fruit is attractive to the birds, and they work on it. I have been looking for non-fruiting trees but so far I have not found one that would qualify.

MODERATOR SHUGERT: We will now go into the third quarter with a paper entitled, "The Diffusion of Root Promoting Substances from *Hedera helix Stems*." The paper written by Ronald Girouard and Dr. C. E. Hess. Mr. Girouard is going to present the paper for us at this time.

THE DIFFUSION OF ROOT PROMOTING SUBSTANCES FROM STEMS OF Hedera helix

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1. Introduction

The vegetative propagation of plants by cuttings has attracted the attention of commercial propagators and research workers for many years. As a method of reproduction it has varying degrees of success depending upon the species, cultivar, clone, or growth phase of the plant used (1, 6). Internal and external factors and interactions of these influence the initiation of roots on cuttings (6, 7, 8). The root promoting substances or cofactors extracted and characterized by Hess (4, 5) are examples of internal factors. Recently the movement of these substances in a downward direction as influenced by the presence or absence of leaves on stem cuttings of juvenile English ivy, was studied. It is this work which we would like to review at this time.

2. Materials and Methods

To determine the activity of substances with root promoting properties, mung bean (*Phaseolus aureus*) seedlings were grown in a controlled environment chamber. At the end of ten days the seedlings were cut 3cm below the cotyledonary node. To each bioassay vial containing four ml. of indoleacetic acid solution, ten bean cuttings were added; several of these vials were kept as controls (3).

In one set of experiments, juvenile *Hedera helix* shoots eight inches in length were cut, stripped of only a few basal leaves and added base down in increasing numbers to vials with bean cuttings. At the end of four to six hours glass distilled water was used to restore the level of the liquid in the vials and thus prevent dessication of the cuttings.

In a second series of experiments one major change was made: the ivy cuttings were completely defoliated before being placed in the vials.

Diffusates, or substances slowly released from the base of ivy cuttings in liquids, were collected over a period of two days in a small volume of glass distilled water, evaporated almost to

dryness and streaked on two-inch-wide strips of Whatman No. 1 chromatographic paper. Using 80 per cent isopropanol the chromatograms were equilibrated for six to ten hours and developed by descending chromatography. The solvent front was allowed to move 30cm from the streak or origin before being stopped by drying. The chromatograms were cut into fifteen equal sections and tested for root initiating activity with mung bean cuttings.

All of the experiments mentioned above were repeated several times and the roots formed on the mung bean cuttings were counted at the end of six or seven days.

3. Results and Discussion

In Figure 1 the top horizontal line indicates the number of roots formed per control bean cutting, that is, per bean cutting where ivy cuttings were not added to the vials. The bars below the line indicate a reduction in rooting. By increasing the number of juvenile ivy cuttings placed base down in an aqueous medium, we were unable to detect the presence of substances which stimulate the initiation of roots. These results were possibly due 1) to the inactivation of indoleacetic in solution, 2) to the rapid uptake of the auxin by both kinds of cuttings, 3) to

