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## **Preliminary study of the feeding management of early rabbits at weaning, on productive parameters and quality of the carcass**

Estudio preliminar del manejo alimenticio de gazapos precoces al destete, sobre parámetros productivos y calidad de la canal

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### **RESUMEN**

El objetivo del presente trabajo fue comparar el manejo alimenticio de gazapos destetados a los 21 d contra el manejo alimenticio tradicional de gazapos destetados a los 35 d de edad y evaluar parámetros productivos y calidad de la canal. Se utilizaron 4 gazapos de la raza California de 21 d de edad, se dividieron en 2 grupos, al grupo 1 se le administró alimento sólido utilizando *Tenebrio molitor* como aditivo y una fórmula líquida elaborada a base de jengibre, agua de coco, *Tenebrio molitor* y miel de abeja; al grupo 2 se le dejó con la madre. Después de 14 d de tratamiento los conejos consumieron alimento de engorda durante 28 d y se procedió al sacrificio. Los resultados obtenidos mostraron que un destete a los 21 d de edad y las condiciones adecuadas de alojamiento, fórmula líquida y alimento sólido con *Tenebrio molitor* como aditivo, no afectan la mortalidad y los parámetros productivos, sin embargo, disminuye el rendimiento en canal. Los resultados encontrados sugieren que el manejo alimenticio en gazapos destetados a los 21 d, podría ser una alternativa cuando es necesario separar al gazapo de la madre anticipadamente.

**Palabras clave:** destete precoz, *Tenebrio molitor*, jengibre, gazapo.

### **ABSTRACT**

The aim of the present work was to compare the feeding management of weaned rabbits at 21 d against the traditional feeding management of weaned rabbits at 35 d of age and to evaluate productive parameters and quality of the carcass. Four rabbits of the California race of 21 d of age were used, they were divided into 2 groups, group 1 was given solid food using *Tenebrio molitor* as an additive and a liquid formula elaborated with ginger, coconut water, *Tenebrio molitor* and honey bee; Group 2 was left with the mother. After 14 d of treatment, the rabbits consumed fattening feed for 28 d and they were slaughtered. The results obtained showed that a weaning at 21 d of age and the adequate conditions of lodging, liquid formula and solid food with *Tenebrio molitor* as an additive do not affect the mortality and the productive parameters, however, the carcass decreases. The results suggest that the feeding management in rabbits weaned at 21 d, could be an alternative when it is necessary to separate the rabbit from the mother in advance.

**Keywords:** early weaning, *Tenebrio molitor*, ginger, rabbit.

## INTRODUCTION

One of the main problems in cunicultural production occurs when the mother abandons the rabbits or dies, which results in a deficit of nutrients and immunity in the newborn due to the lack of breast milk, which implies a low weight index alive; causing economic losses to producers. For this reason, proper food management is vital in the rabbits that suffer from this problem, since the rabbits before 18 days of age consume exclusively breast milk; after this period of time, they start the consumption of solid food (the one that the mother ingests), either by game in first instance and later by the need to nourish. After 25 days they require the same amount of protein provided by the milk as by the solid food, but it will be up to 35 days when the rabbit obtains all the nutrients from the solid food (De Blas *et al.*, 1999). Due to the above, when carrying out an early weaning, it is necessary to cover all the nutritional needs of the rabbit, considering that its fermentation capacity at the blind level is in initial stages (Brecchia *et al.*, 2010). In such a way, a possible alternative to feed the rabbits that suffer from a very early weaning, is to use high solubility products, such as honey, ginger and *Tenebrio molitor* larva (as a source of protein); also, add soluble carbohydrates and lipids easily digestible. Lactose should not be included, as it can cause a decrease in the digestibility of dry matter and protein, which can increase mortality during fattening (Pascual, 2001). In addition to the above, by providing solid food that meets the needs of the rabbit, it can help to make the feeding change during fattening less abrupt. The objective of this work was to compare the feeding management of weaned rabbits at 21 d, against the traditional feeding management of weaned rabbits at 35 d of age; as well as evaluate productive parameters and carcass quality.

## MATERIAL AND METHODS

### Animals and diets

The animals of this study were housed in the Full Cycle Rabbit Research and Production Facility of the Agricultural Sciences Institute (Tulancingo de Bravo, Hidalgo, Mexico) of the Autonomous University of Hidalgo State. The care and management of rabbits was in accordance with the guidelines of the Ethics Committee of the Autonomous University of Hidalgo State. Four 21-year-old California breed rabbits were housed, housed in cages of 90 x 40 x 60 cm, with nest, bottle and bottle feeder. The rabbits were completely randomly selected from the same litter, to form two groups. Group 1 was removed from the mother at 21 d and a liquid formula and weaning food was administered (table 1), on demand for 14 d; group 2 was left with the mother and breastfeeding on demand, until reaching 35 d of age. After the time, both groups were given fattening food (table 1), on demand for 28 days. The average temperature in the experimental building was 20 °C, and relative humidity 65%. The food was pelleted in a machine model SKJ120 (Shandong, China).

