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FORMATION OF A RABBIT SYNTHETIC LINE (ALEXANDRIA LINE) AND PRIMARY ANALYSIS OF ITS PRODUCTIVE AND REPRODUCTIVE PERFORMANCE.

By

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Abstract: *A description of the foundation process of an Egyptian paternal rabbit line, Alexandria line, developed in Alexandria (Egypt) is carried out.*

The formation of the line, a general description, main features of its performance are presented in this document. Notes about genetic improvement for this line are also included.

The breeding plan for this line started in September 2000, at the nucleus breeding rabbit unit of the Poultry Research Center, Faculty of Agriculture, Alexandria University. This line was originated by crossing a V line with a Black Baladi rabbit. Individual selection for daily gain from weaning (28 day) to marketing age (63 day) will be used as a selection criterion of genetic improvement for this line.

From the practical point of view, it could be recommended to commercial rabbit breeders in Egypt to use males of this paternal line to mate with either crossbred or purebred does, that are reputed as having a good prolificacy, to produce progeny that expect to save time and food in their fattening period, to be slaughtered for meat.

INTRODUCTION

The conventional, approach to a breeding program for meat rabbit production improvement has been the establishment of specialized lines through selection. Dam liens are frequently selected for litter size and sire lines for average daily gain from weaning to market age. These lines are subsequently combined in a crossbreeding program to obtain market fryers (Rochambeau, 1997; Feki et al., 1996; Gomez et al., 1998).

Daily gain from weaning to slaughter age has been common objective in selection programmes trying to develop specialized sire lines in

rabbits. In this respect, Armero and Blasco (1992) and Baselga (2004) reported that growth rate is a main economic trait that has been chosen as criteria to select paternal lines in rabbit, but the main objective is to improve feed efficiency (Rochambeau et al., 1989; Estany et al., 1992), a trait with the higher economic value than daily gain (Armero and Blasco, 1992). As daily gain is a trait that has a high negative correlation with feed conversion (Lampo and Van der Broeck, 1975; Randi and Scossirolli, 1980; Moura et al., 1997). Also, this trait is easier to record than individual feed conversion rate.

Moreover, it is also possible to chose a simple method of selection to improve growth rate because values of heritability for this trait are medium-high (Rochambeau et al., 1989; Estany et al., 1992). In agreement with that respect, Lukefahr et al. (1996), Moura et al. (1997) and Rochambeau et al. (1998) found that selection for increased growth rate and market weight has effectively improved these traits. Thus, important differences between sire and dam lines in growth rate, feed intake or feed efficiency have been reported (Feki et al., 1996; Roman et al., 1996). They suggested that, selection of the sire lines for growth rate was the main cause of these differences. In addition, selection on growth rate can modify the whole growth curve of rabbits and changing the age at which commercial slaughter weight is raised (Blasco et al., 1996).

In countries where the rabbit industry has not yet reached a high level of organization, it may not be possible to select and maintain specialized sire and dam lines. An alternative approach could be the development of a multi-purpose line, achieved through simultaneous selection for prolificacy and growth performance traits (Moura et al., 2001).

In Egypt, the first trail to produce a native Egyptian rabbit breed was carried out at Animal Breeding Department, Cairo University, in 1937, through systematic breeding for a native stock of rabbits with the objective of obtaining an albino type of rabbit with faster rate of growth and larger litter size which is presently known as Giza White breed (khalil, 2002a). The second trail was done in stations of Poultry Breeding Section, Ministry of Agriculture through crossbreeding for several generations between native rabbits and Flemish Giant for producing three local strains of Baladi Red, Baladi White and Baladi Black (Badawy, 1975; Galal and Khalil, 1994; khalil 2002b). However, these breeds are medium-sized breeds and are used mainly for meat production.

However, no available literature was found about trials to produce Egyptian specialized rabbit lines, either maternal or paternal lines. Recently,

El-Raffa et al. (2005) indicated that some countries of hot climate, as Egypt and Saudi Arabia, have started a programme of founding several synthetics between exotic maternal lines and local breeds intended to reach a compromise between the performance of the exotic line and the adaptation to the heat stress. The results seem very promising but the last step, the evaluation of complete procedure was not done at that time.

