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THEORETICAL GAIN OF S_2 FAMILY SELECTION

KEMAJUAN TEORITIS SELEKSI FAMILI S_2

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INTISARI

Kemajuan teoritis seleksi famili S_2 dijabarkan lewat regresi frekuensi gen terhadap nilai genotipe mengikuti prosedur yang digunakan oleh Empig et al. *(1972).*

Kata kunci : kemajuan seleksi teoretis,seleksi famili S_2.

ABSTRACT

Theoretical gain of S_2 family selection is derived using regression of gene frequency on genotypic value following Empig *et al.* (1972).

Keywords : theoretical selection gain, S_2 family selection.

INTRODUCTION

Empig *et al.* (1972) have derived theoretical gains of various intra-population as well as inter-population improvement schemes using regression of gene frequency on genotypic value. Though gain of S1 family is also derived, gain of S_2 family selection is not included, though S_2 family selection is also in practice [see, for example, Russell and Eberhart (1975)].

Different approach, using covariance of X (selection unit) and W (improved population), is used by Hallauer and Miranda (1981) to get selection gain, including that of S_2 family selection. Covariance is obtained from resemblance between relatives having special relationship. Doubling is required if selection is for both sexes. In contrast to the later approach, coefficients of the various genetic parameters in the first approach are straightforward from the derivation. The objective of the present short note is to show the derivation of theoretical gain of S_2 family selection following Empig *et al.* (1972).

THEORETICAL DEVELOPMENT

From a Hardy-Weinberg population, S_2 families are generated. For one locus model with two alleles B and b which frequencies respectively are p and $q = 1-p$, the pertinent information is shown in the following Table 1.

Since mean B frequency in the population is p, and mean genotypic value of S_2 families is $m = a(p-q)+½pqd$, then the covariance of interest, covariance between B frequency and genotypic value of S_2 families is

$$= (p^2+½pq)\,a + ¼\,pqd - p\,[\,a\,(p-q) + 2pqd\,]$$
$$= pq\,[\,3/2a + ¼\,(q-p)d\,]$$

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Table 1. Genotypic values and frequencies of S_1 and S_2 families from a population in Hardy-Weinberg equilibrium for single locus with two alleles.

Base population		S_1 family		S_2 family		
Genotype	Freq.	Genotype	Freq.	Genotype	Freq. of B	Genotypic value
BB	p^2	*BB*	p^2	*BB*	1	*a*
Bb	*2pq*	*BB*	½*pq*	*BB*	1	*a*
		Bb	*pq*	*BB* *Bb* *bb*	½	½*d*
		bb	½*pq*	*bb*	0	*-a*
bb	q^2	*bb*	q^2	*bb*	0	*-a*

As $\frac{d\mu}{dp} = 2[a+(q-p)d] = 2a,$

with selection differential *S* then the gain for S_2 selection is

$$\Delta G = \frac{S}{\sigma_{S2}} 2pqa\,[3/2\ a + ¼\,(q-p)\,d]$$

$$= pq\,[3a^2 + 7/2\,(q-p)ad + ½\,(q-p)^2 d],$$

the same results mentioned in Hallauer and Miranda (1981, p. 176). However, the above result is straight from the derivation, while in Hallauer and Miranda (1981) it is obtained after multiplying by two, as selection is for both sexes.

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