Sports Turf Manager

for safe, natural sports turf

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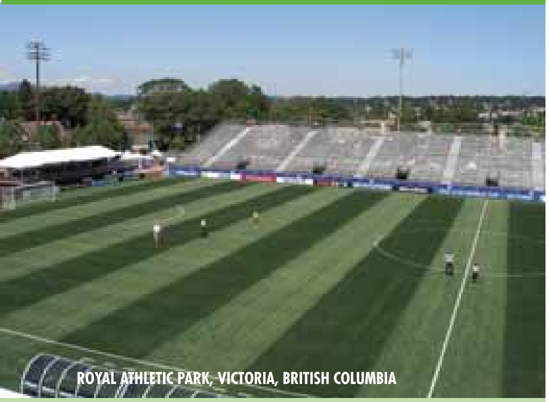
Lost Your Notes?

If you couldn't attend this year's OTS or simply want a refresher on some of the sessions, we recap three of them with articles in this issue.



ROYAL ATHLETIC PARK, VICTORIA, BRITISH COLUMBIA

2007 FIFA U-20

See pages 20-22 for an in-depth look, from the field crew's perspective, at the remarkable transformation Victoria's Royal Athletic Park underwent for last summer's World Cup.

Turn Off the Pesticides & Turn on The Vacuum

NANCY HUDSON, CHINCH BUG RESEARCH PROJECT, NL HORTICULTURE PRODUCERS COUNCIL

An OTS Highlight Article. Agricultural vacuums were first used in the 1950s to protect US cotton crops from insect damage. By the 1960s the use of vacuums expanded into other field crops to provide protection from certain insect pests such as whiteflies, aphids, tarnished plant bugs and Colorado potato beetles. Treatment results ranged from excellent to poor depending on the type of vacuum used. Discontentment with agricultural vacuums may have been driven by the high initial cost of machinery, limited use, soil compaction, and plant losses from mechanical damage.

In the meantime, chemical pesticide manufacturers created new pest control products for use by farmers which ultimately led to the abandonment of agricultural vacuums. Chemical pesticides were touted as a technological wonder because they were so economical and effective at increasing crop yields. However, the perceived miracle ceased when greater amounts of pesticides were needed to achieve treatment results, and when insect pests such as the Colorado potato beetles became chemically resistant. Voices from science, academia, and the public began to surface conveying fears of environmental degradation and human harm resulting from unrestricted pesticide use.

In response to these concerns a multi-tactical approach to pest management emerged; integrated pest management (IPM). IPM was developed to reduce the reliance on chemical pesticides by encouraging the use of other treatment methods such as biological controls, physical controls...

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COVER STORY CONTINUED...

TURN OFF THE PESTICIDES & TURN ON THE VACUUM • NANCY HUDSON,LEAD RESEARCHER • CHINCH BUG RESEARCH PROJECT

and mechanical controls, for example vacuums.

At about the same time, new uses for vacuums were developed which permitted the capture of live insects instead of killing them outright. For instance, large vacuums used in cotton crops were equipped with insect collectors which captured the insects without harming them, which enabled the release of beneficials back into the fields and the subsequent destruction of pests. Small portable vacuums came into existence and were used by researchers to efficiently collect insects and other ecological data in hard to access or remote areas, such as tall grass fields, forest floors, dense woody habitats, and large shrub or small tree canopies.

Today, vacuum samplers such as the backpack aspirator available through BioQuip in California, and smaller handheld units are used for monitoring insect pests in greenhouses, row crops, nurseries and orchards. These vacuums might also be used for monitoring certain pests affecting lawns and landscape plants.

While the smaller vacuum samplers practically coasted through the last half century, large agricultural vacuums experienced a turbulent history.

Agricultural vacuum inefficiencies may have resulted from a failure to account for insect biology and behaviour. To prove this, studies were conducted on Colorado potato beetles to determine how they interacted with potato plants when subjected to air-stream velocities.

The implementation of IPM shifted the focus from killing pests with chemicals to understanding pest behaviour and applying measures to discourage, repel or otherwise manage them. When interest in agricultural vacuums resurfaced, it caught the attention of entomologists and others who became curious about how vacuums might be optimized. They believed that agricultural vacuum inefficiencies may have resulted from a failure to account for insect biology and behaviour.

