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# RECONCEPTION IN GRADE AND PEDIGREE AFRICANDER COWS OF DIFFERENT SIZES – POSTPARTUM FACTORS INFLUENCING RECONCEPTION

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*OPSOMMING:* HERBESETTING IN GRAAD EN GEREGISTREERDE AFRIKANERKOEIE VAN VERSKILLENDE GROOTTES – DIE INVLOED VAN NA-KALWINGSFAKTORE

Die invloed van koeimassa onmiddellik na kalwing, massatoename vanaf kalwing tot aan die einde van die teelseisoen en maand van kalwing op herbesetting, was bepaal in 1 975 graad en 440 geregistreerde Afrikanerkoeie waarvan ongeveer die helfte proteïenbyvoeding gedurende die winter ontvang het. Die koeie was volgens na-kalwingmassa in ses verskillende klasgroottes verdeel. Herbesetting was merkbaar laer onder koeie wat later in die seisoen gekalf het. 'n Hoë persentasie middelmatig en groot tipe koeie (456 –>546 kg) was weer in kalf ten spyte van die feit dat hulle geringe massatoename, of selfs massaverlies na kalwing getoon het. Daarteenoor moes kleiner tipe koeie (< 455 kg) definitief in massa toeneem om weer in kalf te kom. Massa na kalwing en massatoename na kalwing is negatief gekorreleerd ($r = -0,7$; $P < 0,01$). Regressieanalises het getoon dat massa na kalwing, massatoename na kalwing, maand van kalwing en ouderdom van koei in daardie volgorde, byna sonder uitsondering, die mees belangrikste faktore is wat herbesetting beïnvloed. Herbesetting is 'n funksie van massa na kalwing *per se* en nie van massatoename nie. Die belangrikheid van massatoename in die regressie vergelykings is hoofsaaklik toe te skryf aan die hoë negatiewe korrelasie met massa na kalwing.

*SUMMARY*

The influence of postpartum mass, bodymass gain from calving to the end of the bulling season and month of calving was studied in 1 975 grade and 440 pedigree Africander cows that were classified into six size categories according to postpartum mass. Approximately half the number of each breed received protein-rich supplements for bodymass maintenance in winter; the others were not fed. Reconception is negatively related to month of calving. The probability of reconception declined markedly as the month of calving advanced from September to April. In order to reconceive, medium and large size cows (456 – > 645 kg) could gain little or even lose mass after calving and still conceive, whereas small cows (< 455 kg) had to gain considerably in mass. Postpartum mass and postpartum mass gain are negatively related ($r = -0,7$; $P < 0,01$). Regression models obtained through stepwise procedures, revealed that postpartum mass, postpartum mass gain, month of calving and age of dam are in that order the most important factors influencing reconception. Reconception appears to be a function of postpartum mass *per se* and the effect of postpartum mass gain in the statistical models is entirely due to its strong negative relationship with postpartum mass.

It may be postulated that reconception in ranch cows is a function of prepartum bodymass change, postpartum bodymass, postpartum bodymass gain or loss, month of previous calving, age and inherent fertility of the dam, and fertility of sires. Of all these factors the effect of mass gain or loss during winter and the influence of supplementary feeding of protein in relation to subsequent fertility have been studied most. In contrast, little evidence of the relative importance of the other factors with respect to calving rate, and more particularly reconception, is available locally. Apart from Ward (1968) who found that indigenous Mashona cows failed to reconceive below 270 kg bodymass, Richardson, Oliver & Clarke (1975) have determined relationships between postpartum bodymass and postpartum mass gain in the cow and the probability of successful conception. A relationship between size and fertility was suggested when Steenkamp & van der Horst (1974) found that the fertility in herds comprising small, medium and large size cows varied according to size of cow; large ( > 552 kg) and medium(474 kg) size cows having a higher calving rate than small ( < 393 kg) cows. The causative factors were, however, not examined.

This study, the first of several to report on the influences of pre- and postpartum factors on reconception in Africander cows, discusses mainly postpartum effects. These results together with those from subsequent studies will ultimately be used to develop models for predicting the probability of successful reconception for cows of different postpartum bodymass under specified systems of management. The influences of month of calving (MOC), postpartum size of dam (PPM) and postpartum bodymass gain or loss (PPG) on reconception were investigated in 1 975 grade and 440 pedigree lactating Africander cows. Factors influencing postpartum mass and postpartum mass gain are to be considered in subsequent papers. The data were derived from a longterm genotype x environment interaction trials started in 1958.

## Procedure

### *Animals and herd management*

A classification of cows used in this study by treatment and postpartum size is given in Table 1.

