The quail production

Antonio Gilberto Bertechini
Professor Titular, UFLA
bertechini@ufla.br

The establishment of quail production assumed importance worldwide in the last decade, not only for being a laboratory animal for poultry and biomedical research, but also because it is commercially exploited for production of meat and eggs.

The poultry meat and egg industry have a rich story, which goes through various stages of development since the beginning, from captive birds, now reaching the most advanced and organized segment of agriculture worldwide.

The quail production story is more recent and also has the same characteristics that occurred in the broiler and laying hen production.

During the 60´s to 80´s the quail production was regarded as subsistence activity in Brazil, in the small backyard rearing system. From the investment of the genetic selection and quality of product, quail breeding producers could see a good deal for the future. Since then, it was seen the growth of large farms producing eggs, housing more than 100,000 birds in automated low-cost production and a regular supply of eggs with good quality, well packed, and safe to the market, and still making room for growth.

The production of quail has been derived in meat and egg production. The major meat production countries are Spain, France, China and the United States of America. Leading the production of quail eggs are China, Japan, Brazil and France. In the Latin America, Brazil leads the production, followed by Venezuela, Peru, Colombia and Bolivia.

Global trends in the rearing of quail follow opposed directions when compared Brazil and the rest of the world. Worldwide there is a decrease in the use of quails in research as animal models, followed by a significant decline in peer reviewed articles. Nonetheless, in Brazil, it has been seen an increase in scientific papers regarding quail production since 2002, with the development of new production technologies giving support for the continued growth of the segment. Following this trend, a research group led by the author, founded the Center for Studies in Poultry Science and Technology (NECTA) at the Federal University of Lavras, Minas Gerais, contributing with advanced studies in poultry science and discussing the quail production. Then, the first forum for discussion of quail production occurred in 2002. Since then, it has been accomplished international symposia every 2 years with abundant discussions and exchange of technical expertise what resulted in improvement in the Brazilian quail egg and meat chain. As result from these meetings, could be ranked the main research lines to be followed by the quail industry led by the feeding studies (nutritional requirements specific to the stages of breeding / rearing, production, performance and internal and external quality of eggs), management practices (housing density, beak trimming, feed management, equipment, environmental comfort), health (diseases and vaccines, biosecurity) and genetics (genotype *x* environment interaction, production, uniformity of egg, viability, selection and breeding).

The current situation in Brazil is a growing demand for processed eggs (pickles), however, there is a limited supply in day-old chicks what will restrict the market. On the other hand, there is a need to develop breeding programs to obtain better defined strains to produce eggs of good size and in the case of quails for meat production, the reduction of the effects of inbreeding. Studies of interaction between factors responsible for changes in production characteristics are critical for the quail egg chain.

The general trend in egg production is the automation in big farms, integrated with the egg processing industries. Advances have also been observed in the production technology of pickled eggs, always seeking to improve the quality of the product to the consumer.

Production statistics

The quail egg production was stagnant until 2002 (**Fig. 1**), housing 6.2 million birds (IBGE, 2002) with 2.8 million cartons of eggs (600 eggs/carton) produced per year, and a significant increase in approximately 37.5% from 2002 to 2005, and from 2008 to 2009 there was an increase of 27% reaching 11, 5 million birds (IBGE, 2009). In fact, the increase in production followed the increase in consumer demand for eggs (**Fig. 2**). Increased consumption of quail eggs is due to better knowledge of product quality coupled with the increase in processing, resulting in better distribution and easier access.

Comparing both egg chains, it was observe in 2011, an annual intake of 7,300 g of egg (140 eggs / year) of the laying hen egg and just 240 g (24 eggs / year) for quail egg, what represents only 3.2% of the total consumed. These data indicate much room for growth in the consumption of quail eggs.

