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control chemical currently available. Fill out the coupon below, and we will be happy to forward more data. **Cellulose and Protein Products Department, Hercules Powder Company, Wilmington, Delaware 19899.**



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How Cal-Turf Plants and Grows Bermuda Stolons

While the turgrass industry in California is very young in comparison to other parts of the country, rapid advancement has been made in stolon handling and planting methods in its few short years of existence.

Introduction of the improved Tifton-developed hybrid bermudagrass has contributed a great deal to the turf industry in the West. These new varieties are filling a very definite need for the buyer who wants a quality recreational turf, which often must serve the heavy demands of multiple recreation uses.

At present, three varieties of hybrid bermudas, Tifway, Tifgreen, and Sunturf, are grown at two locations. Several characteristics differentiate the hybrid bermudas from the common variety. Most noticeable is the finer texture of the hybrids. The fineness of leaf and stem enables them to form a tight, dense turf which resists wear. Weed infestation is minimized by the tightness of the turf. A longer growth period allows the hybrids to begin growing earlier in the spring and continue longer in the fall, thus holding their color longer than the common bermuda. Seedheads of the hybrids are sterile, making confinement to a given area much easier. The rate of

By **DICK MORROW**

Field Representative, Cal-Turf
Camarillo, California

establishment of these improved bermudas by planting stolons is considerably faster than by seeding, an important fact to consider when time is essential.

The combined factors of large areas, heavy use, and limited maintenance make up the usual problem that schools, parks, and recreational areas must solve. Turf installations are often subjected to abnormally hard and prolonged use. All too often, these large, heavily used grass areas are maintained under a very limited budget. To survive under these conditions, the grass must be especially hardy, disease resistant, wear resistant, and have fast and complete recovery characteristics from wear. The hybrid bermudas are outstanding in all these respects, when planted in their adaptable areas throughout California.

To date, the most common installation for hybrid bermudas has been football fields, but wider use on golf fairways and other athletic facilities is becoming more popular. Two of the first golf courses in California to plant hybrids on all fairways was the La Canada Country Club and the San Marcos Golf Course lo-

cated in those respective cities. The expanding market and new applications include some highway rights-of-way, parks, and industrial sites.

Present company policy is to concentrate solely on the growing and supplying of material and planting equipment to landscape contractors and custom applicators. In some cases where the buyer is doing the installation and no contractor is involved in the work, we offer assistance and make the specialized planters available at the same rental charge as offered contractors.

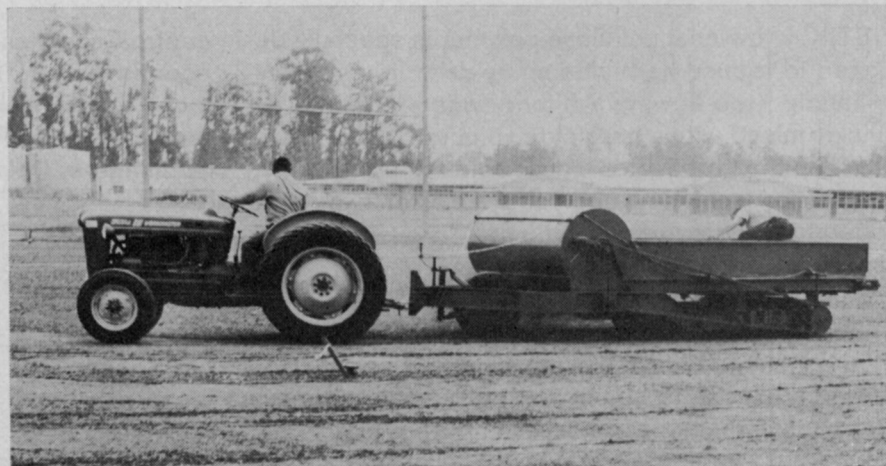
At both of our turfgrass farms, the Camarillo location and the northern growing grounds located at Patterson, California, a constant effort has been made to produce and plant good quality stolons with as little labor and handling as possible.