Single sire herds of 25 cows were bred over three-monthly breeding seasons; herds receiving protein-rich supplements in winter (fed herds) from end-December to end-March and herds receiving no supplementary

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**Table 1**

*Distribution by treatment and postpartum bodymass class of grade and pedigree lactating cows*

| Size category | Body mass class | Fed | | | | Not-fed | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Grade | | Pedigree | | Grade | | Pedigree | | |
| | | Reconceived | Barren | Reconceived | Barren | Reconceived | Barren | Reconceived | Barren | |
| | kg | | | | | | | | | |
| 1 | <365 | 64 | 29 | 7 | 4 | 71 | 72 | 3 | 16 | 266 |
| 2 | 366-410 | 158 | 46 | 29 | 5 | 158 | 103 | 18 | 22 | 539 |
| 3 | 411-455 | 223 | 51 | 57 | 15 | 197 | 117 | 20 | 33 | 713 |
| 4 | 456-500 | 222 | 50 | 72 | 18 | 95 | 50 | 33 | 21 | 561 |
| 5 | 501-545 | 138 | 25 | 29 | 13 | 27 | 14 | 8 | 9 | 263 |
| 6 | >546 | 47 | 13 | 5 | 3 | 3 | 2 | – | – | 73 |
| | | 1 066 | | 257 | | 909 | | 183 | | 2 415 |

feeding (not-fed herds) from mid-February to mid-May. Calves from both fed and not-fed herds were late weaned, the former during the first week in October at 9 to 11 months of age, and the latter in the first week of September at 7 to 9 months of age. Replacement heifers were bred for the first time as three-year-olds to calve at four. Cows failing to produce a calf in two consecutive breeding seasons or which showed a tendency to calve in alternate years were culled.

The provision of supplementary feed has been described in detail elsewhere (Steenkamp & van der Horst, 1975). The mean winter feeding period over 15 years (1958–1973) was 144 days. During this time, cows nursing calves received on average 9,0 kg maize silage and 1,0 kg cottonseed meal daily to maintain bodymass from about June to November each year.

During the calving seasons, birth dates and birth mass of calves were recorded daily. All animals were weighed during the last week of each month throughout their lifetimes. Cows were not pregnancy diagnosed and the term "reconception" used throughout this discussion refers to "recalving". Likewise, no dimensional measurements were taken and the "sizes" of cows were determined entirely by bodymass. Bulls were semen-tested and were certified fertile prior to use in the herds. Sire effects on reconception were not considered.

*Statistical*

Postpartum mass gain was estimated as the difference between mass at the end of the bulling season and the first mass recorded after calving. The latter was also taken as the postpartum mass of the dam and was used for classifying the dams into the six size categories given in Table 1.

**Table 2**

*Mean percentage and number of reconceptions according to month of previous calving for fed and not-fed grade and pedigree cows*

| Treatment | Breed | | Month of calving | | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sep | Oct | Nov | Dec | Jan | Feb | Mar | |
| Fed | Grade | No. | 4 | 262 | 338 | 171 | 63 | 13 | 1 | |
| | | % | 100,0 | 87,3 | 82,2 | 72,5 | 69,2 | 65,0 | 25,0 | 79,92 |
| | Pedigree | No. | | 33 | 85 | 55 | 17 | 7 | 1 | |
| | | % | | 84,6 | 84,2 | 76,4 | 60,7 | 50,0 | 33,3 | 77,04 |
| | | No. | 4 | 295 | 423 | 226 | 80 | 20 | 2 | 1 050 |
| Weighted mean | | % | 100,0 | 87,0 | 82,6 | 73,5 | 67,4 | 59,8 | 29,2 | 79,37 |
| Not-fed | Grade | No. | | | 2 | 311 | 177 | 48 | 13 | |
| | | % | | | 33,3 | 65,1 | 60,0 | 52,2 | 36,1 | 60,62 |
| | Pedigree | No. | | | 1 | 51 | 25 | 4 | 1 | |
| | | % | | | 100,0 | 51,5 | 40,3 | 22,2 | 33,3 | 44,80 |
| | | No. | | | 3 | 362 | 202 | 52 | 14 | 633 |
| Weighted mean | | % | | | 55,5 | 63,2 | 57,6 | 49,9 | 35,9 | 57,97 |

