**Table S1.** Fixed effects considered for daughters’ traits

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Fixed effects | Conception rate heifers | Conception rate cows | Production traits1 | Somatic cells score | Mastitis traits2 | Morphological traits3 |
| Herd-year | X | X | X | X | X |  |
| Herd-date |  |  |  |  |  | X |
| Weekday | X | X |  |  |  |  |
| Semen sex \* year | X | X |  |  |  |  |
| Age at insemination (class) | X |  |  |  |  |  |
| Interval between calving and insemination (class) |  | X |  |  |  |  |
| Age at calving (class) |  | X |  |  |  | X |
| Age at calving (class) – year |  |  | X | X | X |  |
| Month of calving - year |  |  | X | X | X |  |
| Lactation stage (class) - year |  |  |  |  |  | X |
| Gestation rank of the dam | X | X | X | X | X | X |
| Meteorological indicator by month of gestation of the dam (class)4 | X | X | X | X | X | X |

1 Production traits: milk yield, fat yield, protein yield, protein content and fat content

2 Mastitis traits: occurrence of at least one mastitis during the 150 first days of lactation and mastitis number occurrence *(same period?)*

3 Morphological traits for Holstein: height at sacrum, body depth, chest width and body condition score

Morphological traits for Montbeliarde: height at sacrum, body depth, chest width, muscularity at withers, muscularity at thighs

4 Six meteorological indicators were tested:

Average Temperature-Humidity Index classes by month: ]0;40], ]40;45], ]45;50], ]50;55], ]55;60], ]60;65], ]65;80]

Average Maximum temperature classes by month: ]-5;5], ]5;10], ]10;15], ]15;20], ]20;25], ]25;35]

Heat load over Temperature-Humidity Index 65 classes by month: ]0:5], ]5;10], ]10;15], ]15;20], ]20;30], ]30;50], ]50;70], ]70;100], ]100;300]

Heat load over Temperature-Humidity Index 70 classes by month: ]0:5], ]5;10], ]10;15], ]15;20], ]20;30], ]30;200]

Number of days with a Temperature-Humidity Index over 65 classes by month: 0, 1, [2;3], [4;5], [6;8], [9;14], [15;20], [21;31]

Number of days with a Temperature-Humidity Index over 70 classes by month: 0, 1, [2;3], [4;5], [6;8], [9;31]