Growing

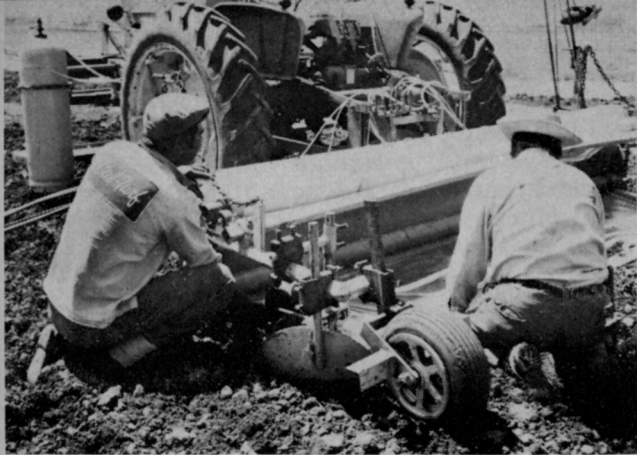
In the production phase of our operation, a modernization program meant the introduction of a system of fumigation that could handle the job of application of fumigant to all growing grounds prior to planting. Initial efforts to attempt this preplant operation of weed, disease, and nematode control on all areas where sod and stolons were to be grown proved costly. A system has been



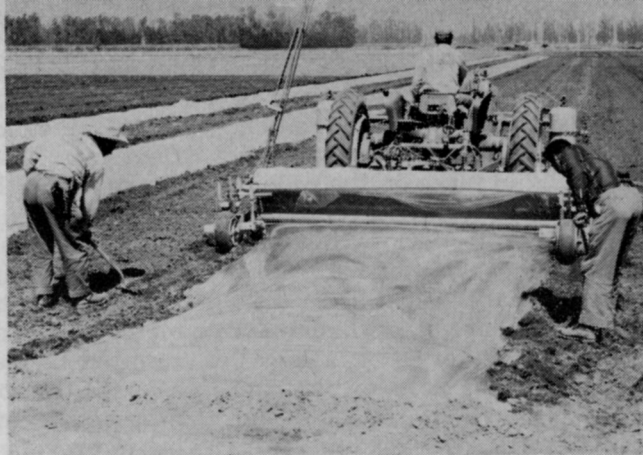
Small area planter automatically distributes and presses bermuda stolons into soil and plants half acre per hour. Capacity is 10 bushels.



Large area stolonizer has sufficient weight to leave new-planted areas smooth. The machine is drawn by a tractor with a three-point hitch. Working capacity of this larger planter is a total of 20 acres per day. Cal-Turf rents this unit to contractors buying its stolons.



Plastic sheeting is readied for field fumigation. Disc in foreground tosses soil into plastic; rubber wheels follow to seal edge into soil.



Three men can fumigate one to two acres per hour. Direct injection method is used with pressurized fumigant cylinders mounted on tractor.

developed and at the present time costs have been reduced to an average of \$400.00 per acre. A direct line injection method is employed with pressurized cylinders of fumigant mounted on a tractor with control valves within easy reach of the operator. Plastic tarp laying follows immediately from the rolls mounted on the back of the tractor. Three men can fumigate from one to two acres per hour, depending on the length of the field run. Ideal conditions require little to no wind, and adequate soil moisture. Recent development of a machine to remove the plastic sheeting from the fields, by the Tri-Cal Co. of Placentia, Calif., a firm that specializes in fumigation techniques, may further reduce costs.

In a master plan for the growing areas, an attempt to isolate various varieties has been made. Every employee is made aware that purity of strain is of utmost

importance and a necessary requirement for a solid foundation, for future sales and company growth. Special equipment is assigned to each variety and when moved into a different block due to unavoidable conditions, the equipment is thoroughly cleaned with air hoses and then steam cleaned, to avoid any contamination.