L.S.D. between treatments x breeds t 0,05 = 9,1 %
t 0,01 = 12,0 %

Analyses of variance were done by least squares for unequal subclass numbers. Stepwise regression procedures, implementing the "forward" technique, were used to determine the relative contributions of the independent variables and certain of their preselected quadratic and interaction terms in explaining percentage reconception as the dependent variable. The following multivariate regression model was used:

$$Y=\beta_o+\sum_{i=1}^{n}\beta_i X_i+\sum_{i=1}^{n}\beta_{ii}X_i^2+\sum_{i=1}^{n}\sum_{\substack{j=1\\ i\neq j}}^{n}\beta_{ij}X_iX_j+\xi$$

where

$Y$ = the independent variable, percentage reconception
$X_i$ = the dependent variables, i=1, .... , n
$\beta_o$ = constant
$\beta_i, \beta_{ii}, \beta_{ij} (i \neq j)$ = regression coefficients of $X_i, X_i^2$ and $X_iX_j$, $i \neq j = 1,2 .... , n-1, n$

The experimental error ($\varepsilon$) was assumed to be normally distributed with mean zero and variance $\sigma^2$.

## Results

*Breed and treatment effects on reconception*

Reconception amongst fed cows was significantly higher ($P < 0,01$) than amongst not-fed cows with not-fed grade Africanders higher ($P < 0,01$) than pedigree. The difference between treatments in reconception was much greater among pedigree cows than among grades (Table 2).

*Reconception by month of calving*

Percentage reconception decreased among fed cows from 100% for cows that calved in September to 29,2% for cows that calved in March. Reconception among not-fed cows also diminished as the calving season advanced (Table 2). Correlation coefficients for the relationships between reconception and month of calving were negative and significant (Table 7). A classification of the data on a within-mass class basis also shows that irrespective of size, cows that calved before December in fed herds, and in not-fed herds before January, were more likely to reconceive than cows that calved later (Tables 3 & 4).

*Effects of postpartum mass and mass gain on reconception*

The majority of cows in both grade and registered herds and in both treatments that calved late in the season and reconceived were from the heavier categories, more specifically Categories 4 (456–500 kg) and 5 (501–545 kg) (Tables 3 & 4).

Of animals that calved within the same month and subsequently reconceived, larger cows gained considerably less postpartum mass than did smaller cows (Tables 5 & 6). Invariably, cows in the mass range 501 – > 546 kg (Categories 4, 5 & 6) gained little or even lost mass postpartum and reconceived. Perusal of the information in Tables 5 & 6 in relation to that in Tables 3 & 4, shows that cows that calved later in the season gained less mass and had a lower reconception rate.

Postpartum mass and postparum mass gain are negatively related both on a within-month of calving and on a within-mass class basis (Tables 5 & 6). The significance ($P < 0,01$) of these relationships is given in the correlation matrices in Table 7.

Table 8 summarises these relationships over month of calving and shows that small cows, despite their larger postpartum gains, have a lower reconception rate.

**Table 3**

*Reconception among fed grade and pedigree cows classified by month of calving within size categories*

| Breed | Size category | Month of calving | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sep | Oct | Nov | Dec | Jan | Feb | Mar | | |
| | | % | % | % | % | % | % | % | No. | % |
| Grade | 1 | | 8,6 | 53,8 | 6,4 | | | | 93 | 68,8 |
| | 2 | | 19,6 | 43,6 | 11,3 | 2,4 | 0,5 | 0,0 | 204 | 77,4 |
| | 3 | | 23,4 | 31,0 | 17,9 | 8,4 | 0,7 | | 274 | 81,4 |
| | 4 | | 29,3 | 23,9 | 18,8 | 7,0 | 2,2 | 0,4 | 272 | 81,6 |
| | 5 | 0,6 | 28,8 | 23,9 | 20,9 | 8,0 | 2,5 | 0,0 | 163 | 84,7 |
| | 6 | 5,0 | 38,3 | 16,7 | 13,3 | 5,0 | | | 60 | 78,3 |
| Pedigree | 1 | | 9,1 | 54,5 | | | | | 11 | 63,6 |
| | 2 | | 14,7 | 50,0 | 20,6 | 0,0 | | | 34 | 85,3 |
| | 3 | | 13,9 | 37,5 | 25,0 | 2,8 | 0,0 | 0,0 | 72 | 79,2 |
| | 4 | | 10,0 | 31,1 | 24,4 | 11,1 | 3,3 | 0,0 | 90 | 79,9 |
| | 5 | | 19,0 | 14,3 | 19,0 | 7,1 | 7,1 | 2,4 | 42 | 69,0 |
| | 6 | | 12,5 | 12,5 | | 25,0 | 12,5 | | 8 | 62,5 |

