

Improving the production performance of the boar in the stud

Year after year, the pork production industry goes through a process of continuous improvement in all its stages. A key factor to such improvement is the automation and regulation of some of the production processes involved.

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At the level of boar studs, the first step in the productive chain, many of the tasks performed (semen collection, quality assessment of the ejaculates, extender dilution, packaging of the semen doses, etc) have already been automated and standardised, reducing the occurrence of human errors.

The stage of semen collection is definitely one of the tasks where the human factor is more determinant in a boar stud.

This is explained by the fact that the most widely used technique is manual collection by a stud operator, which makes the process tedious and time-consuming.

Consequently, the productive efficiency and rhythm of the boars depend on the human factor.

Moreover, such a task frequently

causes work-related injuries such as carpal tunnel syndrome or tendonitis that may derive in sick leave, affecting the normal functioning of the stud. Therefore, automatic systems for collecting ejaculates were designed as a solution and improvement to such critical point, with the following advantages and benefits:

- Simplifying staff's tasks, lessening the physical work load and increasing the number of collections, enabling two boars to be collected at the same time by a single operator. Collection speed per operator is of eight boars per hour and operator with the automatic dummy, while in the manual system it is four boars per hour and operator.

- Reducing result variability among operators, making collections more standard and duration dependent on the boar.

- Cutting down human intervention in the collection process, thus reducing the risk of bacterial contamination in the ejaculate.

- Suitability for every pig breed and facility.

The objective of the present research is to prove the advantages of automatic semen collection systems over the traditional manual technique.

For that purpose, this article looks at a report of the results obtained in a comparison field trial performed with the two systems mentioned.

| | Volume (ml) | Sperm concentration ($\times 10^6$ /ml) | Abnormal forms (%) | Doses/ejaculate |
|------------------|--------------|--|--------------------|-----------------|
| Operator 1 | 195.92±60.7 | 263.35±101.12 | 23.09±10.3 | 15.19±8.3 |
| Operator 2 | 185.19±57.11 | 356.43±98.7 | 21.39±8.5 | 19.984±8.1 |
| Operator 3 | 150.2±59.4 | 354.3±105.7 | 17.95±11.26 | 16.77±8.9 |
| Operator 4 | 190.33±54.4 | 371.46±97.8 | 17.95±11.27 | 22.26±7.3 |
| Operator 5 | 220.25±58.24 | 324.6±78.5 | 19.96±8.56 | 19.81±6.0 |
| Automatic system | 222.6±77.6 | 358.41±101.7 | 17.65±8.7 | 25.26±8.9 |
| Manual system | 188.37±80.9 | 327.65±90.6 | 20.068±12.6 | 18.8±7.72 |
| P (Anova) | P<0.0001 | 0.0002 | P<0.0001 | P<0.0001 |

Table 1. Average ± standard deviation of the parameters: volume, sperm concentration, abnormal forms and number of doses per ejaculate obtained manually (operators) and with the automatic system.

Material and methods

The test was carried out in a Spanish boar stud with capacity for 150 animals during nine months. The research included 35 Pietrain boars, which were collected using both methods (manual and automatic), producing 3376 ejaculates: 2436 manually and 940 with the automatic system.

All the manual and automatic collections were performed with the 'double glove' technique, where the operator uses two gloves: one for stimulating the animal, cleaning the prepuce and penis and discharging urine from the preputial diverticu-

lum and another for holding the penis during the collection.

In the manual system, the operator held the boar's penis with his hand until the animal finished ejaculating and dismantled the dummy. In the case of the Ergos Auto Collect dummy, the penis was introduced into an (disposable) artificial vagina and held by a compression system which maintains the erection needless of further human intervention.

The penis is fixed to the dummy by an adjustable sliding system, which connects the artificial vagina with the collection flask. Once finished

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Fig. 1. Differences in ejaculate volume between the automatic and the manual techniques expressed in ml.

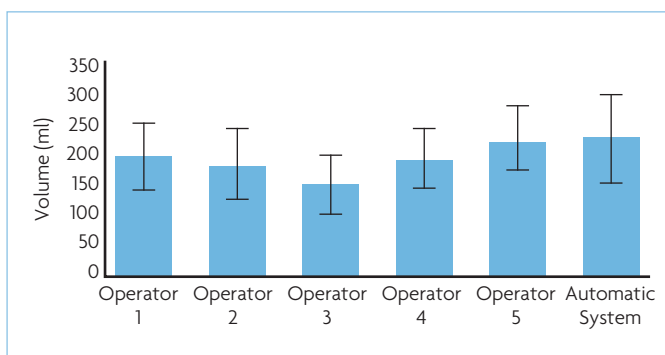
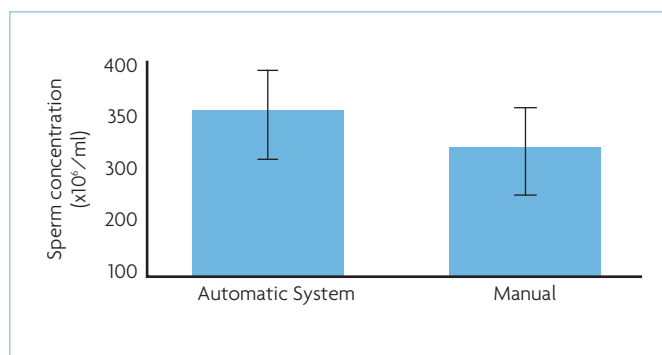


Fig. 2. Difference in sperm concentration between the two collection techniques.



