

## A JOINT PROJECT TO SYNTHESIZE NEW LINES OF RABBITS IN EGYPT AND SAUDI ARABIA: EMPHASIS FOR RESULTS AND PROSPECTS

Youssef Y.K.<sup>1</sup>, Iraqi M.M.<sup>2</sup>, El-Raffa A.M.<sup>3</sup>, Afifi E.A.<sup>2</sup>, Khalil M.H.<sup>4</sup>, García M.L.<sup>5</sup>,  
Baselga M.<sup>6\*</sup>

<sup>1</sup>Animal Production Research Institute, Nadi El-Sead Str., Doki, Gizza, Egypt

<sup>2</sup>Department of Animal Production, Faculty of Agriculture, Benha University, Moshtohor, Toukh-Qalyoubia, Egypt

<sup>3</sup>Poultry Production Department, Fac. of Agriculture, Alexandria Univ., El-Shatby-2145, Aflaton Str. Alexandria, Egypt

<sup>4</sup>College of Agric. and Vet. Medicine, Al-Qassim University, Buriedah 51452 P.O. Box 6622, Al-Qassim, Saudi Arabia

<sup>5</sup>Division de Producción Animal, Dep. Tecnología Agroalimentaria, Univ. Miguel Hernández, 03312 Orihuela, Spain

<sup>6</sup>Department of Animal Science, Universidad Politécnica, Camino de Vera s/n ,46022 Valencia, Spain

\*Corresponding author: mbaselga@dca.upv.es

### ABSTRACT

A selection programme for meat rabbits is being carried out in three Egyptian and one Saudi Arabian research centres, each of them having the task to develop lines of rabbits in their local conditions. This is the largest programme executed in countries of hot climate with comprehensive efforts to develop new lines of meat rabbits, where heat stress is considered as one of the most important limiting factors to raise meat rabbits. The set of lines in the programme are four replicates of the Spanish V line; two local breeds (Sinai Gabali and Saudi Gabali); and five synthetics originated from crossing V line with local breeds. The local breeds used to create the synthetic lines were Black Baladi, Red Baladi and Sinai Gabali in Egypt and Saudi Gabali in Saudi Arabia. The V line was replicated in four different locations, three in Egypt (Alexandria, Animal Production Research Institute (APRI), and Moshtohor) and one in Saudi Arabia (Al-Qassim University). The synthetic Alexandria line is 87.5% from V line and 12.5% from Black Baladi; the synthetic APRI line is 50% from line V and 50% from Red Baladi; the synthetic Moshtohor line is 50% from V line and 50% from Sinai Gabali; the synthetic Saudi 2 is 75% from V line and 25% from Saudi Gabali and the Saudi 3 is 25% from V line and 75% from Saudi Gabali. The lines and breeds are being selected by a BLUP methodology, under different local conditions, following different criteria of selection, depending on the Centres, aiming to develop maternal or paternal lines, giving special consideration of selection for milk production and growth after weaning, in addition to litter size. Data of the last year for V line in four replicates, Sinai and Saudi Gabali and the five synthetics were only used for describing the performances obtained and to get a general idea about the expected productivity. Performances obtained verified that the most stable and convenient trait in all synthetic lines influenced by line V is referring to the prolificacy, which has been around 9.0 total born, 8.5 born alive and 7.2 number weaned per litter in the majority of the locations. Post-weaning daily gains were also convenient and ranged from 34 g/d to 18 g/d in different locations studied. Outstanding performances in some synthetics seemed superior, in some cases, to local breed and the V line originating them.

**Key words:** Rabbit lines, Selection program, Co-operative project, Litter traits, Growth, Hot areas.

### INTRODUCTION

Egypt is a country that produces rabbit meat in family farms, tries to develop industrialised rabbit production and has a very important research structure related to rabbit science and technology. In Saudi Arabia, a national project was established in 2000 for developing rabbit production and to detect the possibilities of producing meat rabbits under industrialised conditions. In Egypt, some years ago, an effort was done creating the breeds of Giza White and the Red, White and Black Baladies (Khalil, 2002a and b), but a permanent programme of selection of them was not established. One of the

conclusions of the First International Conference of Rabbit Production in Hot Climates held in Cairo in 1994 pointed out this lack and gave an attention for the researchers to start selection programmes to improve productivity under local conditions. In Saudi Arabia, the situation was different because rabbit production is recently developed and the targets of research were directed from the beginning to identify which breeds or lines are convenient for this country. For this reason, special emphasis was paid to construct a genetic improvement programme for this hot climate country (Khalil *et al.*, 2002). The objective of this paper is to describe a joint project running in Egypt and Saudi Arabia to develop new lines of meat rabbits. The paper will focus on (1) Base lines and breeds involved in the project, (2) Synthesizing plans to develop new lines, (3) Criteria and methods of selection to be followed in different locations, (4) Results of performances obtained and the current situation, and (5) Some recommendations and proposals for the future.