L.S.D. between size categories t 0,05 =7,4%
t 0,01 =9,7%

## Table 4

*Reconception among not-fed grade and pedigree cows classified by month of calving within size categories*

| Breed | Size category | Month of calving | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | | Nov | Dec | Jan | Feb | Mar | Apr | | |
| | | % | % | % | % | % | % | No. | % |
| Grade | 1 | 0,7 | 36,4 | 11,9 | 0,7 | | | 143 | 49,7 |
| | 2 | 0,4 | 34,9 | 20,7 | 4,5 | 0,0 | | 261 | 60,5 |
| | 3 | 0,0 | 36,6 | 19,4 | 5,7 | 1,0 | 0,0 | 314 | 62,7 |
| | 4 | | 29,0 | 24,1 | 8,3 | 4,1 | 0,0 | 145 | 65,5 |
| | 5 | | 22,0 | 24,4 | 12,2 | 7,3 | | 41 | 65,9 |
| | 6 | | 40,0 | 0,0 | | 20,0 | | 5 | 60,0 |
| Pedigree | 1 | 5,3 | 10,5 | 0,0 | 0,0 | | | 19 | 15,8 |
| | 2 | | 40,0 | 5,0 | 0,0 | | | 40 | 45,0 |
| | 3 | | 24,5 | 13,2 | 0,0 | | | 53 | 37,7 |
| | 4 | | 25,9 | 25,9 | 7,4 | 1,9 | | 54 | 61,1 |
| | 5 | | 35,3 | 11,8 | 0,0 | 0,0 | | 17 | 47,1 |
| | 6 | | | | | | | – | |

L.S.D. between size categories t 0,05 =7,4%
t 0,01 =9,7%

## Table 5

*Mean postpartum mass (PPM) and percentage postpartum mass gain (PPG) for fed grade and pedigree cows that reconceived*

| Breed | Size category | Month of calving | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sep | | Oct | | Nov | | Dec | | Jan | | Feb | | Mar | |
| | | PPM | PPG | PPM | PPG | PPM | PPG | PPM | PPG | PPM | PPG | PPM | PPG | PPM | PPG |
| | | kg | % | kg | % | kg | % | kg | % | kg | % | kg | % | kg | % |
| Grade | 1 | – | – | 348 | 20,5 | 340 | 19,7 | 350 | 12,2 | – | – | – | – | – | – |
| | 2 | – | – | 388 | 17,0 | 389 | 14,7 | 391 | 12,3 | 394 | 4,4 | 406 | –3,9 | – | – |
| | 3 | – | – | 434 | 9,6 | 433 | 10,6 | 432 | 7,2 | 440 | 2,8 | 425 | 2,4 | – | – |
| | 4 | – | – | 476 | 5,7 | 476 | 5,8 | 477 | 5,1 | 479 | 2,8 | 483 | 1,4 | 465 | 0,0 |
| | 5 | 522 | –7,4 | 519 | 3,5 | 520 | 3,2 | 521 | 1,2 | 517 | 2,3 | 523 | –0,6 | – | – |
| | 6 | 555 | –1,1 | 567 | 0,3 | 575 | –0,7 | 568 | 0,6 | 562 | 0,4 | – | – | – | – |
| Pedigree | 1 | – | – | 363 | 15,6 | 351 | 20,9 | – | – | – | – | – | – | – | – |
| | 2 | – | – | 389 | 16,8 | 386 | 17,2 | 395 | 10,0 | – | – | – | – | – | – |
| | 3 | – | – | 435 | 12,0 | 434 | 12,7 | 437 | 11,6 | 433 | 7,5 | – | – | – | – |
| | 4 | – | – | 468 | 7,0 | 479 | 6,5 | 481 | 4,5 | 476 | 3,7 | 470 | 0,0 | – | – |
| | 5 | – | – | 522 | 3,6 | 517 | 2,9 | 512 | 3,6 | 520 | 6,8 | 515 | 3,7 | 503 | 0,0 |
| | 6 | – | – | 565 | –1,6 | 560 | 9,7 | – | – | 566 | 6,4 | 565 | –2,4 | – | – |

