Integrated Pest Management

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UC Davis Defines IPM as:

"Integrated pest management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment."

Section 1: Foliar Recipes (Use one recipe once per week)

How to mix AGSIL16H for use in the recipes below:

I use an old Protekt bottle and add 140 Grams of Agsil16H and 32 Ounces of water then shake like crazy. This bottle will now sit on the shelf and be used for the preparations below.

If you want to make 1 Liter or 1 Gallon at a time then follow these mixing amounts.

Mixing Recipe For 7.8%

780:1
148g / L
560g / Gallon

WEAR A MASK WHEN SPRAYING ESSENTIAL OILS!!!!!!

Foliar:

Foliar Recipe #1: Neem Oil + Agsil16H 7.8% + Aloe Vera + Essential Oils (Use During Lights Out Only)

This is the go to IPM foliar spray for weekly use, but variations of this recipe can be used and will be listed below without all of the detailed explanations. If you are worried about all the recipes, then just use this one and you'll be fine.

1 Gallon Clean Water (You can also use Botanical Tea for the water)
1 Tablespoon Neem Oil (Use Ahimsa Neem @ BuildASoil.com)
1-2 Teaspoons 7.8% Potassium Silicate Solution
½ - 1 Ounce of Essential Oils (Use different combinations and different oils each week)
1/4 Cup Pure Aloe Vera Juice (If using 200x Aloe Powder from BuildASoil.com add 1/8 Teaspoon per gallon)

Oils for for IPM Use: Rosemary, Eucalyptus, Ginger, Lemongrass, Thyme, Clove, Cinnamon, Peppermint etc.

Directions for mixing:

The key is to get the Neem Oil Properly emulsified so that it sprays evenly or else this spray won't be nearly as effective.
Use warm water but not hot. (75-85 degrees)
I like to add 1 cup of the gallon of water into a Protein Shaker cup with the round wire whisk ball for mixing but you can use a whisk and a regular cup, a blender or whatever you have on hand.

To this 1 cup of water I add my Aloe Vera Juice or powder and let sit until clear.

Then emulsify 1 Tablespoon of Neem oil using 1-2 teaspoons of 7.8% Potassium Silicate solution into the shaker cup with the warm water and Aloe Juice.

Add the emulsified neem/silica/aloe solution to the other 15 cups of water to make your full gallon of spray.

Add the essential oils of your choice and stir vigorously to keep the oil emulsified.

Spray the plant down using a sprayer with a wand like a Chapin model 1949. This type of sprayer will allow you to effectively coat your entire plant from bottom to top. Use the wand and work your way from the bottom to the top spraying the underside of every leaf and once done turn the wand over and spray the top of every leaf, completely saturating the canopy until the plant is weeping and ready to fall over from the weight of the foliar spray.

Make Sure to spray this just before or just after lights off as the neem oil and the essential oils will burn your plants if sprayed with lights on. Essential oils are especially reactive to light so be sure to spray at lights out… and not just a couple hours before lights on.

Foliar Recipe #2: Neem + Agsil16H + Aloe

1 Gallon Clean Water

1 Tablespoon Neem Oil

2 Teaspoons Agsil16H 7.8% Solution of ProTekt

Just like it sounds, you can use the same spray as above but without the essential oils and still have a very good spray.

Foliar Recipe #3: Agsil16H + Essential Oils

1 Gallon Clean Water

.5 – 1 Ounce of Essential Oils

1-2 Teaspoons Agsil16H

Foliar Recipe #4: Dr. Bronners Style Soap + Essential Oils

1 Gallon Clean Water

1 Ounce of Dr. Bronners Plain Soap

.5 – 1 Ounce of Essential Oils (Use half this amount if using a scented soap like peppermint or lavender)

Foliar Recipe #5: Neem Cake and Kelp Meal

1 Gallon water

2 tsp. of kelp meal and bubble/aerate for 24 hours.

Then add 1/2 cup of neem seed meal (aka neem seed cake) and aerate for another 24 hours.

Strain and then spray the plants.

