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Original Paper

Analysis of production and reproductive indicators of rabbit of Saris Giant Breed

Martin Fik[1], Cyril Hrnčár[1]*, Dariusz Kokoszyński[2], Jaroslav Andreji[1], Petra Neirurerová[3], Henrieta Arpášová[1], Tomáš Kanka[4]
[1]*Slovak University of Agriculture in Nitra, Faculty of Agrobiology and Food Resources, Department of Small Animal Science, Slovakia*
[2]*UTP University of Science and Technology, Faculty of Animal Breeding and Biology, Department of Animal Sciences, Bydgoszcz, Poland*
[3]*Slovak University of Agriculture in Nitra, Faculty of Agrobiology and Food Resources, Department of Animal Husbandry, Slovakia*
[4]*Slovak University of Agriculture in Nitra, Faculty of Agrobiology and Food Resources, Department of Veterinary Sciences, Slovakia*

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The Saris Giant rabbit (Šo) is a hitherto unrecognized breed of rabbit. The aim of this study was to analyse the Saris Giant rabbit and hybrids with a German Giant Spot (NoS) (50–12.5%) to selected parameters (reproduction, production) in small stud. The rabbits were housed under small-scale stock husbandry conditions. Number of live born kits in litter was 6.73 ±2.57 (NoS 50) – 7.38 ±2.41 (Šo). Number of weaned kits in litter was 6.18 ±2.55 (NoS 50) – 6.73 ±2.50 (Šo). Without statistically significant differences. Number of live born kits and weaned kits in litter was without statistically significant differences. The average daily gains up to the age of 240 days were Šo – 22.39 g, NoS 50 – 26.08 g, NoS 25 – 24.27 g, NoS 12.5 – 23.10 g. Carcass yield in Saris Giant rabbit breed were 54.69 ±1.80 and 53.28 ±2.24 – 54.91 ±1.42% in hybrids (Nos 25 – NoS 50). Without statistically significant differences.

Keywords: Saris Giant rabbit, growth intensity, extensive breeding, rabbit meat

1 Introduction

Bolet et al. (2000) showed that in Europe more than 150 national breeds have been registered from 11 countries. These breeds present a wide range of characteristics and constitute a unique reserve of genetic variability. The diversity of their adult size, growth, conformation, coat colour, fur type is well known, but little is known about their potential diversity in zootechnical performance or genetic polymorphism.The Saris Giant rabbit is a hitherto unrecognized breed of rabbit. The breeding of this breed started in the year 2005 in east Slovakia, in the region of Šariš. For the formation of the breed, population of the Zobor rabbit breed was used, mainly non-standard pigmented individuals (individuals with irregular Dutch markimgs), that occur rarely within the breed. These non-standard individuals of Zobor rabbit breed grew to a higer weight. Vašíčková et al. (2016) described characterization (genetic) of Zobor rabbit and Nitra rabbits breed. In the beginning of the breeding, 22 breeders were involved, mostly from the Šariš region. Bača (2013) states, that the population of the Saris Giant rabbit was composed of 112 breeding females and 44 breeding males placed at 22 breeders. Request for research breeding of this breed was submitted in the year 2009, with the breeding being approved in the year 2011. In the year 2012, 6 breeders petitioned for research breeding and in the same year, Saris Giant rabbits were showcased on the nation-wide exhibition in Nitra. Bača (2015) states, that the offspring of rabbits included in the breeding exhibit not only an irregular

***Corresponding Author:** Cyril Hrnčár, Slovak University of Agriculture in Nitra, Faculty of Agrobiology and Food Resources, Department of Small Animal Science, Tr. Andreja Hlinku 2, 949 76 Nitra, Slovakia; e-mail: cyril.hrncar@uniag.sk

dutch markings, but other faults in other positions in the breeding standard as well. In the past, these would include more delicate heads, weak front limbs, although these faults were suppressed in the present, but greater faults appeared, mainly in the markings, which is not unanimous in the litter and is very varied within the kits in the nest. Another severe deficiency is blue coloration of the iris. For the removal of the more delicate heads and weak front limbs defects, breeders have included in the breeding 2 breeds classified as giant breeds (Flemish Giant and German Giant Spot). At the age of 240 days, the specimens kept for breeding achieve a weight of 5,000–5,800 g (Bača, 2015). The effects of genotype of giant breeds on the growth indicators of broiler rabbits is described by Šmehýl (2017), who states, that growth parameters belong among the significant indicators, that in the process of rabbit meat production are among the fundamental economic factors of efficiency.

