dendrons in the accelerated growth program is worthwhile. It enables one to grow better quality plants more quickly and profitably.

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EFFECTS OF SPENT MUSHROOM COMPOST ON THE PRODUCTION OF GREENHOUSE-GROWN CROPS

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Abstract. Selected cultivars of *Chrysanthemum morifolium* and *Lilium longiflorum* were grown under greenhouse conditions in different ratios of spent compost, and in two commercial growing preparations, with either a 14-14-14 slow release fertilizer, or with a 20-20-20 water soluble nutrient solution. In all cultivars of both plant species, the most commercially desirable plants were produced in spent compost and Speedel in a 1:1 ratio. Plants with the highest bud count were also produced in this mix. The shortest plants were produced in spent compost alone, which exerted a growth retarding effect in all media and nutrient combinations. Nutrient treatments alone had no significant effects on flowering, root development, or bud count.

INTRODUCTION

The use of top soil as a growing medium component for greenhouse and container grown plants has declined. Contamination from herbicides, microorganisms, nematodes, and weed seeds, together with increasingly high cost factors have contributed significantly to this decline. At the same time, the use of commercially prepared growing mixes has risen sharply. These soilless materials have all the characteristics normally associated with a good growing mix. They are contaminant-free, light weight, have high air and water-holding capacity, and drain well. They are also comparatively inexpensive, particularly in consideration of labor and other cost factors associated with the preparation of soil-containing mixes.

The low weight factor associated with perlite, vermiculite, and sphagnum peat-containing commercial mixes is especially significant in minimizing cost when being shipped to distant markets.

Thus, an important consideration for certain local markets is the availability of locally produced materials that could be used as a potting mix component. Materials such as bark, shells of various nuts, coconut husks, sawdust, and spent compost offer immediate or potential means of reducing production cost factors and possibly improving crop quality also. This work addresses the feasibility of using spent compost alone, or as an additive to media mixes for growing greenhouse crops.

Ready availability, nutrient content, and low cost are potential advantages of using spent compost as a growing mix component. These advantages could outweigh the disadvantages of high bulk, initial high water and salt content, lack of uniformity, and reduced structural qualities.

Successful production of selected floricultural crops in spent compost under greenhouse conditions has been reported, (2,5,6,7). The material consists of the remains of fungal mycelium, recycled hay from stable bedding, cotton seed hulls, poultry litter, gypsum, and horse manure.

Initially, upon completion of a mushroom crop, which requires approximately 12 weeks, the salt content of the compost is too high for immediate use. However, after 2 to 3 years of weathering, decomposition, and leaching certain floricultural crops have been found to respond favorably in spent compost as a growing medium (5).

The objective of this study is to further evaluate the feasibility and potential benefits of using spent compost as an additive to the growing medium of floricultural crops.

MATERIALS AND METHODS

Rooted cuttings of chrysanthemum cultivars, Luv, Tip, Surf, and Spirit, along with bulbs (10 in. and up) of Easter lily cultivars, Ace and Nellie White, were potted in five and six in. standard plastic pots, respectively, in the following media: Pro Mix Bx, spent compost, spent compost + Speedel 1:1, and spent compost + Speedel 2:1. Spent compost (S.C.) was obtained from a commercial mushroom grower in eastern Pennsylvania.

The plants were split into two blocks; one containing Osmocote (14-14-14) incorporated at a rate of 5 oz/ft^3. The other was fertilized with Peter's water soluble fertilizer (20-20-20) at 200 ppm nitrogen on a constant feed basis, and leached once per week. Each treatment consisted of three randomized replications of three plants each. Plants receiving Osmocote were watered on a regular basis as required.

The chrysanthemum experiments were initiated on 5 February, 1987, and at this time did not require shading. However, pre-forcing lighting and pinching were applied according to normal cultural procedures (4).

Prior to potting, Easter lilies were soaked in a fungicidal solution according to recommendation in Ball's Red Book (4). Plants were placed on raised benches pot-to-pot until the shoots reached a height of 10 to 12 cm. They were then moved to final spacing of four plants per 30.5 cm.

