# Effect of Twinning on Calving Ease and Viability of Calves

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**Abstract**

The aim of the current research was to evaluate the effects of twinning on calving ease and calves' viability in Romanian Spotted dual-purpose breed. Data from 280 births (260 single and 20 twin births) were enrolled in order to assess the twinning and the dystocia incidences. Viability of calves was estimated based on a data set collected from 300 calves (260 singleton and 40 twin calves). The average incidence of twinning in herd was 7.14%, while the incidence of dystocia was 19.23%. The twin pregnancies proved to be the major factor related to dystocia, causing a higher prevalence compared to single pregnancies (15% *vs.* 4.23%, $p \leq 0.001$). Stillborn incidence was the most prevalent in twin compared to single births (5% *vs.* 2.31%, $p<0.001$). Dystocia proved to be correlated to both, twinning (R=0.31) and calves' viability (R=-0.44). Also, twinning has a strong correlation with calves' viability (R=0.49). The twinning induced a significant increase of morbidity compared to single births (12.5% *vs.* 5%, $p<0.001$). Considering the detrimental effect of twinning on animal health, welfare and subsequent performance, allows the implementation of *after-calving dam-calf care protocols* in order to mitigate these effects.

**Keywords**: calving ease, dystocia incidence, Romanian Spotted, twinning, viability

## 1. Introduction

Cattle are recognized as a monotocous species, and most of pregnancies results in the birth of only one calf. Twinning in cows denotes greater reproductive skills. It is influenced both at the hormonal level and by external environmental (season, climate) or animal-related factors (parity, age, productive level) [1]. The genetic component of twinning is represented by a relatively low heritability, with narrow thresholds between 0.01-0.09 [2,3].

The frequency of twin pregnancies proved to be higher in dairy herds (3%-25%) compared to beef cattle (0.01 -1%) [4,5]. Twinning is characterized by an upward tendency over time, with increasing frequencies of 4.75% in 1978 [6], 5.02% [7], and 5.8% in 2021 [3], associated to the dairy breeds. Higher incidences (10-25%) were observed by Lopez *et al*., (2017) [8]. Similar tendency was recorded in beef cattle, whose incidence increased from 0.01 to 1% [4,5].

In general, the incidence of twin pregnancies increased in parallel with increasing of milk yield due to intensive breeding programmes. The higher milk production proved to be strongly connected with reduced progesterone [9] due to the hepatic metabolism, based on accelerated blood flow caused by an increased quantity and quality of forages [10]. This fact induces an increase concentration of FSH and LH and implicitly an intensive stimulation of ovulation [11].

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The negative effects of twinning involve a loss between 59 USD and 225 USD. Twinning represents an important issue, especially in dairy herds [12] due the infertility, higher incidence of morbidity, stillbirths, lower performances in reproduction caused by the specific injuries, and decrease both gestation and lactation length, issues that should be avoided in dairy farms [13].

In this context, understanding the relationships between the various influential factors, whether they are direct or indirect, as well as the effects, is critical in attempting to mitigate those negative effects.

The aim of the current research was to evaluate the effects of twinning on calving ease and calves' viability in Romanian Spotted dual-purpose cows.

## 2. Materials and methods

Use of animals and the procedures performed in this study were performed in accordance with the European Union's Directive for animal experimentation (Directive 2010/63/EU).

*Animals' management and data collection*: The study was carried out at the Research and Development Station for Bovine Arad, Romania (location: 46° 10' 36" N, 21° 18' 4" E). The animals included in the current research were reared in a semi-intensive system, associated to a moderate growth rate (500-750 g/day) and moderate productive yields (5500-6200 kg milk/lactation).

New-born calves are separated from their dams within first hour after birth and kept in individual pens located in space intended of maternity up to 3 days of age. Between 4-48 days, calves are kept in individual hutches, on straw bed with free access to the resting area (2 m² / head) and moving area (2.3 m² / head). The administration of dairy diet is made with maternal colostrum for the first 3 days and the next 4 days with raw milk from his own dam. From the eighth day, raw milk is administered from collector tank. The dairy diet is made in 2 daily portions, every 12 hours (6 am and 18 pm). In parallel, starting from the 4th day of life, calves receive water and concentrated forage administered ad libitum until day 48 of age.

