Pest Control at Washington State University Tri-Cities

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For my research project, I focused on pesticide use on the WSU Tri-Cities campus. I examined current pest control practices, which include physical and chemical controls. Where chemicals were considered or used, I studied their characteristics, toxicity, cost, and effectiveness. I also discovered various alternatives to pesticide use and made comparisons regarding cost and effectiveness when compared to chemical controls. I concluded with several recommendations regarding the effective control of spiders on campus.

At the present time, the main animal pests on campus are spiders, stinging insects, pigeons, and occasionally, moles. Spiders will be addressed as the main concern of this research project. Stinging insects, including bees and yellow jackets, frequent the campus during spring, summer and fall. While we recognize that these insects are beneficial as pollinators in the environment, they can also become a hazard to human safety if populations are permitted to grow unchecked, and if these populations are in the vicinity of students and faculty. For some, being stung might be an annoyance; for others, it can be life-threatening, causing severe allergic reaction or anaphylaxis. For this reason, Sprague Pest Solutions of Kennewick offered pesticide application for bee control. However, Jerry Massey, WSU Facility Operations Manager, will be using their alternate suggestion of baited plastic bee traps during the spring instead, which Sprague said would capture the queens scouting for nest locations. This should safely control the bee and yellow jacket population on campus with no negative impacts to the environment. Pigeons have been a problem on campus in the past, as they perched on roof lines and created a mess with their droppings down the sides of the buildings. They are no longer a significant problem since bird spikes were installed around the roof perimeter of the buildings. These spikes do not harm the pigeons but make it impossible for them to perch on the roof edges. However, smaller birds are now using the spikes as nest supports. Moles that occasionally infest the lawns

are caught in simple, humane traps and removed. All of these practices for dealing with stinging insects, pigeons, and moles are environmentally sound.

Spiders have caused a more complicated problem not only by coming into the buildings but also by creating extensive webbing mainly on the South and East sides of the campus buildings. Because the University is located near the Columbia River, there is a vast variety and large population of flying insects in the vicinity. These serve as an endless food supply for spiders, which look for corners where they can build their webs to trap the insects. The campus buildings with their windows and doorways provide numerous sheltered corners, which spiders prefer. The resultant webbing is aesthetically unpleasant to many, although the various species of spiders are harmless to humans. The only poisonous spider in the area is the black widow, but Sprague stated that the spiders creating webs on the buildings are harmless wolf spiders and other nontoxic varieties that come from the river area. Some of the spiders do enter the buildings and most students and faculty would find a large interior spider population objectionable, even if harmless. Therefore, the problem is mostly aesthetic.

The University recently contracted with Sprague Pest Control of Kennewick to apply pesticide to the East, West, and CIC buildings. To be effective, applications would need to occur three times per year, in spring, mid-summer, and fall, at an approximate cost of $600 per building, per application ($5,400 per year). Sprague recommends that the exterior of the buildings be pressure washed and all webbing that is washed off should be vacuumed up prior to each application to aid in the effectiveness of their program. It was recommended that insecticide be applied to the South and East faces of each building's exterior, from ground level to ten feet up the walls and around the windows. Two chemicals were originally recommended for application: Suspend SC and Tempo Ultra WP. These recommendations were made to Jerry

Massey by Rick DeVleming, sales agent from Sprague.

Suspend SC is manufactured by Aventis Environmental Science USA LP in Montvale, New Jersey. Its active ingredient is 4.75% deltamethrin. It is an odorless, white liquid concentrate that is diluted and sprayed on the exterior walls and windows. Deltamethrin is a synthetic pesticide called a pyrethroid. Its mode of action is to kill spiders and other insects on contact by paralyzing the nervous system (Extoxnet 1). It is harmful to humans if inhaled, and may cause transient tingling and reddening of the skin upon contact. It may cause slight irritation to the eyes upon exposure to the vapor or spray mist. These hazards are only applicable when the pesticide is being sprayed and while wet; it dries quickly and no longer poses any human health risks. It is recommended that Suspend SC not be applied to institutions when occupants are present. Suspend SC is not considered carcinogenic, teratogenic, or a reproductive toxin based on animal studies. NFPA regulations rate this product as a slight health risk (Aventis 1-3). The chemical breaks down in soil in about 2 weeks, and is rapidly adsorbed by sediment in water. After 10 days, no deltamethrin residues are found on plants where the chemical was sprayed (Extoxnet 3). My main concern for this product, besides human health risks, was the ecological information I found in the Material Safety Data Sheet. It states, “This product is extremely toxic to fresh water and estuarine fish and invertebrates.... Use with care when applying in areas adjacent to any body of water” (Aventis MSDS 4). With our campus’ proximity to the Columbia River, I felt this was a valid concern.