The growth retardant, A-Rest®, was applied to lilies as a spray to the point of run-off at concentrations of 62.5 and 125 ppm when they reached a height of 7.5 cm. Day/night temperatures were maintained at 22 and 17°F, respectively.

RESULTS

Chrysanthemums. These flowered uniformly in all media combinations. There were no significant differences in bud count due to media treatments, except in the cultivar Spirit (Fig. 1). Here the S.C. treatment resulted in fewer flowers than plants in S.C. + Speedel at both 1:1 and 2:1 levels. Spirit produced significantly fewer flowers in spent compost compared to the cultivar Luv, but not Tip or Surf. All other media combinations produced plants with insignificant differences in the number of flowers. Thus, with only one exception, spent compost was as suitable a growing medium as Pro Mix.

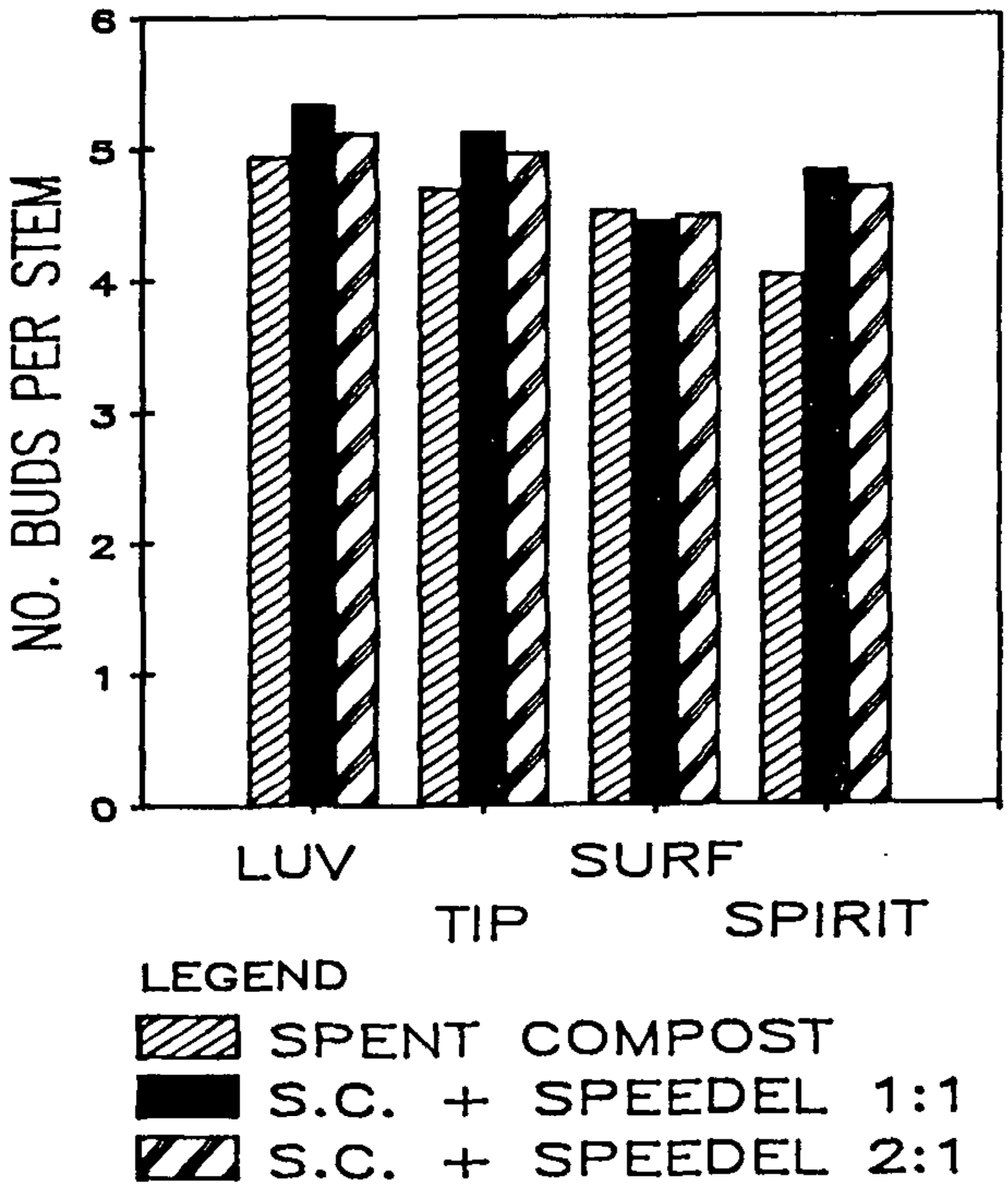

Figure 1. Effects of growing media on bud count in selected chrysanthemum cultivars.

The differences in spread due to media treatments were apparently genetically related. Luv was uniformly smaller in spread, ranging from 62 to 68 cm, while Tip, Surf, and Spirit all had a higher range.

The most significant difference in media treatments was observed in height. There were clear genetic differences. All cultivars grown in spent compost were significantly shorter than those grown in all other media (Fig. 2). Among the four cultivars grown in spent compost treatments, the retarding effect was greatest in Luv and Tip, compared to Surf and Spirit.

