

The use of relationship matrices to avoid inbreeding in small horse populations

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Computer programs have made it possible to calculate exact inbreeding for all animals in a population through large numerator relationship matrices. As all off-diagonal elements of such a matrix can be calculated as functions of diagonal elements, the capacity of inbreeding and relationship calculations has been largely increased and can easily handle 40 000 animals.

This method has been used in the three native Norwegian horse breeds, *Døle-horse*, *Fjord-horse* and *Nordland-horse*, to calculate complete inbreeding coefficients for 37 641, 18 882 and 218 animals in the three breeds, respectively. The results are given in the text.

The practical applications of the knowledge of complete inbreeding and relationship in a breed is discussed in relation to the possibilities of to some extent avoiding inbreeding in small horse populations. As the selection criteria often are not well defined, some of the selection policy could easily be attained to the inbreeding problem.

Breeding problems in the Friesian horse

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The Friesian horse has been bred pure for a hundred years and no fresh blood has ever been introduced. This stud was during the last 30 years threatened by many setbacks. In 1971 the use of A.I. led to the discovery of breeding problems in mares and stallions and then on inventory of these problems was begun.

Dwarf-foalism was estimated in about 5-10 % in the offspring of carriers. Carriers were never selected against as dwarffoalism is not considered a serious threat to the breed; most of these carriers have more favourable qualities.

Since 1972 it is compulsory for young stallions to have a sperm examination before they are admitted to the stud.

The inbreeding coefficient of disqualified stallions during the period 1972 to 1977 was high (0.332; $n = 23$).

During the period 1977 to 1981 we found for the inbreeding coefficient of the same category stallions 0.268 ($n = 81$).

The figures for the first, respectively second group of approved stallions were 0.212 and 0.158.

Selection on sperm quality and on degree of inbreeding did not fail to produce results in the second group of stallions.

Cryptorchism on one or both sides was found significantly more often in stallions from strongly inbred bloodlines up till 50 % of the 2,5 year old stallions.

In a dozen of cases aplasia or hypoplasia of parts of the sexual organs of stallions was found (0.278).