

Evaluating Nursery Plant Performance in Biosolids Amended Soils

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INTRODUCTION

Soils in southern New Jersey have low native levels of organic matter, sometimes dropping below 1% and rarely exceeding 2%. This experiment examined the potential for use of biosolids materials as an organic matter source and the effect of amendment on growth. Sludge and co-compost were used in this study. Co-compost is the combination of municipal solid waste (the portion of garbage) and sludge that is composted.

Biosolids when added to native soils should increase the cation exchange capacity, reduce the leaching potential of fertilizers, enhance the water-holding capacity, and reduce heat and cold injury to the roots. One must, however, weigh the benefits against the cost. There have been restrictions on food crop procurement placed by processors on biosolids-amended land. This research project was designed to assist growers in making an educated decision regarding its use.

A loading rate study was initiated in 1993 that evaluated three rates of co-compost, three rates of sludge cake, and three rates of nitrogen fertilizer against non-amended plots. Results from that study indicated a significant negative growth impact with the addition of co-compost on *Viburnum dentatum* Chicago Lustre™ arrowwood. Unacceptably high levels of pH (7.8), soluble salts (2.98 mmhos), and carbon : nitrogen ratio (52) caused reductions in growth and plant death. Expected levels were a pH of 6.5 to 7.0, less than 1.25 mmhos of soluble salts, and a carbon to nitrogen ratio near 10. Sludge use resulted in significantly growth enhancement.

MATERIALS AND METHODS

A 2-year loading rate study was initiated in 1996 on the same plot as the 1993 study. In a randomized split-plot design with 6-ft-buffer strips containing 112 sub-plots containing 16 *V. dentatum* plants, including guard rows, were planted 36 inches on center. Co-compost plots received no additional amendment while sludge with an analysis of 25% total solids, 17% organic matter, 8.3% total nitrogen, and 4.25% available nitrogen was applied at three rates. Plots were fertilized with four equal applications each of 2 years. Individual treatment amendment combinations are listed in Table 1. Data was statistically analyzed using the Fisher's PLSD test. Separations were at the .05% level (95% probability).

RESULTS

Dry weight measurement indicated all cake treatments were significantly better than the untreated check (Fig. 1). No amendment level of co-compost was significantly better than the untreated check. There was no significant benefit from the use of different fertilizer rates.

The soil pH (Fig. 2) was significantly increased by co-compost and decreased by sludge treatments. Organic matter (Fig. 3) increased with increasing amendment

