PESTICIDE FREE CARE

Alternative Pest Treatment

This pamphlet will cover general information on pesticides, how to handle and dispose pesticides, environmental effects of pesticides, human health effects of pesticides, and other less harmful ways to treat common yard pests.

Avoid using synthetic chemical pesticides to maintain a healthy yard and better our environment.

General Information

Pesticides are chemical compounds used to kill, repel, or control unwanted organisms. They are typically used in farming but can also be applied in parks, home gardens and lawns, and a variety of other places.

POSITIVE Effects of Pesticides

- protect vegetation/crops from structural damage
- protect vegetation/crops from disease
- easy application/storage
- ensure vegetation/crops remain productive
- fast-acting agent

NEGATIVE Effects of Pesticides

- may kill/repel/control non-target organisms
- toxic chemicals can contaminate soil/water/vegetation/crops
- toxic chemicals can negatively affect human health
- organims develop pesticide resistence

COMMON Forms of Pesticides

In this pamphlet we will only be covering **herbicides** and **insecticides**.

Herbicide

A substance that is used to get rid of unwanted plants like **crabgrass** and **chickweed**.

Insecticide

A substance that is used to get rid of unwanted insects like **whiteflies** and **aphids**.

Rodenticide

A substance that is used to get rid of unwanted rodents like **rats** and **mice**.

Fungicide

A substance that is used to get rid of unwanted fungi like **mildew** and **mold**.

Bactericide

A substance that is used to get rid of unwanted bacteria like **E. coli** and **S. aureus**.

Algaecide

A substance that is used to get rid of unwanted algae like **black algae** and **mustard algae**.

Handling Pesticides SAFELY

If you must use pesticides, **please use them safely**.

Always **read the label and follow all provided directions**. Don't forget to also read and follow the **precautions** and **restrictions**.

Never use the pesticide product **for pests that aren't indicated** on the label or in the directions and **keep away from children and pets**.

Never use more of the pesticide product **than is indicated** on the label or directions. Don't think that **twice the amount will do twice the work**.

Always **use protective measures** when handling pesticide product as directed on the label. Wear impermeable gloves, long pants, and long sleeve shirts and always wash your hands after handling pesticides.

Never apply pesticide product on windy or rainy days to prevent pesticides from being carried away by runoff or wind and contaminating other areas.

If you are using a **commercial applicator** or **lawn care service**, discuss with them **potential risks** and **safety precasutions they should be taking**.

Disposing Pesticides SAFELY

After using pesticides, always **dispose of them safely**.

If you have **leftover or expired pesticide product**, they should be taken to a **local household hazardous waste (HHW) collection site** where it can be safely taken care of.

Never pour leftover or expired pesticide product into the **sink, toilet, sewer, or street drain**. If poured down any of these, the chemical compounds found in the pesticide can contaminate nearby bodies of water.

Never pour leftover or expired pesticide product onto **any area of land** that is not meant to receive the pesticide. If poured onto an area of land that is not meant to receive the pesticide, the chemical compounds found in the pesticide can contaminate the soil, groundwater reserves that feed into drinking water, and kill non-target organisms.

Never reuse a pesticide container. Pesticide containers should be **cleaned thoroughly** and **thrown into a household garbage**. Puncture of cut the pesticide container to ensure that is never reused.

If a **pesticide product has been banned**, both the **contents and container** should be brought to a **local household hazardous waste (HHW) collection site** where it to be safely taken care of.

TOXIC Chemical Compounds You Should Beware Of

These are not all the toxic chemical compounds that can be found, just the most **common**.

Glyphosate

Glyphosate is a widely used herbicide made to control broad-leaf weeds and invasive grasses. Glyphosate compounds have been used in the weedkiller brand Roundup. Glyphosate works by inhibiting certain enzymes in targeted weeds. These enzymes are crucial for the production of certain amino acids that are essential for plant growth and protein synthesis.

