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Natural Indeed: Are Natural Insecticides Safer and Better Than Conventional Insecticides?

Plants growing in nature, to survive, produce a host of chemical-defensive compounds, often called allelochemicals, that ward off attack by potential herbivores (plant-feeding insects and mites). These compounds may be directly harmful to herbivores or modify (that is, slow down) their development, thus increasing their susceptibility to natural enemies such as parasitic wasps (= parasitoids) and/or predators. Humans have made use of these naturally derived compounds for many years, and a number of botanical insecticides have been formulated for use by professionals and homeowners. Botanical insecticides are processed in one of three ways: (1) preparations of the crude plant material, ground into a dust or powder; (2) extracts from plant resins, formulated into liquid concentrations; and (3) isolation of the pure chemicals obtained from plants by extraction or distillation.

There is a common misconception that natural or botanical insecticides are always safer than synthetically derived insecticides. Nothing could be further from the truth because a number of registered botanicals are toxic to fish, beneficial insects and mites, and mammals. This is based on the LD_{50}, a term used to describe the lethal dose required to kill 50% of the test animals (mainly mice and rabbits), expressed as milligrams (mg) of toxicant per kilogram (kg) of body weight. The lower the LD_{50}, the more toxic the compound is to humans. In fact, several botanical insecticides have a lower LD_{50} than the synthetically derived insecticides carbaryl (Sevin) and malathion (Table 1). Although naturally occurring insect toxins are extracted from plants, "natural" does not necessarily imply "safe" or "nontoxic." Bottom line: Natural compounds derived from plants are not inherently less toxic to humans than synthetically derived compounds.

In most cases, botanical insecticides are less toxic to humans than syntheticially derived insectides. There are a number of advantages and disadvantages when using botanical insecticides to manage plant-feeding insects and mites in landscapes and gardens.

Table 1. Ranking of botanical insecticides with each other and commonly used synthetically derived insecticides, based on their toxicity rating (oral LD_{50}).

Insecticide	Toxicity rating	Signal word
Nictotine	LD_{50} =50–60 mg/kg	Danger
Rotenone	LD_{50} = 60–1,500 mg/kg	Caution
Sevin*	LD_{50} = 850 mg/kg	Warning/Caution
Malathion*	LD_{50} = 885–2,800 mg/kg	Caution
Ryania	LD_{50} = 750–1,200 mg/kg	Caution
Pyrethrin	LD_{50} = 1,200–1,500 mg/kg	Caution
Linalool	LD_{50} = 2,440–3,180 mg/kg	Caution
Sabadilla	LD_{50} = 4,000–5,000 mg/kg	Caution
Limonene	LD_{50} = >5,000 mg/kg	Caution
Neem	LD_{50} = 13,000 mg/kg	Caution

*Commercially available, synthetically derived insecticides.

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The advantages of botanical insecticides include the following:

Rapid degradation. Botanical insecticides degrade rapidly under environmental conditions such as sunlight, humidity, and rainfall. This means that they are less persistent, which reduces their impact on beneficial and nontarget organisims.

Rapid action. Botanical insecticides kill insects quickly or stop insects from feeding almost immediately after application.

Low mammalian toxicity. Most botanical insecticides have a low mammalian toxicity (based on oral LD_{50}) and are generally nontoxic to humans, mammals, and honeybees.

Selective. Botanical insecticides are generally less harmful to beneficial insects and mites than synthetically derived insecticides—primarily due to their short residual activity.

Minimal impacts on plants. Most botanical insecticides are not harmful to plants (= less phytotoxic) when applied according to the label directions.

The disadvantages of botanical insecticides include

Rapid degradation. Rapid degradation of botanical insecticides, although favorable to the environment and human health, means that more frequent applications may be necessary.

Toxicity. Although considered less toxic than synthetically derived insecticides, several botanical insecticides, including nicotine and rotenone, are more toxic to humans and fish than a number of synthetically derived insecticides.

Costs and availability. Botanical insecticides are generally more expensive than synthetically derived insecticides, and many are not commercially available due to lack of sales and problems associated with providing consistent product.

Lack of efficacy data. Insufficient data exist on botanical insecticides, both in terms of effectiveness and chronic (long-term) toxicity.

Many botanical insecticides, particularly those containing pyrethrin, are formulated with a "synergist," a compound that increases the effective toxicity, preventing insects from "coming back to life" by inhibiting detoxification enzymes, such as mixed-function oxidases (MFOs) or by deactivating enzymes. This blocks the ability of insects and mites to break down the toxin. The synergist most commonly used is piperonyl butoxide, PBO.