Introduction of a certification program by the California Crop Improvement Association, calls for a 50-foot strip between similar species. This restriction has emphasized the need for careful planting of future growing areas to utilize all land to the best advantage. Only basic material of a known origin is used for any planting. The aim of our production crews is to harvest only mature material; experience has proven the best stolons have a large number of nodes and the material has been hardened off to reduce transplanting shock.

All hybrid bermuda stolon growing blocks are kept at approximately two inches high, with minimum water and fertilizer applications. Since it is our desire to harvest material that consists of a majority of heavy rhizome growth that can withstand some possible neglect conditions after planting, only material that is at least one year old is harvested.

Harvesting

Our harvesting operation begins with the area being cut with a sod cutter slightly below the soil level. The stolon harvester, pulled by a tractor, feeds the cut material onto a conveyor belt that carries it into the machine which cuts, shreds, and screens it. Cutting knives are set to cut the majority of the material two and one half inches long. It is then fed automatically into the bins which are carried on the



New machine, developed by Tri-Cal Co., fumigation technique specialists, quickly removes sheeting prior to planting; reduces labor costs.



Hybrid bermuda harvester shreds, chops, and screens stolons in one operation; conveys them into bulk bins carried on back of machine.

back platform of the machine. One bin is always in reserve to avoid any delay in the operation. As one bin is filled, the reserve bin is slid in place on the rollers. The new harvester, developed at the Camarillo farms this past winter, is capable of harvesting up to 1200 bushels per hour. Two sizes of bins are used; the largest has a capacity of 90 bushels.

A forklift is used to pick the filled bins out of the field and deliver them to the loading ramp, where they are iced and loaded

for shipment. Most harvesting is scheduled for late afternoon when the stolons have lost their field heat. With this new system of handling bulk packed bermuda stolons, an equal amount of material can be harvested in one hour, that only a year ago took eight hours. This new method of stolon handling has resulted in fresher material because of the speed and thoroughness of the operation, and is a big improvement on older methods. Although only one of these

machines has been built for the southern farms, work has already begun in our shops to build a similar one for the Patterson farms since it has proved satisfactory.

Planting

In the Southwest, the ideal planting season for hybrid bermudas is short. Because of the wide climate variations, no exact dates can be set, but the most favorable time is considered from the middle of March until the end of September. During the cool season, more planting is being done with an overseeding, usually Creeping Red fescue is specified at 80 to 100 pounds to the acre.

Very little fumigation of the sites to be planted is done, even with the excellent application equipment available. Where fumigation does precede planting, it is very evident that it is an excellent practice and pays dividends in the absence of weeds and getting a fast stand of grass. Much of the planting is done in heavier type soil that has been amended, usually with redwood, sawdust or chips, or in some cases, large quantities of steer manure is used. For ideal planting, the top couple of inches of soil should be loose with some moisture.

New Stolon Planter

Development of a new stolonizer this year is the result of five years of work with varying methods of planting that started with a four-man row sprigger. The machine automatically distributes stolons evenly on the prepared surface and simultaneously presses them into the soil and rolls the area smooth. The machine is drawn with a tractor and is capable of planting up to 20 acres a day. The rate of planting can be varied according to the amount of plant material placed in the self-feeding hopper. A steel hood was incorporated over the distribution tines, which directs the material downward. This hood is especially useful when planting during high winds to prevent any blowing of stolons.