Atrazine

Atrazine is a widely used herbicide made to control broad-leaf weeds and invasive grasses. More than 75 million pounds of Atrazine are used in the US every year. Atrazine works by disrupting photosynthetic processes in targeted weeds.

Chlorpyrifos

Chlorpyrifos is a widely used herbicide made to control a large range of insects. Chlorpyrifos works by inhibiting a certain enzyme that is responsible for nerve signal transmission in targeted insects. When this enzyme is blocked it causes an overstimulation of nerve cells, ultimately leading to neurotoxicity.

TOXIC Chemical Compounds You Should Beware Of

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Pyrethroids

Pyrethroids are a widely used insecticide made to control a large range of insects. Synthetic pyrethroids mimic the characteristics of natural pyrethrins found in chrysanthemums. Pyrethroids work by binding to a specific area in the voltage-gated sodium channels of insect's nerve cells. This action prevents these channels from properly closing, causing a continuous inrush of sodium ions and excessive nerve firing, leading to the insects death.

Metolachlor

Metolachlor is a widely used herbicide made to control broadleaf weeds and invasive grasses. Metolachlor works by interfering with the formation of one fatty-acid chains in target plants. The formation of these fatty-acid chains are necessary for early plant development and growth.

Neonicotinoids

Neonicotinoids are a widely used insecticide made to control a large range of insects. Neonicotinoids affect not only pest insects, but also beneficial pollinators like bees and butterflies. Neonicotinoids work by binding to and overstimulating certain nerve receptors in targeted insects. This ultimately disrupts normal nerve cell functions and leads to uncontrollable actions, paralysis, and death in the insect.

ENVIRONMENTAL Effects

Persistence In Environment

Pesticides that we spray across our lawns, gardens, and farms contain large of amounts of toxic chemicals. Often without us noticing, these toxic chemicals greatly disrupt natural ecosystems, mainly because **these chemicals persist in the environment**. This means that the chemical does not breakdown and over time and will accumulate in living organisms, soil, and water. This phenomenon is known as bioaccumulation and biomagnification. Bioaccumulation is the buildup of absorbed chemicals in an organism over time. Biomagnification is the increase in concentration of these chemicals in each organism as you progress through the food chain.

Declining Soil Quality

Toxic chemicals found in pesticides **disrupt natural processes occurring in the soil** like **decomposition** and **nutrient cycling**. These processes are necessary in order to maintain healthy and fertile soil. Key microorganisms like bacteria, fungi, and earthworms living in the soil decompose organic matter which then stimulates nutrient cycling. However, when these essential microorganisms are killed or repelled by toxic chemicals found in pesticides, they are unable to decompose organic matter and trigger nutrient cycling.

HUMAN HEALTH Effects

Human Contact With Toxic Chemical Compounds

- leech into soil and accumulate in ground water aquifers
- runoff into nearby bodies of water
- chemical residue left on garden/farm produce and plants
- pesticide application

Glyphosate

Glyphosate can induce oxidative stress, mitochondrial dysfunction, neuroinflammation, and damage to normal nerve cell transmissions. In turn, this can all lead to cellular damage and alterations to the structure and function of our nervous system.

Pyrethroids

Pyrethroids can induce oxidative stress, neuroinflammation, DNA damage, reproductive health issues, and has been proven to cause adverse effects on the cardiovascular system.

Atrazine

Atrazine is an endocrine disruptor, meaning it interferes with our hormones which in turn regulate our body systems. Because atrazine is an endocrine disruptor it can cause reproductive dysfunction, behavioral abnormalities, impaired fetal growth, and birth defects.

Metolachlor

Metolachlor is classified as a Group C carcinogen and studies have shown that metolachlor may induce liver cancer.

Chlorpyrifos

When chlorpyrifos enters the body, our systems attempt to break it down, creating a toxic substance called chlorpyrifos oxon. Chlorpyrifos oxon permanently binds to enzymes that control messages between nerve cells. This inhibits our systems and cells from properly functioning.

