

## FATTENING CAPACITIES AND MEAT QUALITY OF JAPANESE QUAILS OF FARAON AND WHITE ENGLISH BREEDS

### УГОИТЕЛНИ СПОСОБНОСТИ И КАЧЕСТВО НА МЕСОТО ПРИ ЯПОНСКИ ПЪДПЪДЪЦИ ОТ ПОРОДИТЕ “ФАРАОН” И “БЕЛИ АНГЛИЙСКИ”

Genchev A. G., S. S. Ribarski<sup>1</sup>, G. D. Afanasjev<sup>2</sup>, G. I. Blohin<sup>2</sup>

<sup>1</sup>Thracian University, Stara Zagora, Bulgaria

<sup>2</sup>Timiryazev Moscow Agricultural Academy – Moscow, Russia

Manuscript received: July 18, 2005; Reviewed: September 19, 2005; Accepted for publication: September 22, 2005

#### ABSTRACT

The aim of the study was to establish the fattening capacity and the meat quality of the combined (meat+eggs) White English breed and to compare with the same of the meat Faraon breed. Logically, the live weight of 31-day old male Faraon-birds was by 5,9 % higher and of the female ones – by 7,9 % compared to the birds of White English breed. Feed conversion ratio for the experimental period (3-31 days) for the White English quails was to 9,95% less effective, compared to the Faraon birds. The meat of Faraon quails contained more dry matter and protein compared to the meat of White English breed. Fat content in the quail bodies of White English breed was significantly lower compared to Faraon breed / $P \leq 0,05$ /. Quail meat of White English breed was characterized by its better capacity for technological processing due to the lower loss of moisture – by 18,8 % for breast and 22,4 % for leg muscles / $P \leq 0,05$ /. The established results characterize the combined White English breed as suitable for producing both of eggs and meat from quails.

**KEY WORDS:** Japanese quail, fattening, meat quality.

#### РЕЗЮМЕ

Целта на изследването е да се проучат угоителните способности и качеството на месото на месо-яйчната порода Бели английски, като се сравни с това на използваната в целия свят специализирана месодайна порода Фараон. Логично на 31-дневна възраст живата маса на мъжките птици от породата Фараон е била с 5,9% по-висока, а при женските - със 7,9% в сравнение с птиците от породата Бели английски. Средно за опитния период (3-31 дни), конверсията на фураж при птиците от породата Бели английски е била с 9,95% по-неефективна в сравнение с тази при месодайната порода Фараон. Месото на птиците от породата Фараон е по-богато на сухи вещества и протеин - съответно с 8% при гръдната и 8,5% при крачната мускулатура сухи вещества и с 3,2% при гръдната и 4,6% при крачната мускулатура протеин. Съдържанието на мазнини в трупчетата от породата Бели английски е достоверно по-ниско в сравнение с трупчетата на породата Фараон / $P \leq 0,05$ /. Месото на пълпъдъците от породата Бели английски се характеризира с по-добра пригодност за технологична преработка, поради по-ниската загуба на влага – с 18,8% за гръдната и с 22,4% за крачната мускулатура / $P \leq 0,05$ /. Получените резултати характеризират породата Бели английски като подходяща за производство на яйца и месо от японски пълпъдъци.

