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Research Article

Influence of Grazing on the Gestation Phase of Sows and the Birth of the Piglet

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Abstract

The present investigation was carried out in the "Rancho Rubén" pig farm, located in the Panecillo site of the Casacay Parish of the Pasaje Canton, Province of El Oro, Coastal Region of Ecuador. The aim of this work was to determine the possible benefits of grazing in pregnant breeders and newborn piglets. For the field experiment, the regulations of the Guide to Good Swine Practices (Agrocalidad-Ecuador) were taken into account. The variables evaluated were: initial weight of the sow, prepartum sow's weight, postpartum sow's weight, weight of the sow at weaning, number of piglets at birth, weight of the piglet at birth, mortality on the first day and feed consumption during gestation. A completely randomized design was used, with 2 treatments, each with a replica of 5 females, for a total of 20 animals; treatment 1 (balanced feeding and management in individual pens); and treatment 2 (feeding with balanced, and grazing). The statistical analysis was based on the book by Blasco [1], applying an ANOVA, prior to assumptions of normality and homogeneity, establishing the differences through the Bonferroni multiple comparison procedure (95% confidence). The statistical program used was Statgraphics Centurión XVI. The results show that there is no difference between the treatments with respect to the variables evaluated, except for the consumption of concentrate feed, which is observed to be reduced in grazing animals, assuming that the grazing system is beneficial by facilitating a more natural behavior and greater animal welfare.

Introduction

The production of pork meat is one of the main economic activities in the livestock sector worldwide, and represents one of the largest sources of animal protein for human consumption at the lowest cost [2]. The pig is a specie subject to various types of management around the world, in general, two categories have been established: extensive, which means, in free life or in the outdoor, and intensive, which refers to placing the animals in confinement; when the animals are raised in pigsties or corrals, the structure of their harborages varies from simple pens made with local materials to modernized housing, while, in open-air management, the animals are in a natural habitat, feed in an autonomous and are usually captured to realized vaccination, marking, sterilization tasks, among others [3]. Unfortunately, in the vast majority of production systems seen today, pigs are housed in small spaces and with little or no stimulation, which limits their motor, sensory and social development, increasing their vulnerability to developing health problems, expression of abnormal behaviors and even reduce their productive parameters due to the high levels of stress they experience in this breeding system [2].

One of the apparently most stressful stages in pig production is the gestation and lactation phase, during which the breeders are individually housed in small cages, limiting their mobility and ability to display natural behaviors such as nest building and interaction with their piglets. As a result of this, sows can develop skin lesions due to lying down for a long time, they can also present alterations in the gastrointestinal system that transform into constipation, compaction and slow intestinal transit [2,4,5]. If all of the above is taken into account, it becomes necessary to search for alternatives that promote respect for the natural traits of the species and animal welfare [6]. On the contrary, open-air production or also called "outdoor" systems, differ from intensive farming as it allows animals to develop in larger housing areas, straw beds, feeding alternatives such as fodder and access to the outside, thus avoiding social isolation in animals [7].

Current pig production demands constant research and application in regards to management, feeding and welfare [8]. The new trends on animal welfare and the legislation of some countries in this regard, have promoted changes in the production systems in conditions of open-air or mixed systems; on the other hand, the growing acceptance that organic productions are having implies a lower use of chemical products such as medicines and feed additives, which drives a greater commitment to animal welfare [9]. Consideration should be given to the fact that despite advances in swine genetic improvement that have allowed breeding females to reach larger sizes and better production levels in terms of litter size and reproductive longevity, the nutritional needs of females sows in a state of pregnancy and lactation are different from those of other categories, since they constitute critical points in production due to the physiological changes that occur in the female in order to satisfy the requirements of the piglets [10]. That is why the management of the reproductive female has a direct effect on the weight at birth, weaning, growth and final weight of the piglets [11], so that at the time of production outdoors it becomes of great importance the selection and administration of raw materials to satisfy the nutritional needs of animals in these stages [12].

The trend in pig feed is to look for sustainable, nutritious and functional inputs, so one of the options that is currently being chosen is to provide fodder in the nutrition of animals [13], forages are economical and are considered the main feed resource in animals of supply [14], within the pastures that have been used, the star grass is found [15]. Under this concept, the aim of this research was to determine the possible benefits of grazing in pregnant breeders and in newborn piglets.

Materials and Methods

Research Location

The investigation was carried out in the enclosure of the "Rancho Rubén" pig farm, which has an area of 3 hectares, and has 40 reproductive females, of which 20 belong to the Yorkshire breed, and 20 to the Pietrain, likewise 4 boars (2 of the Pietrain breed and 2 Yorkshire). It is located in the Panecillo site of the Casacay Parish of the Pasaje Canton, Province of El Oro, Coastal Region of Ecuador, between the geographical coordinates: 79°42'49" West Longitude, 03°194'2" South Latitude, at a height of 134 m.a.s.l.

