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Survey of Best Management Practices in Container Production Nurseries[1]

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Abstract

Twenty-four nurseries producing container-grown plants were surveyed along the coastal zone of south Alabama to determine Best Management Practices (BMPs) implemented since 1988. All nurseries utilized multiple BMPs. Seventy-five percent of all nurseries surveyed have the capability to capture runoff water; however, larger nurseries (medium 4.5–16.6 ha (11–40 A); large 16.6+ ha (40+ A)) were more likely to capture runoff than smaller nurseries 0.4–4.1 ha (1–10 A). Since 1988, 78% of all collection ponds have been built with 44% of those being built in the past 5 years. Other BMPs widely used included installation of grass filter/erosion strips, having specific personnel devoted to water management, use of control release fertilizers, scouting for pests, use of horticultural oils, and staggered herbicide applications.

Index words: water quality, BMPs, environmental quality.

Significance to the Nursery Industry

Development of BMPs for the nursery industry began in the late 1980s and has already impacted nursery production practices in south Alabama. Beginning (in the late 1980s) with efforts to improve water quality of container nursery effluent, nurseries in south Alabama have incorporated many of the BMPs into their operations. One of the most dramatic findings of this survey is the construction of collection ponds. Since 1988 when discussion of BMPs first began in Alabama, 78% of all collection ponds have been built and 44% of those have been built in the past 5 years. Several other BMPs have been similarly adapted by the nursery industry. Based on the positive response of this survey, south Alabama nurseries are concerned about the environmental impact of production practices, have implemented many of these practices, and are willing to make changes if adequate guidelines are developed.

Introduction

There is a concern in our society about the environmental impact of various industries. Potential sources of pollution are classified as either point source or nonpoint source. Many industries with point source pollution classification must collect and treat wastewater prior to it leaving the production site. In contrast, nonpoint source pollution is controlled primarily through the adoption of practical and cost-effective BMPs. In 1989, Baker pointed out the need for individuals to recognize their roles as generators of nonpoint source pollutants, to learn BMPs applicable to such activities, and to implement those practices (1). In 1990, Logan (4) described BMPs as methods, measures or practices designed to prevent or reduce pollution. The best management practice concept was developed specifically to deal with nonpoint-source pollution problems with proactive, voluntary support from the targeted industry. Nursery production is classified as nonpoint pollution. In 1992, Yeager (5) suggested that nursery production practices impacting the environment be identified and modified when needed, but that only open-minded individuals with a willingness to change can achieve progress.

Under Section 319 of the 1987 Amendments to the Clean Water Act, each state was required to develop a nonpoint source assessment and management plan. The U.S. Environmental Protection Agency (EPA) does not have specific parameters for irrigation runoff; however, it delegated regional boards to set standards for their areas. Due to concerns of potential contamination from nursery runoff water in the coastal area of south Alabama, the Alabama Department of Environmental Management (ADEM) began discussion with the Alabama Nurserymen's Association (ANA) concerning how to address this potential problem. The ANA in conjunction with Auburn University developed a limited set of BMPs to address the ADEM concerns. Subsequently the Southern Nurserymen's Association (SNA) developed interest in expanding the scope of Alabama BMPs to include the 16 states in the SNA. Thereafter, a cooperative effort among southern universities, nurseries, allied industries, EPA and ADEM began to address concerns related to potential problems with water management in container production nurseries across the southern United States. Since then a site-specific, menu-driven BMPs manual was developed by university personnel. This manual was reviewed extensively by the nursery industry, EPA, and ADEM, and presented at numerous educational programs; culminating in 1997 with publication of the Best Management Practices Guide for Producing Container-Grown Plants (6).

Similar BMPs enacted in other agricultural industries have been well received and resulting in reports of individual success stories. For example, after installing grass waterways, terracing and developing a nutrient management plan on a 55 acre Pennsylvania crop and livestock farm, nitrates in surface runoff decreased over a six-year post-BMP study (3). While individual success stories exist, little information is available concerning industry wide adoption of BMPs. The objective of this study was to survey nurseries along the coastal zone of south Alabama to determine the extent of BMPs implementation.

