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THE INFLUENCE OF TIME AND TEMPERATURE ON THE PRODUCTION OF INDOLE-3-ACETIC ACID

BY *Rhizopus sinuatus*

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ABSTRACT

Nielsen extracted heteroauxin from the mold *Rhizopus sinuatus* and its substrate in 1930. This substance, which he termed "Rhizopin", had pronounced growth-promoting activity in plants, causing elongation and in certain cases, root formation. When this substance was purified by solvent extraction and distillation under vacuum, the resulting product was identical with indole-3-acetic acid.

The purpose of this investigation was to determine the effect of the two factors, time and temperature, on the production of heteroauxin by *Rhizopus sinuatus*, Nielsen.

The amount of indole-3-acetic acid was determined with the standard Went Avena assay technique described by the author in a previous report in this journal. Went found that within certain limits the amount of oat coleoptile bending induced by the unilateral application of agar blocks containing the plant hormone was directly proportional to the amount of heteroauxin present. Shadowgraphs of these coleoptile curvatures were later measured with a protractor to determine the angle of curvature induced. The fungus was cultured in 10 cm. petri dishes each containing 18 c.c. of a sterile nutrient agar composed of:

MgSO ₄ ·7H ₂ O	M/400
KH ₂ PO ₄	M/220
peptone	0.7 per cent
dextrose	M/9
agar	1.7 per cent
a trace of ferric tartrate.	

After aseptic inoculation, the cultures were incubated at 28° C., 22° C., or at 16° C. for periods of time varying from 2 to 20 days. Initial, progressive and final acidity measurements were made on the contents of 2 petri plates, after expression with a hydraulic press. Duplicate plates were used each time for dry weight determinations of the fungus mat after drying to constant weight at 100° C. Another set of 10 duplicate plates was removed each time for extraction of the indole-3-acetic acid. This was accomplished by grinding three times in 25 c.c. aliquot portions of acidified water. The extract was removed each time by filtering with suction, and the filtrate extracted three times with ether. The ether was removed by heating and the residue taken up in pH 7.6 buffer and stored