The experimental herd consisted in 300 Romanian Spotted dual-purpose calves, derived from a total of 280 births. The new born calves were considered as viable (alive and viable), morbid (alive, but affected by diseases during the study period) or non-viable (born alive but died within first 72 hours of life). Stillborn calves (died at birth) were not considered in this study. Calves' viability was evaluated immediately after birth, based on an adaptation of APGAR protocol for bovine, where A for appearance (skin colour), P for pulse, G for grimace (reflex irritability), A for activity or attitude (muscle tone), and R for respiration described by Mee, (2008) [14]. In the current study, the assessment protocol was performed in an adapted form, based on calves' respiration rates, response to nasal stimulation and pedal reflex.

*Statistical analysis*: The statistical processing and data interpretation processes aimed to determine: a) the incidence of twinning; b) the incidence of dystocia; c) the viability of calves according to type of calving and calving ease.

Data were analysed used Statistica StatSoft software, version 13-11. The proportion of different calves and births category was investigated using chi square test (2x3 model).

## 3. Results and discussion

The average incidence of twinning in the current study was 7.14%. This incidence proved to be similar to those recorded by others studies, which founded values between 1%-8% [15], also in the extended limits of 3%-25%, recorded in similar studies by Komisarek *and* Dorynek, (2002) [5] or Lopez *et al*., (2017) [8]. Lower incidence was found by Victor *and* Paul, (2021) [15] and Silva de Rio *et al*., (2007) [16], ranging between 4.2%-5.8%, results considered notably low for dairy specialized breeds. However, the current incidence of twinning seems to be significantly lower compared to 30% founded in multiparous cows by Garcia *and* López, (2018) [17]. The relatively higher incidence of twinning recorded in the current study may be attributed to the intensive inbreeding processes implemented in order to increase the milk yield, in a milk-beef dual purpose breed. Implicitly, the increase in milk production favours the increase in twinning incidence based on a complex connections of: genetic structure-increased milk yield-increased feed intake-accelerated blood flow at the liver–reduced progesterone-increased FSH and LH, which is concretized in multiple ovulation [9,11]. The twinning incidence recorded an upward tendency over the years according to Kinsel *et al*.,

(1998) [18]. Twinning constitutes an easy way to increase efficiency in beef herds, due to more weaned calves per dams (+70%) and over 48% increase in total weaning weight [19]. Thus, the lower incidence (1%-2%) of twinning documented in beef breeds, needs to be increased, despite the minimal heritability of 0.01-0.06, and repeatability (0.04-0.28) [20]. Twinning represents a major problem for stockholders due to the negative effects induced in the herds. In dairy farms, twin births have considered as detrimental due to increased problems in both, dam and calves, also increasing costs and the losses. Twinning is associated with increased incidence of retained placenta, higher mortality and morbidity in calves, occurrence of freemartins and longer calving interval, lower lactation, increased culling rate and poor reproductive performance [19,21].

**Table 1. The share of the calves according to type of birth**

| Parameters | Viable calves | Morbid calves | Non-Viable calves |
|---|---|---|---|
| **Simple births** | 92.69[a] | 5[a] | 2.31[a] |
| **Twin births** | 82.5[b] | 12.5[b] | 5[b] |

[a,b] Columns means with different superscripts differ significantly at P≤0.05

**Table 2. Incidence of dystocia according to type of birth**

| Parameters | Eutocia | Dystocia |
|---|---|---|
| **Simple births** | 95.77[a] | 4.23[a] |
| **Twin births** | 85[b] | 15[b] |

