**Articles. January-December 2019; Vol. 9. Received: 20/09/2018 Accepted: 03/12/2018**

http://dx.doi.org/10.21929/abavet2019.96

# Analysis of Lidia cattle behavior. Influence of handling and selection

## Análisis del comportamiento del ganado de lidia. Influencia del manejo y la selección

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**ABSTRACT**

The fighting bull breed is characterized by a genetic selection based on a certain behavior called "bravery". Making use of the etiological assessment computer software designed by the Department of Animal Production of the University of León, the behavior of 2577 animals aged from 3 to 6 years has been recorded. These animals have been grappled since 1991 to 2016 in different Spanish bullrings of 1st and 2nd category, in order to study the evolution of the selection carried out in the breed during the last 25 years and the influence on the behavior of the improvements implemented in the management of this type of livestock. Interesting results can be obtained that reflect the change in the selection of the fighting bull towards a nobler bull and "tolerable", corresponding to the information that gives us the starting point behavior of the animal and during the third of rods. In turn, there is an increase in physical activity developed by the animal, which leads to longer crutches, with more batches, probably due to improvements in feeding and the implementation of a physical training protocol in most of the farms.

**Keywords:** fighting bull, behavior, management, selection.

**RESUMEN**

La raza bovina de lidia se caracteriza por una selección genética en base a una determinada conducta de comportamiento denominada bravura. Haciendo uso del programa informático de valoración etológica diseñado en el Departamento de Producción Animal de la Universidad de León se ha registrado el comportamiento de 2577 animales de 3 a 6 años lidiados durante los años 1991 a 2016, lidiados en diferentes plazas de toros españolas de 1ª y 2ª categoría para estudiar la evolución de la selección llevada a cabo en la raza durante los últimos 25 años y la influencia en el comportamiento de las mejoras implantadas en el manejo de este tipo de ganado. Se obtienen resultados interesantes que reflejan el cambio en la selección del toro de lidia hacia un toro más noble y “toreable”, correspondientes a la información que nos da el comportamiento de salida del animal y durante el tercio de varas. A su vez, se registra un aumento de la actividad física que desarrolla el animal, que propicia tercios de muleta cada vez más largos, con mayor número de tandas, probablemente debido a las mejoras en alimentación y la implantación de protocolos de entrenamiento físico en la mayoría de las explotaciones.

**Palabras clave:** toro de lidia, comportamiento, manejo, selección.

## INTRODUCTION

The bovine species of fighting mainly has in our country genealogical records for more than two centuries, and it was a pioneer in the implementation of complex selection programs based on phenotypic characters and behavior.

The aptitude of the race is the production of behavior under certain conditions and this will condition the value of an individual, its relatives and in a singular way the choice of the possible reproducers, both males and females (Gaudioso *et al*., 1985). It is of vital importance to assess the productive performance of each animal in the ring, to decide which breeding individuals should be removed from the herd and which ones chosen or selected to permanently integrate the future of livestock, and in this way obtain the maximum yield in the process of genetic improvement.

For several authors (Gaudioso *et al*., 1985, Purroy, 2003, Ruiz Villasuso, 2005), the definition of the ideal behavior of a bull presents serious difficulties and a great variability of response among farmers. Moreover, the evolution of the tastes of the fans (consumers of the product) or the specific weight of each of the thirds of the fight vary; inevitably the pressure of the farmer in front of a certain condition of the animal, or in front of the manifestation or absence of certain patterns of behavior.

Traditionally to assess the behavior of the animal, each farmer has been using his own simple and practical evaluation system (Bartolomé, 2009); however, several authors have wanted to study the behavior of the bull from a more objective point of view, analyzing a greater number of parameters. Such is the case of the brave bull qualification table proposed by Fernández in 1959, the aptitude test devised by MONTERO in 1974, the assessment form prepared by the Domecq family (Domecq and Díez, 1985, Domecq Solis, 2008), the computer program for the ethological evaluation designed by Sánchez *et al*. (1990) or more recently the system developed by García González-Gordon and Almenara Barrios (2004).

