Weed Control Options

• Water Management
• Flaming
• Cultivation
• Mulches
• Bio-control
• Organic Herbicides
Just prior to flaming
5 minutes after flaming
10 minutes after flaming
Weed Density 18 days after Tomato planting as Affected by Preirrigation

Weed density (#/m²)

- Furrow Pre-Irrigation
- No Pre-Irrigation

Graph showing the comparison of weed density between Furrow Pre-Irrigation and No Pre-Irrigation conditions.
Mulches

- Act by blocking light
- Numerous organic and synthetic materials can be used for this purpose
Light (%) under various amounts of straw mulch

![Bar graph showing light (%) under various amounts of straw mulch. The x-axis represents mulch (tons/acre) ranging from 0 to 16, and the y-axis represents light (% of full light) ranging from 0 to 100. The graph shows that as the amount of mulch increases, the light percentage decreases.]
String trimmer damage??
Rodents???
Effect of Mulches on Weed Control in Organic Bosc Pears

Weed Control (%)

- Wood chip
- Lumite

Month:
- Dec 2008
- May 2009
- Nov 2008
- Apr 2010
- Jun 2010
- Nov 2010
- Jan 2011
Mulches

- Effectively control most weeds
- Need some maintenance to prevent weed invasion
Weed Control with Organic Herbicides vs. Mulches

- **wood chip**
- **Weed Pharm**

Weed control (%)

- Dec
- Mar
- May
- July
- Nov
- Apr
- Jun
- Nov
- Jan
Organic Herbicides

- C-Cide
- GreenMatch
- Matran EC
- Weed Pharm
- Weed Zap
- Racer
- GreenMatch EX
- Experimental
- Biolink

All are contact type herbicides – no residual activity
CiDe 

THE ALL-NATURAL VITAMIN-C BASED HERBICIDE

This product is effective at controlling unwanted plant & weed growth.

The product is an all-natural, non-hazardous product.

The all-natural, non-hazardous product guarantees that the formulation meets the standards for exemption under FIFRA 25(b).

KEEP OUT OF REACH OF CHILDREN.

8.59 lbs. = 1 gallon = 128 fl oz.

ACTIVE INGREDIENT:
CITRIC ACID.........5%
ASCORBIC ACID......10%
OCTANOIC ACID SODIUM SALT....2%
SOAPBARK (QUILLAJA SAPONIN) 82%
WATER................100%

TOTAL................100%

MANUFACTURED BY
Biological Solutions, LLC
900 East Liberty St.
Sumter, SC 29153
1.803.775.8643

PRECAUTIONARY STATEMENTS:
Latex Gloves are Recommended.
Goggles are Recommended.

CAUTION:
Causes moderate eye irritation. Avoid contact with eyes.

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 eye. 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 1-866-842-1708 for Emergency Medical Information.
Marrone Bio-Innovations

Active Ingredient:
d-limonene 70%

New formulation is called GreenMatch
d-limonene 55%
GreenMatch EX
Burndown Herbicide

OMRI Listed
For Organic Production

- 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.
Matratec
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.

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
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: 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. International & United States Patents Pending

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

IF SWALLOWED
- Call a Physician or Poison Control Center.
- Drink one or two glasses of water.
- Do not induce vomiting.
- If person is unconscious, do not give anything by mouth or induce vomiting.

IF IN EYES
- Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes.
- Get medical attention if irritation persists.

IF ON SKIN
- Wash with plenty of soap and water.
- Get medical attention if irritation persists.

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, misapplication or any application not specifically described on the label.

Manufactured by: JH Biotech, Inc. P.O. Box 3536 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)
AllDown is a new Green Chemistry, non-selective weed and grass herbicide that is a breakthrough in environmentally responsible vegetation management. AllDown is made of a special blend of synergistic components containing no harsh chemicals that will dehydrate unwanted top growth foliage. Within less than an hour you will notice wilting of plants caused by desiccation. In some cases a repeat application may be required to perennial weeds. Weed management is an important component of cultural practices in agriculture. Weeds compete with crops affecting their yield and quality.

Approved for the production of certified organic food and fiber crops

Uses:
- Organic agriculture
- Reclaim land for agriculture or grazing or that has been taken over by weeds
  - In vegetable gardens and flowerbeds
  - Along fence lines and foundations
  - Around trees and shrubs
  - On patios, driveways and sidewalks

Application Instructions:
Apply only to areas that you want to knockdown. For large agricultural areas, it is recommended that SummerSet AllDown be applied under spray hoods to protect desirable row crop foliage from coming in contact with the spray solution.

Do not dilute. Apply to target vegetation at a rate sufficient to saturate the leaves to a point where droplets begin to appear.