## Table 6

*Mean postpartum mass (PPM) and percentage postpartum mass gain (PPG) for not-fed grade and pedigree cows that reconceived*

| Breed | Size category | Month of calving | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Nov | | Dec | | Jan | | Feb | | Mar | |
| | | PPM | PPG | PPM | PPG | PPM | PPG | PPM | PPG | PPM | PPG |
| | | kg | % | kg | % | kg | % | kg | % | kg | % |
| Grade | 1 | 351 | 27,1 | 342 | 23,7 | 345 | 17,2 | 342 | 19,8 | – | – |
| | 2 | 372 | 14,0 | 386 | 12,7 | 391 | 11,7 | 391 | 6,7 | – | – |
| | 3 | – | – | 431 | 10,5 | 430 | 6,7 | 427 | 7,3 | 433 | 3,8 |
| | 4 | – | – | 473 | 3,5 | 473 | 3,0 | 466 | 4,1 | 472 | 1,4 |
| | 5 | – | – | 516 | –2,7 | 507 | 3,1 | 516 | –1,3 | 519 | 1,0 |
| | 6 | – | – | 551 | –2,2 | – | – | – | – | 569 | 6,8 |
| Pedigree | 1 | 351 | 29,0 | 327 | 27,2 | – | – | – | – | – | – |
| | 2 | – | – | 391 | 19,5 | 404 | 15,5 | – | – | – | – |
| | 3 | – | – | 432 | 13,6 | 440 | 9,8 | 429 | 7,1 | – | – |
| | 4 | – | – | 473 | 9,2 | 478 | 5,9 | 463 | 4,6 | 469 | 13,5 |
| | 5 | – | – | 519 | 1,9 | 527 | 1,5 | – | – | – | – |
| | 6 | – | – | – | – | – | – | – | – | – | – |

**Table 7**

*Simple correlation coefficients between percentage reconception (Y), postpartum bodymass (PPM), postpartum mass gain (PPG), month of calving (MOC) and age*

| Grade / Pedigree | Fed | | | | | Not-fed | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Y | PPM | PPG | MOC | Age | Y | PPM | PPG | MOC | Age |
| Y | | ,27 | ,05 | −,59** | −,41* | | ,21 | ,31 | −,37* | −,15 |
| PPM | ,06 | | −,73** | −,08 | ,11 | ,18 | | −,75** | ,29 | ,60** |
| PPG | ,35 | −,56** | | −,28 | −,36* | ,37 | −,75** | | −,38* | −,48** |
| MOC | −,50** | ,22 | −,61** | | 23 | −,59** | ,35 | −,74** | | ,12 |
| Age | −,04 | ,48* | −,54** | ,18 | | ,32 | ,82** | −,46* | ,04 | |

** Significant P < 0,01 * Significant P < 0,05

**Table 8**

*Reconception (RCN), postpartum mass (PPM), postpartum gain (PPG) and mean age of fed and not-fed grade and pedigree cows*

| Size category | Fed | | | | | | | | Not-fed | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grade | | | | Pedigree | | | | Grade | | | | Pedigree | | | |
| | RCN | PPM | PPG | Age | RCN | PPM | PPG | Age | RCN | PPM | PPG | Age | RCN | PPM | PPG | Age |
| | % | kg | % | yr | % | kg | % | yr | % | kg | % | yr | % | kg | % | yr |
| 1 | 68,8 | 342 | 19,0 | 6,3 | 63,6 | 353 | 20,1 | 4,3 | 49,7 | 343 | 22,1 | 5,7 | 15,8 | 335 | 27,8 | 5,7 |
| 2 | 77,4 | 389 | 14,5 | 6,4 | 85,3 | 390 | 15,4 | 5,6 | 60,5 | 388 | 11,9 | 6,5 | 45,0 | 392 | 19,1 | 6,5 |
| 3 | 81,4 | 434 | 8,7 | 7,0 | 79,2 | 435 | 12,0 | 7,4 | 62,7 | 431 | 8,9 | 7,4 | 37,7 | 435 | 12,2 | 7,1 |
| 4 | 81,6 | 476 | 5,2 | 7,3 | 79,9 | 478 | 5,3 | 8,4 | 65,5 | 472 | 3,3 | 7,6 | 61,1 | 474 | 7,4 | 7,8 |
| 5 | 84,7 | 520 | 2,5 | 7,6 | 69,0 | 517 | 3,7 | 8,2 | 65,9 | 513 | 0,1 | 7,4 | 47,1 | 521 | 1,8 | 9,0 |
| 6 | 78,3 | 568 | 0,0 | 8,4 | 62,5 | 564 | 3,7 | 9,2 | 60,0 | 557 | 0,7 | 8,7 | – | – | – | – |

Reconception among cows of Category 6 is for all groups distinctly lower than for Categories 4 and 5. This decline may possibly be due to obesity among cows of Category 6. This could not be determined from the data.

The negative relationship between postpartum gain and age of dam is indicative of the confounding effect of age with size in that older cows are larger (Table 8). There is more variation in age among pedigree than grade cows.