## MATERIALS AND METHODS

The project involves different research centres in Egypt and Saudi Arabia represented by two Faculties of Agriculture in Alexandria and Moshtohor and Ministry of Agriculture (Animal Production Research Institute, APRI) in Egypt, the College of Agriculture and Veterinary Medicine (Al-Qassim University) in Saudi Arabia, and Faculty of Agriculture of Valencia (UPV) in Spain.

### Founder lines and breeds

The genetic resources used to synthesize new lines of meat rabbit from the genetic improvement programmes in Egypt and Saudi Arabia were:

- Line V, a maternal line selected for litter size at weaning by Animal Science Department (UPV, Valencia, Spain). The interest of using line V lies in several features. One is its long history of selection in Valencia (García and Baselga, 2002), where the climate is not widely different from the weather of Delta of Nile in Egypt. Another interesting aspect is that line V has been studied in places of hot climates such as Adana in Turkey or Zagazig in Egypt and this line has revealed more productivity than other exotic breeds, as reported in the First International Conference of Rabbit Production in Hot Climates, held in Cairo (Yamani, 1994) and in the 6<sup>th</sup> World Rabbit Congress, held in Toulouse (Testik, 1996). Recent results obtained for V line in Saudi Arabia have confirmed the fact that adaptability of line V in heat stress conditions is good (Khalil *et al.*, 2002).
- Black and Red Baladi, Egyptian traditional breeds that, after their formation, have not followed a programme of genetic improvement (Khalil, 2002b).
- Sinai Gabali, Egyptian breed, recently studied by Afifi (2002) and Iraqi *et al.* (2007), showing very promising results.
- Saudi Gabali, purebred Saudi breed exhibiting good performances under hot and desert conditions (Al-Saef *et al.*, 2007).

The local breeds in Egypt and Saudi Arabia were contributing to the final set of lines through involving them in the genetic programme (if their performances as pure breeds are of interest) or through their contribution in the synthesis of new lines after being crossed with line V. Lines synthesized from crossing line V with local breeds could be used as compromising breeds relevant to productive capability and adaptability to the heat.

### Locations, lines replicated and selection criteria

A review article dealing with the current situation and perspectives of selection to get maternal lines was written by Garreau *et al.* (2004). In our project, the method of selection was in all cases a BLUP, under animal models or animal-repeatability models, depending if the trait refers to the young rabbits or to the does. Litter weight at weaning included as a criterion of selection in majority of the locations (APRI, Moshtohor, and Saudi Arabia) because there is a belief saying that capability of does for milk production is not quite enough when litter size increases. The size of the founder lines used, in general,

is around 120 does and 25 bucks. The line V used in this project was established in Alexandria at the end of 1998 from rabbits imported from Valencia. Selection was practiced in this V line in Alexandria using litter size at weaning as a criterion of selection. This line was replicated in Alexandria to be the base to establish one replicate in APRI, since 2001, and another replicate in Moshtohor, two years later. There are some reasons advising us to keep several replicates of the same line in different locations, as in the case of line V. The first reason for such replication is the security respective to the healthy troubles or accidents that could affect the animals in a certain location and could cause their extinction, *e.g.* disappearance occurred for V line sent to Zagazig University in Egypt several years ago as a result of contamination of feed with aflatoxins. The second reason for replication is that the stage of multiplying the programme of selection is actually the stage of true selection and the farmers are served better (Baselga, 2004).

### Breeding plans to synthesize the new lines

The lines synthesised in the project, the genetic aspects in synthesizing and the places of the work are specified in the following:

