The Gabali Rabbits

Male Gabali

Female Gabali

The Gabali Rabbits (Egypt)

E.A. Afifi
Department of Animal Production, Faculty of Agriculture at Moshtohor, Zagazig University, Banha Branch, Moshtohor, Qalyoubia, Egypt

SUMMARY – A description of the Egyptian local breed of rabbits, Gabali, is carried out. Items that have been dealt with are: (i) a general description; (ii) climate and main features of its farming; (iii) performance; (iv) stress resistance; and (v) genetic improvement.

Key words: Gabali, description, performance, crossbreeding.

RESUME – *"Les lapins Gabali (Egypte)". Cet article présente une description de la race locale égyptienne de lapins Gabali. Les éléments suivants ont fait l'objet d'études : (i) une description générale ; (ii) le climat et les principales caractéristiques d'élevage ; (iii) les performances ; (iv) la résistance au stress ; et (v) l'amélioration génétique.*

Mots-clés : *Gabali, description, performances, croisement.*

1. Breed name

(i) *Breed name synonyms:* El-Gabali, Al-Gabali.
(ii) *Strains within breed:* Gabali of Sinai, Gabali of the western desert (Khalil, 1999).

2. General description

2.1. Population data

2.1.1. Population size and census data: <200

(i) Total number of females being used in purebreeding: 70.
(ii) Total number of females being used in crossbreeding: 50.
(iii) Percent of females being used pure: 60%.
(iv) Total number of males used for breeding: 30.
(v) Number of males used in AI-service: none.

Source of data: (i) a project funded by the Regional Council for Research and Extension, Agricultural Research Center, Ministry of Agriculture, Egypt, started in 1994 in the Faculty of Agriculture at Moshtohor, Zagazig University, Banha Branch; and (ii) Abdel-Aziz (1998) and Gad (1998).

Census data all over Egypt and private farms are unavailable

2.1.2. Herd sizes (Table 1)

2.1.3. Origin of the breed

Sinai and eastern and western (in the north coast belt) deserts of Egypt. They are raised by the Bedouins for their food. They are referred to by Mahmoud (1938) as Native Egyptian rabbits. They were also raised in some western Giza Governorate areas by individual persons.

Table 1. Herd sizes

	Governmental farms	Small-scale farms
Mean		
Adult animals	25	Unknown
Young animals	486 at 12 weeks	Unknown
Range		
Adult animals	20-30	Unknown
Young animals	205-668	Unknown

Source: Khalil (1996), Afifi (1997, 1999), Abdel-Aziz (1998) and Gad (1998).

2.1.4. Situation with regard to danger of extinction

Endangered, since the total number of breeding stock is less than 200.

2.2. Use of the breed in a descending order of product importance

The breed is a medium sized breed and used mainly for meat.

2.3. Colour

Yellowish-brown with black hairs spread all over the body with soft fur. Black hairs are intense on tail.

2.4. General type

2.4.1. Body parts

Well rounded hips and well fitted loin and ribs, extending forward to combine with shoulders. The shoulders blend smoothly into the mid section which extends into the hind quarters, with medium body length and a good depth, as illustrated in Table 2. The top body line shows a gradual curve to the base of the tail. The sides taper slightly from the hind quarters to the shoulders and the back is markedly ventrally convex. The animals are not pot-bellied. The skin is smooth.

Table 2. Body measurements (cm) at sexual maturity

Trait	Sex	Mean	Range
Body length	Males	36.5	35-38
	Females	39.0	35-40
Chest circumference	Males	31.5	31-32
	Females	33.5	33-34
Loin width	Males	9.5	9-10
	Females	9.0	9
Thigh circumference	Males	14.5	14-15
	Females	14.0	13-15

Source: Afifi (1999), unpublished data.

2.4.2. Head: convex

2.4.3. Eyes: black or dark brown

2.4.4. Ears: erect

2.4.5. Feet and legs: medium

2.4.6. Tail: straight

2.5. Basic temperament (for males and females): docile

2.6. Special characteristics of the breed

Adapted to hot climate and somewhat resistant to diseases.

2.7. Nest quality: pooled and sometimes scattered

3. Pattern

3.1. Climate

3.1.1. Elevation and topography: desert and valley conditions

3.1.2. Favourable climate: temperature from 18°C to 35°C and relative humidity from 25% to 75%

3.2. Main features of farming

3.2.1. Socio-management system: extensive system in batteries in governmental farms (production starts in September and ends in May)

3.2.2. Mating method: natural mating

3.2.3. Nutrition

(i) *Concentrates:* pelleted.
(ii) *Water:* freely available all year round.
(iii) *Seasonality of nutrition:* Berseem (*Trifolium alexandrinum*) available from December to following May, while Darawa (fodder maize) used in summer.

