Herbicide-Coated Fertilizers and Weed Control in Container-grown Ornamentals

Cynthia K. Crossan, Charles H. Gilliam, Gary J. Keever, and D. Joseph Eakes
101 Funchess Hall, Department of Horticulture, Auburn University, Auburn University, Alabama 36849

Herbicide-coated and herbicide-blended fertilizers were evaluated for weed control and plant injury with container-grown *Gardenia augusta* 'August Beauty'(syn. *G. jasminoides* 'August Beauty'). Herbicide-coated and -blended fertilizers provided similar weed control, compared to standard broadcast or spray application of herbicides. In a second experiment, herbicide-coated Nursery Special 12-6-6, Osmocote 17-7-12, and Polyon 24-4-12 provided effective prostrate spurge and crabgrass control.

INTRODUCTION

Broadcasting herbicide over container-grown ornamentals is the standard herbicide application practice in container nurseries. Gilliam et al. (1992) studied granular Ronstar and nontarget herbicide loss. They reported that when empty containers were on 12-inch centers, 80% of the herbicide missed the container. Follow up research by Porter and Parish (1993) concluded that, depending on container spacing and plant growth habit, up to 86% of broadcast herbicide fell between containers. In a nursery situation these nontarget herbicide losses raise environmental questions concerning herbicide runoff and potential groundwater contamination. Keese et al. (1994) studied granular herbicide runoff from container nurseries and reported that the greatest herbicide concentrations were detected within 15 min after initial irrigation. Camper et al. (1994) researched containment ponds as a possible solution to polluted runoff water. They concluded that herbicides did not accumulate in the collected water, but detected trace levels of herbicides a year after application.

A possible solution to non-targeted herbicide loss is by using container-applied, herbicide-coated fertilizers to reduce the total amount of herbicide utilized.

In Experiment 1, the objective was to evaluate Nursery Special 12-6-6 fertilizer as a herbicide carrier in container-grown *Gardenia augusta* 'August Beauty' (syn.*G. jasminoides* 'August Beauty'). In Experiment 2, the objective was to incorporate results from Exp. 1 and compare two controlled-release fertilizers, Osmocote 17N-7P-12K and Polyon 24N-4P-12K, with Ronstar 50WP-coated Nursery Special 12N-6P-6K.

MATERIALS AND METHODS

Experiment 1. Ronstar and Pennant were evaluated for their potential to be blended or coated onto Nursery Special 12N-6P-6K fertilizer. The two granular formulations (Ronstar 2G or Pennant 5G) were layered with 25 lb (11.4 kg) of

Nursery Special using a Patterson-Kelley Twin Shell blender and mixed. The coated products (Ronstar 50WP and Pennant 7.8E) were prepared similarly except that the herbicide, mixed with 100 ml water, was poured into a funnel and sprayed through the horizontal rod in the blender as the shell was mixing. Herbicide rates were determined based on the container surface area of a trade-gallon container treated with 6.5 g of Nursery Special. Each herbicide formulation was prepared at 2, 4, 8, and 16 lb ai per acre .

Uniformed *G. augusta* 'August Beauty' liners were potted in trade-gallon containers in a growing medium of 6 pine bark : 1 sand (v/v) amended with 0.9 kg m^{-3} (1.5 lb yd^{-3}) Micromax and 2.9 kg m^{-3} (5 lb yd^{-3}) dolomitic limestone. Plants were treated on 3 May 1993 by applying 6.5 g of the herbicide-coated or -blended fertilizer evenly over the container surface. Herbicide-coated and -blended treatments were compared along with an untreated, broadcast, and spray-applied controls. The blended herbicide-fertilizer treatments received 0.2, 0.4, 0.8, or 1.4 g of Nursery Special 12N-6P-6K, based on the rate applied, to equalize the amounts of fertilizer applied to all treatments and controls. All containers were overseeded with approximately 20 seeds of prostrate spurge, *Euphorbia humistrata*, on 10 May 1993. Prostrate spurge was selected because it is a troublesome weed in southeastern-container nurseries. The experimental design was 10 single plant replicates in a completely randomized design (n=10). Prostrate-spurge weeds were counted every 30 days. At termination (90 days after treatment, DAT) weed number, fresh weight, and dry weight were recorded and *Gardenia* growth indices ((height + width-1 + width-2)/3) were taken.