Neonicotinoids

Neonicotinoids can have similar and more severe effects of nicotine. Neonicotinoids alter the density of certain neuroreceptors, in turn inducing an increased risk of nervous system disorders. Neonicotinoids also cause adverse effects on reproductive health.

Integrated Pest Management

PHASE 1: Prevent

There are various preventative measures you can take in order to ensure that your lawns, gardens, and farms are not overrun by pests.

PHASE 2: Monitor

Make sure to consistently monitor your lawns, gardens, and farms to check for signs of pest infiltration. Check your plants, produce, and soil.

PHASE 3: Intervene

If you do realize that you have a pest issue, make sure to intervene right away using effective and environmentally friendly methods.

Integrated Pest Management MONITOR

If you consistently notice any of the following issues, **please do further research** based on the issue at hand and the plants/produce affected in order to **take proper action**. Some of these issues listed are subject to many causes so please be mindful about jumping to conclusions and take the time to thouroghly look into the problem. These signs are simply potential indicators.

Structural Damage

- Skeletonized Leaves
- Consistent Holes
- Damaged Produce
- Damaged Roots
- Suspicious Bite Marks
- Bitten Leaf Edges

Foregin Substances

- Suspicious Larvae
- Suspicious Eggs
- Unusual Seed Heads
- Unusual Soil Mounds
- Moldly Residue
- Sticky Residue

Wilting/Discoloration

- Discolored Spots
- Curled Leaf Edges
- Unusual Leaf Wrinkling
- Consistent Wilting
- Yellow/Brown Patches
- Yellow/White Speckles

Integrated Pest Management PREVENT

Pests are fairly simple organisms and are therefore only able to consume and digest other simple substances. By making the plants in your lawns, gardens, and farms and these environments more complex, pests will be less attracted and able to destroy and consume our plants and produce. Though this may sound difficult, all you need is a few adjustments to your lawns, gardens, and farms and you can create a more complex environment that is better able to ward off pests by itself.

Marigolds

Marigolds are extremely beneficial to plant in your lawns, gardens, and farms. Firstly, the strong scent of marigolds repels insect pests. Secondly, marigolds bright color and nectar attracts beneficial pollinators into the environment like bees and butterflies. Thirdly, marigolds attract biological predators , like parasitic wasps that feed on and kill insects pests. Lastly, marigolds can help improve soil health thanks to their ability to repel harmful soil nematodes.

Beneficial Compost

Applying compost to soil in your lawns, gardens, and farms, has numerous beneficial impacts. The organic matter found in compost enriches soil with an abundance of essential micro- and macro-nutrients and promotes communities of beneficial microorganisms that help with nutrient cycling and disease suppression within in the soil. Because these nutrients are also slow-released from the organic matter found in the compost, the nutrients are also less prone to runoff. Composting also helps improve soil structure by increasing the porosity and lowering the density of soil. This in turn allows for a better flow and retention of water and nutrients in the soil.

Integrated Pest Management PREVENT

Chrysanthemums

Similar to marigolds, chrysanthemums are extremely beneficial to plant in your lawns gardens, and farms. Firstly, due to the pyrethrin content in chrysanthemums, chrysanthemums have the ability to repel insect pests. Pyrethrin is a naturally occurring pesticide that deters and wide variety of insect pests. Secondly, chrysanthemum's bright color and nectar attracts beneficial pollinators into the environment like bees and butterflies.

Cover Crops

Cover crops are small non-harvestable plants that can be planted in open spaces in your lawns, garden, and farms or in places where crops would reside during off-seasons. Cover crops have many benefits, the first being that they prevent soil erosion from wind and water. Cover crops are planted in areas with bare soil and by being there, the roots systems of the cover crops hold the soil in place. Cover crops also manage the spread of weeds by occupying open areas in your lawns, gardens, and farms that may have otherwise been exposed and vulnerable to weed growth. Lastly, cover crops also better nutrient content and retention in soil because cover crops have the ability to fix certain nutrients from the air and absorb and retain nutrients from water and soil.

