Project: Evaluation of Chipco Proxy for Use as a Poa Seedhead Inhibitor on Golf Course Greens and Overseeded Fairways

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Summary:

Following up on 1999 trials that demonstrated the efficacy of ethephon (Proxy) as a *Poa annua* seedhead inhibitor, six replicated field trials were conducted at four different golf course locations during 2000. Both cool season putting greens and overseeded fairways served as test sites for the continued evaluations of the seedhead inhibitory effect of ethephon, and ethephon combinations with trinexepac-ethyl (Primo). Key results include:

- The use of Proxy at rates of either 5 oz or 10 oz/1000 square feet resulted in a significant decrease in the density of *Poa annua* seedheads. This effect was observed for as long as seven weeks after a single application of Proxy.
- A single application of Proxy at 5 oz/1000 sq ft resulted in significant suppression (45-85%) of poa seedheads on golf course greens and fairways.
- There was a lag time of approximately 3 weeks before significant seedhead suppression was observed (Fig. 1,2,5,6).
- Suppression with the 5 oz rate of Proxy declined to <50% by 7 weeks after treatment (Fig. 1,2, 5,6)
- The level of seedhead suppression was positively correlated with rate, with the 3 oz rate of Proxy resulting lower suppression (10 – 55%) and the highest rate (10 oz/1000 sq ft) resulting in the highest levels of suppression (up to 97%) (Fig. 1,4,5)
- The addition of Primo (≥0.060 oz/1000 sq ft) to Proxy (5 oz/1000 sq ft) resulted in a significant increase in seedhead suppression, as well as improved turf quality on golf course greens (Fig. 2,6,8,9,10).
- When used by itself, Primo had little or no effect on seedhead suppression (Fig. 1,5)
- Embark (mefluidide) provided very good poa seedhead suppression, and is the standard product currently used for this purpose on all poa greens (Table 3). However, the product had to be applied every 3 weeks, and significant (though reversible) turf discoloration resulted. This product causes signficant damage to bentgrass and is therefore not utilized on greens containing bentgrass.
- Timing Proxy applications to target early seedhead formation (January/February in coastal and inland Southern California) appears to result in better seedhead suppression than applications made later in the season (March/April). (Fig. 11) The higher temperatures characteristic of the Low Desert may require an even earlier application initiation. Developing optimal timing strategies require further work.
- Proxy caused no discoloration or phytotoxicity on any of the turf types tested including *Poa annua,* bentgrass, perennial ryegrass and bermudagrass.

Materials and Methods:

Locations: see Table 1 below.

Experimental design and application: Plots measured 5 feet by 10 feet (greens studies) or 5 X 20 feet (fairway study) and treatments were replicated three times, in a randomized design.

Treatments were applied with a CO_2 backpack sprayer equipped with 8004 VS flat fan nozzles and delivering 0.98 gallons of water per 1000 square feet, with 30 psi at the boom. Calibration of each nozzle was confirmed prior to application to be within 5% of the desired nozzle flow rate. Boom height was 17 inches above the ground. The spray swath was 5 feet. Speed was 3 mph. Spray bottles were agitated by shaking 20 times prior to charging with compressed CO_2. Spray lines were purged with CO_2 and then water prior to changing treatments.

Seedhead production and application timing: For trials initiated in February, light seedhead production had already commenced. For trials initiated in late March or early April, there were significant seedheads (>50% of all poa plants with seedheads) present.

Evaluations: Seedhead suppression was determined for all trials conducted on greens through visual comparison with the non-treated control, with 100% representing no seedheads present, and 0% representing the level of seedheads present in the non-treated check.

Due to relatively low poa infestations in the fairway trial, accurate estimates of percent poa seedhead suppression were not feasible. Instead, poa seedhead control was estimated in the fairway trial by counting the number of clumps of Poa per plot that were producing seedheads

Data analysis: Data was subjected to analysis of variance, and treatment means were separated using Fisher's LSD, where $P<0.05$ (greens studies) or $P<0.10$ (fairway study) Percent seedhead suppression data was transformed prior to statistical analysis using the arcsine (square root of the proportion).

