Reproduction and production in a buffaloes farm of the Marche region: a ten-year study

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RIASSUNTO – Aspetti riproduttivi e produttivi in un allevamento bufalino della regione Marche: un decennio di attività. Sono stati valutati i parametri riproduttivi e produttivi di un’azienda bufalina locata nell’area Marchigiana dell’Appennino Centrale, per un periodo di attività di 13 anni. L’età media al primo parto di 35,9 mesi, sottolinea una notevole precocità riproduttiva degli animali e buone performance riproduttive della mandria (intervallo interparto medio 443 d e durata dell’asciutta 156 d). La produzione di latte è aumentata nel periodo di osservazione fino al massimo produttivo di 2321 kg di latte nell’anno 2002. La non eccellente qualità del latte, prodotto in una zona d’allevamento non vocata, suggerisce la necessità di una stima dei fabbisogni reali delle bufale per raggiungere un titolo lipidico più idoneo alla trasformazione casearia del latte bufalino, che in Italia è destinato unicamente alla produzione di mozzarella.

Key words: buffalo, milk, reproduction, production.

INTRODUCTION – Water buffalo milk reproductive and productive traits are fundamental to evaluate farm efficiency and dairy economy. Due to the buffalo cows’ long life these aspects are also important to assess the improvement of genetic animal potential and to reach optimal productive performance. Currently this knowledge is critical since the Italian cattle population is decreasing whereas the national buffalo sector is expanding; this trend is partially depending on the reconversion of some dairy cattle’ farms into buffalo cows’ farms. The present investigation was undertaken to study non-genetic factors affecting reproductive parameters and milk production traits in a farm located in a not traditional area for buffalo farming.

MATERIAL AND METHODS – 589 complete records regarding the productive careers of 111 buffalo cows from 1st up to 11th lactation, reared in a farm of the Marche region, were analysed to outline the productive performance over a period of 13 years: from 1992 up to 2004. The buffalo farm is located in the Marche Apennine area (689 m asl), where climatic and environmental conditions are deeply different from those characterising the Italian buffalo traditional farming areas (Campania, Lazio and Puglia). Reproductive parameters were analysed: age at calving, length of calving interval and length of dry period. The quali-quantitative parameters of buffalo milk produced throughout 1992-2004 were effective lactation length and related milk production, protein and fat percentage and fat/protein ratio. Moreover an estimation of milk energy content was computed according to the NRC prediction equation (1989) based on milk fat content (kcal/kg = 96.2 Fat + 351.2). A three-way ANOVA was performed (Statistica, 1989) to estimate the effects of the non genetic variables year, parity and calving season, known to affect reproductive and productive milk buffaloes traits. For this analysis parities greater than the 7th were grouped in the same class.

RESULTS AND CONCLUSIONS – ANOVA showed a high significant effect of year on all parameters but the length of dry period; parity, as expected, affected age at parturition, length of period between two subsequent deliveries, milk yield and lactation length; the season of calving, which is known to influence buffalo
cows careers, affected all parameters but lactation length and fat/protein ratio (Table 1). Regarding the reproductive parameters, tightly related to an adequate feeding of heifers in growing phase and to the age at first oestrus, the primiparae showed an average age of 35.92 mo at first calving (Table 2), that was lower than those reported in literature for dairy buffaloes breeds reared in the tropics (www.ssdairy.org) and for Italian buffaloes cows (39.5 mo) controlled by A.I.A. (Matassino and Rossi, 1998). For age at following parturitions a regular increase, depending on the calving interval, was found. Length of period between calvings was in the range of 421-467 days according to results reported by Tekerli et al. (2001) for Anatolian buffaloes; due to its low heritability this trait could be lowered through a better nutrition and an early breeding. Dry period estimated as days between the end of lactation and the beginning of the next one, ranged from 142 up to 165 days.

Table 1. Results of ANOVA for the evaluated dependent variables.

| Dependent variables     | Sources of variation | Year (df 12) | Parity (df 7) | Calving Season (df 3) |
|-------------------------|----------------------|-------------|---------------|-----------------------|
| Age at Calving (mo)     | ***                  | ***         | **            |
| Calving Interval § (d)  | ***                  | **          | ***           |
| Dry Period § (d)        | ns                   | ns          | ***           |
| Milk Yield (kg)         | ***                  | *           | **            |
| Lactation Length (d)    | ***                  | *           | ns            |
| Protein (%)             | ***                  | ns          | *             |
| Fat (%)                 | ***                  | ns          | *             |
| Fat/Protein             | ***                  | ns          | *             |
| Milk Energy (kcal/kg)   | ***                  | ns          | *             |

§ For calving interval and dry period df were respectively 11 for year and 6 for parity.
ns = not significant; *, **, *** = significant at P<0.05, P<0.01, P<0.001 respectively.

According to calving season, deliveries where mainly distributed in Summer and Autumn (28.6 and 36.8% respectively); calving interval was shorter for delivery occurring in Autumn (416 d) and higher for the ones occurring in Spring (483 d) certainly because of the buffaloes’ seasonal nature and bull presence in the herd (Borghese et al., 1994). The dry period by calving season was shorter for Autumn calves and higher for deliveries occurring in Spring as also observed by Zicarelli et al. (1977).