A set of cup discs can be lowered to break any surface soil

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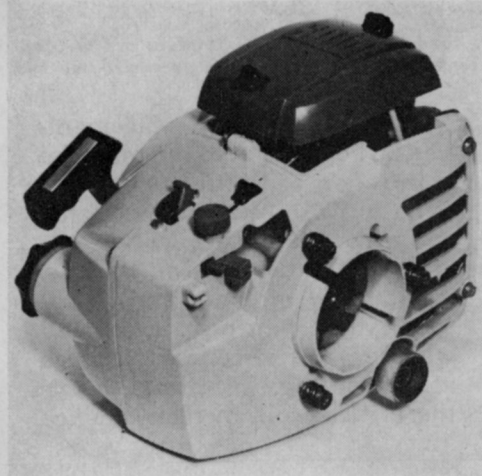
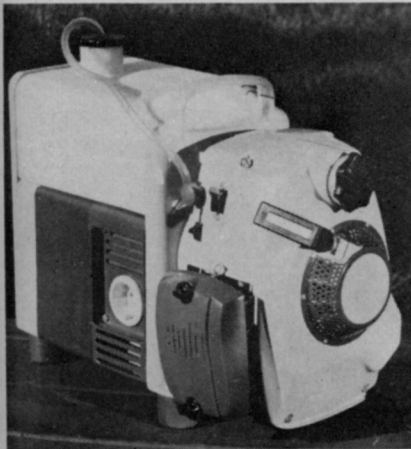
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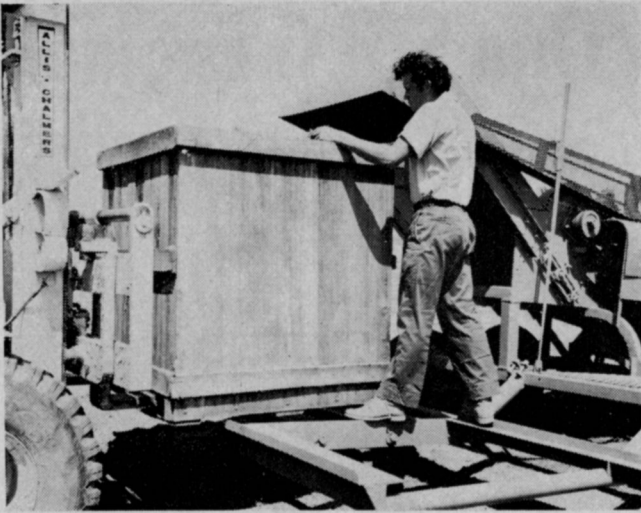
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Large bins are easily unloaded from harvester. Loaded, bins weigh 900 lbs. Empty bin is quickly slid in place for continuous harvesting.



Stolons are bagged right in the field to assure freshness. Operation is scheduled for late afternoon when stolons have lost field heat.

crust. Two sets of offset straight discs, spaced two inches apart, presses the material into the soil for good contact.

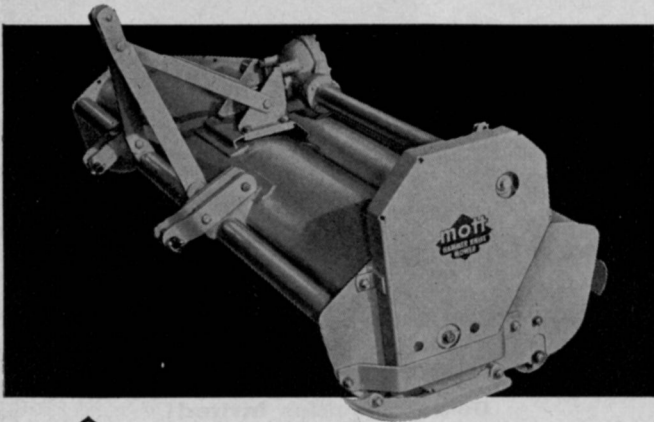
Stolon Placement Controlled

The majority of the stolons are placed in the top one-half inch of soil. Incorporated in the new machine is a guide wheel that can be raised or lowered to con-

trol depth of stolon placement. The last operation of the machine is a roller of sufficient weight to pack the soil around the plants and leave the surface level. Rate of coverage depends on amount and quality of the material applied, the temperature and weather, and of course, the care after planting. Water also plays the critical role in maintenance

after planting. Stolonizing is always done with regard to the layout and the sprinkler sequence pattern; care is always taken not to plant too far ahead of watering. A maximum time delay before watering is very dependent on whether it is a bright, hot day or a cool and cloudy day, but never do we exceed this general guide: (100°-15 minutes,

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Bagged stolons, two and a half inches long, are loaded onto huge trailer and then quickly iced to protect quality during transport.

