EFFICIENT MONITORING FOR AN URBAN IPM PROGRAM

by John Ball

Abstract. Integrated pest management (IPM) is gradually becoming part of commercial tree services. Many IPM programs for various insect and disease problems have been developed during the past decade and they can be adapted into a business. Unfortunately IPM has not yet become fully integrated into tree service companies. Two drawbacks to an urban IPM program are monitoring costs and the public's reluctance to purchase monitoring as part of a total tree care package. A study was performed to determine how a monitoring program could be made more efficient and inexpensive enough to encourage homeowners to purchase this vital part of any IPM service.

Résumé. Le contrôle intégré des insectes et des maladies (IPM) devient graduellement une composante des services offerts par les firmes d'arboriculture. Plusieurs programmes de contrôle d'insects et de maladies ont été développés au cours de la dernière décennie et ils peuvent être adaptés aux services d'une entreprise. Malheureusement, ces types de programmes de contrôle n'ont pas été complètement intégrés au sein des firmes d'arboriculture. Deux désavantages d'un programme de contrôle intégré sont les coûts de surviellance et la réticence du public à accepter la surveillance comme une partie du service de protection des arbres. Une étude fut réalisée pour déterminer comment un programme de surveillance pourrait être rendu plus efficace et assez bon marché pour encourager les propriétaires à acheter cette partie vitale d'un service de contrôle intégré d'un insecte ou d'une maladie.

Integrated pest management (IPM) has been utilized in agriculture for over the past 25 years (12). Many businesses in agriculture are devoted to some aspect of IPM such as scouting for pest problems and evaluating the effectiveness of pest management tactics. This same trend is now beginning to appear in the tree care industry. Several companies are beginning to market an IPM program as part of their tree care services. However, there are several important differences between an urban and an agricultural IPM service. An agricultural IPM program is based upon crop quality and yield. Farmers will pay for an IPM service that can show them that the price of the service is justified by the value of the crop. There is also less diversity in the agricultural landscape. Many IPM companies specialize in fruit, vegetable or field crops. This specialization allows the service to concentrate on a limited number of hosts and pests. One other major component of an agricultural IPM service is that economic threshold levels have been determined for many crops. The services know when pest management tactics should be implemented to prevent an economical loss of crop yield or quality.

An urban IPM service does not operate in the same manner. An urban program is not based on yields but aesthetics (9). Management tactics may be implemented before the health of the ornamental plant is affected due to an objectionable appearance (8). Hence an urban IPM program must appeal to the client's sense of aesthetics, their willingness to pay for their plants to look better. An urban IPM service must also contend with the great diversity of the landscape. There are many different plant species each with its associated pest complex. The service must also work without aesthetic thresholds developed for the plants they must treat. Very little information is available on the public acceptance of various levels of defoliation or other plant injury (7).

To aid the development of IPM programs for commercial tree services a two part study was initiated. The first part examined the public's perception of an IPM service. This part was completed last year. The survey results showed homeowners interested in an IPM based tree service were active gardeners (1). They were not opposed to pesticides as long as spot treatments were applied. They also wanted to be involved in any management decisions or at least kept informed.

The second part of the study was concerned with monitoring procedures that would make an IPM program more efficient. The second part of the study was necessary for two reasons. First, monitoring is an essential part of any IPM program. IPM is more than just a collection of strategies and tactics, it is a decision-making process. However decisions can not be made without information. Monitoring plants and their associated insect and disease complexes permits

a manager to make intelligent treatment decisions and then be able to evaluate the success of that action.

Second, given that monitoring is a integral part of a IPM service, a company must find a profitable way of providing it. Monitoring is a very labor intensive activity. The labor cost of an IPM service can be considerably higher than that of a pesticide based service(1, 6). Hence, a company must find ways to use this labor time most efficiently.

Methods

The town of Owatonna, Minnesota (pop. 17,000) was selected for the monitoring study. Selected homes were inventoried for all their woody plants. A landscape map was made of each homesite and every woody plant was located on the map. Each individual plant was then examined for any pests or environmental injury. Once a map was completed, visits were made on a biweekly basis to determine any changes in plant condition and pest population.