- **Alexandria line:** This line was developed in the Department of Poultry Production, Alexandria University, Egypt and selection criterion used in synthesizing was daily gain between 28-63 d. The first step of synthesis was to obtain female progeny from crossing line V bucks with Black Baladi does. The next step was to carry out two backcrossing generations with line V bucks, obtaining progeny of 87.5% from line V and 12.5% from Black Baladi. The foundation was finished after two generations of *inter se* mating, in order to reduce the gametic disequilibrium (El-Raffa, 2007). During this process, when possible, selection of coloured animals was practised (black and dark brown). In the rabbitry of Alexandria University, V and Alexandria lines were kept.
- **APRI line:** This line was developed in the Animal Production Research Institute in Egypt. The first step of synthesis was to get F<sub>1</sub> coming from crossing Red Baladi bucks with does of V line. The procedure continued getting F<sub>1</sub>, F<sub>2</sub>, F<sub>3</sub> and so on. After F<sub>3</sub>, the animals were named APRI line. In this line, the proportion of genes is 50% from line V and 50% from Red Baladi. The line V is housed at the stations of Sakha and Gimmiza and selected for litter weight at weaning. The Institute keeps also the APRI line at Sakha station and was selected with the same criterion that was in V line.
- **Moshtohor line:** It was developed in the Department of Animal Production, Moshtohor, Banha University, Egypt. The procedure followed in synthesizing was similar to that for APRI line, but with using Sinai Gabali bucks instead of Red Baladi bucks. Consequently, this line is formed from 50% V line and 50% Sinai Gabali. In V line, Moshtohor line and a population of Sinai Gabali breed and selection was practiced for litter weight at weaning and individual weight at 56 d and the animals were kept in the rabbitry of Banha University.
- **Saudi 2 and Saudi 3 lines:** In this experiment, a replicate from V line was started in Saudi Arabia at the end of 2000 using the rabbits imported from Valencia. For Saudi 2 line, the first synthesizing step in this line was to get F<sub>1</sub> from crossing Saudi Gabali bucks with V line does, then backcrossing with bucks of V line, followed by four generations of *inter se* mating. Saudi 2 (75% from V line and 25% from Saudi Gabali) was synthesised and located in the rabbitry of Al-Qassim University, Saudi Arabia. For Saudi 3 line, the procedure of synthesis was similar to the one followed in Saudi 2 and the first step was to get F<sub>1</sub> from crossing V line bucks with Saudi Gabali does, followed by backcrossing with Saudi Gabali bucks, finishing the program after four generations of *inter se* mating. Saudi 3 (75% from V line and 25% from Saudi Gabali) was synthesised and located in the same place of Saudi 2. The criteria of selection in both lines were, litter weight at weaning and individual weight at 84 d.

## Recorded traits

The reproductive traits recorded were total born, number born alive and number weaned per litter, while the growth traits were weaning weight and daily gain between weaning age and a specified age of 64 d or 84 d.

## RESULTS AND DISCUSSION

The indicative data of reproductive and growth performance in the breeds and lines maintained here in the programs of selection were taken from the last year of production. The objective is not to compare performances between them but, only, to know the level and range of variation of the traits in the places where the breeds and lines are placed. Consequently, performances will be presented as actual means, indicating the numbers of records involved in the computation of the means. Table 1 shows the reproductive and growth performances of line V in the four replicates used. The differences between them are attributed to environmental variations in terms of differences in housing, temperatures, cages, management, quality of feed or disease incidence and they are indicators of the efforts needed to control these factors.

**Table 1:** Observed performances<sup>+</sup> of Line V in different locations of the project

Location	Litters	TB	BA	NW	Young	WW	DG	AGE
Alexandria	561	9.2	8.3	7.4	2921	528	30.8	63
APRI Stations	455	8.8	8.1	5.7	2036	526	20.3	84
Moshthohor	134	-	5.6	4.8	462	545	17.9	56
Saudi Arabia	84	9.1	-	7.14	270	649	29.2	84

<sup>+</sup>TB= Total born; BA= Number born alive; NW= Number weaned; WW= Weaning weight (g); DG= Daily gain (g/d) from weaning (28 d) to age (d).

Table 2 shows the performance observed for local breeds and synthetics. At the present situation, these results are encouraging factors to allow us to use these lines and breeds as pure lines and to cross them with V line to get crossbred does to be distributed for the farmers in Delta, reclaimed areas and Upper Egypt (where the temperatures are higher than in the Delta) and in different areas in Saudi Arabia as well. The four replicates of V line, the two local breeds and the five synthetics are large sets of genetic resources that were selected in local conditions should be a tool to increase the productivity and adaptability of the rabbits raised in hot areas. The program here presented, including different breeds and strains, some of them existing and some of them of new synthesis all of them undergone defined programs of selection, including studies for their best use and diffusion, meet the essential points discussed by Baselga (2004) and Garreau *et al.* (2004) to be satisfied by a true program of genetic improvement of meat rabbits.

**Table 2:** Observed performances<sup>+</sup> of local breeds and synthetic lines of the project

Breed or line	Litters	TB	BA	NW	Young	WW	DG	AGE
Alexandria	204	8.8	8.1	7.2	734	564	34.5	63
APRI	318	8.5	7.9	5.6	867	494	20.5	84
Moshthohor	91	-	6.1	5.9	440	621	21.0	56
Sinai Gabali	77	-	5.9	5.5	365	493	23.3	56
Saudi Gabali	40	7.0	-	5.4	294	609	27.8	84
Saudi 2	237	10.2	-	9.0	1167	658	31.2	84
Saudi 3	463	9.5	-	8.2	1815	672	33.8	84

<sup>+</sup>TB= Total born; BA= Number born alive; NW= Number weaned; WW= Weaning weight (g); DG= Daily gain (g/d) from weaning (28 d) to age (d)

## Prospects for the future

To get more benefits from this project, the programs of selection must be continued in different locations to identify the adaptation aspects for does of pure lines and does of simple crosses in different areas and systems of production. For optimizing the efficiency of crossbred does, it would be

necessary to diffuse the crossbreed does for small scale rabbit producers by economic, simple, efficient and safe ways.

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