**Table 1. Nutritional composition of liquid formula and types of food offered during the experiment**

Ingredients	FL	AD		AL	AE
	(1L)			BS %	
Drinking water	c.b.p.				
Ginger	20 g				
Coconut water	30 mL				
Vinegar	20 mL				
Honey bee	30 mL				
<i>Tenebrio molitor</i> (larva)	80 g	2.0			
Oat straw		6.0		12.0	15.0
Alfalfa Hay		6.0		0.0	0.0
Ground corn		19.0		19.0	17.5
Canola paste		8.0		8.0	8.5
Soybean paste		17.0		24.0	17.0
Ground sorghum		15.0		15.0	18.0
Molasses		1.0		1.0	1.0
Soybean husk		13.0		14.0	6.0
Wheat bran		10.0		4.0	14.0
Mineral and vitamin premix		3.0		3.0	3.0
PC %	13	18.1		18.2	16.0
ED Mcal kg MS <sup>-1</sup>	2.9	2.5		2.5	2.5
FC%		12.0		12.5	12.0

FL = Liquid formula, AD = Weaning food, AL = Breastfeeding food, AE = Fattening food, BS = Dry base, PC = Raw protein, FC = Raw fiber, ED = Digestible energy.

### Productive parameters

During the experiment, the animals were weighed every week, while the daily intake of food was determined by weighing the food offered and rejected. From these data, the daily weight gain during the four weeks of fattening, total gaining and feed conversion during the fattening period was calculated. At the end of the fattening, the rabbits were slaughtered with an average age of 63 d of age; for this, they were transported to the Meat Workshop of the Institute of Agricultural Sciences, where they were slaughtered in accordance with NOM-033-SAG/ZOO 2014. The channel was dissected according to the recommendations of Blasco *et al.* (1993), and the pH and water retention capacity were measured (SAGARPA, 2011).

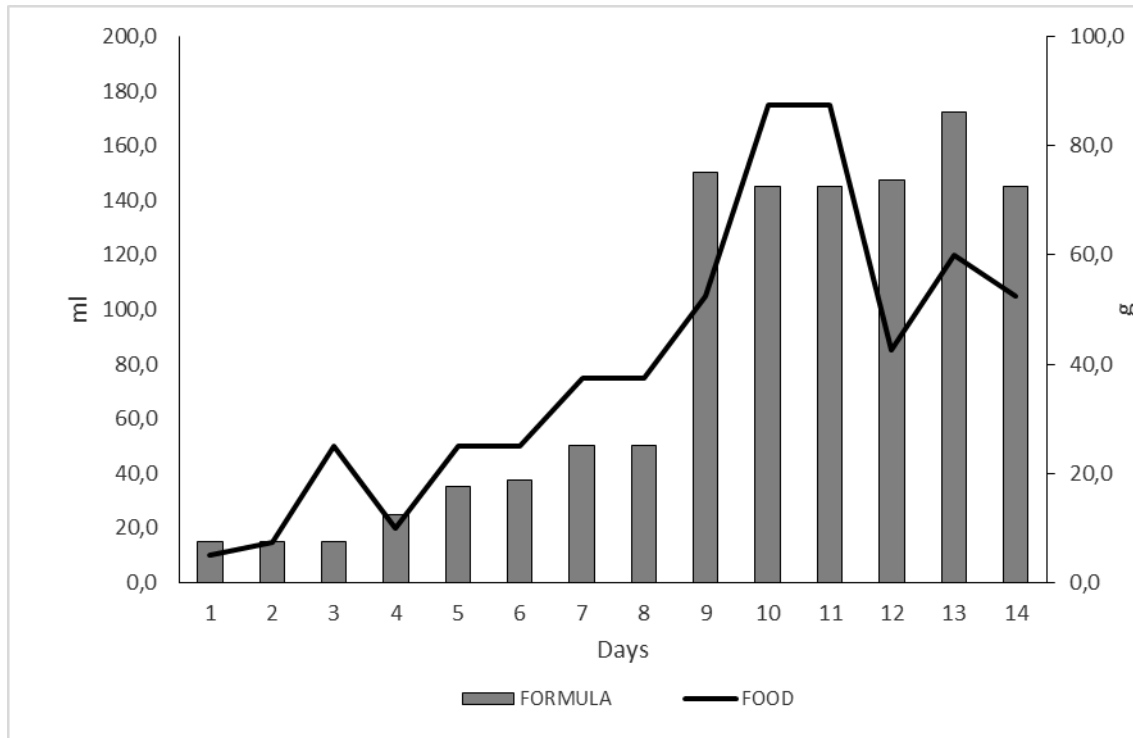
### Data analysis

The data were evaluated through a descriptive analysis.