*Relative contribution of independent factors to reconception*

The regression coefficients, the coefficients of determination ($R^2$) and the significance of regression models used in stepwise regressions are given for breeds and treatments separately and in all combinations in Table 9.

In the individual models for grade and pedigree fed cows (Models 1 & 3) month of previous calving and age of the dam are of overriding importance. The significance of the interaction between month of calving and age ($b_{34}$) shows that in order to reconceive certain age groups had to calve in certain months. In this connection Table 8 reveals the relationship between age and size, so that the influence of age is a measure of size.

All models are highly significant and except for Model 1 ($R^2$ = 43,5%) and Model 7($R^2$ = 41,8%) the coefficients of determination are high, ranging from 61% for the model incorporating both breeds and treatments (Model 9) to 74% for the model in which fed and not-fed pedigree Africanders are combined (Model 6). Except for Models 1 and 3 discussed above, postpartum mass, which is indicative of the postpartum gain a cow will make, postpartum gain, month of calving and age of dam are, in that order, the most important factors affecting reconception.

## Discussion

Several nutrition studies concerned with the relationship between various rates of postpartum gain and reconception have shown that cows which gain mass rapidly subsequent to calving have better reproductive performances than cows making little or moderate gains (Hight, 1968; Wiltbank, 1969). Wiltbank (1969)

**Tabel 1**

*Besetting van Afrikaner- en Jerseykoeie deur middel van KI*

| Ras | Produksiestatus | Aantal diere beskikbaar | Geïnsemineer | | Beset | | |
|---|---|---|---|---|---|---|---|
| | | | Aantal | % | Aantal | % van totaal | %van geïnsem. |
| Afrikaner | V | 252 | 232 | 92,1 | 112 | 44,4 | 48,3 |
| | DK | 350 | 348 | 99,4 | 191 | 54,6 | 54,9 |
| | LKT | 695* | 462* | 66,5 | 274* | 39,7 | 59,3 |
| | LK 1 | 136 | 76 | 55,9 | 39 | 28,7 | 51,3 |
| | LK 2 | 412 | 328 | 79,8 | 202 | 49,0 | 61,6 |
| | Totaal | 1 297 | 1 042 | 80,3 | 577 | 44,5 | 55,4 |
| Jersey | V | 145 | 144 | 99,3 | 107 | 73,8 | 74,3 |
| | DK | 30 | 29 | 96,7 | 22 | 73,3 | 75,9 |
| | LKT | 182 | 165 | 90,7 | 111 | 61,0 | 67,3 |
| | LK 1 | 65 | 56 | 86,2 | 30 | 46,2 | 53,6 |
| | LK 2 | 117 | 109 | 93,2 | 81 | 69,2 | 74,3 |
| | Totaal | 357 | 338 | 94,7 | 240 | 67,2 | 71,0 |

*Lakterende koeie totaal is nie die som van LK 1 en LK 2 nie omrede die eerste jaar se data nie voorsiening gemaak het vir hierdie indeling nie.

**Tabel 2**

*Besetting van Afrikaner- en Jerseykoeie deur middel van natuurlike dekking*

| Ras | Produksie-status | Aantal diere beskikbaar | Beset | |
|---|---|---|---|---|
| | | | Aantal | % |
| Afri-kaner | V | 170 | 162 | 95,3 |
| | DK | 80 | 68 | 85,0 |
| | LKT | 110 | 79 | 71,8 |
| | LK 1 | 18 | 7 | 38,9 |
| | LK 2 | 92 | 72 | 78,3 |
| | Totaal | 360 | 309 | 85,8 |
| Jersey | V | 15 | 11 | 73,3 |
| | DK | 30 | 23 | 76,7 |
| | LKT | 33 | 27 | 81,8 |
| | LK 1 | 30 | 24 | 80,0 |
| | LK 2 | 3 | 3 | 100,0 |
| | Totaal | 78 | 61 | 78,2 |

dieselfde prosedure is 71,0% van die Jerseys wat estrus getoon het, beset. Die besettingsyfer by Afrikanerkoeie wat natuurlik gedek is (Tabel 2) toon 'n sterk ooreenkoms met die persentasie koeie wat as bronstig waargeneem is (sien kolom "Geïnsemineer", Tabel 1). Gevolglik word dit aanvaar dat bronstigheidswaarnemings bevredigend uitgevoer is maar dat daar nog leemtes bestaan in die KI-prosedure by die Afrikaner, waarskynlik ten opsigte van inseminasietyd na waarneming. Die bevindinge van Bisschop (1962) dat ovulasie neig om later plaas te vind by hierdie ras mag hier ter sprake wees en regverdig oorweging van 'n dubbele inseminasie tydens die bronsperiode. Die opvallende beter KI-resultate by die Jersey mag toegeskryf word aan 'n langer en meer opvallende bronsperiode asook die rustiger temperament van die ras. Gegewens dui daarop dat temperament en gepaardgaande spanning, 'n betekenisvolle invloed uitoefen op besetting tydens KI (Daniel & Venkatasami, 1972). Die rede vir die relatief lae besetting van die Jerseys met natuurlike dekking is onverklaarbaar. Die getalle is egter te klein en oor 'n lang periode versprei om 'n afleiding te regverdig.