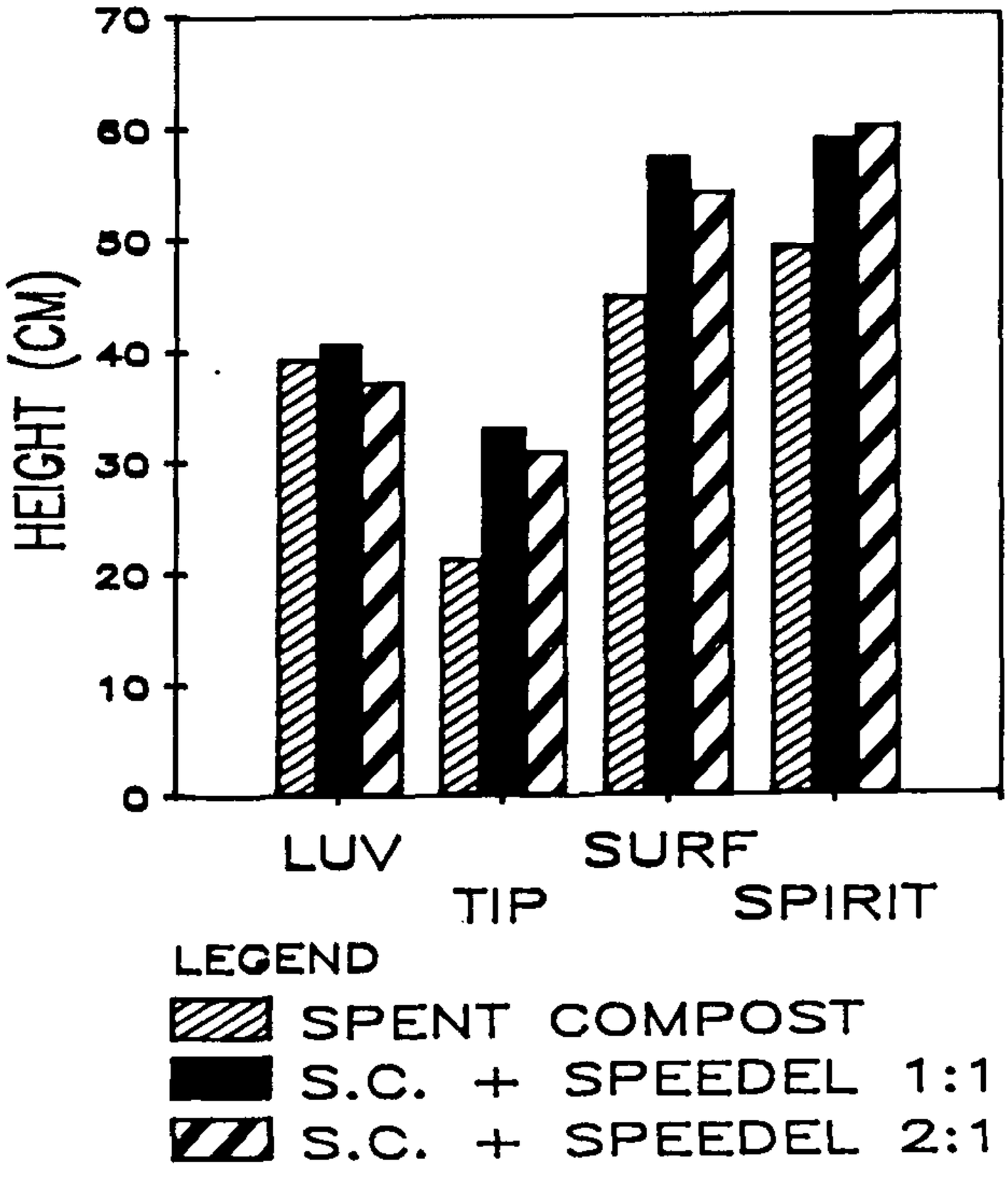

Figure 2. Effects of growing media on height in selected chrysanthemum cultivars.

Because of the high salt content in spent compost, roots were evaluated in each of the cultivars at maturity. Using a subjective system of 1 to 5 for evaluating root development (1 = poor, 5 = excellent), it was determined that the root systems of plants grown in spent compost was comparable to that of all other media, except in the cultivar, Spirit. Here the roots displayed a faded brown color that was uncharacteristic of normally healthy roots. This difference in root development was also reflected in the lower number

of buds produced per stem in this cultivar. The condition is probably due to greater uptake of water by Spirit, thus leading to more rapid and frequent drying out, compared to the other cultivars.

Chemical analysis of the spent compost used in this study revealed an uncharacteristic profile compared to commercial and normally composted soils. This was especially so with respect to soluble salts and calcium. In addition, nitrate nitrogen, potassium, and magnesium levels were considerably higher than normal for freshly prepared greenhouse soils (Table 1).

There were no differences in cultivar response in any of the chrysanthemums tested due to fertilizer treatments.

Table 1. Spent compost nutrient analysis

Element	Nutrient level (PPM)
Macronutrients	
Nitrate nitrogen	213.00
Ammonium nitrogen	1.49
Phosphorus	3.18
Potassium	160.00
Calcium	554.00
Magnesium	62.00
Micronutrients	
Manganese	0.028
Iron	0.205
Copper	0.064
Boron	0.382
Molybdenum	0.089
Zinc	0.028
pH	7.53
Soluble salts (mmhos)	3.45

Easter lilies. The growth-retarding compound, A-Rest®, was used as a means of controlling height in the lily cultivars. Height reduction was proportional to the concentration applied, as illustrated in Figure 3.

More flowers were produced in Nellie White than in Ace, (Fig. 4). This was true both with and without A-Rest® applications. Neither treatment had any effects on the hastening of flowering in Easter lilies.

From these experiments it is clear that spent compost can be effectively used as a growing medium additive for some greenhouse-grown crops. It remains to be determined how uniform this medium might be when obtained from different mushroom growers, and what effects variability in uniformity might have on the growth and development of certain crops.