## RESULTS AND DISCUSSION

The results obtained regarding the consumption of dry food and formula (figure 1), of the weaned rabbits at 21 d of age that underwent the food management, showed that until the third day they began to eat solid food (25 g), increasing gradually until the ninth day, reaching the maximum increase on the tenth day (87.5 g). Regarding the consumption of the liquid formula during the first 8 days the consumption was low (15 to 50 ml), increasing substantially from the ninth day (150 ml), remaining until day 14 (145 ml). It can be explained because at that stage of life the rabbits need to consume 50% of milk protein and 50% of the food, until they reach day 30, where they only need 18% of milk,

and already on day 35 milk consumption is not necessary and is only for food (De Blas *et al.*, 1999).



**Figure 1. Dry food consumption and liquid formula of weaned rabbits at 21 d of age**

Regarding the weight of the rabbits during food handling, both those weaned on day 21 and those weaned on day 35; showed similar behavior for both groups; however, the weaned rabbits at 21 d showed greater weight at 63 d of age (1673 g) than those weaned at 35 days (1540 g). It should be mentioned that at the beginning of the fattening (day 35), the newly weaned rabbits began with a greater weight (875 g), than those weaning early (695 g) (figure 2). This weight gain at 65 days of fattening can be explained because the weaned rabbits at 21 d showed greater daily weight gain (GDP) from 35 to 42 d of age (53 g), compared to weaned at 35 days (24 g). However, at the end of the fattening (65 days) both treatments had similar weight gains (figure 3), which can be explained because of the former had the stage of early adaptation when they were separated from the mother 15 d before. Also it had the opportunity to consume food and formula with the necessary nutrients to maintain an adequate pH, which is related to a higher fermentation of VFAs (Pascual, 2001). These results suggest that the nutritional management of the early weaned rabbits is of vital importance so that the rabbits in the end obtain a weight gain similar to the rabbits that are weaned physiologically.

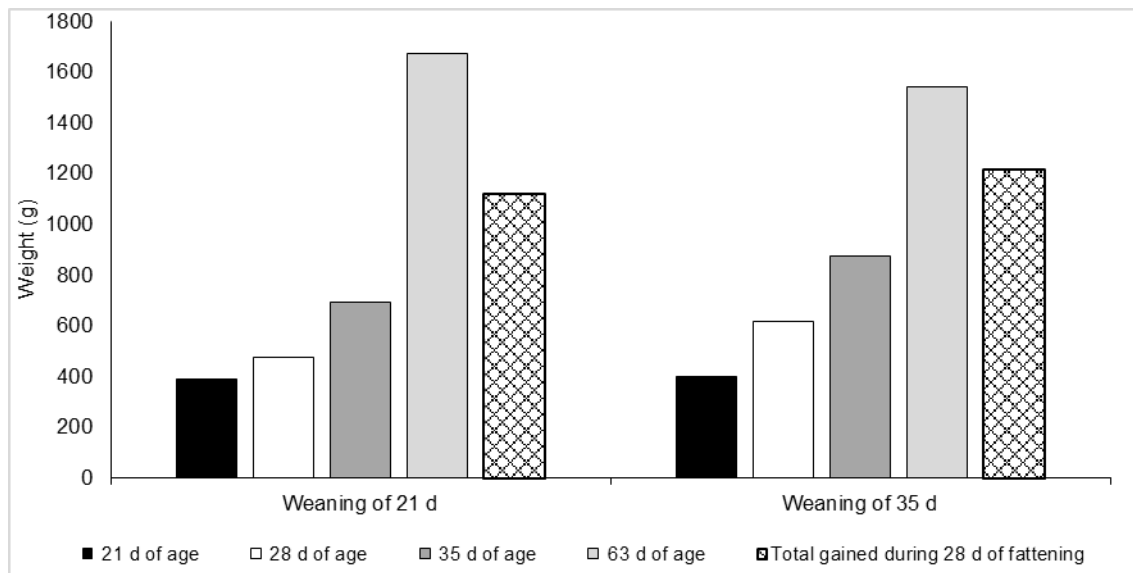


Figure 2. Weight of weaned rabbits at 21 and 35 d of age, with different feeding management, before and during fattening