Botanical Tea Recipe for use in place of water in the above recipes:

"*I also make fresh teas using different plant leaves - lavender, spearmint, peppermint, oregano, thyme, borage, comfrey and my new favorite, yarrow. In fact when I spray with neem oil rather than mixing with plain water I use a botanical tea in its place" - ClackamasCoots*

Take a couple cups of fresh leaves, chop, puree or grind to a pulp and add to 4-5 gallons of water and let it sit for up to 2-3 days. Stir occasionally or bubble with an airstone. Strain and use for foliar with IPM recipes or use as a soil drench.

Use the spent material and cycle through your compost or worm bin so as not to waste.

Gil Carandang's Recipe for Garlic + Ginger… also add hot peppers.

This is an awesome product for plants and animals. It boosts the immune system and helps fight insect and fungal pests. Ginger-Garlic is a common and very useful variation so I'm discussing it here, but you can use any combination of plants for whatever effect you are going for.

How to Make:

Ginger and Garlic are quite difficult to ferment, or extract active ingredients from. By adding fermented liquid already like beer or wine, the active ingredients in Ginger and Garlic are more easily fermented. Then we add sugar. Remember, sugar gives the microbes energy to continue fermentation. After letting this sit for a week or so, you arrest fermentation and enhance potency by adding a strong alcohol.

Here's how to make:

Get an equal amount of Ginger and Garlic, but keep them separate. As a rule of thumb, we try to ferment each material separately as you do not know if there is interaction when mixed. Once materials are fermented they are much more stable and compatible.

Put in container and fill with beer or wine until it is covered. Leave for 12-24hrs.

Add 1/3 sugar(crude sugar is best). E.g. if you have 1L worth of ginger-garlic soaking in beer/wine, you would add 1/3kg sugar.

Ferment this for 7-10 days. Longer the better.

After that time, add alcohol to arrest the fermentation process. Use at least 40%, or 80 proof.

Leave this mixture for 10 days. This allows the extraction process to take place, where the beneficial ingredients of the ginger/garlic are extracted with the alcohol.

After 10 days drain the fluid from this concoction.

You separated the ingredients in Step 1 and fermented them separately. Now that they are fermented you can mix them to make ginger-garlic extract!

TIP: Potency depends on the part of the plant you use. Generally, seeds have the greatest potency, then fruit, leaf, roots, and stems in that order.

How to Use:

Add 1tbsp per gallon of water.

Plants

Treat fungal problems of plants (Sulphur from Garlic is good fungicide)

Use as insecticide (add chili to fermentation to make it hot)

Ginger is good natural antibiotic/preventative medicine for plants

This extract has a myriad of uses in both plants and humans. Feel free to modify the recipe, adding plants as you see fit – chili, neem fruit, curry fruit, marigold for potency, etc. We look at the fermented extracts as food, food supplement to plants, animals and humans. They are simple food, more concentrated nutrients. You can ferment anything except poisons. The formulations may vary widely, simply mix and match as you see fit. Just experiment!

Section 2: Root Drench Recipes for IPM

Weekly Recipe for Increased Plant Health that is just as important as the IPM sprays:

Recipe #1
Per 5 Gallon bucket with 4 gallons of water:
1 Cup Malted Barley Seed (Pilsner Malt)
1/2 Dose of Ful Power Liquid Fulvic Acid from Bio Ag

Add the 1 cup Malted barley seed to your coffee grinder or food processor and grind to a fine powder.

Add this to one gallon of water and bubble for 12-24 hours and no longer.

Strain the gallon of Barley Enzyme tea that you just bubbled into your bucket of clean water and then add the half dose of Ful-Power and use this solution immediately.

Recipe #2
Per Gallon of Clean Water add 1/4 cup Pure Aloe Vera Juice and water your plants.

Recipe #3
Per Gallon of Clean Water add 1/4 cup Pure Young Coconut Water and water your plants.

Recipe #4
Bubble 1/2 cup of Kelp Meal per 4-5 gallons of water in a bucket for 24 Hours and use once per week.

