A fuller discussion of all these problems will be published elsewhere. JOSEPH WEISS

Departement of Chemistry, University of Durham King's College, Newcastle upon Tyne. England, November 15, 1950.

Zusammenfassung

Es wurde gezeigt, daß eine von S. ANDERSEN kürzlich gefundene empirische Gleichung, die die Reaktionskinetik der Reaktion zwischen Wasserstoffsuperoxyd und Ferrisalzen in einem ziemlich weiten Bereiche gut wiedergibt, aus dem Haber-Weißschen Reaktionsschema abgeleitet werden kann.

The Influence of Organic Solvents on the Growth of Plants

While studying the influence of hormonal extracts on the growth of shoots of different plants we often used organic solvents for the extraction. There arose the problem whether minute quantities of these solvents do not themselves influence the sprouting and growth of plants. In order to resolve this question we investigated the influence of aqueous solutions or emulsions of most commonly used organic solvents (amylalcohol, ethylalcohol, butylalcohol, acetone, benzene, chloroform, petroleumether, sulphuricether and xylen) on the sprouting and growth of plants. As we see in the plant growth hormones, the stimulating or inhibiting action of a given chemical substance on the growth of plants depends mainly of the strength of its solution. It was therefore necessary to examine the dilution of solvents on the widest possible scale. We have therefore used dilutions or emulsions within the limits of 1:5 to $1:10^9$. Shoots of oats cultivated on Petri dishes and sprinkled daily with dilutions and emulsions of various organic solvents served as objects for our experiments. We weighed for each Petri dish the same quantity of oat seeds (5 or 10 grams). In every experiment we used for each solvent 13 dishes (equal to the number of dilutions we worked with) which gave, together with the water control, a total of about 120 dishes.

After 15 days we determined on each plate: the number of shoots; the height of each shoot; the total weight of the shoots; the total weight of the roots.

The figures thus obtained, compared with the water control, gave the measure of the inhibiting or stimulating influence of each organic solvent in a given dilution. We performed 12 experiments on about 1400 dishes investigating about 220,000 seeds.

The influence of the solvents on the shoots proved to be very strong:

(1) Solvents used in a low dilution (degree of dilution depends upon the solvent) were very toxic and provoked a marked inhibition of the germination of seeds and of the growth of shoots (inhibition area).

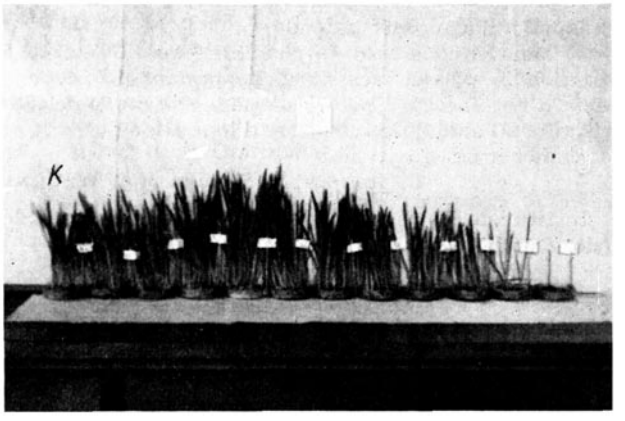
(2) Moderate dilutions did not show any influence, neither stimulating nor inhibiting; the shoots did not differ from the control either in number or in height and weight ("neutral area").

(3) In high dilutions there was a marked stimulating influence concerning the number of shoots as well as the height and weight of stems ("stimulating area").

The average growth of the shoots as well as their height and weight was approximately the double of the water control ones.

The maximum stimulation appeared with dilutions $1:10^5$ to $1:10^7$. The stimulating influence disappeared with dilutions lower than $1:10^7$. These relations are illustrated by the enclosed figure.

Amylalcohol proved to have the most toxic inhibiting effect; the least toxic was petroleumether, but on the other hand it stimulated growth most strongly.



Oat shoots cultivated on chloroform emulsion in a dilution from 1:5 to $1:10^9$ (from right to left). *K* = water control.

Considering their toxic action, all the investigated solvents can be ranged as follows: amylalcohol, butylalcohol, xylen, benzen, ethylalcohol, acetone, chloroform, sulphuricether, petroleumether. The more toxic a solvent is, the larger is its inhibition area, the more its neutral point is shifted towards smaller concentrations, and the smaller is its stimulating area. We give below the average value number we obtained for various solvents in all used dilutions (Table).

The results obtained show that traces of organic solvents in extracts of various tissues may influence the growth and development of plants, which must be taken into consideration in all experiments on plants.

The mode of action of the organic solvents is not yet quite clear and requires further investigation.