Tempo Ultra WP Insecticide Wettable Powder is manufactured by Bayer Corporation inn Kansas City, Missouri. Its active ingredient is 10% beta-Cyfluthrin. It also contains up to 7.5% crystalline silica as an inert (but hazardous) ingredient. It is a slightly aromatic, tan powder that is mixed with water and sprayed on exterior walls and windows. It is harmful to humans if

inhaled, and may cause skin and mucous membrane irritation, including itching, stinging, reddening or rash, on contact. Dust and spray mist should be avoided during mixing and application. Treated surfaces should be avoided until dry. According to the MSDS, “persons with a history of asthma, emphysema, or hyperreactive airway disease may be more susceptible to a response at low concentration. In addition, pulmonary and respiratory diseases may be aggravated by exposure to respirable crystalline silica” (Bayer 1). Beta-Cyfluthrin is not considered carcinogenic, but crystalline silica is classified as a Group 1 carcinogen by the International Agency for Research on Cancer (IARC), and as an Anticipated Human Carcinogen by the National Toxicology Program (NTP). Tempo Ultra WP is not considered mutagenic but there may be risks for developmental toxicity, reproductive toxicity, and neurotoxicity as shown in animal experiments. NFPA regulations rate this product as a moderate health risk. Besides human health risks, I was concerned with the environmental hazards listed in the MSDS, which states, “This product is toxic to fish... and should be kept out of streams, lakes and other aquatic habitats of concern.... Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas” (Bayer MSDS 4, and Label). As with Suspend SC, I feel this is a concern because of proximity to the Columbia River.

I contacted Rick DeVleming at Sprague Pest Solutions to ask about the possible toxic effects on salmon and other aquatic organisms in the Columbia River and to inquire about their possible mitigation measures to prevent contamination. Mr. DeVleming asked me what my research would be used for, and where it might be published. I told him it was simply a research project for an environmental class I was attending, and would not be published but perhaps presented to faculty involved in pesticide use. Mr. DeVleming seemed uncomfortable with my questions and seemed to be unaware of any toxicity or mitigation possibilities. He stated that he

really was not the most informed person to give me the information I requested, and referred me to the general manager, Jim Lovelace. I was unable to contact Mr. Lovelace for several weeks. Meanwhile, on April 15, Sprague applied pesticide to the campus buildings; however, there was a change of plans. Instead of applying both pesticides, they did not apply the Tempo Ultra WP; they only applied the Suspend SC. A note was sent out to faculty advising them to avoid the immediate area during spraying (although, I believe students were not informed). As a mitigation measure, the spraying would be delayed if the day was windy, to avoid unnecessary spread of the pesticide. When I spoke with Mr. Lovelace a few days later, he stated that toxicity to fish or river contamination was never a concern, nor was it a factor in deciding not to use the more toxic Tempo Ultra WP, since there is "an equal level of risk for all pesticides" (something I disagree with, especially after consulting MSDS's for several pesticides). He stated that the campus buildings are not "near water" because there is at least a 30 to 50 foot buffer zone. I asked why they had only applied Suspend SC instead of both pesticides as originally planned, and he stated that it was an "ease of use" issue, because Tempo Ultra WP is in powder form and more difficult to mix than Suspend SC, which is a liquid concentrate. He also stated that the reason for avoiding spraying during windy periods was "for worker safety" and not because of the proximity of the river.

Although only one pesticide was used, the cost for application remained the same ($1800). This included spraying the East, West, and CIC buildings from roof line to ground level on all sides. This was more chemical application than was previously planned (from ground level to ten feet up the walls, plus windows, on two sides of the buildings only). Sprague stated an expected effectiveness of 1 ½ -2 months for spider control for the application. Although a film formed on the windows when the pesticide dried, washing the windows would reduce the

efficiency of the pesticide and is not recommended. Therefore, we have traded the aesthetic issue of spider webs on the windows for one of chemical film-hazed panes. Jerry Massey plans to assess the effectiveness of this application, and if he is pleased with the results, may repeat the application in mid-summer and fall, as Sprague recommended. However, I will present some alternatives for spider control that may prove more effective, cost efficient, and environmentally sound than repeated chemical applications. Use of these alternatives would be consistent with Washington State University's mission of "Greening WSU" by taking one of the "initial steps toward sustainability at WSU," namely, to "use integrated pest management techniques to minimize or eliminate use of pesticides" (WSU 1).