The botanical insecticides that have primarily been or are commercially available include pyrethrin/pyrethrum, rotenone, sabadilla, ryania, nicotine, citrus oil extracts, and neem.

Prethrin/pyrethrum. Pyrethrin, or pyrethrum, is derived from the seeds or flowers of *Chrysanthemum cinerariaefolum*, which is grown in Africa, Ecuador, and Kenya. Pyrethrin has a low mammalian toxicity; however, cats are highly susceptible to pyrethrin poisoning. The LD_{50} of pyrethrin is 1,200 to 1,500 mg/kg. Pyrethrin is one of the oldest household insecticides still available and is fast acting, providing almost immediate "knockdown" of insects following an application. It works as both a contact and a stomach poison. The material has a very short residual activity—degrading rapidly under sunlight, air, and moisture, which means that frequent applications may be required. Pyrethrin can be used up until harvest, as there is no waiting interval required between initial application and harvest of food crops.

The way pyrethrin kills insects (mode of activity) is by disrupting the sodium and potassium ion-exchange process in insect nerves and interrupting the normal transmission of nerve impulses. Formulations of pyrethrin always contain a synergist such as PBO so that insects don't "come back to life." It is important to avoid mixing pyrethrin with lime or soapy solutions. Pyrethrin has activity on a wide range of insects and mites, including flies, fleas, aphids, thrips, mosquitoes, whiteflies, leafhoppers, caterpillars, mealybugs, beetles, lice, and spider mites.

Rotenone. The active compounds found in rotenone are derived from the roots of two plants: *Lonchocarpus* sp. and *Derris* sp. are both legumes originally from the East Indies, Malaya, and South America. Rotenone is one of the more acutely (short-term) toxic botanical insecticides, with an LD_{50} of 350 mg/kg. In fact, rotenone is more toxic than both carbaryl (Sevin) and malathion, two commonly used synthetically derived insecticides. Also, rotenone is extremely toxic to fish. This botanical insecticide works both as a contact and a stomach poison. Rotenone is slower acting than most botanical insecticides, taking several days to kill pests; however, pests stop feeding almost immediately. The material has a short residual activity, degrading rapidly in air and sunlight.

Rotenone is not toxic to honeybees and is safe to use on most plant material. The way the material kills insects is by inhibiting respiration, or the use of oxygen by body cells. This leads to a reduction in breathing and heart rates. Rotenone is active on many insect and mite pests, including leaf-feeding beetles (that is, Mexican bean beetle and Colorado potato beetle), caterpillars (that is, European corn borer and corn earworm), thrips, lice, mosquitoes, aphids, spider mites, ticks, fleas, flies, and fire ants.

Sabadilla. Sabadilla is derived from the seeds of the plant *Schoenocaulon officinale*, which is grown in Venezuela. Sabadilla is one of the least toxic registered botanical insecticides, with an LD_{50} of 5,000 mg/kg. However, it may have a sneeze-inducing effect when inhaled, as a result of irritating the mucous membranes. Also, sabadilla is toxic to honeybees. Sabadilla works as a contact and a stomach poison. Similar to the other botanical insecticides, the material has minimal residual activity, degrading rapidly in sunlight and moisture (rainfall).

Sabadilla works by affecting nerve cell membranes, causing loss of nerve function, paralysis, and death. The material is primarily effective on the group of insects called "true bugs," such as stink bugs, tarnished plant bugs, harlequin bugs, and squash bugs. However, it is also active on caterpillars, potato leafhopper, thrips, beetles, and flies. Sabadilla has no activity

on aphids or spider mites.

Ryania. The active components of ryania are derived from the roots and woody stems of the plant *Ryania speciosa*, native to Trinidad. Ryania has a low mammalian toxicity, with an LD_{50} of 750 mg/kg, and works as both a contact and a stomach poison. It has the longest residual activity of the botanical insecticides, providing up to 2 weeks of control following initial application.

This botanical insecticide has a unique mode of activity, as it works by preventing muscle contraction and disrupting insect muscle membranes. Ryania works best on caterpillars (that is, codling moth, imported cabbageworm, corn earworm); however, it also has activity on a wide range of insects and mites, including citrus thrips, beetles (that is, Colorado potato beetle, elm leaf beetle, flea beetle, Japanese beetle), lace bugs, whiteflies, squash bug, and aphids. Ryania has no activity on spider mites.