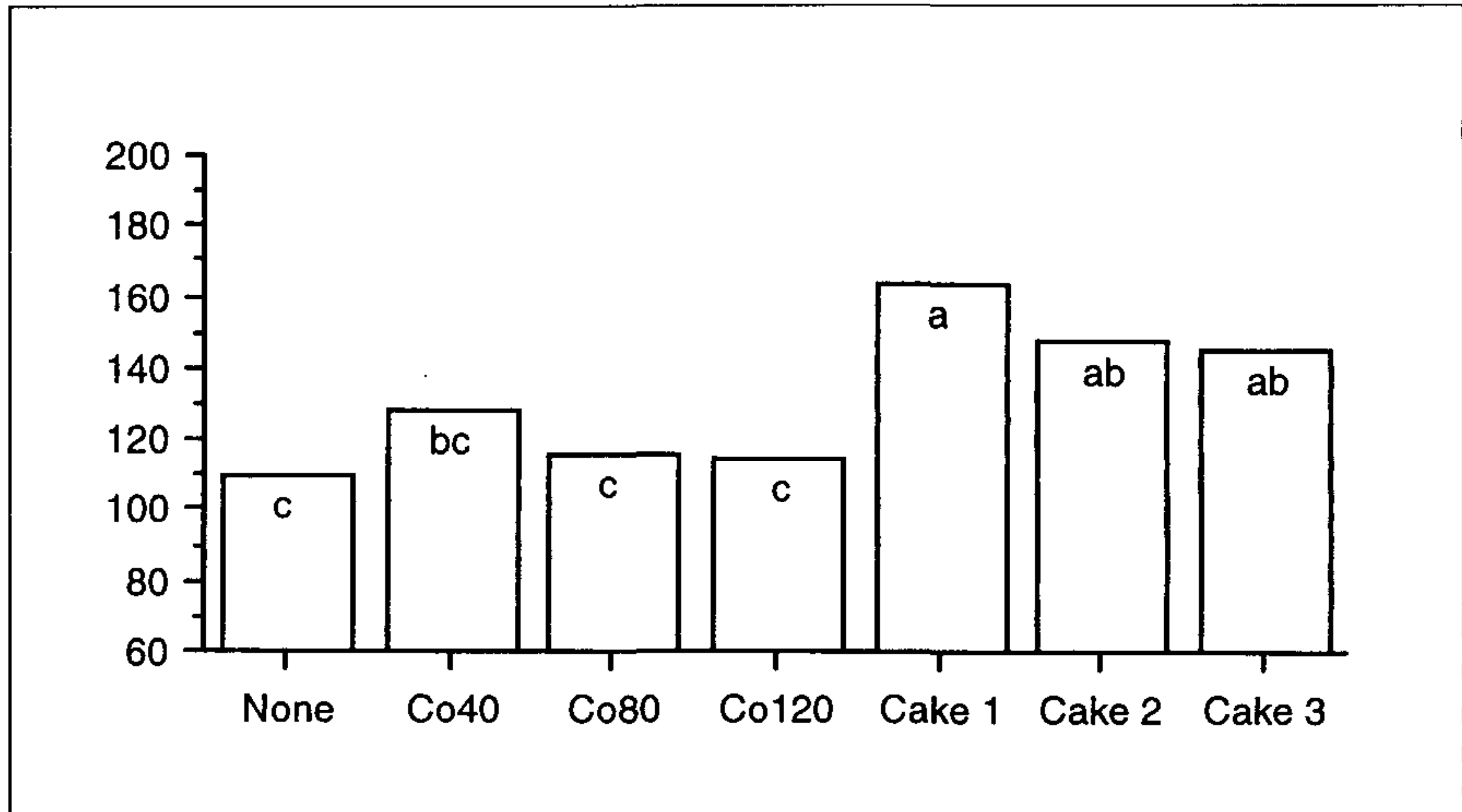


Figure 1. Effect of co-compost and sludge (cake) on the growth of *Viburnum dentatum*.