**КЛЮЧОВИ ДУМИ:** японски пълпъдъци, угояване, качество на месото.

## РАЗШИРЕНО РЕЗЮМЕ

Невъзможността на този етап да бъде извършвано рано и точно сексиране при японските пьдпъдъци, създава сериозни проблеми пред производителите на яйца. Разходите, които се правят до сексирането на 17-20-дневна възраст са много големи, което прави неуместно унищожаването на излишните мъжки. Те се подлагат на угояване, въпреки че специализираните яйценосни и някои общоползвателни породи и линии пьдпъдъци се характеризират с посредствени месодайни качества. Целта на изследването е да се проучат угоителните способности и качеството на месото на месо-яйчната порода Бели английски, като се сравни с това на използваната в целия свят специализирана месодайна порода Фараон. По време на експеримента бяха контролирани признаците: преживяемост; индивидуална жива маса на 3-, 10-, 17-, 24- и 31-дневна възраст; групова консумация и конверсия на фураж. На 31-дневна възраст, след 6-часово гладуване, мъжките птици бяха заклани. Индивидуално бяха отчетени процентът на почистеното трупче спрямо живата маса, относителният дял на разфасовките гърди, бутчетата (бедро и подбедрица), фенер, шия и вътрешни органи. Гърдите и бутчетата бяха обезкостени и беше отчетен процентът на месото. След кланичния анализ бяха взети проби от гърдната мускулатура и от мускулатурата на краката, на които бяха определени рН, ВЗС. Получените резултати ни дават основание да заключим, че по своите угоителните способности породата Бели английски отстъпва на специализираната месодайна порода Фараон. Логично на 31-дневна възраст живата маса на мъжките птици от породата Фараон е била с 5,9% по-висока, а при женските - със 7,9% в сравнение с птиците от породата Бели английски. Средно за опитния период (3-31 дни), конверсията на фураж при птиците от породата Бели английски е била с 9,95% по-неефективна в сравнение с тази при месодайната порода Фараон. Съдържанието на сухо вещество и протеин в месото на птиците от породата Фараон е по-високо – съответно с 8% при гърдната и 8,5% при крачната мускулатура за сухите вещества и с 3,2% при гърдната и 4,6% при крачната за протеина. Месото на пьдпъдъците от породата Бели английски съдържа по-малко мазнини в сравнение с това на породата Фараон / $P \leq 0,05$ /. То се характеризира с по-ниска загуба на влага – с 18,8% за гърдната и с 22,4% за крачната мускулатура / $P \leq 0,05$ /, което е важен критерий за пригодност към технологична преработка. На базата на получените резултати в експерименталната постановка можем да характеризираме месо-яйчната порода Бели английски като удачна за производство

на яйца и месо от японски пьдпъдъци.

## INTRODUCTION

Nowadays Japanese quails are to be found in all the continents. A number of lines, breeds and varieties have been developed for different production purposes. The biggest number of birds is to be found in South-East and East Asia, most often used for egg production [6]. The prevailing breeds in Europe and the USA are those of the combined and of the meat production type.

The percentage content of edible meat in Japanese quail is very high. Breasts amounts to 37,3-38,7 % of the body, legs - 22,7-24,6 % and the carcass, neck and wings in total - 35,9-37,8 % [7]. The boned meat of the valuable parts of the body (breasts and legs) amounts to 36 % for the breasts and 15 % for the legs [9]. The protein content in breasts is 23 % versus 18,7 % in legs [2]. According to the authors that difference is formed mainly by the difference in the content of mineral substances (1,05 % versus 1,35 %) and lipids (3,1 % and 5 %, respectively). Lipids in breast and leg muscles are characterized by high value as 19,4 – 54 % of them consist of polyunsaturated fatty acids [10].

The meat of the Japanese quails has very good water retention capacity. Water losses from meat varied from 28 – 29 % [1] to 31,5 - 33,9 % [4]. The established pH values of the species 24 hours after slaughtering were within 6.0-6.3, which showed that glycogenolysis was over.

The impossibility of carrying out early and accurate sexing of Japanese quails at present creates serious problems in countries like Bulgaria where the producers have directed their efforts mainly towards egg production. The expenses until sexing at the age of 17-20 days are very high, which makes killing of the surplus males inappropriate. The specialized egg laying quail breeds and lines are characterized by poor meat production qualities. In such cases the logical question put, is to choose not only the production trend but also to establish the universal breed meeting the demand of egg production but also making possible the mass production of Japanese quail meat by intensive fattening of the male individuals.