Nicotine. Nicotine, which is derived from *Nicotiana tabacum*, is the most toxic of the botanical insecticides, with an LD_{50} between 50 and 60 mg/kg. It is extremely harmful to humans. Nicotine, a fast-acting nerve toxin, works as a contact poison. It kills insects and mites (and humans) through bonding to receptors at the nerve synapses (junctures), causing uncontrolled nerve firing, and by mimicking acetylcholine (ACh) at the nerve–muscle junctions in the central nervous system.

Certain plant types, such as roses, may be harmed or injured by nicotine sprays. Nicotine is most effective on soft-bodied insects and mites, including aphids, thrips, leafhoppers, and spider mites. Many caterpillars are resistant to nicotine.

Citrus oil extracts. The compounds limonene and linalool are extracted from orange and other citrus fruit peels. The LD_{50} of these two compounds is between 4,000 and 5,000 mg/kg. Citrus oil extracts are contact poisons; however, they have very short residual properties. The mode of action is not well understood; however, it is thought that they may increase the spontaneous activity of the sensory nerves, causing massive overstimulation of motor nerves that leads to convulsions and paralysis. Both limonene and linalool are used in flea dips and shampoos. Also, they are active on lice, ticks, aphids, mites, fire ants, house flies, paper wasps, and crickets.

Neem. Neem is derived from the tree *Azadirachta indica*, grown in India and Africa. Neem has an extremely low mammalian toxicity and is least toxic of the botanical insecticides, with an LD_{50} of 13,000 mg/kg. Neem is considered a contact poison; however, it has "some" systemic activity in plants when applied to the foliage. The material is generally nontoxic to beneficial insects and mites. Neem has a very broad mode of activity, working as a feeding deterrent, insect-growth regulator, repellent, and sterilant; and it may also inhibit oviposition. The material is active on a broad range of insects, including aphids, whiteflies, mealybugs, thrips, Japanese beetle, and caterpillars.

Botanical insecticides have limited availability, but a number of them may be purchased from Gardens Alive (www.GardensAlive.com), Worms Way (www.wormsway.com), Peaceful Valley Farm Supply (www.groworganic.com), Charley's Greenhouse & Garden (www.charleysgreenhouse.com), and Gardeners Supply Company (www.gardeners.com). When applying any botanical insecticide, always be sure to wear protective equipment and clothing because, as this article has already discussed, a number of botanical insecticides may be harmful to humans. *(Raymond A. Cloyd)*

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2004 S.A.F.E. Fly-in

The Illinois Agricultural Aviation Association (IAAA) held an Operation S.A.F.E. fly-in from April 27 to 30. IAAA is the state chapter of the National Agricultural Aviation Association (NAAA), a professional organization representing the agricultural aviation industry. One of the major goals of both organizations is to promote safe and accurate aerial pesticide applications.

S.A.F.E. stands for Self-regulating Application and Flight Efficiency. The program offers aerial applicators an opportunity for a professional analysis of their aircraft's performance. Fly-ins are important in helping pilots set up their aircraft. At a fly-in, pilots bring their aircraft in to be evaluated. Specialized equipment is used to test and measure the spray pattern and the size of the spray droplets created by the aircraft. Analysts help the pilots evaluate the results of these tests and make adjustments on their aircraft to ensure safe and accurate applications. Educational programs are also offered during the event to keep the pilots up to date on the latest research and information about agricultural aircraft and aerial application.

Width and uniformity of the aircraft's spray pattern is tested using a string-analysis system. A special nontoxic dye is mixed with water in the aircraft's tank. The pilots then fly over a string laid out on a flight line, spraying as they would during a normal application. For each test series, an aircraft makes three passes over the string. It is then collected on reels and taken to the analysis center, where it is run through a fluorometer, which measures the amount of dye deposited. A software program records the data and is used to interpret the results. Two important pieces of information are gained from this analysis. First, the pilot can determine if the spray pattern is uniform.

Second, the swath width that will give the best uniformity across a field during an application is determined.

The size of the spray droplets made during an aerial application is measured using water-sensitive cards, a flatbed scanner, and highly specialized software. The water-sensitive cards are placed on the flight line in front of the string on the aircraft's third pass of a series. The cards are yellow but turn dark blue when they come in contact with water, so spray droplets from the aircraft leave blue spots where they deposit on the cards. The cards are then scanned, and the software program determines the size of the droplets that created the spots on the cards. The volume median diameter and the percentage of spray volume in 50-micron-droplet size classes are generated from the results. This information tells the pilot the size of the spray droplets being created during an application. Creating the required droplet size for an application is important for achieving pest control and reducing the risk of drift.

