Weed Control For Certified Organic Farmers

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University of California, Davis
Organic Weed Control

- Mulches
- Water management
- Cultivation
- Flamers
- Organic Herbicides
Mulches

• Act by blocking light
• Numerous organic and synthetic materials can be used for this purpose
Seedling Emergence relative to Light

Seedling emergence (No./m²)

Dark  Light  Light + Glass

0  100  200  300  400  500  600
String trimmer damage??
Rodents???
Lumite Mulch

Wood chip Mulch
Water Management
Preirrigation for weed seed reduction prior to crop planting

Questions:

• Is furrow irrigation any different than sprinkler irrigation as a preirrigation method

• How long should you wait after preirrigation before weed removal

• What is the most effective method of weed removal – flamer or cultivation
Hand Weeding Time as Affected by Preirrigation and Weed Removal Timing and Method

- 7 Day wait
- 14 Day wait

<table>
<thead>
<tr>
<th>Method</th>
<th>7 Day wait</th>
<th>14 Day wait</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Preirrigation</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Furrow</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Sprinkler</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>
Preirrigation Conclusions

• Maximum weed emergence occurred at 120 to 130 cumulative degree days (base temperature = 10°C)
• Preirrigation/weed removal was less beneficial when weed density is low
• Hand weeding times are reduced if pre-irrigation and weed removal are performed prior to crop planting.
Cultivation

• Best when weeds are small
• Dry conditions after cultivation help to prevent re-rooting
• Shallow cultivation reduces the quantity of new seeds brought to the surface
# Weed Seed Emergence relative to Depth (inches)

<table>
<thead>
<tr>
<th>Weed</th>
<th>Optimum Depth</th>
<th>Maximum Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wild oat</td>
<td>1.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Shepherdspurse</td>
<td>0.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Lambsquarters</td>
<td>0.3</td>
<td>2.0</td>
</tr>
<tr>
<td>Crabgrass</td>
<td>0.4</td>
<td>1.6</td>
</tr>
<tr>
<td>Foxtail</td>
<td>1.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Chickweed</td>
<td>0.4</td>
<td>0.8</td>
</tr>
</tbody>
</table>

King 1966
Night Cultivation?

- Some studies have found that cultivation at night reduces weed germination
- GPS guided systems (?)
- Better results after repeat treatments
- At worst, you lose a little sleep
Propane Flamers

• Kills weeds like a contact herbicide
• Treated leaves go from a glossy to a mat finish
• Fuel cost??
Just prior to flaming
5 minutes after flaming
10 minutes after flaming
# Organic Herbicides

<table>
<thead>
<tr>
<th>Registered for Food Use</th>
<th>Not Registered for Food Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>• C-Cide</td>
<td>• Pine Oil</td>
</tr>
<tr>
<td>• Green Match O</td>
<td>• Racer*</td>
</tr>
<tr>
<td>• Matran EC</td>
<td>• Acetic Acid – must be food grade</td>
</tr>
<tr>
<td>• Weed Zap</td>
<td></td>
</tr>
<tr>
<td>• Green Match EX</td>
<td></td>
</tr>
</tbody>
</table>

All are contact type herbicides – no residual activity
**The All-Natural Vitamin-C Based Herbicide**

C-Cide is an All-Natural, Non-Hazardous, Minimum Risk Herbicide. This product is effective at Controlling Unwanted Plant & Weed Growth.

**DIRECTIONS FOR USE:**
- 1 Gallon of C-Cide at 1:2 dilution with water will treat 1,000 sq. ft. (Makes 3-5 gallons).
- For Poison Ivy and Resilient Vegetation: DILUTE 1:3. (Example: 1 oz. of C-Cide with 3 oz. of water)
- For Broad Leaves & General Vegetation Control: DILUTE 1:3
- For Hard Sunked Weed: DILUTE 1:2 or No Dilution.

**LIQUID APPLICATIONS:**
1. Dilute C-Cide with water, as per instructions above.
2. Use a medium stream sprayer can to apply C-Cide directly over unwanted vegetation.
3. Results will be visible within 48 hours.

**CAUTION:** Use caution when applying. Apply ONLY to vegetation you want to treat. This product will kill grass and other vegetation on contact.

**STORAGE & DISPOSAL:** Store in cool place. Do not reuse bottle. Finish bottle and discard in trash.

**C-Cide is excellent for controlling:**
- poison ivy, poison oak,
- poison sumac, garden weeds,
- Indian grass,
- straw grass and more.