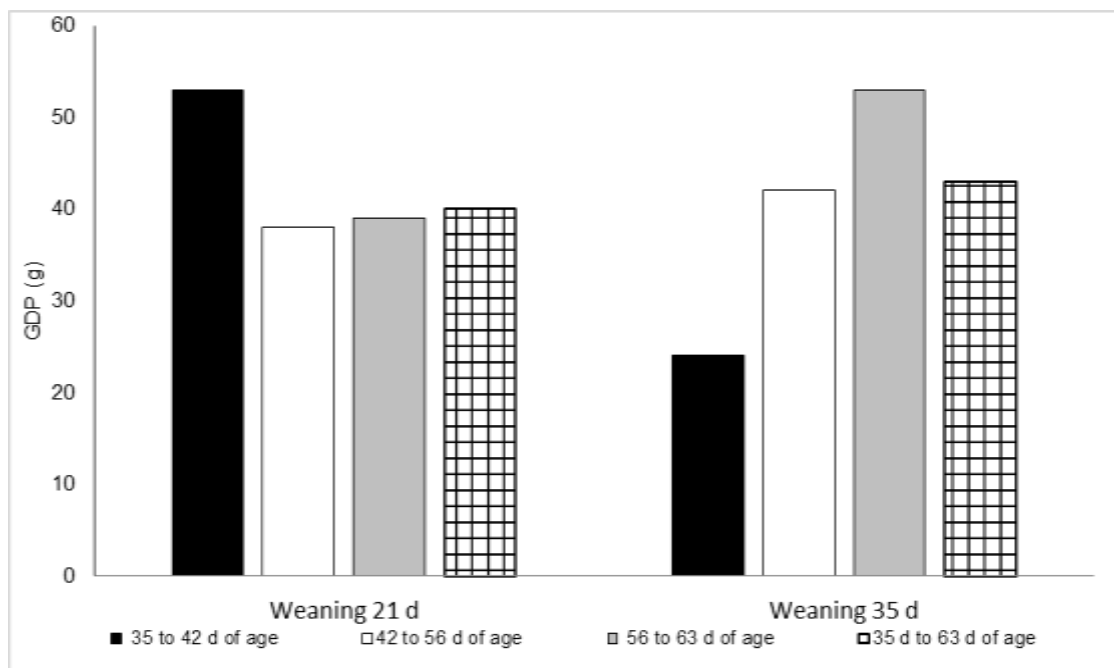


Figure 3. Daily weight gain (GDP) of rabbits weaned at 21 and 35 d of age, during fattening, with different feeding management

On the other hand, when evaluating the quality of the carcass (table 2), the weaned rabbits at 21 d had a lower weight on skin, legs, viscera, hot carcass and cold carcass. However, the main difference is observed in head, scapular fat, renal fat and fat content in the legs; since in terms of meat of the legs and loin the data were similar, which is explained because the weaned rabbits at 35 days, had a better development of the digestive tract (De Blas *et al.*, 1981).

**Table 2. Quality of the weaned rabbit carcass at 21 and 35 d of age, with different feeding management**

Variables, weight g	Weaning of 21 d	D.E	Weaning of 35 d	D.E.
Skin	255.50	10.61	311.00	1.41
Legs	40.00	1.41	52.50	3.54
Viscera	386.00	43.84	520.50	19.09
Full digestive tract	274.00	16.97	377.50	0.71
Heart	6.00	0.00	6.50	2.12
Lungs	12.00	2.83	19.50	2.12
Spleen	1.00	0.00	1.50	0.71
Liver	70.00	19.80	90.50	19.09
Kidneys	11.00	1.41	13.50	0.71
Empty digestive tract	147.00	2.83	165.00	16.97
Bladder	5.00	0.00	8.00	1.41
Hot carcass	895.00	21.21	1072.50	74.25
Cold carcass	895.00	14.14	1115.00	120.21
Head	100.00	7.07	117.50	10.61
Previous part	217.50	3.54	250.00	0.00
Middle part	105.00	28.28	152.50	38.89
Back part	142.50	17.68	187.50	3.54
Renal fat	8.50	3.54	18.00	4.24
Scapular fat	3.00	0.00	7.50	6.36
Legs	315.00	7.07	380.00	49.50
<i>meat</i>	222.50	17.68	262.50	17.68
<i>bone</i>	85.00	14.14	107.50	24.75
<i>fat</i>	2.00	2.83	3.50	3.54

## CONCLUSION

The results obtained suggest that by providing adequate integral food management (liquid formula and solid food) in early-weaned rabbits, their mortality during fattening can be avoided, since it does not affect the production parameters and the quality of the carcass; these results are the preamble for future research related to this problem.

There is a lot of research work to do and somehow include more animals to achieve statistical tests that demonstrate the importance of this nutritional management.

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