In short, the different scales of assessment of the behavior developed by the bull during the fight, allow to obtain an objective and comparable qualification, which can become a useful tool when making decisions in the breeding process, which allows a greater effectiveness of the selection programs, increasing the speed of the genetic progress of the breed and resulting in a greater benefit of the show.

The conception of the fight has changed remarkably throughout the last century; thus, the preponderance that the first third had at the beginning of the twentieth century, when the struggle consisted mainly in the struggle of the bull and the picador; has given way to the current situation, in which the crutch is the center of the show; while the luck of rods represents only a preparatory phase (Gaudioso *et al*., 1985). This tendency towards a fight based on the crutch has continued during the last years, relegating the third of rods to a second plane; in many cases because the animal does not have enough strength (or chaste)

to hold more than one rod. The bullfighting journalistic criticism thinks that a good part of the breeders have changed their criteria of selection based on the tastes of the public (non-amateur); trying to obtain a noble bull that has mobility and repetition in the last third and promotes the triumph of the bullfighter (Lorca (2017), Zabala de la Serna (2017), Amorós (2017), Molés (2017).

## MATERIAL AND METHODS

In the present work we have studied 2577 fighting bovine animals, from 4 to 5 years old, grappled in first and second category squares, during the period between 1991 and 2016. For this we have used the evaluations carried out Doctoral dissertations carried out in the Department of Animal Production of the University of León de Gutiérrez (1996), Bartolomé (2009), Escalera (2011) and Lomillos (2012), referred to animals that were studied under the same criteria and following the same methodology during four periods of time corresponding to: 1991-1993, 2004-2006, 2007-2009 and 2010-2012 respectively; and finally we have completed the study with 100 animals grappled in first and second category squares during the 2014, 2015 and 2016 seasons.

To assess the behavior of the bull, the behavior exhibited during the fight by the animals was recorded and analyzed using the software and methodology described by Sánchez *et al.* (1990).

The computer program used to evaluate the behavior of the animal during the fight, for which, at the end of each of the parts of the show are presented on the screen variables that should be weighted from 0 to 5 points. These behavior notes of each animal studied are recorded in an independent Excel file, along with the times of each third (in seconds). The statistical results have been obtained using the Statistica for Windows program.

## RESULTS AND DISCUSSION

### 1. Duration of the different parts of the fight and distribution of the fall by third

The average duration of the fight in our study rises to 17.65 minutes (Table 1), a fact that agrees with the values cited by Paniagua (1997) and Sanes *et al*. (1994) and differ in part from those of Aceña (1993) and Sanz Egaña (1942); exceeding them in approximately 2 minutes.

The predominance of the last third has been accentuated in recent years, a result that agrees with the assessments made by Sanes *et al*. (1994), Paniagua (1997) and García Schneider (2008), who point out that the duration of the third crutch is 38.37%, 48.08% and 50.85% of the total time of the fight. In our case we have observed for the most recent years, object of our study, an increase of this percentage up to 51.82%; the highest percentage recorded for this third compared to previous studies.

