Growth of Geranium and Snapdragon "Plugs" Fertilized with Controlled Release Micro-Fertilizer and Exposed to Root-Zone Heating

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"Plug" culture is a very popular topic in commercial floriculture in the 1980's, and imaginative minds should be able to exploit this innovation. Anyone who has transplanted plug seedlings knows how easy and fast the procedure can be, in contrast to the more traditional way of transplanting seedlings. There is no transplant "shock" and the seedlings take off very quickly. Much is yet to be learned about plug culture, however, and we have been devoting quite a bit of effort and time to plug research. Our new facilities, with Biotherm root-zone, heating travelling irrigator, movable benches and two vacuum seeders, enable us to conduct the experiments in a meaningful way.

We know several of the commercial mixes contain some nutrients, and we also know that bedding plant growers do use liquid fertilizer, either at each irrigation or at least at weekly intervals. We wanted to use controlled release fertilizer in at least some of our plug experiments, but Osmocote pellets were too large to assure placement of at least one pellet in each compartment. Some other compartments, strictly by chance, would get too many. We asked Karl Kolb, technical director of Sierra Chemical Company in Milpitas, California, if some finer particles of fertilizer could be coated for our plug research. They did, and our preliminary studies were very encouraging. This report describes one experiment and its consequences. On May 13, 1985 we started another experiment, and Robert Milks will report those results at our Bedding Plant Day in Raleigh in July.

Materials and Methods

Seed of the snapdragon cultivar Bismarck and the geranium cultivar Ringo Scarlet were sown February 25th and 27th, respectively, with a Hamilton vacuum seeder. Two media were used, and these were Premier Pro-Mix, a commercial peat-lite mix with major and minor elements in it, and a mix we formulated (80% acid peat moss : 20% vermiculite, on a volume basis, with no nutrients added). Only Premier Pro-Mix will be discussed in this report. Snapdragon seedlings were exposed to root-zone temperatures of 60, 65, 70 and 75°F, and geranium seedlings were exposed to root-zone temperatures of 70 and 75°F.

Each plug tray (288 compartments) was divided into 4 sections, with 72 compartments per section. We were able to have rates of 0, 2.5, 5.0, and 10.0 pounds of Micro-fertilizer (16-9-12) per cubic yard. There were 4 trays of each species in each medium and root-zone temperature treatment. Germination percentages and fresh weights were recorded, and photographs were taken of representative trays.

Results and Discussion

Germination Percentages: The highest germination percentages usually were obtained when the lowest rates of micro-fertilizer were incorporated in the medium. This was true for both snapdragons and geraniums (Table 1). No time elapsed from when the controlled release micro-fertilizer was incorporated to when seed were sown, but soluble salts levels were not monitored in the different treatments. A combination of a high micro-fertilizer rate and a root-zone temperature of 75° resulted in low germination percentages for snapdragon seed but was not so adverse for geranium seed. Irrigation was not a planned variable in this experiment, but the interaction of a warm root zone and moisture content in an area as confined as a plug compartment cannot be discounted. The highest germination percentage for snapdragon seed was

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only 78% even with no micro-fertilizer, while the best geranium seed germination was an acceptable 86%, at a root-zone temperature of 75°, with 2.5 pounds of micro-fertilizer per cubic yard.

Fresh Weight: The most vigorous seedlings were those subjected to the 5 and 10 pound rates of micro-fertilizer (Table 2, Figures 1 and 2). It is not surprising that seedlings grown without Osmocote or liquid fertilizer were the smallest in the experiment, but it was surprising that root-zone temperatures did not have greater impact on growth. Again, a water deficit might have limited growth at 70 or 75°, as the travelling irrigator provided equal quantities to seedlings at all temperatures and was not operating at night.

Conclusions

Very vigorous seedlings were produced when 2.5, 5.0 or 10.0 pounds of controlled release micro-fertilizer were incorporated per cubic yard of Premier Pro-Mix. Germination was somewhat inhibited at the highest rate, perhaps because of excessive soluble salts, though that possible cause has not been confirmed.

Bedding plant growers have expressed concern about their inability to regulate growth by withholding fertilizer if Osmocote has been incorporated in the medium. We currently are conducting an experiment with growth regulators to control stem elongation and soft growth without sacrificing the high quality achieved with the controlled release micro-fertilizer. We also are comparing liquid with controlled release fertilizer.

Sincere appreciation is extended to the following companies for their contributions to this research project:

B.F.G. Supply Co.; Fred Gloeckner Co., Inc.; Growing Systems, Inc.; Premier Brands, Inc.; Sierra Chemical Co.; Yoder Brothers, Inc.

Table 1. Percentage germination of 'Bismarck' snapdragon and 'Ringo Scarlet' geranium seed, sown in a medium containing 4 rates of controlled release micro-fertilizer and different root zone temperatures.

