WEIGHT GAIN IN REPRODUCTIVE RABBITS THROUGH THE APPLICATION OF A SELECTION SYSTEM AND BREEDER IN A CLOSED POPULATION

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ABSTRACT

Objective: To determine if there are differences in the weights of the reproductive male rabbits after ninety (90) days of age, after the application of a Selection System in a closed population. ***Materials:*** Reproductive male crossbred rabbits. ***Method:*** Weight calculated on the 90th day of birth of the reproductive males. ***Results:*** The weight gain of the animals in study was of 246 gr. ***Conclusion:*** The selection system applied was successful. ***Key words***: reproductive rabbits, controlled mating, genetic selection, weight gain.

INTRODUCTION

A domestic rabbit, *Oryctalagus Cuniculus*, is the "domestic mammal with the greatest reproductive capacity"; a doe is capable of producing up to 1.200% of its live weight in a one-year exploitation, in relation to the number and weight of its young breeds during that time; what makes of this sector, a definite alternative for human food all over the world, especially in Latin America, in which the agricultural activities are related to the family's everyday activities. There are no limitations about genre and age for the assistance of the rabbit breeding, so they could be assisted by young people and elderly as well because it does not require any strong physical efforts.

The absence of technical specialized knowledge, in the rural production area, represents a real challenge to obtain the best results in getting the meat weight considering time, physical space and animal population.

The rabbit farm *Madre Tierra,* is located near the city of Barquisimeto, Lara state (Venezuela), and it has a tradition of over 20 years of rabbit breeding experience. Its beginnings were with crossbreed animals from California and New Zealand mainly, with no previous records of production, like in the majority of the farms in Venezuela in which rabbit breeding is undertaken in an empirical manner, in part, because of the lack of existing tradition of the consumption of rabbit meat in the population. Although lately, there has been an sustained increase in the demand of rabbit meat, mainly in local restaurants, which has obliged to incorporate management techniques and strategies in order to increase the efficiency of the farm's production.

For over 15 years, the farm had been selecting breeding in a traditional manner; including the incorporation of selected animals of other national farms in order to reach a level in which the farm's productive parameters were satisfactory. However, as time passed by, a type of stagnation or difficulty to improve them was observed different from that initial success. This was basically because of the lack of national stallions from other farms which could provide the genetic benefits taking into account the increase of the productive and reproductive averages.

Breeding between rabbits were done, taking care of the direct origins of the sons, so they were not mated with their immediate families. However, there was no control over the consanguinity that might arise in the herd.

At this point, it was decided to incorporate some advisory in the area of genetics and apply new strategies in the management of crossbreeding of animals with a new mating model, grounded on the registry of information as the base of a strict selection program, in a closed population; avoiding the maximum consanguinity and their possible adverse effects. As an immediate consequence, an increase of the productive averages was observed, measured as Daily Weight Gain, and Slaughterhouse Weight, as well as the reproductive averages measured as the number of young rabbits born, weaned rabbits per litter, accumulated young rabbits during the reproductive useful life of each female.

Nowadays, the farm is formed by 160 reproductive females and 24 reproductive males which produce an average of 150 young rabbits a week weighing from 2.5 kg on the 90th day of birth, and a return of 70 % (including head and guts), and that after three years of the application of this method, a series of productive and reproductive improvements have been obtained that will be exhibited in the content of this paper.

The selection of the breeders of the farm is based on the following criteria:

Females: The number of born young rabbits is considered, the number of weaned rabbits is also considered, and the number of Reproductive Life Days (DVR). The relationship between the number of young rabbits produced with time is very important; because in this way, various characters are assessed simultaneously, such as the prolificacy of each animal (multiple ovulation and fertility), through the size of the litter birth, the maternal ability (milk production and breeding care), through a number of weaned rabbits and the capability or reproductive efficiency maintained through time (interval between births and number of births) destined to the reproduction.

For this, the farm applied an efficiency formula, called REPRODUCTIVE INDEX (IR), which is the amount of weaned young rabbits accumulated in every birth, between the days of interval between the first and the last birth to be assessed of its reproductive useful life, multiplied by 30 days, to make the monthly correction. So we have:

$$\text{Reproductive Index} = \frac{\text{Accumulated young rabbits}}{\text{Accumulated days}} \times 30$$

If the IR of a doe is deemed, which in a year has presented 8 births, and has 48 weaned young rabbits accumulated; we will have:

$$\text{Reproductive Index} = \frac{\text{48 weaned young rabbits}}{\text{365 days}} \times 30$$

Reproductive Index (IR) = 3.95 weaned rabbits per month.

Parting from this parameter, the does with greater IR are chosen, to select their daughters as the next breeding of the herd, the less breeder are then put aside, what is considered as the cause which has permitted to observe significant improvements considering the number of born and weaned young rabbits.

Another achievement is that the does have an increase in the weight, greater to 3 Kg after 120 days, which indicates that they could be in an optimal condition for the service at that age. However, the service is done on the 135th day of age in order to guarantee greater physiological maturity.

