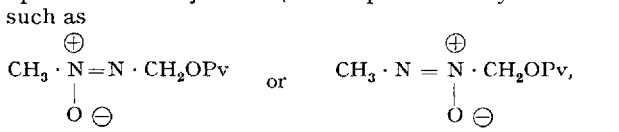
chemical behaviour of macrozamin therefore provides only a limited amount of structural information.

The hydrolysis of macrozamin with hot *N* hydrochloric acid takes place stoichiometrically, the primeverose appearing as glucose and xylose, and the two carbon atoms of the aglycone as methanol and formaldehyde. The nitrogen atoms appear quantitatively as nitrogen gas. A formation of elementary nitrogen on hydrolysis of a plant product has not previously been observed, and we consider it to indicate that the two nitrogen atoms of macrozamin are linked directly to each other.

Macrozamin is very labile to aqueous alkalis, even 2 *N* aqueous ammonia causing a rapid decomposition in which the primeverose is liberated intact. The reaction with hot dilute sodium hydroxide has been followed quantitatively; the principal nitrogenous products are cyanide ion (0·5–0·7 mol) and elementary nitrogen (0·5 mol), together with small amounts (c. 0·09 mol each) of methylamine and ammonia.

Macrozamin absorbs no hydrogen in the presence of Adams' palladous oxide in aqueous alcohol. In aqueous acetic acid with zinc dust the glycosidic link is broken and primeverose liberated, although macrozamin is stable to aqueous acetic acid alone. Use of the hexaacetyl derivative in purified ethyl acetate with Adams' platinic oxide and hydrogen gave varyable results; in some experiments no reduction took place; in others some hydrogen was absorbed, but afterwards only unchanged starting material, together with a nitrogen-free substance could be isolated; the latter gave heptaacetyl primeverose on acetylation and is probably heptaacetyl primeverose. Using the same catalyst, macrozamin in 0·2 *N* hydrochloric acid absorbs 4 mols hydrogen at room temperature, giving 2 mols of a volatile base, identified as methylamine by conversion to its chloroplatinate; significant amounts of dimethylamine or ammonia were absent. Similar reduction in *N* hydrochloric acid causes absorption of only 3·3 mols hydrogen; 2 mols of base are formed, but this must contain ammonia as well as methylamine, since 0·4 mols formaldehyde were also present in the products of reduction.

This behaviour excludes most of the known types of nitrogen structure for the macrozamin molecule. That open to least objection is an aliphatic azoxy structure, such as



where Pv represents the primeverosyl radical, $C_5H_9O_4 \cdot C_6H_{10}O_5$, and the synthesis of aliphatic azoxy compounds for comparison purposes is being undertaken in this laboratory. The above experiments will be described and discussed in greater detail elsewhere.

B. LYTHGOE and N. V. RIGGS

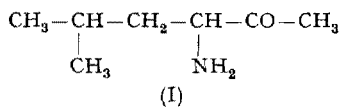
University Chemical Laboratory, Cambridge, England, August, 30, 1949.

Zusammenfassung

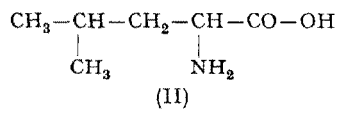
Macrozamin, der toxische Bestandteil der australischen Pflanze *Macrozamia Riedlei*, besitzt die Formel $C_{13}H_{24}O_{11}N_2$ und enthält eine Primverosylgruppe, glykosidisch mit einem Rest $C_2H_5O_2N_2$ verbunden. Dieser Rest zerfällt sofort quantitativ in Methanol, Formaldehyd und elementaren Stickstoff, wenn er durch verdünnte Säure in Freiheit gesetzt wird. Auch durch kalte verdünnte Alkalien wird die glykosidische Bindung gespalten. Es entstehen dann als stickstoffhaltige Hauptprodukte Stickstoffgas und Blausäure. In neutraler Lösung wird Macrozamin durch Wasserstoff und Palladium nicht reduziert, wohl aber in verdünnter Säure mittels eines Platinkatalysators. Dabei werden 4 Moleküle Wasserstoff aufgenommen unter Abspaltung des Zuckerrestes und Bildung von 2 Molekülen Methylamin. Die angeführten Tatsachen weisen auf keine eindeutige Struktur hin. Sie sind aber am besten mit einer aliphatischen Azoxyformel vereinbar.

Regenerationshemmende Wirkung einer leucinähnlichen Verbindung, des 2-Methyl-4-amino-hexanon-(5)

Im folgenden berichten wir über einige biologische Effekte[1] des 2-Methyl-4-amino-hexanon-(5) (I), einer Verbindung, die sich als strukturähnlich[2] mit dem Leucin (II) formulieren läßt.



