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EXPERIENCES WITH PHOTODEGRADABLE MULCHES IN FLORIDA

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Abstract. **Photodegradable plastic mulches that proved satisfactory for summer growing seasons in the north had to be modified to suit Florida full (raised) bed growing conditions. Results of large scale field evaluation in the 1979-80 season of the modified products have been satisfactory. A development project combining photodegradability with super-strength, and having a low methyl bromide transmission rate has performed excellently.**

The plastic mulch system as used in the production of vegetables in Florida has been discussed in this publication on several occasions. Water control, fertilizer placement, cultivation, and fumigation are among the advantages most discussed. The greatest disadvantage of the system is the removal and destruction of the plastic after the crop is harvested.

The usefulness of a plastic mulch is dependent upon the requirements for satisfactory field performance. Before adding photodegradation this criterion must first be considered:

(1) Dimensional stability on the roll so it unwinds in a straight line.
(2) Good quality cores that are water and crush resistant.
(3) Protected stacking on pallets to prevent blocking and flattening on shipment.
(4) Roll length, width, weight, and gauge must meet grower needs.
(5) Good tear and impact resistance to withstand the stresses encountered in the laying operation.

Once the film has been produced that satisfies these requirements, attention can be given to the aspects of degradation. Biodegradation is a word that comes to mind, but consideration must be given to the fact that to have that portion of the plastic degrade which has it held in place is not practicable. Photodegradation is the natural alternative.

In Florida plastic is laid from July through February. The ultraviolet light intensity during this time span varies greatly. The temperature during the July to October period is such that the mulch must be reflective in order to prevent the soil temperature reaching the point that the plant is destroyed as well as to protect the plastic itself. This can be achieved during manufacturing or by coating with a white paint after the plastic has been laid. A photodegradable plastic does not lend itself to being painted because it then becomes impossible to predict the time necessary for degradation. For a photodegradable plastic to survive the necessary 120 days during this period it must reflect the light as well as absorb enough to degrade. As the November-February period approaches, it is necessary that the photodegradable plastic absorb more of the light in order to increase the temperature of the soil. This dictates a change of color as well as the chemistry of the plastic. Once the plastic becomes photodegraded it is necessary that it be biodegradable so that when it is incorporated into the soil it does not become a problem.

The Ecolyte Company has developed a photodegradable mulch that does perform under Florida conditions. The film is a polymer which will totally degrade within two years after being photodegraded and incorporated into the soil. This prevents a build-up of plastics as is happening in the fields at this time. The removal cost is reduced to that which would ordinarily be spent for discing and leveling the field after the crop.

Recent developments have resulted in the production of high-barrier films have proven successful in field trials and have allowed the growers to reduce the amount of methylbromide by up to 25%. This savings, coupled with the savings of removal cost, should prove to be valuable to the grower.

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EFFECT OF CDEC AND AMOUNT OF WATER CARRIER ON CRISPHEAD LETTUCE YIELD, QUALITY AND WEED CONTROL[1]

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Abstract. **CDEC (2-chloroallyl diethyldithiocarbamate) was applied to 'Minetto' lettuce at 0, 2, 4, or 8 lb ai/A in 1978, 8 and 22 days after seeding in addition to the standard preemergence CDEC treatment (5 lb ai/A). Lettuce injury occurred when postemergence treatments were made 22 days after seeding. Treatments 8 days after seeding had little or no effect on lettuce yield and quality. Postemergence applications of CDEC enhanced weed suppression and decreased weed growth compared to lettuce treatments with only preemergence application. In 1979, CDEC at 0, 2, or 4 lb ai/A was applied postemergence in all possible combinations with 30, 60, or 90 gal water/A to 'Montello' 10 days after seeding. Postemergence treatments were made subsequent to a 4 lb ai/A application of CDEC at seeding. Yield measured by weight and number of marketable heads was not affected by CDEC rate or amount of water used in application. Mean head weight was significantly decreased by the use of 60 gal of water/A compared to 30 and 90 gal**

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of water/A. Lettuce quality was not affected by the treatments. CDEC at 2 to 4 lb ai/A as a postemergence application made 8 to 10 days subsequent to preemergence application in 30 gal water/A provided an effective means of weed control in lettuce.