Enhancing the quail egg chain, the pickled eggs were the main cause triggering the production, where the distribution throughout the food chain turned viable, as popularization opened the access to the processed product in all segments of the food sector in the country. Present mainly in self-service networks, eggs processed (canned) increased the demand and consequently its production. Approximately 39% of quail eggs consumed are processed, 60% fresh (in natura) and only 1% in other forms of consumption. Comparing with laying egg industry, the market of fresh chicken eggs represents more than 90% in Brazil.

Breeding lines used in Brazil are the *Coturnix coturnix japonica*, unique to egg production and *Coturnix coturnix coturnix*, of European origin used to produce both, eggs and meat. In Brazil there are several public research centers working with breeding lines for meat production and improving the productive efficiency of these birds.

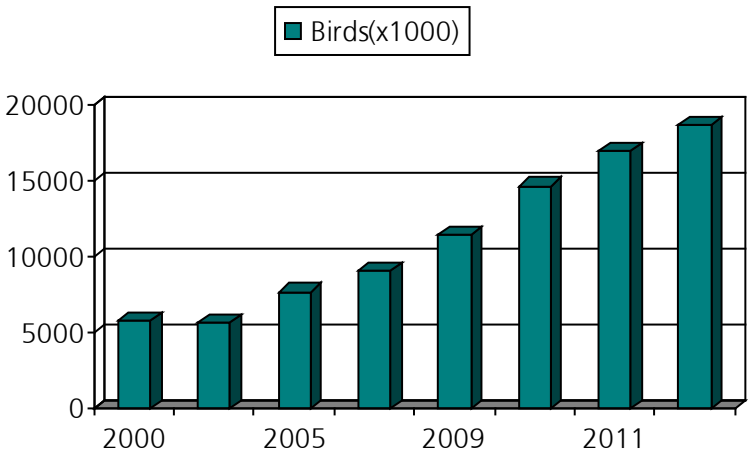

Figure 1 - Quail housed from 2000-2012 (*estimated).

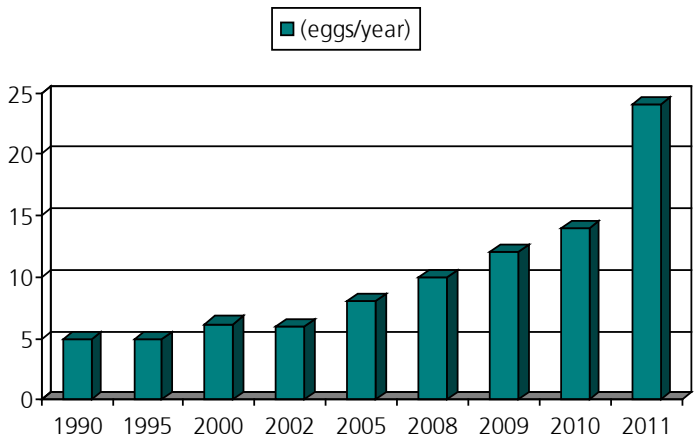

Figure 2 - Evolution of the quail egg consumption *per capita* annual.

Production systems

The production systems of quail egg are similar to the layer industry. The phases of rearing birds in the system occur in the floor or in cages, from 1 to 21 days and rearing from 22 to 42 days (Murakami and Garcia, 2010). The birds start egg production at 42 weeks of age, and the length of this phase depends on the quality of the bird at the beginning of production and management. Quail birds are highly sensitive to any stress factor. The temperature and relative humidity are determining factors for increased mortality in the flock. Day-old chicks require a warm environment from 1-7 days of age at 38 °C and birds are highly sensitivity for temperature with a heat stress response for only 0.5 °C variation. In the next two weeks, 34 and 28 C respectively, are the required temperatures. The relative humidity should not exceed 60% during these growth phases. Also, during the production phase, a low external noise level is a determinant factor. Although

domesticated, quails still retain wild characteristics, when the presence of man is a stressful factor.