90°-20 minutes, 80°-30 minutes, 70°-1 hour). When possible, all planting is scheduled for early morning or late afternoon, especially during extremely hot weather.

After planting, quick coverage becomes the immediate objective. This means adequate irrigation, fertilization, and early and regular mowing. The results of

the planting will depend, to a great extent, on the willingness of the buyer to provide a good maintenance program.

In an effort to observe new varieties being developed throughout the country, the company has established plots at both growing grounds. The most promising varieties are being observed for possible future plant-

ings after they are proven to have desirable characteristics and will adapt to the varied California soil and climatic conditions. With regard to expansion, options have been taken on new growing grounds, to insure the firm areas to expand, to keep pace with this young, but fast-growing turf industry throughout the state.

try this simple test...



Take an object weighing twenty pounds into your hands (the vacuum cleaner is just fine) . . . Kneel down with it . . . Now, still crouching . . . move ahead five feet . . . now five more . . . stand up . . . kneel down . . . move ahead another five feet . . .

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Now hold the same object in your hands and remain standing. Move ahead five feet . . . now another five . . . and another five . . .

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Expanding Overseas Market Competing for Chemicals, Manpower, 20th Northeastern Weed Meet Hears in New York Last Month

"A new demand for trained personnel and product distribution is coming from the foreign weed control market," Dr. William R. Furtick, Oregon State University in Corvallis, told delegates to the 20th Annual Northeastern Weed Control Conference. Almost 700 weed control contractors, highway and utility workers, horticulturists, and researchers attended the three-day conclave at New York City's Hotel Astor, Jan. 5-7, honoring pioneers in the weed control field whose work during the last two decades has made this group's annual sessions one of the country's most educational conferences. The concurrent subway strike, which created massive chaos for New York City, did little to dampen delegates' interest and enthusiasm for this year's fact-filled program. Only minor arrival and departure inconveniences held total attendance slightly under last year's record enrollment.

"Weed control is one of the most rapidly growing fields today in this country," Dr. Furtick continued, "and now international sales have exceeded domestic use. Demand for additional trained personnel in the USA will increase more than ever before. We already have a serious shortage. And now the growth of the foreign market further complicates the problem," he observed during the first session of the combined technical- and use-oriented weed control meet.

Serving needs of conference delegates were reports of test results on weed control methods, chemicals, and equipment, given by contract applicators, researchers, and representatives from industrial, university, and governmental organizations.

New Products from Industry

Among the new products being offered weed controllers, nine new herbicides were described for potential use in non-agricultural fields. Dr. Robert Metz of Niagara Chemical Corp. chaired the panel of chemical company researchers.

Dr. Mark B. Weed, Agricul-



Dr. Stan N. Fertig, Cornell University, Ithaca, N. Y., discussed preemergence treatments for weed control. He also co-authored a report with Dr. Armin H. Furrer, from Rutgers University, on fall treatments for quackgrass control in clay soils.

tural Research Section of the E. I. duPont de Nemours & Co., Inc., introduced the first new herbicide, Sinbar, formerly known as test chemical 732. "Sinbar," he said, "is a uracil-type compound which has controlled deep-rooted annual weeds and perennials during test trials. Its oral LD₅₀ to rats is 1,000 mg./kg. Toxicity tests in feeding studies with dogs and rats are in process. Sinbar inhibits photosynthesis and leaves the plant in a chlorotic state with stems and leaves somewhat faded." Weed explained, "It has given good control of quackgrass at 2 to 4 lbs. per acre. Plants pick the chemical up through their roots, and apparently there is no translocation of it downward into the soil."