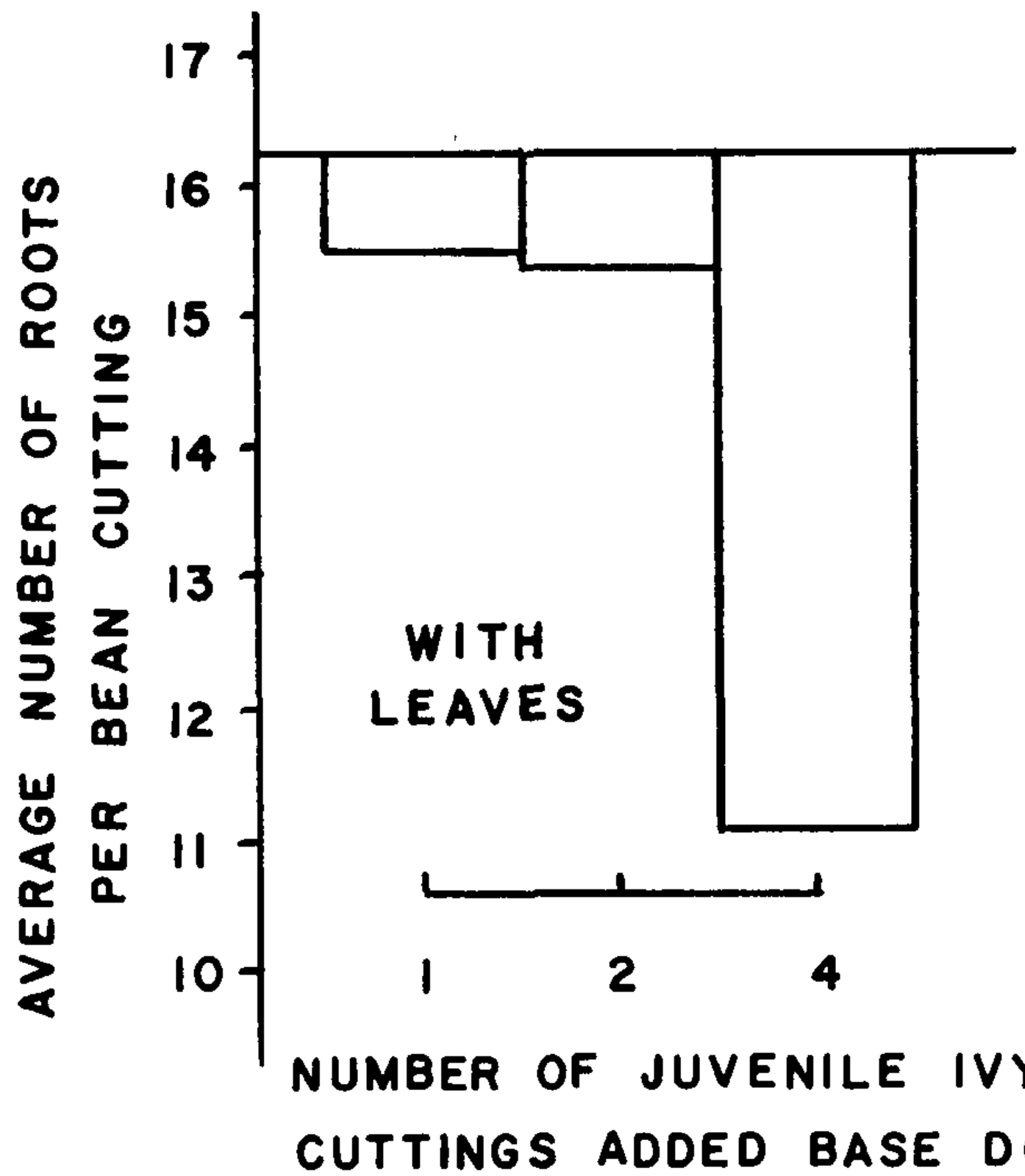

Figure 1. An increase in the number of juvenile ivy cuttings, with leaves, added base down to vials containing indoleacetic acid solution and mung bean cuttings resulted in a decrease in the number of roots formed per bean cutting.