[a,b] Columns means with different superscripts differ significantly at P≤0.05

Average dystocia incidence in the herd was 19.23%, including all difficulty degrees, out of which 9.26%, 6.4% and 3.57% for ease, medium and severe dystocia, respectively. Dystocia occurrence is strongly influenced by numerous external factors. Thus, the season of calving could lead to a wildly variations related to dystocia incidence. Dystocia births are more likely to occur in the winter season compared to summer season, due to an increased blood flow to the uterus, which imply heavier calves [22]. Also, dry period tends to represent a risk factor for dystocia occurrence. Thus, Atashi *et al*., (2013) found that a dry period longer than 60 days increases the risk of difficult calving due to excessive fat accumulation [23]. According to cows' parity, the higher dystocia incidence was associated to primiparous *vs*. multiparous. These aspects could explain the various levels of incidence of difficult calving recorded in different studies. Not least, these differences concerning dystocia incidence could be recorded due to the case of the definition of dystocia [24], or assessment method, routine-non routine assistance or 1 to 5 severity scale [14]. It is well known that dystocia is more likely to occur in twin births. In this respect, the current study investigated the incidence of dystocia according to the type of calving. The incidence of dystocia was significant reduced in single compared to twin births (4.23 *vs.* 15%, p≤0.001), results also confirmed by Olson *et al*., (2009) [25]. The foetal-pelvic disproportion represents a major cause of dystocia. Its effect is more prevalent in twin births. The results obtained in time are conflicting, and previous studies performed in this respect over the years were not conclusive. In this sense, Echternkamp *and* Gregory, (1999) argues that the 46.9% incidence of dystocia observed in twin heifers is directly associated with the abnormal presentation of calves (one or both), instead of the number of calves [26].

Gregory *et al*., (1996) found that dairy breeds have a higher prevalence of dystocia compared with dual purpose breeds, exceeding 20% in single and 42% in twins [27].

The analysis regarding the calves' viability highlighted significant differences (p≤0.001) between single and twin. Single births revealed an overall survivability of 92.69% compared to twin births which decreased this value to 82.5% (p≤0.01). Stillbirths in single calves was 2.31% while twinning induced a significant increased threshold of 5% (p≤0.001). These results are confirmed by numerous previous studies performed in this respect which recorded an incidence range between 4.2% and 4.9% [28; 29; 30]. Twinning represents a major risk factor for calves' mortality, the worldwide incidence being 12%-16% compared with a 3%-6% in single births [31]. In the current study, the calves' survivability

in single births was 10.19% higher than twinning, the results being consistent with the previous outcomes of 10% to 15% or even 18% [27].
The analysis regarding the correlation between the studied traits highlighted significant connections concerning calves' viability and survivability. The calves' viability significantly decreases according to calving ease. The current research calculated a strongly correlation between these two traits (R=0.44). The major cause of dystocia in twinning is represented by the abnormal position of one or both calves. This situation exerts an influential metabolically pressure on calves (especially on energetically and immunologically reserve). This fact reduces the ability to adapt to the new extra uterine life and implicitly the chances of survival. At the same time, the presence of two calves in twinning, might prolonged parturition and causing inadequate abdominal contractions, which can cause the calves' death by asphyxiation [32]. The effect of twinning on dystocia is highlighted by a medium correlation (R=0.31) because dystocia is not a direct effect of the number of calves, but the associated problems that occur in twin pregnancy, such as foetal-pelvic disproportion, abnormal position of calves, calves' body weight at birth, or parts of more than one foetus enter the birth canal at the same time [33,34].

## 4. Conclusions

Twinning is mostly considered an undesirable character in dairy and dual-purpose herds. The losses caused in terms of calves' viability, the health status of the dams as well as other economic losses come to strengthen this statement. Twinning increase the dystocia incidence, also calves' morbidity or death. Although twinning does not directly affect the calves' viability. The induced dystocia it contributes significantly in this sense. Avoiding twinning in herds is a sure way to reduce the previously mentioned losses. Further studies regarding farm management in order to avoid the foetal loss, abortion, dystocia, stillbirth and many more are necessary, especially due to the preventable character of these traits, with highly impact on animal health and welfare and on farm efficiency.

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