3.2.4. Housing

(i) *Cages:* wired cages and indoor rabbitries are used.
(ii) *Photoperiod:* variable periods.

3.3. Common diseases and parasites

Viral haemorrhagic disease, pasteurellosis, ear and body mange, digestive disturbance.

4. Performance

4.1. Reproduction

Averages in Table 3 show that age at first kindling in Gabali rabbits is about 7 months which is later than 6.2 and 6.3 months reported by Khalil (1996) on New Zealand White and Californian rabbits respectively. At the same time, it is earlier than those given by Khalil (1997, 1999) for

other Egyptian local breeds (Giza White, Baladi Red, Baladi White, Baladi Black) which ranged from 7.7 to 9.5 months.

Table 3. Sexual maturity

Trait	Mean	Range
Age of buck at first service (months)	6.0	5-7
Age of doe at first mating (months)	5.5	4.5-6.5
Age of doe at first kindling (months)	6.8	6-8

Source: unpublished data.

Figures in Table 4 indicate that the kindling interval in Gabali rabbits is longer than in other Egyptian local breeds (Giza White, Baladi Red, Baladi White, Baladi Black). The estimates ranged from 48 to 66 days as reported by Khalil (1997, 1999). All these observations reveal that Gabali rabbits exhibit lower performance for fertility traits than New Zealand White, Californian and other local breeds mentioned above.

Table 4. Fertility and litter traits

Trait	Mean	Range
Kindling interval (days)	71.6	48.0-108.7
Litter size at birth	6.3	5.7-7.2
Litter size at 21 d	4.7	4.2-4.9
Litter size at weaning (4 weeks)	4.6	3.6-5.8
Litter weight at birth (g)	372	260-514
Litter weight at 21 d (g)	1355	1183-1527
Litter weight at weaning (g)	3083	1623-4388

Source: Khalil (1996), Afifi (1997, 1999), unpublished data.

The average performance of Gabali rabbits for litter size traits (Table 4) are within the ranges of averages reported in the Egyptian literature (Oudah, 1990; El-Desoki, 1991; Hassan, 1993; Khalil, 1996) on New Zealand White and Californian at kindling (5.9-8.0 and 5.5-7.8 bunnies respectively) and at weaning at 4 weeks (5.2-6.5 and 5.0-6.5 bunnies respectively). The same picture could be seen when dealing with litter weight traits. Averages of litter weight cited from the Egyptian literature for New Zealand White and Californian rabbits ranged from 356 to 477 and from 295 to 464 g at kindling while from 2072 to 3368 and from 1540 to 3342 g at weaning at 4 weeks (Yamani *et al.*, 1994; Afifi, 1997; Gad, 1998). Figures in Table 4 and averages reported by Khalil (1997, 1999) on Egyptian local breeds gave evidence that litter size in Gabali rabbits at kindling and weaning at 4 weeks are somewhat smaller (6.4 and 4.6 bunnies) than in Giza White (6.7 and 5.8 bunnies) but larger than in Baladi White (5.3 and 4.2 bunnies). In addition, litter weight in Gabali rabbits is heavier than in other local breeds either at kindling (258-330 g) or at weaning at 4 weeks (1145-1700 g).

4.2. Milk yield traits.

Averages of milk yield traits in Gabali rabbits (Table 5) are low compared to those calculated from the available literature (Yamani *et al.*, 1991; Hassan *et al.*, 1992; El-Maghawry *et al.*, 1993; El-Sayaad, 1994; Khalil, 1996; Afifi, 1997; Ahmed, 1997) for New Zealand White and Californian rabbits raised in Egypt. The averages for 21-day, 28-day, and 35-day milk yield in New Zealand White rabbits were 2655, 3139 and 3989 g, respectively, and the average for 35-day milk yield in Californian rabbits was 4600 g. Also, the average for 35-day milk yield in Gabali rabbits (3272 g) is lower than in Giza White (3620 g) and Baladi Black (3550 g).

Table 5. Milk yield traits

Trait	Mean	Range
21-day milk yield (g)	1788	1334-2235
Total milk yield (g, weaning at 4 weeks)	2176	1938-2413
Total milk yield (g, weaning at 5 weeks)	3272	3160-3383

Source: Khalil (1996), Afifi (1997), Abdel-Aziz (1998) and Khalil (1999).