Field methodology

The investigative work was developed taking into account the standards published in the Guide to Good Swine Practices [16]; For this, a random selection of 20 first-time sows that were 8-9 month old, suitable for mating and with a Body Condition Score of ⅗, was made. An individual separation was made in each pen/farrowing pen, whose space had the following measurements: 3 m long x 2.5 m wide x 1 m high and within it, a space for piglets (1 m long x 0.80 m wide x 1 m high), with its respective entrance opening (0.20 m wide x 0.30 m high). Regarding the treatments, in group 1, mating, gestation and partum took place in the space designated for this purpose, while in group 2, the gestation phase took place in the paddocks, whose area was 120 m long x 80 m wide.

With regard to feeding, in the gestation phase, T1 was given 1.5 kg of balanced feed daily, while T2 animals were given 0.5 kg. Both water and pasture (*Cynodon nlemfuensis*) consumption were managed ad libitum. The investigation lasted 140 days.

Experimental design

The field investigation was of an Experimental type, where 2 treatments were used and each one with a replica of 5 female pigs, to give a total of 10 animals per group. Treatment 1 (Figure1), It was fed with commercial feed according to the stage, from the company Procerdos (Ecuador) and all handling was carried out in individual pens; while, treatment 2 (Figure 2), in addition to having a balanced diet, had access to pastures, where their gestation phase also took place.

Figure 1: Treatment 1 female.

Figure 2: Treatment 2 female.

Statistic analysis

The corresponding analyzes were based on the book by Blasco [1], where the variables were subjected to normality and homogeneity tests prior to the application of an ANOVA, and those that did not comply were applied to the Kruskal-Wallis test. To establish the differences between the means, the Bonferroni multiple comparison procedure was used with a 95% confidence level. The statistical program used was Statgraphics Centurión XVI.

Variables evaluated

The variables were quantitative. For female pigs, an electronic scale (CAMRY brand, model CAM-TCS300ZE21 "China") with a capacity of 300 kg and a margin of error of ±100 g was used. For piglets and feed, an electronic scale (CAMRY brand, model EB9013L "China") with a maximum capacity of 150 kg and a margin of error of ±100 g was used.

Sow's initial weight (kg)

Carried out at the moment prior to mating, with the digital scale and the cage inside the mating pen, applied to all treatments and their replicas.

Prepartum sow's weight (kg)

It was performed 3 days before the possible date of delivery (day 112 of gestation).

Postpartum sow's weight (kg)

On the third day after parturition, this data was obtained taking into account proper handling because the breeder was able to get up normally and collaborated to enter the cage and later take weight on the digital scale.

Weaning weight of the sow (kg)

This data was obtained prior to the separation of the piglets to avoid restlessness and aggressiveness due to their absence. Once registered, they were immediately removed from the pen.

Number of piglets at birth

This data was recorded by accounting for all newborn animals, taking into account the specific management that is performed on each of them.

Piglet weight at birth (kg)

This data was recorded individually, immediately after cutting the umbilical cord, taking advantage of the fact that the piglet's activity and movements are slight (Figure 3).

Figure 3: Postpartum piglet weighing.

First-day mortality (%)

It was registered by litter the next day (24 hours after birth).

Feed consumption during gestation (kg)

Intakes were recorded daily, individually weighing the feed for each of the breeders in the different treatments (Figure 4).

Figure 4: Feed weighing.

Results and Discussion

Initial, prepartum, postpartum and weaning weight of breeders

When analyzing these variables, no significant statistical differences were found when comparing the treatments (Table 1), results that differ from the findings obtained by Rauw et al. [17], who in their experiment "Feed efficiency and loin meat quality in Iberian pigs" tested a three-period system in Iberian pigs, of which in the first period they provided a restricted diet of concentrate, in the second a restricted diet of acorns (both in confinement), and in the third an ad libitum diet of acorns supplemented with restricted concentrate (outdoors), finding in the first period a greater weight gain.

Table 1: Average of the variables obtained in the different phases of the experiment with their respective confidence intervals expressed in kg. The confidence intervals shown are based on the Bonferroni multiple comparison procedure. Treat: Treatments, 1 feeding with balanced feed in individual pens and 2 feeding with balanced feed and grazing. ab: Statistical significant differences (p value < 0.05).