*Effek van produksiestatus op besetting*

By die Afrikanerkudde het die lakterende koeie (veral eerste laktasie koeie) met beide KI en natuurlike dekking die laagste persentasie totale besetting gehad (Tabelle 1 en 2). Ten opsigte van besetting van die geïnsemineerde diere, is daar min verskil tussen die groepe gevind en wil dit dus voorkom of daar weinig verskil in vrugbaarheid van die bronsperiodes by diere van verskillende produksiestatus is. Word die aantal dosisse per besetting asook besetting na eerste inseminasie (Tabelle 3 en 4) egter in ag geneem blyk dit dat die lakterende Afrikanerkoeie wel maklik beset raak mits die *post partum* anestrus opgehef is. Die relatief lae totale besetting van hierdie groep moet dus toegeskryf word aan die lengte van die anestrusfase en/of die onvermoë om vroeë bronstigheid by hierdie koeie waar te neem. Die swak besettingsresultate met KI by Afrikanerverse, veral as dit in verband gebring word met natuurlike dekking, is onverklaarbaar. Hierteenoor het die Jerseyverse goed presteer met KI terwyl die totale persentasie besetting van die lakterende en droë Jerseykoeie dieselfde tendens getoon het as in die geval van die Afrikanerkudde. Alhoewel die besettingsyfer van die geïnsemineerde Jerseyverse, droë en lakterende koeie min van mekaar verskil, het die lakterende groep tog die swakste gevaar in teenstelling met die resultate van die Afrikanerkudde.

*Besetting met eerste inseminasie*

Die mees opvallende aspek van Tabel 3 is die hoë persentasie konsepsie verkry met eerste inseminasie by die lakterende Afrikanerkoeie. Dit is gevind dat lakterende koeie heelwat later in die dekseisoen hul eerste waarneembare *post partum* estrusperiode vertoon teenoor

**Tabel 3**

*Besetting tydens opeenvolgende inseminasies en dosisse semen nodig per besetting (1967-data uitgesluit)*

| Ras | Produksiestatus | Totaal diere beset | % besetting tydens opeenvolgende inseminasies | | | Aantal* dosisse/besetting |
|---|---|---|---|---|---|---|
| | | | 1ste | 2de | 3de | |
| Afrikaner | V | 70 | 48,6 | 31,4 | 20,0 | 4,71 |
| | DK | 146 | 47,3 | 32,9 | 19,8 | 4,05 |
| | LKT | 241 | 71,8 | 24,5 | 3,7 | 3,30 |
| | LK 1 | 39 | 79,5 | 20,5 | – | 3,26 |
| | LK 2 | 202 | 70,3 | 25,3 | 4,4 | 3,31 |
| | Totaal | 457 | 60,4 | 28,2 | 11,4 | 3,75 |
| Jersey | V | 34 | 67,7 | 23,5 | 8,8 | 3,59 |
| | DK | 22 | 36,4 | 40,9 | 22,7 | 3,41 |
| | LKT | 111 | 55,0 | 33,3 | 11,7 | 3,08 |
| | LK 1 | 30 | 63,4 | 33,3 | 3,3 | 3,40 |
| | LK 2 | 81 | 51,9 | 33,3 | 14,8 | 2,96 |
| | Totaal | 167 | 55,1 | 32,3 | 12,6 | 3,23 |

*Hierdie syfer is bereken deur die totale aantal dosisse semen wat op die kudde gebruik is, te deel deur die aantal diere beset.