Table 1 shows some comparative data between laying hens and quails. There are several differences that characterize the species. In general it appears that the performance of laying hens is better than quails. It appears that up to 60 weeks of age, quails produce more eggs, due to its sexual precocity in its early stage of rearing. On the other hand, the high mortality of quail in the production phase, affects the number of eggs per hen housed, leading to a reduction in relation to production bird / day and the quail maintain a high production for long periods. Regarding feed efficiency, hens are more efficient than quails and this fact influences the cost of kg of egg mass comparing these birds. On the other hand, the production cost of a dozen quail eggs results in an advantage over the laying hens. Other factors also influence the economic results in the production such as high precocity and short rearing period and additionally great rusticity (Takahashi *et al*., 1984, Koyama *et al*., 2005). Only few diseases such as avian cholera, enteritis and mycotoxicosis (Shanaway, 1944, Salter *et al*., 1990) may affect the quail, however, occur mainly due to managerial problems.

Table 1 - Comparison between laying hens and quail.

Items	Laying hens	Egg quails
Day-old chick weight, g	38	7,5
Rearing period phase, days	126	42
Weight start production,g	1350	120
Feed during rearing phase,g	6500	418
Days to 50% of production	147	56
Peak production, %	93-96	93-96
Hen-day eggs to 60 weeks	250	290
Hen-housed eggs to 60 weeks	240	240
Livability up to 60 weeks,%	92-94	76-78
Egg weight, g	62 – 64	10 -12
Egg yolk weight, g[1]	17.8 – 19.0	3.20 – 3.90
Cholesterol, mg/g yolk[1]	12.3	12.1
Cholesterol, mg/g egg[1]	3.64	3.9
Cholesterol, mg/egg	218 – 233	39 – 47
Linoleic acid, mg/g yolk[2]	10.7	7.8
Linolenic acid, mg/g yolk[2]	0.30	0.34
Docosahexaenoic acid, mg/g yolk[2]	0.56	1.27
n-6/n-3 ratio, mg/mg[2]	14.2	5.6
Body weight to 60 weeks, g	1550	180
Kg feed/kg eggs to 60 weeks,g	1,85	3,25
kg/dozen eggs to 60 weeks,g	1,30	0,390
Cage-stocking density, cm²/bird	375	100-120
Stocking density, kg/m²	36	12,8
Feed cost/kg of eggs, U$	0,70	1,14
Feed cost/dz of eggs, U$	0,49	0,15
Production cost/kg of eggs,U$, 70% feed cost	1,00	1,63
Production cost/dz of eggs,U$, 70% feed cost (A)3	0,70	0,21
Sale value/dz ovos, U$	0,97	0,38
Profit/dz of eggs, U$ (B)	0,27	0,17
B/A *100	38,5	80,9

1 - Braganlolo & Rodriguez-Amaya (2003). 2 - Kazmierka *et al*., (2005). 3 - Kato (2007).

Comparing the nutritive value of eggs from laying hens and quails, it appears that there is similarity in the composition of the yolk and the cholesterol content. On the other hand, because the higher yolk percentage in the quail eggs results in a higher amount of this nutrient per 100g of edible egg. Levels of essential fatty acids in the eggs from hens have higher levels of linoleic acid, with similar amounts of linolenic acid. On the other hand, quail eggs have more than doubled that of docosahexaenoic acid (DHA) than laying hens. The fatty acids n-6/n-3 ratio in the yolk is higher for quail eggs nearly the ideal ratio for human health.

The equipment industry has developing new technologies, with a trend for the total automation of the farms. The cage systems for the rearing phase could be pyramidal or vertical and have been used to improve the efficiency of production of quail eggs, with a reduction in production costs.

Conclusions

Considering the growth achieved in the last five years, still incipient consumption of quail eggs, the technological development of the

sector, the practical possibilities of exports and population growth, we can report that in 2020, will be housed more than 36 million birds, allowing a per capita consumption of around 30 eggs per year. On the other hand, more research is needed and particularly in the genetic breeding area giving support to this important egg chain. The quail egg chain industry is becoming a solid segment as an animal protein source of the high biological value for human consumption.

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