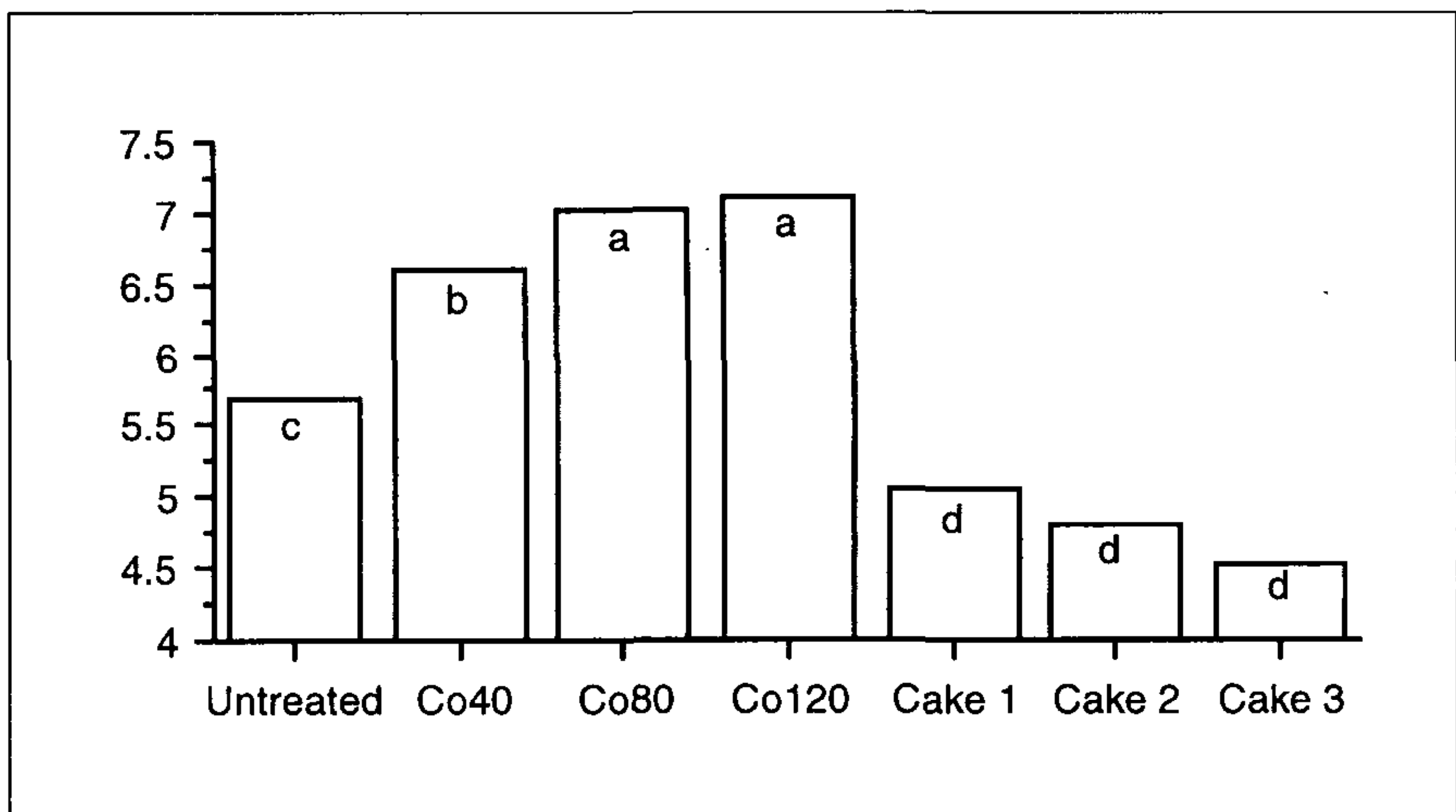


Figure 2. Effect of co-compost and sludge (cake) on soil pH.

in both the co-compost and cake treatments. All organic matter levels were significantly better than the untreated check. The trend for cation exchange capacity (Fig. 4) reflected that of organic matter content, with significant differences from the untreated check occurring in all but the lowest level of co-compost.

DISCUSSION

As with the earlier study, the cake source of biosolids again out-performed the co-compost treatments. Since the highest dry weight levels were recorded in the lowest cake treatment, additional information is required to determine if the pH reduction, while not significant, plays a part in that difference. Questions should be answered

Table 1. Individual treatment amendment combinations.

Amendment Rates	Treatments Fertilization (split appl.)
No Amendment	0# TN/A
	75 TN/A
	150 TN/A
	225 TN/A
93 Co-Compost	0# TN/A
@ 40 T/A = 1"	75 TN/A
	150 TN/A
	225 TN/A
93 Co-Compost	0# TN/A
@ 80 T/A = 2"	75 TN/A
	150 TN/A
	225 TN/A
93 Co-Compost	0# TN/A
@ 120 T/A = 3"	75 TN/A
	150 TN/A
	225 TN/A
Cake @ Load 1	0# TN/A
(3.04 bu/plot)	75 TN/A
	150 TN/A
	225 TN/A
Cake @ Load 2	0# TN/A
(6.08 bu/plot)	75 TN/A
	150 TN/A
	225 TN/A
Cake @ Load 3	0# TN/A
(9.13 bu/plot)	75 TN/A
	150 TN/A
	225 TN/A