Products tested: See Table 2.

Table 1. Proxy Trial Locations, 2000. The numerals (1) and (2) are used to distinguish early season (1) and later season (2) trials conducted at San Diego Country Club and Del Mar Country Club.

Location	Superintendent	Turf type	Climate	Initiation Date
Mountain Vista	Nancy Dickens	Fairway: overseeded bermuda	Low Desert	2/10/00
San Diego CC (1)	Gary Dalton	Greens: poa	Coastal	2/28/00
Del Mar CC (1)	David Major	Greens: bent/poa	Coastal	2/22/00
Oak Valley GC	John Harkness	Greens: bent/poa	High Desert	2/10/00
San Diego CC (2)	Gary Dalton	Greens: poa	Coastal	4/17/00
Del Mar CC (2)	David Major	Greens: bent/poa	Coastal	3/27/00

Table 2. Products tested. Each product was applied only once per trial.

Product	Active Ingredient	oz/1000 sq ft	Locations tested
Chipco Proxy	21.7% ethephon	3	Del Mar (1), San Diego (1), Oak Valley, Mountain Vista
Chipco Proxy	21.7% ethephon	5	San Diego (1+2), Del Mar (1+2), Oak Valley, Mountain Vista
Chipco Proxy	21.7% ethephon	10	San Diego (1+2), Del Mar (1), Oak Valley, Mountain Vista
Primo Liquid	12% trinexapac-ethyl	0.125	San Diego (2), Del Mar (2)
Primo Liquid	12% trinexapac-ethyl	0.500	San Diego (1), Del Mar (1)
Embark	28% mefluidide	0.14	San Diego (1+2)
MIXTURES			
Proxy + Primo		5.0 + 0.060	Del Mar (2)
Proxy + Primo		5.0 + 0.125	San Diego (2), Del Mar (2)
Proxy + Primo		5.0 + 0.250	Del Mar (2)
Proxy + Primo		5.0 + 0.500	San Diego (1), Del Mar (2)

Results

Table 3: San Diego Country Club, trial 1. One application made on 2/28/00 to Poa annua putting green. The best performing treatments on each date are highlighted in yellow. Treatment means were separated using Fisher's LSD, where P<0.05.

Product	Rate: oz/1000 sq ft	3/13 2 WAT	3/20 3 WAT	4/10 6 WAT	4/17 7 WAT
No treatment	---	0.0	0.0 d	0.0 e	0.0 d
Chipco Proxy	3.0	27.3	55.0 c	41.7 c	36.7 ab
Chipco Proxy	5.0	39.4	76.7 b	45.0 c	23.3 bc
Chipco Proxy	10.0	25.9	96.0 a	76.7 a	70.0 a
Primo	0.5	24.1	3.3 d	0.0 e	0.0 d
Proxy + Primo	5.0 + 0.5	30.6	97.0 a	53.3 b	33.3 bc
Embark 2S	0.14	42.6	85.0 b	30.0 d	6.7 cd

Figure 1: San Diego Country Club, Trial 1. Proxy activity lasted as long as 7 weeks. Primo provided minimal seedhead control.