If watering 4 times per week then use Recipe 1,2,3,4 and then repeat.

If watering more than 4 times per week, space out the above solution recipes and use plain water in between.

Below is an excerpt that ClackamasCoot shared in the past:

Maybe sharing different approaches will be helpful for everyone, i.e. taking a different look at making the best use of the materials you have to work with.

Neem (or Karanja) products are at the center of my IPM program. Neem meal (aka cake) is used in the soil mix and I also use it to make a tea in conjunction with kelp meal. As a bio-nutrient accumulator, neem meal is on par with the heavies like alfalfa, kelp, comfrey, borage, stinging nettles, etc. and what distinguishes one from another are the unique compounds that they create. Only brown kelp species create Alginic acid & Mannitol. Alfalfa creates Triacontanol but Comfrey does not and so on and so on.

Neem creates over 360 compounds of which around 30 function as a pesticide and/or fungicide. So with this one material I have two problems covered. Another compound that we want to see in our soil is an enzyme called Chitinase (Pronounced Kite-In-A's) Many organisms create this enzyme including bacteria. The reason that we add crab meal is for the Chitin (Kite-In) As bacteria degrade this polysaccharide this enzyme is created and it's this enzyme that gives us the pesticide benefit - not the Chitin directly.

Well, in my studies I learned that sprouted seeds release this enzyme that was encoded by the parent plant. So besides the enzymes that enhance the resin levels, the enzymes teas play a role as a growth regulator by degrading the eggs preventing the larva from maturing.

I also top-dress the containers with a mix of chopped leaves with vermicompost. Plants that I've used successfully include comfrey, borage, peppermint, spearmint, oregano, rosemary, thyme, stinging nettles and always a bit of neem meal. Having that layer prevents a number of problems as far as insects & equally important the powdery mildew curse in the PNW.

I also make fresh teas using different plant leaves - lavender, spearmint, peppermint, oregano, thyme, borage, comfrey and my new favorite, yarrow. In fact when I spray with neem oil rather than mixing with plain water I use a botanical tea in its place. Some of the compounds in these leaves will kill on contact whereas neem oil does not. It works in a completely different way so by using botanical teas as the base you're getting a double whammy against the invaders.

Besides spraying above the soil I also lightly mist the top of the soil with any combination that I mentioned.
Powdery Mildew free since 2009 and as close as you can get to being free of Spider Mites in the PNW for over 2 years. The results speaks for itself.
CC

Section 3: Explaining Why These Recipes Work

1. **Neem Oil: Use Pure Cold Pressed From India with highest counts of active properties**
   Neem oil is much more than just Azadirachtin like many of the insect spray companies want you to believe. Just look at the chemical constituents of Neem Fruits/Seeds/Oil

