g	653	66,9	661	72,6	0,526
	%	30,6	1,5	30,6	1,0	0,957

NOTE:

The differences between the groups marked with different letters are statistically significant figures - ^{A, B}P <0.01, ^{a, b}P <0.05.

Observation at the end of 42 days of age. *Weis and Hrnčár (2013)* found that ROSS 308 had a higher live weight (2,299.8 g) by only 5.7 g than COBB 500 (2,294.1 g). Feed consumption per 1 kg of gain for ROSS 308 was 1.83 kg and slightly lower for COBB 500 hybrids (1.82 kg).

The difference in carcass yield between the ROSS 308 (77.25%) and COBB 500 (77.31%) hybrids was only 0.06%.

Ciurescu and Grosu (2011) demonstrate a live weight at 42 days of age. for ROSS 308 was about 2,477 g and for COBB 500 59 g lower (2,418 g). They found lower feed consumption per 1 kg gain in the ROSS 308 combination (1.78 kg) than in the COBB 500 combination (1.85 kg).

Petricevic et al. (2011) reported live weight in their follow-up for ROSS 308 combination taps at 42 days of age 2,746.5 g and the combination COBB 500 88.1 g lower (2,658.4 g). ROSS 308 hens also had a higher live weight (2,283.5 g) of 5.2 g than COBB 500 hens (2,278.3 g). The ROSS 308 combination had higher mortality (3.19%) than the COBB 500 hybrids (2.6%). The feed consumption per 1 kg gain in both hybrid combinations was the same, amounting to 1.83 kg.

Nevertheless, it can be seen from the table below that the COBB 500 cocks achieved a 0.3% higher carcass yield (77.6%) compared to the hens (77.3%).

A statistically and highly significant difference between the genders/sexes was found in the weight of the breast and thigh muscles. The difference between roosters and hens was 127 g for breast muscle and 118 g for thigh muscle.

Table 5.15. Slaughter yield in 42 days of age according to gender for COBB 500.

Indicators		Cocks (N = 30)		Hens (N = 30)		P
		$\bar{x}$	s	$\bar{x}$	s	
LBM	g	3 204 ^A	45	2 703 ^B	44	0,000
Slaughter yield	%	77,6	1,5	77,3	1,8	0,491
Fat	g	59	15	61	16	0,497
Breast muscles	g	774 ^A	58	647 ^B	56	0,000
	%	33,4	1,8	33,2	2,2	0,758
Thigh muscles	g	712 ^A	27	594 ^B	35	0,000
	%	30,7	0,8	30,5	1,9	0,711

NOTE:

The differences between the groups marked with different letters are statistically significant figures - ^{A, B}P <0.01, ^{a, b}P <0.05.

Ciobanu et al. (2012) confirmed a lower live weight at the age of 42 days for the Cobb 500 hybrid combination. It was 2,586.6 g for taps and 619.4 g lower for hens (1,967.2 g). The carcass yield was found to be 71.3% in hens and was in hens 5.3% higher (76.6%). The weight of the pectoral muscle was 513.2 g, it was 192 g higher than hens (321.2 g). The cocks also had a higher thigh muscle weight (690.6 g) compared to chickens (438.4 g).

However, the follow-up table shows that the rocks of the ROSS 308 hybrid combination achieved carcass yield (77.8%), 0.3% higher than in hens (77.5%). In the case of the cocks, the weight of the pectoral muscle was 787 g, in the case of the hens 138 g lower (649 g). For thigh muscle, the difference between the sexes was 130 g. Differences between faucets of hens were respectively determined to be statistically and highly significant in both hybrid combinations.

Table 5.16. Slaughter yield in 42 days of age according to gender for ROSS 308

Indicators		Cocks (N = 30)		Hens (N = 30)		P
		$\bar{x}$	s	$\bar{x}$	s	
LBM	g	3 267 ^A	127	2 702 ^B	49	0,000
Slaughter yield	%	77,8	1,5	77,5	1,1	0,451
Fat	g	43 ^A	15	57 ^B	21	0,005
Breast muscles	g	787 ^A	50	649 ^B	32	0,000
	%	33,2	1,2	33,2	1,2	0,913
Thigh muscles	g	726 ^A	38	596 ^B	21	0,000
	%	30,7	1,1	30,5	1,0	0,409

NOTE:

The differences between the groups marked with different letters are statistically significant figures - ^{A, B}P <0.01, ^{a, b}P <0.05.

According to *Marcu et al. (2014)* statistics, they reported a lower live weight at 42 days for the ROSS 308 combination. (2,616.7 g). The difference in carcass yield between roosters (73.4%) and chickens (73.5%) was 0.1%.

The proportion of pectoral muscle in the cocks (647.5 g) was higher by 89.6 g than in the hens (557.9 g). For pectoral muscle, the difference between the cocks (527.1 g) and hens (421.9 g) was 105.2 g.

Sehu et al. (2012) found in their experiment with the ROSS 308 hybrid combination a lower live weight of 2,378.2 g at the age of 42 days and lower feed consumption per 1 kg gain (1.73 kg). The carcass yield in this experiment was 76.27%.