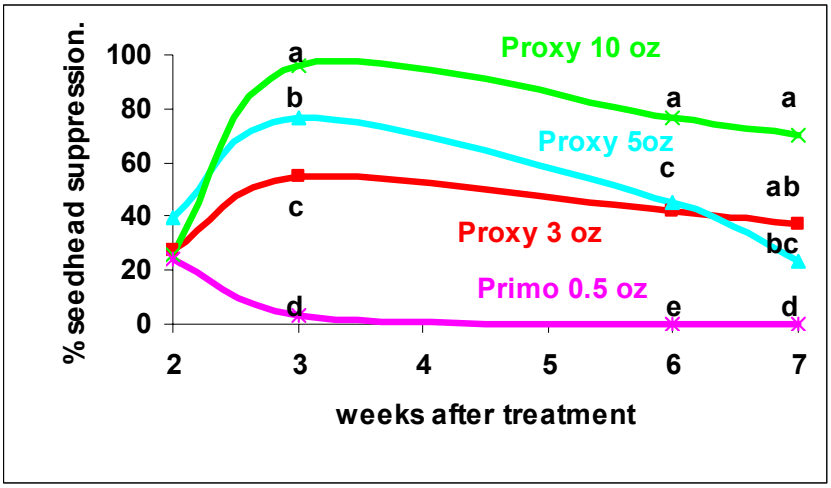


Figure 2: San Diego Country Club, Trial 1. The addition of Primo to Proxy caused a significant increase in seedhead suppression.

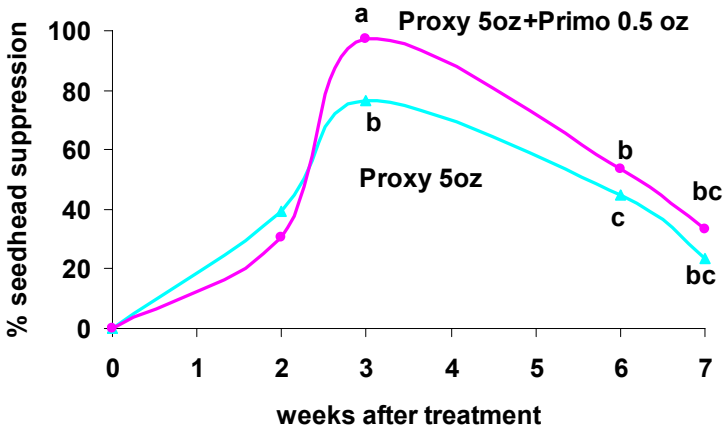


Table 4: San Diego Country Club, Trial 2. All products applied 4/17/00. Embark re-applied 5/4/00. All products were applied in same plot areas as for Trial 1. The best performing treatments are highlighted in yellow. Treatment means were separated using Fisher's LSD, where P<0.05.

		% seedhead suppression		Turf quality	
Product	Rate: oz/1000 sq ft	5/4/00 2.5 WAT	5/22/00 5 WAT	5/4/00 2.5 WAT	5/22/00 5 WAT
No treatment	---	0.0a	0.0a	6.7ab	6.2d
Chipco Proxy	3.0	30.0b	10.0b	7.2a	6.3cd
Chipco Proxy	5.0	53.3c	43.3c	7.0ab	6.8b
Chipco Proxy	10.0	40.0bc	38.3c	7.3a	6.7bc
Primo	0.125	0.0a	0.0a	6.0b	6.0d
Proxy + Primo	5.0 + 0.125	58.3c	16.7b	7.5a	6.3c
Embark 2S	0.14	30.0b	95.0d	7.2a	8.0a

Figure 3: San Diego Country Club, Trial 2. Seedhead suppression was lower than for trials initiated in February. Embark provided excellent seedhead control, but some discoloration resulted. In addition, Embark was applied twice (every 3 weeks), while Proxy was applied only once.