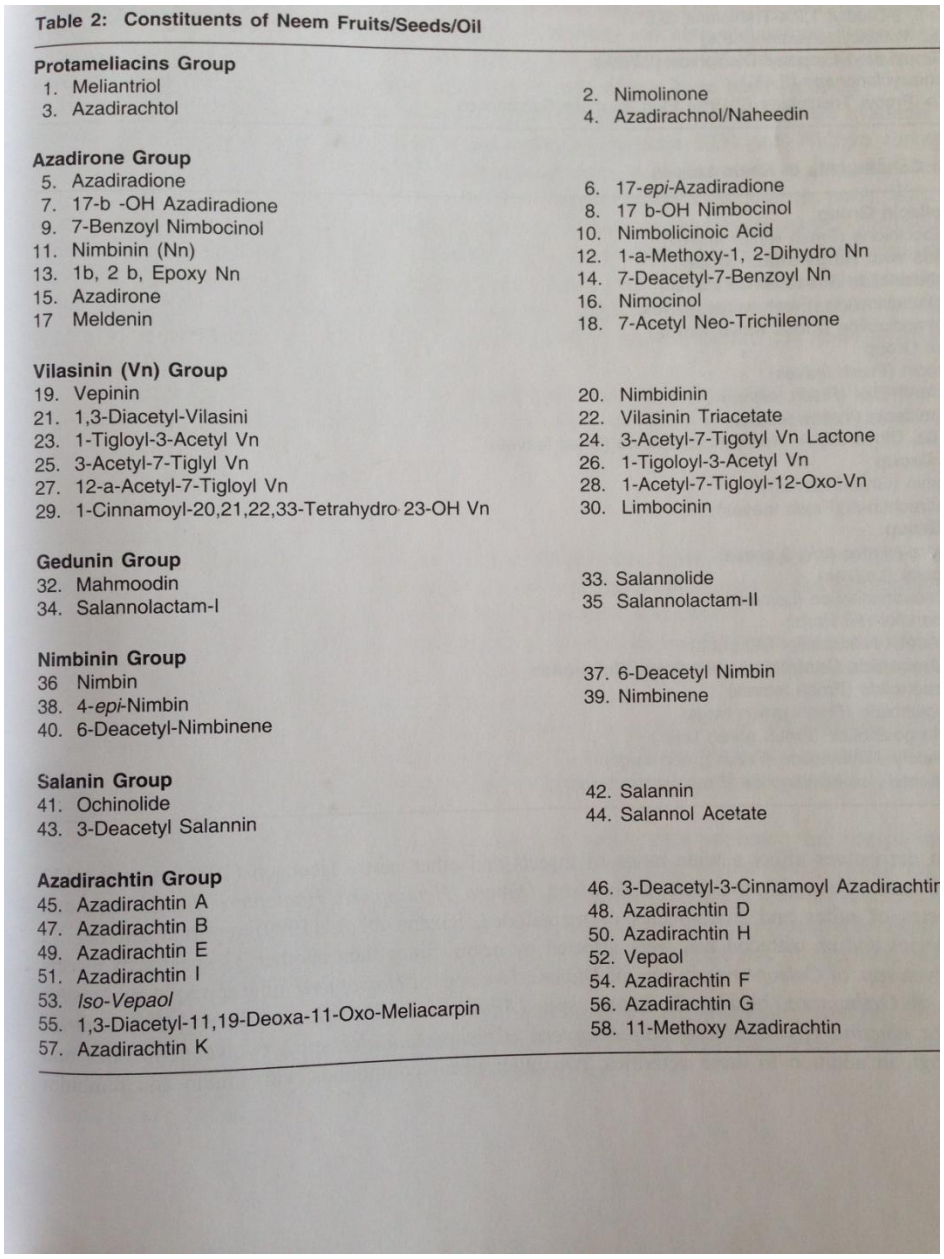

Table 2: Constituents of Neem Fruits/Seeds/Oil

Protameliacins Group	
1. Meliantriol	2. Nimolinone
3. Azadirachtol	4. Azadirachnol/Naheedin
Azadirone Group	
5. Azadiradione	6. 17-*epi*-Azadiradione
7. 17-b -OH Azadiradione	8. 17 b-OH Nimbocinol
9. 7-Benzoyl Nimbocinol	10. Nimbolicinoic Acid
11. Nimbinin (Nn)	12. 1-a-Methoxy-1, 2-Dihydro Nn
13. 1b, 2 b, Epoxy Nn	14. 7-Deacetyl-7-Benzoyl Nn
15. Azadirone	16. Nimocinol
17 Meldenin	18. 7-Acetyl Neo-Trichilenone
Vilasinin (Vn) Group	
19. Vepinin	20. Nimbidinin
21. 1,3-Diacetyl-Vilasini	22. Vilasinin Triacetate
23. 1-Tigloyl-3-Acetyl Vn	24. 3-Acetyl-7-Tigotyl Vn Lactone
25. 3-Acetyl-7-Tiglyl Vn	26. 1-Tigoloyl-3-Acetyl Vn
27. 12-a-Acetyl-7-Tigloyl Vn	28. 1-Acetyl-7-Tigloyl-12-Oxo-Vn
29. 1-Cinnamoyl-20,21,22,33-Tetrahydro 23-OH Vn	30. Limbocinin
Gedunin Group	
32. Mahmoodin	33. Salannolide
34. Salannolactam-I	35 Salannolactam-II
Nimbinin Group	
36 Nimbin	37. 6-Deacetyl Nimbin
38. 4-*epi*-Nimbin	39. Nimbinene
40. 6-Deacetyl-Nimbinene	
Salanin Group	
41. Ochinolide	42. Salannin
43. 3-Deacetyl Salannin	44. Salannol Acetate
Azadirachtin Group	
45. Azadirachtin A	46. 3-Deacetyl-3-Cinnamoyl Azadirachtin
47. Azadirachtin B	48. Azadirachtin D
49. Azadirachtin E	50. Azadirachtin H
51. Azadirachtin I	52. Vepaol
53. *Iso-Vepaol*	54. Azadirachtin F
55. 1,3-Diacetyl-11,19-Deoxa-11-Oxo-Meliacarpin	56. Azadirachtin G
57. Azadirachtin K	58. 11-Methoxy Azadirachtin

