

## Number of Faecal Pellets Dropped Daily by the Wild Rabbit (*Oryctolagus cuniculus*)

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**Abstract:** An experiment utilizing wild rabbits (*Oryctolagus cuniculus algirus*) was conducted to evaluate the number of faecal pellets dropped by the animals in 24 h. When fed with a diet of known composition. Twenty four individually cage-born adult wild rabbits, coming from the Southern Iberian Peninsula (Spain), were fed with a commercial feed having 16.5% Crude Fibre, 16.5% Crude Protein, 89.8% Dry Matter. The average number of faecal pellets dropped per rabbit in 24 h measured during 6 consecutive days, was 373, remaining homogeneous along the days for each rabbit, but with differences between individuals. Values found in this experiment differ from that of the wild rabbit in many locations in its distribution area around the world. The results confirms that the number of faecal pellets dropped daily by the wild rabbit is recommended to be locally tested every time the population size of an area is to be evaluated with the purposes of game management, pest control and in assessing of risk of propagation of the diseases.

**Key words:** Wild rabbit, *Oryctolagus cuniculus*, faecal pellets, population density, wildlife management, paratuberculosis propagation

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### INTRODUCTION

Wild rabbits (*Oryctolagus cuniculus*) are involved in the epidemiology of paratuberculosis in domestic and wild ruminants grazing pasture contaminated by rabbit faeces (Daniels *et al.*, 2003; Greig *et al.*, 1997). Paratuberculosis is considered highly prevalent among wild rabbits and other wildlife in many countries (Daniels *et al.*, 2003; Gortazar *et al.*, 2007). The transmission of *Mycobacterium avium* subspecies *paratuberculosis* that has been isolated from rabbit faeces, occurs through the faecal-oral route (Daniels *et al.*, 2001). As the potential for disease transmission from pasture contaminated with faeces depends on its rabbit density, to assess the risk of propagation of the paratuberculosis it is necessary to measure population densities of the wild rabbit.

However, because of the wild rabbits spend most of the day hidden in their warrens, it is difficult to estimate their densities by direct counts. Therefore, faecal pellets counts (number of faecal pellets deposited/ha) have been used to estimate rabbit abundance and its relationship with the potential for paratuberculosis transmission (Daniels *et al.*, 2001, 2003; Greig *et al.*, 1997) and are adequate for broad-scale studies, when the densities of pellets counted in a sample of plots along a number of transects provide a pellet abundance index (pellets m<sup>-2</sup>) (Delibes-Mateos *et al.*, 2008). However, the average number of faecal pellets dropped by the wild rabbit in 24 h shows, a very wide variation across the studies published in the literature (Lockley, 1962; Simonetti, 1989; Wood, 1988). The deposition rate seems to be a

population and not specific, characteristic, strongly dependent on the microhabitat (Simonetti, 1989) and probably, the diet and subspecies of the rabbits involved. Some studies have directly counted the number of faecal pellets dropped daily by the wild rabbit (Lockley, 1962; Simonetti, 1989). These researches however, have been carried out using very few rabbits or with a lack of information either on the subspecies of rabbit used or the composition of the plants or feed ingested by the animals.

Thus, this research describes, a trial carried out with the aim of investigating a precise measurement of the number of faecal pellets dropped daily by wild rabbits belonging to the *O. c. algirus* subspecies fed with a feed of known composition. This will be useful for estimating rabbit densities for game management, pest control purposes and to assess the risk of propagation of the paratuberculosis.

### MATERIALS AND METHODS

Twenty-four individually cage-born adult wild rabbits (*Oryctolagus cuniculus* sbsp. *algirus*), coming from the Southern Iberian Peninsula (Spain), were fed *ad libitum* with a commercial feed having 16.5% crude fibre, 16.5% crude protein, 2.5% crude fat, 10.0% ash and 89.8% dry matter. Water was provided *ad libitum*. Rabbits were used according to the standards for handling laboratory animals as stipulated by the European Convention for the protection of vertebrate animals used for experimental and other scientific purposes (Council of Europe, 1986). The number of faecal pellets dropped per rabbit, the total

amount of fresh faeces and the faeces dry matter were measured every day during six consecutive days. The statistical analysis, performed with the SPSS 15.0 program (SPSS Inc., 2006), consisted of: mean, Standard Error of the Mean (SEM) and coefficient of variation of the number of faecal pellets, of the total amount of fresh faeces and of the faeces dry matter produced per rabbit in 24 h, Friedman's test to assess homogeneity of the number of faecal pellets along the days for each rabbit; and Kendall's coefficient of concordance to assess homogeneity of the number of faecal pellets between individuals.