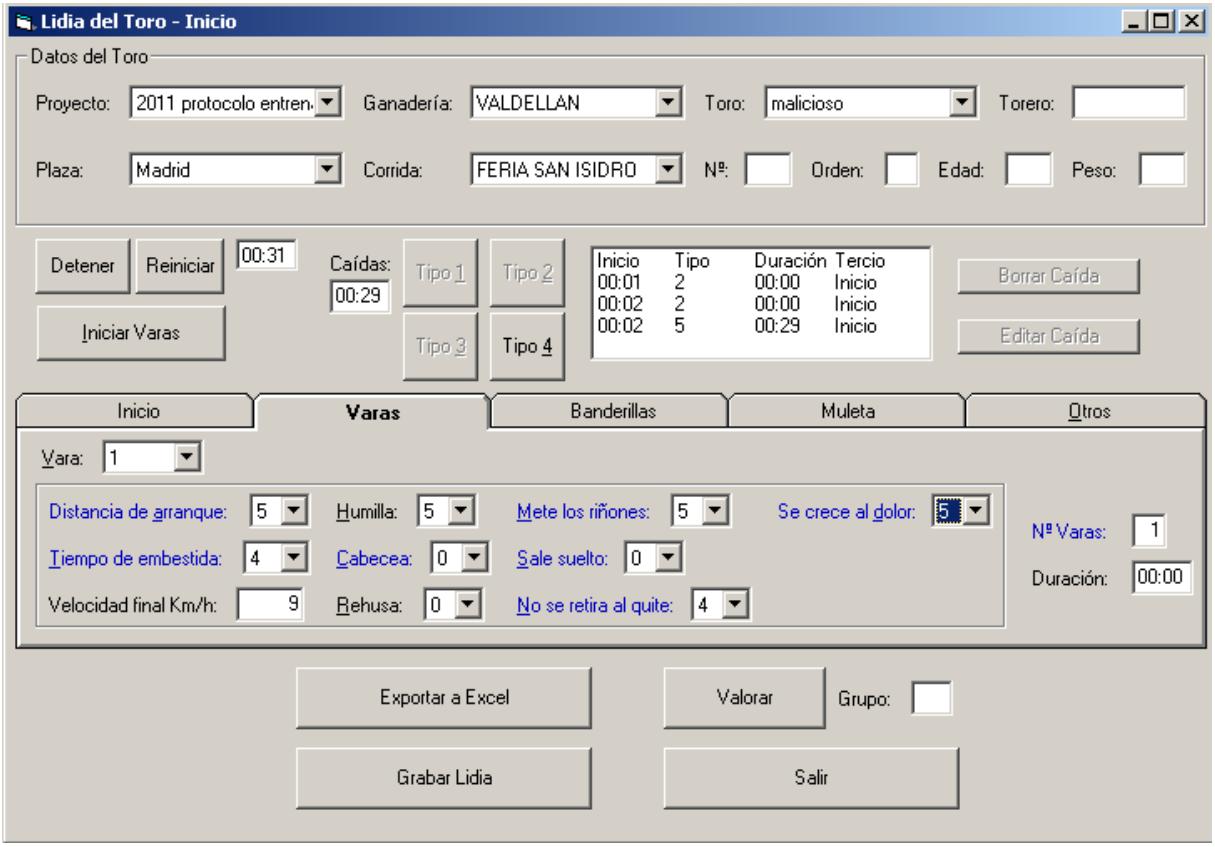


**Figure 1. Behavior assessment software**

Although the duration of these periods of the fight will depend in a considerable way, first of all, on the category of the square; in first places, a third of the longest rods is counted, since it is essential that the animal comes at least twice to the horse, and the third of banderillas is usually more lucid and longer. Second, it will depend on the skill of the bullfighters, and finally on the origin of the bull; it is known that some encastes are usually characterized by the fixity and repetition of the thrusts in the cloak of the matador, being therefore propitious animals to make thirds of rods and short banderillas (Domecq, 2008); while others are characterized by being very "fan", that is, distracted animals that in the beginning do not fix their attention on any stimulus; thus extending the duration of the preceding thirds to that of crutch, such is the case of Murube and Atanasio (Purroy, 2003, Rodríguez Montesinos, 2002).

## 2. Behavior during the beginning of the fight

From the moment in which the bull goes out to the square and until it is placed in luck to go to the horse to bite, five behavior parameters were recorded: "Rapisal": speed of exit, "Parapu": the bull stops at the door, "Recorre": distance that runs in the square, "Acudlar": goes long to the cap and "Remata": rammed against the ring touching the boards with the pythons.

It was observed that since 2010, the speed of the exit of bullpens has increased (with values above 3.6), with respect to the previous values that point a decrease with the years of the bulls that stop at the door. The "cross the square" parameter is the one that has most clearly increased in recent years. Thus, for Lomillos (2012), which assesses the effect of training on the behavior in the fight from 2010, and appreciates an increase in physical effort and displacement in the ring made by the bulls subjected to training guidelines prior to the fight ; this is evidenced fundamentally in the initial journey of the animal on the ring. While it is true that each sexual reproduction has a particular type of output, which can influence the overall score, but in a large number of animals makes this variable disappear.