The homes were randomly selected by a single stage cluster sampling technique (4). Thirty clusters were selected within the area and then at the intersection marking the cluster every other house in a westerly direction was selected until three houses were at each cluster. Homeowners were encouraged to participate in the monitoring study by being given a copy of the inventory and a summary of the monitoring information.

To study the influence of certain plants on the length of monitoring time, homesites were paired with homes having similar number of plants. Size of homesite was approximately .25 acres for all sites. The data were analyzed by the Wilcoxon signed rank test (11).

Results and Discussion

A total of 2136 plants were located on the 90 homesites in Owatonna, Minnesota. American arborivitae (*Thuja occidentalis*) was the most common plant, making up slightly more than 20 percent of the total (table 1). The second was juniper (*Juniperus* spp.) at 8.3 percent and third was white spruce (*Picea glauca*) at 5.6 percent. This list differs greatly from one prepared for Maryland (10). The predominance of evergreens is a reflection of the Minnesota winters and points out the importance of regionally developed plant lists.

Of the 10 most common plant species, the most problem prone was Tatarian honeysuckle (*Lonicera tatarica*) (table 1). The pest problem affecting 95 percent of the plants was witches' broom caused by the honeysuckle aphid (*Hyadaphis tataricae*). This insect, since its introduction into the Midwest several years ago, has caused a tremendous amount of aesthetic damage on an otherwise relatively pest-free plant. If this same survey had been conducted in 1975, this plant would have been considered relatively pest-free. The second most problem prone plant on this list was green ash (*Fraxinus pennsylvanica*). While plant bugs (*Tropidosteptes* spp.) infested 88 percent of trees it is not considered a serious problem by most homeowners, especially once informed about the minor influence it has on tree health. Hence, this problem is not one that warrants much concern. However, in the extremely wet spring of 1986 the green ash in the area suffered severe defoliation from ash anthracnose (*Gloeosporium aridum*).

More important than the position in the pest problem ranking is the number of serious or life threatening problems that occur on the plants. For this list, serious is defined as a persistent problem that produces an objectionable aesthetic injury (table 2). While tatarian honeysuckle is still on this list, so are hawthorn (*Crataegus* spp.) because of

Table 1. The relative abundance and frequency of problems for 10 of the most common woody ornamental plants found at 90 homesites in Owatonna, Minnesota.

Plant species	*% of total plants*	*% of total problems*	*% of plants with problems*
Thuja occidentalis	20.4	4.1	7.6
Juniperus spp.	8.3	1.5	6.7
Picea glauca	5.9	1.1	7.1
Lonicera tatarica	5.6	14.2	95.0
Spiraea x vanhouttei	5.5	3.8	2.6
Lonicera xylosteum	4.3	0.0	0.0
Fraxinus pennsylvanica	3.7	8.6	88.5
Potentilla fruticosa	3.5	0.0	0.0
Syringa vulgaris	3.2	6.7	78.3
Picea pungens	3.2	3.4	39.1

cedar-hawthorn rust (*Gymnosporangum globosum*) and honeylocust (*Gleditsia triacanthos* var. *inermis*) because of nectria canker (*Nectria cinnobarina*). Homesites containing species from this list require additional time for monitoring.

This is a part of the key plant concept (10). Key plants are those ornamental plants that have serious, persistent pest problems. These plants can represent a considerable investment in monitoring expense. Using paired homesites, there was a significant difference ($P < .01$) in monitoring time between homesites containing fewer than 8 key plants and those containing more (table 3). Hence, an IPM service may find that knowing the number of key plants on a client's homesite can be an accurate indicator of monitoring time required for the site. The length of monitoring time was closer correlated to the number of key plants ($r^2 = 0.68$) than it was to the total number of plants ($r^2 = 0.41$).

Monitoring can be segregated into four categories based on function: detection surveys, biological evaluations, loss or damage survey and pest control evaluation (5). Detection involves the identification of the presence and kind of pest. This type of monitoring should be conducted at least once a year on all plants, preferably in the spring. While some plants are relatively pest free, annual inspection alerts the scout to any new problems.

