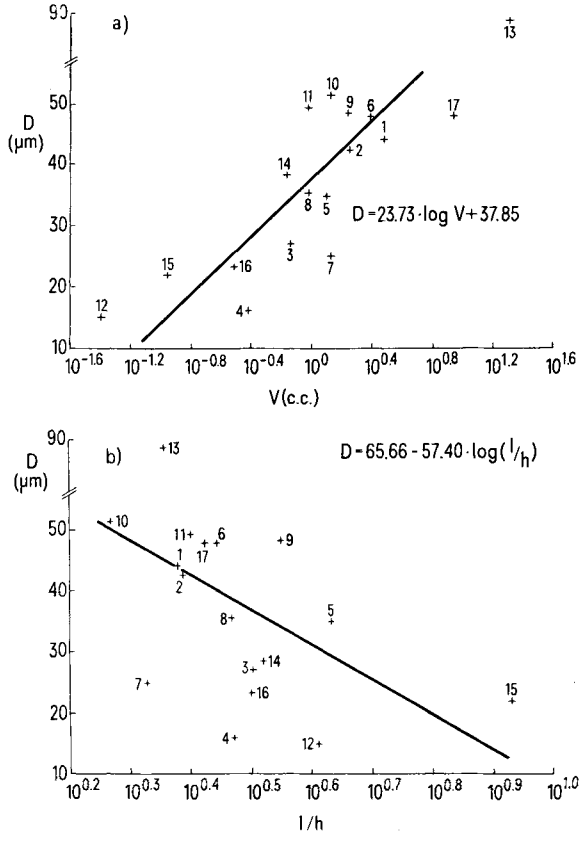
sions than that found in the bird or fish class. In fact, if certain groups of mammals are treated separately, a direct relationship between fibre size and body size is seen. JULIAN and CARDINET[11] found that large dogs had larger muscle fibres than small dogs, and LUFF and GOLDSPINK[12] found a similar stituation in mice.

The results of this investigation also suggest that there is an inverse relationship between muscle fibre size and length:height ratio (l/h). This relationship becomes statistically significant when log (l/h) is used, suggesting that the relationship is not linear.



Shows the relationship between mean muscle fibre diameter (D) and (a) Volume of fish (V), (b) length: height ratio (l/h). Both V and l/h axes are written on a log scale. The equations for the plotted lines of regression are shown. The numbers against each fish correspond to the fish numbers shown in Table I.

There is some evidence[13] that faster fish tend to have a higher length:height ratio. It would seem, therefore, that faster fish may have smaller fibre diameters. In mammals, GAUTHIER and PADYKULA[4] reasoned that fibre size is related to body size because body size is inversely related to metabolic activity[14]. Only if metabolic activity in fish is related to relative speed can it be said that the results presented here agree with those found in mammals.

In mammals, the decrease in fibre size with increasing metabolic activity is due to a higher proportion of red muscle fibres, as well as a decrease in size of the white muscle fibres[4]. In the fish studied here, the characteristic lateral line strip of red muscle fibres[15] appeared very small or non-existent, and, in any case, these fibres were not included in the measurements. However, in some of the 'faster' fish, a 'mosaic' arrangement of small and large fibres was seen in the bulk of muscle which might correspond to the mosiac arrangement of red and white muscle fibres seen in some fish[15]. A histochemical study would be required to investigate this idea.

Taken as a whole, the results pose difficult problems. If muscle fibre size is directly related to body size and inversely related to l/h then this suggests that smaller fish are more stream-lined with smaller muscle fibres. It is possible that the relationship between fibre size and l/h is a result of a relationship in the fish used here between body size and l/h. A wider range of teleosts should be examined, preferably in which body size and l/h are unrelated, in order to investigate these inter-relationships more fully[16].

Summary. In a survey of 17 species of teleosts, a direct relationship was found between the diameter of muscle fibres and estimated volume of the fish. The results also suggested an inverse relationship between muscle fibre diameter and 'streamlinedness' of the fish (as measured by length:height ratio).

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[13] P. GREENWAY, Experientia *21*, 489 (1965).
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[16] Thanks are due to Mr. THEO D'SOUZA for help in identifying the fish used in this investigation.

Isolation and Culture of Mesophyll Protoplasts of *Hyoscyamus niger* L. var. *annuus* Sims[1]

Plants of *Hyoscyamus* were grown in the greenhouse under long day conditions for 1 month. Differentiated leaves were cut off and washed 3 times with tap water, and then surface sterilized by treatment with 4% NaOCl for 3 min. The hypochlorite was removed by 3 successive washes in sterile water. After the lower epidermal layer had been stripped away with forceps, the leaves were treated as described by MEYER[2], 1 h premaceration followed by 1,5 h maceration. The protoplasts were separated from unmacerated material by filtration through a plastic gauze and then sedimented by centrifugation at 50 *g* for 5 min. The sedimented protoplasts were washed 3 times with fresh salt solution and resedimented by centrifugation. All these solutions were adjusted at pH 5.2.

