QUANTITATIVE DETERMINATION OF EXTRACTABLE PROTEINS FROM PISUM SEEDS AND PODS DURING DEVELOPMENT

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As pea seeds ripen, changes occur in the rate of protein deposition and in the type of protein synthesized. The mother plant provides the carbonaceous and nitrogenous nutrients for the biosynthesis of the storage proteins in the seeds. The nitrogenous substances are not translocated directly to the seeds but are in part stored in the pods as protein, which is then broken down and transferred to the developing seeds.

In this experiment., protein content was determined at eight stages of pod and seed development in var. 'Dippes Gelbe Viktoria' in order to follow the changes in protein concentration (% of dry weight) and content (mg) during development. Based on their characteristics of solubility, the extracted proteins were divided into albumins and globulins from seed and into water soluble (wsp) and water insoluble proteins (wip) from pods.

Results are given as percentage of dry weight (Fig. 1a, 2a) and mg per pod (Fig. 1b), as well as mg protein of seeds per pod (Fig. 2b).

The protein content of the pods alone, expressed as percentage of dry weight, decreased continuously during seed ripening (Fig. 1a). However, the real or absolute protein content of the pods (mg protein/pod) at fir:;t increased, then reached a maximum, and finally declined (Fig. 1b). The initial decrease in percentage protein was dependent upon the growth of pods, which showed a rapid increase in dry weight. Later the reduction in percentage protein was attributable to a diminution in total protein. Water soluble and water insoluble proteins followed a similar trend, but the water insoluble proteins represented an insignificant fraction of the total at all stages of development (Fig. 1b).

In the case of seed protein, expressed as percentage of dry weight, the concentration declined in the early stages of development; thereafter, it increased considerably (Fig. 2a). Total seed protein, calculated with regard to the number of seeds per pod, increased steadily from the first stage of development (Fig. 2b). The major protein synthesis did not begin until after the lowest value of percentage protein had been reached (stage e). From that time on, the protein accumulation contributed substantially to the increase in dry weight. The concentration of globulins was lower in the last stage of development, just as was total protein, whereas albumin increased continuously. In the early stages the albumins represented the main fraction, but in dry seeds the globulin content was 1.3-fold higher.

From these results it would appear that the onset of massive protein synthesis in the seeds is correlated with the reduction of total protein content in the pods.

