Municipal Integrated Pest Management Lawn Demonstration Project

FINAL REPORT OF 3-YEAR STUDY SPONSORED BY THE ONTARIO PESTICIDE ADVISORY COMMITTEE

Objectives

1. To demonstrate the impact of conventional lawn care, IPM, no-pesticide and alternative herbicides on turf quality and pest infestations.

2. To document the results of maintaining turf without pesticides for a three year period.

Study Description

This study began in 2003 and continued on the same plot areas in 2004 and 2005. The study was established in three municipal settings: Guelph, Brantford and London. At Guelph, the plots were located at the Guelph Turfgrass Institute (GTI). There were 32 plots, 9x5.5 m each, with a total demonstration area of 1584 m^2 (Figure 1). There were four management programs and they include: conventional, IPM, alternatives and no pesticides. The conventional approach used pesticides exclusively for pest control (total of 6 applications). IPM plots were monitored for pests and treated with pesticides when thresholds were exceeded. The alternative management program used organic pesticides (corn gluten meal and Nature's Weed and Feed – beet juice extract in year 1 and 2 and Juicy Lawn in year 3) for weed control. Lastly, no pesticides were applied under the no-pesticide management program.

At Brantford, the plots were located at the Glenhyrst Art Gallery, near the Grand River. There were three management programs and they are as follows: conventional, IPM and no-pesticides. There were 24 plots, 7x5 m each, with a total demonstration area of 840 m^2. In London, the plots were located at Watson Park, near the Thames River. There were two management programs, IPM and no-pesticides, and the study consisted of 16 plots, 10x4.5 m each, with a total demonstration area of 720 m^2.

In all three municipal settings, the demonstration trials were set up on established, predominantly Kentucky bluegrass turf with an existing moderate level of weed infestation. The plots of each demonstration trial were divided into four lawn care management programs: conventional, IPM, alternative and no-pesticide. Within each management program, the plots were subdivided into three superimposed treatments including fertility (2.0 kg/100 m^2 of nitrogen annually vs. no fertilizer), mowing height (4 cm vs. 8 cm) and irrigation vs. no irrigation. The purpose was to demonstrate the effect that these treat-

Figure 1. Plot plan at the Guelph Turfgrass Institute, Guelph.

Irrigated 4 cm mowing height		Irrigated 8 cm mowing height	
Fertility	**No Fertility**	**Fertility**	**No Fertility**
Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides
Non-Irrigated 4 cm mowing height		**Non-Irrigated 8 cm mowing height**	
Fertility	**No Fertility**	**Fertility**	**No Fertility**
Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides

Figure 2. Influence of lawn care management on turf quality at GTI in 2003, 2004 and 2005.

