

## PREDICTION OF PROGRESS FROM SELECTION ON NON-NUCLEAR GENES\*

by

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The inheritance of quantitative characters depends on nuclear and cytoplasmic genomes. Mendelian inheritance is attributed to nuclear DNA and cytoplasmic inheritance is attributed to mitochondria and chloroplast DNA. Mitochondria and chloroplast DNA are maternally inherited. The expression of quantitative characters and the heritability depend on nuclear, cytoplasmic, and nuclear-cytoplasmic interaction effects and variances. The knowledge of contributions to genetic variances and covariances among relatives from cytoplasmic and nuclear-cytoplasmic interactions can be used to increase the accuracy of prediction of response to selection of plants and animals. Considering a diploid nuclear genome and a haploid cytoplasmic genome, a model was developed for cytoplasmic effects and nuclear-cytoplasmic interactions effects in addition to the nuclear effects for a random mating population. Then the model was utilized to predict the progress from selection on nuclear and cytoplasmic genes and their interactions. Finally, modification of reciprocal mating designs in order to estimate cytoplasmic and nuclear-cytoplasmic interactions variance components was investigated.

KEY WORDS: Cytoplasmic inheritance-Heritability-Offspring and mother covariance-Modified reciprocal mating designs