CDEC (2-chloroallyl diethyldithiocarbamate) is effective for preemergence weed control in lettuce (1, 3) and is recommended for commercial plantings on organic soils in Florida (2). Its effectiveness decreases with time, particularly during periods of heavy rainfall and high temperatures. These studies were undertaken to obtain performance data of postemergence application of CDEC on weeds and crop tolerance to support registration of CDEC for lettuce.

Materials and Methods

In the spring of 1978, 'Minetto' crisphead lettuce was seeded on organic soil. CDEC (lb of active ingredient per acre) was broadcast at 5 lb/A in 48 gal/A water at 30 psi at the time of seeding (using Teejet (8003) nozzles). Eight and 22 days after seeding a subsequent application of 0, 2, 4 or 8 lb/A CDEC was made. The experimental design was a splitplot with subplots of 50 ft by 12 ft. Each plot consisted of 4 beds on 3 ft centers with 2 lettuce rows per bed. In the spring of 1979, 'Montello' crisphead lettuce was seeded. CDEC was applied at 4 lb/A at seeding. Subsequent applications of 0, 2, or 4 lb/A of CDEC were applied 10 days after seeding in 30, 60, or 90 gal water/A. Treatments were arranged in randomized blocks with 4 replications. Plots were 40 ft by 12 ft with 4 beds on 3 ft centers. Each bed had 2 lettuce rows and yields were determined from a 30 ft inside bed. In both experiments standard cultural practices were followed (2).

Results and Discussions

Since 5 lb/A CDEC was applied in the first study as a preemergence treatment at the time of seeding, very few weeds were present at the time of the first (8 days) and second postemergence application (22 days). Weed counts, made 45 days after seeding, were not significantly affected by CDEC rates (Table 1). There were significant differences due to time of application. The weeds present in the check plots (preemergence CDEC but no postemergence) were much larger than in plots with 2, 4 or 8 lb/A CDEC as a postemergence treatment. Application of CDEC 22 days after seeding was not as effective as application of CDEC 8 days after seeding in control of weeds. Weeds present were goosegrass (*Eleusine indica*), purslane (*Portulaca oleracea*) and pigweed (*Amaranthus* sp.).

Table 1. Effect of postemergence CDEC rates 8 and 22 days after seeding on weed populations, lettuce growth and yield.

Time (Days after seeding)	CDEC (lb ai/A)	No. weeds/ 90 ft²[x]	No. plants damaged[y]	No. heads harvested	Marketable (lbs)
8	0	24	2	46	57.0
	2	17	2	44	55.3
	4	41	2	42	51.6
	8	17	4	44	53.2
22	0	40	2	42	50.7
	2	30	8	41	51.0
	4	56	12	35	44.2
	8	39	19	36	43.7
Sources of variation					
CDEC rate		NS	*	NS	NS
Time of appl.		*	*	*	*
CDEC rate x time of appl.		NS	*	NS	NS

[x]Weed counts made 45 days after seeding.
[y]Plants showing phytotoxicity 34 days after CDEC application.
*Significant at .05 level of probability.

Observations made before and after postemergence CDEC applications indicate that plant phytotoxicity occurred several days after some postemergence applications. The effect of time of application, rate and their interaction on plant damage was highly significant. As the CDEC rates increased, plant damage increased. CDEC rates had no significant effect on the number of plants damaged if applied 8 days after seeding; however, when applied 22 days after seeding, the number of plants damaged increased with an increase in the rate of CDEC (Table 1). The degree of damage was moderate in all the treatments and was reversible. At harvest time, plants did not show CDEC phytotoxicity. However, some of the plants damaged earlier, particularly those treated with 8 lb/A CDEC applied 22 days after seeding, did not produce marketable heads. This was reflected in a lower percentage of plants harvested.

Since plant stand was not affected by rate or time of CDEC application, yield differences were attributed to the effect of the postemergence applications of CDEC. Rates of CDEC did not affect the number of heads or pounds of lettuce harvested. Time of application did significantly affect yields.

In the second study, preemergence application of 4 lb/A CDEC provided good weed control. The additional CDEC application postemergence 10 days after seeding enhanced weed control. The number of weeds was significantly reduced in comparison to the check plots (Table 2). Furthermore, the weeds were smaller in plots also treated postemergence with CDEC, indicating that they germinated later and/or their growth was reduced. Weed counts were especially low at this site due to previous cultural practices. Weed populations were not affected by the amount of water used in the application of the herbicide.