## 3. Behavior during the third of rods

To analyze the number of lance points that the bull receives, we have discarded the bulls fought in first category squares, where it is mandatory that the bull receives at least two rods; to do the statistical analysis with only second category places (Figure 2). For this type of place, Gutiérrez (1996) pointed out 1.83 lances on average; while Bartolomé (2009) already fell to 1.23, reaching the current 1.05 points of lance.

**Table 1. Average duration of each of the thirds during the periods studied**

| Studied period (year) | n | Start (s) | Rods (s) | Banderillas (s) | Muleta (s) (red cloth draped over a short stick) | Bullfighting (s) |
|---|---|---|---|---|---|---|
| Gutiérrez (1991-1994) | 1.119 | 92,62 ±98,22 | 154,41 ±60,21 | 195,09 ±87,76 | 406,05 ±281,34 | 844,45 ±279,29 |
| Bartolomé (2004-2006) | 650 | 144,81 ±41,27 | 127,56 ±42,45 | 135,39 ±62,71 | 587.96 ±131,36 | 995.93 ±152,61 |
| Escalera (2007-2009) | 475 | 131,8 ±72,93 | 156,5 ±98,22 | 158,5 ±72,22 | 565,9 ±172,20 | 1012,6 ±210,82 |
| Lomillos (2010-2012) | 233 | 134,72 ±49,74 | 173,99 ±77,58 | 174,92 ±70,99 | 519.78 ±140,12 | 1003,41 ±124,61 |
| Presente estudio (2014-2016) | 100 | 129,22 ±65,28 | 161,92 ±37,92 | 163,87 ±65,12 | 604,21 ±132,36 | 1059,22 ±133,48 |

**Table 2. Average values of each behavior parameter recorded during the beginning of the fight**

| Studied period (years) | n | Rapisal | Parapu | Recorre | Acudlar | Remata |
|---|---|---|---|---|---|---|
| Gutiérrez (1991-1994) | 1.119 | 3,02 ±0,98 | 1,84 ±1,12 | 2,78 ±0,76 | 3,66 ±1,27 | 0,97 ±0,95 |
| Bartolomé (2004-2006) | 650 | 2,39 ±0,77 | 0,41 ±0,99 | 2,59 ±0,81 | 2,14 ±0,69 | 1,30 ±1,11 |
| Escalera (2007-2009) | 475 | 2,24 ±0,62 | 0,23 ±0,44 | 2,58 ±1,04 | 2,08 ±0,53 | 1,05 ±0,97 |
| Lomillos (2010-2012) | 233 | 3,50 ±0,58 | 0,19 ±0,05 | 3,61 ±0,83 | 2,59 ±0,56 | 0.65 ±0,78 |
| Presente estudio (2014-2016) | 100 | 3,24 ±0,79 | 0,94 ±0,65 | 4,03 ±0,94 | 2,45 ±0,73 | 0,98 ±1,19 |