The aim of the study was to make the comparison between the fattening capacities and meat quality of Faraon breed specialized for meat production and the combined (eggs+meat) White English breed.

## MATERIAL AND METHODS

340 Japanese quails were included in the study – 172 from the combined (meat + eggs) White English breed and 168 from the specialized for meat Faraon breed.

The birds of both breeds originated from a population of the Timiryazev Moscow Agricultural Academy – Moscow, having been bred for three years at the Poultry Science Section of the Thracian University in Stara Zagora. Breeding with White English quails aimed at the increase of egg weight and the improvement of meat production capacities of the birds, at the same time working on maintaining their egg productivity. The results obtained until now in that direction have been promising.

At the age of 3 days the birds were weighed and labeled. The experiment included the period from 3 to 31 days of the bird age. During the experimental period the quails were raised in cell batteries under the same conditions. They had a permanent access to food and water and 17-hour daylight. The provided area per bird at the end of the period was 150 cm<sup>2</sup>.

Starting and finishing mixtures were prepared for the needs of the experiment, chemical analyses being conducted for evaluating their nutritive value. The starting mixture contained 12 MJ exchangeable energy, 24 % of crude protein, 1,3 % of Ca, 0,6% absorbable P, 1,3 % lysine and 0,52 % methionine [8]. The birds were fed on it until the age of 17 days. The nutritive content of the finishing mixture contained 12,54 MJ exchangeable energy, 20 % of crude protein, 1% of Ca, 0,43 % absorbable P, 1 % lysine and 0,43 % methionine. The finishing mixture was fed from 18-day age until the end of the experiment.

The following characteristics were reported during the experiment: survival, individual live weight at the age of 3, 10, 17, 24 and 31 days, group forage consumption and conversion. When 31 days old, after 6-hour of starvation the male birds were slaughtered. It should be mentioned that the processing of the slaughtered birds included cleaning the bodies by their skinning together with the feathers. That led to reducing the slaughtering output by approximately 6-6,5 %. When cutting the breasts, the sections were made according to the adopted methods. Legs were cut along the border between the last lumbar

and the first sacral vertebra, after which they were parted into two along the medial line. The percentage of the cleaned body to the live weight, the relative share of breasts, legs, carcasses, necks and giblets were reported individually. Breasts and legs (thighs and drumsticks) were boned and the meat percentage was calculated. After the slaughter analysis the cut parts were cooled and stored for 24 hours at a temperature of 0-2° C. Samples were collected from the breast and leg muscles of 5 male birds having a mean live weight for the group ( $\bar{x} \pm S\bar{x}$ ). Meat quality analysis was carried out, determining pH and water retention capacity. Water retention capacity was determined by the classical method of Grau and Hamm, modified by [11].

### RESULTS AND DISCUSSION

The breed of the Japanese quails exerted a statistically significant effect on the live weight of the birds throughout all the stages of the experiment (Table 1). In the period between the 4<sup>th</sup> and the 24<sup>th</sup> day the quails of Faraon breed were by 4,4-5 % heavier in average than the birds of White English breed. In the last week of the experiment the difference between the groups increased up to 5,9 % for the males and to 7,9 % for the females. The obtained differences in the live weights between both breeds were logical, rendering an account of the different production trends of the studied breeds of Japanese quails. The variation coefficients in the live weight reached the values of 5,6 - 7,7 % in the male birds and 6,5 - 9,8 % in the female ones. It showed over 85 % of equivalence of the live weight of the male quails and over 70 % - of the females.

For the whole experimental period (3-31 day of age) the feed conversion by the White English quails was 9.95% less effective compared to the Faraon breed (Table 2). A similar difference in forage conversion between Faraon breed and the other generally used quail breed – Black

Table 1. Live weight- g

Age – days	Faraon- breed	Significance*	English-White – breed
	$\bar{x} \pm S\bar{x}$		$\bar{x} \pm S\bar{x}$
3	17,9±0,19	-	18,0±0,15
10	56,7±0,53	**	54,3±0,55
17	101,9±0,88	***	97,3±0,87
24	149,7±1,09	***	142,5±1,05
31 male	181,7±1,64	***	171,6±1,72
31 female	195,5±1,99	***	181,2±1,59

\*Notice: Significant: \*-by - P< 0,05; \*\* - By P< 0,01 и \*\*\* By P<0,001.