Hooker Chemical Co. researcher, Dr. L. G. Butler, described their new product, Glytac. "Its technical name is ethylene glycol bis-(trichloroacetate), and has an oral LD₅₀ to rats of 7,000 mg./kg. Use of Glytac is now restricted to the Delta area, and is not used on crop plants," he said. Tests have shown that Glytac's herbicidal activities are reduced when it is applied as an emulsion. Hooker recommends

its dilution in an oil solvent. Among the weeds controlled, Butler listed johnsongrass, quackgrass, and broadleaf annuals.

Richard Otten, Amchem Products, reported on his firm's new herbicide, Sindone, formerly known as D 263. It is a mixture of 1,1-dimethyl-4,6-di isopropyl 5 indanyl ethyl ketone and 1,1-dimethyl-4,6-di isopropyl 7 indanyl ethyl ketone. "During trials, this herbicide controlled hairy crabgrass, goosegrass, and most seedling grass weeds. It should be applied at 8 to 10 lbs. per acre for weed control in turf. It controlled weeds after pre-plant soil and preemergence applications."

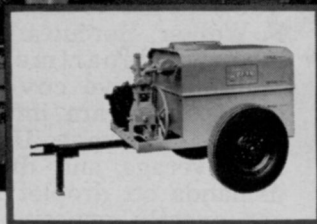
"Application to register Paraquat for nonagriculture use has been made," J. P. Good of Chevron Chemical Co. disclosed. "It will be especially useful in grass seed bed applications, but Paraquat should not be used with anionic wetting agents." The herbicide, insoluble in most organic solvents, is soluble in water. Its oral LD₅₀ to rats is 115 mg./kg., and has a very short residue period.

Velcisol's coded herbicide, OCS-21799, was explained by Dr. Warren H. Zick. The chemical name for this new entry is 2-(4-chloro-o-tolyloxy)-N-methoxyacetamide. "The potassium salt of this compound is formulated in water as the herbicide, and its oral LD₅₀ to rats is 175 mg./kg. Results from two test seasons have shown high general herbicidal activity when applied both preemergence or post-emergence. Currently, combinations of Banvel-D and OCS-21799 are being tested, and 1:2, 1:3, and 1:4 ratio formulations will be available," Zick concluded.

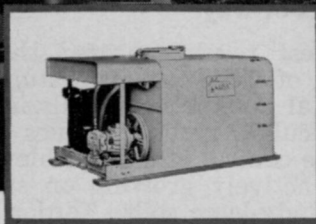
"Now formulated as a 75% wettable powder, Planavin (SD 11831) is used primarily for weed control in cotton but does look promising on turf. However, it is not yet registered for such use," Dr. R. H. Schieferstein, Shell Development Co., said. "As a preemergence herbicide, Planavin is very active, and

leadership engineering pushes performance up - prices down

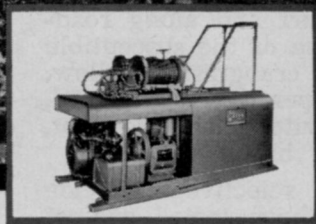
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has a low oral LD₅₀ to rats of 2000 mg./kg.

"Niagara Chemical Division of FMC Corp. is developing a new herbicide, NIA 11092, for low-rate nonagriculture use," Dr. Richard W. Bushing, from Niagara's Middleport, N. Y., headquarters, told delegates. "It is now formulated as granules, a wettable powder, or 1 lb./gal. emulsifiable concentrate. It has a low LD₅₀ rating orally to rats at 3,000 mg./kg." Bushing said that 3 to 5 lbs./A. should be used for annual weeds and up to 6 lbs./A. for woody-rooted perennials. Applied at 2 lbs. per 100 gals., NIA 11092 will defoliate conifers and maples within 6 weeks.

