

PROSPECTS FOR BREEDING SHEEP RESISTANT TO WIRE WORM
(*Haemonchus contortus*)

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A study was done by the Grootfontein Agricultural Development Institute to develop a protocol for the evaluation of internal parasite resistance of breeding sires, which are bred in the extensive sheep grazing areas of South Africa where the natural infection of wireworm (*Haemonchus contortus*) is limited. Animals from the Carnarvon Afrino flock was used for the study.

There are not many parameters or traits that can be used as phenotypic indicators of host resistance against internal parasites. Those that are available (faecal egg counts, degree of anaemia and other blood parameters) all have pros and cons that influence their suitability as selection criteria for host resistance. The parameters evaluated in this study were faecal egg counts and FAMACHA[®]-score. A differentiation should be made between increasing host resistance in the current flock by means of, for instance selective drenching and culling of repeatedly infected individuals on the one hand, and on the other hand, trying to improve host resistance in a flock by introducing genetically resistant sires into the flock. Identifying the latter, i.e. sires that will be genetically resistant to internal parasites in any environment, is the issue that was dealt with in this study.

The artificial challenge test was done on the lambs at Carnarvon between the ages of five to nine months. Experimental animals for the artificial challenge were drenched daily with Levamisole at 15 mg/kg live weight for two consecutive days before artificial infection to ensure that they were free from natural *H. contortus* infections. The animals were then infected with 4000 to 6000 third stage *H. contortus* larvae, administered in three equal doses over three days. Twenty-eight days after artificial infection, faecal egg counts (FEC) and FAMACHA[®]-score (FAM) were done for each animal.

It was also evaluated in practice whether the progeny of sires with high breeding values for resistance under extensive conditions (Carnarvon), expressed this resistance under conditions of higher parasite challenge. For this part of the study, 40 Afrino ram lambs from the Carnarvon Afrino flock, progeny of sires with high and low breeding values for resistance (estimated from artificial challenge), were annually transferred to Potchefstroom at 12 months of age from September 2003 to September 2007. At Potchefstroom, these lambs were kept on pastures for eight months. During this period, resistance of the animals was evaluated through several natural challenge tests.

From the results of the various tests, it was evident that there is a large variation in FEC between animals within a specific test. Perhaps even more important than the actual FEC reached during challenge is the number of animals with zero or undetectable FEC's, as it is not possible to discriminate between animals with zero egg. It is not possible to estimate accurate breeding values for FEC when the true differences among individuals could not be measured. It was also evident that the range between the highest and lowest breeding values for FEC was wider for sires used in those years when average FEC's of the specific challenge tests were higher and there were less individuals with zero FEC. The heritability estimates obtained for artificial and natural challenge FEC in this study were 0.22 and 0.19, which is similar to estimates found in other countries.

The FAMACHA[®]-technique enables quick detection of anemic individuals that may require drenching. As most sheep are not drenched, they still pass eggs from susceptible worm strains and the selection for resistance to anthelmintics should be considerably slowed down.

From the correlations estimated in this and other studies it seems that selection for increased host resistance within a flock would have no detrimental effect on any of the economically important production (body weight and wool) and reproduction traits.

Prospects for developing a protocol to evaluate sires born in the extensive sheep grazing areas in terms of host resistance against internal parasites do not look promising if the results of this study are considered. Correlations estimated between FEC under artificial challenge in Carnarvon and FEC of progeny of these sires under more favourable conditions at Potchefstroom with natural challenge, are very low. Even the correlations between FEC of the same animals at Carnarvon and at Potchefstroom were very low.

If host resistance should be included as a trait in the selection programme, the FEC test should be done at a specific time. Age of the lambs should be between weaning and 12 months of age. However, *H. contortus* is a summer parasite, therefore there is a limit in terms of the period when the tests can be done. In practice, it could be done between January (weaning) and April/May. During the next summer, the lambs would already be beyond selection age.

For the purpose of developing a protocol to evaluate breeding values for resistance of sires born in the extensive sheep grazing areas, the natural challenge procedure will definitely not be an option. This is largely due to the low and unpredictable rainfall, with the resultant variable parasite challenge, which makes this procedure unreliable for use at a specific time each year.

Furthermore, using breeding values for parasite resistance based on the FAMACHA[®]-technique will also not be feasible for the evaluation of breeding sires in the extensive areas. The reason for this is that the recording period is too long before differences between animals are expressed. Furthermore, employing the FAMACHA[®]-technique after natural challenge is unfeasible, as mentioned above. To employ the FAMACHA[®]-technique after artificial challenge would be unpractical, as faecal egg counts can already be recorded on day 28 after infection, after which the test can be finished. The data collected during this study, however, confirm that the FAMACHA[®]-technique is an excellent management tool to identify animals that need anthelmintic treatment and for increasing host resistance in the current flock by means of selective drenching and culling of repeatedly infected individuals.

For the purpose of developing a protocol to evaluate sires born in the extensive sheep grazing areas, FEC after artificial challenge procedure should be the best option as selection criteria for resistance against internal parasites. Further investigations should however to done before this can be implemented in practice.