About 1 ml of protoplast suspension (Figure 1) was mixed with about 10 ml of liquid nutrient media described by DURAND et al.[3], Na_2EDTA and $FeSO_4 \times 7\ H_2O$

[1] Supported by a grant of the Bundesministerium für Forschung und Technologie, Bonn.
[2] Y. MEYER, Protoplasma *81*, 363 (1974).
[3] J. DURAND, I. POTRYKUS et G. DONN, Z. Pflanzenphysiol. *69*, 26 (1973).

according to MEYER[2]. The concentration of mannitol was changed to 0.5 and 0.6 *M*. The protoplasts were cultivated in droplets after GAMBORG and WETTER[4], 4 of them were set on the bottom of a plastic petri dish (6 cm diameter). The petri dishes were sealed with Parafilm, kept in a climate chamber at 25 °C, and illuminated for 12 h per day with 600 lux. The tider of protoplasts was 6.9×10^4 protoplasts/ml.

After 4 days of culture about 50% of protoplasts had burst. Between the 3rd and the 14th day, many of the surviving protoplasts were budding. Some of the protoplasts increased remarkably in size and showed growth

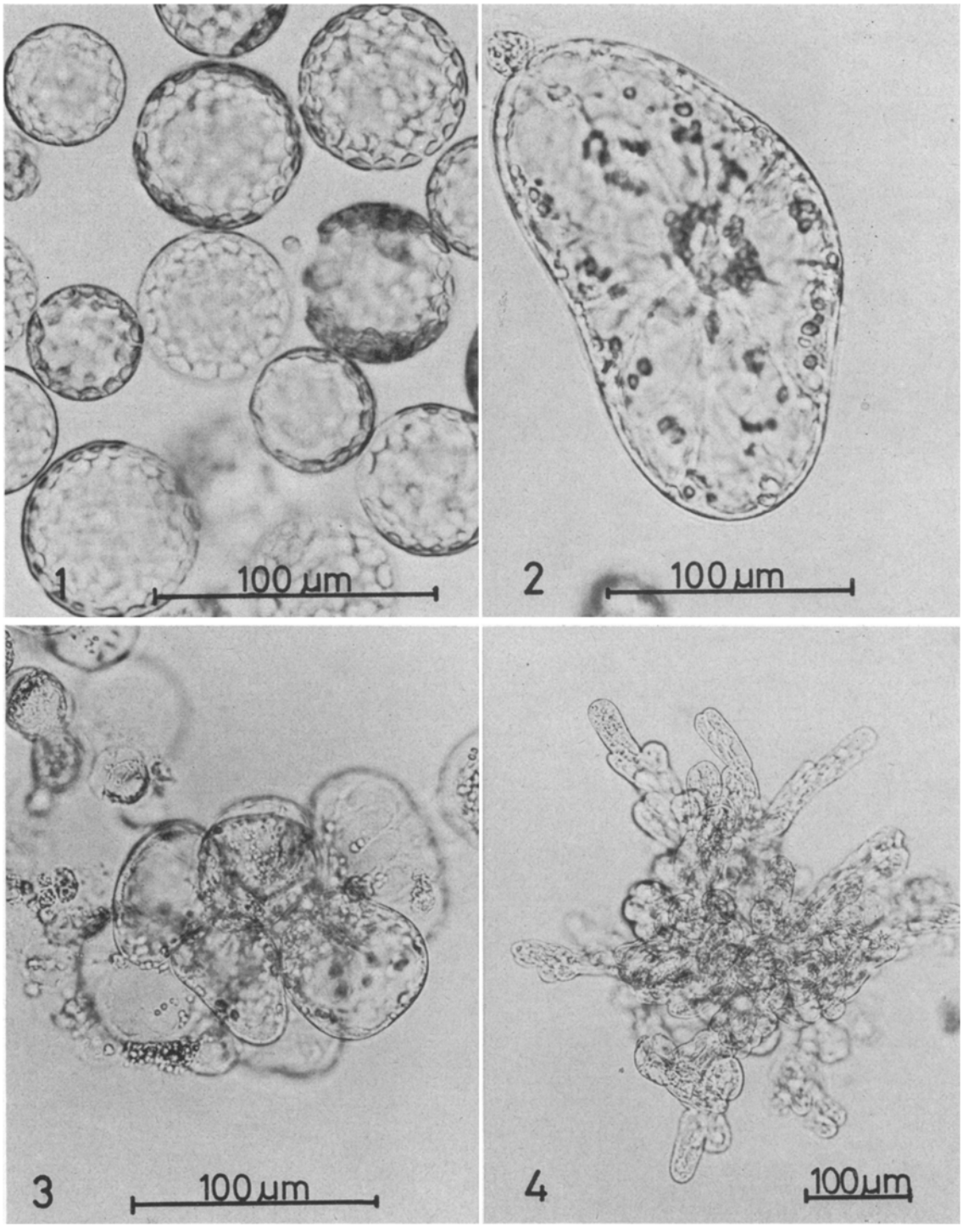

Fig. 1. Mesophyll protoplasts immediately after isolation.
Fig. 2. Enlarged protoplast with regenerated cell wall and multiplied cytoplasm.
Fig. 3. Division growth of an isolated protoplast.
Fig. 4. Cell cluster derived from an isolated protoplast.

of their nuclei and a great multiplication of cytoplasm (Figure 2). Others underwent sustained divisions (Figure 3) and grew into cell clusters (Figure 4) within 20 days.