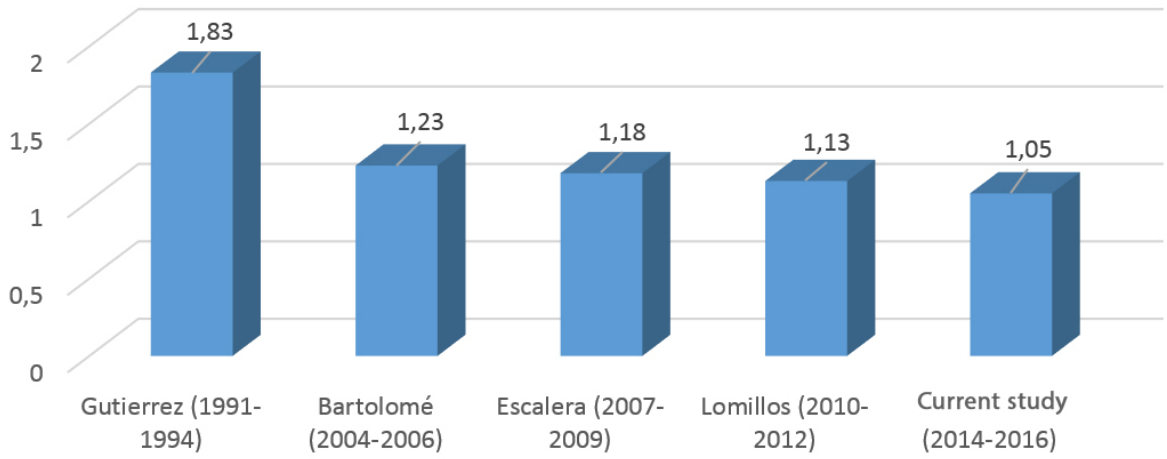


**Figure 2. Average number of rods received by sampled individuals**

Therefore, it can be said that over the years, the most frequent is that this third is reduced to "monopoint of lance", applying most of the punishment in the first and only rod; with which we agree with Barona *et al*. (1999) and Fernández and Villalón (1999), when they affirm that the punishment is not measured.

Perhaps the great weight of the current horse, the hardness of the breastplate and the greater braveness and consequent thrust of the bull that is fought at present, make that a single point of the lance is enough to temper the onslaught of the same one; even sometimes the picador must regulate the punishment for the animal's lack of strength. The bull has no chance to show his bravery in a second match, because the right-handed asks for and automatically obtains the change of third on the part of the president. It seems that at the time of the 90$^{s}$, Gutiérrez's study (1996) reflects a third of rods composed of two entrances to the horse in most cases; on the contrary, at present, the luck of rods has become a procedure, except in some festivities, such as the bullfighting competitions of cattle ranches, an certain very specific bull rings of our geography and France.

Since the animal is placed in luck to go to the horse to sting, until the president terminates the third of rods; seven behavioral parameters were recorded, all of them scored on a scale of 0 to 5; taking into account the number of rods received by each beef and the speed with which he came to meet him with the chopping horse: "Humilla": degree of lower inclination of the head when charging, "Empuja": pushes with the muscles of the third after attacking the horse, "Cabeceo": moves the head violently from one side to the other, "Suelto": it comes loose from the encounter with the picador and "Crecedol": it grows in pain.

In the parameters recorded in the third of rods we do not see a marked trend or significant differences, except in the case of the parameter "suelto" that in the last three years has increased a lot (2.91), compared to previous years, symptom of meekness of the animal.

## 4. Behavior during the third of banderillas

During the course of the third of banderillas were scored, on a scale of 0 to 5, the following parameters of behavior: "Largoban": go long to the banderillero cite, "Fijoban": stare at the banderillero, "Sigueban": follow the banderillero after the pour into and "Seduele": it hurts after the placement of the banderillas.

During this, it is about letting the bull recover and "take a breath" after his encounters with the picador before his final fight (Plasencia, 2000), since the bull is not an athletic animal and the fight involves an overexertion who is not used to it (Escalera-Valente *et al*., 2013). This phase has a greater number of pauses, and when the banderillero is attacked without the need to humiliate, many bulls recover from the first third, since they apparently breathe better by not flexing their necks as much (Fernández and Villalón, 1999).

During this third period, two parameters considered indicative of bravery were recorded (Gaudioso *et al*., 1985): "fixedness in the banderillero" and "going long". These patterns showed lower values in the bulls analyzed in the thesis after Gutiérrez (1996), indicating a loss of bravery in this third of gradual form with the step of the years; however, our values for the parameter "hurts" reflex of meekness, were lower than those of Gutiérrez (1996).

## 5. Behavior during the third of muleta

During the course of the third crutch, the following behavioral parameters were scored on a scale of 0 to 5: "Largomul": goes long to the cite with the muleta, "Humilmul": humiliates when attacking the muleta, "Codicia" repeated several times without stopping, "Tardea" for motionless between passes and passes, "Embiste": go to the cite of the bullfighter in all the grounds of the ring, "Fijomul": fixed his eyes on the crutch at all times and "Huyemul" : run away from the crutch when you are called.

