INHERITANCE OF PROTEIN CONTENT IN PEAS. IVa. ANALYZING PROTEIN CONTENT BY THE HALF-SEED TECHNIC

Swiecicki, W. K., Plant Experiment Station, Wiatrowo, Poland
Z. Kaczmarek, and M. Surma Institute of Plant Genetics, Poznon, Poland

Studies reported earlier (PNL 12:67-69), provided us with some information about the mode of inheritance of protein in pea and led to several observations essential for further studies. The necessity of analyzing the protein content of individual seeds in order to increase the precision and effectiveness of selection was discussed. Since, however, protein analysis is a destructive process we attempted to apply a half-seed technic. The estimation of protein content in one half and the possibility of getting a plant from the other half would allow us to define the mode of inheritance of protein together with elements of structure of yield.

Prior to conducting full-scale investigations we decided to check the protein content estimated in a half seed with an embryo and in a half seed without an embryo, both in comparison with the protein content of a whole seed. Moreover, two methods of analyzing protein content (the Foss-Electric automatic nitrogen analyzer and the standard Kjeldhal's method), were compared for speed and precision. Both methods proved to be nearly equal with respect to speed of analysis. However, the automatic analyzer requires a smaller sample (0.5g) than the micro-Kjeldahl method (O.lg) and titration is automatic in the former method.

The seeds of 20 plants of line WT 3527 were analyzed. Forty seeds from each plant were divided into two parts, one half for estimation by the analyzer and the other half by the micro-Kjeldahl method. From each 20 seeds 10 were analyzed for protein as whole seeds and the remaining 10 as half seeds, some with and some without the embryo (Table 1).

Table 1. Average content of % protein in whole seeds and half-seeds estimated by Foss-electric and micro-Kjeldahl.

Method of analysis	Condition of seeds: Whole seed	Half seed: With embryo	Half seed: Without embryo	Mean
Micro-Kjeldahl	21.3	21.2	20.8	21.1
Foss-electric	21.3	21.7	21.1	21.4
Mean	21.3	21.4	20.9	

The results of analyses made by different methods are very close, both with respect to the average protein content and to the variability of individua samples.

The protein content in halves without embryos was lower (0.4-0.6%) than LII halves with embryos or in whole seeds. The difference, though very slight, was statistically significant. In order to estimate the protein content of a whole seed on the basis of analysis of a half with and without an embryo, it was necessary to compute a curvilinear regression. This provided a linear correlation among the tested kinds of seeds, the degree of dependence being defined by coefficients of correlation given in Table 2. Slight differences

in average protein content in halves and in whole seeds as well as the linear nature of correlation between them suggest the possibilities of using results of analyses of protein content in halves of seeds without embryos in genetic and selection work.

Table 2. Coeffecients of correlation between % protein content in whole seed and half seed.

Condition of seeds	Whole seeds	Half seeds	
		With embryo	Without embryo
Method of analysis	Foss-electric	Micro-Kjehldal	
Whole seeds		0.816**	0.765**
Half seeds:			
With embryo	0.737**		0.935**
Without embryo	0.833**	0.890**	

** - significance on the level $\alpha = 0.01$