**Tabel 4**

*Persentasie besetting na eerste inseminasie*

| Ras | Produksie-status | Aantal in-semineer | Beset na 1ste inseminasie | |
|---|---|---|---|---|
| | | | Aantal | % |
| Afrikaner | V | 132 | 34 | 25,8 |
| | DK | 263 | 69 | 26,2 |
| | LKT | 404 | 173 | 42,8 |
| | LK 1 | 76 | 31 | 40,8 |
| | LK 2 | 329 | 142 | 43,3 |
| | Totaal | 799 | 276 | 34,5 |
| Jersey | V | 40 | 23 | 57,5 |
| | DK | 29 | 8 | 27,6 |
| | LKT | 165 | 61 | 37,0 |
| | LK 1 | 56 | 19 | 33,9 |
| | LK 2 | 109 | 42 | 38,5 |
| | Totaal | 244 | 92 | 34,7 |

droë koeie en verse wat reeds in siklus is met die aanvang van die dekseisoen (Coetzer *et al.*, 1975). Dit volg dus dat die gemiddelde lakterende koei uiters twee waarneembare siklusse voltooi voor die einde van die dekseisoen en sal die verkreë besetting dus noodwendig van hierdie eerste twee inseminasies afkomstig wees.

'n Meer objektiewe beeld van besetting na eerste inseminasie word in Tabel 4 weergegee. Die neiging in Tabel 3 word gestaaf deur die data in Tabel 4 naamlik dat by beide die Jersey en veral die Afrikaner, 'n hoër besetting met eerste inseminasie verkry is by lakterende koeie teenoor droë koeie. By beide rasse het die lakterende koeie ook die kleinste aantal dosisse per besetting benodig. Alhoewel die Afrikanerkudde gemiddeld swakker gevaar het ten opsigte van totale besetting (Tabel 1) het hulle dieselfde prestasie as die Jerseys gelewer met eerste inseminasie. Die lae besetting van Afrikanerverse met eerste inseminasie is moeilik verklaarbaar terwyl die situasie by die Jerseys uiters bevredigend was. Die gemiddelde besetting met eerste inseminasie (34,5 %) is egter heelwat laer soos gevind onder meer intensiewe toestande (David & Cembrowicz, 1971) en beklemtoon dit die probleme van KI onder ekstensiewe toestande.

*Dubbele inseminasie*

Resultate verkry met 'n dubbele inseminasieprosedure word in Tabel 5 aangetoon.

As die besettingsyfers van Tabel 5 vergelyk word met die gemiddeld oor al die jare (Tabel 4) blyk dit dat eersgenoemde 8,7 en 13,2% hoër was vir die Afrikaner en Jersey onderskeidelik. Hoewel die effek van jare nie bepaal is nie, word dit betwyfel of dit 'n groot invloed kon gehad het. Dit is opvallend dat by beide rasse

**Tabel 5**

*Besetting na 'n dubbele inseminasie tydens eerste estrus*

| Ras | Totaal beset 1ste estrus | | Oorsprong van besetting | | | |
|---|---|---|---|---|---|---|
| | | | Eerste inseminasie 12 uur na observasie | | Tweede inseminasie 24 uur na observasie | |
| | Aantal | %van geinsem. | Aantal | % | Aantal | % |
| Afrikaner | 121 | 43,2 | 86 | 71,1 | 35 | 28,9 |
| Jersey | 34 | 47,9 | 24 | 70,6 | 10 | 29,4 |

ongeveer 29 % van die besettings afkomstig was vanaf die tweede inseminasie. Dit bly 'n ope vraag of besetting nie buitendien sou plaasgevind het vanaf die eerste inseminasie nie aangesien dit aanvaar word dat semen vir ongeveer 24 tot 48 uur aktief bly in die geslagskanaal van die koei (Van Rensburg, 1966). Die feit dat 'n verhoogde besetting egter wel verkry is met 'n dubbele inseminasie dui op die moontlikheid dat 'n persentasie van die koeie relatief laat ovuleer onder die genoemde omstandighede.

## Gevolgtrekkings

Die toepassing van KI onder ekstensiewe toestande lewer praktiese bestuursprobleme wat ten nouste gekoppel is aan die sukses van só 'n onderneming. Dit is duidelik dat faktore soos bronstigheidwaarneming, tyd en tegniek van inseminasie, ras en produksiestatus van die koeie, hanteringsfasiliteite, voeding en algemene bestuur almal 'n invloed uitoefen op die resultaat wat verkry word. Tot tyd en wyl meer kennis onder ekstensiewe omstandighede ingewin is, word dit aanbeveel dat 'n dubbele inseminasie tydens eerste estrus toegepas word, dat diere slegs oor twee siklusse geïnsemineer word en dat "opraap" bulle gebruik word om 'n hoë besettingsyfer te verseker. Laasgenoemde faktor is nie slegs om ekonomiese redes essensieel vir die ekstensiewe vleisprodusent nie, maar voorkom ook dat koeie/verse oorslaan en sodoende fisiologiese probleme ontwikkel wat die reproduksieprestasie van die kudde mag benadeel.

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