A postemergence application of CDEC caused some lettuce injury which was not evident by harvest. However, these observations were not consistent and check plots also had a few plants with injury symptoms. This may indicate that some of the symptoms were due to preemergence treatment or to other causes. The high postemergence rate of CDEC (4 lb/A) resulted in more damage than the check plots and the 2 lb/A rate; however, most of the plant injury symptoms disappeared within 2 weeks.

Total weight or number of marketable heads was not significantly affected by rates of CDEC or amount of carrier used in application (Table 2). Mean head weight, however, was significantly decreased by 60 gal of carrier/A as compared with 30 and 90 gal/A (Table 2). The percent of marketable heads harvested per plot was significantly affected by CDEC rate and there was a significant interaction between CDEC rate and amount of water carrier (Table 2). At 30 and 90 gal of carrier/A, percent of marketable heads harvested increased with rates of CDEC but at 60 gal/A there was a decrease at the highest rate of CDEC. This point must be clarified with further research.

The use of CDEC at 2 to 4 lb/A as a broadcast postemergence treatment 8 to 10 days after seeding, subsequent to a preemergence treatment of CDEC at the time of seeding reduces weed population and growth without affecting lettuce yields of the crop.

Table 2. Effect of postemergence CDEC rates and amounts of water carrier 10 days after seeding on lettuce yields and weed control.

Water Carrier (gal/A)	CDEC (lb ai/A)	No. weeds/ 90 ft²	Marketable (lbs)	No. heads harvested	Mean head wt. (lbs)	% Heads harvested
30	0	10	135.4	50	2.7	96
	2	7	141.7	50	2.8	98
	4	6	134.0	50	2.6	99
60	0	15	132.1	50	2.6	97
	2	7	133.9	50	2.6	99
	4	4	128.6	49	2.6	96
90	0	11	134.0	48	2.7	93
	2	7	137.6	51	2.7	98
	4	6	134.6	50	2.7	99
Sources of variation						
gal/A water		NS	NS	NS	*	NS
CDEC rate		*	NS	NS	NS	*
gal/A water x CDEC rate		NS	NS	NS	NS	*

*Significant at .05 level of probability.

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WILD RICE—A PROMISING GOURMET CROP FOR THE EVERGLADES[1]

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Additional key words. Zizania; aquatic crops; soil subsidence.

Abstract. **In our first paper on aquatic vegetable trials, we mentioned the possibility of growing wild rice on flooded Everglades farmlands, and it now appears that it may be especially desirable for rotation with vegetables, providing extra income for the farmer while permitting spring/summer flooding for pest control.**

Until 1960, this cereal was harvested from the wild, mainly in Minnesota, Wisconsin and Canada, except for a commercial "farm" in Manitoba. Successful efforts at domestication in the U. S. resulted in 900 cultivated acres (364 ha) in Minnesota in 1968 and 15,000 acres (6,073 ha) in 1980, with yields 4 to 14 times higher than those from natural stands, partly due to the selection of types semi-resistant to shattering.

Following lysimeter trials in 1977 and 1978, wild rice was field grown in small plots at the AREC-Belle Glade in 1979 and 1980. Several named selections received from the University of Minnesota were planted in February, March and April and immediately flooded to a depth of 2 to 8 in (5 to 20 cm). The grain generally was ready for harvest 70 to 75 days later, with yields ranging up to ca. 900 lb/acre (roughly 1,000 kg/ha) at ca. 9% moisture. In addition to problems such as bird loss, shattering and foliar diseases which are also observed in traditional wild rice growing areas, Everglades producers will have to acquire the equipment and knowledge needed for harvesting, processing and marketing. These requirements may not be unreasonable in view of the return that may be expected from this high-revenue, gourmet product.

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Over 100,000 acres (40,500 ha) of organic soils in the Everglades Agricultural Area are fallowed each summer as part of the normal winter vegetable and sugarcane cultural system. Many growers flood this land to control soil-borne diseases and insects, and to improve soil tilth. Flooding also reduces microbial oxidation of the organic soils, the major cause of soil subsidence. Already in some places in the EAA there is insufficient organic soil over bedrock to support traditional crops, and this acreage will increase in the future (10). For these reasons, we are interested in crops which can be grown on flooded organic soils of the Everglades (5). Wild rice appears to be such a crop.

Botanical Identification

The wild rice famed as American Indian fare and as a gourmet accompaniment for wild duck and game meats has generally been identified in the literature as *Zizania*