The reports generated are given to the pilot. An analyst can go over the results and answer questions the pilot might have about aircraft performance and setup. The analyst looks over the aircraft, and recommends changes to improve pattern uniformity and droplet size. After adjustments are made, the pilot can then fly another series over the string and cards to see if the adjustments produce the desired results. Technology used in agricultural aviation is constantly changing and improving. Fly-ins allow pilots to make sure new equipment is set up correctly and performing as it should.

This year's fly-in held at the Coles County Memorial Airport near Mattoon, co-sponsored by Syngenta and FMC. Over the course of 4 days, 16 aircraft from four states were tested and evaluated, making a combined total of 144 passes over the flight line. Dennis Gardisser of the University of Arkansas and Bob Wolf of Kansas State University conducted the workshop, offering expert advice to the pilots. When it was too windy to fly, they gave talks dealing with various aspects of aerial applications, focusing on spray-droplet deposition and drift control. I assisted and received on-the-job training. The fly-in was a success, and plans were started for the 2005 event. *(Scott Bretthauer)*

Always Wear Pesticide Protective Clothing

When working with pesticides, you are most likely to be poisoned dermally, through the skin. Proper clothing helps protect you when you are filling the sprayer or granular applicator and applying pesticide.

Clothing should be absorbent to keep pesticide drift or leaks from reaching your skin. Clothing with a high cotton content is not only absorbent but also cooler during warm weather. Layering clothing is also an effective means of protection. Underwear, including an undershirt or T-shirt of high cotton content, helps provide this layering effect under shirt and trousers. Wearing a coverall on top of these provides another layer of protection. Starching the clothes provides additional protection from pesticides. The starch actually absorbs the pesticide, keeping it from the skin. When the clothing is washed, the pesticide-containing starch washes away, reducing the amount of pesticide that stays in the clothing.

Spun-bonded polyester fabrics such as Tyvek and Kleengard are also protective and have the advantage of being disposable. Many companies provide clothes in these fabrics for employees to protect them, provide a uniform look, and avoid laundering tasks and equipment. Research has shown that washing spun-bonded polyester fabrics greatly reduces their protective ability. They are inexpensive enough to throw away once they become soiled.

Although it is important to protect most of your skin surface when applying pesticides by wearing a long-sleeved shirt, long pants, hat, shoes, and socks, remember to clean those articles of clothing soon after use. Cloth hats and hatbands can retain pesticide. When a contaminated hat is worn, pesticide comes in contact with the forehead and top of the head, which absorbs pesticide four times faster than the forearm. Be sure to launder hats along with your other pesticide-contaminated clothing.

Clothing contaminated with pesticide concentrates or highly toxic pesticides should be thrown away. Pesticide concentrates bind too tightly to the cloth fibers to be washed away effectively. Pesticide diluted with water separates from the cloth fibers much more effectively during washing and can easily be made clean enough to wear. Because even thoroughly washed clothes typically contain a small pesticide residue, even a small amount of highly toxic pesticide remaining in the clothing may constitute a hazard to the wearer.

Clothing contaminated with dilute pesticides can be laundered in a typical washing machine as a separate load. Use a hot-water wash and a cold-water rinse. Afterwards, to clean out the washer, run a complete cycle with hot water and detergent without clothes. If practical, line-dry the clothes rather than using a clothes dryer. The movement of fresh air and the exposure to ultraviolet light (sunlight) while the clothes are on the clothesline reduce the pesticide residue remaining on the clothes after washing.

Realize that leather or canvas (tennis) shoes also absorb pesticide readily. This can be a major source of pesticide exposure if you walk across treated areas, as is done in turf application. Rubber boots provide more protection if your work puts you in contact with treated surfaces. Shoes are also available with the lower part made of rubber for moisture protection but with leather or canvas upper areas to provide more ventilation and comfort. *(Phil Nixon)*

Supplemental Labeling

As you read various pest management newsletters, you'll inevitably come across discussions of various types of supplemental pesticide labeling. Sometimes a

pesticide company issues a bulletin or recommendation that slightly modifies (but does not contradict) an existing pesticide label. In other cases, a supplemental label may be issued that substantially expands the scope of an existing label. This article explains three types of supplemental labeling that merit your attention.