**C-Cide is an All-Natural, Non-Hazardous Product**

**BILOGICAL SOLUTIONS GUARANTEES THAT THE FORMULATION OF C-CIDE MEETS THE STANDARDS FOR EXEMPTION UNDER FIFRA 25(e)(4A)**

**This Product is effective at Controlling Unwanted Plant & Weed Growth.**

**RESEARCH IS CONTINUING WITH CORNELL COOPERATIVE EXTENSION IN THE AREAS:**
- Systemic Mechanism
- Planting Time After C-Cide Treatment

**PRECAUTIONARY STATEMENTS:**
- Hazardous to humans and domestic animals.

**CAUTION:**
- Causes mild skin irritation. Avoid contact with eyes.
- Wash thoroughly with soap and water after handling.

**FIRST AID:**
- If in Eyes: Flush eyes with water for at least 15 minutes. Contact physician. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a Poison Control Center or doctor for treatment advice. Have the product container or label with you when calling a Poison Control Center or doctor, or going for treatment. You may also contact 1-888-442-1700 for Emergency Medical Information.

**KEEP OUT OF REACH OF CHILDREN.**
NO ALL-NATURAL VITAMIN-C BASED HERBICIDE FOR SOIL & GROWTH.

KEEP OUT OF REACH OF CHILDREN.

CAUTION: Wash thoroughly with soap and water after handling. Latex Gloves are Recommended. Goggles are Recommended. Caution: Causes severe irritation. Avoid contact with eyes. Use only as directed. May also contact 1-866-961-1086 for Emergency Medical Information.

FIRST AID: If In Eyes: Flush eyes with water for at least 15 minutes. Contact Physician. Remove contact lens if present. If symptoms continue, call a Poison Control Center or doctor or going for treatment. You may also contact 1-866-961-1086 for Emergency Medical Information.

PRECAUTIONARY STATEMENTS:

ACTIVE INGREDIENTS:
- Citric Acid: 1%
- Ascorbic Acid: 10%
- Sodium Salicylate (Salicylic Acid): 10%
- Sodium Sulphate (Sodium Sulfate): 1%
- Water: 10%
- TOTAL: 100%

MADE BY:
Biological Solutions, LLC
1190 East Liberty St.
Sumter, SC 29153

MANUFACTURED BY:
Biological Solutions, LLC
1-800-775-8643
C-Cide 33% @ 70 GPA
55° F at application
C-Cide 33% + 1% NuFilm P @ 70GPA  74°F
C-Cide 33% + 1% NuFilm P @ 70GPA
10 DAT
C-Cide 25% 70gpa + 0.5% Natural Wet
81 °F at application
C-Cide 25% 70gpa + 0.5% Natural Wet

81 °F at 1st and 76 °F at 2nd application – treated twice
For Control of Annual and Broadleaf Weeds In Non-Crop Areas

ACTIVE INGREDIENT: d-limonene ............. 70%
INERT INGREDIENTS: ........................................ 30%
Total ........................................................................100%

KEEP OUT OF REACH OF CHILDREN

CAUTION
EPA Reg. No. 82052 - 1
EPA Est. No. 82052-GA-1
Manufactured by:
Cutting Edge Formulations, Inc.
5106 Bristol Industrial Way
Buford, GA 30518
(866) 906-WEED

DIRECTIONS FOR USE:
It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

General information: GREENMATCH O is a broad spectrum weed killer that contains a citrus extract. It is non-selective and controls most annual weeds, both grasses and broadleaves. For best performance, complete coverage of target weeds is necessary. Spray until thoroughly wet. It is recommended for non-food areas such as borders, driveways, sidewalks, around mature trees and ornamentals, around buildings, in greenhouses and around flower beds.
GreenMatch O 10% + 1% NuFilm P @ 70 GPA
55°F at application
GreenMatch O 15% + 1% Natural wet @ 70 gpa 81° F
GreenMatch O  15%+ 1% Natural wet @ 70gpa - treated twice
EMULSIFIABLE CONCENTRATE
NO REENTRY INTERVAL

Ingredients in this product meet the requirements of the US EPA National Organic Program

Active Ingredients:
- Clove Leaf Oil: 50.00%
- Other Ingredients*: 50.00%

Total 100.00%

*Wintergreen Oil, Butyric, Lactate, and Lecithin

KEEP OUT OF REACH OF CHILDREN
CAUTION - PRECAUTION

Situated no entienda el etiqueta, buscar a alguien para que se lo explique a usted en detalle. Si no entiende el label, haga que alguien lo lea en detalle. Vea la etiqueta para otras precauciones

Use only according to label instructions. Read the entire label before using this product.

This product has not been registered by the US Environmental Protection Agency. EcoSMART represents that this product qualifies for exemption from registration under the Federal Insecticide, Fungicide, and Rodenticide Act.

First Aid

IF IN EYES: Rinse with water for at least 15 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a physician if irritation persists.

