Untersuchungen an Aspergillus niger van Tiegh.über Zinkaufnahme und Aktivitätsveränderungen einiger Enzyme bei Zinkmangel

Author(s):
Geser, Günther

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Von der

EIDGENÖSSISCHEN TECHNISCHEN HOCHSCHULE IN ZÜRICH

zur Erlangung

der Würde eines Doktors der technischen Wissenschaften

genehmigte

PROMOTIONSARBEIT

Vorgelegt von

Günther Geser

dipl. Ing.-Agr. ETH

von Waldkirch (SG)

Referent: Herr Professor Dr. L. Ettlinger

Korreferent: Herr Professor Dr. H. Deuel

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Summary

The exact time of zinc uptake by *Aspergillus niger* was established with the help of Zn^{65} as tracer.

As soon as the conidia come in contact with zinc containing nutrient solution they take up zinc in considerable amounts until the stage of conidia swelling is completed. The zinc uptake is very small during the sprouting of the germtube. From the beginning of the real growth of mycelium the zinc uptake by the fungus approximately parallels the increase in mycelium dry weight.

Zinc deficient and normal mycelium (submerged culture) was homogenised and the soluble cell extract was fractionated by gel filtration with Sephadex G-25.

The zinc compounds in deficient mycelium are soluble in phosphate buffer to a greater extent than the zinc compounds of the normal mycelium. The high molecular fraction of the cell extract is greater in zinc deficient than in normal mycelium. Considering the zinc content of the cell extract, the low molecular fraction of the normal mycelium is greater than that of the deficient mycelium. However, in relation to the total zinc content of the cell, there is no difference in the low molecular fraction between the deficient and normal mycelium.

The activity of some enzymes involved in glucose degradation, citric acid cycle, and glyoxylic acid cycle in cell extracts of deficient and normal mycelium was also determined.

In glucose degradation according to the Embden-Meyerhof pathway, there is a bottleneck due to the strong inhibition of fructose-1,6-diphosphate aldolase in zinc deficient mycelium, as was already found by BERTRAND and DE WOLF (1959).

In pentose phosphate cycle, the activity of 6-phosphogluconic acid dehydrogenase is increased due to the zinc deficiency. The glucose-6-phosphate dehydrogenase is inhibited due to the zinc deficiency. However, the stronger the inhibition of fructose-1,6-diphosphate aldolase the weaker is the inhibition of glucose-6-phosphate dehydrogenase, and vice versa. Probably, more glucose is oxidized through the pentose phosphate cycle in zinc deficient mycelium than in normal mycelium.

A degradation of glucose according to the Entner-Doudoroff pathway could not be detected.

In the citric acid cycle, zinc deficiency increases the activity of aconitase, but decreases the activity of the isocitrate dehydrogenases and of fumarase.

The activity of isocitratase, the enzyme opening up the glyoxylic acid cycle, is slightly increased due to zinc deficiency. Zinc deficiency does not affect the capacity for induced formation of this enzyme due to changes in the constitution of the nutrient solution.

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