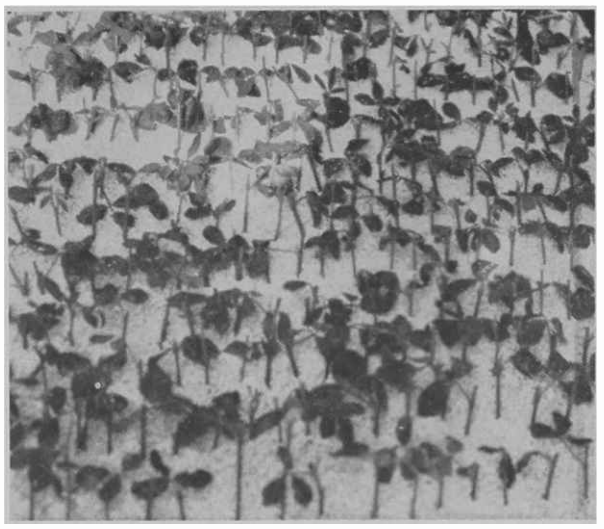
Rooting Alfalfa Stem Cuttings

A. E. El-Tabbakh
and
M. A. Massengale

Propagation of superior genotypes of many plants has been a problem facing nurserymen and research scientists for years. With hybrid alfalfas coming on the market, vegetative propagation has also become a problem for seed producers. For example, in the production of seed of hybrid alfalfa, it may be necessary to use large numbers of rooted alfalfa cuttings from many clones. One of the biggest obstacles to propagating alfalfa vegetatively is the difficulty in establishing vigorous roots from stem cuttings.

The study reported here sought to obtain information which might be useful in propagating alfalfa vegetatively. Several plant growth regulators were tested on different alfalfa genotypes to determine: (1) the most promising compounds for promoting the start of roots on alfalfa stem cuttings; (2) to determine the best concentration of those compounds found to be superior in stimulating root formation; and (3) to determine the response of different alfalfa genotypes (clonal lines) to root-promoting chemicals.



ALFALFA STEM cuttings which have been dipped in growth regulator solutions for 30 seconds and then placed in a perlite medium where rooting occurs.

If a growth regulator could be found that would consistently increase root formation on stem cuttings of alfalfa, and its optimum concentration determined, much time and effort would be saved in the production of large numbers of alfalfa clones.

The authors are members of the Department of Agronomy.

A Big Step Forward

The discovery that plant growth promoting chemicals such as indoleacetic acid were of real value in stimulating the production of adventitious roots on stem and leaf cuttings was a major turning point in propagating plants asexually. Before the use of synthetic growth regulators in rooting stem cuttings, many other chemical compounds such as sugar, potassium permanganate, carbon monoxide, ethylene, propylene, manganese, iron and phosphorous were tried without consistent success.

We made three successive experiments in the greenhouse during late summer and fall. Chemicals studied in these experiments were indoleacetic acid (IAA), naphthaleneacetic acid (NAA), indolebutyric acid (IBA), thiamine hydrochloride (vitamin B_1), gibberellic acid (G.A.), and 2,4-dichlorophenoxyacetic acid (2,4-D). All alfalfa stems used in these investigations were obtained from clones growing at The University of Arizona's Campbell Avenue Farm. Stems that were two weeks old were selected from four different genotypes designated as E-12, M-5-20, P-14 and Wyoming.

Cuttings of mature stems were taken from the fourth and fifth internode below the terminal bud. Each cutting consisted of parts of two internodes and one node which had leaves and a vigorous appearing axillary bud. Half an inch of stem was left above the node, and two inches of stem were left below.

Dipped for 30 Seconds

One inch of the basal ends of the cuttings was dipped for 30 seconds into the solutions containing the growth regulators. After dipping in the different solutions, one and one-half inches of the basal portion of the stem cuttings were placed in a medium of sterilized perlite. The cuttings and perlite were contained in greenhouse flats (wooden boxes 24" x 18" x 4"), see above. The position of each flat was changed daily in a clockwise manner to eliminate the position effect. Cuttings were watered at two-hour intervals from 8 a.m. to 10 p.m. daily for the duration of each experiment.

At the end of each experiment, approximately 20 days after cuttings

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in all seed growing areas of the United States and may run as high as 85 percent in individual fields.

This insect, as shown in the photo on Page 20, is a tiny wasp that lays its eggs in young alfalfa seeds. In a short time the eggs hatch and tiny grublike larvae feed within the seeds, consuming everything but the seed coats. Only one larva survives in each seed. The larvae mature, pupate, and emerge as adults in two to three weeks. Thus, the insect spends most of its life within the alfalfa seed. The females usually lay 40 to 80 eggs which give rise to a similar number of infested seeds.