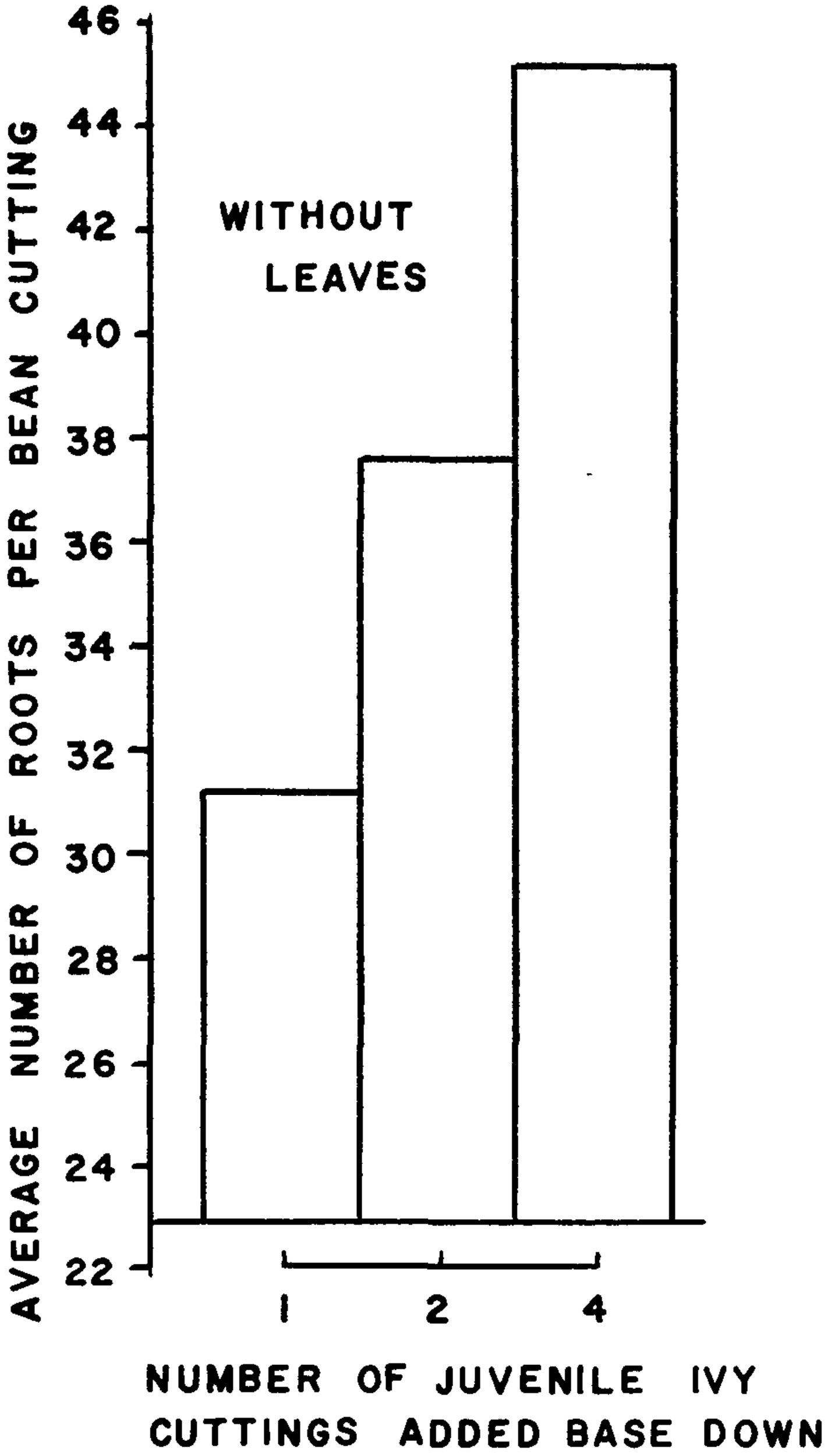

Figure 2. Addition of leafless juvenile ivy cuttings in increasing numbers to bioassay vials resulted in an increased number of roots forming per bean cutting.

the slow movement of root initiating substances out of the ivy stems, or 4) to several of these factors.

At this point one might suspect that inhibitors were affecting the rooting of the cuttings, but later analyses of diffusates will show that this was really not the case.

Next, in Figure 2 we note that when leafless ivy cuttings were added base down to the bioassay vials the rooting of the bean cuttings was promoted with increasing numbers of ivy cut-

tings. This shows then that substances which enhance root initiation definitely moved out of the stem cuttings of ivy. Perhaps with removal of the leaves the uptake of water and auxin by the cuttings was greatly reduced and therefore, this may have allowed release of substances from the stems in detectable amounts and action of auxin in the rooting processes. The data seems to indicate that leaves left on the cuttings play a major role not only in the synthesis and breakdown of organic compounds but possibly in reducing the loss of substances from detached plant parts. It was encouraging to find that substances with root initiating capacity were able to move down to the base of cuttings where the roots generally form.

In Figure 3 a histogram shows the biological activity of diffusates from juvenile *Hedera helix* stems as determined under lighted conditions by a mung bean rooting bioassay. At Rf .3, .4 to .6, and .9 to 1.0 the activity tended to correspond closely with rooting cofactors 2, 3 and 4 described by Hess.

Kawase (2) working in Canada has reported that the diffusate of *Salix alba* cuttings was strong in root promoting activity at Rf 0.2 to 0.4 which is characteristic of cofactor 2. It