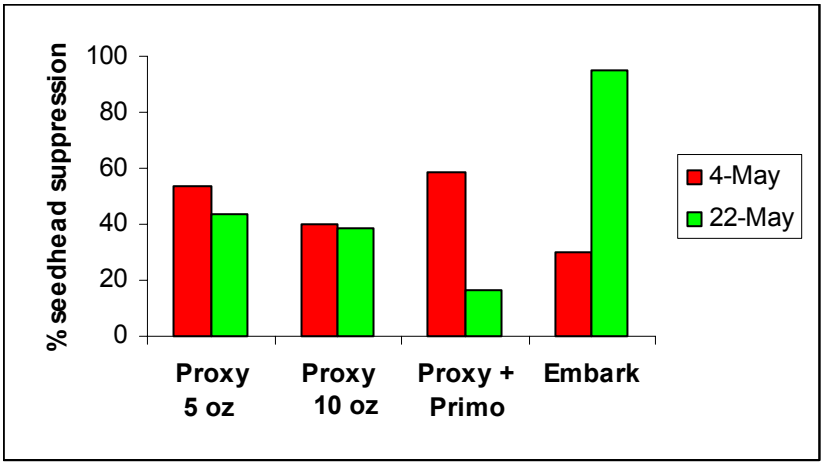


Table 5: Oak Valley Golf Course. One application made to bent/poa green on 2/10/00. The best performing treatments on each date are highlighted in yellow. There was approximately 1/8" rain on 2/10, 1 hour after application which did not appear to affect efficacy of Proxy. Treatment means were separated using Fisher's LSD, where P<0.05.

		Percent seedhead suppression	
Product	Rate: oz/1000 sq ft	3/15 5 WAT	4/7 8 WAT
No treatment	---	0.0 d	0.0 b
Chipco Proxy	3.0	53.3 b	40.0 a
Chipco Proxy	5.0	65.0 ab	30.0 a
Chipco Proxy	10.0	76.7 ab	43.3 a
Primo	0.5	16.7 c	0.0 b
Proxy + Primo	5.0 + 0.5	85.0 a	6.7 b

Figure 4: Oak Valley Golf Course. Percent seedhead suppression, 3/15/00 (5 weeks after treatment)

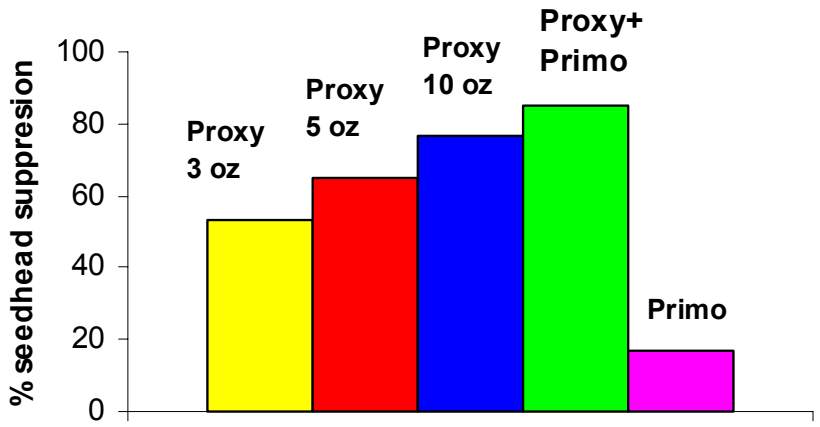


Table 6: Del Mar Country Club, Trial 1. One application of each treatment was made to the bent/poa green on 2/22/00. The best performing treatments on each date are highlighted in yellow. Treatment means were separated using Fisher's LSD, where P<0.05.

		Percent seedhead suppression		
Product	Rate: oz/1000 sq ft	3/20 4 WAT	3/27 5 WAT	4/10 8 WAT
No treatment	---	0.0 e	0.0 d	0.0 b
Chipco Proxy	3.0	40.0 c	20.0 c	3.3 b
Chipco Proxy	5.0	68.3 b	75.0 b	15.0 a
Chipco Proxy	10.0	82.7 ab	97.0 a	16.7 a
Primo	0.5	13.3 d	6.7 cd	0.0 b
Proxy + Primo	5.0 + 0.5	96.0 a	83.3 ab	3.3 b

Figure 5: Del Mar Country Club, trial 1.