**Table 3. Mean values of the behavior parameters recorded during the third of rods**

| Srudied period (year) | n | Humilla | Empuja | Cabecea | Suelto | Crecedol |
|---|---|---|---|---|---|---|
| Gutiérrez (1991-1994) | 1.119 | 2,61 ±0,92 | 1,69 ± 0,99 | 1,31 ±1,17 | 0,58 ±0,62 | 1,81 ±0,69 |
| Bartolomé (2004-2006) | 650 | 1,56 ±0,87 | 1,41 ±0,81 | 0,82 ±1,01 | 1,11 ±1,14 | 0,85 ±0.72 |
| Escalera (2007-2009) | 475 | 1,58 ±0,72 | 1,50 ±0,59 | 1,14 ±1,86 | 0,96 ± 0,92 | 1,21 ±0,93 |
| Lomillos (2010-2012) | 233 | 2,83 ±0,72 | 1,62 ±0,87 | 0,91 ±1,02 | 1,53 ±1,38 | 1,02 ±0,89 |
| Presente estudio (2014-2016) | 100 | 2,42 ±0,84 | 1,79 ±0,72 | 0,82 ±0.98 | 2,91 ±1,52 | 0,62 ±0,77 |

**Table 4. Average values of the parameters registered during the third of banderillas**

| Studied period (year) | n | Largoban | Fijoban | Sigueban | Seduele |
|---|---|---|---|---|---|
| Gutiérrez (1991-1994) | 1.119 | 2,65 ±1,02 | 3,27 ±0,91 | 4,23 ±1,19 | 1,08 ±0,87 |
| Bartolomé (2004-2006) | 650 | 2,04 ±0,90 | 2,02 ±0,82 | 1,52 ±1,07 | 1,07 ±1,08 |
| Escalera (2007-2009) | 475 | 1,73 ±0,84 | 1,97 ±1,02 | 0,82 ±1,10 | 0,81 ±0,82 |
| Lomillos (2010-2012) | 233 | 1,92 ±1,01 | 1,57 ±0,89 | 1,64 ±0,76 | 0,79 ±0,87 |
| Presente estudio (2014-2016) | 100 | 1,32 ±0,76 | 2,02 ±0,80 | 2,01 ±0,88 | 0,62 ±0,65 |

This is the third most important in the current fight, because it is where the prize awarded by the public to the acting bullfighter is decided (Darracq, 2000).

Unlike the third of banderillas, in the crutch we appreciate higher values for the indicative patterns of bravery in the bulls valued in recent years: they rammed from farther away, with more "Fijezamul" in the muleta, and in turn boasting a greater nobility, represented by a greater frequency of the patterns "Humillamul" and "Embiste"; however, the parameter "Codicia" decreases, sign of the caste and increases "Tardea" reflection of meekness or lack of strength.

It is observed in broad strokes in the last ten years, that the animals have maintained, even moderately improved their level of bravery and nobility, and slightly increased certain symptoms of meekness; all within a context of a longer duration of this phase of the fight.

The predominant bull of our time is selected without taking into account its behavior in the horse and especially valuing its class in the Muleta, where the nobility and repetition of lunges weigh more in the selection than the rest of the parameters. In turn, it has been improved in the feeding and physical preparation of the bull for the fight, which allows it to face the third Muleta of the longest duration in history (Ruiz Villasuso, 2005); it has even been recorded that in the last 25 years the animal has improved its resistance, decreasing the suffering of the fall syndrome (Lomillos *et al*., 2018).

If we compare with objectivity, we must recognize that the bull of today, is an animal that has increased its size and average weight about 100 Kg (Bartolomé, 2009), moves more and resists a much more demanding fight, attacking with a delivery and depth much greater than that of a few decades ago.