There are several reasons to consider alternatives to chemical control of spiders. Chemical treatments may be harmful to humans and the environment. Long-term effects of low doses are risks that are difficult to measure. Also, many pesticides are no longer effective. Sheila Daar, an expert in least-toxic pest control, states that "as many as 500 species of the most common insect pests are now resistant to one or more widely used insecticides" (Jaret 42). Spiders, especially, are frequently more resistant to pesticides because of their ability to shut down their respiratory systems and avoid pesticide vapors and dusts (Haws 23). Because of this resistance, physical and other alternative measures are often more effective than chemical pesticides for spider control.

It is essential to realize that total elimination of spiders at WSU Tri-Cities is impossible and unrealistic. Instead, we can focus on population control and web removal. The main reason for our large spider population on campus is our proximity to the Columbia River. Large numbers and varieties of flying insects breed by the river and serve as an endless food source for spiders. One method of spider control is to decrease their food supply. An example sited in

"Tying Up the Spin Doctor" shows how effective this technique can be. A Florida office building was plagued with spiders on their exterior walls and windows because of its proximity to a storm water drainage containment pond, which was a breeding ground for flying insects. When the exterior light fixtures were changed to sodium vapor lamps, "the spider population crashed significantly because the available food supply dropped" (Hedges 2). This did not eliminate the spiders, but it had a significant impact. Sodium vapor lamps are not nearly as attractive to flying insects as normal exterior lighting; this may be one option for our campus in controlling its spider population.

A simple physical control for spiders is the removal of their webs. "Repeated disruption of spider homes and habitat prevents them from being able to nest and lay eggs" (Haws 23). Regular web removal also lessens the problem of aesthetically unpleasing webbing on the windows. Webs can be removed on a regular basis by pressure washing the buildings. This would need to be done before each pesticide application by Sprague anyway, so this measure does not increase costs or efforts toward spider control. It is essential that after each pressure washing, the fallen cobwebs and egg sacs around the buildings must be vacuumed up and discarded. Otherwise, the eggs will hatch and contribute to the resident spider population. Reducing or eliminating vegetation, leaf litter, and mulch around the building foundation is also recommended to decrease available spider cover (Hedges 3, 4).

If physical controls alone do not give satisfactory results, my next recommendation is to add a natural, nontoxic repellant. One such repellant is Cobweb Eliminator by Dr. T's Nature Products, Inc., in Pelham, Georgia. Its ingredients are water, natural soap, vinegar, capsaicin (hot pepper), coriander oil, and anise oil. It comes in a ready-to-use liquid which is sprayed on areas where spiders are a problem. Cobweb Eliminator works by breaking down the webs' attachment

points and leaving a residue that discourages web reformation. (Dr. T's 1, 2). It is 100% natural, FDA/USDA approved, and contains no hazardous substances. Respiratory protection is usually not needed, but inhalation may irritate the respiratory tract. The concentrate may cause skin irritation on contact. It is not considered a health risk or carcinogen and there is no expected ecological risk (Dr. T's MSDS 1). This product should be applied quarterly for best results. WSU may obtain this product at the most reasonable cost from The Biological Control Network by calling (800) 441-2847. A 55-gallon drum of Cobweb Eliminator costs $890.00 plus a shipping charge of $245.07. The product ships from Georgia, and if two drums were purchased the shipping cost would only increase by about 50% for a total cost of $2147.60. One drum of product would cover approximately 60,500 to 82,500 square feet and would not need to be applied to the entire exterior of the buildings. Application would be to problem areas only, such as window edges, so two drums may well be enough product for a year's worth of applications. This would provide a savings of $3252.40 annually over the cost of continuing to use Sprague's tri-annual application of Suspend SC. While Jerry Massey has expressed concern over the aesthetics of dust on the windows that an oil-based application may attract, I do not believe the dust would be worse than the pesticide film from the Suspend SC nor the original webbing. It does not need to be applied to the entire window pane, but only to the edges and corners. Cobweb Eliminator dries clear and will not stain, and perhaps its dust attraction will be minimal. I believe it deserves a trial over current chemical pesticide use.

