STUDENT PAPERS . . .

James L. Davenport, Editor

EFFECTS OF DIFFERENT PHOTOPERIODS AND FOLIAR APPLICATIONS OF SEVERAL SUGARS ON ROOTING OF LIGUSTRUM LUCIDUM

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With the increase in housing development and industrial growth during the past few years, a growing interest in landscape planning and beautification of the home grounds has arisen. More pressure has been placed on the retail nurserymen for more and higher quality shrubs and ornamental plants.

Nursery operators have many problems which need to be solved quickly and correctly if they are to remain in the business and make a reasonable profit from their products. Nurserymen should seek every avenue which will cut overhead costs, increase turnover of their products, increase yield per unit of space, reduce risk to a minimum, and, above all, maximize their net returns.

For some time now, the procedures used in the rooting of most cuttings has followed certain methods of treatment such as the wounding of the basal end of the cutting, the use of bottom heat, mist propagation, and the use of synthetic rooting hormones. If some treatment could be employed which would decrease the time required for rooting, increase the amount of roots produced, and at the same time be economical and practcal for the average nurseryman to use, it would greatly affect the profits received by the nurseryman as well as the price paid by the consumer because of the greater volume of plants produced at a reduced cost.

A study was conducted at Arkansas State College during the Fall of 1963 to evaluate the effects of diffferent photoperiods in association with foliar application of various sugar solutions on the rooting of stem cuttings of **Ligustrum lucidum.**

Hartmann and Kester (7), citing Gardner, report that the absence of light seems to be favorable for the initiation of root primordia in stem tissue. They also state that etiolation may have some effect on the organic or inorganic nutrition of the internal stem structure which may lead to increased root initiation.

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Downs and Bortnwick (3) found that additional light had an effect on the vegetative growth of the **Weigela florida** var. Variegata. They found that rooted cuttings placed under 8 and 12-hour photoperiods ceased growth after two months. Plants that had been on 14 or 16-hour photoperiods had considerable soft wood and were producing new growth. It was shown that growth of the terminal bud is influenced by the uppermost pairs of leaves on the plant.

Downs and Piringer (4) experimented with five **Viburnum** species and found that plants of all species showed increased vegetative growth on long days. Photoperiods to which plants were subjected were 8, 12, 14, and 16 hours. The main axis and lateral branches in each species made relatively little growth in 8-hour days. On the longer daylengths, plants of **V. carlesii** produced more than three times as much growth, **V. juddii** produced about five times as much growth, and **V. plicatum** produced more than four times as much growth as plants of the same species on 8-hour days.

Einert (5), working with **Ilex cornuta** Burfordi, found that rooting of stem cuttings was significantly increased by 24-hour lighting, whereas 12-hour lighting and normal daylength failed to produce a significant increase in root formation.

Bonner and Galston (1) propose a general principle which may govern the passage of substances into and out of plant cells. This has to do with the size of the molecules involved. Measurements of the rate of water entry into living plant cells have shown that water penetrates into and out of plant cells by a factor of 10,000 to 1,000,000 times more rapidly than does sucrose.

Hartmann and Kester (7) cite Knudson's Solution B which is an aseptic culture medium used for growing orchid seedlings. Twenty grams of sucrose is used in the solution. They also state that sucrose is the best sugar for aseptic cultures, although glucose can be used. Sugar concentration may be from .5 per cent to 2 per cent but may vary with the age of the seedling.

Curtis and Clark (2) have observed an increase in respiration when various sugars, especially sucrose, glucose, fructose, and maltose, are supplied to leaves floating in sugar solutions or when cut ends of stems or petioles are placed in sugar solutions. It is also noted that the plant can absorb sugar solutions through the leaves more easily than through the roots. Respiration

was maesured by the amount of carbon dioxide which was evolved.

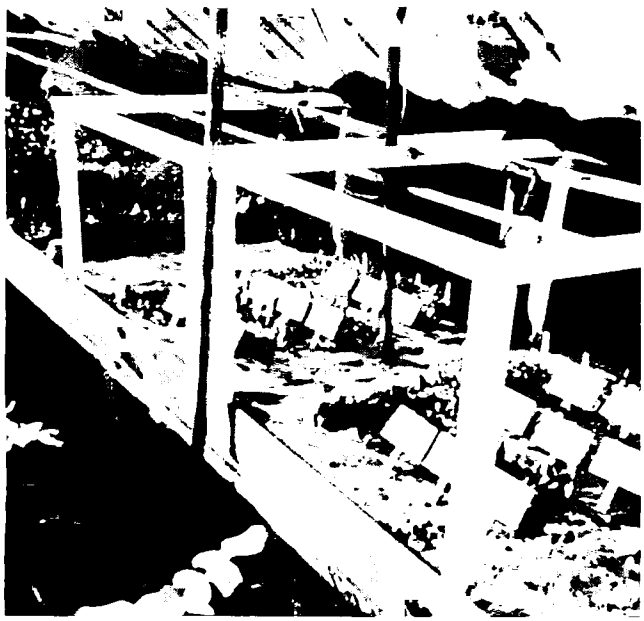
Ferry and Ward (6) state that expanded leaves with little cutinization most readily absorb water soluable salts. However, only mobile ions, i.e., NO_3 SO_4, PO_4, K, Na, Mg, Mn, and BO_3 are translocated by the phloem in sufficient quantities to maintain growth of the meristematic areas. The first successful use of foliar sprays of essential nutrients was the use of the microminerals such as Zn, Cu, BO_3 and Mo.

