ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN—POLONIA
VOL. XIII. 1 SECTIO C 1958

Z Katedry Botaniki Ogólnej Wydziału Biologii i Nauk o Ziemi UMCS
Kierownik: prof. dr Piotr Wiśniewski

Piotr WIŚNIEWSKI

Influence of the 2,4 D. Plantgrowth Substance on Germination of Turiones of *Hydrocharis morsus ranae* L. in Darkness
(Preliminary report)

Wpływ hormonu 2,4 D na kiełkowanie turionów *Hydrocharis morsus ranae* L. w ciemności (Doniesienie tymczasowe)

Влияние гормона 2,4 Д на прорастание турионов *Hydrocharis morsus ranae* L. в темноте (Предварительный доклад)

In my paper on the resting period of water plants (4) I have stated among others that the turiones of *Hydrocharis morsus ranae* L. germinate in light only; in darkness it was not possible to stimulate their germination by any factor. Thus severe injuries, which in light stimulate their development in any stage of the resting period, had no influence on their germination in darkness. In the same way, the influence of high temperature, ether and other factors gave no effect.

More accurate investigations showed that the main reason of the turiones being unable to germinate without light was the fact that their outer leaves which are fairly advanced in their development and contain chlorophyll bodies could not grow in darkness. In exceptional cases, when the turiones had been cut longitudinally into halves, very slow growth of the inner leaves, beginning with the 7th leaf, could be observed in darkness.

In the same way young buds formed on cut turiones as the result of a regenerative process could grow without light. Further investigations on the influence of light on these buds were carried out by Simon (1, 2), and resulted in the statement that the red rays of the spectrum which favour most photosynthesis had the strongest influence on the development of the buds. It could be therefore assumed that the development of the buds was somehow dependent on photosynthesis.

Some investigations on auxins seem to suggest that sometimes the formation of these substances may depend on the products of photosynthesis. Zhdanowa (3) found that in some cases the formation of auxins can be caused by supplying some sugars, glucose and sacchharose among them.

It can be also inferred from my experiments on the influence of light on mobilization of diastase that in the turiones of *Hydrocharis morsus ranae* L. sugars somehow influence the formation of hormones. I found that light when stimulating the growth of buds at the same time influences the formation or activation of amylolytic enzymes which results in the appearance of sugars in the buds.

Turiones placed in Petri dishes containing gelatine with soluble starch, under the influence of light secreted into the medium amylolytic enzymes, so that starch-free areas formed round them, which could be easily demonstrated by addition of J in KJ. Turiones placed in darkness, on the other hand, did not secrete diastase and starch did not disappear in their vicinity. Yet when the turiones were placed in a saccharose or glucose solution they could not be stimulated to start their growth in darkness.

Investigations conducted by me in the years 1954—1957 showed that turiones of *Hydrocharis morsus ranae* L. can be stimulated to start growing in darkness by direct application of 2,4-Dichlorophenoxy-acetic acid. (2,4 D.) in my experiments. This substance influences above all the growth of outer leaves which, as I have already mentioned, cannot be forced to grow in darkness by any other means.

The turiones were placed in distilled water containing 2,4 D-Na-salt dissolved in proportion from 1:2000 to 1:20.000, at about 20°C in darkness; after some days their germination could be observed. The effects of stimulation could be seen in outer leaves, from the 1st to the 6th included, which, when no 2,4 D. is added, can grow in light only. Higher concentrations of 2,4 D. e.g. 1:500. made the turiones rot or produced the growth of the outermost leaves only, from the 1st to the 3rd included. The turiones could be also stimulated by injecting of 2,4 D. into their body in concentration about 1:300. Injections were made along the longer and the shorter axis of each turion; the needle of the syringe was introduced to about the half of the length and width of the buds. After the injections the turiones were placed in darkness on moistened cotton-wool and kept in small glass vessels covered with glass plates provided with a strip of wet filter-paper or cotton-wool on their lower surface, which assured a high degree of humidity in the environment of the buds. After such treatment the turiones germinated in about the same way as those placed directly in the strongly diluted hormone. In both exper-

iments, however, the turiones began to rot after they had developed 5 or 6 outer leaves.