Companion Planting

Companion planting is a powerful method to strengthen plants in your lawns, gardens, and farms. Companion planting involves strategically planting certain plants next to each other in order to enhance their growth or naturally deter pests. Plant roses next to garlic because the garlic's strong scent helps repel insect pests and enhances the intensity of rose's fragrance. Plant carrots next to onions because the onions strong scent helps repel carrot flies while the carrot's root system helps breakup the soil for the onions, improving the onions growth. Plant tomatoes next to basil because the basil's strong scent helps repel insect pests while and enhances the tomatoes flavor.

Integrated Pest Management INTERVENE

STEP 1: **Physical Barrier**

Physical barriers are the first measure you should take when you notice pests in your lawns, gardens, and farms. Physical barriers are an alternate way to prevent pests from impeding plant growth and destroying plant structure. This method involves constructing physical structures that are able to ward off and stop pests from damaging your plants.

Fencing

Fences can be built and placed around plants and produce we want to protect. Make sure to build a type of fence that is catered to keep out the type of pest you are looking to protect your plants and produce from.

Row Covers

Row covers are a lightweight and semi-transparent mesh sheet you can place over and around plants and produce to protect them from all kinds of pests while ensuring that they still recieve water and sunlight.

Wire Cages

Wire cages can be placed around plants and produce that are susceptible to being harmed by larger pests. Additionally, wire cages can act as support for vining plants.

Integrated Pest Management INTERVENE

STEP 1: **Physical Barrier**

Soil Toppers

Soil toppers like wood-chips, gravel, straw, or mulch can be laid over soil to prevent pests from reaching and damaging the roots of our plants and produce as well as preventing foreign seeds from entering the soil.

Sticky Traps

Sticky traps placed around our plants and produce can capture insect pests in a non-toxic adhesive. The bright colors of the sticky traps attract the insects to its surface and the sticky glue traps the pests.

Copper Tape

Copper tape, typically placed around the bottom edge of garden boxes, can deter slug and snail pests. This tape carries a natural electrical charge that causes an unpleasant electrical shock in these pests, deterring them.

Plant Collars

Plant collars placed around the stems and the beginning root areas of our plants and produce create a physical barrier that prevents pests from damaging these key regions.

Integrated Pest Management INTERVENE

STEP 2: **Biological Barrier**

If physical barriers are unable to ward off the pests plaguing your lawns, gardens, and farms, the next step is to utilize biological barriers. Organisms have natural predators, parasitoids, and pathogens. By identifying a pest's natural predator, parasitoid, or pathogen and introducing any of these biological weapons into the environment, you can take advantage of these natural enemies as an agent to get rid of your pests.

Parasitic Wasps

Parasitic wasps lay eggs inside their hosts, and as the larvae develop, they feed off of and kill them. Parasitic wasps kill aphids, carpenter worms, elm leaf beetles, glassy-winged sharpshooters, lace bugs, mealybugs, psyllids, scales, thrips, weevils, and whiteflies.

Parasitic Flies

Parasitic flies lay eggs inside their hosts, and as the larvae develop, they feed off of and kill them. Parasitic flies kill caterpillars, cottony cushion scales, elm leaf beetles, slugs, and snails.

Bacillus Thuringiensis

Bacillus thuringiensis produces a certain protein toxic to many insects, effectively killing them. Bacillus thuringiensis kills caterpillars and mosquitos.

Predatory Mites

Predatory mites are insect predators. Predatory mites feed on and kill scales, spider mites, and thrips.

Integrated Pest Management INTERVENE

STEP 2: **Biological Barrier**

Lady Beetles

Lady beetles are insect predators. Lady beetles feed on and kill aphids, lace bugs, mealybugs, psyllids, scales, spider mites,, and whiteflies.

Soldier Beetles

Soldier beetles are insect predators. Soldier beetles feed on and kill aphids and caterpillars.

Green Lacewings

Green lacewings are insect predators. Green lacewings feed on and kill aphids, caterpillars, glassy-winged sharpshooter, lace wings, mealybugs, psyllids, scales, spider mites, thrips, and whiteflies.