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ished ejaculating, the boar itself dismounts the dummy, releasing the penis by relaxation.

Manual semen collections were performed by five different operators of the stud following the same instructions.

The automatic collection system used in the trial was the dummy Ergos + Autocollect (Magapor SL).

As the objective of this article is to test the efficiency of boars to produce semen doses depending on the collection technique applied, it only includes those parameters that are determinant for the number of doses per ejaculate (volume, sperm concentration and abnormal forms) out of all the parameters analysed in the spermogram after each semen collection.

The results obtained were analysed and managed using the statistical software StatView. After checking the normality of the parameters with the Kolmorov-Sminrov test, analysis of variance (Anova) was assessed. Results are represented on the charts as average \pm standard deviation, and significant differences are considered when $P < 0.05$. In order to verify and explain the differences found in the Anova test, a post-hoc Fisher's PLSD test at 5% was carried out.

Results

● Ejaculate volume

In Table 1 it is observed how the volume of the ejaculate obtained in each semen collection was considerably higher using the automatic system as compared to manual collection ($P < 0.0001$); 222.6 ± 77.6 ml and 188.37 ± 80.9 ml respectively. (Table 1).

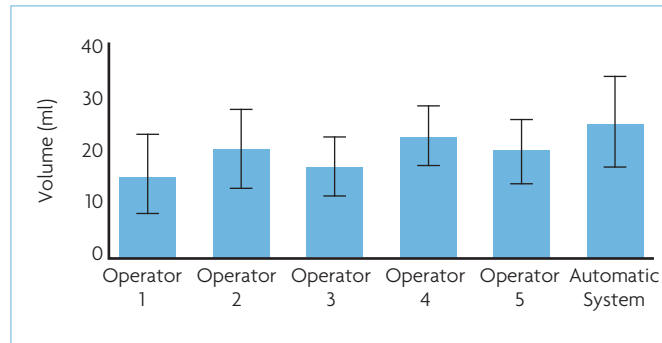


Fig. 3. Average of the number of doses per ejaculate by operators and using the automatic dummy.

Moreover, Table 1 also shows significant differences in the volume obtained per ejaculate among the operators who carried out the semen collection ($P < 0.0001$).

Operators number 2 and 3 obtained the lowest volumes (185.19 ± 57.1 ml and 150.2 ± 59.4 ml respectively).

● Sperm concentration

Sperm concentration, the same as the volume, is another determinant parameter in the number of doses produced. Variance analysis reveals that the average sperm concentration obtained was significantly higher in the automatic system with regards to manual collection, 358.41 ± 101.7 vs 327.65 ± 90.6 ($P = 0.0002$). (Table 1 and Fig. 2). Moreover, Table 1 also shows important differences on the concentration obtained per ejaculate among the operators who performed the semen collection ($P < 0.001$). Operator 1 registered the lowest concentration value, 263.35 ± 101.12 .

● Number of semen doses per ejaculate

Out of 3,376 ejaculates collected from 35 Pietrain boars, 2436 were

obtained manually, producing a total amount of 44,364 semen doses, and 940 ejaculates were collected with the automatic system, producing a total of 23,500 semen doses. The comparison test between the two collection techniques (manual and automatic) proved the number of doses per ejaculate is statistically higher in the case of the automatic system. ($P < 0.0001$). The average number of doses per ejaculate was 25.26 ± 8.99 with the automatic dummy and 18.8 ± 7.72 in the manual collection (Table 1). Similarly to the differences observed between manual and automatic collection, results also varied significantly depending on the operator in the case of the manual system (Table 1). Operator 1 obtained the lowest number of doses per ejaculate (15.19 ± 8.3 doses, $P = 0.008$) (Fig. 3).

Discussion

The comparison test between the two collection techniques, namely the automatic dummy and the man-

ual one, has proven that there are significant differences in some of the parameters analysed depending on the system used.

In the case of the automatic dummy, the number of doses per ejaculate obtained (25.26 ± 8.9) was higher than with the manual system (18.8 ± 7.72).

It also produced higher volume (222.6 ± 77.6 ml vs. 188.37 ± 80.9 ml) and concentration values (358.41 ± 101.7 vs 327.65 ± 90.6), being both results considerably greater in the collections performed using the automatic dummy.

This could be related to the fact that the duration of collection depends completely on the boar in the automatic technique, which removes the human factor, increasing the parameter of doses produced per ejaculate, as it was observed in the results of this test.

It has also been detected a significant variation in the number of doses per ejaculate among the different operators, which could be attributed to different ways of working, different technical training or the preferences of the animals for some workers over others.

Conclusion

According to the results obtained in this trial, we can conclude that statistically significant differences have been shown between the use of a manual collection system and an automatic dummy Ergos + Autocollect (Magapor SL), the latter having the following advantages:

- Higher volume of ejaculate collected.
- Higher sperm concentration.
- Higher number of doses per ejaculate. ■