Section 2(ee) recommendation. Under Section 2(ee) of amended FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act), supplemental "labeling" is allowed as long as it is consistent with the registered and approved Section 3 label for the pesticide product. Section 2(ee) bulletins or recommendations allow pesticide companies to respond rapidly to a limited range of pest and application issues. Thus, the time-consuming process of amending the Section 3 label and intro-ducing it into the market can proceed without inconvenience to the applicator or pesticide company. FIFRA Section 2(ee) allows that a pesticide may be

- Applied at any dosage, concentration, or frequency less than that specified on the label (unless the label specifically prohibits such an application). *Note that a Section 2(ee) recommendation can NOT change the timing of the application, nor can it decrease the pre-harvest interval or the interval between applications.*
- Applied against any target pest not specified on the label (unless EPA has required that the pesticide may be used only for the specified pests). *Note that a Section 2(ee) recommendation can NOT add a crop/site or expand upon an existing crop/site.*
- Applied by any method not prohibited by the label (unless the label specifically states the pesticide may be applied only by the methods specified on the label). *Note that a Section 2(ee) recommendation can NOT add chemigation as a method of application.*
- Mixed with another pesticide or a fertilizer (if not prohibited by the label).

Section 24(c) registration. Amended FIFRA permits a state to provide registration for additional uses of federally registered pesticides for distribution and use within that state to meet "special local needs." Such registrations are referred to as state labels, special local needs, or 24(c) registrations and are considered as federal registrations that authorize distribution and use only within the granting state. Such registrations are subject to all provisions of FIFRA that apply to currently registered products, including cancellations, renewals, and suspensions.

A special local need is defined as a situation in which an appropriate, federally registered product is not sufficiently available for an existing or imminent pest problem within a state, as determined by the state lead agency (for example, Illinois Department of Agriculture, IDA), based on satisfactory supporting information. States are authorized to register a new product for any use, or an additional use of a federally registered pesticide product, if the following conditions exist:

- A special local need exists for its use within the state.
- The use is covered by necessary tolerances, exemptions, or other clearances under the Federal Food, Drug, and Cosmetic Act if the use is for food or feed use.
- Registration for the same use has not previously been denied, disapproved, suspended, or canceled by the USEPA administrator or voluntarily canceled due to health or environmental concerns about an ingredient contained in the pesticide product unless such denial, disapproval, suspension, or cancellation has been suspended by subsequent action of the USEPA.
- Registration would be in accord with the purposes of FIFRA.
- States may not register a new product that contains any active or inert ingredient not found in a federally registered product.

The IDA's Bureau of Environmental Programs is responsible for registering pesticides for special local needs in Illinois. Specific items or documents are requested to be included in each special local needs 24(c) packet sent to Illinois for consideration. Documentation requirements vary, based on the proposed changes to the label, and may include data on pesticide residue, metabolism, and environmental fate. If disapproved by the USEPA administrator, a registration issued by a state for special local needs shall not be effective for more than 90 days. If the registration is inconsistent with the Federal Food, Drug, and Cosmetic Act or constitutes an imminent hazard, the administrator may immediately disapprove the registration. Section 24(c) pesticide registrations are governed by Title 40 of the Code of Federal Regulations, Section 162 (http://cfr.law.cornell.edu/cfr/). For detailed information about this type of registration, see http://www.epa.gov/opprd001/24c.

Section 18 exemption. Amended FIFRA makes it illegal to use a pesticide for any reason unless it has been registered for that use or purpose. However, there are situations for which a registered pesticide is not available for a certain use. An outbreak of a previously minor pest may occur on a crop for which no registered pesticide is available. If the crop is a food crop and no tolerance exists on that crop, a state 24(c) label cannot be obtained. Amended FIFRA provides for emergency use of pesticides in these and similar situations. A state may obtain permission to use an unregistered pesticide in an emergency when a registered pesticide is not available to control the pest problem. FIFRA provides for four types of exemptions:

Specific exemption. When a pest outbreak has occurred or is about to occur and a registered pesticide for that use or purpose is not available, a request for an exemption to use a certain pesticide to control the outbreak may be made by the state lead agency (IDA). A specific exemption may be authorized to avert a significant economic loss or a significant risk to endangered/threatened species, beneficial organisms, or the environment. Information including the nature, scope, and frequency of the problem; the pest involved; which pesticide or pesticides will be used and in what amounts; the economic benefits anticipated; and an analysis of possible adverse effects must

be supplied. The USEPA grants the exemptions. Reports must be filed when the treatment is over. A specific exemption is good only for a specified amount of time and for a designated area.