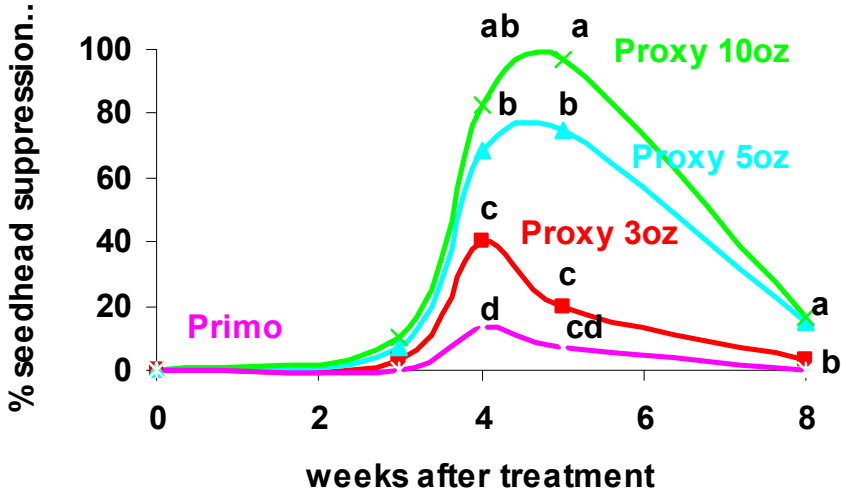


Figure 6: Del Mar Country Club, trial 1. The addition of Primo to Proxy caused a significant increase in seedhead suppression.

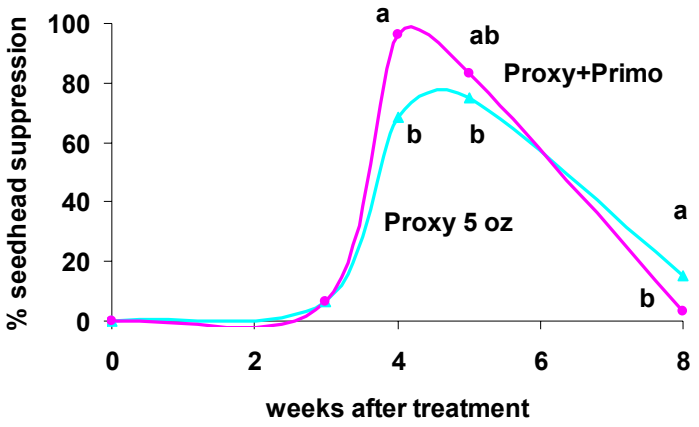


Figure 7: Del Mar country Club, Trial 2. Proxy was applied on 3/27/00. Photo was taken 3 weeks later, on 4/17/00.

Figure 8: Del Mar Country Club, trial 2. Proxy plus Primo was applied 3/27/00. Photo was taken 3 weeks later, on 4/17/00.

Table 7: Del Mar Country Club, trial 2. All products applied 3/27/00. The best performing treatments are highlighted in yellow. Treatment means were separated using Fisher's LSD, where P<0.05. By 5/4/00 (5.5 WAT), there was minimal poa present in the non-treated check, and no obvious differences among treatments.

		% seedhead suppression	
Product	Rate: oz/1000 sq ft	4/10/00 2 WAT	4/17/00 3 WAT
No treatment	---	0.0c	0.0c
Chipco Proxy	5.0	36.7b	30.0b
Chipco Proxy + Primo	5.0 + 0.06	53.3ab	68.3a
Chipco Proxy + Primo	5.0 + 0.125	56.7a	83.3a
Chipco Proxy + Primo	5.0 + 0.250	63.3a	80.0a
Primo	0.125	0.0c	0.0c

Figure 9: Del Mar Country Club, trial 2. Poa seedhead suppression efficacy, as influenced by the addition of Primo at three different rates to Proxy (5 oz/1000 sq ft). Products were applied on 3/27/00 and evaluations made two and three weeks after treatment. Treatments with a blue asterisk had significantly higher poa seedhead suppression (p<0.05) than Proxy alone on a given date.