Rohm & Haas Co. researcher, Dr. V. H. Unger, described two experimental herbicides BV-201 and BV-207. Both are formulated as either a 40% wettable powder or an emulsifiable concentrate at 1.5 lbs./gal. Each is soluble in organic solvents and only slightly soluble in water. "To date, most tests have been made on weed control in agronomic crops," Unger explained, "but these compounds applied at from 2 to 6 lbs./A. were effective on some 30 weeds species found in turf and along roadsides." Some of the susceptible species are crabgrass, mallow, chickweed, pennycress, pigweed, purslane, witchgrass, crowfoot, and annual bluegrass.

"Another selective herbicide which has been tested against many annual weeds is Patoran, a product of CIBA Corp., available in technical form or as a 50% wettable powder. It has been tested against 29 weed spe-

cies and gave control at from 1 to 4 lbs./A. During standard sensitivity tests, beets, most cucurbits, most cole crops, and tomatoes were found to be susceptible to it," Dr. R. B. Seely of CIBA, summarized at the close of the new products session.

Drift Control Additives Tested

"Our research in a small wind tunnel revealed that particulated sprays reduced drift potential to less than 1% compared with unmodified water-solution sprays," B. C. Byrd, Technical Specialist for The Dow Chemical Co. explained during a session on utility and railroad weed control. Particulated sprays are formed by adding special chemicals to mixtures of water and herbicide. Uniform and larger particles are formed from herbicide droplets so the spray is less subject to air currents. "Field tests tend to substantiate wind tunnel results. In nine different states, Norbak (a particulating agent) prevented off-right-of-way damage by confining the herbicide, Tordon, to intended targets when sprayed from helicopters. There was little effect on plants off the rights-of-way.

"Test results showed that 2 gals. of Tordon 101 mixture in a total volume of 10 gals./A. of particulate spray provides adequate control of susceptible species actively growing on sandy or sandy-loam soils. Tordon 101 mixture is .54 lb./gal. of 4-amino-3,5,6-trichloropicolinic acid and 2 lb./gal. of 2,4-D as the triisopropanolamine salt. On rocky areas, clay soils, or where brush



Graduate assistant, A. B. Rogerson from Virginia Polytechnic Institute, reported on the effectiveness of soil sterilants under highway guardrails. His research was planned with Doctors T. O. Evrard and W. E. Chappell, both staffers at V.P.I.

is covered with dense vines, 3 gals. in 15, or 4 gals. in 20, may be needed to control less susceptible species. Double applications at 1/2 rate per swath, and during periods of active plant growth, have given consistent and most effective results," Byrd told the weedmen.

On the subject of drift control with invert emulsions, John F. Walker, Hercules Powder Co. research department, added, "Both effective coverage and drift control are influenced by droplet size range. Unfortunately, coverage and drift control demands on droplet size range are exactly opposite. Right-of-way spraying, usually done by aircraft at a substantial altitude, calls for strict drift control. Here, a large droplet size is necessary so that herbicide will hit only the weedy targets." Walker explained that, on the other hand, spraying very large areas at low altitudes, or from the ground, necessitates small droplet size to get good coverage. Drift in this case would be held to a minimum since the spray is applied near the ground. "We now know that properties of invert emulsions are variable and in any piece of equipment, aerial or ground rig, requirements of invert applications can be met by adjusting characteristics of the invert emulsion, either in the field or lab."

J. W. Suggitt, research chemist for the Hydro-Electric Power Commission of Ontario, Canada, pointed out, "Where herbicides must be applied to right-of-way



Registration was nearly 700 at the 20th Annual Northeastern Weed Control Conference at the Hotel Astor in New York City. Weed controllers, suppliers, and researchers were processed rapidly under the supervision of Dr. and Mrs. John A. Meade. Dr. Meade, 1965 Secretary-Treasurer, organized the check-in process and helped maintain its steady flow.