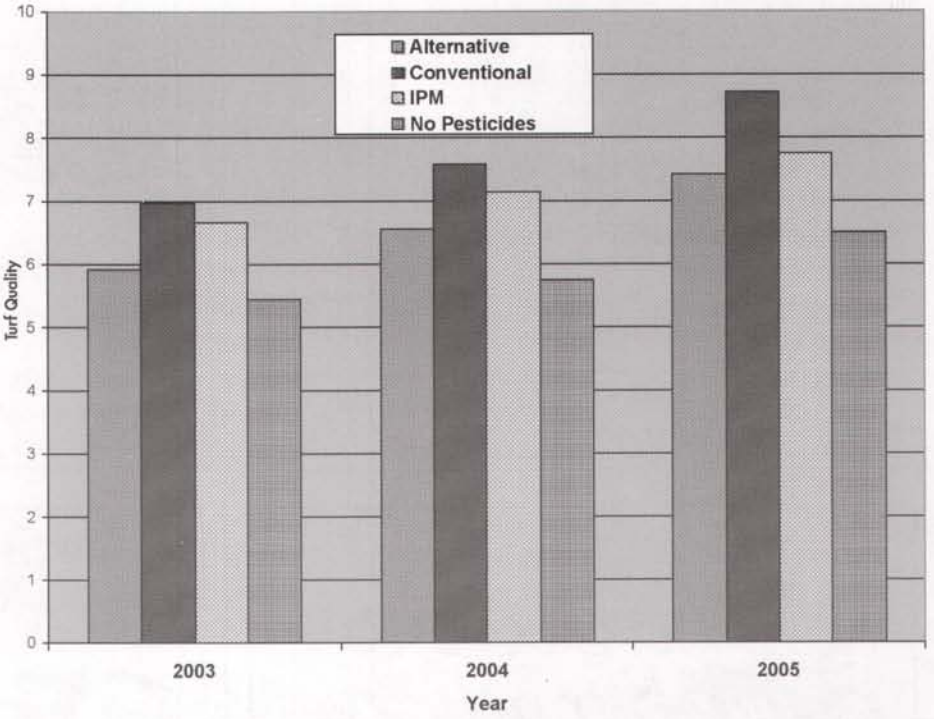
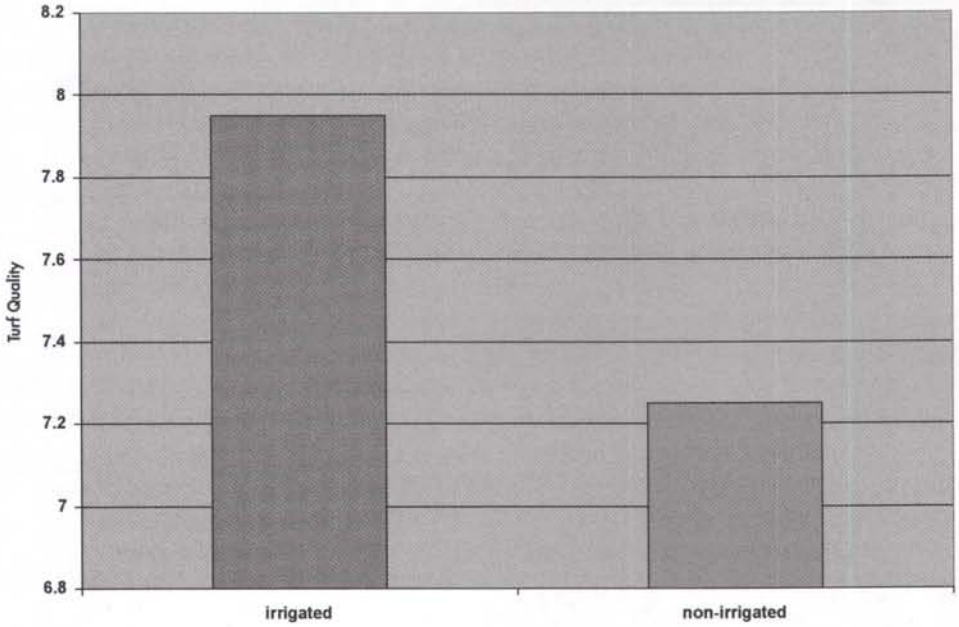


Figure 3. Effect of irrigation on turf quality at GTI, 2005.