Apply when skies are mostly sunny and no rainfall is predicted within 4 hours of application.

Apply when the air is calm and temperatures are between 65° and 90° F.

Guaranteed Product Analysis:

<table>
<thead>
<tr>
<th>Active Ingredients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citric acid</td>
<td>5.0 %</td>
</tr>
<tr>
<td>Garlic</td>
<td>0.2 %</td>
</tr>
<tr>
<td>Other Ingredients:</td>
<td>94.8 %</td>
</tr>
</tbody>
</table>

v vinegar, water
Blackberry & Brush Block

FOR ORGANIC PRODUCTION

Attacks blackberries, brush, star thistle, deep-rooted weeds & woody plants

CONTENTS 128 fl. oz. (1 Gal.) 3.785 Liters

CAUTION
KEEP OUT OF REACH OF CHILDREN
READ ALL PRECAUTIONARY STATEMENTS

CAUTION
Harmful if swallowed or absorbed through the skin. Causes eye irritation. Avoid contact with eyes, skin or clothing. Wash thoroughly after handling. Wear protective eyewear and gloves when handling, mixing and applying this product. In case of a spill of concentrate product, leave area and do not return for an hour. Do not spray pets or humans. Avoid contamination of foodstuffs.

STATEMENT OF PRACTICAL TREATMENT
IF SWALLOWED: Call a physician at the poison control center immediately.
IF INHALED: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth to mouth. Get medical attention.
IF IN EYES: Flush with plenty of water. Get medical attention if irritation persists.

Active Ingredients
Citric Acid........20%
Inert Ingredients
Water..............80%
Total..............100%

OMRI Listed
Organic Materials Review Institute

WARRANTY STATEMENT:
All statements concerning this product are to be applied only when used as directed. The manufacturer makes no warranties, expressed or implied concerning this product or its use, which extend beyond the directions for use description on the label. Read all directions carefully. Buyer assumes all responsibility for safety and use not in accordance with directions.

www.greenergyinc.com

Blackberries
Poison Oak
Star Thistle
Deep Rooted Weeds
Horsetail
Dandelions
Scotch Broom
Tansy along fence rows, roadways, non crop areas & residential sites

IMPORTANT: Do not apply this product in a manner that will contact near by desirable plants or crops including soil within their drip line of root zone.
BRUSH-WEEDS & GRASS HERBICIDE for ORGANIC PRODUCTION

Attacks blackberries, brush, Star thistle, deep-rooted weeds & woody plants


CERTIFIED ORGANIC MATERIALS

CAUTION

Harmful if swallowed or absorbed through the skin. Causes eye irritation. Avoid contact with eyes, skin, or clothing. Wash thoroughly after handling. Wear protective eyewear and gloves when handling, mixing and applying this product. In case of a spill, contain and do not return for an hour. Do not spray pets or humans. Avoid contamination of foodstuffs.

STATEMENT OF PRACTICAL TREATMENT

IF SWALLOWED: Call a Physician at the poison control center immediately.

IF INHALED: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth to mouth. Get immediate attention.

IF IN EYES: Flush with plenty of water. Get immediate attention if irritation persists.

ACTIVE INGREDIENTS

(CERT.ORGANIC) CITRIC ACID 20%

INERT INGREDIENTS

(CERT.ORGANIC) VINEGAR 4%

(CERT.ORGANIC) SURFACTANT 15%

WATER 25%

TOTAL 100%

WARRANTY STATEMENT:
All statements concerning this product are to be applied only when used as directed. The manufacturer makes no warranties, expressed or implied concerning this product or its use, which extend beyond the direction for use description on the label. Read all directions carefully. Buyer assumes all responsibility for safety and use not in accordance with directions.
Experimental product

BioLink Herbicide

Active Ingredient: Fatty Acids ................................8.00%
Inert Ingredients: Lactic acid, glycerol, soapbark
Acid .........................................92.0%

Directions For Use

SHAKE WELL BEFORE USING

Use 6 gallon of BioLink Herbicide per 100 gallons of water.
Agitate during application of spray.

DANGER: KEEP OUT OF REACH OF CHILDREN. Do not get in eyes or on clothing. Wear protective eyewear
(goggles or face shield). Wash thoroughly with soap and water after handling and before eating, drinking or chewing
gum. Remove contaminated and wash clothing before reuse.

Store in cool dry place out of direct sunlight. Avoid freezing
and extreme heat.