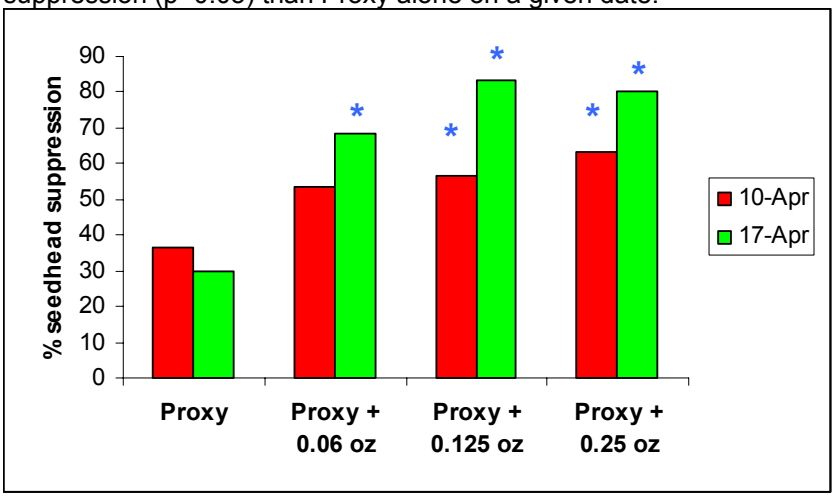


Figure 10: Del Mar Country Club, Trial 2.. The influence of the addition of various rates of Primo Liquid on poa seedhead suppression with Proxy (5 oz/1000 sq ft). Application made April 17, 2000. Note that the only significant difference observed was between Proxy without Primo vs. Proxy with any rate of Primo. Thus, even the lowest rate of Primo tested (0.060 oz/1000) was sufficient to increase Proxy performance.

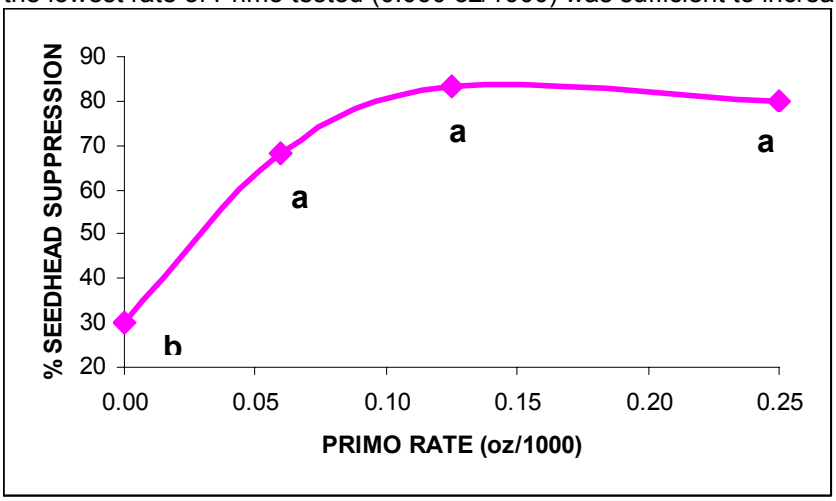
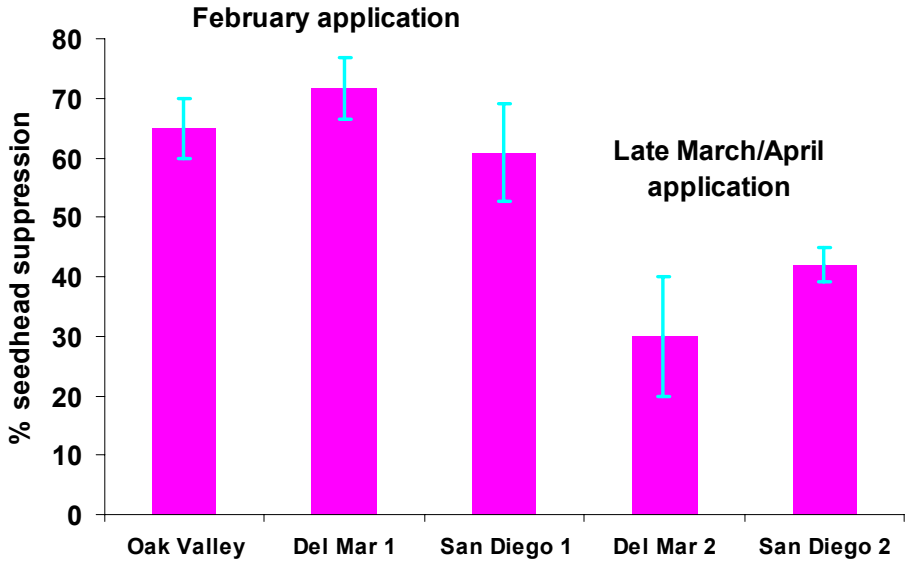