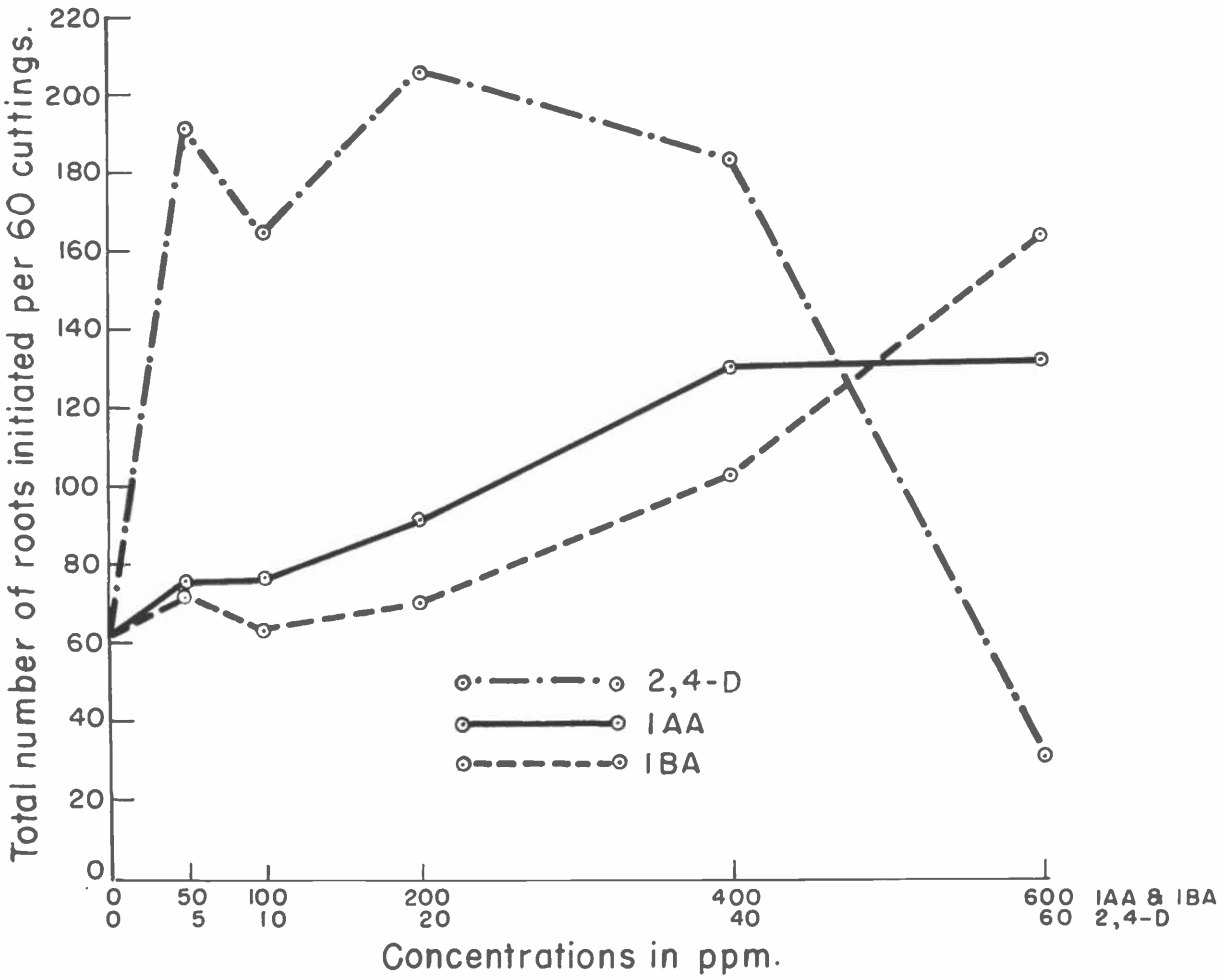
In research at The University of Arizona Branch Experiment Station at Mesa, thousands of alfalfa plants have been screened and tested in the last three years. The plants are first screened in the field at a time when high populations of the chalcid are present. Next, samples of racemes (group of seed pods) in the plump, green stage of development are taken from the plants and placed in special rearing containers. The adult chalcids emerge and are counted. Plants that have low infestations by this test are saved for further testing in the greenhouse. Small cages are used to confine 10 adult chalcids on a single raceme, as shown in the photo at left.

If the plant is resistant very few, if any, eggs are laid and little seed damage results. On the other hand if many eggs are laid, much seed damage occurs, and the plant is discarded.