Quarantine exemption. This exemption may be granted to prevent the introduction or spread of a foreign pest into or throughout the United States. The procedure for requesting this exemption is the same as for the specific exemption.

Public health exemption. A public health exemption may be authorized in an emergency condition to control a pest that will cause a significant risk to public health. The procedure for requesting this exemption is the same as for the specific exemption.

Crisis exemption. A crisis exemption may be used if a pesticide registered to control or eradicate the pest is not readily available and there is not time to request and get approval for a specific, quarantine, or public health exemption. However, the state must notify the USEPA at least 36 hours in advance of utilization of the crisis provisions to allow an expedited review of the proposed use. If concerns are noted, the USEPA confers with the state and may not allow a crisis to be de-clared. The duration of a crisis exemption is short (at most 15 days unless application for a specific, quarantine, or public health exemption has been submitted), and no pesticide that has been suspended or canceled may be used. Within 3 months following the last date of treat-ment, the state must file information with USEPA similar to that required for the specific exemption.

Section 18 pesticide registrations are governed by Title 40 of the Code of Federal Regulations, Section 166 (http://cfr.law.cornell.edu/cfr/). For detailed information about this type of registration, see http://www.epa.gov/opprd001/section18.

Final note. If you wish to use a pesticide as directed by a Section 24(c) or Section 18 supplemental label, you must have a copy of the supplemental label in your possession at the time of use. You can obtain these labels from your pesticide dealer or directly from the pesticide manufacturer. Remember that these labels specifically state where, how, and for how long the product may be used. *(Bruce Paulsrud. Source:* Illinois Pesticide Applicator Training Manual 39-13: Demonstration and Research, *University of Illinois Extension, 2001.)*

Pesticide Update

The following information provides registration status of particular pesticides and should not be considered as pesticide recommendations by University of Illinois Extension.

Agronomic

BACILLUS PUMILUS *GB-34–Gustafson* –Proposed to EPA for an exception from residue-tolerance requirements on all food commodities when used as a seed treatment and on soybeans when applied after harvest. The comment period expired 4-2-04. *(FR,* vol. 69, 3-3-04) [fungicide]

BAYTHROID 2 EMULSIFIABLE PYRETHROID INSECTICIDE–Bayer CropScience–A 2(ee) recommendation has been made for control of soybean aphid in soybeans. *(Source: IL Interagency Committee on Pesticides meeting, 3/12/04.)*

CHLORPYRIFOS 4E AG–Makhteshim Agan–A 2(ee) recommendation has been made for control of soybean aphid in soybeans. *(Source: IL Interagency Committee on Pesticides meeting, 3/12/04.)*

CONCUR (imidacloprid/metalaxyl)–Agriliance–A new seed treatment to be used on corn to control various insects and diseases.

CRUISER EXTREME PAK (thiamethoxam/azoxystrobin/fludioxonil/mefenoxam)–Syngenta–A new combination insecticide/fungicide seed treatment for use on corn.

DISCIPLINE 2EC (bifenthrin)–Amvac –The company has received registration for this new formulation for use on corn. [Insecticide]

Dual Magnum (S-metolachlor)–Syngenta Crop Protection–The special local need (Section 24(c)) request for the use of this herbicide on horseradish in Illinois has been approved. *(Source: e-mail from IL Dept. of Ag., 4/6/04.)*

EMPOWER (bifenthrin)–FMC–A new formulation for use on corn. [insecticide]

EXTREME (imazethapyr/glyphosate)–BASF–Added to their label the application on soybeans in the fall before the ground freezes. [Herbicide]

FOLICUR 3.6F (tebuconazole)–Bayer CropScience–USEPA has granted approval through a Section 18 for use on wheat to control Fusarium head blight. Approval is effective through May 31, 2004. *(Source: e-mail from IL Dept. of Ag., 4/22/04.)*

FOSPHITE (mono-dipotassium salts of phosphorous acid)–JH Biotech–Registration is pending to control Fusarium and Rhizoctonia diseases on numerous crops.

