

FIELD EVALUATION OF GreenMatch EX: A NEW BROAD SPECTRUM ORGANIC HERBICIDE

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ABSTRACT

GreenMatch EX is a new contact, non-selective, broad spectrum, foliar herbicide. It is exempt from EPA registration and is approved for use in organic farming. This biological product controls both annual and perennial broadleaf and grassy weeds. GreenMatch EX has been tested in California against various broadleaf and grassy weed species to obtain efficacy and weed spectrum data. Studies with three dilution rates (7.5, 10, and 15%) and three spraying volumes (35, 60, and 100 gallons per acre) showed a significant correlation between concentration/water volume and percent weed control. The best efficacy was achieved at 10 to 15% dilution rate (v/v) employing 100 gallons of water per acre, which indicates that complete tissue coverage is required to achieve full efficacy. GreenMatch EX performance was dependent upon the age of the weeds, and the best weed control was obtained when plants were young and actively growing. GreenMatch EX at 15% was more effective than GreenMatch (d-limonene) and Matran EC (clove leaf oil) at the recommended commercial application rates of 18% and 5%, respectively.

INTRODUCTION

Interest in incorporating natural-based pesticides in "green" integrated pest management programs has increased dramatically during the past few years^{1,2,3}. Currently, biopesticides represent 2.4% of the global pesticide market, and is projected to increase to 4.2% by 2010⁴. Weeds constitute the main problem in agricultural systems by reducing crop yields up to 12%⁵, and various kinds of herbicides are employed worldwide to control weed pests. During 2005, the estimated global pesticide market was 33.6 billion dollars with herbicide use accounting for 45.8% of this market⁶. At present, the number of biological herbicides with potential to control weeds is limited. Corn gluten meal, a by-product in the manufacture of cornstarch, is available as BioweedTM and has efficacy as a pre-emergence herbicide. Other commercially available post-emergence herbicides include fatty acid (pelargonic acid) sold under the trade name ScytheTM, essential oil (clove) sold as MatranTM, and monoterpane (d-limonene) from citrus oil sold as Nature's AvengerTM and GreenMatchTM O^{1,2}. The present study discusses the effectiveness of GreenMatch EX as a new non-selective biopesticide with potential to control a broad spectrum of grassy and broadleaf weeds.

MATERIALS AND METHODS

Efficacy of GreenMatch EX was evaluated in three locations in California. The first trial was established in two locations in Davis, CA: inside a peach orchard and in an open field. The second trial was located in Wasco, CA inside an almond orchard. A third trial was performed in Fresno, CA in a golf course. The treatments in all field experiments were arranged under a randomized complete block experimental design with 3 or 4 repetitions. In the trials performed in Wasco and Fresno, Matran[®] EC and GreenMatch were used as the commercial controls at the rate specified in the label. Treatments in the Wasco and Fresno trials were applied using a hand-held CO₂ sprayer, while all treatments in Davis were applied with a hand-held sprayer. Water was used as a carrier during the treatment application. When indicated, Nu Film P at 0.05% was used as a surfactant.

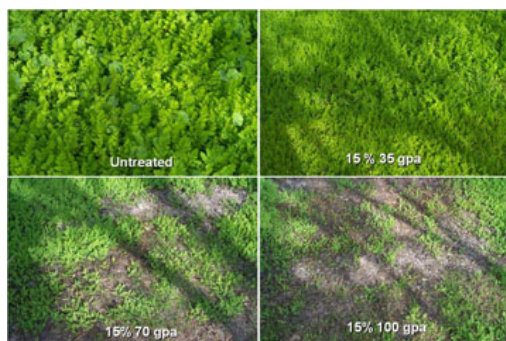


FIG. 1. GreenMatch EX EFFICACY 20 DAYS AFTER TREATMENT (WASCO, CA)

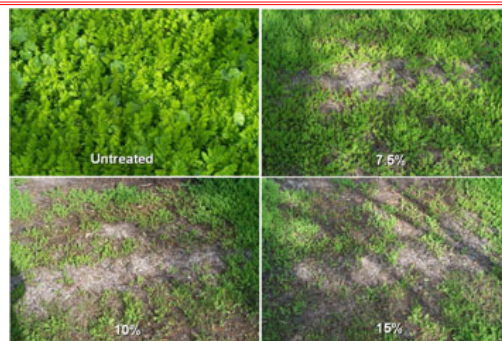


FIG. 2. GreenMatch EX EFFICACY AT 100 GPA 20 DAYS AFTER TREATMENT (WASCO, CA)

TABLE 2. EFFICACY (%) OF GreenMatch EX CONTROLLING WEEDS 20 DAT (WASCO, CA)

Treatment	Weed common name					
	Redstem filaree	Little malion pursue	Shepherd's London rocket	Hairy fleabane	Annual bluegrass	
Untreated	0	0	0	0	0	0
EX 7.5%, 35 gpa	6.3	7.5	12.5	11.3	8.8	6.5
EX 10.0%, 35 gpa	10.0	11.3	35.0	33.8	33.8	7.5
EX 15.0%, 35 gpa	42.2	37.5	80.0	82.5	82.5	17.5
EX 7.5%, 70 gpa	30.0	30.0	63.8	58.8	41.3	13.8
EX 10.0%, 70 gpa	68.8	77.5	92.0	92.5	93.8	82.5
EX 15.0%, 70 gpa	76.3	72.5	94.8	94.8	98.0	63.8
EX 7.5%, 100 gpa	68.8	75.0	94.8	94.8	94.8	80.0
EX 10.0%, 100 gpa	77.5	92.0	99.5	99.5	99.0	80.0
EX 15.0%, 100 gpa	94.5	87.5	100.0	100.0	100.0	92.5
GM 18%, 60 gpa	66.3	71.3	92.3	94.3	96.0	62.5
Matran 5%, 60 gpa	40.0	42.5	48.8	46.3	40.0	21.3

Application date: November 9, 2007. gpa= gallons per acre; DAT = days after treatment.
EX = GreenMatch EX; GM = GreenMatch.