Table 2. Reproductive parameters by parity (mean±std. error).

| Parity | #   | Age at Calving (mo) | Calving Interval (d) | Dry Period (d) |
|--------|-----|---------------------|----------------------|----------------|
| 1      | 111 | 35.92±0.76          | ---                  | ---            |
| 2      | 106 | 51.58±0.87          | 467.58±10.10         | 165.42±7.43    |
| 3      | 98  | 65.42±0.92          | 433.23±10.48         | 142.20±8.14    |
| 4      | 78  | 77.34±1.03          | 426.14±11.64         | 154.09±9.74    |
| 5      | 57  | 88.64±1.24          | 421.42±11.72         | 151.16±10.11   |
| 6      | 47  | 102.58±1.42         | 454.02±17.60         | 164.21±12.56   |
| 7      | 41  | 115.20±1.45         | 419.12±14.38         | 145.95±13.15   |
| ≥8     | 70  | 140.63±1.88         | 454.06±12.97         | 162.91±12.20   |

For 607 deliveries occurring in 13 year period, the rate of twinning was very low (0.66%) but higher then values reported in literature for swamp buffaloes (Buffalo Production, 1992); for 606 records regarding calf’s sex, the sex ratio was 49.84 % males vs. 50.16 % females. The results of productive parameters are listed in Table 3.
Table 3. Productive parameters by year (mean±std. error).

| Year | #  | Milk (kg) | Lactation length (d) | Protein (%) | Fat (%) | F/P | Milk Energy (kcal/kg) |
|------|----|-----------|---------------------|-------------|---------|-----|----------------------|
| 1992 | 28 | 1857±65.45| 273±6.13            | 4.81±0.05   | 7.90±0.13| 1.64±0.02  | 1111±12.99          |
| 1993 | 28 | 1815±63.92| 275±7.80            | 5.03±0.07   | 7.22±0.14| 1.43±0.02  | 1046±13.41          |
| 1994 | 30 | 1906±89.75| 239±6.83            | 4.50±0.05   | 7.53±0.13| 1.68±0.02  | 1076±12.04          |
| 1995 | 31 | 1898±113.6 | 255±9.27           | 4.75±0.04   | 7.54±0.14| 1.59±0.02  | 1077±13.24          |
| 1996 | 54 | 2201±79.37| 281±8.19            | 4.67±0.04   | 7.90±0.08| 1.69±0.01  | 1111±7.66           |
| 1997 | 51 | 2176±73.31| 288±7.92            | 4.55±0.04   | 7.31±0.10| 1.61±0.02  | 1054±9.71           |
| 1998 | 46 | 2031±75.28| 258±5.38            | 4.75±0.04   | 8.17±0.11| 1.72±0.02  | 1137±10.39          |
| 1999 | 54 | 2300±90.72| 295±6.52            | 4.49±0.04   | 7.40±0.07| 1.65±0.01  | 1063±6.50           |
| 2000 | 67 | 2309±92.39| 325±9.66            | 4.49±0.03   | 7.75±0.07| 1.73±0.01  | 1097±6.68           |
| 2001 | 75 | 2242±90.42| 304±9.62            | 4.59±0.03   | 7.48±0.08| 1.63±0.01  | 1071±7.38           |
| 2002 | 55 | 2321±86.55| 303±9.74            | 4.64±0.04   | 7.81±0.09| 1.68±0.02  | 1103±8.92           |
| 2003 | 51 | 2296±91.78| 323±9.82            | 4.66±0.04   | 7.57±0.10| 1.62±0.02  | 1079±9.22           |
| 2004 | 19 | 2059±111.46| 332±20.32          | 4.68±0.07   | 8.14±0.20| 1.74±0.04  | 1134±19.35          |

Milk yield increased almost regularly throughout the period of analysis reaching the highest value in 2002 with an effective lactation length of 303 days. Since 1996 the quantitative milk production, realised by the farm, overcame the 2002 national productive average (2168 kg) reported by A.I.A. (2003), regarding 24,000 productive records, concerning mainly buffaloes reared in traditional farming area and it was slightly lower than milk production realised in 20 farms of central Italy (2417 kg) (Bartocci et al., 2002). The milk quality expressed as protein and fat percentage showed a protein content similar to values reported in literature (Zicarelli, 1999; Bartocci et al., 2002) whereas the fat level was always lower than the previously values reported but in the range mentioned by Bertoni et al. (1994) for Italian buffalo cows. As a consequence, the fat/protein ratio was quite low (1.59-1.73) and far away from optimal value suggested for cheese-manufacturing (1.83) and milk estimated energy content was lower than the value (1220 Kcal/kg) reported by Bertoni et al. (1994). Yield and lactation length were significantly affected by order of lactation confirming that quantitative production increased till animal reached adult body conformation.

The productive level of the farm was satisfactory for an intensive management farm, however efforts for improving milk quality should be performed to obtain buffalo milk more suitable for mozzarella cheese-manufacturing.

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