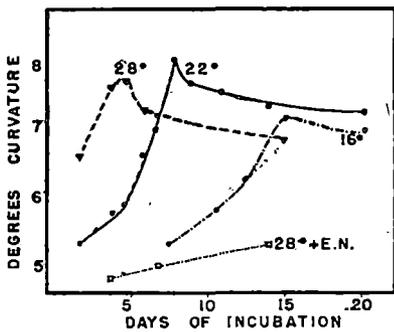


FIG. 1

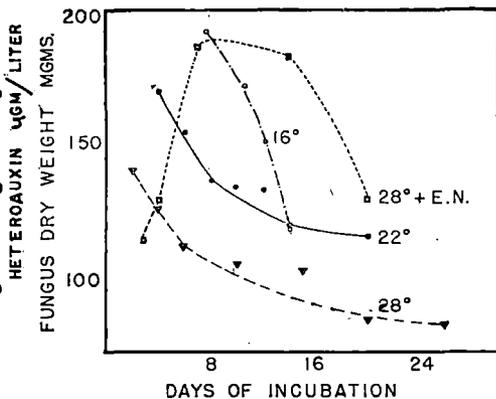


FIG. 2

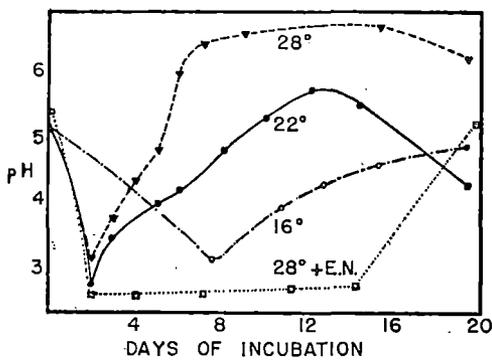


FIG. 3

in the cold until the *Avena* assay could be made. Comparison of the amount of oat coleoptile curvature induced by these extracts with that induced by a known concentration of synthetic indole-3-acetic acid afforded a measure of the amount of this substance produced by *Rhizopus*. The results of heteroauxin assays, dry weight determinations, and pH measurements are shown in Fig. 1, 2, and 3 respectively. They show that within the limits of the experimental conditions, that the warmer the temperature, 1. the sooner the maximum amount of indole-3-acetic acid is produced, 2. the sooner the dry weight of the fungus decreases, probably as a result of autolysis, and 3. the sooner the acidity decreases. It is evident from the study of the graphs that the rapid formation of indole-3-acetic acid is coincident with the onset of autolysis as evidenced by decreased dry weight and decreased acidity. Klotz has shown that the decrease in acidity is the result of the liberation of ammonia and other basic compounds in autolysis. Increasing the dextrose concentration to M/5.5 in one experiment and incubating the cultures at 28° C. resulted in delayed autolysis and delayed acidity decrease as well as delayed formation of heteroauxin. This extra nutrient experiment is designated as 28°—E.N. on the graphs. In the dextrose M/9 experiments the maximum amount of heteroauxin formed at the different temperatures is relatively the same. There is evidence of a small amount of destruction of indole-3-acetic acid after the maximum is attained.

LITERATURE CITED

- Klotz, L. J. Some aspects of nitrogen metabolism in Fungi. *Ann. Mo. Bot. Garden*, **10**: 364, 1923.
- Nielsen, N. Untersuchungen über einen neuen Wachstum Regulierenden Stoff: Rhizopin, *Jahrb. Wiss. Bot.*, **73**: 130, 1930.
- Rabideau, G. S., Wang, K. W., and Abbe, E. C., The hormone content in maize in relation to the degree of heterosis, *Proceedings of the Minnesota Academy of Science*, **12**: 49, 1944.
- Went, F. W., and Thimann, K. V., *Phytohormones*, MacMillan Company. New York, N. Y., 1937.

THE EFFECT OF SMOKING CIGARETS ON
NORMAL PERSONS*GRACE M. ROTH
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ABSTRACT

This investigation was begun primarily to determine whether habitual smokers with normal blood pressure and pulse rate and normal vascular systems develop a tolerance to tobacco or demonstrate any physiologic changes as a result of smoking. Vasoconstriction in these subjects was evidenced by a decrease in the skin temperature of the extremities and an increase in blood pressure and pulse rate during smoking of two standard cigarettes. An increase in the basal metabolic rate and changes in the electrocardiographic tracings also took place. The blood pressure, pulse rate and electrocardiographic tracing were normal within five to fifteen minutes after the smoking ceased, while the peripheral vascular constriction, as evidenced by a decrease in skin temperature, persisted from a half to one hour.

While most individuals smoke when sitting or walking, few observations have been made under these circumstances. However, we found the same degree of vasoconstriction in our subjects who were fully clothed during the smoking of two cigarettes while sitting or walking slowly as when they were at rest under basal conditions.

Since vasoconstriction was not evident during the puffing of an unlighted cigarette, and during smoking corn silk cigarettes, the mechanical effort of smoking was not a factor in the production of vasoconstriction. Also we found that various cigarette papers were not a factor in the production of vasoconstriction. This leaves the absorbed products of the tobacco to be accounted for. We had the opportunity of observing the effects of nicotine alone. We confirmed the observation of Maddock and Coller and of Moyer and Maddock in regard to the peripheral vasoconstriction as evidenced by the decrease in skin temperatures and an elevation of blood pressure and pulse rate produced by both smoking of standard cigarettes and by a similar amount of nicotine injection intravenously. Likewise the effect of smoking standard cigarettes and the intravenous injection of a similar amount of nicotine on the electrocardiographic tracings of these subjects was strikingly similar.

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OXYGEN EVOLUTION AND ACID FORMATION BY ILLUMINATED CHLOROPLAST SUSPENSIONS *

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* Published in Archives of Biochemistry, 9: 25, 1946.

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A WATER SOLUBLE FACTOR INVOLVED IN OXYGEN PRODUCTION BY ILLUMINATED CHLOROPLAST FRAGMENTS

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ABSTRACT

Chloroplasts when exposed to supersonic vibrations and centrifuged at high speed gave a dark green solution of disintegrated chloroplasts. This proved to be photoactive in ferric oxalate solution as measured by acid production, which Hill showed to be related to oxygen production. The centrifugate from this preparation suspended in water showed no such activity.

Active chloroplast fragments were centrifuged and resuspended in water and a decrease in activity was noted. This suspension upon recentrifuging and resuspension in water showed no activity. The clear supernatant obtained from the first centrifugation gave no activity. The broken chloroplasts washed once by resuspension in water and centrifugation were resuspended in (1) the first supernatant, (2) the first supernatant boiled and (3) the first supernatant precipitated with half saturated ammonium sulfate and resuspended in water. The first two preparations regained their original activity whereas the last one had no activity. Thus it was postulated that there was a water soluble factor which was necessary for the Hill reaction. A concentrate of this was made by grinding leaves from 10 pounds of grocery spinach in a Waring Blendor and boiling to coagulate the proteins. This was concentrated by heating in a large evaporating dish on a steam bath and blowing air over the surface with an electric fan. When this material was added to broken chloroplasts inactivated through washing by centrifugation, a marked increase in activity was obtained.