To prove this, studies were conducted on Colorado potato beetles (CPB) to determine how they interacted with potato plants when subjected to air-stream velocities. Results of one study showed that CPB adults grabbed onto plants and maintained their grip in spite of incredible forces used to dislodge them. Fortunately in another study it was shown that CPB adults were knocked-off the foliage by air blown horizontally through the plants and while detached from the plants they were easily collected by the vacuum. Studies were also conducted to examine the affect of airflow velocities on potato plants in order to establish air-stream tolerance levels and methods to minimize plant damage.

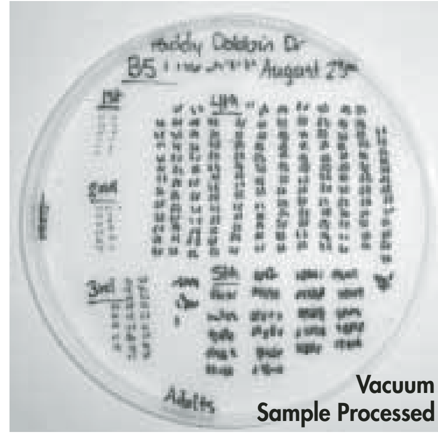
As it turned out, the air-stream levels needed to dislodge CPB adults were within the range tolerated by the potato plants. Another approach that was taken to optimize vacuum efficiency was to analyze the affect of hood orientation and design on air-stream patterns and airflow rates. Laboratory experiments and the use of numerical model simulations allowed investigators to examine numerous configurations without having to produce costly prototypes and perform extensive testing. By the 1990s, agricultural vacuums were at their peak and were marketed worldwide. Unfortunately they could not maintain their stay in the market and as interest subsided, manufacturers halted the production of these machines. Today agricultural vacuums still exist but they are in limited use, and are mainly operated by organic crop producers and specialty growers.

A third vacuum emerged at about the same time as the agricultural vacuums and vacuum samplers, however it had no association with insect capture or control. It was instead intended to be used as a debris removal machine. Debris removal vacuums were manufactured to pick up leaves, organic litter, garbage, bottles, cans, dirt and other debris from hard surfaces and turfgrass. Use for insect control apparently was not an intended function for these machines. The debris removal vacuums were marketed as an essential labour saving tool for cleaning up exterior spaces.

Today numerous manufacturers produce a wide variety of debris removal vacuums that range in size, form and function. Smaller machines such as the Billy Goat wide area vacuum can be either self-propelled or pushed manually; larger machines can be mounted on tailgates or trailers, and huge machines can be mounted on trucks or tractors for wide area applications. These vacuums have been used on sod farms, municipal lands, commercial sites, sports fields, public parks, cemeteries, concert sites, military bases, etc. Debris removal vacuums have been successful over time, perhaps due in part to the diversity of design and wide rage of application.

For decades, vacuums have been used to control agricultural crop pests, collect specimens, and remove debris, however their use to control lawn or landscape pests was somehow overlooked. Perhaps landscape vacuums were bypassed because of chemical pesticides; they were effective, easy to apply and there was a wide variety available. However, an unavoidable trend toward reducing chemical pesticides is underway, which may prompt the industry to consider vacuums as a viable means for managing certain lawn and landscape pests. With the need for alternatives to chemical pesticides at the forefront, perhaps interest in vacuums will surface and propel efforts to create designs that are suitable for managing pests in the landscape. Industry and the public at large could certainly benefit from a non-chemical pest control option, for example vacuuming to control chinch bugs.