Table 2. Feed conversion ratio- kg/kg

Age- days, from- to	Faraon- breed	English-White – breed
3-17	2,14	2,35
18-31	3,86	4,24
3-31	3,01	3,31

Table 3. Slaughter analysis , % from live weight

Index	Faraon- breed $\bar{x} \pm S\bar{x}$	English-White – breed $\bar{x} \pm S\bar{x}$
Grill	62,44±0,44	61,89±0,92
Breast	23,10±0,31	23,44±0,93
Legs	19,42±0,30	19,64±0,17
Abdominal fat	0,49±0,05*	0,32±0,06*
Neck	2,02±0,06	2,25±0,09
Winks + rest	14,52±0,22	14,08±0,21
Meat from breast	19,12±0,3	19,11±0,72
Meat from legs	11,64±0,26	11,4±0,24

Notice\* - significant by  $P < 0,05$ .

Table 4. Quality characteristics of the meat

Index	Breast meat		Leg's meat	
	Faraon- breed	English-White – breed	Faraon- breed	English-White – breed
pH <sub>24</sub>	5,66±0,04	5,61±0,01	6,61±0,06	6,63±0,04
Free water content, %	26,00±0,83*	21,88±0,96*	19,83±0,60*	16,20±0,97*
Dry matter, %	31,92	29,56	32,83	30,27
Ash in meat- %	2,26	2,40	1,77	1,90
Protein in meat-%	26,39	25,58	25,63	24,51
Fat in meat - %	3,27	1,58	5,43	3,86

Notice:\* - significant by  $P < 0,05$ .

English, was established in our earlier studies [5]. Those prerequisites have logically led to the higher growth in Faraon breed, which refers to the specialized meat production breeds of Japanese quails.

An important zootechnical characteristic in the experiment was bird survival. The values of that characteristic were very high during the period 3-31 days – 96,51 % for Faraon breed and 97,09 % for White English breed.

Table 3 presents the data of the slaughter analysis. It should be noted that the content of abdominal fats in the birds of the White English breed was significantly lower / $P \leq 0,05$ /. The fat content in the neck depots was also lower - 1,29 % versus 0,89 % / $P \leq 0,05$ /.

That fact is of great importance for the modern quality and dietary assessment of meat of White English breed.

Consumers' preferences are an important argument in developing the strategies of modern poultry breeding, influencing the choice of breeds and hybrid combinations for fattening, as well as the methods and duration of the fattening period.

The quality indices of the produced poultry meat are presented in Table 4. Quail meat of White English breed contained twice less fats in breast and 1,4 times less fats in leg muscles compared to the birds of Faraon breed, the values of which were close to those cited by [2]. The dry matter and protein content in meat was higher in Faraon breed by 8-8,5 % and 3,2-4,6 %, respectively. The protein content in the breast and leg's meat of the investigated from us population of White English quails is about 9% higher compared to the data cited by [1] for

the same breed.

The hydrogen ion content in breast muscles was within the limits 5,61-5,66, i.e. close to the normal values for breast muscles in broiler chickens [3]. The values for the thigh muscles were close to the neutral (6,61-6,63), which means that the glycogen stock in leg muscles had been totally exhausted before bird slaughtering.

In the last years a serious attention has been paid to water retention capacity when assessing meat quality. Rendering an account of relationship between pH and water retention capacity, the obtained differences between water retention capacity of the breast and thigh muscles were logical (21,88-26 % for the breast and 16,2-19,83 % for the leg muscles). The values of water retention capacity obtained by us for the both of the races were lower than those in the literature cited [1,4], which was an indication of the high quality of the produced meat. The meat of White English breed quails was characterized by lower loss of moisture – by 18,8 % for the breast and by 22,4 % for the leg muscles / $P \leq 0,05$ /, which makes it more suitable for technological processing.