The does mustn't have physical defects or pathologies at the moment of being taken into account for the selection.

The heritage with the genetically mother component are about 10%. The heritage of the weight gain is in between 20 and 25%.

Male: The candidates to be postulated as the next breeders must have a series of requirements:

They must be sons of "good mothers", that is, only the sons of the Doe with a Reproductive Index (IR) greater than the average of each group of comparison, which guarantees the transmission to their daughters, the benefits of prolificacy and the measured motherhood ability.

They must come from a large litter, over the average, so as to assess their individual behavior in the same conditions with other individuals of the same litter and from other contemporary litters, from birth, irrespective of the IR of the mother, as an extra requirement, due to that other small litters, have a tendency to greater individual body development because there is minor competence for the breast milk during nursing.

They must have a Weight Gain on the 90th day, greater to the average of their group of comparison, which makes of these future stallions, individuals capable of transmitting to their offspring, the genetic capacity of being better meat producers, measured as body mass in the less time possible.

When selecting males, taking into account the characters of the mother (high IR and large litters) we would have the probability that those proper female characteristics would be transmitted to their daughters.

They must not have any physical defects or diseases at the moment of being assessed.

The weight for the selection of the male players is determined on the 90th day after birth. Although at the beginning, when we did not have the current genetic material, the farm produced animals of 2 Kg when they were 120 days old, and as the crossing system was applied, improvements were observed in the production level. Nowadays, the average weight has been increased to 2.5 Kg. At the same time, the time of achieving this weight was diminished to 90 days. Also, we do a follow-up on the weight until they are 120 days old, to have a reference of that age. What is aimed at is to obtain male players without diminishing the growing rate, close to the 90 days, but to keep that weight long enough after the date of sacrifice.

In this way, the probability of gaining weight increases up to the 120th day, and will not diminish close to the date of sacrifice (90 days).

Materials

For the assessment of the application of SC6G, the data of the weights was taken from the male players on the 90th day from birth, since the previous year to the application of the system (2010) until 2013. **Table 1.** In total, 81 male players were assessed in 4 consecutive years.

	YEAR 2010		YEAR 2011		YEAR 2012		YEAR 2013	
Number of Animals	Breeding Male	Weight 90 days	Breeding Male	Weight 90 days	Breeding Male	Weight 90 days	Breeding Male	Weight 90 days
1	C30	**2.800**	C42	2.700	101	2.800	105	**3.000**
2	C31	**2.800**	C44	2.600	103	2.800	107	2.800
3	C32	2.500	C46	**2.800**	104	2.800	108	2.900
4	C33	2.700	C48	**2.900**	105	2.700	109	2.800
5	C34	**2.800**	C50	2.400	203	2.800	208	2.900
6	C35	2.600	C52	**2.800**	206	**2.900**	209	**3.200**
7	C36	2.600	C55	2.500	301	2.700	210	2.800
8	C37	2.400	C60	2.600	307	2.800	211	**3.000**
9	C40	2.400	C63	2.600	308	**3.000**	212	2.900
10	CH2	2.600	C65	**2.800**	401	3.000	213	2.900
11	N06	**2.800**	C68	**2.800**	403	2.500	214	2.900
12	N08	2.500	C70	2.600	404	2.700	309	2.700
13	N10	2.600	CH4	2.500	405	2.800	311	2.700
14	N12	2.500	M03	2.600	407	**3.000**	312	2.800
15			N15	2.500	408	2.800	313	2.800
16			N16	2.700	501	2.800	314	**3.100**
17			N18	**2.900**	502	2.800	315	**3.000**
18			N61	2.500	601	**3.000**	316	2.800
19					605	2.800	409	2.600
20							410	2.800
21							503	2.700
22							504	2.700
23							505	**3.200**
24							506	**3.300**
25							507	2.800
26							508	2.900
27							607	2.600
28							608	2.700
29							609	2.700
30							610	2.800
	Average Weight	2.614	Average Weight	2.656	Average Weight	2.816	Average Weight	2.860

Table 1. Relation of weight of the male players in the time of study. The numbers in BLACK are the ones with greater weight each year.

Method

In an initial population of 160 female players, 6 groups were added identified with their respective numbers from 1 to 6; each group according to their identifiable ancestry to try to keep the most genetic likeness possible within each group, and to obtain in this way, the greatest genetic distance possible among the groups, to later proceed to the cross breeding among the groups. Six (6) female genetic groups were then obtained, formed by approximately 26 females each; the same procedure with the males grouped also in six (6) groups according to their origins. So, the result was 6 groups of males formed by 4 males each, for a total of 24 males.

The male players belonging to each group were assigned a number of 3 digits, of which the first digit corresponds to the Mating Group and the other 2 digits are the identification of each individual. For example: the male 103 corresponds to Group 1, and it is the individual

03. The male 602 would be from Group 6 and the individual 02. And like this with all the other players.

The female players were identified with three digits, assigning the corresponding number of cage. Also, a number is assigned in every registry with the relative number to the corresponding mating group to which it belongs to.