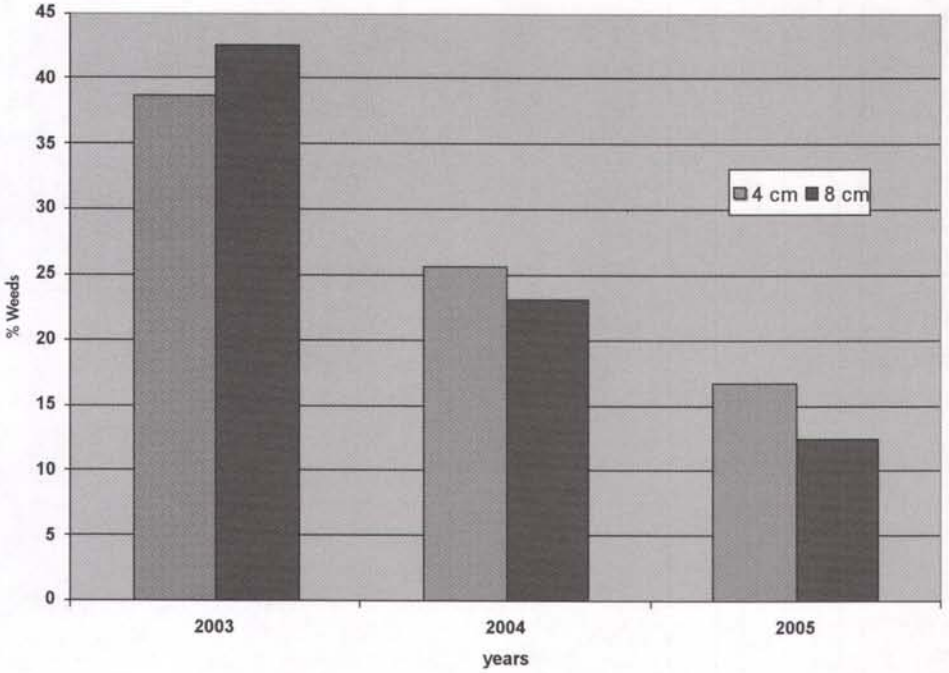
ments had on turf quality and pest levels. The amount of irrigation was based on rainfall values. If less than 2.5 cm of rain fell per week, the plots received irrigation to make up the deficit. However, due to the large amount of rainfall in 2003 and 2004, almost no irrigation was necessary and we were unable to demonstrate irrigation versus non-irrigation effects. For those two years, the irrigation and non-irrigation plot data were combined. In 2005, there were several weeks at each location that did not receive 2.5 cm of rain and irrigation was necessary. The trial started at all three locations at the beginning of June and continued until mid-November in all three years. Visual ratings and mowing were carried out weekly while the application of fertilizers, the monitoring of pests, and the application of pest control were carried out according to each of the four management programs and their superimposed treatments. The schedules of pest monitoring, treatments, pest monitoring techniques and amount of time spent monitoring is summarized in previous articles in the *Sports Turf Manager* (Summer 2004, Spring 2005 and Winter 2005). Results at all three sites were very similar. Results from GTI are presented here in an effort to save space. The full report will be available on line this spring at www.gti.uoguelph.ca/OPAC. In addition, it must be noted that this trial was for demonstration purposes only and was not set up to be analysed statistically.

Results – Guelph Turfgrass Institute

Turf Quality

The turf quality was consistently highest in the conventional plots, followed closely by the IPM plots, alternative plots and the lowest quality was consistently in the no-pesticide plots (Figure 2). Over the duration of this study, the quality of all

Figure 4. Influence of mowing height on broadleaf weed infestation at GTI, 2003, 2004 and 2005



management types increased with each successive year. There was very little effect of mowing height on turf quality over the three years of the study. The lower mowing height resulted in a slightly denser turf. There was a slightly larger effect of fertility on turf quality. The fertilizer treatment had an effect on turf density and colour which are two of the three parameters which are averaged to come up with turf quality. Uniformity is the third parameter that was measured and these three are averaged to determine an overall turf quality rating.

In 2005, we were able to demonstrate the influence of irrigation on turf quality (Figure 3). The overall quality of the irrigated plots was higher than the non-irrigated plots. The non-irrigated plots were fully dormant during June and early July.

Broadleaf Weeds

To determine the influence of mowing height, fertility and the alternative herbicide products on broadleaf weed infestation, only the no-pesticide and alternative plots were considered because both the conventional and IPM plots received broadleaf herbicides to control the weeds. Mowing height had a small effect on the percent broadleaf weed cover but it had less of an effect than fertility (Figure 4 and

Figure 5. Influence of fertility on broadleaf weed infestation at GTI, 2003, 2004 and 2005.