(I)



(II)

Angaben über die von H. KÜHNE durchgeführte Darstellung und die chemischen Eigenschaften dieser Verbindung erfolgen an anderer Stelle. Das Hydrochlorid des 2-Methyl-4-amino-hexanon-(5) schmilzt bei 154° und ist in Wasser gut löslich. Die Verbindung geht in alkalischen Lösungen in Gegenwart von Oxydationsmitteln in das entsprechende Pyrazinderivat über, ist aber in saurer Lösung beständig.

Die Substanz wurde in destilliertem Wasser gelöst und auf ihre biologische Wirkung im Regenerationstest an der Larve des Krallenfrosches *Xenopus laevis* geprüft[3]. Die Länge der regenerierenden Schwanzspitze war bei den behandelten Tieren gegenüber der Kontrolle (Regenerationslänge = 100%) im 10-Tage-Versuch wesentlich reduziert. Sie betrug bei einer Serie junger Larven von ca. 2,5 cm Länge in der Konzentration 1:10000 0,3%, in 1:20000 8%, in 1:30000 14%, in 1:50000 33%, in 1:100000 47%, in 1:200000 53% und in 1:500000 83%. Bei älteren Tieren von ca. 3 cm Länge war der Effekt etwas geringer, er lag immerhin für die gleichen Konzentrationen zwischen 43% und 83%. Damit gibt die Substanz einen regenerationshemmenden Effekt bei großer Wirkungsbreite und geringer Toxizität, wie er bei zahlreichen anderen, als wachstumshemmend bekannten Substanzen in diesem Ausmaße von uns bisher nicht gefunden wurde[4]. Der Effekt wird durch Zusatz von *l*-Leucin nicht beeinflußt. Das histologische Bild der gehemmten Regenerate zeigt wenige, aber normale Mitosen, dagegen sind die histologischen Umwandlungen im Regenerationsbereich des Schwanzes schon nach 36 Stunden gegenüber den gleich alten Kontrollen deutlich verzögert und vor allem in der

[1] Über die Eigenschaften des entsprechenden, mit Tyrosin isosteren Aminoketons s. H. ERLENMEYER und H. KÜHNE, Helv. chim. acta *32*, 370 (1949).

[2] Siehe H. ERLENMEYER, Bull. Soc. Chim. biol. *30*, 792 (1948).

[3] F. E. LEHMANN, W. BERNHARD, H. HADORN und M. LÜSCHER, Exper. *1*, 232 (1945); M. LÜSCHER, Helv. physiol. acta *4*, 465 (1946).

[4] F. E. LEHMANN, Exper. *3*, 223 (1947) und unpublizierte Befunde.

Epidermis, die besonders langsam regeneriert, nicht so ausgeprägt wie in der Norm. Der Effekt der geprüften Substanz scheint sich also in der Hemmung des ganzen regenerativen Funktionszustandes zu äußern, er kann somit eher als *histostatisch* denn als antimitotisch angesprochen werden, im Gegensatz zum Colchicin, das teilungsreife Zellen zur Mitose anregt und sie dann zur Degeneration zwingt und damit ausgesprochen zytoklastisch wirkt[1].

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Anorganisch-chemische Anstalt der Universität Basel und Abteilung für Zoophysiologie des Zoologischen Instituts der Universität Bern, den 26. September 1949.

Summary

The 2-methyl-4-amino-hexanone-(5) (I) which is structurally similar to leucine (II) has a strong inhibiting effect on the regeneration of the tail in *Xenopus* tadpoles. The range of the inhibiting concentration is remarkably wide and the toxicity rather low. The inhibiting effect is not antagonized by leucine. The histological picture of inhibited regenerating tissues suggests a rather histostatic than a pronounced antimitotic action.

[1] M. LÜSCHER, Helv. physiol. acta *4*, 465 (1946).

Cytological Studies upon Genus *Otiorrhynchus (Curculionidae, Coleoptera)* in Poland

