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THE INHERITANCE GROWTH AND JUMPING IN SUBSPECIFIC CROSSING OF MICE

ABSTRACT

The small size of Yonakuni wild mice (Y. *Mus Musculus molossinus yonakuni*, about 14 g) and the large size of laboratory mouse CF#1 (C. *Mus musculus domesticus*, about 40 g) were used in a series of experiments of subspecific crossing to study the inheritance of growth and jumping. The other two laboratory mice designated C3H/HeNCrj (H) and C57BL/6NCrj (B) were added as materials in the 4x4 diallel cross study for body weight. Inheritance of the traits were also examined in two- and three-way rotational crossing.

Gompertz, Logistic and the other five growth curve functions were compared to five growth curve functions were compared to fit growth data. The Koops's triphasic function was the best fit according to the highest of adjusted coefficient of determination ($AdjR^2$) of 0.999. Reciprocal crossing between C and Y was conducted to evaluate the genetic effects on body weight. Litters were standardized to six mice at birth, three males and three females, and the first litter used only. Average direct genetic effects were larger than average maternal genetic effects in contributing effects accounted for 61 to 96 % and 35 to 92 % of total variance for 1 to 7% for males and 3 to 23% for males. This means that prenatal maternal effects had a greater influence than postnatal maternal effects in contributing to variation of body weight.

From 4x4 diallel cross experiment, C male x C female (CXC) ranked the highest in body weight at all ages studied (Wk1, Wk3, Wk6 and Wk10) followed by HxH, BxB and YxY. Heterosis effects were 6.5%, 10.22%, 8.70% and 5.89% for the respective ages. Degree of general combining ability (GCA) and maternal genetic effects (MGE) can be ranked as C>H>b>Y. Crossing between C and had a greater specific combining ability (SCA) than other combinations, whereas BxY had the smallest. Linebred had the highest effects on body weight, followed by GCA heterozygosity, MGE and SCA.

Inheritance of jumping, as a measure of vigor, due to DC-electric-shocking was analyzed in reciprocal crossing between C and Y. The ratio between jumping and non jumping mice (J:NJ) for C was 0%:100% whereas Y was 68% : 32%. The F1 and F2 from Y male H C female showed 65%:35% and 51% "49% respectively; while reciprocal F1 and F2 from C male Y female demonstrated 100%"%, respectively. No differences were found in average height of the first three jumping of Y, the first and second generations, ranged from 16.8 to 20.1 cm. The distribution of jumping height showed a tendency to be a normal distribution. The jumping activity and jumping height may be affected by some major genes and polygenes, respectively. Three-way rotational crossing tended to maintain higher heterosis effects of body weight, but resulted in lower heterosis effects of jumping height, in which these results in contrast to two-way rotational crossing.