HORNET (flumetasulam/clopyralid)–Dow AgroSciences–Added to their label the postemergence use on corn with Callisto or Atrazine. [Herbicide]

LIBERTY (glufosinate)–Syngenta Crop Protection–A 2(ee) recommendation has been made for postemergence use following a full, labeled rate of Dual Magnum or Bicep Magnum brand herbicides applied at or before planting, for improved control of woolly cupgrass in LibertyLink corn. Callisto at 3 fl oz/A may be applied in tank mixture with Liberty for postemergence broadleaf weed control. *(Source: IL Interagency Committee on Pesticides meeting, 3/12/04.*

LIGHTNING (imazethapyr/imazapyr) –BASF–Label changes include the tank mix with Distinct and Callisto for use on corn. [herbicide]

RELDAN (chlorpyrifos-methyl)–Gustafson–The phaseout of this product to protect stored grain will be until 12-31-05 for the distribution channels to use up inventories. [insecticide]

OLYMPUS (propoxycarbazone)–Bayer Crop Science–Used on wheat as a postemergence treatment to control downy brome, cheatgrass, and wild oats.

OSPREY (mesosulfuron)–Bayer Crop Science–A new herbicide used as a post-

emergence treatment on wheat to control wild oats and annual ryegrass.

PRIORITY (carfentrazone-ethyl/halosulfuron-methyl)–Tenkoz–A new combination herbicide for use as a postemergence treatment on sorghum.

QUILT (azoxystrobin/propiconazole)–Syngenta–A new combination formulation being developed as a foliar treatment for use on wheat and rice. [Fungicide]

REGENT 4 SC (fipronil)–BASF–A 2(ee) Recommendation has been made for control of wireworm and seedcorn maggot on field corn. *(Source: IL Inter-agency Committee on Pesticides meeting, 3/12/04.)*

SCEPTER (imazaquin)–BASF–Approved for use on soybeans applied in fall in OH, IN, IL, MO, and KS. [herbicide]

TRIZMET (metolachlor/atrazine)–Drexel–A new formulation for use on corn. [herbicide]

WIDE MATCH M (fluroxypyr/clopyralid)–Dow AgroSciences–A new combination herbicide for use on wheat, barley, and oats that controls a wide spectrum of broadleaf weeds.

Fruit/Vegetable

APPLAUD (buprofezin)–Nichimo America Inc–Added to their label the control of mealybugs, leafhoppers, and scales.

ASANA (esfenvalerate)–DuPont–Added to their label the use on kiwi fruit. [insecticide]

CAPTEVATE 68WDG (captan/fenhexamid)–Arvesta–A new combination formulation for use in strawberries. [fungicide]

COURIER (buprofezin)–Nichimo America–Added to their label the use on snap beans. [insecticide]

DIAMOND (novaluron)–Uniroyal/Crompton–Registration is pending for use on potatoes, apples, pears. [insecticide]

FURADAN 4F (carbofuran)–FMC–Illinois Department of Agriculture recently approved a special local need request (section 24c) for use on cucurbits; to expire 12/31/06. (Source: e-mail, IDA, 5/24/04)

GUTHION (azinphos-methyl)–Bayer Crop Science–Added to their label the control of the raspberry crown borer.

HEADLINE (pyraclostrobin)–BASF–Registration pending for use on brassica leafy vegetables, sweet corn, leafy vegetables, peas, beans, and turnips. [fungicide]

IMPRESSION (Bacillus subtilis *QST 713)–Agra Quest*–A new biofungicide being developed for use on grapes and tomatoes.

MAXCEL (N6-benzyl adenine)–Valent Bio Sciences–A new plant-growth regulator to be used on apples and pistachios.

PERFORMANCE PAK (azoxystrobin/chlorothalonil)–Syngenta–A prepack that can be used on potatoes and cucurbits. [fungicide]

PREFAR (bensulide)–Gowan–Added to their label the use on cilantro. [herbicide]

PREVICUR FLEX (propamocarb hydrochloride)–Bayer Crop Science–Registration is pending for use on cucurbits, fruiting vegetables, lettuce, peppers, potatoes and tomatoes. [fungicide]

REASON (fenamidone)–Bayer Crop Science–Registration is expected sometime this year for this foliar fungicide for use on lettuce, tomatoes, cucurbits, onions, and potatoes.

SCALA (pyrimethanil)–Bayer Crop Science–Registration is pending for use on bulb vegetables, potatoes, strawberries, tomatoes, and other tuber and corm vegetables. [fungicide]

SPARTAN (sulfentrazone)–FMC–Registration is expected this spring in time for use on potatoes. [herbicide]

VEGETABLE PRO (prometryn)–Makhteshim–A new formulation for use on celery, fennel, parsley, dill, and pigeon peas. [herbicide]

VERDICON–This is the new name of the horticultural distribution company that recently combined United Horticultural Supply (UHP), UAP Timberland, and York Distributors.

VINTAGE (fenarimol)–Gowan–A new formulation used to control powdery mildew on grapes.