The objective of this work is to describe a procedure carried out at the rabbit production unit, belong to Poultry Research Center, Faculty of Agriculture, Alexandria University to found a paternal rabbit line, which will be called Alexandria Line. The formation of the line, a general description, main features of its performance are presented in this document. Notes about genetic improvement for this line are also included.

MATERIALS AND METHODS

Location and origin of the line

A new synthetic paternal rabbit line, called Alexandria line, was established and developed at the nucleus breeding rabbit unit of the Poultry Research Center, Faculty of Agriculture, Alexandria University. This line was originated by crossing a V line with a Black Baladi rabbit.

Line V is a synthetic maternal line originated in 1982 at the Department of Animal Science of the Universidad Politecnica de Valencia, Valencia (Spain). Litter size at weaning was considered as the criterion for selection in this line. The method that is used to evaluate the animals is a BLUP under an animal-repeatability model (Estany et al., 1989). A set of V Line rabbits was imported to the Poultry Research Center, Alexandria University at the end of year 1998 (El-Raffa, 2000; Garreau et al, 2004; El-Raffa et al., 2005), multiplied for five years and after that the selection was continued under the same criterion used in Valencia.

Black Baladi is a native Egyptian breed. It was founded at stations of Poultry Breeding Section, Ministry of Agriculture (Egypt) through crossbreeding for several generations between native rabbits and Flemish Giant (Badawy, 1975; Galal and Khalil, 1994). This breed are medium-sized breed and is used mainly for meat production (khalil 2002b). In year 1999, a set of about 50 females and 10 males of Black Baladi was reared in Poultry Research Center, Alexandria University.

Management

The animals were housed in an open, east-west oriented windowed rabbitry, with a two level pyramid design cages having galvanized wire.

Breeding animals were kept individually in the first level, whereas the growing animals were kept in the second one. The maternity facility consisted of 224 commercial wire cages (75x50x40 cm) whereas 336 cages (50x50x40 cm) were available for growing rabbits after weaning. Each cage was equipped with a metal feeder and water supply of nipple drinkers.

All the flock was kept under the same managerial and environmental conditions (El-Raffa, 2000; El-Raffa, 2005). Ventilation and temperature were natural. A period of 14-16 hours of day light was provided. A pelleted commercial ration containing approximately 18% crude protein and less than 14 % crude fiber was available. Clean fresh water was available for rabbits all the time. Manure was dropped from the cages on the floor and were collected and removed daily.

Males and females were first mated at a mean age of 5 months. At the beginning of the breeding season, during September, the breeding rabbits were divided into groups for within group mating. Each group was made up by three does and one buck that were chosen to avoid matings between close relatives (avoiding full-sib, half-sib and parent-offspring matings). Each doe was transferred to the buck's cage to be mated. Ventral palpation was performed 15 days post mating to determine pregnancy. Does that failed to conceive were returned to the same buck at the next mating date. At the 33rd day of pregnancy, the birth was released by an injection of oxytocine in case of the doe had not littered until that time. Parturition-mating interval was 10 days. Number born alive was recorded within 16 h after kindling. Cross fostering was not practiced. During the pre-weaning period, the does had free admission to their litters. During this period, unrestricted access for litters to food and water was allowed.

Litters were weaned at 28 d of age. At weaning, young rabbits were removed from doe's cages. After receiving an identification, litter were mixed and young rabbits were randomly assigned to wire growing cages, five per cage. Fattening period lasted 5 weeks.

Doe culling criteria included three consecutive reproductive failures, whereas buck's included lack of libido and low fertility. Breeding rabbits were culled if health problems such as respiratory trouble, sore hocks, wryneck or abscesses occurred. Young does and bucks were added to the herd as needed to replace those lost by death or by culling.

It must be noted that, the occurrence of disease could be largely avoided by a high standard of hygiene and careful management, so, the rabbits in our farm have never been treated with any kind of systematic vaccination. In case the

growing rabbits had digestive problems, they were treated with antibiotics in order to overcome these troubles.

Criteria to found Alexandria line and method of selection

First step: obtaining VB females

A first step of the process was to obtain female progeny (VB1) through crossbreeding between black Baladi females mated to bucks of V line, a line reputed as having a good prolificacy (Baselga et al., 1992). This step was performed between September 2000 and up to July 2001 (Table 1).