The weevil genus *Otiorrhynchus* GERM. is particularly suited to be studied from the point of view of geographical parthenogenesis. There occur parthenogenetic species, and related bisexual ones; among many species of this genus both parthenogenetic and bisexual races are known. In *O. scaber* L. there are even two parthenogenetic races: the one, Alpine, being triploid, and the other, from Finland, tetraploid[1]. From previous research it becomes evident that different races have different geographical range, in some cases the parthenogenetic and bisexual ones coexist in the same localities. It is known, from cytological studies of SUOMALAINEN[2] and SEILER[3] that parthenogenetic races are polyploid in comparison with the bisexual ones, treated as diploid. In genus *Otiorrhynchus* no diploid parthenogenetic race was found, though it occurs in genus *Polydrosus*. As in Finland *P. mollis* STRÖM. breeds in Poland as parthenogenetic and diploid. The occurrence of this race is affirmed in the Pieniny Mountains (a chain of lime rocks north of the Tatras) and near Krakow (not yet published). SUOMALAINEN presumes that parthenogenetic diploid races ought to exist also in genus *Otiorrhynchus*, this being the intermediary stage between bisexual-diploid, and parthenogenetic-polyploid races, as found in *Solenobia triquetrella*[4]. The lack of evidence as to the existence of such a race in genus *Otiorrhynchus* may be due to the scarcity of material studied up to now. SUOMALAINEN expresses his opinion, that geographical parthenogenesis and polyploidy of weevils has a connexion with the glacial period[1]. To prove this, it is necessary to investigate cytologically many species and races, also in different points of their distributional range.

SUOMALAINEN's study covers areas of Finland, Germany, Austria, Switzerland, the results of an analysis of 30 species having been published. SEILER has investigated the cytology of *O. sulcatus* F. occurring near Naumburg. Till recently any knowledge concerning chromosome-relations of weevils in Poland was lacking, although this area, considering its proximity to SUOMALAINEN's area, as well as its specific conditions in the glacial period, deserves attention.

Since 1947 I have collected material for cytological studies of weevils of Poland, especially those of genus *Otiorrhynchus*. One part of my results forms the subject of this notice.

The material described here comes chiefly from the Karpaty Mountains. The 10 species investigated (*inflatus v. salebrosus* BOH., *multipunctatus* F. [= *irritans* HBST.], *niger* F., *fuscipes* OL., *morio* F., *kollari* GYLL., *equestris* RICHT., *obtusus* BOH. [= *graniventris* MILL.], *corvus* BOH., *obsidianus* BOH.) were collected in the Tatra Mountains (Mala Laka Valley, Suchy Zleb-Kalatówki, Gubalówka), in Eastern Beskid (Wielka Roztoka Valley), Western Beskid (Babia Góra), and 1 species, *O. repletus* BOH., endemic for Poland, in the neighbourhood of Warsaw.

The localities cited above have had different conditions during the glacial period. Mala Laka Valley was covered with glacier, the morenes existing till now prove it definitely[1]. From the lower parts of this valley there come very abundantly *O. niger, corvus, multipunctatus*. From the upper parts in neighbourhood of the glacial cirque *O. kollari*. All these species are—in these localities—bisexual. Similar conditions existed in Suchy Zleb where bisexual *O. obtusus* is found. The question of the glaciation of Gubalówka, where *O. fuscipes* taken for investigation were collected, is not yet definitively solved. On the contrary Wielka Roztoka Valley, the habitat of bisexual *O. kollari, niger, equestris, obsidianus, inflatus* was not covered with glaciers. This concerns probably also habitats on the *Babia Góra* slopes where *O. morio* is found.

All (11) species investigated are, in the localities cited above, bisexual and diploid. Chromosome relations of different species are described on the basis of a study of spermatogenesis. Up to this time the course of spermatogenesis was known, according to SUOMALAINEN, in *O. niger, fuscipes, morio, equestris, inflatus*. New results concern *O. corvus, multipunctatus, obsidianus, obtusus, kollari, repletus*.

The diploidal number of chromosomes stated in spermatogonies is 22 (as in the bisexual ones according to SUOMALAINEN), 20 being autosomic and 2 sexual, which differ in size. Meiosis goes on normally. In the first metaphase 11 elements are visible, 10 of which form autosomic tetrades, the 11th being a pair of sexual chromosomes. In the first anaphase the conjugating elements undergo a separation and the plates arising have 11 chromosomes each, 10 of which are autosomes, and the 11th chromosome x or y. The second meiotic division is equational. The further course of spermatogenesis is also normal.

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Department of Zoology, Jagellonian University, Krakow, and Department of Comparative Anatomy and Embryology, Copernicus University, Toruń, Poland, June 30, 1949.

[1] B. HALICKI, Bull. Serv. Géol. Pologne *5*, 23 (1930).

[1] E. SUOMALAINEN, Sitz.-Ber. Finn. Akad. Wiss. *1944*, 181 (1945).

[2] E. SUOMALAINEN, Ann. Acad. Sci. Fennicae, Ser. A, *14*, 1 (1940); Hereditas *33*, 29 (1947).

[3] J. SEILER, Chromosoma *3*, 88 (1947).

[4] J. SEILER, Rev. suisse zool. *48*, 537 (1941); 3. Jahresber. Schweiz. Ges. Vererbungsforsch. *18*, 691 (1943); Rev. suisse zool. *53*, 529 (1946).