Treatment		Plant Species	
Fertilizer (lbs./cu. yd.)	Root-Zone Temperature (°F)	Snapdragon	Geranium
0	60	67%	-
0	65	70	-
0	70	69	70%
0	75	63	80
2.5	60	57	-
2.5	65	60	-
2.5	70	56	66
2.5	75	60	86
5.0	60	54	-
5.0	65	58	-
5.0	70	60	78
5.0	75	47	77
10.0	60	55	-
10.0	65	60	-
10.0	70	55	67
10.0	75	45	79

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Table 2. Fresh weight of 'Bismarck' snapdragon and 'Ringo Scarlet' geranium seedlings subjected to 4 rates of controlled release micro-fertilizer and different root-zone temperatures. Average weight per seedling.

Treatment		Plant Species	
Fertilizer (lbs./cu. yd.)	Root-Zone Temperature (°F)	Snapdragon	Geranium
0	60	20 mg	-
0	65	20	-
0	70	30	220
0	75	40	280
2.5	60	110	-
2.5	65	110	-
2.5	70	120	320
2.5	75	110	480
5.0	60	140	-
5.0	65	150	-
5.0	70	110	490
5.0	75	130	650
10.0	60	160	-
10.0	65	180	-
10.0	70	160	490
10.0	75	140	660
LSD at 5% level		29	120

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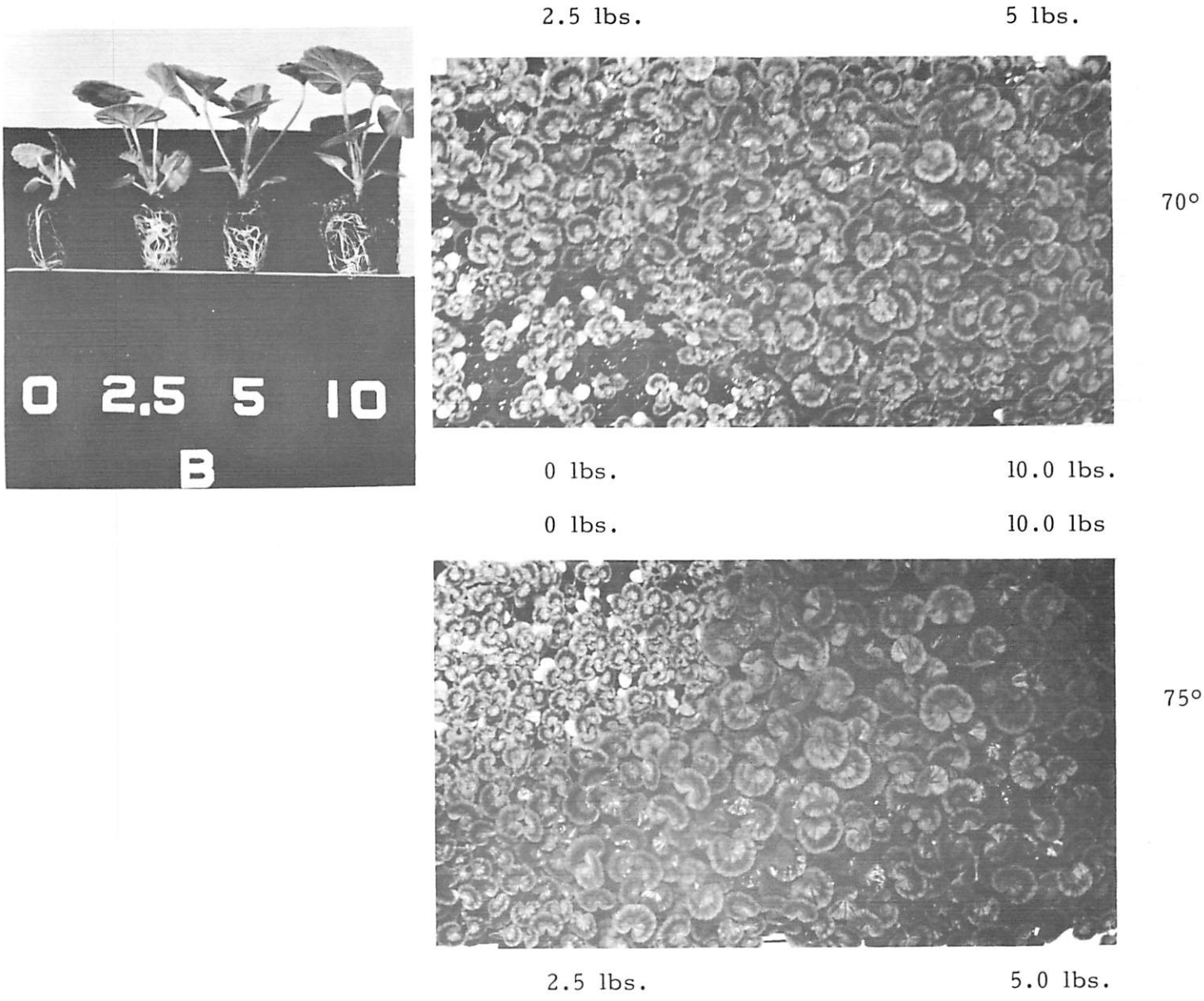

Figure 2. 'Ringo Scarlet' geraniums. Left; 4 controlled release micro-fertilizer treatments in pounds/cubic yard. Upper right; 70° root-zone temperature, with 4 fertilizer treatments. Lower right; 75°. Photographs taken 33 days after sowing.