MATERIALS AND METHODS

On November 18, 1963, Ligustrum lucidum cuttings were taken from stock plants grown in gallon containers at the Arkansas State College nursery. Cuttings were selected at random as they were placed in the rooting bench. The cuttings were wounded, treated with a commercial root stimulating hormone consisting of 0.8 per cent indolebutyric acid, and placed in a rooting medium composed of pure builder's sand.

During the time of root development, water was supplied by syringing regularly and by the use of intermittent mist. Bottom heat was applied to the rooting bench by a thermostatically controlled lead heating cable which was set at 24°C. (74°F.) during the rooting period.

Three treatments were applied to the cuttings with respect to photoperiod. These were: continuous illumination, intermittent illumination with a 4-hour light period between two dark periods of 6 hours each, and normal daylength. The light treatments were initiated immediately after the cuttings were placed in the bench and continued until the cuttings were removed.



Progagation Bench Showing the Photoperiod Cases, Position of the Incandesent Lights, and Mist System January 11, 1964

Using a randomized block design, three treatments with three replications each were made with respect to sugar application under each light treatment. These treatments were: check, sprayed with distilled water, one-half Molar solution of gloucose, and one-half Molar solution of sucrose. These solutions were applied as a foliar spray three times weekly, and continued until 14 applications were made.

The cuttings were removed from the rooting bench on January 11, 1964. After photographing, the roots of all treatments were excised and fresh weights recorded. The roots were placed in a drying oven at 54° C for 48 hours. Dry weights of the roots were then obtained.

Wherever applicable the data were analyzed for statistically significant differences. Differences required for significance between treatments were caculated by the method of analysis of variance as described by Snedecor (8).

RESULTS AND DISCUSSION

The data presented in Table I show the effects of the light and sugar treatments. Under continuous light, root formation under sucrose treatment was significantly greater at the 5 per cent level than with the glucose treatment. Root growth of the control plot was significantly greater at the 1 per cent level than the glucose treatment but there was no significant difference between the control and the sucrose treatment. Under the intermittent light treatment, the rooting response of the control was significantly higher at the 1 per cent level than the sucrose treatment and higher at the 5 percent level than the glucose treatment. Glucose treatment was significantly higher at the 5 per cent level than sucrose. Under normal light, both the control and the glucose treatment were significantly greater at the 5 per cent level than sucrose. There was no significant difference between the control and the glucose treatment. Significant differences can also be shown between several sugar treatments interacting with the light treatments.

TABLE I. Effects of various photoperiods in relation to different sugar treatments on the rooting response of Ligustrum lucidum.

Light Treatment	Sugar Treatment	Av. Wt. of 3 reps/grams
	Check	1.2664
Continuous Light	Glucose	0.6198
	Sucrose	1.0439
	Check	1.6852
Intermittent Light	Glucose	1.2914
	Sucrose	0.9555
	Check	0.9613
Normal Light	Glucose	0.9252
	Sucrose	0.5233

L.S.D. .01 — .4462 .05 — 0.3067

SUMMARY AND CONCLUSIONS

The effect of the treatments as measured by the weight of the roots produced, showed that the control under each light treatment gave the best results. The control treatment under intermittent light produced the largest amount of roots. The glucose treatment gave better rooting than

the sucrose treatment under intermittent light and normal light treatments, while the sucrose treatment gave better rooting than glucose under continuous light. The response of the cuttings to photoperiod was not significant.

The results indicate that foliar application of glucose and sucrose do not increase the rooting response of stem cuttings of **Ligustrum lucidum.** Neither can any relationship between photoperiod and rooting be shown. Further studies of this problem are suggested.

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Vocational Agricultural Education . . .

Dr. James Elliott, Editor

Performance in College Freshman Biology as Related to High School Preparation in Science and Agriculture

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INTRODUCTION

In recent years various studies have resulted in the generalization that college success, as measured by grades earned, is not closely related to secondary school training in a specific subject matter area (3, 4, 5). If this conclusion is taken at face value, it can be assumed that the various regulations of college admissions committee which uniformly require specific credit (s) in particular subject matter areas for admittance are in fact, groundless. Nevertheless, colleges continue to require various courses as entrance prerequisites presumably because they and their administrations suspect the existence of a beneficial relationship between secondary training and college level performance in specific subjects.

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The data reported in this paper were collected to supplement existing knowledge in this area of investigation. More specifically, the present study attempts to ascertain the reliability of beliefs held by some local and state administrators (7) that vocational agriculture as taught in secondary schools is not proper training for prospective college science students. In general, these administrators seem to feel that a student taking a preponderance of science courses in high school with little or no agriculture increases his chances of success in college science offerings. A review of the literature on this subject reveals no adequate basis for such a belief. (1, 2, 3, 4, 5).

The primary object of this investigation was to compare the performance (measured in terms of grades) in a college biology course (freshman botany) of students whose secondary school training encompassed either science subjects only or vocational agriculture only in conjuction with the normal secondary curriculum. However, a preliminary investigation of all male students enrolled