



Track 2 Panel Discussion:

Bioherbicides

Challenges and opportunities
Common use rates & recommendations

Moderator:

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What are Bioherbicides?

▶ **Microbial**

- ▶ Viruses, bacteria, fungi, oomycetes
- ▶ Live or killed (including fermentation products)

▶ **Biochemical**

- ▶ Microbial extracts
- ▶ Botanical extracts: allelochemicals, essential oils, seed oils
- ▶ Organic acids, fatty acid salts

Microbial Bioherbicides

- ▶ Over 30 identified worldwide, but fewer than 1/3 are commercially available*
 - Narrow spectrum: Host-specific plant pathogens
 - Temperature & moisture requirements of live microbes
 - High cost: Fermentation, downstream processing & formulation

- ▶ Only 5 currently listed as active EPA Sec. 3 registrations (www.npirs.org):

ACTIVE INGREDIENT	TYPE	TARGETS	EPA REG. NO.	REGISTRANT	TRADE NAME(S)
<i>Bacillus licheniformis</i> SB3086	Live bacteria	Algae	8709-10	Mars Fishcare North America	PondCare Microbial Algae Clean
<i>Pseudomonas fluorescens</i> D7	Live bacteria	Brome, medusahead, jointed goatgrass in cereals & rangeland	73771-4	Verdesian Life Sciences	D-7
<i>Streptomyces acidiscabies</i> RL-110	Killed bacteria	Annual grasses, sedges, broadleaf weeds	84059-12	ProFarm	Opportune
<i>Chondrostereum purpureum</i> PFC 2139	Live fungus	Tree regrowth from cut stumps	64137-18	Lallemand Plant Care	Chontrol, Lalcide Chondro, BioFence
<i>Colletotrichum gloeosporioides</i> f. sp. <i>aeschynomene</i>	Live fungus	Northern joint vetch (curly indigo) in rice	82681-3	Agricultural Research Initiatives	LockDown Liquid

Biochemical Bioherbicides

EPA Registered biochemical bioherbicides:

Active ingredient	Tradenames	EPA Reg. No.	OMRI	Source
Acetic acid (vinegar)	Multiple	Multiple	Yes	Multiple
Capric + caprylic acids	Suppress®	51517-9	Yes	SAN Agrow
Caprylic + capric acids	Homeplate®	67702-54-70051	Yes	Certis Biologicals
d-limonene (citrus oil)	Avenger™	92967-1	Yes	Avenger Products
Ammonium nonanoate	Axxe®	70299-23	Yes	BioSafe Systems
Pelargonic acid	Scythe®	10163-325	No	Gowan Co.

FIFRA 25(b) exempt active ingredients:

Cinnamon oil Clove oil Lemongrass oil Thyme oil
 Citric acid Eugenol Sodium lauryl sulfate