

Effect of Slow-release Fertilizers on Nitrate Nitrogen Runoff

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Nature of Work: Slow-release fertilizers are commonly used in container plant production because of their long-term nutrient release. Adequate nutrient levels must be maintained during crop production while groundwater quality is protected. This research was conducted to examine the levels and duration of nitrate nitrogen in runoff from slow-release fertilizers under nursery production conditions.

Three liners of *Viburnum odoratissimum* were potted June 21, 1990 with a 2 pine bark : 1 Canadian peat : 1 builders' sand (v:v:v) medium in each 5 gallon container. The potting medium was amended with dolomitic limestone at 7 lbs/cubic yard and micronutrients were incorporated separately for each fertilizer treatment. On August 30, 1990, the following complete fertilizers were surface-applied to each container; 1) Escote (a trademarked fertilizer of Vigoro Industries, Inc., Fairview Heights, Illinois), 2) Osmocote (a trademarked fertilizer of Grace-Sierra Chemical Co., Milpitas, California), 3) Prokote (a trademarked fertilizer of O.M. Scott and Sons, Marysville, Ohio), or 4) Nutricote (a trademarked fertilizer of Plantco, Inc., Ontario, Canada). Nutricote granules were pushed just below the media surface. Control containers received no fertilizer. Complete fertilizers and micronutrient amendment rates as per manufacturers recommendations are given in Table I.

Seven replicate containers per treatment were placed on platforms at Amerson Nursery, Palmetto, Florida. Platforms were constructed of 4 x 8 feet sheets of exterior grade plywood and were lined with double sheets of black polyethylene and set upon concrete blocks. The platforms were slanted toward one corner so that runoff could be collected via an opening in the 1 by 2 inch platform rim in a 5 x 5 x 24 inch plastic trough. Plants were watered as needed with Nelson Whiz-head overhead sprinklers (0.4 inch per application). Irrigation water contained 0.2 ppm nitrate nitrogen. Runoff was sampled every two weeks for the initial 4.5 months after fertilizer application and monthly thereafter until March 13, 1991. An aliquot of runoff from each platform was analyzed for nitrate-nitrogen using standard analyses (1). An initial and final average growth index was determined by summing the height and greatest width for each of the three liners

per container and dividing by 6 (Table 2).

Results and Discussion: Growth indices indicate that at manufacturers' suggested rates, the resulting plant growth among the four fertilizer treatments was comparable. Nitrate nitrogen levels in runoff 2 weeks after application was highest for Prokote (33 ppm), followed by Escote (24 ppm), Osmocote (11 ppm) and Nutricote (3 ppm). A second surge of nitrate nitrogen release for the Escote treatment occurred approximately 60 days after application, with 33 ppm nitrate nitrogen measured in runoff. Nitrate nitrogen runoff levels for the Nutricote treatment remained below 5 ppm throughout the study, except for the January 16, 1991 sample, where all treatments exhibited an increase in nitrate nitrogen levels in runoff. Nitrate nitrogen levels on January 16 were 13 ppm for Prokote, 8 ppm for Osmocote, 39 ppm for Escote and 19 ppm for Nutricote. This sample date followed an exceptionally heavy rainfall of 2.5 inches. Nitrate nitrogen levels in runoff were less than 1 ppm for all fertilizer treatments on February 13, 1991, 5.5 months after fertilizer application.

Significance to Industry: These data indicate that runoff may contain nitrate nitrogen levels higher than the 10 ppm federal drinking water standard, even though slow-release fertilizers are used. Runoff nitrate nitrogen levels vary with sampling time and consequently repetitive sampling over a period of time should be used when monitoring runoff. Nitrate nitrogen runoff levels were consistently below 1 ppm for all the fertilizers used in this study, 5.5 months after application. Nursery operators may observe different release rates under altered temperature and moisture conditions.

Literature Cited

1. Hanlon, E., G. Kidder and B. McNeal. 1990. Soil, container media, and water testing; interpretations and IFAS standardized fertilization recommendations. University of Florida Extension Cir. 817.

Florida Agricultural Experiment Stations Journal Series No. N-00424

The authors appreciate companies supplying fertilizers. Trade names and companies are mentioned with the understanding that no discrimination is intended nor endorsement implied.

Table 1. Treatments applied to *Viburnum odoratissimum* grown in 2 pine bark:1 Canadian peat:1 builders' sand (v:v:v) medium in 5 gallon containers.

Complete Fertilizer^z	Fertilizer (g/container)	Nitrogen (g/container)	Micronutrient amendment	Micronutrients (g/container)
Prokote Plus 20-3-10, 270 Day	106	21.2	Step	33.6
Osmocote 18-6-12, 270 Day	110	19.8	Micromax	25.2
Escote 19-6-12, 300 Day	150	28.5	Perk	33.6
Nutricote Total 18-6-8, 270 Day	82.5	14.9	Nutritrace	50.4

^z Complete fertilizers were surface-applied and growth medium was amended with the respective micronutrient product.

Table 2. Growth indices^z for *Viburnum odoratissimum* at the time of fertilization (August 30, 1990) or 7 months later.

Fertilizer	Months after fertilizer application	
	0	7
Prokote Plus 20-3-10, 270 Day	24	44
Osmocote 18-6-12, 270 Day	25	46
Escote 19-6-12, 300 Day	22	42
Nutricote Total 18-6-8, 270 Day	25	44
Control	24	24

^z Average growth index [(height + width) / 6] for each of 3 plants per container (n=21)