In a few cases their further development could be achieved. The condition was to wash them carefully in distilled water after they had developed some outer leaves and to place them in other dishes containing water only.

Attempts at stimulating the germination in darkness by application of heteroauxin have been so far unsuccessful. It has proved equally impossible, as I have mentioned before, to force the turiones to grow in darkness by placing them in a solution of saccharose or glucose.

It results from the above-described experiments that:

1. The turiones of *Hydrocharis morsus ranae* L. can be stimulated to germinate in darkness by application of growth substances.

2. So far, their forcing to germinate could be obtained only after application of hormone 2,4 D.

3. The forcible development of the turiones does not seem to depend either directly or indirectly on photosynthesis since the supply of sugar has no effect on their germination, thus having no direct influence on the growth of their leaves or on the formation of corresponding growth substances.

4. It is most probable that light has a direct influence on the formation of growth substances or at least on their activation.

BIBLIOGRAPHY

1. Simon S. V.: Zur Keimungsphysiologie der Winterknospen von *Hydrocharis* morsus ranae L.; zugleich ein Beitrag zur Frage der Jahresperiodizität. Jahrb. f. wiss. Bot. 68, r .1928.
2. Simon S. V.: Weitere Untersuchungen zur Keimungsphysiologie der Winterknospen von Hydrocharis. Jahrb. f. wiss. Bot. 75, r. 1931.
3. Zhdanova L. P.: Mechanism of Auxin Formation in Green Plants. Comp. Rend. Acad. Sc. URSS 24, r. 1939.
4. Wiśniewski P.: Beiträge zur Kenntnis der Ruheperiode der Winterknospen der Wasserpflanzen. Bull. Acad. Sc. Cracovie Cl. Sc. Math.-Nat. 7, r. 1912.

STRESZCZENIE

W pracy nad okresem spoczynkowym roślin wodnych (4) autor wykazał, że turiony *Hydrocharis morsus ranae* L. pędzą tylko na świetle.

Z badań przeprowadzonych w latach 1954—57 wynika, że turiony te mogą być pobudzone do pędzenia i w ciemności pod wpływem hormonu

2,4 D w rozcieńczeniu 1 : 2 00 do 1 : 20 000; mogą też pędzić przy zastosowaniu zastrzyków tego hormonu w rozcieńczeniu 1 : 300.

Autor uważa, że pędzenie tych pąków nie jest uzależnione od asymilacji CO_2, lecz światło w tym wypadku powoduje powstawanie substancji wzrostowych lub przynajmniej wpływa na ich aktywizację.

РЕЗЮМЕ

В работе о периоде покоя водных растений (4) автор доказал, что турионы *Hydrocharis morsus ranae* L. могут прорастать только при доступе дневного света.

Исследования произведенные в 1954 — 1957 гг. показали, что эти турионы можно заставить прорастать и в темноте, действуя на них гормоном, 2,4 Д в разбавлении от 1 : 2000 до 1 : 20000; они могут прорастать тоже при применении инъекций упомянутого гормона в разведении 1 : 300.

Автор считает, что прорастание турионов не зависит от ассимиляции CO_2, но свет в этом случае вызывает образование веществ стимулирующих рост, или по крайней мере, влияет на их активизацию.

Papier druk. sat. III kl. 70 g Format 70 x 100 Druku 4 str.
Annales UMCS. Lublin 1958. Lub. Druk. Prasowa—Lublin. Unicka 4. Zam. 1974.18.V.59
1.100 + 200 odb. E-2 Data otrzymania manuskryptu 14.V.59. Data ukończenia druku 30.X.59 r.