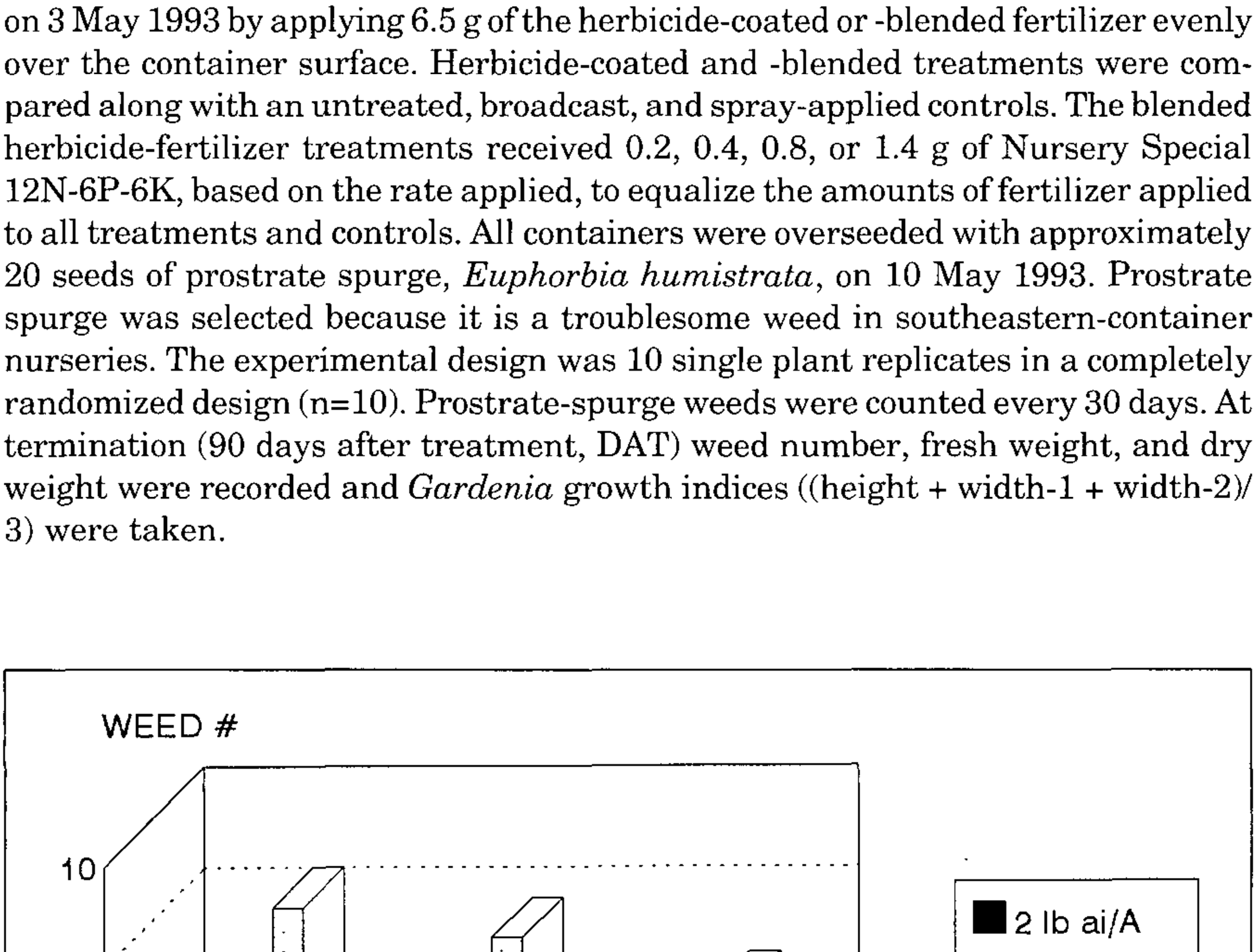

Figure 1. Spurge number per container with Ronstar 50WP, Experiment 1. Represented is 30 DAT LSD .05=3.0 linear, 60 DAT LSD .05=3.5 linear, and 90 DAT LSD .05=3.1 linear.