Turf/Ornamental

MERIT (imidacloprid)–Bayer Environmental Sciences–Added to their label the control of European crane flies in turf.

TALUS (buprofezin)–Nichimo America Inc–Added to their label the use in greenhouses and a decrease in the preharvest interval. [insecticide]

Structural

SERENE (cyromazine)–Triad Specialty Products–A new formulation to control flies on horses and their corrals and barns.

Many

APPLAUD (buprofezin)–Nichimo America –Added to their label the control of mealybugs, leaf hoppers, and scales.

DISUS (cyfluthrin/imidacloprid)–Olympic–A new formulation to control various insects on ornamentals, or nonbearing fruit and nut trees, and in field and container nurseries.

DIMETHOATE–Cheminova/Drexel/Gowan/Micro Flo–Due to high cost of reregistration, registration was cancelled on grapes, apples, head lettuce, spinach, raab, chard, broccoli, fennel, tomatillo, lespedeza, and trefoil, effective 1-28-04. Registrants are permitted to sell or distribute existing stock for 1 year after the effective date. *(FR,* vol. 69, 1-28-04) [insecticide]

ME-TOO-LACHLOR (metolachlor)–Drexel–A new formulation for use on corn, soybeans, cotton, peanuts, and vegetables. [herbicide]

OBERON (spiromesifen)–Bayer Crop Science–Registration is expected midyear for use on cotton, corn, cucurbits, tomatoes, peppers, cole crops, and strawberries. [insecticide]

PRISM (clethodim)–Valent–Added to their label the control of bentgrass and millets.

PROFUME (sulfuryl fluoride)–Dow AgroSciences–This new fumigant formulation has been registered for postharvest control of insects and rodents in cereal grains and dried fruit and nuts in processing plants, storage facilities, mills, and transportation vehicles.

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SONATA (Bacillus pumilus)–*Agra Quest* –Registration is pending to control downy and powdery mildew on numerous crops.

SWITCH (cyprodinil/fludioxonil)–Syngenta–Registration is pending for use on beans, leafy greens (except spinach), cucurbits, mustard, and yams. [fungicide]

TOUCHDOWN HI-TECH (glyphosate-potassium salt)–Syngenta–A new formulation that contains 5 pounds per gallon active ingredient. [herbicide]

UP CYDE (cypermethrin)–United Phosphorus–A new formulation for use on cotton, several vegetable crops. [insecticide]

VANGARD (cyprodinil)–Syngenta–Registration is pending for use on beans, leafy greens (except spinach). [fungicide]

Other

AGRA QUEST–The company under a license agreement with the University of Montana is developing three biofumigants based on *Muscador albus* as a replacement for methyl bromide: Arabesque is for postharvest crop application, Andante for greenhouse uses, and Glissade for soil treatment.

AMVAC–The company has entered into an agreement with Syngenta to supply Force 3G (tefluthrin) corn soil insecticide for use through Amva's Smartbox application system.

AQUAMASTER (glyphosate)–Monsanto –Added to their label the control of salvinia in aquatic sites.

BAYER CROPSCIENCE–This company purchased Crompton's share of the Gustafson seed-treatment business for $124 million, making them full owners of Gustafson's NAFTA business. (Press release at http://www.bayercropscience.com)

GOWAN–The company has purchased Monsanto's Trilliate (Fargo) herbicide business, which includes registrations and trademarks.

CERTIS USA–The company has taken over the marketing of the soil fumigant Basamid (dazomet) from BASF.

IMC GLOBAL–The company plans a merger with Cargill's fertilizer business, Cargill Crop Nutrition, to become the leading U.S. phosphate fertilizer company.

ISAGRO–This Italian agricultural chemical manufacturer plans to open a U.S. office based in San Francisco.

NIPPON SODA–This Japanese company has purchased the agrichemical business of Dainippon Ink & Chemicals (DIC). DIC will continue to own its production facility and manufacture products for Nippon Soda.

RENOVATE 3 (triclopyr)–Sepro Corp–A new product for the control of woody plants, broadleaf weeds, water lilies, etc., in ponds, lakes, and marshes.

SUMITOMO–The company is restructuring its agrochemical business. It is merging its subsidiaries Sumika-Takeda Agro Mfg. and the Scibu Kassi Co. into a new company called Sumika Agro Mfg. Corp.

(*Michelle Wiesbrook, unless otherwise noted, adapted from* Agricultural Chemical News, *April and May 2004.)*

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