Syrphid Flies

Syrphid flies are insect predators. Syrphid flies feed on and kill aphids, mealybugs, scales, and thrips.

Minute Pirate Bugs

Minute pirate bugs are insect predators. Minute pirate bugs feed on and kill lace bugs, psyllids, spider mites, thrips, and whiteflies.

Beneficial Nematodes

Beneficial nematodes enter a hosts body and release a bacteria that effectively kills the hosts. The nematode then feeds on the dead host. Beneficial nematodes kill carpenter worms and weevils.

Integrated Pest Management INTERVENE

STEP 3: **Chemical Barrier**

Chemical barriers are a last resort due to the underlying conseuqnces of using chemical compounds to combat pests. If using chemical compounds is needed, they should be applied strategically and in small, concentrated doses. The chemicals used should be targeted towards the specific pests causing issues and should be placed in deliberate places in the environment and at deliberate times that have the greatest possibility of affecting the pests. In order to protect other organisms, as well as air, water, and soil health, the selective chemical compounds should be placed in bait stations or spot-sprayed.

!!WARNING!!

CHEMICAL COMPOUNDS ARE, ONCE AGAIN, A LAST RESORT AND SHOULD BE USED CAREFULLY. THOUGH THE SUGGESTED CHEMICAL COMPOUNDS BELOW ARE LESS TOXIC, MAKE SURE TO STILL WEAR PROTECTIVE GEAR AND APPLY THE COMPOUNDS IN THE CORRECT TARGET AREAS. ANY AND ALL CHEMICAL COMPOUNDS SHOULD NEVER BE USED EXCESSIVELY AND CARELESSLY.

Abamectin

Abamectin kills a variety of target pests and works by stimulating an excessive release of a certain neurotransmitter, thereby overstimulating the nervous system and eventually causing paralysis and death. Abamectin is accepted into the IPM program because it has shown low toxicity to non-target beneficial arthropods, does not persist or accumulate in the environment, and was found to be readily degraded by soil microorganisms, sunlight, and water. There is therefore no residue left on crops or in soil, making it unlikely for humans to come into contact with the compounds. Abamectin should be carefully applied to plant leaves, especially their undersides, and stems.

Integrated Pest Management INTERVENE

STEP 3: **Chemical Barrier**

IGRs

IGR compounds work by mimicking the actions of specific hormones and can therefore disrupt typical insect molting and growth processes. Though IGRs do not directly kill pests, they interfere with insect development and can later inhibit the insect from carrying out typical functions which can eventually then lead to its death. IGRs are often used in the IPM program because while they are lethal to immature insect they have low toxicity when it comes to other mammals. It is most beneficial and safe for non-target insects to apply IGR compounds to areas where the pest's larvae or eggs are located.

Pyrethrins

Pyrethrins are a group of naturally occurring compounds that come from chrysanthemum flowers. Pyrethrins work to effectively kill pests by targeting sodium channels in insect nerve cells thereby eventually causing the paralysis and death of the insect. Pyrethrins are often used in the IPM program because they are quick acting, do not persist or accumulate in the environment, and can be readily degraded by soil microorganisms, sunlight, and water. There is therefore no residue left on crops or in soil, making it unlikely for humans to come into contact with the compounds. Pyrethrins should be carefully applied to plant leaves, especially their undersides, and stems.

Neem Oil

Neem oil is a naturally derived pesticide that effectively kills pests three ways. The first is through neem oil's main active ingredient, azadirachtin, which interferes with insect hormone systems and makes it more difficult for insects to grow and lay eggs. The second is by suffocation which occurs when the neem oil coats the insects bodies and blocks their breathing pores. The third is repellency which occurs because the strong odor of neem oil deters insects from feeding on treated plants. Neem oil is accepted in the IPM program because it can be readily degraded by soil microorganisms, sunlight, and water, and can encourage an increase in earthworm activity. Neem oil should be carefully applied to plant leaves, especially their undersides, and stems.