Here is a quote from, “Neem: A Treatise” Page 15

The neem tree (Azadirachta indica) and its derivatives have great relevance in organic farming practices. This remarkable tree has been identified as a renewable resource for homegrown agro-chemicals and nutrients, which are biodegradable, non-toxic and epact.

Long before synthetic chemicals and commercial insecticides and fertilizers were available. Neem derivatives were used in Indian villages to protect and nourish crops. Scientific research has shown that neem extracts can influence nearly 400 species of insects.

It is significant that some of these pests are resistant to pesticides, or are inherently difficult to control with conventional pesticides (floral thrips, diamond back moth and several leaf miners). Most neem products belong to the category of medium to broad-spectrum pesticides, i.e. they are effective over a wide range of pests.

Using neem derivatives for managing pests is a non-violent approach for controlling pests. They may not kill the pests instantaneously but incapacitate it in several ways. Neem very subtly employs efforts such as repellence, feeding and ovipositional deterrence, growth inhibition, mating disruption, chemo-sterilization, etc. These are now considered far more desirable than a quick knockdown in integrated pest management programs as they reduce the risk of exposing pest natural enemies to poisoned food or starvation.

The action of neem products fulfills all priorities among environmental objectives. This unique tree is perhaps the most significant example of how nature can combine diverse functions i.e. the action of de oiled neem cake as a pesticide-cum-fertilizer.

2. **Essential Oils:** *(Check out the new Essential Oil Blend at BuildASoil.com and save money!)*
From the research below the top ten most effective Essential Oils for pests and molds/mildews in no particular order are:
    1. Rosemary
    2. Eucalyptus
    3. Ginger
    4. Lemongrass
    5. Thyme
    6. Clove
    7. Cinnamon
    8. Peppermint
    9. Caraway Seed
    10. Cintronellal

The Essential oils were tested throughout the studies at various levels and found to burn plants with doses that were too high especially if administered while lights are on. **Use essential oils during lights out ONLY.** The best effects were around 1% essential oils by volume and as such we recommend using .5 – 1% essential oils for our mixtures and to test in a small amount first.

Essential Oils as Green Pesticides
http://projects.nri.org/adappt/docs/63-84.pdf

Plant Essential Oils For Pest and Disease Management
http://www.researchgate.net/publication/222556726_Plant_essential_oils_for_pest_and_disease_management/file/d912f508abdf6907f6.pdf

Assessing the efficacy and persistence of rosemary oil as a miticide/insecticide for use on greenhouse tomato https://circle.ubc.ca/handle/2429/17565

Rapid Evaluation of Plant Extracts and Essential Oils for Antifungal Activity Against Botrytis cinerea. http://apsjournals.apsnet.org/doi/pdf/10.1094/PDIS.1997.81.2.204

3. Potassium Silicate:

EPA: Potassium silicate is listed in Title 40 (Protection of Environment), Part 180—tolerances and exemptions for pesticide chemical residues in food Subpart D—Exemptions From Tolerances, 180.1268:

Potassium silicate is exempt from the requirement of a tolerance in or on all food commodities so long as the potassium silicate is not applied at rates exceeding 1% by weight in aqueous solution and when used in accordance with good agricultural practices.