4.3. Semen characteristics

Averages in Table 6 and those calculated from the cited Egyptian literature (El-Sherbiny, 1987; Khalil, 1996, 1997, 1999; Afifi, 1997) indicate that:

(i) Ejaculate volume and sperm concentration in Gabali rabbits (0.68 ml and 362 10^6/ml) are higher than in New Zealand White (0.60 ml and 329 10^6/ml), Californian (0.58 ml and 314 10^6/ml), Giza White (0.38 ml and 282 10^6/ml) and Baladi (0.46 ml and 330 10^6/ml) rabbits.

(ii) The percentage of abnormal sperm in rabbits of that breed (20%) is lower than in New Zealand White (22%), and Baladi rabbits (23%), but higher than in Californian (18%) and Giza White (17%).

(iii) Percentage of dead sperm and mass and individual motilities in Gabali rabbits (21%, 1.44% and 50%, respectively) are lower than in the New Zealand White (24%, 2.82% and 55%, respectively).

These results indicate the superiority of Gabali rabbits, in semen characteristics, compared to those of local and exotic breeds (New Zealand White and Californian raised in Egypt).

Table 6. Semen traits characterising adult bucks

Trait	Mean	Range
Ejaculate volume (ml)	0.68	0.66-0.71
Sperm concentration per ml (10^6)	362	338-387
Sperm abnormalities (%)	20	14-27
Live sperm (%)	58	58
Dead sperm (%)	21	21
Mass motility (%)	1.44	1.44
Individual motility (%)	50	50
pH	7.48	7.48

Source: Khalil (1996) and Afifi (1997).

4.4. Weaning and post-weaning body weight traits

Averages of body weight at 4, 6, 8, 10 and 12 weeks of age (Table 7) and those calculated from the literature (Afifi *et al.*, 1990; El-Maghawry, 1990; Yamani *et al.*, 1991; El-Hindawy *et al.*, 1992; Tagel-Din *et al.*, 1992; Abdel-Raouf, 1993; El-Deghadi, 1996; Khalil, 1996, 1999; Afifi, 1997, 1999; Ahmed, 1997; Abdel-Aziz, 1998; Gad, 1998) indicate that Gabali rabbits surpassed exotic breeds (New Zealand White and Californian) raised in Egypt and local breeds (Giza White, Baladi Red, Baladi White, Baladi Black) at the above mentioned ages. This superiority has differences ranging from 34 to 308, from 15 to 312, from 30 to 519, from 50 to 605 and from 27 to 666 g at 4, 6, 8, 19 and 12 weeks respectively. The differences are limited, moderately low and sizeable when considering New Zealand White, Californian and Egyptian local rabbits in the same order.

Table 7. Body weight at weaning and post-weaning (g)

Trait	Mean	Range
Weight at weaning (4 weeks)	622	432-793
Weight at 6 weeks	813	560-1173
Weight at 8 weeks	1227	942-1553
Weight at 10 weeks	1571	1236-1898
Weight at 12 weeks	1876	1501-2227
Weight at 16 weeks	2036	1836-2236

Source: Khalil (1996, 1997, 1999), Afifi (1997, 1999), Abdel-Aziz (1998) and Gad (1998), unpublished data.

4.5. Carcass traits

According to Blasco *et al.* (1992), means of carcass traits listed for Gabali rabbits in Table 8 and the ones calculated from the Egyptian literature for exotic and local Egyptian breeds of rabbits (Boulos, 1978; Sallam and Hafez, 1984; Hassan, 1988; Mohamed, 1989; El-Sayaad *et al.*, 1990; Hanna, 1992; Youssef, 1992; Khalil, 1996, 1997, 1999; Abdel-Aziz, 1998; Gad, 1998; Saad, 1998) indicate that Gabali rabbits approximate or slightly excel New Zealand White and Californian rabbits in this respect. At the same time the high means for carcass traits show that Gabali rabbits surpassed the other local Egyptian breeds for the performance of most traits. Also, means of carcass traits of Gabali rabbits given in Table 8 reveal that this breed is characterised by:

(i) Moderate slaughter age (12 or 16 weeks), compared to other local breeds.
(ii) Moderate weights for hot carcasses and giblets along with moderate dressing percentage.
(iii) Slightly or moderately heavy weights for loin, front part, hind part and head.
(iv) Heavy weight for fur.