TABLE 3. EFFICACY (%) OF GreenMatch EX CONTROLLING WEEDS 21 DAT (FRESNO, CA)

Treatment	Weed common name					
	Smooth crabgrass lettuce	Tricky spurge	Annual sowthistle	Postrate spurge	Horse weed	Flax fleabane
Untreated	0	0	0	0	0	1.4
EX 7.5%, 35 gpa	100.0	73.5	62.7	59.4	20.0	8.9
EX 10.0%, 35 gpa	70.0	78.5	41.6	43.1	39.4	22.4
EX 15.0%, 35 gpa	ND	90.3	87.9	68.8	16.5	11.8
EX 7.5%, 70 gpa	100.0	90.0	44.7	65.6	64.3	10.1
EX 10.0%, 70 gpa	ND	78.0	52.9	81.3	50.0	26.1
EX 15.0%, 70 gpa	90.0	83.8	48.8	53.8	42.4	38.6
EX 7.5%, 100 gpa	100.0	68.3	55.0	82.5	30.6	13.3
EX 10.0%, 100 gpa	100.0	77.5	50.9	86.7	47.5	29.6
EX 15.0%, 100 gpa	100.0	68.1	55.6	86.3	50.0	56.3
GM 18%, 60 gpa	50.0	77.9	65.6	79.4	75.6	28.6
Matran 5%, 60 gpa	100.0	85.6	69.8	86.3	22.5	61.3

Application date: October 15, 2007. gpa= gallons per acre; DAT = days after treatment.
EX = GreenMatch EX; GM = GreenMatch.

RESULTS

GreenMatch EX showed non-selectivity in controlling weeds. Both broadleaf and grassy weeds were burned in the presence of herbicide. In the trial performed inside the peach orchard in Davis, eight weed species were commonly found during the evaluation. Excellent control was observed against spurge and thistle; good control against bindweed, clover, and crabgrass; and satisfactory control against bermuda grass. Poor efficacy was detected in controlling henbit and dandelion. Table 1 shows the overall control estimated during this trial. Herbicidal effect was increased in the presence of surfactant. Control was greater than 86% at 10% dilution of GreenMatch EX at 100 gpa in the presence of 0.05% NuFilm P.

Redstem filaree, little malion, shepherd's purse, london rocket, hairy fleabane, and annual bluegrass were the most common weeds found in the almond orchard in Wasco (Table 2). Data in table 2 shows that weed control depended upon GreenMatch EX concentration and volume of water employed (Figs. 1, 2). All six weeds were controlled at the 15% concentration at 100 gpa. It was interesting to note that efficacy on shepherd's purse, london rocket, and hairy fleabane was higher than 92% at 10% concentration in 70 gpa. At these concentrations, GreenMatch EX performance was better than Matran EC applied at the recommended label rate.

Seven weed species were selected for the trial performed in the golf course in Fresno (Table 3). Smooth crabgrass was highly sensitive to GreenMatch EX followed by prickly lettuce and postrate spurge. Lower efficacy was detected against annual sowthistle, horse weed and flax fleabane. Interestingly, purple cudweed was not affected by GreenMatch EX, GreenMatch, and Matran EC.

TABLE 1. HERBICIDAL EFFECT (%) OF GreenMatch EX AND GreenMatch IN A PEACH ORCHARD (DAVIS, CA)

TREATMENT	5 DAT	14 DAT	31 DAT
EX 5%, 100 gpa	26.7	35.0	40.0
EX 5%, 100 gpa*	7.7	19.7	25.7
EX 5%, 60 gpa	5.3	8.0	2.7
EX 5%, 60 gpa*	1.0	2.7	24.3
EX 7.5%, 100 gpa	23.0	41.0	18.3
EX 7.5%, 100 gpa*	46.7	44.0	51.7
EX 7.5%, 60 gpa	11.0	20.7	12.0
EX 7.5%, 60 gpa*	3.3	6.0	5.7
EX 10%, 100 gpa	58.3	48.3	36.7
EX 10%, 100 gpa*	91.7	92.3	86.7
EX 10%, 60 gpa	18.3	35.0	14.3
EX 10%, 60 gpa*	38.3	49.0	25.0
GM 18%, 100 gpa	84.7	84.3	78.3
GM 18%, 100 gpa*	75.7	83.3	65.0
GM 18%, 60 gpa	29.0	44.0	35.0
GM 18%, 60 gpa*	52.3	71.7	68.3

*Nu Film P (0.05%) was added to all treatments. gpa= gallons per acre; DAT = days after treatment.
EX = GreenMatch EX; GM = GreenMatch.

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CONCLUSIONS

- GreenMatch EX shows good control of a wide variety of broadleaf and grassy weed.
- For best efficacy, GreenMatch EX should be used at 10-15% dilution and 100 gal/acre.
- Good coverage (high gpa) is important for best performance.
- Surfactant improves efficacy at high application volumes.
- Excellent control can be obtained for the following weed species: spurge, sowthistle, shepherd's purse, clover, mustard, London rocket, hairy fleabane, annual bluegrass, smooth crabgrass.