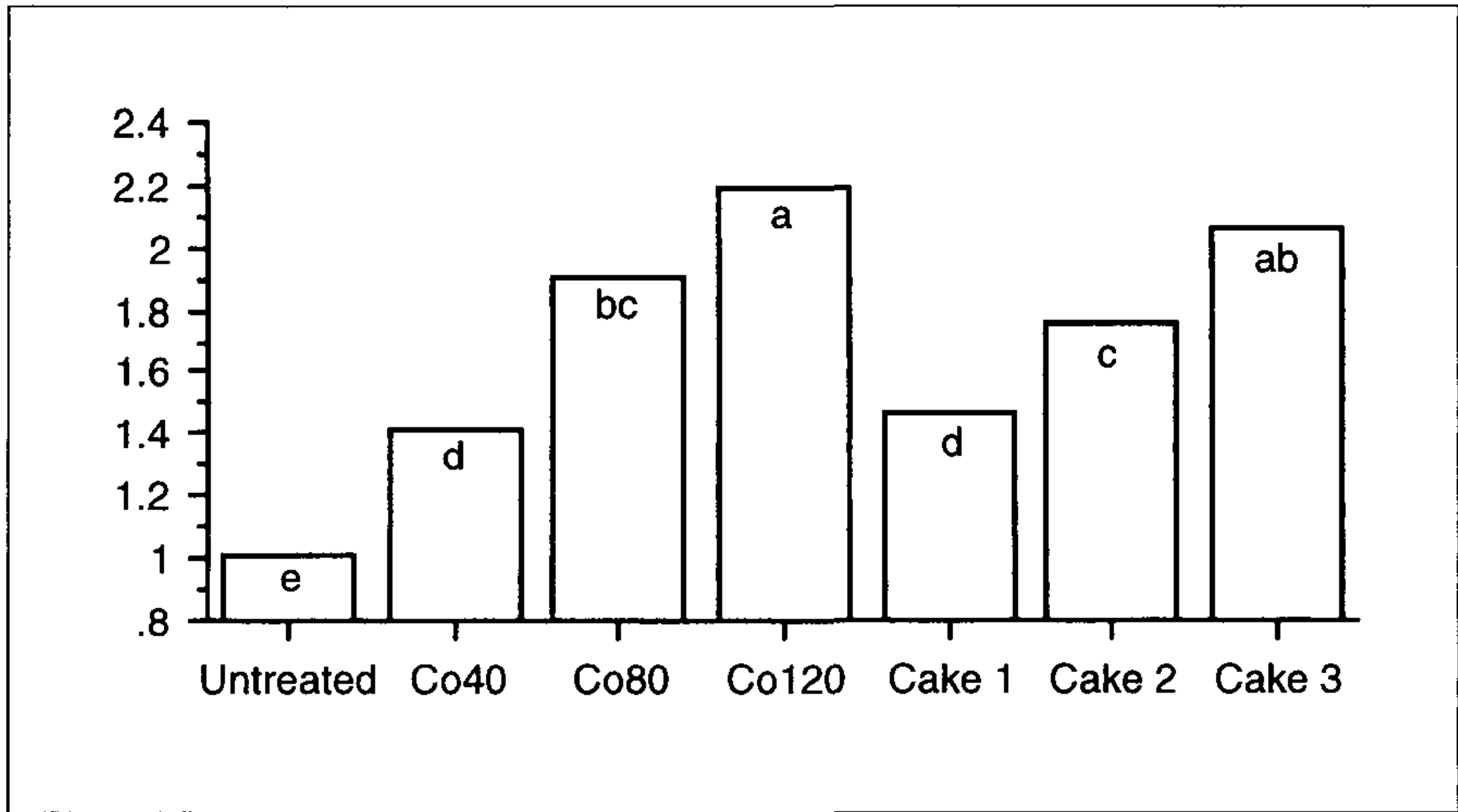


Figure 3. Effect of co-compost and sludge (cake) on soil organic matter content.