Second step: obtaining generation 0

Second stage was from September 2001 up to July 2003, during this stage, heavy does of V Baladi genotype that born in the previous generation were upgraded by mating them to pure V line bucks in order to obtain progeny (VB3) that is considered as a parent of base generation of Alexandria line (Table 1). During this stage colours were isolated and black and dark brown were segregation. The main objective through this period was to increase the percentage of V line coexist in crossbreed rabbit to maximize the benefit of its good performance in base population of the Alexandria line.

It must be noted that, during this stage, generations were not overlapping as mating between animals of different generations were precluded. The offspring of each generation were from mating between 16-24 sires and 62-85 dams.

Third step: inter-se mating

In this stage, the bucks and does from base generation of Alexandria line were mated without any selection, for two generations (from September 2004 up to July 2006), in order to reduce gametic disequilibrium (Table 1).

Fourth step: beginning of selection

In current season (2006/ 2007), third generation, selection of parents was based on daily body weight gain through fattening period, which taking place between 28-63 days of age.

Individual phenotypic selection was practiced, but sires were selected within sire families in order to reduce inbreeding. Mating was random, with the avoidance of mating between animals having common grandparents.

Table (1): The breeding plan used for producing Alexandria line.

Year	Breeding animals		Offspring	% V*	% B**
	Bucks	Does			
00-01	V	B	VB1	50	50
01-02	V	VB1	VB2	75	25
02-03	V	VB2	VB3	87.5	12.5
03-04	VB3	VB3	Alexandria (Base population)		
04-05	Alexandria	Alexandria	Inter-se mating between animals without selection.		
05-06	Alexandria	Alexandria			
06-07	Beginning of the selection for post weaning daily gain				

* V: Line V ** B: black Baladi

DESCRIPTION OF LINE ALEXANDRIA (Egypt)

1. Breed name

(I) *Breed name synonyms:* line Alexandria

(II) *Strains within breed:* none

2. General description

2.1. Population data

2.1.1. Population size and census data

(I) Total number of females being used in pure breeding: 80.

(II) Total number of females being used in crossbreeding: 0.

(III) Percent of females being used pure: 100%.

(IV) Total number of males used for breeding: 250 in crossbreeding. 30 in pure breeding.

Source of data: Nucleus rabbit unit, Department of Poultry Production, Faculty of Agriculture, Alexandria University, Egypt.

2.1.2. Herd sizes (Table 2)

Table 2: Herd sizes

	Nucleus of selection	Commercial farms
Mean		
Adult animals	125	5
Young animals	700	30
Range		
Adult animals	90-150	3-15
Young animals	600-800	15-90

2.1.3. Origin of the breed

As cited before, line Alexandria is a synthetic paternal line which comes from fusion of two lines, one exotic line (V line) and other native one (black Baladi). The method of selection is individual selection on post-weaning daily gain from weaning, that taking place at 28 days, to the end of fattening at 63 days.

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

This line is a specialized paternal line that is usually will cross with crossbred doe to produce young for slaughter.

2.3. Colour

Yellowish-brown over-colour, lighter on the ventral region, the tone can be darker or lighter depend on dominating black or red hairs. See photograph.

2.4. General type

2.4.1. Body parts (Table 3)

Table 3: Body measurement (cm) at marketing age (63) day

Trait	Mean	Range
Body length	31.6	28-34
Chest circumference	27.1	26-29
Loin width	5.0	4.4-5.6
Thigh circumference	12.6	11.2-13.8

2.4.2. Head: Convex

2.4.3. Eyes: Black

2.4.4. Ears: Erect

2.4.5. Feet and legs: Medium in length

2.4.6. Tail: Straight

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

2.6. Special characteristics of the breed:

This line has been founded recently and at the moment does not show special features of adaptability and resistance to heat stress. A large variability for the traits related to production is observed.

2.7. Nest quality: Pooled

3. Pattern

3.1. Climate

3.1.1. Elevation and topography: this line is raised around Alexandria but is being spread to other places of Egypt.

3.1.2. Favorable climate: temperature from 10-32^{o} C and humidity between 60-80%.

3.2. Main features of farming

3.2.1. Socio-management system: intensive

3.2.2. Mating method: natural mating

3.2.3. Nutrition

(i) *Concentrates:* pelleted..

(ii) *Water:* Freely available.

(iii) *Seasonality of nutrition:* no seasonality.

3.2.4. Housing

(i) *Cages:* wired cages in indoor rabbitries.