Potassium silicate was registered by the US Environmental Protection Agency (EPA), Office of Pesticide Programs as a biopesticide, September 7, 2007 (PC Code 072606). The EPA noted the wide distribution of silicon in the earth's crust and concluded exposure to silicates was commonplace in activities involving contact with soil and natural water. Potassium silicate was approved as an active ingredient to be used as a fungicide, insecticide and miticide. Potassium silicate is used as a broad spectrum, preventative fungicide with optimum control obtained when used under a scheduled preventative spray program.

Potassium silicate also provides suppression of mites, whiteflies, and other insects. It is approved for use on agricultural crops, fruits, nuts, vines, turf and ornamentals. The EPA accepted the data and information provided by PQ Corporation addressing the mammalian and non-target toxicology data requirements and concluded that they adequately satisfied data requirements to support the registration (Reilly et al., 2007). No additional data was needed to support registration. Potassium silicate is exempt from the requirement of a tolerance.

DA: Silica and silica gel (a hydrated amorphous form of silica) are considered GRAS by FDA (21 CFR 182.90 and 21 CFR 182.1711). FDA provides that silicon is ubiquitous in the environment and further states that there is no evidence in the available information on aluminum calcium silicate, calcium silicate, magnesium silicate, potassium silicate, sodium silicate, sodium aluminosilicate, sodium calcium aluminosilicate, tricalcium silicate, silica aerogel, and talc that demonstrates or suggests reasonable grounds to suspect a hazard to the public when they are used at levels that are now current or that might reasonably be expected in the future.

Potassium silicate is listed under title 21—food and drugs, Part 178—indirect food additives: adjuvants, production aids and sanitizers, Subpart D—certain adjuvants and production aids as § 178.3297 colorants for polymers (d) Color additives and their lakes listed for direct use in foods, under the provisions of the color additive regulations in

parts 73, 74, 81, and 82 of this chapter, may also be used as colorants for food-contact polymers. (e) List of substances: Aluminum and potassium silicate (mica).

USDA: Potassium silicate is listed under title 7—Agriculture, part 205—National Organic Program, subpart G—administrative, § 205.601—Synthetic substances allowed for use in organic crop production. The rule permits the use of potassium silicate for plant disease control and as an insecticide or miticides with the restriction that the silica, used in the manufacture of potassium silicate, must be sourced from naturally occurring sand.

4. Chitonase: An enzyme for IPM use. (We get this by using Crustacean Meal in our Soil mix and especially from using Barley Seed Tea's)

Read the excerpts below or check out the whole article from the links below.

Plants represent the major component of biota and have the capability to synthesize their food through the process of photosynthesis. Physiological and environmental changes affect their health and make them vulnerable to variety of diseases thus directly or indirectly affect other components of ecosystem. A large number of environmental issues are linked with the eradication of plant diseases with chemical compounds. Most of these diseases are caused by fungal and insect pathogens. Chitin is the main structural component of these organisms and thus the enzyme responsible to hydrolyze chitin content are receiving attention in regard to their development as biopesticides or chemical defense proteins in transgenic plants and in microbial biocontrol agents. Therefore, understanding the overview of chitinase will provide a basis for improving the pathogenic activity of potential biocontrol strains, for developing novel biological control strategies and for exploring their roles in the plant defense. The present review describes the properties of chitinase with respect to plant health improvement.

http://scialert.net/fulltext/?doi=ajb.2011.29.37&org=10

CONCLUSION

Chitinases are prime molecules of interest for plant pathologist and can be utilized by variety of ways to improve plant health. These enzymes are classified into various types on the basis of their structural and **functional properties**. One class of chitinase was not found equally active against chitin of another source. Thus there is a need to isolate and identify chitinase of broad spectrum activity. In addition to it, reactions conditions of the enzyme must be known prior to its use in open environment and in affected site. Besides these, there is an utmost requirement to enhance the basal level of chitinase production by using recent approaches of genetic engineering. Therefore a coordinated strategy by using above plans may be meaningful to assess the full potential of chitinolytic organisms in rendering plant defense.