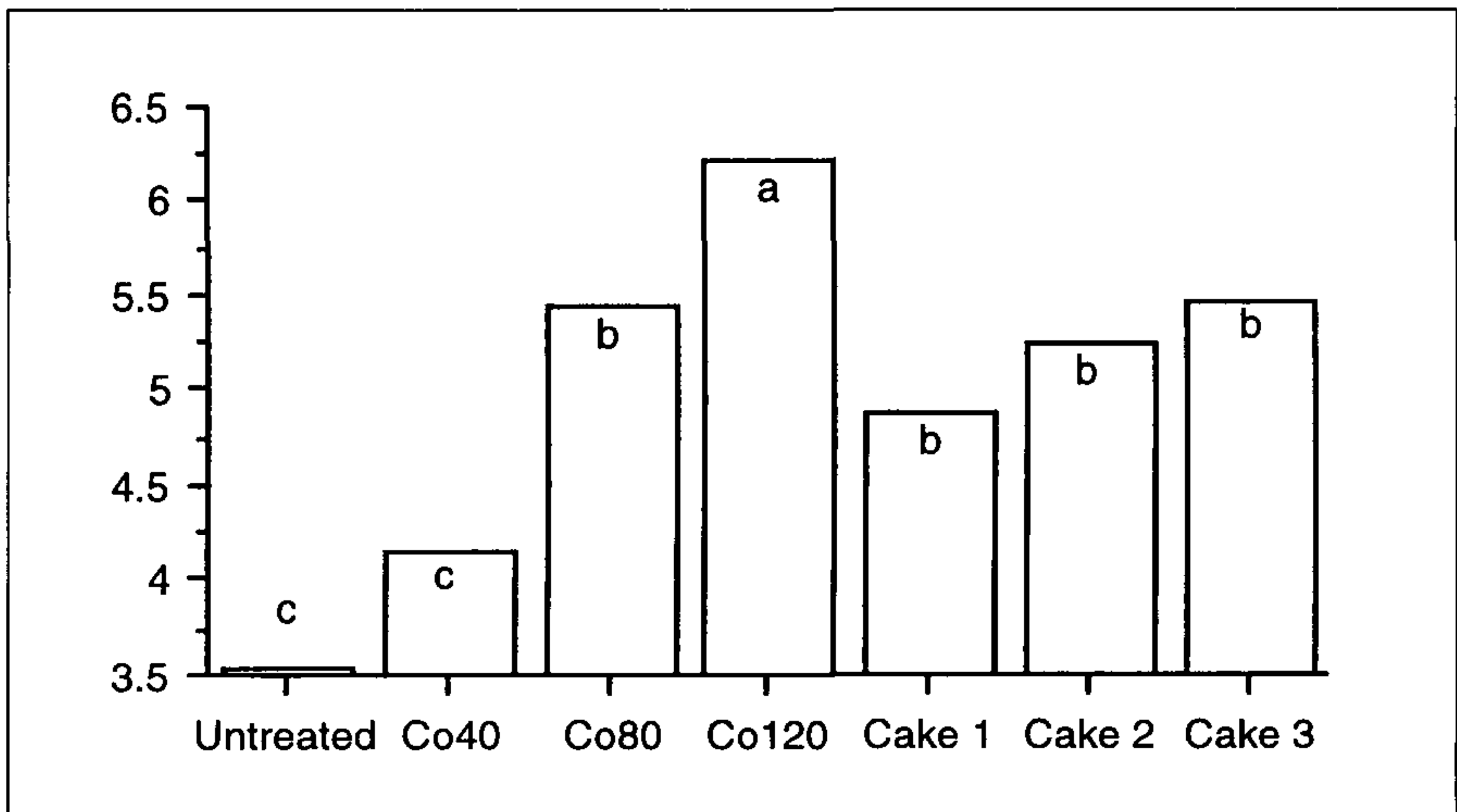


Figure 4. Effect of co-compost and sludge (cake) on soil cation exchange capacity.

why trends toward higher organic matter and cation exchange capacity levels resulted in reversed growth trends.

CONCLUSIONS

Results of this project demonstrated the greatest benefits and exposed the greatest concerns of using biosolids products in agricultural production. The lack of quality control resulted in no significant benefits from the use of co-compost through the two 2-year studies and actually caused significant problems in the first 2-year project. Even though soil organic matter and the cation exchange capacity were significantly increased through the co-compost biosolids there have been no growth benefits 5 years after application. Soil pH was also significantly increased.

The use of sludge biosolids resulted in significant growth enhancement during each of the two, 2-year studies. The soil organic matter and the cation exchange capacity were also significantly enhanced. The issue of soil pH depression with the use of cake must be addressed.

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Low-budget Grafting of Japanese Maples

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Rivendell Nursery is a 190 acre B&B nursery specializing in landscape-sized plant material. About 50% of our lined-out material is produced in-house. Japanese maples are one of the plants we produce by bench grafting.

I started grafting maples in January about 8-years ago. After a few years, I had two problems:

- 1) With only one heated house I was out of room with many grafts and many cuttings.
- 2) I needed more time in January and February for dormant pruning.

We switched to grafting maples at the end of August because:

- 1) It kept the help busy during a slow time
- 2) We created a grafting house with materials we had on hand using no heat.

OUR METHOD

Acer palmatum seed is collected in early September while still green. Seed is sown in flats and covered with sand. Young seedlings are transplanted into 4-inch pots in a pine bark, peat, and sand mix (3:2:1, by volume) with a 360-day time-release fertilizer. In late August, we collect scionwood early in the morning. Leaves are removed leaving a piece of petiole attached and stored in a refrigerator until ready to use. We only collect enough for 1 day's grafting. Scions are grafted onto the potted seedlings using a modified side veneer graft. Once grafted, the union is wrapped with an 8-inch budding strip and the top sealed with Tree Kote.

Finished grafts are placed in a 14-ft-wide polyhouse covered with plastic saved from the spring. Mist is applied every 20 min for about 2 weeks at which time the plastic is removed and replaced with a shade cloth. Grafts are then overwintered in an unheated cold frame and headed back in mid-February with a 3-inch snag left. In May, the snag is removed and plants are potted into 2-gal pots anytime from June until August (time permitting). Plants are staked and grown on for 2 years and lined out in September-October.

This method has produced 80% to 95% depending on the cultivar. Although I use a Tina grafting knife, my help uses a 98¢ razor knife purchased at local hardware stores.

After 5 years of this low-budget method, we have upgraded to a high-budget house with vents and a fog system. My initial results show the "low-budget" method works just as well on maples.