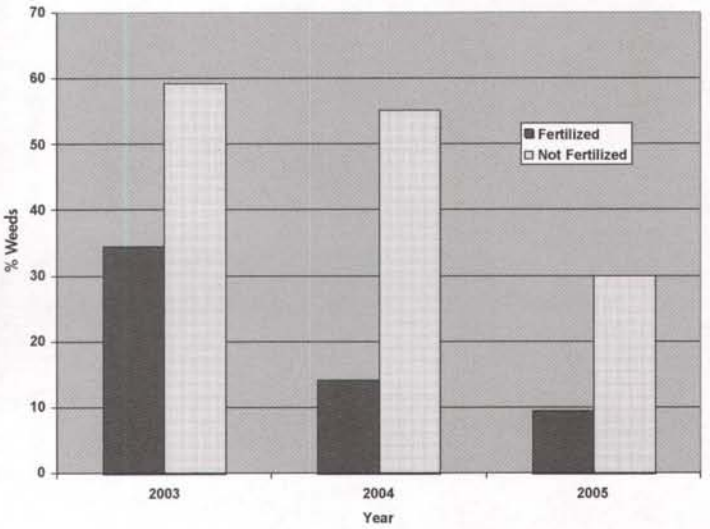
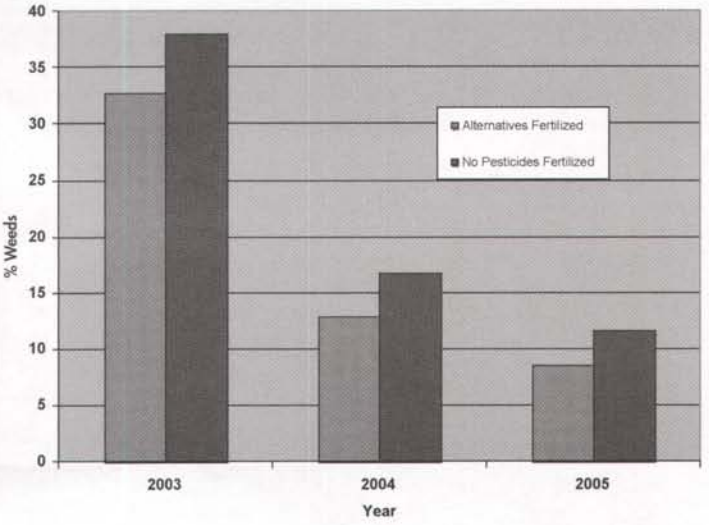


Figure 6. Effect of alternative herbicide treatments vs. fertility alone on broadleaf weed infestation at GTI, 2003, 2004 and 2005.



5). There were slightly more broadleaf weeds at the higher mowing height in 2003 and slightly fewer broadleaf weeds at the lower mowing height in 2004 and 2005. With the addition of 2.0 kg of nitrogen per season in 2004 and 2005, we were able to keep the broadleaf weed cover below the OMAFRA threshold of 10-15%. At this level of weed infestation, spot treatments alone can be used.

A comparison was made of the alternative plots and the no-pesticide fertilized plots (Figure 6). The purpose of this comparison was to separate the fertility effect of the alternative herbicide treatments (corn gluten meal contains 8% nitrogen and the beet juice extract products, Nature's Weed and Feed and Juicy Lawn, contain 7% and 15% nitrogen respectively) from the herbicidal effects. There was a slight reduction in percent broadleaf weed cover consistently each year with the combination of corn gluten meal and beet juice extract treatments. Because of the trial design, we are unable to determine which of these two treat-

ments are responsible for the reduction in broadleaf weed cover, but we do know that application of both of these products together does result in a reduction of weeds. This could be due to the suppression of germination of broadleaf weeds seeds from the corn gluten meal or some suppression of established broadleaf weeds from the beet juice extract or from the nitrogen contained in these products. It is also suggested from this data that it may take more than one year of application of these products to realize a reduction in broadleaf weeds. After three years of application of the combined alternative products, the result was an overall broadleaf weed cover of less than 10%. It should be noted however, that the addition of fertilizer alone also reduced weed cover to a similar level.

At the beginning of the study at GTI, there was an average of 15-20% weed cover in all plots. Examining the no pesticide/no fertility plots, there was a rapid rise in the weed population to just under 60% by November 2003. There was a plateau at this level throughout the 2004 season until September 2004 when weed cover dropped below 50% and rose again in late fall. Over the 2005 season, weed levels dropped off throughout the season ending off at 30%. It is possible that the dry weather in the spring and summer of 2005 inhibited the germination of new weed seeds or that the drought had an adverse effect on the perennial broadleaf weeds.

In 2005, the plots at GTI, Brantford and London were irrigated. The effect of the irrigation during the season on average weed cover was the opposite of what was expected. The irrigated plots had a higher percent broadleaf weed cover than the non-irrigated plots. It is possible that the irrigation provided the necessary moisture for weed seed germination during a droughty year.