The aim of the research was to analyse the Saris Giant purebreds and hybrids with a German Giant Spot (50 – 12.5%) in terms of its reproduction and production performance.

2 Material and methods

Rabbits were kept in small-scale conditions (fancy breeders). Outdoor housing (wooden rabbit hutch) used straw and solid floor. Booths (in cage) were used to give birth to females. Weaning was performed on the 42nd day *post partum*. Type of weaning – putting the litter in another cage (without mixing litters in a cage). Water and feed were available *ad libitum*. Rabbits were fed a pelleted commercial type diet (15.60% crude protein, 16.10% crude fibre and 3.9% ether extract) + barley and meadow hay *ad libitum*. The ratio of commercial pellets to barley was 50 : 50. This is a typical way of feeding in smale-scale (in Slovakia). The same nutrition was used in all monitored farms. Rabbits were bred in the Prešov district of the Saris region (eastern Slovakia).

Monitored reproduction parameters: number of live-born kits, number of weaned kits and milk production.

Monitored production parameters: litter weight on the day 21, growth indicators – growth performance (day 60, 90, 120, 150, 180, 210 and day 240), slaughter indicators (dressing out percentage, the weight of individual parts of carcass body). Slaughter age 100–120 days (2,900–3,100 g). This slaughter weight is typical for small-scale stock husbandry conditions. Slaughtered of rabbits – cervical dislocation, cut the jugular arteries. Methodology used by Blasco – Ouhayoun (1996).

Monitored groups:

- GGS 50 – hybrid 50% German Giant Spot breed and 50% Saris Giant rabbit breed.
- GGS 25 – hybrid 25% German Giant Spot breed and 75% Saris Giant rabbit breed.
- GGS 12,5 – hybrid 12.5% German Giant Spot breed and a 87.5% Saris Giant rabbit breed.

SG – Saris Giant rabbit breed – local population (purebred) maintained in Slovakia since 2005. The bred is preparing for recognition. Background of the SG breed – non-standard individuals (individuals with irregular Dutch markimgs) of Zobor rabbit breed grew to a higer weight. Microsoft Excel has been used.

3 Results and discussion

Adequate fertility was found for giant breeds of rabbits. Live-born kits in litter was 6.73 ±2.57 pcs (GGS 50) – 7.38 ±2.41 pcs (SG). Weaned kits in litter was 6.18 ±2.55 pcs (GGS 50) – 6.73 ±2.50 pcs (SG). Without statistically significant differences. The average daily gains up to the age of 240 days were SG – 22.39 g, GGS 50 – 26.08 g, GGS 25 – 24.27 g, GGS 12.5–23.10 g. Fik (2016) showed in rabbit of Saris breed quantity of live-born kits in litter was 9.09 pcs. An overview of the results (growth intensity, daily weight gains, slaughter indicators) obtained is given in tables 1 to 3. The results of the monitored reproductive indicators are shown in tables 4 and 5. Fik et al. (2018) showed in rabbit of Nitra breed quantity of live-born kits per litter was 6.88 ±0.28 pcs. Quantity of stillborn kits per litter was 0.09 ±0.06 pcs. Quantity of weaned kits per litter was 5.98 ±0.29. Topczewska et al. (2013) published the effect of breed on reproductive indicators. These authors recorded the 6.27 pcs per litter (Californian breed) and 8.49 pcs per litter (Popielno white). Weight of kits at day 35 of age recorded from 603.21g (Alaska breed) to 736.10 g (Giant Chinchilla breed). Dalle Zotte (2002) published quality and factors (major factors) that affect rabbit meat production. Quality of the rabbit carcass published the Dalle Zotte (2000).