IF ON SKIN: Wash exposed area with plenty of soap and water for at least 15 minutes. Remove contaminated clothing. See medical attention if irritation persists.

IF INHALED: Remove person to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

IF SWALLOWED: Rinse mouth out with water. Call a doctor or get medical attention as soon as possible. Do not induce vomiting. Do not give anything by mouth to an unconscious person. Avoid alcohol.

Chemical Safety Information: Call 1-800-535-5053 Anytime (InfoTrac Chemical Response System).

PRECAUTIONARY STATEMENTS

Personal Protective Equipment (PPE)

Persons applying this product should wear:
- Long sleeve shirts and long pants, shoes and socks
- Protective eyewear
- Chemical resistant gloves made of neoprene, nitrile or natural rubber

User Safety Recommendations

Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove clothing immediately if the product gets inside. Wash thoroughly and put on clean clothing. Remove PPE after handling product. Wash the outside of gloves before removing, as soon as possible. Wash thoroughly and change into clean clothes.

Physical or Chemical Hazards

Do not use, pour, spill or store near heat or open flame. Store only in original container.

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It also contains specific instructions on PPE exceptions pertaining to statements on this label about personal protective equipment (PPE). The requirements of this section only apply to use of this product that are covered by the Worker Protection Standard.

Do not reenter field until residue is dry. PPE required for entry to treated areas that are permitted under the Worker Protection Standard and involve contact with anything treated such as plants or soil is: Long sleeve shirt, long pants, shoes and socks, chemical resistant gloves.

Directions for Use

SHAKE WELL BEFORE USING.

MATRAN EC is intended for non-selective weed control and Nuts & Vegetable Crops. Only protected handlers may enter the application area. Do not apply this product in a way that will come in contact with workers or other persons. Do not use non-recommended equipment.

To prevent crop injury, use MATRAN EC strictly as directed.
Matran EC 10% + 1% Natural Wet @ 35 GPA
55°F at application
Matran EC 10% + 1% NuFilm P
@ 70 GPA  10 DAT
Matran 15% + 0.05% Natural wet @ 70 gpa
PHARM SOLUTIONS

WEED PHARM

www.pharmsolutions.com

FAST ACTING
WEED & GRASS KILLER

A FOOD GRADE ORGANIC ACID
For Non-Selective Control of Herbaceous Broadleaf Weeds and Weed Grasses on Residential, Non-Crop, Right-of-Way, and Industrial Land Sites

1 Gallon

Active Ingredients by wt.

Acetic Acid ... 20.0%*
Other ingredients ... 80.0%
TOTAL ............ 100.0%

*Equivalent to 200 grain vinegar by titration

First Aid
If in Eyes
Hold eyelids open and flush with a steady, gentle stream of water for 15-20 min. Remove contact lenses, if present, after first 5 min., then continue rinsing eye.

If in Eyes: Call poison center or doctor for advice.
Pharm Solutions Inc.
2023 E. Sims Way.
Suite #358
Port Townsend, WA 98368
Vinegar 20% + 1% NuFilm P
@ 70 GPA    55°F
Vinegar 20% + 1% NuFilm P @ 70 GPA  Treated twice
Vinegar 20% + 1% NuFilm P
@ 70 GPA 10 DAT
Vinegar 20% 70gpa + 0.05% Natural Wet
81°F at application
Vinegar 20% 70gpa + 0.05% Natural Wet – Treated twice
WEED ZAP™
A NON-SELECTIVE HERBICIDE FOR ANNUAL GRASSES AND WEEDS

General Information
WEED ZAP is a contact, non-selective, broad spectrum, foliar-applied herbicide. This product will only control actively growing emerged green vegetation. It controls both annual and perennial broadleaf and grassy weeds. This product does not translocate. It will affect only those plants that are coated with the spray solution.

ACTIVE INGREDIENTS:
- Clove Oil ........................................ 45%
- Cinnamon Oil .................................. 45%
- Inert Ingredients: ......................... 10%
- Lactose and Water.
TOTAL ........................................... 100%

This product is exempt from registration with the Federal EPA under section 25 (b) of FIFRA. WEED ZAP has not been registered with the Environmental Protection Agency. JH Biotech, Inc. represents that this product qualifies for exemption from registration under the Federal Insecticide, Fungicide and Rodenticide Act.

APPLICATION RATE TABLE
Mix 3 gallons of WEED ZAP concentrate per 100 gallons of spray water. Apply enough WEED ZAP to cover the entire surface of the weed. Spray to the point of run off. The use of a spreader/sticker such as JH Biotech’s Natural Wet® may increase contact and efficacy of treatment.