Table 8: Sun City, Palm Desert. Poa control on overseeded fairway turf. Fairways were overseeded with perennial ryegrass 10/1/99. AO = after overseeding. BO = before overseeding. Poa control was estimated by counting the number of clumps o per plot that were producing seedheads (#SH). The best performing treatments are highlighted in yellow. (LSD, P<0.10). Pro not perform optimally in this trial, possibly due to warmer temperatures and more mature poa plants at this Low Desert locatio

				Mean # Poa clumps with seedheads	
Product	**Rate**	**Timing**	**Application Dates**	**3/3/00**	**3/15/00**
Prograss	0.5 ga/A	1 November, 1 December app	11/30/99, 12/21/99	0.0a	0a
Barricade	1 lb/A	6 wk BO	8/19/99	0.0a	0a
No treatment				15.3b	16.0bc
Prograss	0.5 ga/A	1 January app	2/10/00	1.3a	2.3ab
Prograss	0.5 ga/A	1 December, 1 January app	12/21/99, 2/10/00	0.0a	0a
Prograss	0.5 ga/A	1 December app	12/21/99	0.3a	0.3a
Prograss	0.5 ga/A	1 November app	11/30/99	0.3a	0.3a
Proxy	5 oz/1000	1 February app	2/10/00	4.0a	13.3ab
Proxy	3 oz/1000	1 February app	2/10/00	13.7b	28.0c
Proxy	10 oz/1000	1 February app	2/10/00	7.3ab	8.7ab

Figure 11: Summary of performance on greens. When Proxy performance at the 5 oz/1000 sq ft rate was averaged for each location (Proxy rate tested was 5 oz/1000 sq ft), a trend towards better performance from applications made earlier in the year emerged. Percent suppression = mean value (± SE) for readings taken 3-6 weeks after treatment.



Conclusions:

- Proxy, used either alone or in combination with Primo, provides good to excellent suppression of poa seedheads, without causing damage to turf on greens or fairways.
- When Primo Liquid was added to Proxy, even rates as low as 0.06 oz/1000 sq feet resulted in a significant improvement in seedhead suppression. This is despite the fact that Primo alone had almost no effect on seedhead suppression. In addition to apparently synergizing the seedhead suppression mechanism, turf

quality was improved (in terms of darker color and greater density) when Primo was added to Proxy, due to the unique growth regulating effects of Primo.

- Proxy has several advantages when compared against two other growth regulators used for poa management. In contrast to Primo, Proxy demonstrated far better poa seedhead suppression, and no phytotoxicity or discoloration. In contrast to Embark, Proxy demonstrated significantly better safety to turf, as well as longer residual activity.
- The application initiation date appears to have a large impact on Proxy performance. This requires further investigation for optimal performance (Fig. 11). This is because decreased seedhead suppression appears to occur under warmer conditions and/or later in the season. This requires further investigation
- The benefits of follow up applications of Proxy every 4-6 weeks during the Poa annua seedhead production season requires further study.