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Materials and Methods

Twenty-four container production nurseries in south Alabama were surveyed during the spring of 1998. Nurseries were divided into three categories: small 0.4–4.1 ha (1–10 A), medium 4.5–16.6 ha (11–40 A) and large 16.6+ ha (40+ A) representing 6.9%, 19.1% and 74% of the total acreage surveyed respectively. There were eight nurseries in each category with a total of 339 ha (838 A) of actual production area. Nurseries surveyed represent about 80% of the total estimated acreage in Mobile and Baldwin counties in south Alabama. This survey was conducted using personal interviews and a questionnaire pertaining to BMPs and water quality strategies. The survey was divided into four sections: water, fertilizer, pesticide management and pesticide selection. Each section contained multiple questions and potential responses.

Results and Discussion

When nurseries were questioned about their water source, 54% of nurseries used wells exclusively while 42% used a combination of wells and ponds. Only one nursery had a pond as its only water source. When questioned about water management and asked about daily irrigation scheduling, 38% of small and 57% of large nurseries indicated irrigation occurred early in the morning whenever possible (Table 1). Thirty-eight percent of small nurseries utilized cyclic irrigation to reduce runoff water while no large nurseries reported cyclic irrigation use. Limited use of cyclic irrigation with large nurseries is probably due to difficulty in managing irrigation schedules around their large labor forces. Smaller nurseries (75%) were more likely to incorporate peat, coir, or rice hulls to increase container substrate water retention than medium (43%) and large nurseries (57%). Sixty-seven (67%) percent of nurseries representing 71% of acreage surveyed have installed and/or maintain grass filter/erosion strips. All large nurseries reported sampling runoff at least once with most large nurseries sampling runoff regularly. However, among small and medium nurseries only 13% and 38% regularly sampled irrigation runoff water.

An area where additional improvement is needed is monitoring of irrigation efficiency. All nurseries reported specific personnel were devoted to water management, however only 50%, 57% and 33% of small, medium and large nurseries respectively, directly monitor the efficiency of their irrigation systems. These nurseries represented only 31% of the total surveyed acres. In a previous survey conducted in 1989 and 1990 nurseries were asked, 'How much irrigation is applied' (2). Growers responded they normally watered for about 1 hour, applying about 2.5cm/hr (1 in). However, when these nurseries were monitored for two years, it was determined that the average amount applied was 1.6 cm/hr (0.6 in), or 40% less than most nurseries assumed they were applying. The amount of irrigation water required depends primarily on container size, substrate type, species and time of year. Thus the irrigation volume should vary depending on the previously mentioned factors. Growers need to irrigate based on plant need at the time of irrigation, which can vary from day to day, and location in the nursery. In past years, many Alabama nurseries may not have been concerned about water-use efficiency due to the abundant supply of clean water. However, a critical step in reducing runoff water is to apply the minimum amount of water needed for optimal plant growth. This can be done by adjusting the irrigation volume according to the amount of water lost since the last irrigation (6).

Nurseries were asked if they had collection ponds and when they were built. Seventy-five percent of all nurseries, representing 93% of the total acreage surveyed, captured some or all of their runoff water (Table 1). Most of the collection ponds had been built since 1988 (78%) and almost half (44%) since 1993. About 50% of all nurseries had more than one collection pond. These data may reflect efforts by the Alabama Nursery Association and Auburn University in the early 1990s when development of BMPs for container production began. Of those nurseries with collection ponds, recycling was more likely to occur with larger nurseries. For example, all large nurseries had collection ponds for capturing runoff and recycled about 68% of the water captured. While only 50% of small nurseries had collection ponds, an estimated 98% of

Table 1. Water and fertilizer management practices in south Alabama container nurseries in 1998.

	Percent by nursery size[z]		
Water use management	**small**	**medium**	**large**
Water early in the A.M. when possible	38	38	57
Cyclic irrigation	38	25	0
Monitor irrigation efficiency	50	57	33
Increase media water holding capacity	75	43	57
Collection pond	63	75	100
Installation of grass filter/erosion strips	63	75	63
Runoff water captured (% captured)	50 (98)	75 (83)	100 (75)
Recycle runoff water (% recycled)	13 (100)	25 (48)	38 (68)
Ever tested runoff water	25	38	100
Test runoff water regularly	13	38	63
Specific person(s) devoted to water management	100	100	100
Fertilizer use management			
Controlled release fertilizer only	50	100	50
Controlled release fertilizer primarily	50		50
Liquid feed liners	75	25	25

[z]Nursery size: small 0.4–4.1 ha (1–10 A), medium 4.5–16.6 ha (11–40 A) and large 16.6+ ha (40+ A).