Pesticide Reduction

At the GTI, conventional plots received a total of six broadcast pesticide applications, while the IPM plots received only two treatments and many of these plots were spot treatments only. The alternative plots received a total of five broadcast treatments of organic herbicides. At Brantford there was an additional post emergence crabgrass treatment on the IPM plots due to the presence of crabgrass on some plots. This represents a reduction of 66.6% in the number of pesticide applications at GTI for each year of the study and a reduction of 50% in the number of pesticide applications at Brantford for each year of the study.

The total area that was treated with pesticides each year on the IPM plots vs. the conventional plots was also calculated for GTI and Brantford in Table1. By year three of the study there was a 99.35% reduction in the amount of area treated with pesticides for GTI and a 98.33% reduction in the area treated at Brantford. A part of this reduction was due to the fact that the conventional plots received two insecticide treatments and a pre-emergence crabgrass treatment and the IPM plots demonstrated that those three treatments were not necessary. Secondly, by year three there was

Contributions Welcome

Contact Lee Huether at the STA office if you are interested in contributing to the *Sports Turf Manager*. We appreciate feature-length articles, column ideas and newsworthy items. Updates on innovative research or equipment are also welcomed. This is a great way to both support your professional association and enhance your resume!

Table 1. Total reduction of pesticide treated area of IPM vs. conventional plots in Brantford and GTI in all years.

Location	Treatment	2003	2004	2005
GTI	Conventional	2376	2376	2376
GTI	IPM	350.955	165.924	15.444
GTI % Reduction (Conventional–IPM/Conventional x 100)		**85.23%**	**93.01%**	**99.35%**
Brantford	Conventional	1680	1680	1680
Brantford	IPM	221.2	31.08	28
GTI % Reduction (Conventional–IPM/Conventional x 100)		**86.80%**	**98.15%**	**98.33%**

only a need to spot treat for broadleaf weeds and this also greatly reduced the amount of area treated with pesticide in the IPM plots.

Conclusions

Turf quality was highest in conventional followed by IPM, alternative and no-pesticide programs in all three years. Despite the 50-66.67% reduction in the number of pesticide use or the 98-99% reduction in the area of turf treated with pesticides in the IPM plots compared to conventional plots, the quality of the turf in IPM plots was only reduced slightly. In addition, quality of the turf at the two different mowing heights was very similar. The 4 cm height of cut was slightly denser than the 8 cm height of cut. The application of fertilizer improved turf colour and density resulting in higher quality ratings and it also reduced broadleaf weed cover in the no-pesticide plots.

Turfgrass insects were not an issue in all three municipalities in all three years. They were all present in numbers below the OMAFRA threshold for each pest. Crabgrass infestation was also not a problem. It was only found at Brantford and London in numbers below the IPM threshold level (10-15%) with the exception of one plot in 2003. In subsequent years, it was below the threshold and only required spot treatment in a few plots. Again, this study demonstrated very significant pesticide reductions without loss of turf quality by implementing IPM.

As for broadleaf weed cover, a couple of trends were observed. The no pesticide/no fertilizer plots at GTI had a rapid increase in broadleaf weeds in 2003, up to 60%. This remained steady through 2004 until the late fall. Weed cover rose again in the summer of 2005, but it did not go as high 2003. Finally, at the end of the summer in 2005, the weed population declined to 30%. Both the no pesticide/fertilized plots and the alternative plots had an increase in weeds in the summer of 2003. The following seasons there was a steady decline in weeds to a final weed count of 10% at the end of the study period. This trend was very similar in the no pesticide plots at Brantford and London. There was a noticeable interaction between the different growing seasons and the broadleaf weeds, with all weed populations decreasing in 2005. This was consistent at all three sites and demonstrates the effect of temperature and rainfall on weed ecology. This trial clearly demonstrated that broadleaf weed cover can be greatly reduced with regular applications of fertilizer at a rate of 2.0 kg of nitrogen/100m^2 per season. With this rate of fertilizer application, weeds were below the OMAFRA threshold of 10-15% and only spot treatment would be needed, eliminating the need for broadcast applications of broadleaf herbicides. ♦

— Gema Cheong, Ontario Pesticide Advisory Committee (OPAC) Resource Technician (RT); Stacey Fearman, OPAC RT; Erica Gunn, Guelph Turfgrass Institute RT; and Pam Charbonneau, OMAFRA