

THE DISTRIBUTION OF THE ENZYMES IN RESTING CEREALS

III. THE DISTRIBUTION OF ESTERASE IN WHEAT, RYE, AND BARLEY*)

by

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Little is known about the lipolytic enzymes in grain. PETT¹ has studied the hydrolytic activity towards methylbutyrate as a measure for the lipase activity in wheat. He dissected the seeds and investigated bran, endosperm, scutellum, cotyledon and radicles separately. We repeated his investigations with wheat, rye and barley using the same technique as was employed in our previous studies (ENGEL² and ENGEL AND HEINS³), which made it possible to investigate the aleurone layer separately.

EXPERIMENTAL

Material as in our previous studies. Sampling and histological technique as described by LINDERSTRØM-LANG AND ENGEL⁴ and ENGEL².

The determination of the esterase activity was carried out according to GLICK⁵, which method was also used by PETT (l.c.).

For a single determination 4 slices were used which were added to a 17.5 μ l drop of water. With a semi automatic pipette methylbutyrate-buffer solution was added and after 24 hours hydrolyses at 40° C the mixture was titrated with N/20 HCl. The same experiment was carried out without methylbutyrate. The enzyme activity was calculated and expressed as μ l N/20 HCl per μ l of tissue per 24 hours.

RESULTS AND DISCUSSION

In Fig. 1 the results from a series of experiments with slices of the outer layers of the wheat grain are given. In the aleurone cells the amount of esterase is 10 to 20 times higher than in the endosperm. Separate determinations on the inner endosperm gave values of 1 μ l N/20 HCl. In contrast to PETT's findings there was in our case no autolysis. The figure for rye was similar to that obtained on wheat and has therefore not been presented. In barley there was very considerable autolysis, making an exact determination of esterase activity impossible.

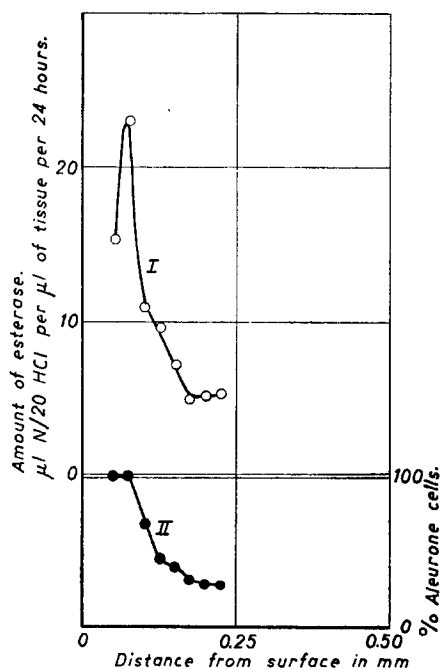


Fig. 1. The distribution of esterase in the outer layers of the grains of Manitoba wheat.

Curve I esterase activity.

Curve II percentage of the aleurone cells in the sections.

* For II, see CHR. ENGEL and J. HEINS, *Biochim. Biophys. Acta*, 1 (1947) 190.

In the germ part of the grain determinations were carried out on ground whole germs, and results are presented in Table I.

TABLE I

THE ESTERASE CONTENT OF THE GERM OF WHEAT AND RYE EXPRESSED AS μl N/20 HCl PER μl OF TISSUE PER 24 HOURS

	Wheat Manitoba	Wheat Juliana	Rye Petkus
Total hydrolysis . . .	29.3	52.1	96.0
Autolysis	13.9	13.2	25.4
Enzyme activity . . .	15.4	38.9	70.6

In the germ a rather high rate of autolysis was found, but in addition the enzyme activity towards methyl butyrate is considerable.

SUMMARY

The distribution of esterase activity in cereal grains has been investigated. The aleurone cells and the germ part of wheat and rye grains are rich in esterase. It was not possible to carry out the esterase determinations in the aleurone layer of barley.

The amount in the endosperm was in all cereals under investigation negligible.

RÉSUMÉ

La distribution de l'activité de l'estérase dans les grains de céréales a été étudiée. Les cellules d'aleurone et la partie germinative des grains de blé et de seigle sont riches en estérase.

Il ne nous a pas été possible de déterminer l'estérase dans la couche d'aleurone de l'orge.

La teneur d'estérase dans l'endosperme de toutes les céréales étudiées était négligeable.

ZUSAMMENFASSUNG

Die Verteilung der Esterase-Aktivität in den Körnern der Getreide-arten wurde untersucht.

Die Aleuron-Zellen und der Keim des Weizen- und Roggenkorns sind reich an Esterase.

Es ist nicht möglich gewesen, die Esterase in der Aleuron-Schicht der Gerste zu bestimmen.

Der Esterase-Gehalt im Endosperm der untersuchten Getreidearten war sehr gering.

REFERENCES

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- ⁵ D. GLICK, *Z. Physiol. Chem.*, **223** (1934) 252.

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