Experiment 2: Gallon containers were filled on 14 April 1994, with a medium similar to Exp. 1. Ronstar 50WP was coated on Nursery Special 12N-6P-6K, Osmocote 17N-7P-12K, and Polyon 24N-4P-12K at the 2, 4, 8, and 16 lb ai per acre rates. Herbicide-coated treatments were prepared similarly to Experiment 1. Containers were treated on 5 May 1994 with 6.5 g of Nursery Special and 20 g of Osmocote or Polyon. Containers were overseeded with 10 seeds each of prostrate spurge or crabgrass, *Digitaria sanguinalis*, 7 days after the treatments were applied. The experimental design was completely randomized consisting of 10 single-container replicates per weed species. Spurge and crabgrass emergence numbers were recorded every 30 days. At termination (60 DAT-crabgrass and 90 DAT-spurge) weed number, fresh, and dry weight were recorded.

RESULTS AND DISCUSSION

Experiment 1: Ronstar 50WP-coated fertilizer provided similar weed control at the 2, 4, and 8 lb ai per acre rates compared to standard spray application (Fig. 1). With a spray application the average spurge weeds per container was two, whereas with 16 lb ai per acre had less than one.

Ronstar 2G-blended fertilizer at the 4, 8, and 16 lb ai per acre rates provided similar weed control to standard broadcast applications (Fig. 2) with approximately one spurge per container.

A comparison of mean spurge numbers over all rates, 90 DAT, revealed that Ronstar 50WP and Ronstar 2G had the best spurge weed control. The untreated control had five times as many weeds per container. Fresh and dry weights followed a similar trend when analyzed.