Pest control evaluations are conducted to determine the effectiveness of a particular treatment tactic. This survey is a necessary part of any IPM program. Pest control evaluations are not conducted at any regular interval but when necessary.

Biological evaluations are directed at collecting population size and distribution information. Loss or damage surveys are utilized to determine the impact of a pest on a plant. These two categories, the biological evaluation and damage survey, are the backbone of a commercial monitoring service. Many IPM services monitor on a biweekly basis (6). However, this schedule may not be the most efficient use of monitoring time. Instead a service should know the key pests of the plants and intensely monitor during those time periods biological evaluations or damage surveys would be pertinent to that particular pest. Since homesites contain different plant species, the monitoring interval and frequency will differ among the homesites.

A monitoring calendar was developed to determine the monitoring interval and frequency for a homesite. The calendar was developed from the list of key plants and their pests. Each pest was then identified as to the most appropriate time for biological evaluation and damage survey. The number of monitoring visits required for each of the homesites was then tabulated. These data were compared to a standard biweekly monitoring schedule. This standard schedule, which typically run from mid-April until mid-September, would re-

Table 2. The relative abundance and frequency of problems for 10 woody ornamental plants most often affected by serious pest problems. Data from 90 homesites in Owatonna, Minnesota.

Plant species	*% of plants with problems*	*% of total problems*	*% of total plants*
Picea pungens	39	3.4	3.2
Cotoneaster lucidus	71	3.8	2.0
Elaeagnus angustifolia	71	0.8	0.3
Gleditsia triacanthus var inermis	75	1.1	0.6
Malus spp.	78	5.2	2.5
Ribes alpinum	83	7.5	2.8
Crataegus spp.	89	2.3	0.9
Lonicera tatarica	95	14.2	5.6
Ulmus americana	100	1.1	0.4
Betula pendula	100	0.8	0.3

Table 3. Comparison of monitoring time between homesites having fewer than 8 key plants and those having more utilizing the Wilcoxon signed rank test procedure. Homesites were 0.25 acre lots in Owatonna, Minnesota.

Total number of woody plants	*n*	*Avg. monitoring in minutes*	
		Less than 8 key plants	*8 or more key plants*
11-20	10	9	15
21-30	14	10	16
31-40	10	12	19
40 +	8	16	24

Differences between paired data were significant at the 0.01 level.

quire approximately 12 visits. By utilizing a calendar developed for the key plants in an individual homesite, monitoring visits were reduced an average of 40 percent. This is only meant as an example. This system could possibly result in more visits rather than less. The important use of this system would be to produce a more accurate estimate of time required to monitor a particular homesite. This would improve the ability of an IPM service to price the monitoring aspect of a particular job.

Summary

Monitoring is a vital part of an urban IPM tree service. Unfortunately, it is not a service that clients consider critical, hence they are generally reluctant to pay for it. To reduce monitoring cost it would be better to keep it in line with the cost associated with a particular homesite rather than have a flat charge. An accurate method of determining yearly monitoring costs is to determine the number of key plants contained at the homesite. This will enable an IPM tree service to determine the length of time to monitor at a given site and also the frequency of the visits.

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Abstract

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Some valid reason for pruning are: to improve form and balance, to repair damage, to guide growth habit, to stimulate new growth where growth is lacking, to rejuvenate older plantings and to maintain a clipped or tightly pruned hedge. If a vigorous plant has opposite buds, both buds will break and two shoots will replace the twig you cut. If the plant has alternate buds, the bud immediately below your cut will produce the dominant new growth. A bud on the *outside* of the twig - as opposed to the one facing toward the center of the plant - will produce a new shoot that will grow upward and outward. If the bud is on the *inside*, the new shoot will grow inward. Rejuvenation pruning, an important aspect of grounds maintenance, ought to be an ongoing job. Do renewal pruning on a periodic basis, depending on the particular species. In the case of lilac, for example, overhaul the plant every 3 to 5 years. Remove one or two of the oldest trunks, cutting to the ground. Work over younger wood at the same time, pruning out inward-growing branches and cutting out crowded or weak canes at the ground.