Westbridge
1260 Avenida Chelsea, Vista, CA 92081
Tel. 760-399-8855

Net Content: 1 quart
0.25% v/v Natural Wet
35 GPA spray volume
16 Days after treatment
organic herbicides tested provided only temporary suppression of grasses
Greenhouse Conclusions

- Higher concentrations and spray volumes increased weed control across all products
- Spray volume has a greater impact on weed control than concentration
- Adjuvant use improved control across all products – use high rates
- Grasses are much harder to control than broadleaf weeds
Field testing
Methods for Weed Size study

- Entire trial area cultivated to remove existing weeds
- Field irrigated to germinate weed seeds
- Field divided into three segments, with each section treated at a different time
- Treatments applied at 14, 21 or 28 days after the initial irrigation
- All treatments applied at 70 GPA and 1% Natural Wet adjuvant added to each treatment
Concentrations used in Field testing

- C-Cide – 25 to 50% v/v (1.25 to 2.5% citric acid)
- GreenMatch – 7.5 to 15% v/v (4.1 to 8.25% d-limonene)
- GreenMatch EX 10 to 15% v/v
  (5 to 7.5% lemongrass oil)
- Matratec 7.5 to 15% v/v (3.75 to 7.5% clove oil)
- Weed Zap – 7.5 to 20% v/v
  (6.3 to 18% clove + cinnamon oil)
- Racer – 6 to 10% v/v (2.4 to 4% NH₄ nonanoate)
- Weed Pharm – 100% (20% acetic acid)
- Biolink – 3 to 9% v/v (0.24 to 0.72% fatty acids)
Broadleaf Weed Control (%) at 1, 5 and 15 days after application

Weed Control (%)

C-Cide 25%  GM EX 15%  GM 15%  Mat 15%  WPh 100%  WZ 15%

1 DAT  5 DAT  15 DAT

Broadleaf weeds = purslane, pigweed, black nightshade

Applic. – June 15, 2009
Broadleaf Weed Control (%) at 1, 5 and 15 days after application

Weed Control (%)

Applic. – June 22, 2009
Broadleaf Weed Control (%) at 1, 5 and 15 days after application

Weed Control (%)

Applic. – June 29, 2009

Broadleaf weeds = purslane, pigweed, black nightshade
Grass Weed Control (%) at 1, 5 and 15 days after application

Grass weeds = crabgrass and barnyardgrass

Applic. – June 15, 2009
Grass Weed Control (%) at 1, 5 and 15 days after application

Grass weeds = crabgrass and barnyardgrass

Applic. – June 22, 2009
GreenMatch 15% + 1% Natural Wet @ 70 GPA 81°F
GreenMatch  15%+ 1% Natural Wet @ 70 GPA - treated twice
Matran EC

14 DAT

5% v/v + 2.5% humasol

35 GPA spray volume
Matran EC

14 DAT
10% v/v + 2.5% humasol
35 GPA spray volume
Matran EC 10%  4-5 leaf mustard
Mustard Control with Acetic Acid (70 GPA)

Acetic Acid

Control (%)

5% 10% 15% 20%

14 DAT Treated Dec 20, 2006
2-3 leaf mustard

0.1% Yucca extract added to all trmts
Acetic acid 20% + 1% NuFilm P @ 70 GPA
Treated twice
acetic acid 20%  70 GPA + 1% Natural Wet
81°F at application
WeedZap 10% 70 GPA
+ 0.5% Natural wet
Plantain Control with Organic Herbicides

3% Biolink  7.50% GreenMatch  7.50% Matratec  7.50% WeedZap  100% Weed Pharm  Unt

4 DAT  9 DAT

Biolink      GreenMatch    Matratec       WeedZap     Weed Pharm
Plantain Control with Organic Herbicides

<table>
<thead>
<tr>
<th>Product</th>
<th>4 DAT</th>
<th>9 DAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biolink</td>
<td></td>
<td></td>
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<tr>
<td>GreenMatch</td>
<td></td>
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<tr>
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</tr>
<tr>
<td>WeedZap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weed Pharm</td>
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</tr>
</tbody>
</table>

Product comparison across different DAT (Days After Treatment): 4 DAT and 9 DAT.
Biolink 3 % v/v – 9 DAT
Biolink 6 % v/v – 9 DAT
GreenMatch 7.5% v/v – 9 DAT
GreenMatch 15% v/v – 9 DAT
Matratec 7.5% v/v – 9 DAT
Matratec 15% v/v – 9 DAT
WeedZap 7.5 % v/v – 9 DAT
WeedZap 15 % v/v – 9 DAT
Organic adjuvants
Matran 10% - 2 DAT
Matran 10% + Organic Adjuvant 1% - 2 DAT
Organic Herbicides

- Good spray coverage is essential – 70 GPA
- Work better in warm weather (25°C)
- Organic adjuvants improve weed control
- Small weeds easier to control
- Repeat applications are needed for larger weeds
Questions?