Treat	Inicial Weight	Prepartum Weight	Postpartum Weight	Weaning Weight
1	81.51±0.91[a]	105.78±2.45[a]	94.18±2.27[a]	79.45±1.65[a]
2	81.45±0.91[a]	104.76±2.45[a]	91.79±2.27[a]	77.90±1.65[a]

Number of piglets born, weight of piglets at birth and mortality of piglets on the first day

When comparing these variables, it was observed that there is no statistically significant difference between the treatments (Table 2), similar to the results reported by Sañudo [18] regarding the number of piglets, who in his book "World Atlas of Zootechnical Ethnology", indicates that the average number of offspring born for the Pietrain breed is 8.5 and the average for Yorkshire is 9.45; differs from that reported by Petrocelli et al. [6], who in their study "Evaluation of an outdoor breeding system: 1. Sow performance until farrowing" obtained an average of 9.9 total piglets born in an outdoor system, likewise, an average weight individual of piglets of 1.37 kg.; Likewise, they differ from what was found by Sanvicente et al. [19], in their research "Raising free-range pigs and wild peccaries in transition zones of protected areas in southeastern Mexico" found in rural rearing systems (backyard rearing, seasonal itinerant rearing and itinerant rearing) close to a Protected Natural Area, peasants who fed Creole pigs with corn grains and wild forage in different proportions depending on the system, using a greater amount of corn grains in backyard rearing (with higher feed cost), achieving variable results in productive and reproductive indices.

Table 2: Average of the variables measured in the piglets. The confidence intervals shown are based on the Bonferroni multiple comparison procedure. Treat: Treatments, 1 feeding with balanced feed in individual pens and 2 feeding with balanced and grazing. Significant statistical differences (p value < 0.05).

Treat	N° Piglet Born	Piglet Born Weight (kg)	Mortality of Piglet at Day
1	9.20±0.72[a]	1.93±0.02[a]	0.70±0.48[a]
2	8.70±0.72[a]	1.94±0.02[a]	0.90±0.48[a]

If the results of the percentages of death of piglets in the experiment are analyzed, it is similar to what was stated by Ángel & Cruz [7], who in a bibliographic review "Advantages and disadvantages of outdoor systems on the well-being of pregnant and lactating sows", affirm that indoor systems reduce the mortality of piglets due to crushing and predation, and allow greater control of the animals, while outdoor systems condition a natural maternal behavior, which is reflected in the reduction of dead piglets, not finding an association of this last system with the increase in deaths due to crushing; similar to the findings of Estévez et al. [20] who in their experiment called "Possibilities of using protein paste as alternative food sources and its effect on the size and weight of the litter at birth and at weaning in pig breeders CC21" found similarity when managing diets with commercial feed and with protein paste from animal waste, noting that there was no significant difference in the reproductive parameters between the females of both treatments.

Feed consumption during gestation

When performing the analysis of this variable, we found that there is a statistically significant difference (p-value < 0.001) (Figure 5), and this differs from what was found by Caicedo et al. [21] who, when evaluating the addition of orito banana and panela cane silage in the feeding of pregnant sows, found that there were no significant differences in feed consumption, in systems with and without silage.

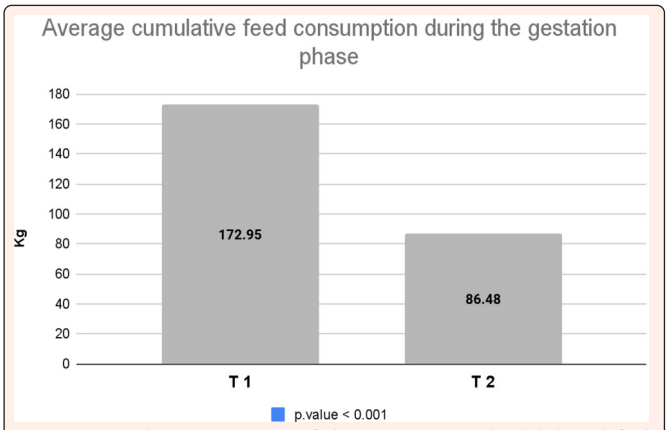

Figure 5: Graphic representation of the average accumulated balanced feed consumption (kg) during the gestation phase in both treatments. T: Treatments, 1 feeding with balanced feed in individual pens and 2 feeding with balanced and grazing.

Zuluaga & Ocampo [22] in their research "Breeding sows in open fields in the tropical zone" found that the grazing behavior of sows varies greatly depending on the time of year, those that spend more time grazing in the dry season that in the humid one, for the latter, the females spend more time in the shelters. Milera [23] who in his bibliographic review "Contribution of grazing sow management to the resilience of swine systems" mentions that pasture can represent up to 50% of requirements for the maintenance of sows. Perez et al. [24] in their work "Key aspect in feeding hyperprolific sows" mention that depending on the number of farrowing, different feeding protocols should be used to adjust to the needs of the sow, in addition it is increasingly common to provide two different feeds that meet the needs of the sows.

Conclusion

In light of the results, it is concluded that there is no difference between the treatments in the weight of the breeders during the entire research phase, which allows us to assume that they can be managed with grazing systems without any problem. With regard to piglets, there is no observable economic loss, nor an incidence in their mortality, to this is added the benefit of the grazing system by facilitating a more natural behavior and having repercussions on animal welfare. And finally, grazing influences the consumption of accumulated feed, therefore, in the economic factor, since pasture is considered the cheapest and most accessible feed that a producer has.

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