Table 8. Carcass traits at 12 and 16 weeks

Trait	Mean	Range
12 weeks		
Pre-slaughter weight (g)	1746	1700-1791
Hot carcass weight (g)	921	820-1022
Dressing percentage (%)	53	48-58
Front part weight (g)	256	256
Loin weight (g)	218	95-341
Hind part weight (g)	343	343
Giblet weight (g)	77	77
Head weight (g)	112	112
Fur weight (g)	228	225-231
16 weeks		
Pre-slaughter weight (g)	2124	1943-2181
Hot carcass weight (g)	1095	937-1253
Dressing percentage (%)	55	52-58
Front part weight (g)	311	273-349
Loin weight (g)	280	219-340
Hind part weight (g)	389	355-423
Giblet weight (g)	90	70-110
Head weight (g)	115	107-121
Fur weight (g)	298	260-336

Source: Khalil (1996, 1999), Abdel-Aziz (1998) and Gad (1998).

5. Genetic aspects

5.1. Crossing Gabali rabbits with standard exotic breeds

Genetic diversity among different standard exotic breeds newly introduced to Egypt (e.g., New Zealand White, Californian) and some local breeds (Baladi Red, Baladi White, Baladi Black) was utilised in Egypt through crossbreeding experiments to improve doe reproductive performances, milk production, post-weaning growth, carcass and other traits (El-Qen, 1988; Hassan, 1988; Oudah, 1990; El-Desoki, 1991; Youssef, 1992). All crossbreeding experiments conducted in Egypt and started before 1991 did not include Gabali rabbits (local rabbits believed to be adapted to hot climate conditions). Till now, three crossbreeding experiments using Gabali rabbits were conducted. The first experiment started in 1991, using Gabali and New Zealand White rabbits, the second one started in 1993 involving Gabali and Californian rabbits. Both experiments were carried out at Maryout Research Station, Desert Research Center, Ministry of Agriculture, Egypt. This station is located in the North Coast Belt of the western desert 35 km to the south of Alexandria, near Maryout lake (35° latitude). The third experiment started in 1995 using Gabali and New Zealand White rabbits at the experimental rabbitry of the Faculty of Agriculture at Moshtohor, in the Nile valley, 35 km to the north east of Cairo. This experiment was carried out through a project funded by the French Regional Council of Research and Extension, and the Faculty of Agriculture at Moshtohor. Findings of these three experiments could be summarised as follows.

5.1.1. Direct heterosis

(i) Crossing between Gabali and New Zealand White rabbits evidenced the presence of:

- Positive direct (individual) heterosis in most litter size and litter weight traits along with mean bunny weight per litter traits (Khalil, 1996; Abdel-Aziz, 1998; Afifi, 1999).
- Positive direct heterosis in total milk production of the doe during the suckling period and milk coefficient (Abdel-Aziz, 1998).
- Negative heterosis in preweaning litter mortality (Khalil, 1996).
- Positive and significant individual heterosis in important semen traits, e.g. mass and individual motility and percentage of live sperm (Afifi, 1997).
- Positive direct heterosis in most body weight, daily gain and survival traits from weaning to 12 or 16 weeks of age (Khalil, 1996; Abdel-Aziz, 1998).
- Positive direct heterosis in most carcass traits (weight of fasted rabbits, hot carcass, fore part, loin, hind part, head and fur at 14 and 16 weeks of age (Abdel-Aziz, 1998).

All these findings would reveal that crossing between Gabali and New Zealand White rabbits is associated with improvement in most litter traits (litter size, litter weight, mean bunny weight and litter mortality from kindling to weaning), milk production, post-weaning growth and survival traits up to 16 weeks and most carcass traits at 14 and 16 weeks of age.

(ii) Crossing between Gabali and Californian rabbits (Gad, 1998) evidenced the presence of:

- Positive direct heterosis in mean bunny weight per litter from kindling until weaning and negative direct heterosis in litter size and litter weight during the same period.
- Negative direct heterosis in direct preweaning mortality.
- Positive significant direct heterosis in body weight, daily gain and survival of the progeny from weaning till 16 weeks of age.
- Positive direct heterosis in most carcass traits at 12 and 16 weeks of age.

All these results would lead us to state that crossing between Gabali and Californian rabbits is associated with improvements in mean bunny weight per litter

from kindling to weaning, preweaning litter mortality, post-weaning growth and survival of the progeny from weaning up to 16 weeks of age together with most carcass traits.