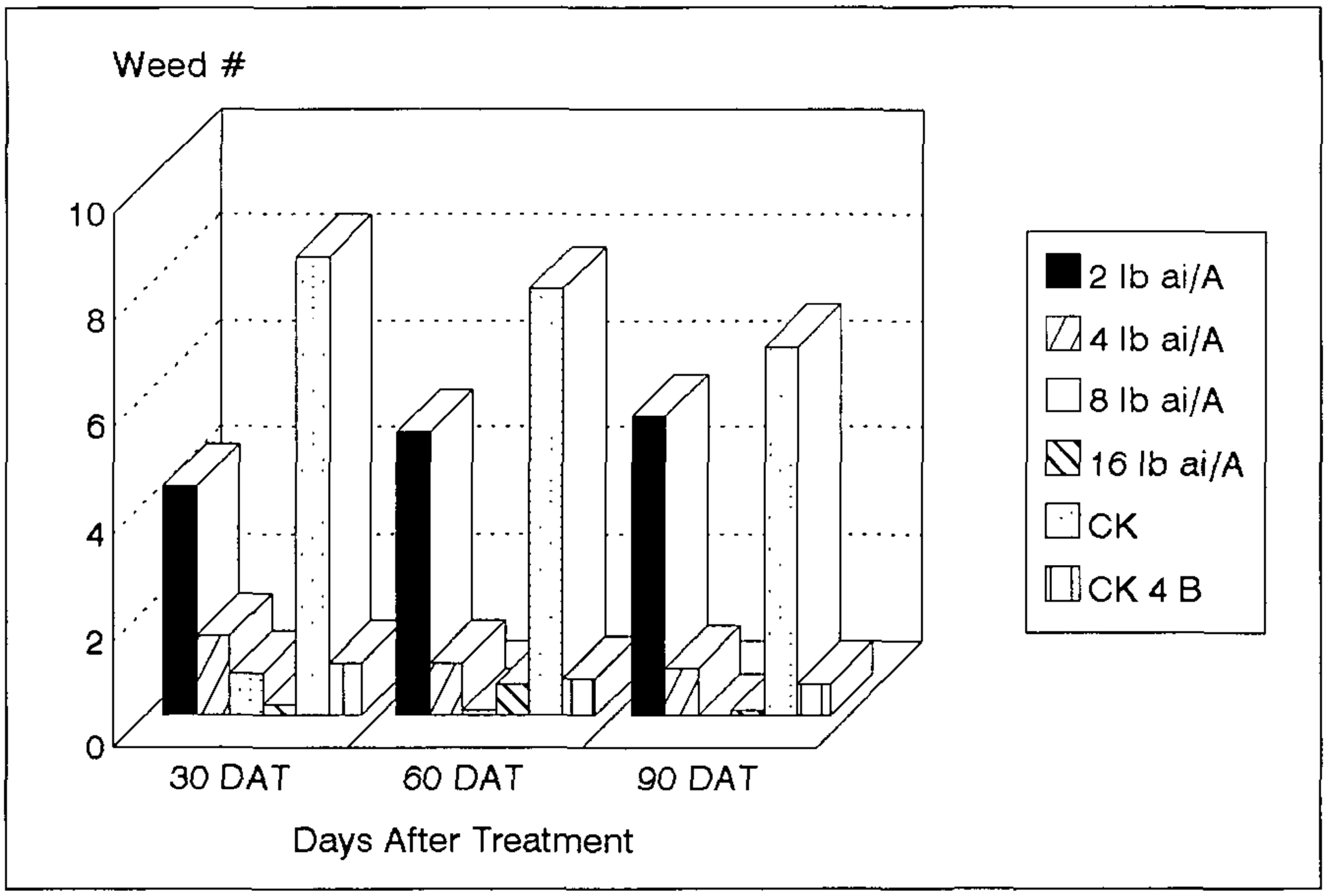

Figure 2. Spurge number per container with Ronstar 2G, Experiment 1. Represented is 30 DAT LSD .05=3.0 linear, 60 DAT LSD .05=3.5 linear, and 90 DAT LSD .05=3.1 linear.