FINAL MIX VOLUME FL. OZ.
1 Gallon 4
5 Gallons 20
10 Gallons 40
25 Gallons 100
Repeat application as necessary. Coverage is essential to establish control.

CAUTION KEEP OUT OF REACH OF CHILDREN
PRECAUTIONARY STATEMENTS
Off target application of WEED ZAP will result in damage to growing plants. Do not apply this product through the irrigation system.

Avoid contact with skin, eyes or clothing. In case of contact, immediately flush eyes or skin with plenty of water. Get medical attention if irritation persists.

STATEMENT OF PRACTICAL TREATMENT

<table>
<thead>
<tr>
<th>IF SWALLOWED</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Call a Physician or Poison Control Center.</td>
<td></td>
</tr>
<tr>
<td>- Drink one or two glasses of water.</td>
<td></td>
</tr>
<tr>
<td>- Do not induce vomiting.</td>
<td></td>
</tr>
<tr>
<td>- If person is unconscious, do not give anything by mouth or induce vomiting.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IF IN EYES</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes.</td>
<td></td>
</tr>
<tr>
<td>- Get medical attention if irritation persists.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IF ON SKIN</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Wash with plenty of soap and water.</td>
<td></td>
</tr>
<tr>
<td>- Get medical attention if irritation persists.</td>
<td></td>
</tr>
</tbody>
</table>

LIMITED WARRANTY
Manufacturer or seller makes no warranty, whether expressed or implied, concerning the use of this product other than for the purposes indicated on the label. Neither manufacturer nor seller shall be liable for any injury or damage caused by this product due to misuse, mishandling or any application not specifically described on the label.

Manufactured By: JH Biotech, Inc. P.O. Box 3558 Ventura, CA 93006

NET CONTENTS:
- 1 Pint (0.47 liter)
- 2.5 Gallons (9.45 liters)
- 2 x 2.5 Gallons (18.9 liters)
- 5 Gallons (18.9 liters)
- 55 Gallons (207.9 liters)
0.25% v/v Natural Wet
35 gallons per acre spray volume
16 Days after treatment
WeedZap 15% + 1% Natural Wet @ 35 GPA
55°F at application
WeedZap 20% + 1% NuFilmP
@ 35 GPA   10 DAT
WeedZap 10% @ 70 GPA
10 DAT
WeedZap 10% 70gpa + 0.05% Natural wet
GreenMatch EX
Burndown Herbicide™

- For Control of Grasses and Broadleaf Weeds in Crop and Non Crop Areas
- CONCENTRATED EMULSION
- NO REENTRY INTERVAL
- Ingredients in this product meet the requirements of the USDA National Organic Program

Active Ingredient: Lemon grass oil ...................................................... 50%
Other Ingredients:* .......................................................... 50%
Total: ............................................................................ 100%
* Water, Corn Oil, Glycerol Esters, Potassium Oleate and Lecithin

KEEP OUT OF REACH OF CHILDREN
CAUTION

See Inside Booklet for Additional Precautionary Statements and directions for use.

This product has not been registered by the US Environmental Protection Agency. Marrone Organic Innovations represents that this product qualifies for exemption from registration under the Federal Insecticide, Fungicide, and Rodenticide Act.
GreenMatch EX 15% @ 35 GPA
10 days after application
GreenMatch EX 15% 70gpa + 0.05% Natural wet
GreenMatch EX
10% 70 GPA
1% NuFilm P
Does age (size) make a difference?

2nd application date

Grass control (%)

S. Horimoto, unpublished
Organic Adjuvants

Organic surfactants are designed to improve the effectiveness of other chemicals in agricultural applications. They work by enhancing the dispersion of active ingredients in water, increasing the wetting and adherence of the treated substance to surfaces, and improving the stability and longevity of the mixture.

Some common organic adjuvants include:

- Humic Acid: Enhances the availability of nutrients and improves uptake by plants.
- Fulvic Acid: Acts as a chelating agent, increasing the solubility of certain nutrients.
- Silwet ECO Spreader: A silicone-based adjuvant that improves the spreadability of liquid applications.

These adjuvants are often used in conjunction with organic fertilizers and other natural pest management products to provide synergistic effects, enhancing the overall efficacy of the treatment.

For more information, refer to the NAP32 Fertilizer Guide and the Environmental Protection Agency (EPA) database for registered organic adjuvants.
Matran 10% + Organic Adjuvant 1% - 2 DAT
Matran + WE 1098 + 1 DAT
Organic Herbicides

- Good spray coverage is essential
  70 GPA?
- Work better in warm (sunny?) weather (80°F)
- Organic adjuvants improve weed control
- Treat when weeds are small
- Repeat applications are needed for larger weeds
Prevention

• Avoid letting weeds go to seed

• Do not let weeds come in on equipment
Questions?