Summary. Mesophyll protoplasts of *Hyoscyamus niger* var. *annuus* could be isolated enzymatically. They showed cell division and developed into cell clusters.

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Fachbereich Biologie–Botanik — der Universität, Siesmayerstrasse 70, D–6000 Frankfurt am Main 1 (German Federal Republic, BRD), 30 June 1975.

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Einfluss verschiedener Kombinationen von Silybin, Silydianin und Silychristin auf das embryonale Wachstum von Gartenkresse (*Lepidium sativum* L.)

Influence of Various Combinations of Silybine, Silydianine and Silychristine on the Embryonic Growth of Garden Cress (*Lepidium sativum* L.)

In einer früheren Mitteilung[1] ist über den Einfluss von Silymarin auf Keimung und embryonales Wachstum von Gartenkresse (*Lepidium sativum* L.) berichtet worden. Darin wurde gezeigt, dass die drei Hauptkomponenten des nativen Silymarins[2–4], die Polyhydroxyphenylchromanone Silybin (I), Silydianin (II) und Silychristin (III), unterschiedliche aber signifikante und dosisabhängige Wirkungen auf das Wurzelwachstum der Kressekeimlinge ausüben, auf die Samenkeimung aber keinen äusserlich erkennbaren Einfluss zeigen.

Diesen drei Verbindungen wird andererseits von VOGEL[5] eine gleichartige, auf die Leber gerichtete Aktivität zugeschrieben; zwischen den hepatischen Wirksamkeiten von I, II und III sollen keine qualitativen Unterschiede bestehen[5]. Die zuletzt genannte auf den Ergebnissen zahlloser tierexperimenteller Untersuchungen beruhende Aus-

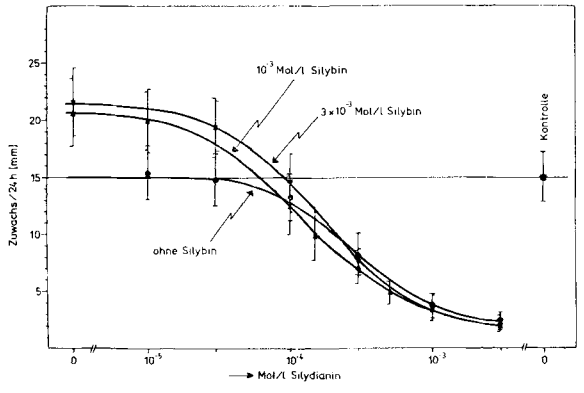

Fig. 1. Dosis-Wirkung-Kurven und Standardabweichungen von Silydianin und von zwei Kombinationen Silydianin + Silybin im Wuchstest an Kressekeimlingen.

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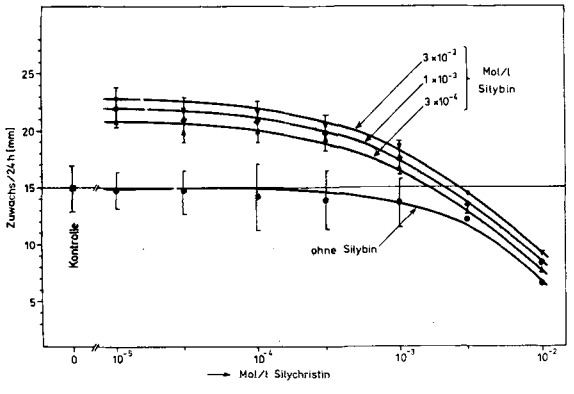

Fig. 2. Dosis-Wirkungs-Kurven und Standardabweichungen von Silychristin und von drei Kombinationen Silychristin + Silybin im Wuchstest an Kressekeimlingen.

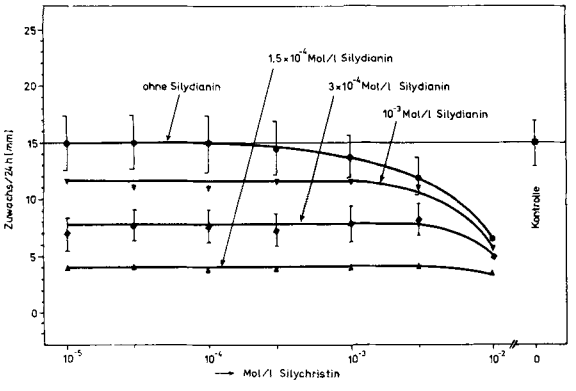

Fig. 3. Dosis-Wirkungs-Kurven und Standardabweichungen von Silydianin und von drei Kombinationen Silydianin + Silychristin im Wuchstest an Kressekeimlingen.