## RESULTS

The number of faecal pellets dropped per rabbit in 24 h was  $373.25 \pm 26.03$  (mean  $\pm$  SEM, coefficient of variation 34.2%), ranging from 174-641. The number of faecal pellets was homogeneous along the days for each rabbit (Friedman's test:  $\chi^2 = 6.200$ ;  $p = 0.287$ ). In contrast, there were differences between individuals (Kendall's coefficient of concordance:  $W = 0.155$ ). The average diameter of the faecal pellets was  $7.90 \pm 0.14$  mm ( $n = 50$ ). The total amount of fresh faeces produced per rabbit in 24 h was  $54.55 \pm 2.80$  g (mean  $\pm$  SEM; coefficient of variation 25.2%), ranging from 38.8-78.7 g. Faeces dry matter was  $40.77 \pm 2.71\%$  (mean  $\pm$  SEM; coefficient of variation 18.8%).

## DISCUSSION

This is the first research, investigating the number of faecal pellets dropped per day by the wild rabbit of the *O. c. algirus* subspecies, in which the composition of the diet ingested by the animals is clearly known. Although, figures for captive animals are open to objection, the ones found in this research are useful to compare them with figures for free-ranging animals because the composition of the feed used was similar to the diet of the rabbit in the wild (Martins *et al.*, 2002), at least in the main area of distribution of *O. c. algirus* in South Iberian Peninsula, where the study was carried out.

The average daily yield of 373 pellets a day found here for *O. c. algirus* when fed with a typical feed compound used for rabbit farming (Mendez and Villamide, 1989) compares well with the figures described for the wild rabbit in Wales (276-446 faecal pellets; Lockley, 1962) and in New South Wales (325 faecal pellets; Wood, 1988). This number of faecal pellets dropped daily was however, much lower than that of the wild rabbit in New Zealand (820 faecal pellets; Taylor and Williams, 1956) and in central Chile (540 faecal pellets; Simonetti, 1989). This

confirms the wide variation that shows the deposition rate of the wild rabbit among different populations in its distribution area along the world, being it a population, but not specific, characteristic (Simonetti, 1989).

The rabbits of the subspecies used in this research are the lightest among all the European rabbits in the world (Soriguer, 1980). This could explain, in part, the differences in the deposition rate of the *O. c. algirus* in comparison to the ones of rabbits from other populations, belonging to the *O. c. cuniculus* subspecies. The genetic differences between both subspecies (Branco *et al.*, 2000) and the phenotypic differences, particularly in size, showed by the wild rabbits from different regions (Sharples *et al.*, 1996) could lead to differences in amount of food ingested and therefore, in the deposition rate.

In contrast to the findings of Simonetti (1989), the data reveal that the defecation rate remains constant along the time for each individual rabbit. Therefore, the average number of faecal pellets seems to be not only a population characteristic (Simonetti, 1989), but also an individual one.

The total amount of fresh faeces produced per rabbit in 24 h is not comparable to that of meat rabbit breeds because, the latter are 3 times heavier than the wild rabbits of the *O. c. algirus* subspecies and therefore, eat more food. However, the dry matter percentage of the faeces found in this research was lower than that of reported for domestic rabbits (58%) when, fed with a similar feed (Proto, 1980), suggesting the existence of differences in the digestive activity between wild and domestic rabbits.

Methods based on faecal pellets count are widely used to census rabbit populations (Simonetti, 1989) with the purposes of game management, pest control and in assessing of risk of propagation of the paratuberculosis. The extrapolation of published relationships between counting of faecal pellets and rabbit density however, becomes inaccurate and unreliable, when the genetic or population characteristic of the rabbits and the feeding regimes or plants association in their habitats lead to a different deposition rate. This implies that the number of faecal pellets dropped daily by the wild rabbit must be locally tested every time the population size of an area is to be evaluated (Simonetti, 1989) and a stratified random sampling should be used for determining overall deposition rate (Wood, 1988).

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