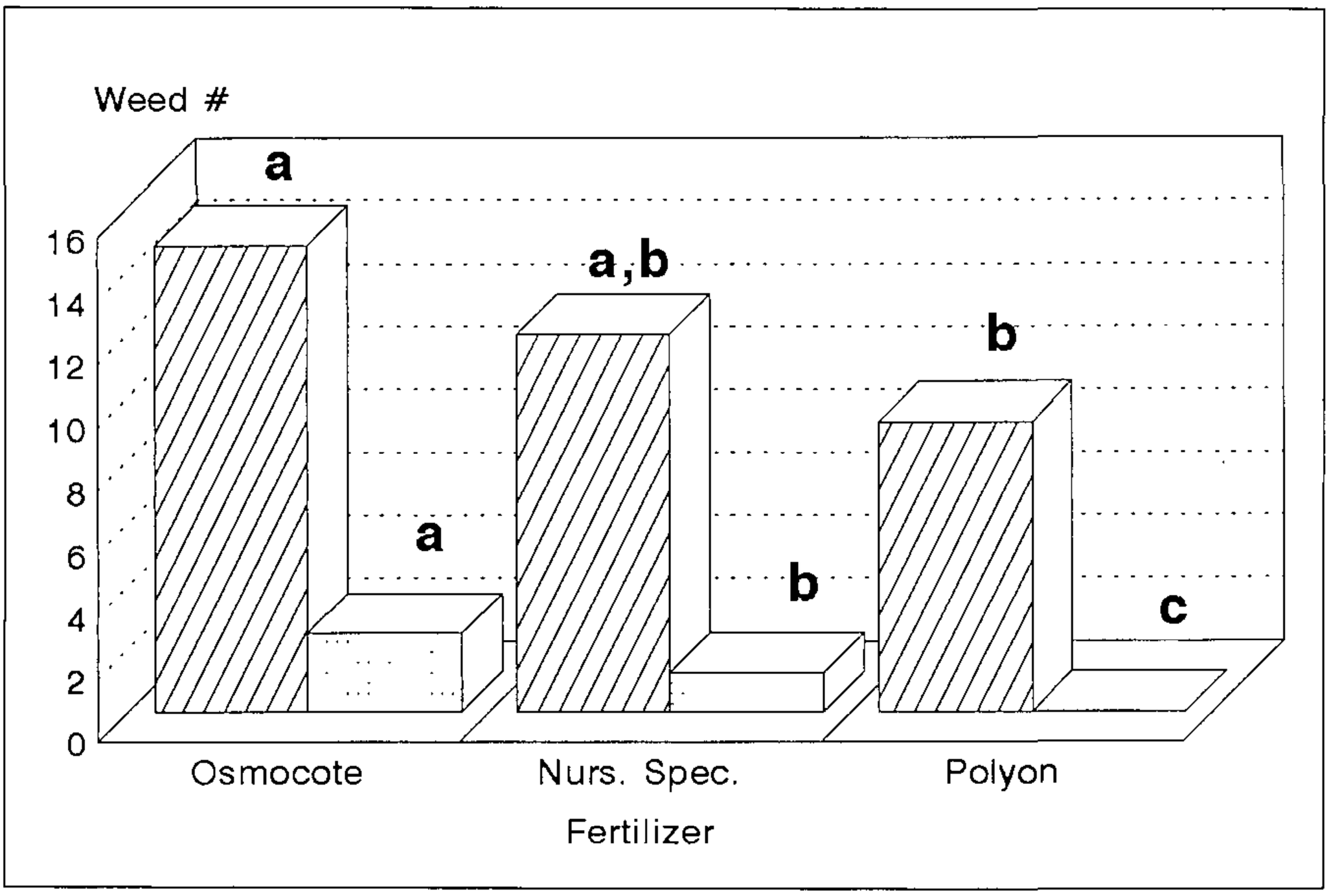

Figure 3. Spurge and crabgrass number per container, Experiment 2. Herbicide-coated Polyon and Nursery Special provided the most spurge control, 90 DAT, and herbicide-coated Polyon provide the crabgrass control at 60 DAT.

Ronstar provided more effective spurge control than Pennant (data not shown). As herbicide rate increased spurge control increased; this trend was linear and quadratic with Ronstar and linear with Pennant. Fresh and dry weights of spurge followed the same pattern.

Herbicide formulations were not statistically different (data not shown). With these results and the concern of herbicide-fertilizer separation in the blended products, work was continued only with Ronstar 50WP-coated products.

Gardenia growth indices were similar among all treatments. No differences were observed in *Gardenia* growth habit or size. Since these herbicide-coated or -blended fertilizers are applied directly to the container, there was no foliage burning or phytotoxicity.

In Experiment 2: Ronstar 50WP was used as the herbicide-coating on two controlled release fertilizers. At termination, herbicide-coated Osmocote at the 2 lb ai per acre rate did not provide adequate weed control of either crabgrass or spurge. Herbicide-coated Osmocote did provide effective (less than 1 weed per container) spurge control at 16 lb ai per acre and with crabgrass at 4, 8, and 16 lb ai per acre.

Herbicide-coated Polyon provided the most crabgrass control. Herbicide-coated Nursery Special and herbicide-coated Polyon provided similar spurge control at 90 DAT and herbicide-coated Polyon provide the most crabgrass control at 60 DAT (Fig. 3).

All herbicide-coated fertilizers at the 4, 8, and 16 lb ai per acre rates provided comparable results to the sprayed herbicide control application. Data based on weed fresh and dry weight followed a parallel trend as herbicide rate increased weed weight decreased.

CONCLUSIONS

Data collected indicated that herbicide-coated or blended fertilizers may provide effective weed control in nursery container production. These products reduce the amount of herbicide needed by 90% to provide effective weed control. They are environmentally friendly due to the elimination of nontarget herbicide losses. Even when these herbicide-coated fertilizers are directly applied to the container at higher than industry standard rates, no phytotoxicity or growth reduction occurred. Concern exists with herbicide blended fertilizer due to potential separation of the herbicide and fertilizer in handling and shipping; smaller particles may settle to the bottom.

Data indicated that herbicide-coated fertilizers should be considered as an alternative to either broadcast or sprayed application to diminish pesticide contamination in the environment.

LITERATURE CITED

Camper, N.D., T. Whitwell, R.J. Keese, and **M.B. Riley**. 1994. Herbicide levels in nursery containment pond water and sediments. J. Environ. Hort. 12(1):8-12.

Gilliam, C.H., D.C. Fare, and **A. Beasley.** 1992. Nontarget herbicide losses from application of granular Ronstar to container nurseries. J. Environ. Hort. 10:175-176.

Keese, R.J., N.D. Camper, T. Whitwell, M.B. Riley, and **P.C. Wilson**. 1994. Herbicide runoff from ornamental container nurseries. J. Environ. Qual. 23:302-324.

Porter, W.C. and **R.L. Parish**. 1993. Nontarget losses of granular herbicide applied to container-grown landscape plants. J. Environ. Hort. 11(3):143-146.

Whitwell, T. and **K. Kalmowitz**. 1989. Control of prostrate spurge (*Euphorbia humistrata*) and large crabgrass (*Digitaria sanguinalis*) in container grown *Ilex crenata* 'Compacta' with herbicide combinations. J. Environ. Hort. 7(1):35-37.