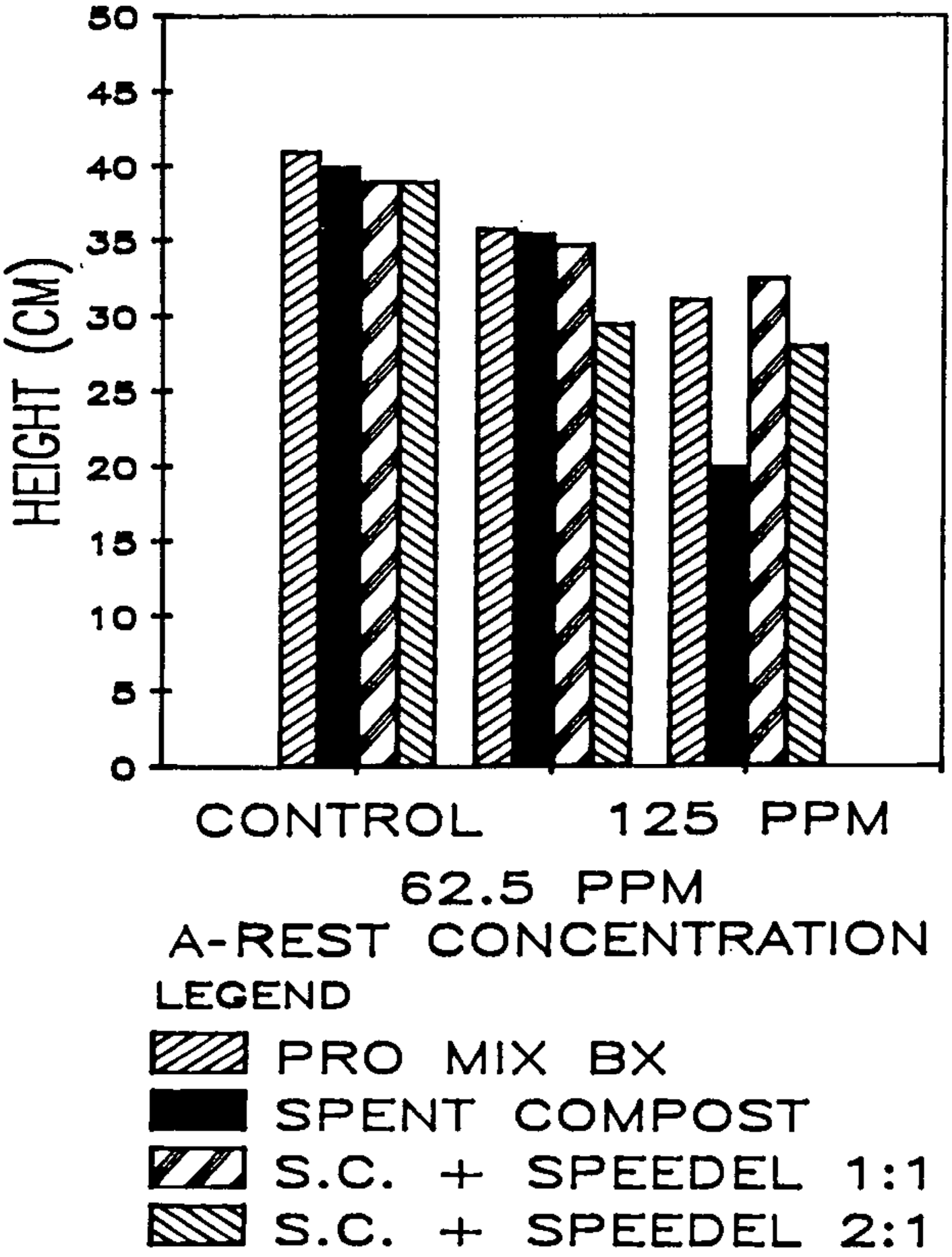

Figure 3. Effects of growing media and A-Rest on height in Easter lily cv. Ace.