(ii) *Photoperiod:* light-dark constant period (16/8)

3.3. Common diseases and parasites

Pasteurellosis, some intestinal diseases and sore hocks.

4. Performance

4.1. Reproduction (Tables 4 & 5)

Table 4: Information of sexual maturity

Trait	Mean	Range
Age of buck at first service (months)	5	4.5- 5.5
Age of doe at first mating (months)	5	4.5- 5.5
Age of doe at first kindling (months)	6	5.5- 6.5
Weight of buck at first service (g)	3300	3100- 3570
Weight of doe at first mating (g)	3540	3150- 3840

Table 5: Fertility and fecundity traits

Trait	Mean	Range
Conception rate (%)	78	50-92
Kindling interval (days)	48	42-67
Litter size at birth	8.79	1-14
Litter size at weaning (28 d)	7.41	1- 11

4.2. Prenatal mortality per litter (Table 6)

Table 6: Prenatal mortality per litter

Trait	Mean	Range
Total (%)	8.4	4-12
Abortion (%)	0.4	0-2
Still birth (%)	8	4-12

4.3. Milk yield traits

The number of teats has a mean of 8.8 and ranges between 8 and 10.

4.4. Post weaning body weight and gain (Table 7)

Table 7: Post weaning growth traits of body weights and gains (g).

Trait	Mean	Range
Weight at weaning (28 d)	564	340- 750
Weight at 9 weeks	1775	1130- 2380
Daily gain 4-9 weeks	34.5	22-48

5. Genetic improvement

5.1. Genetic parameters

The study of the genetic improvement of Alexandria line is at the beginning.

5.2. Selection of economic traits

As said before, after foundation of the line, two generations without selection were obtained, after that, the line is being individually selected for daily gain between weaning (28 day) and slaughter (63 day). The main objective is to improve feed efficiency because of the negative and important genetic correlation between growth rate and conversion index.

5.3. Crossing between breed with other breed

Crossbred the bucks of Alexandria line with crossbred or purebred does, that are reputed as having a good prolificacy, in commercial farms to get progeny that expect to save time and food in their fattening (in prospect).

In this concept, Baselga (2004) reported that, in the cross between maternal does and paternal line, complementarily plays a central role in the sense that the aim is that the doe should be extreme as regards reproductive performance and the paternal line as extreme as possible in growth, feed efficiency and carcass traits.

CONCLUSSION

More studies are needed to evaluate the performance of Alexandria line during its selection program, and also to determine the performance of its cross with different types of crossbreed or purebred maternal does in commercial farms in order to obtain progeny that save time and food in their fattening period, and to take advantage of the expected positive heterosis in its performance.

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الملخص العربى

استنباط خط أرانب (الخط إسكندرية) والتحليل الأولى لصفاته الإنتاجية والتناسلية

علاء محمد عزت الرفه

قسم إنتاج الدواجن ــ كلية الزراعة (الشاطبى) ــ جامعة الإسكندرية

وصف لعملية استنباط خط أرانب ابوى مصرى، الخط أسكندرية، تم انجازه وإتمام خطواته فى مزرعة إنتاج الأرانب بمركز بحوث الدواجن – كلية الزراعة – جامعة الإسكندرية، الإسكندرية (مصر).

تكوين الخط والوصف العام والمميزات الرئيسية لأدائه تم شرحها فى هذا البحث، يشتمل هذا البحث أيضاً على خطة التحسين الوراثى لهذا الخط.

خطة التربية لهذا الخط بدأت فى سبتمبر عام 2000. بداية إنشاء هذا الخط تمت عن طريق الخلط بين أرانب الخط V النقية والبلدى الأسود. الانتحاب الفردى لصفة معدل النمو اليومى من الفطام (28 يوم) وحتى عمر التسويق (63 يوم) سوف يطبق كصفة رئيسية للتحسين الوراثى لهذا الخط.

من الناحية العملية، يمكن التوصية لمزارع الأرانب التجارية باستخدام ذكور هذا الخط الأبوى للتزاوج مع إناث نقية أو خليطه مميزة بمعدلات الخصوبة العالية لإنتاج أبناء خليطه من المتوقع لها أن توفر الوقت والغذاء أثناء فترة تسمينها، من خلال وجود قوة الخلط الموجبة بها.

Alexandria line male

Alexandria line female

Progeny of Alexandria line