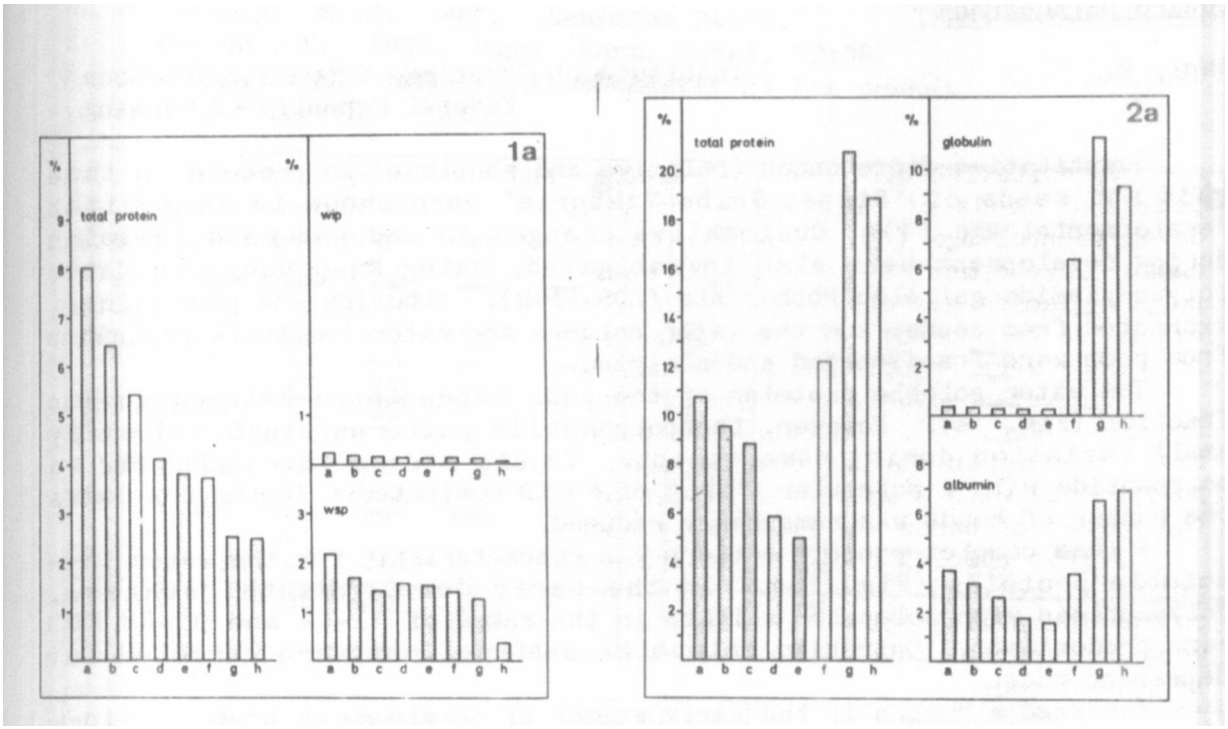

Fig. 1. Protein content of pods without seeds at eight stages of development (a-h).
(a) percentage of dry weight (b) mg protein per pod

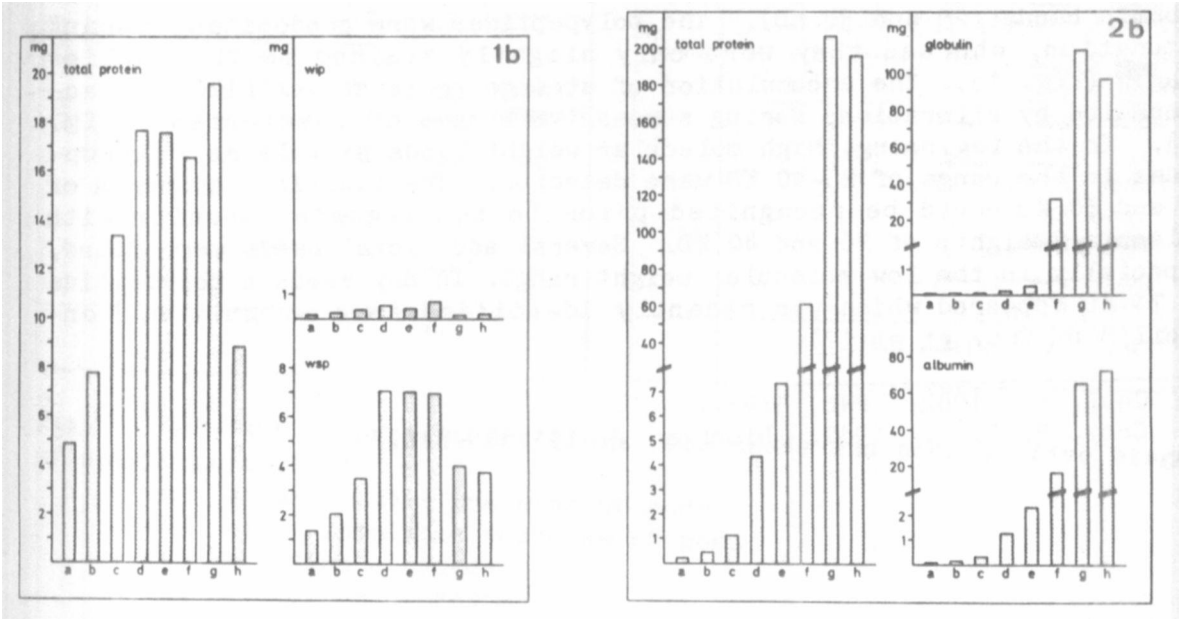

Fig. 2. Protein content of seeds at eight stages of development and ripening (a-h)
(a) percentage of dry weight (b) mg protein of seeds per pod