Full PDF Article:
http://scialert.net/qredirect.php?doi=ajb.2011.29.37&linkid=pdf

5. Salicylic Acid and plant SAR. (We get this by using Aloe Vera Juice)

From Wikipedia:

The systemic acquired resistance (SAR) is a "whole-plant" resistance response that occurs following an earlier localized exposure to a pathogen. SAR is analogous to the innate immune system found in animals, and there is evidence that SAR in plants and innate immunity in animals may be evolutionarily conserved. Plants use pattern-recognition receptors to recognize conserved microbial signatures. This recognition triggers an immune response. The first plant receptors of conserved microbial signatures were identified in rice (XA21, 1995)[1] and in Arabidopsis (FLS2, 2000).[2] Plants also carry immune receptors that recognize highly variable pathogen effectors. These include the NBS-LRR class of proteins. SAR is important for plants to resist disease, as well as to recover from disease once formed. SAR can be induced by a wide range of pathogens, especially (but not only) those that cause tissue necrosis, and the resistance observed following induction of SAR is effective against a wide range of pathogens, which is why SAR resistance is sometimes called "broad spectrum." SAR is associated with the induction of a wide range of genes (so called PR or "pathogenesis-related" genes***), and the activation of SAR requires the accumulation of endogenous salicylic acid (SA).*** The pathogen-induced SA signal activates a molecular signal transduction pathway that is identified by a gene calledNIM1, NPR1 or SAI1 (three names for the same gene) in the model genetic system Arabidopsis thaliana. SAR has been observed in a wide range of flowering plants, includingdicotyledon and monocotyledon species. SAR can be activated in corn, however, widely adapted commercial like Benzothiadiazole may not be efficient against P. sorghi causing common rust.[3]

Section 4: How to duplicate Common All Natural Pesticides

Use the all new BuildASoil Blend of Essential oils to make a much more potent IPM spray, but to understand why we created the BuildASoil blend we wanted to breakdown common popular pest sprays. Take a look at the MSDS for each product and look at the ingredients. For the money and dilution rates most of these sprays cost about $50.00 per gallon of actual spray. Using the BuildASoil essential oil blend we are able to cut that cost to $2.50 - $5.00 per gallon of spray depending on .5 or 1% final solution ratio.

Keep in mind these sprays are concentrated and come with instructions for diluting and that get's the essential oils to +/- 1% by volume depending on the product and type of oils used.

1. Liquid Ladybug Spray:
   http://cdn.arbico-organics.com/downloads/liquid-ladybug-msds.pdf
   Peppermint Oil 2.00%
   Geraniol 1.50% (Geranium Oil)
   Citric Acid 0.50% (Preservative)
2. SNS 217 Spray:
   http://sierranaturalscience.com/wp-content/uploads/2012/02/SNS-217_C-Concentrate-MSDS.pdf
   Rosemary Oil 10%
   Polyglyceryl Oleate 3.0% (Emulsifier)
   Lauric Acid 0.5% (Found in cinnamon oil, butter, coconut oil etc.)
   Water Balance to: 100%
3. GC Mite Spray –
   http://www.zadco.com.au/Organic_Products/GC_Mite
   Cottonseed Oil:40.0%
   Clove Oil: 5.0%
   Garlic Extract: 10.0%
   Oleic Acid: 2.0%
   Lauric Acid: 1.0%
   Sodium Bicarbonate: 2.0%
   Water: 26.0%
4. EcoSMART
   http://www.ecosmart.com/wp-content/docs/msds/home-pest-control.pdf
   2-Phenethyl propionate 2.0%
   Clove oil 1.0%
   Rosemary oil 1.0%
   Peppermint oil 1.0%
   Thyme oil 0.5%