**Table 5. Average values of the parameters recorded during the third of the muleta**

| Studied period (years) | n | Largomu | Humillamul | Codicia | Tardea | Embiste | Fijomul | Huyemul |
|---|---|---|---|---|---|---|---|---|
| Gutierrez (1991-1994) | 1.119 | 2,7 ±1,45 | 2,65 ±0,92 | 4,04 ± 1,82 | 1,14 ±1,19 | 4,75 ±0,70 | 3,46 ±0,93 | 0,14 ±1,88 |
| Bartolomé (2004-2006) | 650 | 1,25 ±0,92 | 1,84 ±0,84 | 1,58 ±0,95 | 1,85 ±1,33 | 2,10 ±0,98 | 2,22 ±0,84 | 0,25 ±0,84 |
| Escalera (2007-2009) | 475 | 2,59 ±0,94 | 1,17 ±0,86 | 2,5 ±0,97 | 1,88 ±1,36 | 2,91 ±1,36 | 2,23 ±0,84 | 0,29 ±0,87 |
| Lomillos (2010-2012) | 233 ± | 3,81 ±0,79 | 2,8 ±0,70 | 1,77 ±0,18 | 2,77 ±0,81 | 3,28 ±1,91 | 3,22 ±1,45 | 0,25 ±0,61 |
| Presente estudio (2014-2016) | 100 ± | 3,96 ±0,42 | 3,01 ±0,98 | 1,19 ±0,68 | 2,82 ±0,77 | 3,91 ±0,38 | 3,40 ±0,82 | 0,72 ±0,89 |

## CONCLUSIONS

The analysis of the behavior of the whole struggle in the square, shows a change in the selection made by the ranchers in the farms; consisting of choosing breeding animals with a nobler and "can be fight bulls" behavior than those selected in the last century; where the role of the animal during the third of rods was fundamental and in the current times is a mere procedure. In turn, the increase in physical activity developed by the animal, favoring longer thirds of Muleta is due to the selection of highly repetitive animals, in addition to the improvements made in feeding and the implementation of protocols physical training, which have improved the locomotion of the animals and increased the time of the tasks.

## CITED LITERATURE

ACEÑA MC. 1993. Estudio de la respuesta de estrés en el toro bravo y su relación con la fuerza y la adaptación muscular al ejercicio durante la lidia. Tesis doctoral. Universidad de Zaragoza. España.

AMORÓS A. 2017. Continúa el desastre ganadero en San Isidro. Periódico ABC. Madrid (España). Ejemplar de 23-mayo-2017. Consultado en: http://www.abc.es

BARONA HERNÁNDEZ L, Cuesta López A, Montero Agüera I. 1999. ¿Cumplen las puyas su misión? Revista de Estudios Taurinos, 9: 95-112. ISSN: 1134-4970.

BARTOLOMÉ DJ. 2009. Influencia de la acidosis ruminal en el Síndrome de Caída y la respuesta etológica del toro de Lidia en la plaza. Tesis Doctoral. Universidad de León. España.

DARRACQ J. 2000. Genèse de la corrida moderne. Ediciones Cairn, Pau. 91-96. ISBN: 2912233275.

DOMECQ Y DÍEZ A. 1985. El toro bravo. Teoría y práctica de la bravura. Colección La Tauromaquia. Madrid. Espasa Calpe. 474 pp. ISBN: 8423954021.

DOMECQ SOLÍS B. 2008. Del toreo a la bravura. Madrid. Alianza Editorial. 448 pp. ISBN: 9788420693644.

ESCALERA F. 2011. Indicadores sanguíneos y su relación con el síndrome de caída en el toro bravo durante la lidia. Tesis Doctoral. Universidad de León. España.

ESCALERA F, González-Montaña R, Alonso de la Varga ME, Lomillos-Pérez JM, Gaudioso-Lacasa VR. 2013. Influence of intense exercise on acid-base, blood gas and electrolyte status in Bulls. *Research in Veterinary Science*. 95:623-628. http://dx.doi.org/10.1016/j.rvsc.2013.03.018.

FERNÁNDEZ J, Villalón J. 1999. Estudio de las lesiones producidas por la suerte de varas en la segunda parte de la Feria de San Isidro de 1998. *Revista de Estudios Taurinos*. 9:113-139. ISSN: 1134-4970.