ARTUR BER and ZOFIA MOSKWA

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Zusammenfassung

Bei der Untersuchung verschiedener Organextrakte im Pflanzenwachstumstest haben wir oft zur Extraktion organische Solvenzien verwendet. Es war deshalb wichtig, den Einfluß der Extraktionsmittel an und für sich zu untersuchen. Es wurden wäßrige Lösungen oder Suspensionen folgender Stoffe untersucht: Azeton, Amyl-, Äthyl- und Butylalkohol, Benzol, Chloroform, Petroläther, Schwefeläther und Xylen. Es wurden Verdünnungen von 1:5 bis $1:10^9$ verwendet. Mit diesen Verdünnungen wurden täglich Hafersamen in Petri-Schalen begossen. Insgesamt wurden zwölf Untersuchungen auf ca. 1400 Schalen durchgeführt. Für jedes Solvens haben wir eine toxische, hemmende Zone in kleineren Verdünnungen, eine neutrale in etwas größeren und eine Stimulierung des Wachstums der Stengel, ihrer Zahl und ihres Gewichts in ganz großen Verdünnungen festgestellt. In noch größeren Verdünnungen bleibt die Wirkung aus. Amylalkohol war am meisten toxisch. Mit Petroläther gab es die stärkste Förde-

(The average results of all experiments)

Dilutions	The weight of shoots									
	Amyl-alcohol	Butyl-alcohol	Xylen	Benzene	Ethyl-alcohol	Acetone	Chloroform	Sulphuric ether	Petroleum ether	Water control
1:5						0	0	0	0	5,1 ± 0,005
1:10					0	1,4 ± 0,09	0,9 ± 0,17	2,1 ± 0,11	0,9 ± 0,18	
1:20	0	0	0	0	0,8 ± 0,21	2,8 ± 0,10	1,3 ± 0,13	2,9 ± 0,16	1,9 ± 0,14	
1:50	0,3 ± 0,05	0,4 ± 0,07	0,9 ± 0,15	0,6 ± 0,18	2,1 ± 0,13	2,8 ± 0,12	2,1 ± 0,27	3,1 ± 0,12	4,8 ± 0,14	
1:100	0,7 ± 0,10	0,9 ± 0,13	1,7 ± 0,16	2,8 ± 0,12	3,5 ± 0,23	4,1 ± 0,21	5,1 ± 0,32	6,0 ± 0,12	7,5 ± 0,18	
1:200	1,6 ± 0,08	2,0 ± 0,12	2,3 ± 0,14	3,8 ± 0,16	4,4 ± 0,11	4,1 ± 0,19	5,7 ± 0,12	6,3 ± 0,18	7,6 ± 0,14	
$1:10^3$	4,2 ± 0,16	4,8 ± 0,12	4,7 ± 0,28	5,4 ± 0,16	5,2 ± 0,27	5,3 ± 0,15	6,0 ± 0,18	7,4 ± 0,15	8,8 ± 0,12	
$1:10^4$	4,2 ± 0,14	5,8 ± 0,21	5,6 ± 0,25	6,1 ± 0,28	5,3 ± 0,18	5,6 ± 0,18	8,0 ± 0,15	8,0 ± 0,19	9,0* ± 0,08	
$1:10^5$	7,0*[1] ± 0,25	6,0 ± 0,16	8,0* ± 0,20	7,0 ± 0,14	7,1 ± 0,15	7,9* ± 0,14	8,5 ± 0,26	8,4* ± 0,11	8,5 ± 0,18	
$1:10^6$	6,5 ± 0,19	7,2 ± 0,14	7,0 ± 0,12	8,0* ± 0,19	7,5* ± 0,18	7,0 ± 0,31	9,5* ± 0,11	6,5 ± 0,18	7,5 ± 0,14	
$1:10^7$	5,6 ± 0,22	8,0* ± 0,21	6,4 ± 0,17	6,5 ± 0,16	5,5 ± 0,14	7,0 ± 0,18	8,5 ± 0,16	6,0 ± 0,25	5,0 ± 0,10	
$1:10^8$	5,2 ± 0,15	6,9 ± 0,16	6,1 ± 0,25	6,4 ± 0,12	5,2 ± 0,17	6,2 ± 0,25	7,0 ± 0,22	5,1 ± 0,31	5,0 ± 0,17	
$1:10^9$	5,2 ± 0,09	5,3 ± 0,19	5,3 ± 0,18	5,3 ± 0,17	5,0 ± 0,13	5,1 ± 0,14	5,1 ± 0,18	5,0 ± 0,13	5,0 ± 0,22	

* The highest value in each column marked with *.

rung. Die Einzelheiten sind in der Tabelle wiedergegeben.

Die Untersuchungen zeigen, daß auch die kleinsten Spuren der organischen Lösungsmittel einen Einfluß auf das Pflanzenwachstum ausüben können. Das muß bei der Ausführung der Experimente berücksichtigt werden.

The Action of 6-Amino Undecane on Wheat Seedlings

According to VELDSTRA's[1] findings fatty acids with branched chains have a greater physiologic activity than acids with a straight chain of the same size. This is supposed to depend upon the balance between lipo- and hydrophilic groups.

The experiments which were carried out on wheat plants with di-n-amylacetic and lauric acid (BURSTRÖM[1]) confirmed this result for branched and unbranched lipophilic chains containing a hydrophilic COOH.

In the present research the effect of 6-amino undecane-HCl has been investigated on wheat seedlings. This compound structurally resembles di-n-amylacetic acid, but it contains an amide (NH_2) group in the middle of the lipophilic chain. The main purpose was to compare the physiologic activity of the amide with that of the acid. Towards this end comparative experiments were carried out on various physiologic processes such as growth, permeability, water balance, and transpiration.

The observations on the growth, in various amide concentrations at different intervals of time (Table I) revealed that there was a gradual retardation in growth starting from the third day on. This delay in the elongation of the shoots was statistically significant even within the first two days.

[1] H. VELDSTRA, Soc. Chim. Biol. *30*, 772 (1948); *31*, 1 (1949).

[1] H. BURSTRÖM, Physiol. Plant. *2*, 197 (1949); *2*, 332 (1949); *3*, 175 (1950).