These parameters should obtain a specific level to improve the profitable aim, mainly in broiler production, but also in small stud (Bianospino et al., 2004). Mach et al. (2006) published for broiler populations of rabbits a dressing out percentage 58%.

Jenisová (2013) recorded (in broiler population) from small stud to dressing out percentage from 54.89 up to 55.18% (slaughtered weight 2,470–3,425 g). Šmehýl (2010) recorded (broiler population under intensive farming condition) dressing out percentage from 54.89 up to 55.18% (slaughtered weight 2,490–2,510 g). The similar values to our work recorded Dokoupilová

Table 1 Growth intensity comparison of the Saris Giant rabbit with hybrid (German Giant Spotted × Saris Giant rabbit)

Group/num. of sub.	GGS 50 68-39	GGS 25 76-52	GGS 12,5 81-48	SG 83-45
60 d	1,096.75 ±175.25	1,145.79 ±170.39	1,101.22 ±137.34	1,056.44 ±128.22
90 d	2,147.06 ±203.96	2,198.72 ±147.00	2,245.44 ±125.04	2,140.57 ±128.38
120 d	3,258.42 ±357.64	3,129.00 ±274.51	3,048.09 ±193.39	3,081.83 ±119.20
150 d	4,328.35 ±485.79	4,418.23 ±448.53	4,186.44 ±333,78	4,097.28 ±154.13
180 d	5,120.40 ±517.53	4,869.22 ±572.60	4,897,14 ±397.15	4,455.85 ±221.21
210 d	5,689.41 ±441.98+	5,358.81 ±308.52	5,227.20 ±250.67	5,185.27 ±273.60
240 d	6,258.42 ±328.18	5,824.39 ±443.25	5,543.87 ±294.35	5,374.48 ±295.01

+ statistically significant differences ($p \leq 0.05$); d – days; num. of sub. – number of subjects

Table 2 Comparison of average daily weight gains (g) of the Saris Giant rabbit with hybrid (German Giant Spotted × Saris Giant rabbit)

Group/num. of sub.	GGS 50 68-39	GGS 25 76-52	GGS 12,5 81-48	SG 83-45
Up to 60 d	18.28	19.10	18.35	17.60
60–90 d	35.01	35.10	38.14	36.15
90–120 d	37.05	31.01	26.75	31.38
120–150 d	35.66	42.97	37.95	33.85
150–180 d	26.40	15.03	23.69	11.95
180–210 d	18.97	16.32	11.00	24.33
210–240 d	18.96	15.51	10.56	6.29

d – days; num. of sub. – number of subjects

Table 3 Comparison of dressing out percentage of the Saris Giant rabbit with hybrid (German Giant Spotted × Saris Giant rabbit)

Group	GGS 50	GGS 25	GGS 12,5	SG
Num. of sub.	10	10	10	10
Live weight	3,062.10 ±57.21	3,026.20 ±57.08	3,049.91 ±49.97	3,061.73 ±40.64
Carcase weight	1,681.70 ±64.75	1,611.90 ±61.39	1,664.30 ±86,61	1,674.30 ±55.88
Scraps weight	1,139.80 ±60.06	1,205.60 ±112.38	1,201.72 ±96.91	1,133.00 ±45.40
Weight of edible viscera (%)	155.51 ±11.72	1,56.30 ±11.42	156.64 ±10.48	158.30 ±10.12
Dressing out percentage (%)	54.91 ±1.42	53.28 ±2.24	54.55 ±2.28	54.69 ±1.80