Another nontoxic repellant alternative is EcoExempt IC by EcoSmart Technologies, Inc., of Franklin, Tennessee. Its ingredients are rosemary oil, oil of wintergreen, and mineral oil. It is a clear, colorless liquid with a minty scent. It comes as a concentrate to be mixed with water and sprayed on affected areas. It acts mainly as a repellant but also kills some spiders on contact. It is

100% natural and contains no hazardous substances. Respiratory protection is not required when used outdoors or in ventilated areas. Prolonged contact and overexposure may cause skin and mucous membrane irritation. EcoExempt IC is not considered carcinogenic and there are no expected health or ecological risks, but care should be taken not to contact aquatic life with the concentrate (Biocontrol Network MSDS 1, 2 and Label). This product should be applied to problem areas such as window edges and can also be used as a perimeter treatment around the building foundation to repel spiders. Quarterly application is recommended. EcoExempt IC can be purchased from the Biocontrol Network by calling (800) 441-2847. A case of four, one-gallon containers of concentrate costs $370 plus a shipping and insurance charge of $29.59, for a total cost of $399.59. One gallon of concentrate will make 16 to 32 gallons of spray for use in compressed air sprayers, providing 8,000 to 16,000 square feet of coverage per gallon on concentrate depending on dilution. Thus, a case of four, one-gallon containers of concentrate will provide up to 64,000 square feet of coverage. This is similar to the coverage for one drum of Cobweb Eliminator; if two cases of EcoExempt IC were needed per year, the total cost would be $799.18. This would provide a savings of $4600.82 annually over the cost of continuing to use Sprague's tri-annual application of Suspend SC. I believe this treatment is a safe, effective and cost efficient alternative that should be considered.

For spot treatment of interior and exterior spiders, I recommend that the cleaning and landscaping staff be equipped with spray bottles of nontoxic spider control spray. There are two simple ways to mix your own sprays; this would be easy and cost effective, and would only need to be mixed a few times per year. For immediate spider elimination, use a spray made from 5 tablespoons of any natural liquid soap, 5 tablespoons of citronella oil or Citra Solv cleaner, and 1 quart of water. This will kill spiders on contact but will not provide long-term repellence

(Forsyth 9). A second, but more expensive alternative is to use 1 ounce of Safe Solutions Enzyme Cleaner with Peppermint diluted in one quart of water. This is an all-natural and safe spray that kills spiders on contact and gives residual control for up to four weeks. It can be purchased on the Internet at http://www.safesolutionsinc.com. A third alternative is to mix one quart of straight 5% white distilled vinegar with a teaspoon of coconut oil. This very inexpensive spray can be used to help remove and prevent spider webs. It not only makes web cleanup easy, but also repels spiders and prevents them from rebuilding their webs (Tvedten 2). Cleaning and landscaping faculty can keep a spray bottle of the mixture with their supplies and spot treat spider webs inside and outside campus buildings as needed. This will help control spider populations and reduce the number of spiders inside campus buildings.

Pest control is an issue wherever nature and humans meet. On our campus in particular, there is a large population of spiders due to proximity to the river. There are several safe, nontoxic alternatives to chemical pesticide application that we can use to minimize webbing on the windows and to reduce the interior and exterior spider population. We can limit their food supply by switching to sodium vapor lighting, and disrupt their reproduction by regular pressure washing of building exteriors and vacuum removal of fallen webs and egg sacs. Natural repellants such as Cobweb Eliminator or EcoExempt IC would provide control that would likely rival or exceed that of Sprague's Suspend SC application, since deltamethrin only remains effective for 1 ½ - 2 months after exterior application. The cost of using natural controls is much less than what is currently being spent with Sprague. Easily mixed, safe sprays for janitorial and grounds keeping use for spot treatment of spiders would be an economical solution for interior spider control and exterior population reduction. Using these methods would essentially eliminate risks to human health and concerns about toxicity to fish and aquatic life that are

inherent in the use of commercial chemical pesticides, and would be consistent with WSU's mission of "greening the campus" by reducing or eliminating the use of chemical pesticides.

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