One Percent is Resistant

About one percent of the plant population tested since 1961 has had a level of resistance adequate for use in development of a new alfalfa variety.

In spite of the apparent success in finding plants with a satisfactory degree of resistance to the alfalfa seed chalcid, much more research and testing will be necessary before a resistant variety finally is released for commercial use.



EFFECT OF DIFFERENT concentrations of three different treatments on number of roots started on 60 stem cuttings of alfalfa genotype P-14.

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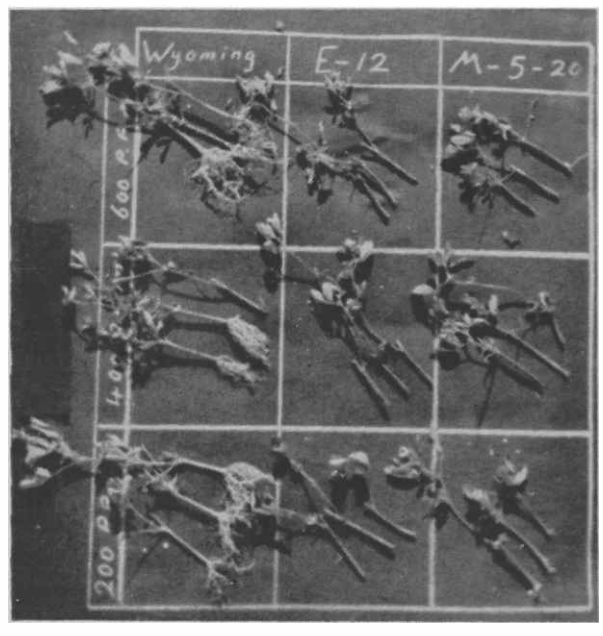
were made, the cuttings were removed from the perlite medium, thoroughly rinsed, and collected in a beaker containing distilled water. Data on the number of roots per cutting, length of the longest root, and dry weight of the roots were obtained.

Data from the first experiment showed that the number of roots from cuttings treated with 2,4-dichlorophenoxyacetic and indoleacetic acids was significantly higher than the number of roots from cuttings treated with other chemicals, or from the controls. Indolebutyric acid was not available for comparison in this test. Results of this experiment further showed that root growth expressed in length and/or weight was less affected by the plant-growth regulators studied than was the number of roots. There were large differences in dry weight of roots, number of roots and length of the longest root among the different genotypes of alfalfa, as seen in the photo above.

Other experiments sought to learn the best concentration of IAA, IBA and 2-4-D to use for start and growth of roots on alfalfa stem cuttings. Comparative effects of the three plant growth regulators on the number of roots are shown in the graph. These data show clearly that concentrations



ROOT FORMATION on alfalfa stem cuttings which had remained in perlite medium for 20 days. Note large number of roots on the Wyoming genotype as compared with genotypes E-12 and M-5-20.

up to 600 ppm for IAA and IBA did not reach the toxic level for root initiation and growth, but a concentration beyond 40 ppm of 2,4-D caused inhibition of root initiation and growth. Apparently, 2,4-D was toxic to the stem tissue at a level higher than 40 ppm.

In general, the best root start, growth and development on alfalfa stem cuttings came when they were treated with concentrations of 600 ppm of IAA and IBA and between 5 and 40 ppm of 2,4-D. We also gathered that different genotypes of alfalfa may require a different concentration of these growth-regulating chemicals for best rooting response.

Food Poisoning Is Human Hazard

F. Eugene Nelson

Each year a few thousand people in the United States suffer from the discomforts of what is known as "food poisoning." This combination of diarrhea, vomiting, nausea and weakness frequently is caused by eating food in which bacteria have grown extensively.

Staphylococcal food poisoning and salmonella "food poisoning" are the major examples of this type. A few people contract botulism each year, and about 65 percent of the cases are fatal.

Botulism usually starts out with fatigue, dizziness and headache, followed by double vision and difficulty in swallowing. The nervous system is involved, resulting in eventual paralysis of the respiratory system and the heart.

Staphylococcal food poisoning is caused by an organism known as *Staphylococcus aureus* (occasionally by *(Staphylococcus albus)*. Some strains of this organism are able to produce an enterotoxin, a substance which causes characteristic pronounced reactions when taken into the gastrointestinal tract. In a few instances symptoms may appear within an hour after the food containing the organisms and their growth products is eaten.

Recovery is Usual

More commonly, two to six hours elapse before illness, and periods as long as 12 hours have been known. While the discomfort is considerable at the time, the afflicted person usual-

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Dr. Nelson is Professor of Dairy and Food Technology, Department of Dairy Science, University of Arizona.