## CONCLUSIONS

1. As a breed specialized for meat production, the fattening capacities of Faraon quails are better than those of White English. At the age of 31 days the live weight of the male birds was by 5,9 % higher and of the female ones – by 7,9 % compared to the birds of White English breed. Both breeds were characterized by high equation in live weight, the variation coefficient being 5,6 - 7,7 % in the males and 6,5 - 9,8 % in the female birds.
2. Feed conversion ratio for the experimental period (3-31 days) for the birds of White English breed was 9.95% less effective compared to the same for the Faraon breed.
3. The meat of Faraon quails contained more dry matter and protein compared to the meat of White English breed – by 8 % in breast and 8,5 % in leg muscles for the dry matter and by 3,2 % in breast and 4,6 % in leg muscles for the protein, respectively.
4. Fat content in the quail bodies of White English breed was significantly lower compared to Faraon breed /  $P \leq 0,05$ /.
5. Quail meat of White English breed was characterized by its better capacity for technological processing due to the lower loss of moisture – by 18,8 % for breast and 22,4 % for leg muscles / $P \leq 0,05$ /.

## RECOMMENDATIONS

The good egg laying capacity of White English breed combined with the excellent quality of the produced

meat and, on top of that, the white color of feathering, make that breed one of the attractive for industrial-scale production of Japanese quail eggs and meat. Based on the results obtained during the experimental study, we can recommend of White English breed as suitable for the production of quail eggs and meat.

## LITERATURE

- [1] Baumgartner J., O. Palanska Z., Koncekova, 1990. Technological quality and nutritive value of meat of English white quail. *Hydinarstvo, Ivanka pri Dunaji, CSFR*, 25, 97-107.
- [2] Choudhary M., T. Mahadevan, 1986. Influence of age, storage and type of cuts on the composition of quail meat. *Indian Poultry Sci.*, 21, 3:252-254.
- [3] Drbohlav, V., D. Drbohlavova, 1987. The effect of storage on some properties characterizing the quality of broiler meat. *Journal of Food and Beverage Science*, III, 1:25-29. (BG)
- [4] Drbohlav, V., S. Metodiev, 1997. Interrelations between some fattening and carcass traits in Japanese quails (*Coturnix coturnix Japonica*). *Journal of Animal Science, Supplement*, 159-162. (BG)
- [5] Genchev, A., D. Alexieva, S. Ribarski, 2001. Fattening and slaughter characteristics of Japanese quails of different productive type. *Journal of Animal Science*, 2:77-80.(BG)
- [6] Minvielle F., 2004. The future of Japanese quail for research and production. *World's Poultry Sci. Journal*, 60, 4:500-507.
- [7] Panda and Singh, 1990. Developments in processing quail meat and eggs. *World's Poultry Sci. J.*, 46, 3:219-234.
- [8] Todorov, N., A. Ilchev, V. Georgieva, D. Girgrinov, D. Djuvinov, D. Penkov, Z. Shindarska, 2004, *Animal Nutrition, Sofia – Publ.* (BG)
- [9] Václavský A., S. Vejčík, 1999. *Analyza produkčních znaku japonských křepelek plemene Faraon. Collection of Scientific Papers, Faculty of Agriculture in Ceske Budejovice, Series for Animal Sciences*, 16, 2:201-208.
- [10] Vračin, V., M. Fomina, 1988. Fatty acid content in breast and leg's meat of the Japanese quails, depending from the age, *Biology and technology methods for intensification of poultry breeding*, 106-112 (Ru).
- [11] Zahariev, Z., A. Pinkas, 1979. *Methods for slaughter analysis and quality control of the meat*, Sofia-Publ. (BG).