Like this, and in an illustrative manner the groups are crossed in a pre-established sequence and the mating is done in this way:

The males from Group 1 would be crossed with the females from Group 3, and the result would turn into Group 2. While the females from Group 1 mate with the males from Group 5, generating Group 6.

The males of Group 2, would be crossed with females of Group 4 and the result would be Group 3, while the females from Group 2 mate with the males from Group 6, generating Group 1.

The males from Group 3 would be crossed with the females from Group 5 and the results would be Group 4, and finally the females from Group 6 mate with the males from Group 4, generating Group 5.

In this way, the males are the ones that determine to which group its progeny is destined. Each group of males creates the immediate higher number.

The crossings among each one of the females with the male of the corresponding group, are totally at random. A female could be crossed with any male of the corresponding group.

Groups of Female Players	Crossed with	Groups of Male Players
3	X	1
4	X	2
5	X	3
6	X	4
1	X	5
2	X	6
		1

Table 2. Mating scheme of 6 groups of breeding rabbits.

Results

The results of the compilation of the data of the obtained weights during the study are reflected in **Table 3.** It shows that the increase in weight in the year 2011 is less than the following years. For that moment, the players were still the product of the breeding without the application of the SC6G. From the year 2012, the players are the product of breeding of the SC6G which is where the greater increase in the weight gain can be observed.

YEAR 2010		YEAR 2011		YEAR 2012		YEAR 2013	
Average Weight	2.614	Average Weight	2.656	Average Weight	2.816	Average Weight	2.860

Table 3. Summary of the averages of the male players during the time of study.

Discussion

Based on the obtained results, it can be observed that the increase in weight gain of the male was of 246 gr. After three years of having applied the SC6G.

If this weight gain is considered in the players to have the same incidence in the total of young rabbits destined to the slaughterhouse, irrespective of the final weight, all of the herd must gain weight in approximately 246 gr. at the same age of sacrifice.

In this case, there would be 150 young rabbits by 52 weeks/ year = 7.800 rabbits per year.

7.800 rabbits by 0, 246 Kg = 1.918 Kg of rabbit in live weight /year.

1.918 Kg per 70% of revenue = 1.342 Kg of rabbit meat of increase from the application of the SC6G.

Moreover, the increase in the gross income, it can be affirmed that the application of the SC6G does not imply any type of dispensing of significant money for the structure of costs of the farm.

However, the SC6G would not be of greater use if there were no clear objectives and parameters that every commercial exploitation rabbit farm must have. The phenotypic ranges that are desired

the most to consolidate in the herd must be well defined, in order to advance faster and more firmly.

In this case, it would be the weight gain on the 90th day after birth, as one of the parameters for the selection of the future players.

This system of breeding destined for closed populations is flexible in the sense that other male players could be incorporated to the herd which might improve some desirable features in any or in several of the 6 groups, introducing those genes to the herd.

In Table 1, it is observed that every year, the male players increase. This is because every time, there is more and more availability of animals of better weight to select from.

In the broodstock from the year 2012 a greater weight gain is observed in relation to the previous year, because these are the first product sons of the SC6G, being a consequence of the greatest heterosis between the breeding of groups the most distant possible.

Conclusions

Definitely, the application of the SC6G brought as a consequence, an increase in the weights of the male players, after its application, if it is considered that during the time of study, there were no feeding changes or different management practices that could have affected in the weights, trying to keep the environmental conditions the same during all that time.

Although it is not the objective of this paper, treating the reproductive characteristics of the female, one can refer to an increase on: number of born rabbits, number of weaned young rabbits, weaning weight, and interval diminishing between births, and also the increase of the size and weight of the females in the age for service; understanding that the SC6G keeps the level of consanguinity to the minimum in the herd, hence the negative consequences over the production and reproduction.

As any other closed herd, the universe of genes is always the same. What is searched is the genetic combination which is more beneficial taking into account the productive and reproductive performance. That is why the Selection System is so important; it is necessary to choose the desired characteristics of the herd.

The only fact of applying the SC6G does not guarantee the increase in the production. We have to be capable of selecting the "elite" animals for them to be the next players and so have the probabilities to improve the index of productivity.

Bibliographic References

Blasco A, Baselga M., Estany J., Cátedra de Fisiogénetica. ETSIA. Universidad politécnica Camino de Vera, 14. 46002-Valencia.

Petersen J., Vásquez R., 2007. Influencia del rendimiento maternal antes y después del parto sobre el desarrollo de conejos de engorde. Universidad ISA Rep. Dominicana.

Zamora M., MANEJO EN CUNICULTURA Responsable del área de Cunicultura de la FESC-UNAM Presidenta de la Asociación Nacional de Cunicultores de México A.C.

Deháquiz J., SISTEMA DE PRODUCCION CUNICOLA 2013. UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA ESCUELA DE CIENCIAS AGRICOLAS, PECUARIAS Y DEL MEDIO AMBIENTE.