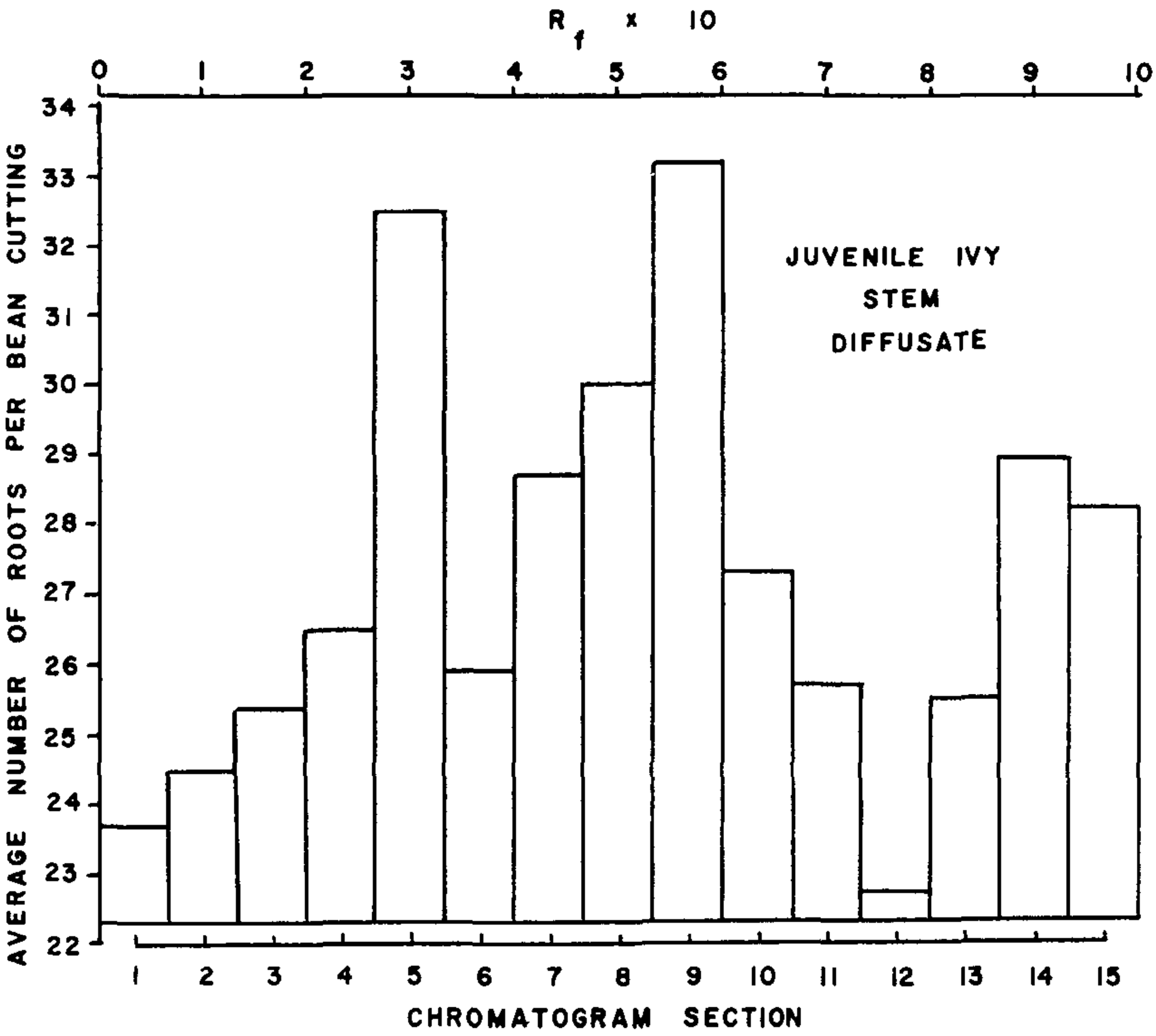

Figure 3. This histogram shows the biological activity of diffusates from juvenile *Hedera helix* stems as determined under lighted conditions by a mung bean rooting bioassay.

is interesting to note that he could concentrate diffusate by centrifuging leafless cuttings and that these cuttings rooted better than those which were not centrifuged.

4. Summary

We can say that leaves on stem cuttings of juvenile *Hedera helix* tended to reduce or interfere with the downward movement of substances which promoted root initiation. Diffusates collected from the base of stem cuttings had activity corresponding to rooting cofactors 2, 3 and of 4.

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MODERATOR SHUGERT: Our second paper in this quarter is by Mr. Donald Wedge from Albert Lea, Minnesota. He will tell us about lilac production at the Wedge Nursery.

LILAC PRODUCTION AT WEDGE NURSERY

DONALD WEDGE
Wedge Nursery
Albert Lea, Minnesota

The common Lliac, Syringa vulgaris, is one of the most popular and prominent shrubs. It succeeds in all but the warmest sections of this continent and grows particularly well in the colder areas. A Lilac will out live the person who plants it and will outlast the house near which it is planted.

Our nursery has grown Hybrid Lilac since 1902. In 1935, realizing many nurseries were having difficulties propagating Lilac and we were having fair success, we decided to specialize in Hybrid Lilac and stepped up our propagation. For the past 12 years we have grafted 120,000 to 150,000 Lilac per year, depending on our balanced supply of scion wood which has been a limiting factor, growing mainly for other nurseries under contract. We are now growing 38 out of the 40 top A rated varie-