Num. of sub. – number of subjects

et al. (2006). This authors recorded 61.81% (dressing out percentage) with hybrid (75% of national breeds and 25% of broiler meat line). Skřivanová et al. (2000) recorded from 60.9% for Zika commercial hybrid to 62.4% (dressing out percentage) for HY2000 commercial hybrid. Bízková and Tůmová (2009) published 59.50% (dressing out percentage) in medium weight breeds (rabbits). Same authors recorded 31.30% percentage of thighs and percentage of back 19.5% from the carcass body. In national breed Czech white rabbit was 60.18% (dressing out percentage with head) and 33.42% percentage of thighs (Tůmová & Hrstka, 2013). In breed Czech white rabbit was 59.80% (Volek et al., 2013). Šmehýl (2017) published (in broiler meat line) the live weigh in day 1 from 56.92 to 93.23 g and live weight in day 21 *post partum* from 325.50 to 552.20 g. In population of the Saris Giant rabbit (our research) were these values lower in both cases. Šmehýl (2010) published 4.10 to 7.93 pcs of weaned kits per litter and 8.90–32.20% mortality values up to day 35 *post partum*. Increasing of the ratio giant breed (Moravian Blue or Belgian Giant White) in synthetic meat hybrid elevated the parameters of growth and

Table 4 Comparison of selected reproduction parameters (number of live births, litter weight, number of weaned in litter) of the Saris Giant rabbit with hybrid (German Giant Spotted x Saris Giant rabbit)

Group	Number of litters (n)	Number of live born kits	Weight of litter after birth (g)	Number of weaned kits of the litter
GGS 50	30	6.73 ±2.57	446.47 ±147.85	6.25 ±1.75
GGS 25	33	7.03 ±2.28	419.97 ±88.52	6.18 ±2.55
GGS 12.5	41	6.97 ±2.60	413.28 ±123.39	6.31 ±2.60
SG	36	7.38 ±2.41	405.34 ±117.40	6.73 ±2.51

Table 5 Comparison of selected reproduction parameters (litter weight on day 21, milk production) of the Saris Giant rabbit with hybrid (German Giant Spotted x Saris Giant rabbit)

Group	Number of litters (n)	Weight of the litter at day 21 (g)	Milk produced (g)
GGS 50	30	2710.63 ±814.79	4528.33 ±1386,33
GGS 25	33	2436.28 ±631.19	4032.62 ±1148.32
GGS 12.5	41	2424.62 ±544.92	4022.69 ±881.28
Šo	36	2351.22 ±646.97	3974.62 ±998.54

reduced carcass yield, whereas recessionary the ratio of blood of giant breeds reduced the parameters of growth but elevated carcass yield (Šmehýl, 2017). The authors Tůmová et al. (2013) published some properties of Czech national breeds. Authors relative to these national breeds with a industry meat populations. Recorded that Czech White breed grew intensified (without significant diferences) like industry hybrid Hyplus. The maximum daily weight gain was recorded in Czech white breed. Slaughter characteristics particularly, correlated with weight of body; the maximum dressing out percentage was in the small weight breed (Czech Gold – 62.0%) and the minimal in the Hyplus rabbit (57.0%). Volek et al. (2013) recorded in test of Czech white breed live weight at day 42–882 g, day 63–1,715 g, day 70–2,018 g and day 91 of age – 2,704 g. Relative to Czech white rabbit breed has the Rabbit of Nitra upper growth efficiency at day 70 *post partum* and from this age is the growth performance relative to that breed markedly lower (Fik et al., 2018). Relative to Czech white rabbit breed and the Rabbit of Nitra has the Saris Giant Rabbit and Hybrids (NoS 50, Nos 25, Nos 12.5) lower growth performance to 60 and 90 days. Tůmová et al. (2011) published growth performance of (Czech) national breed rabbits. Czech white breed day 42–889 g, day 77–2,265 g, day 91–2,747 g. Moravian white of brown eye 42 days – 873 g, 77 days – 1,868 g, 91 days of age – 2,210 g. Relative to Moravian white of brown eye rabbit breed has the Saris Giant Rabbit and Hybrids (NoS 50, Nos 25, Nos 12.5) similar growth performance to 90 days of age. Zawiślak et al. (2015) showed determine weights of body in New Zealand White (2,422–2,456 g) and Blanc de Termonde rabbits (2,471–2,364 g) on the day 90 of age (in fattening). These record are in agreement with results of Lukefahr et al. (1983), Mach (1992) or Bolet et al. (2004). These authors Tůmová et al. (2011) recorded that litter size of medium weight breeds (Moravian white of brown eye and Czech white) was 5.72 (Moravian white of brown eye) kits and 6.83 (Czech white), weaned of kits in litter 5.22 (Moravian white of brown eye) and 6.46 (Czech white) and percentage of mortality till weaning 8.32% (Moravian white of brown eye) and 5.38% (Czech white). We are recorded in this work the percentage of mortality until weaning was 7.13% – NoS 50, 12.09% – NoS 25, 9.47% – NoS 12.5 and 8.81% – Šo.