6 Conclusion

The aim of this bachelor thesis was to evaluate rather understand the production and processing of poultry in the Czech Republic in relation to the performance of hybrid combinations of chickens particularly the two main distinctions of COBB 500 and ROSS 308 based on the test of parent forms of domestic – meat-type chickens respectively.

In the Czech Republic, however, it was statistically estimated by *Karel et al. (2019)* that 168,000 tons of poultry meat was produced. The article further suggested that the annual production increase was slightly above 1%. As of 2020 Czech Republic according to the *World data atlas (2020)* exported at least 22,000 tons of poultry meat. Generally, the statistics of the report suggested that over the recent years there has been a fluctuation in the export value of poultry meat between 2001 and 2020 estimating an export value of over 60,000 USD and an Import value of over 290,000 USD in 2020 increasing annually at an estimated fast rate of about 15.31% leaving a huge gap on import value of 27,725USD in 2001.

According to foreign trade article by *Státní zemědělský intervenční fond and Tržní Informační systém České republiky (2021)*. Foreign trade Imports of poultry meat, including offal, into the Czech Republic in August in comparison to mid-year during the month of July slightly dropped by 12.65 tons measuring at (0.2%) to 8,089.83 tons in average unit valued at CZK 57.90 / kg. As it is well known that the Czech Republic imports its poultry, in this review most poultry meat including offal was imported from Poland on a scale of 5,144.23 tons reflecting (63.6%) for CZK 57.47 / kg. The proportion value of chicken meat including offal on total poultry meat imports in August was recorded at 70.4% totalling up to 5,693.91 tons for CZK 52.80 / kg.

However, exports of poultry meat on the other hand including offal from the Czech Republic in August of 2021 compared to July the very same year recorded a slight decrease at least by 7.66 tons marking (0.4%) to 1,721.44 tones for CZK 45.49 / kg. On this account, most poultry meat including offal was exported to Slovakia at least 631.98 tons recording (36.7%) at CZK 49.25 / kg. Share of chicken meat in total poultry exports meat was reflecting 84.3% resulting to 1,451.06 tons valued at 40.51 CZK / kg.

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7.3 List of Figures

Figure 2.1. Annual production and demand for poultry meat 2011-2020.....	10
Figure 2.2. Annual production and demand for poultry meat 2011-2020.....	10
Figure 2.3. Big intensive modern day indoor chicken farm.	11
Figure 2.4. Factors influencing quality and growth of broiler chickens.	12
Figure 2.5. Shows broiler chick drinking system.	13
Figure 2.6. Shows broiler chick drinking system.....	13
Figure 2.7. Modern ventilation system i.e., Czech Republic Markovice Big Dutchman.	16
Figure 2.8. Mean concentration of some gases in poultry houses from an assessment among some European countries carried by Groot Koerkamp et al. (1998).	20
Figure 2.9. Chicken cat harvester used in PEER System model By Chickencat.eu ..	25
Figure 2.10. Illustrates PEER system model broiler loading for transit.....	26
Figure 4.1. Visual chick live body mass during breeding in weeks.	33
Figure 5.1. Average live weight – growing period.....	38
Figure 5.2. Average body weight – carcass analysis.....	40
Figure 5.3. Breast and thigh weight	41
Figure 5.4. Live body mass and feed consumption within 35 days in (g).....	42
Figure 5.5. Live body mass and Feed consumption within 42 days in (g).....	47

7.4 List of Tables

Table 2.1. Lighting schedule and intensities.	15
Table 4.1. Indicators to Chicken fattening.	31
Table 4.2. Chick live body mass during breeding in weeks.	32
Table 4.3. Lighting program exposure	34
Table 4.4. Feed producer was ZZN Pelhřimov, a. s.	35
Table 5.1. Fertility and hatchability of eggs.....	37
Table 5.2. Average live weight – growing period (g).	38
Table 5.3. Individual live weight – growing period (g).	38
Table 5.4. Feed conversion ratio – FCR (g).....	39
Table 5.5. Mortality during growing period in 32 days.	39
Table 5.6. Carcass analysis – 39 days	40
Table 5.7. Live body mass and feed consumption per 1 kg of live body mass within 35 days in (g).....	42
Table 5.8. Mortality during the fattening period to up to 35 days of age.....	42
Table 5.9. Slaughter yield in 35 days of age according to a combination of COBB 500 and ROSS 308.	44
Table 5.10. Slaughter yield in 35 days of age according to gender for COBB 500... 45	
Table 5.11. Slaughter yield in 35 days of age according to gender for ROSS 308.... 46	
Table 5.12. Live body mass and feed consumption per 1 kg of live body mass within 42 days (g).....	47
Table 5.13. Mortality during the fattening period to up to 35 days of age.....	47
Table 5.14. Slaughter yield in 42 days of age according to a combination of COBB 500 and ROSS 308.	48
Table 5.15. Slaughter yield in 42 days of age according to gender for COBB 500... 50	
Table 5.16. Slaughter yield in 42 days of age according to gender for ROSS 308.... 51	