

SHOWN AT LEFT, alfalfa seed chalcid, magnified 25 times actual size. A — adult; B — larva; C — pupa. (After Urbahns, 1914).

Alfalfa Seed Chalcid Resistance in Alfalfa

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Development of an alfalfa variety resistant to the alfalfa seed chalcid (*Bruchophagus roddi* (Gussakovsky)) is now within the realm of possibility.

Recent research in Arizona has turned up a number of alfalfa plants



RACEMES AND ADULT chalcids from susceptible and resistant plants, following cage testing. Five adults emerged from racemes of resistant plant, above, and 66 adult chalcids from racemes of susceptible plant, below.



GROUP OF ALFALFA plants being cage-tested in the greenhouse at the Mesa Branch Experiment Station. Note the little bottle-like screen cage around each raceme or flower cluster. Each such caged raceme contains 10 adult chalcids.

that are promising in the development of varieties that will give protection from the devastating effects of the chalcid and provide increased seed production for the growers.

Immune to Control

The alfalfa seed chalcid is one of the most destructive insect pests of alfalfa seed. There is no known control that will adequately reduce populations of this insect. Damage to the seed crop usually occurs every year

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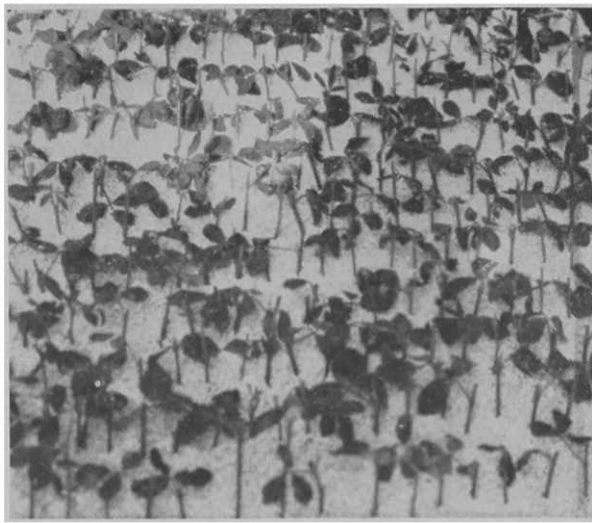
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Rooting Alfalfa Stem Cuttings

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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



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

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.

If a growth regulator could be found that would consistently in-

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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.

crease 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.

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 B₁), 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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