5.1.2. Maternal additive effects

(i) Crossing between Gabali and New Zealand White rabbits (Khalil, 1996) proved that maternal additive effects were insignificant on most litter traits and post-weaning body weight traits. In general estimates of maternal additive effects in both groups of traits are in favour of New Zealand White maternity.

(ii) Crossing between Gabali and New Zealand White rabbits (Abdel-Aziz, 1998), evidenced that maternal additive effects on litter traits (litter size, litter weight, mean bunny weight per litter, pre-weaning litter mortality), kindling interval, milk production traits (total milk production during the suckling period, litter milk efficiency, milk coefficient), post-weaning daily gains and survival up to 16 weeks of age and most carcass traits (weights of fore part, loin, hind part, giblets, head and fur) at either 14 or 16 weeks of age were insignificant. The same effects on post-weaning body weights for most ages studied (5, 7, 8, 9, 10, 11, 12, 13, 14 and 15 weeks of age) were significant. Maternal additive effects were in favour of Gabali rabbits compared to New Zealand White rabbits for most litter size and litter weight traits in addition to pre-weaning litter mortality, kindling interval, milk production, litter milk efficiency, most body weight traits and post-weaning survival up to 16 weeks of age and most carcass traits at either 14 or 16 weeks of age. On the other hand, maternal additivity was in favour of New Zealand White for mean bunny weight per litter, milk coefficient and post-weaning daily gain up to 16 weeks of age. Differences between the two breeds for maternal additive effects were generally limited. All these results indicate that Gabali rabbits might be used as a doe breed comparable to New Zealand White and accordingly could be used in crossbreeding programmes as a doe breed.

(iii) Crossing between Gabali and Californian rabbits (Gad, 1998), showed that maternal additive effects on most doe litter traits (litter size at kindling and at weaning, mean bunny weight per litter at kindling, pre-weaning litter mortality, kindling interval, post-weaning survival up to 16 weeks of age and most carcass traits at 12 and 16 weeks of age were insignificant; while those of most body weight traits, post-weaning daily gain at different intervals up to 16 weeks of age were significant. Estimates of maternal additive effects for litter size at kindling and weaning, litter weight at kindling, mean bunny weight per litter at kindling, 21 days and weaning, and kindling interval were in favour of California rabbits. For preweaning litter mortality, body weight from 8 to 16 weeks of age, post-weaning daily gain and survival up to 16 weeks and most carcass traits, maternal additive effects were in favour of Gabali rabbits. All this information leads us to state that:

- Using Californian rabbits is better than using Gabali rabbits as a doe breed in crossbreeding between the two breeds for improving litter traits and kindling interval.
- Gabali rabbits are better to be used as a doe breed rather than a buck breed in crossing between Gabali and Californian rabbits for improving post-weaning body weight and gaining weight and survival up to 16 weeks of age.

5.1.3. Direct additive effects

(i) Crossing between Gabali and New Zealand White rabbits (Khalil, 1996) gave evidence that direct additive effects of Gabali rabbits on traits of the crossbred litters and post-weaning growth traits were almost similar to that of the New Zealand White. Thus it is possible to use Gabali rabbits as a breed of bucks in a crossbreeding programme between these two breeds under the Egyptian conditions.

(ii) Crossing between Gabali and New Zealand White rabbits (Abdel-Aziz, 1998) revealed that direct additive effects are not significant between Gabali and New Zealand White rabbits for litter traits (litter size, litter weight, mean bunny weight per litter, preweaning litter mortality), kindling interval, milk production traits, most body weights and gains, and carcass traits at 14 and 16 weeks of age. The differences were significant for post-weaning survival. However, the differences between the two breeds in direct additive effects were mostly limited and in favour of Gabali rabbits for some characters and in favour of New Zealand White for some others. These notations could indicate the possibility of utilising Gabali rabbits as a terminal buck breed in a crossbreeding programme using both breeds.

(iii) Crossing between Gabali and Californian rabbits (Gad, 1998), proved that differences in direct additive effects between both were not significant for doe reproductive traits, most body weights and gains, post-weaning liveability and some carcass traits. Direct additive effects were in favour of Californian rabbits for most litter traits, while in favour of Gabali rabbits for reproductive traits, post-weaning growth and survival traits, and carcass traits at 12 and 16 weeks of age. Thus it is advisable to utilise Californian rabbits as a buck breed in crossing systems between the two breeds.

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