

# HOMOGAMETIC HETEROSIS IN CROSSBREEDING EXPERIMENTS WITH SHEEP

M. H. FAHMY

Canada Department of Agriculture, Research Station, Lennoxville, Quebec.

Received August 15, 1969, accepted March 2, 1970.

## ABSTRACT

Data from two crossbreeding experiments with sheep were analyzed to test the difference in heterosis between males and females in the  $F_1$ , backcross, and three-breed crosses. The characters studied were birth and weaning weights and preweaning daily gain. In the  $F_1$ , no marked differences in heterosis in weaning weight and preweaning gain were observed between sexes while in birth weight the two experiments gave conflicting results. In backcrosses and the three-breed crosses, females showed higher heterosis than males

in the three characters studied. The ratios of heterosis in males to that in females did not support the hypothesis that differences between sexes in heterosis are due to the action of the sex chromosomes. The results of the two experiments suggested a possible interaction between the  $X$  and  $Y$  chromosomes of different breeds. The results in general did not give good evidence of homogametic heterosis in crossbreeding experiments with sheep.

## RESUME

On a analysé les résultats de deux expériences de croisement avec les moutons, afin de vérifier la différence d'hétéroïse entre les mâles et les femelles d'un premier croisement ( $F_1$ ), d'un rétro-croisement et d'un croisement de trois races. L'étude a porté sur les poids à la naissance et au sevrage et le gain quotidien avant le sevrage. Dans le premier croisement il n'y a pas eu de différence d'hétéroïse marquée dans le poids au sevrage et le gain avant le sevrage entre les deux sexes, tandis que dans les deux expériences, le poids à la naissance a donné des résultats contradictoires.

Dans le rétro-croisement et le croisement de trois races, les femelles ont montré un hétéroïse plus élevé que les mâles pour les trois critères étudiés. Le rapport entre mâles et femelles ne semble pas attribuer les différences d'hétéroïse à l'action des chromosomes. Les résultats des deux expériences font voir une interaction possible entre les chromosomes  $X$  et  $Y$  des différentes races. En général, les résultats n'ont pas donné une bonne preuve d'hétéroïse des homogamètes dans les expériences de croisement de moutons.

## INTRODUCTION

Homogametic heterosis is a hypothesis suggested by Stonaker (16) to explain the greater amount of heterosis found in the weaning weight of females (15%) as compared with that of males (8%) in crossing inbred lines of Hereford cattle. The hypothesis explains the difference in heterosis between sexes as a result of the differences in sex chromosomes and is supported by reports of other work (2, 3, 7, 18) on the Hereford breed during the preweaning period.

Brinks *et al.* (2) presented an alternative hypothesis to explain the greater heterosis of the female. They showed that the same genotypes may show a differential response in an environment that is actually different for the two sexes in proportion to their potential for growth. They added that if their interpretation is correct, the magnitude of the differential sex response to inbreeding or heterosis would depend on the level of environment to which the animals are subjected.

The results of crossbreeding experiments with beef cattle (4, 19), sheep (10, 14, and W. R. Harvey, 1962, personal communication cited in 16), swine (12) and mice (20) showed that either the differences between the two sexes in heterosis were nonsignificant or inconsistent in the different traits, or that males showed higher heterosis. Fahmy (5) reported markedly higher heterosis in body weight and seven body measurements for female than for male crossbred yearling sheep.