Chinch bugs are common insect pests that are highly destructive to lawns and other turfgrass areas. They are true bugs from the order Hemiptera; both adults and young feed on grasses (turf and agricultural grass-crops) by siphoning plant fluids through their straw-like mouthparts. The adults are very small, roughly 3.5 mm in length which is similar to the size of a black fly. Chinch bugs typically aggregate forming tight colonies, one or more of which can be found randomly distributed in a lawn, particularly in locations that are hot, dry and sunny. They are mostly surface dwellers and can be exposed by parting the grass. There are several species of chinch bugs that are native to North America. In the US there are four subspecies that are considered to be of economic importance, three of which inhabit Mexico


Vacuum Sample Processed


Adult Chinch Bug


Billy Goat Vacuum

and parts of Canada. Damage is particularly problematic in the eastern provinces, including Quebec, New Brunswick, Nova Scotia and Newfoundland. The chinch bug's biology and its habitat appear to be well suited to the application of vacuuming as a treatment method which could prove to be a suitable alternative to the use of chemical pesticides.

Vacuum research is being conducted in Newfoundland as part of a project titled *Non-Chemical Methods for Chinch Bug Control (2006-2009)*. The project was initiated in response to an emerging issue for the lawn care industry, sod growers, and the general public looking for alternatives to chemical pesticides for chinch bug control in lawns and turfgrasses. Funding for the project is provided by the Newfoundland and Labrador Agri-Adapt Council Inc., in partnership with the Nova Scotia Agri-Futures Council and the New Brunswick Agricultural Council, through the Advancing Canadian Agriculture and Agri-Food (ACAAF) Program; and is administered by the Newfoundland and Labrador Horticulture Producers Council. During the summer of 2007, a modified lawn vacuum was tested to determine its effectiveness at controlling chinch bugs in lawns, as compared to a spray treatment using Seven T & O (carbaryl) and a control. The experiment used pre treatment counts and post treatment counts obtained in 0.1 metre square quadrants to measure treatment effectiveness.

The vacuum used in the study was a 6.75 hp (1750 cfm) Minuteman Parker APV debris removal vacuum which had a 4" diameter x 10 foot hose attachment, to which we added 1.5" diameter x 50 feet of hose, hose-end attachments, and an inline collection bag. Vacuum samples were collected using the long hose which permitted the vacuum to remain in a stationary position away from the sample collection area. From previous studies using certain debris removal vacuums on the lawns, we found the vacuums to be difficult if not impossible for an operator to handle, plus there were issues of inaccessibility to sites due to obstacles such as stairs and retaining walls. The vacuum modifications were used to overcome prior obstacles and to test preliminary design concepts.

Monitoring was conducted weekly July through September and a treatment (spray, vacuum or control) was applied in mid-August. The results obtained with the vacuum were comparable to the spray treatment; in both cases the post treatment counts were significantly lower than the pre treatment counts. The vacuum provided a 71% reduction in chinch bug numbers at 24 hours after treatment where as the spray provided a 91% reduction after 24 hours. One week after treatment, two out of three vacuum sites provided at least 90% reduction compared to the spray sites which provided 99% reduction in chinch bug numbers. Samples collected by the vacuum were analyzed to obtain chinch bug counts per each life-stage, i.e. egg, 1st instar nymph, 2nd instar nymph, etc. It was evident that large numbers of chinch bugs were captured by the vacuum and that all stages were collected (egg through adult). Relatively low numbers of beneficial insects such as big-eyed bugs and damsel bugs were captured by the vacuum, however, it was clear from pre and post treatment counts that the vacuum treatment did not significantly reduce the beneficial insect population.

At present it is unfair to compare the performance of vacuum treatments with spray treatments regarding the ease of application and the results obtained. The vacuum used in this study was sufficient for gathering preliminary data; however, it requires significant restructuring in order to reach its full potential as an insect control device. To optimize vacuum performance, we are collaborating with industry and Memorial University of Newfoundland's (MUN) Faculty of Engineering & Applied Science. Senior engineering students at MUN are working on a vacuum prototype which we intend to use in field tests this summer. We believe that this technological innovation will result in numerous benefits including a reduction in chemical pesticide use, an increase in market share and revenue, a reduction in environmental degradation, and an increase in public advocacy. It is expected that at the conclusion of this project, all of our goals will be attained including the testing of a vacuum prototype and a new vacuum design. Upon receipt of additional funding, we expect to continue to perfect the lawn-pest vacuum and associated treatment protocols, and hope to examine further design configurations that will provide expanded vacuum use and application in the landscape. ♦

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