Bolet et al. (2004) in a research of fertility of the European Rabbit Genetic Resources recorded that upper number of weaned kits was in medium weight size breeds in relative to giant and small breeds. Bolet et al. (2004) showed that number of litter of medium weight breeds is usually from 6.0 to 7.3.

Bača (2015) reported that litters with 8,9 and 10 kits represented 58.16% of kits from all litters in Saris Giant Rabbit breed. Fik (2016) states that the Saris Giant Rabbit breed has a very good growth ability (day 60 – 1,102.03 ±129.14 g; day 90 – 2,245.65 ±193.10 g; day 240 – 5,642.03 ±456.20 g). Bača (2015) states a relatively large weight range (697 g – 1,978 g) at the age of 60 days in Saris Giant Rabbit breed. Fik (2016) states carcass yield in males Saris Giant rabbit breed (slaughter weight 3,146.10 g) 57.01% in females (slaughter weight 2989.90 g) 56.43%. Current carcass yield in Saris Giant rabbit breed were 54.69 ±1.80 and 53.28 ±2.24 – 54.91 ±1.42% in hybrids (Nos 25 – NoS 50). The research Fik et al. (2018) was focused on reproduction parameters, parameters of growth (day

1, day 21, day 42 up to day 119), parameters of slaughter in Rabbit of Nitra breed. Authors (Fik et al., 2018) in rabbit of Nitra breed reported weight of body (live) in males (min. 12 months) ranged from 3,740 g to 5,862 g and the average weight was 5291.21 ±85.22 g. In does (min. 10 months), average weight of body (live) – 4,623.85 ±88.48 g and values ranged from 3,820 g to 5,352 kg. The weight after the litter was 57.84 ±1.08 g, weight on day 21 was 310.09 ±7.21 g, day 42 from 1,034.26 ±50.70 g up to 1,128.13 ±30.78 g, day 77 from 2,126.48 ±85.49 g up to 2,243.70 ±47.07 g and day 91 from 2.379.29 ±31.22 g up to 2.653.53 ±37.86 g. Dressing out percentage was 62.47 ±0.23% (average live weight 3051.25 g). The results show, the population (in purebred) and the hybrids (GS × GGS) archieved a lower growth intensity compared to the breeding standard of giant breeds. The breed standard states a weight at the age of 3 months for Flemish giant 2,600 g, Moravian blue 2,500 g and German giant spot 2,300 g.

4 Conclusions

The results of the study show data regarding the of Saris Giant breed. The Saris Giant rabbit is a so far unrecognized rabbit breed. The breed achieves exceptional growth indicator results in small stud conditions. It is a breed well suited into extensive breeding with a self-sufficiency function. The preliminary data of fertility and growth revealed that Saris giant breed is a breed which may be a source of traits suitable for meat production, especially for traditional rabbit breeds (home-farming). The intensity of growth is lower compared to other giant breeds. It would be appropiate to add giant breeds with better growth to the population. Thus the breed could gain in attractiveness. On the other hand, there is the need for next research of all performance traits in our local rabbit breeds.

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