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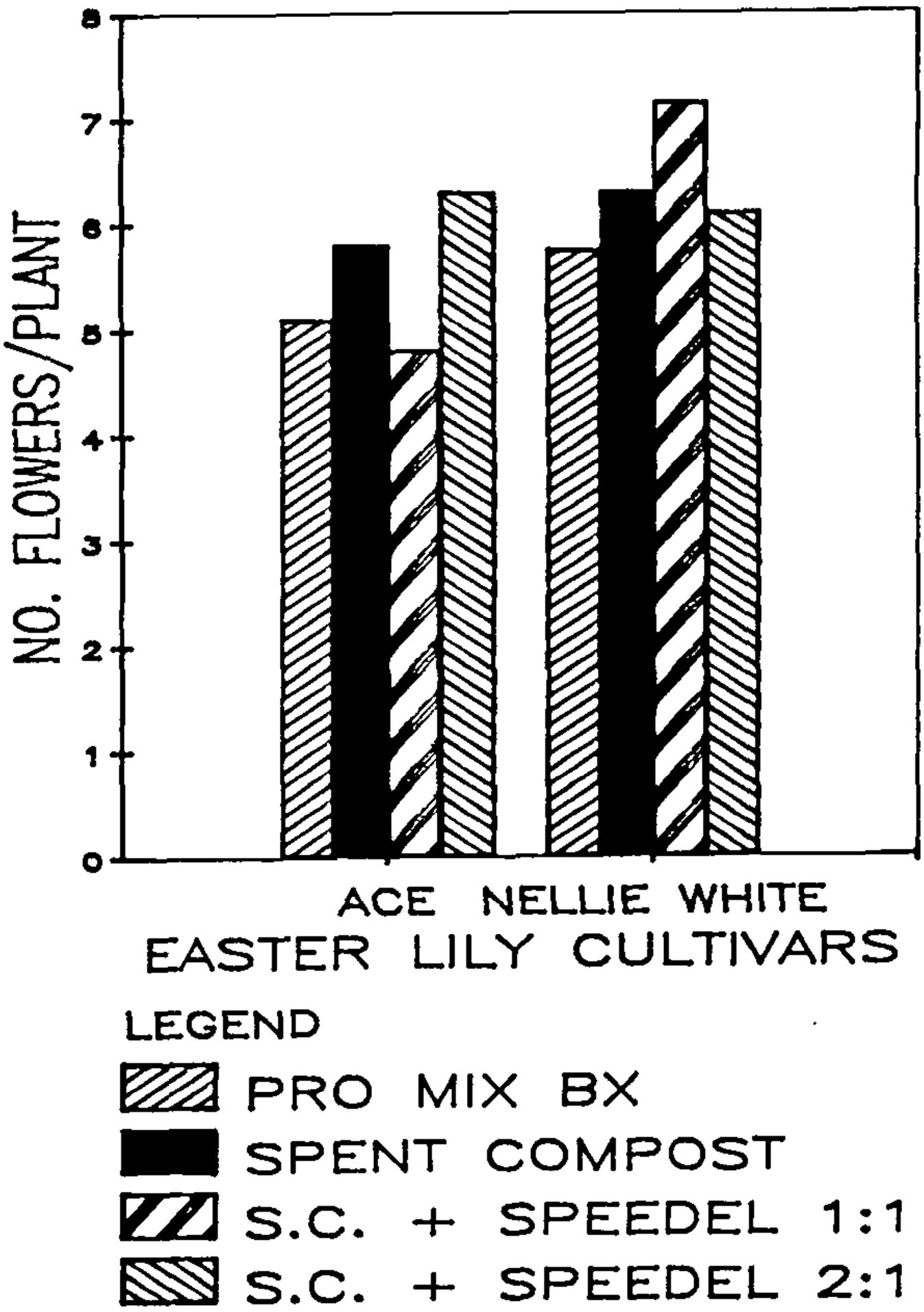

Figure 4. Effects of growing media on flowering in Easter lily, cvs. Ace and Nellie White.

HUGH STEVENSON: A comment on the use of mushroom compost. As the speaker mentioned, it must be weathered. We used fresh with disastrous results some years back.

BRUCE BRIGGS: Our mushroom compost has a high pH (7.0) because of high calcium and lime content. Since it is made with straw, it is also not stable over time.

PETER ORUM: We have used fresh mushroom compost as an additive for 20 years in our container mix. We use it fresh at a maximum of 25% with peat and sand for established plants, i.e. when going from 2 gal. into 5 gal. containers. For newly-rooted cuttings, 12 to 15% is maximum. It has a lot of soluble salts and must be used with caution.

DARELL APPS: The pH is lower now because the composting has changed with the use of sphagnum moss in the compost. I use it fresh with daylilies. Mix it half with bark or soil.