The active principle was found to be stable to boiling over a pH range of 5.0 to 7.0. It is dialysable and not soluble in ether, alcohol or acetone. This preparation is being further studied to fractionate the active principle or principles.

A STATISTICAL STUDY OF VARIATION IN STATURE
IN SUCCESSIVE GENERATIONS OF
FOUR LINES OF MAIZE

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University of Minnesota

Physical Science

THE SIMULTANEOUS MEASUREMENT OF ABSORPTION AND REFLECTION SPECTRA OF LEAVES AND CHLOROPLASTS*

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* Published in *Am. Jour. Bot.* 33: 769-777, 1946

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THE EFFECTS OF INCREASED INTRAPULMONARY PRESSURE ON THE SKIN TEMPERATURES OF THE EXTREMITIES

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ABSTRACT

In the first portion of the paper mention is made of the relationships between altitude and arterial oxygen saturation when air is being breathed at altitudes up to 18,000 feet. The use of oxygen enables normal arterial oxygen saturation to be maintained at all such comparatively low altitudes and up to altitudes approximating 35,000 feet. But a reasonably safe arterial oxygen saturation (about 85 per cent) cannot be maintained in this manner at altitudes about 38,000 to 40,000 feet. Under these conditions theoretical and experimental data show the usefulness of increased intrapulmonary pressure. It has been found that increases in altitude of several thousand feet are possible with the maintenance of approximately normal arterial oxygen saturation. This is the rationale of the use of intrapulmonary pressures about 15 mm. of mercury in excess of ambient pressure ("positive pressure breathing") in order to ensure physiologic well-being at altitudes exceeding 40,000 feet.

The second portion of the paper is concerned with a presentation of original data on the effects of such increased intrapulmonary pressure on the circulation of the blood as judged from changes in cutaneous temperatures. Measurements of skin temperatures of the extremities (toes and fingers) are taken on subjects in a basal metabolic state who have been lying on a comfortable bed for an hour or more (to eliminate the effects of posture). During this period and throughout the course of the tests they were kept in a room

maintained at 25.5° C. (78° F.) and 40 per cent humidity (within a range of $\pm 1^{\circ}$ C. and ± 3 per cent relative humidity). The various investigations of Sheard, Williams, Roth and other associates at the Mayo Foundation and Mayo Clinic have established fundamental relationships between basal metabolism, ingestion of food, changes of environmental temperature and humidity, on the one hand, and the temperatures of the extremities, on the other. Increased flow of blood to the extremities, which are in a state of vasomotor regulation, is evidenced by increases of temperature of the fingers or the toes or both and is dependent upon the metabolic state of the subject and the temperature and humidity of the environment. The fingers and toes are selected as the sites of measurement of temperatures for the reason that the distal portions of the digits exhibit most sensitively the presence of the vasomotor regulation which takes place over the whole integument of the body in the interest of maintaining equilibrium between production and loss of heat. In other words, changes in the temperatures of the fingers and toes are the most sensitive indicators of changes in vasomotor regulation and, therefore, of changes in peripheral blood flow.

The investigations with positive pressure breathing (either 7.5 or 15 mm. mercury pressure or 4 or 8 inches of water) indicate that: (1) during the first few minutes (five to ten minutes) there is frequently a decrease in temperature of the fingers and toes, thereby indicating reduction in blood flow and (2) there is a subsequent rise of temperatures of the extremities to the original level prior to the application of increased intrapulmonary pressure and, in many instances, a further increase of from 1° to 3° C. Such a result indicates a maintenance of, or increase of, blood supply to the extremities. These facts show that the initial decrease of peripheral blood flow is succeeded by a restoration of flow of blood to the extremities, possibly as a result of increased cardiac work and increased metabolism.

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SOME PLEISTOCENE MAMMALIAN INHABITANTS OF MINNESOTA

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INTRODUCTION

The intricate series of glacial deposits widely distributed over Minnesota and the central northwest is very thick in a large part of the state. The complexity of these beds is more apparent in the Wisconsin stage although it is also to be observed in the Kansan. As a consequence it has not always been possible to determine the