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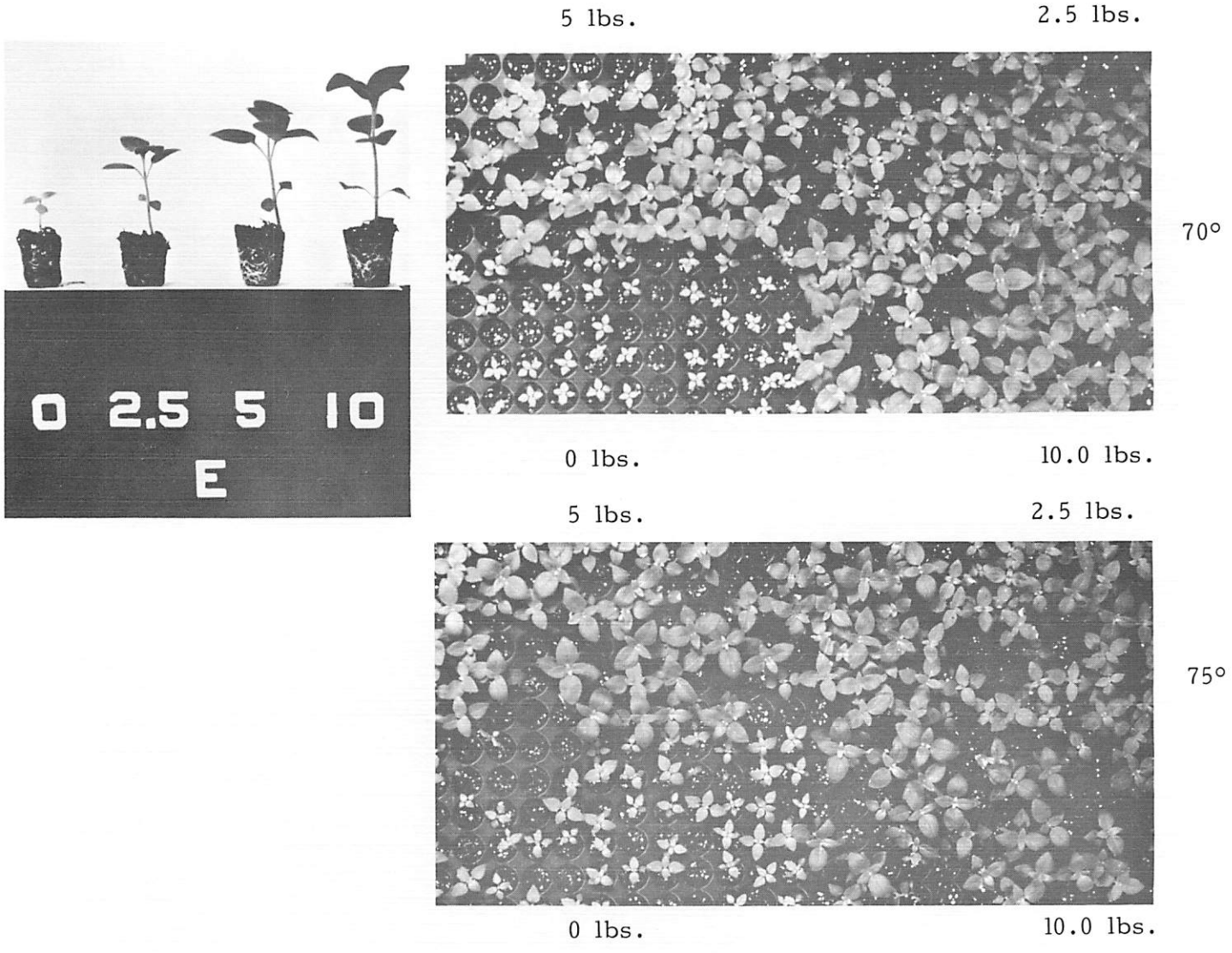

Figure 1. 'Bismarck' snapdragons. Left; 4 controlled release micro-fertilizer treatments, in pounds/cubic yard. Root-zone temperature was 70°F. Upper right; 70° root-zone temperature, with 4 fertilizer treatments. Lower right; 75°. Photographs taken 33 days after sowing.