Table 2. Changes in pesticide treatment/application at south Alabama container nurseries in the last three years.

	Changes by nursery size[z]								
	small			medium			large		
Pesticide management	more	same	less	more	same	less	more	same	less
Scouting for pests	63	37	—	63	25	12	88	12	—
Use of horticultural oils	75	25	—	75	25	—	50	37	13
Use of electrostatic sprayers	12	—	—	12	—	—	12	25	—
Use of bio-control agents	—	12	12	—	25	—	25	37	—
Apply herbicide to jammed containers	63	37	—	12	88	—	25	63	12
Apply herbicides on a staggered basis	37	63	—	25	63	—	50	50	—

[z]Nursery categories: Small 0.4–4.1 ha (1–10 A), medium 4.5–16.6 ha (11–40 A) and large 16.6+ ha (40+ A).

their water use was supplied from water captured and recycled from these ponds. Lack of collection ponds at small nurseries was primarily due to space limitations. Although collection ponds are often mentioned as the primary method of eliminating potential problems that arise from container nursery runoff, BMPs must be site specific and the BMP menu must be broad enough to include all nursery applications including smaller nurseries.

With respect to fertilizer management, all nurseries either used control release fertilizer only or used it as the primary source of fertilizer for their container grown plants. Supplemental liquid feeding was more likely to occur with either small nurseries or large nurseries. Liquid fertilization of liners occurred more with small nurseries (75%) than with either medium (25%) or large nurseries (25%). While not specifically questioned in the survey, several growers indicated that in the past they had used liquid fertilization, but had discontinued this practice because of environmental concerns.

To determine pest management practices, nurserymen were questioned as to how their pesticide treatment/application methods had changed over the past three years. Areas targeted for questioning were: scouting for pests, use of horticultural oils, use of electrostatic sprayers, use of bio-control agents, applying herbicides to jammed containers, and staggering herbicide applications (Table 2). Responses included: not used, more, same, or less. Several changes had occurred with the most notable being increased scouting for pests. This indicates a shift towards targeting pesticide applications for specific needs as opposed to previous use of preventative sprays. Another change closely following increased scouting was the use of horticultural oils. Seventy-five percent of small and medium nurseries used more oil during the past three years. Two pest management strategies with limited use were use of electrostatic sprayers and bio-control agents. Large nurseries were more likely to incorporate these into their pest management strategy than medium and smaller nurseries.

Nurseries were asked to rank (1 to 5) importance of various pesticide selection consideration factors. Across all nurseries, efficacy (4.9), toxicity of pesticides (4.5), and environmental impact (4.0) were considered to be the most important factors when choosing a pesticide while formulation (2.7) and cost of pesticides (3.0) were considered the least important.

Other questions included if the nursery had a central location for storing/mixing of chemicals, elimination of species from production because of pesticide inputs and other changes made to minimize environmental impact. Thirty-eight percent, 50% and 67% of the small, medium and large nurseries respectively, had a central pesticide mixing and rinsing station. Fifty-eight percent of all central pesticide rinsing and mixing stations at surveyed nurseries have been built in the last five years. While half of all nurseries had stations, most remaining nurseries had plans to construct one in the future. When asked if species or varieties have been eliminated from production because of chemical inputs, 80% of all nurseries had eliminated one or more species from production due to that species' need for frequent pesticide applications. Species listed as eliminated were *Photinia fraseri* (70%) and *Euonymus japonicus* 'Aureus' (33%). Rhododendron was the only other genera mentioned more than once.

Nurseries were questioned about any other changes they expect to make in their operation in the future. Responses included: better education in dealing with pesticides, increased worker training, installation of wetland plants, installation of grass waterways, installation of windbreaks, and moving from production areas with urban encroachment to more rural areas to avoid negative public perceptions.

Our data show that nurseries in south Alabama are proactive in addressing environmental issues relating to production of container-grown nursery crops. While future regulations regarding water quality and availability may be imposed on the nursery industry, this study indicates that many nurseries are forward thinking and concerned about implementing BMPs.

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