GARCÍA GONZÁLEZ-GORDÓN R, Almenara Barrios J. 2004. Escala de evaluación de la bravura para bovinos de lidia (EBL-10). *Revista de Estudios Taurinos* . 18:251-278. ISSN: 1134-4970.

GARCÍA SCHEIDER JMN. 2008. These: Développement et validation d´une nouvelle méthode quantitative et objective d´evaluation du comportement et des dépenses énergétiques du taureau Brave au cours de la corrida: Applications á l´etude de La faiblesse dês taureaux lors de La corrida. Université Paul-Sabatier de Toulouse. Toulouse. Francia.

GAUDIOSO V, Pérez-Tabernero A, Sánchez JM. 1985. Evaluación de la bravura, nobleza y mansedumbre del toro de lidia. *Buiatría Española*. 1:218-232. ISSN: 1132-6352.

GUTIÉRREZ MARTÍNEZ P. 1996. Estudio de idoneidad del toro para la lidia. Tesis Doctoral. Universidad de León. España.

LOMILLOS JM. 2012. Aplicación de nuevas tecnologías a la caracterización, cría y manejo de ganado vacuno de lidia. Tesis Doctoral. Universidad de León. España.

LOMILLOS JM, Alonso ME, Gaudioso V. 2013. Revista Información Técnica Económica Agraria. 109(1): 49-68. ISSN: 1699-6887.

LOMILLOS JM, Alonso ME, Gaudioso V. 2018. Evolución del síndrome de caída del toro de lidia en los últimos 25 años. Abanico Veterinario 8(1):80-90. http://dx.doi.org/10.21929/abavet2018.81.8.

LORCA A. 2017. El toro, determinante para el éxito o fracaso de la larga Feria de San Isidro. El País. 11-mayo-2017. Disponible: Disponible: https://elpais.com/cultura/2017/05/10/actualidad/1494432147_019644.html

MOLÉS M. 2017. Que llamen ellos. Revista Aplausos nº 2044. Disponible: https://www.aplausos.es/noticia/37115/opinion/que-llamen-ellos.html

MONTERO A. 1974. Fluctuaciones de conducta en el toro de lidia. *Veterinaria*. 39:337-347. ISSN: 1130-5436.

PANIAGUA ARELLANO FJ. 1997. Tiempos de lidia y de ejercicio del toro. II Congreso Mundial Taurino de Veterinaria. Córdoba. España. Pp.: 143-145.

PLASENCIA P. 2000. La fiesta de los toros. Historia, Régimen Jurídico y Textos Legales. Editorial Trotta. Madrid. 460 pp. ISBN: 9788481643909.

PURROY A. 2003. Comportamiento del toro de lidia. En el campo, en el ruedo. Ed.: Universidad Pública de Navarra. Pamplona. 267 pp. ISBN: 9788497690317.

RODRÍGUEZ MONTESINOS A. 2002. Prototipos raciales del vacuno de lidia. Ed. Ministerio de Agricultura, Pesca y Alimentación. Madrid. ISBN: 9788449105371.

RUIZ VILLASUSO C. 2005. La evolución: el toro disperso, el toro reunido, el toro bravo. En: Un siglo de toros 1905-2005. Unión de Criadores de Toros de Lidia. Madrid. España. Pp.:82-107.

SÁNCHEZ JM, Riol JA, Eguren VG, Gaudioso VR. 1990. Metodología de obtención de un programa informático para la valoración del toro durante la lidia. *Acta Veterinaria*. 4:17-26. ISSN: 1820-7448

SANES JM, Meseguer JM, Gonzalo C, Fuentes F. 1994. Estudio preliminar de diferentes parámetros de la lidia. I Congreso Mundial Taurino de Veterinaria. Zaragoza, España. Pp.: 155-157.

SANZ EGAÑA CS. 1942. La bravura del toro de lidia. Espasa-Calpe. Madrid. ISBN: 0002060088.

ZABALA DE LA SERNA V. 2017. Un escándalo de toro. El Mundo. 15-mayo-2017. Disponible: Disponible: http://www.elmundo.es/cultura/toros/2017/05/15/5919fddbe5fdea350c8b45ae.html