SOME EFFECTS OF CYCOCEL AND ETHREL ON MATURITY, YIELD AND KEEPING QUALITY OF ONIONS. *(Allium cepa L.)*

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SUMMARY

This paper reports experiments with cycocel and ethrel on onion maturity, yield and keeping quality.

Cycocel applied at rates between 0.25 M and 1.0 M as a seed soak before sowing caused plants to mature up to 10 days earlier than untreated plants, without affecting yield or keeping quality. The effect on maturity was most marked in early sowings and in years when weather conditions were not favourable for early maturity. Ethrel applied by spraying at rates between 500 ppm and 10000 ppm sometimes caused earlier maturity, but yield was considerably reduced and bulb quality was poorer in treated plants.

INTRODUCTION

Onions are becoming an important export crop for New Zealand. One of the most important export markets is Japan, for which onions are required in January, a time that demands earlier harvest than is normal for most onions grown in this country.

The observations that the growth regulating chemicals cycocel (2 chloroethyl trimethyl ammonium chloride) can accelerate maturity in some species (Cathey 1964) and ethrel (2 chloroethane phosphonic acid) can accelerate bulbing in ionions (Levy and Kedar 1970, Montano 1971), suggested that their application to onions could be potentially useful for hastening maturity.

METHODS

In all experiments six replicates of each treatment were used. Plot size was 2.97 m^2. Rows were 30 cm apart, with plants 7.5 cm apart in the rows.

Plots were recorded as mature when 50% of the tops had fallen over. Yield was recorded after the bulbs had been dried. Bulbs were stored for nine months in keeping tests.

Temperature and rainfall were taken from the meteorological station located at Levin Horticultural Research Centre.

Cycocel Experiments:

Seed of cultivars Pukekohe Longkeeper, Porters Early Globe, and New Zealand Hybrid 30 was soaked in cycocel 0M, 0.25 M, 0.5 M and 1.0 M overnight and then dried out sufficiently before sowing. Sowings were made within three days of 10 June and 25 August in 1968, 1969, 1970 and 1971. Time of maturity and yield data were recorded from each sowing. Storage results were recorded from 1968 and 1969 sowings only.

Ethrel Experiments:

Two experiments using c.v. Pukekohe Longkeeper, one sown on 10.6.70 and the other on 26.8.70 were carried out in the 1970-71 season. In each experiment ethrel at concentrations of 0ppm, 500 ppm, 1000 ppm, 5000 ppm and 10000 ppm was applied by spraying to run off either two, four or six times at weekly intervals when plants had four true leaves. Time of maturity, yield and storage data were recorded.

In the 1971-72 season two experiments using c.v. Pukekohe Longkeeper were sown on 10.6.71. There were seven treatments in the first experiment, applying ethrel at various times until the plants had four true leaves. The treatments were -

1. Untreated seed.

2. Seed soaked in water before sowing.

3. Seed soaked in 500 ppm ethrel, and the emerged plants sprayed twice at weekly intervals soon after germination with 500 ppm ethrel.

4. Plants with one true leaf sprayed with 500 ppm ethrel three times at weekly intervals.

5. Plants with two true leaves similarly treated.

6. Plants with three true leaves similarly treated.

7. Plants with four true leaves similarly treated.

In the second experiment ethrel treatments started at approximately the time those in the 1970-71 season finished. Plants were sprayed to run off with 5000 ppm or 10000 ppm ethrel nine, six or three weeks before the expected time of maturity. Control plots were sprayed with water.

In the 1971-72 season only maturity and yield results were recorded.

RESULTS AND DISCUSSION

Cycocel Experiments:

(1) Time of Maturity.

Tables 1 and 2 give the time to maturity, the number of days from sowing to when 50% of the tops fell, in the June and August sowings in each year.

From these tables it can be concluded that:-

1. Earlier maturity was obtained in treated plants of c.v. Pukekohe Longkeeper more consistently than the other two cultivars.

2. The difference in time of maturity between treated and untreated plants was greater each year, with the exception of 1968, in June than in August sowings.

3. All concentrations of cycocel were about equally effective in producing earlier maturity.

4. Untreated plants matured later in 1968 and 1971 than in 1969 or 1970. Later maturity occurred when the weather was colder and wetter.

5. When untreated plants matured earlier, the effect of cycocel treatment was not as marked overall as in years when untreated plants matured ~~earlier~~ later.

TABLE 1 : TIME TO MATURITY (DAYS FROM SOWING)
JUNE SOWINGS 1968-71

Cultivar	Cycocel	1968	1969	1970	1971	Mean
PLK	0 M	222	205	206	221	214
	0.25 M	216**	198**	199**	217	208
	0.5 M	216**	198**	198**	216**	207
	1.0 M	216**	198**	200**	216**	207
Porters	0 M	210	194	194	213	203
	0.25 M	198**	190**	194	205**	197
	0.5 M	200**	191**	194	205**	198
	1.0 M	206*	190**	193	205**	199
Hybrid 30	0 M	215	194	197	216	206
	0.25 M	208**	194	196	205**	201
	0.5 M	210**	194	195	206**	201
	1.0 M	214	194	197	207	203

Maturity significantly earlier than untreated at 5% (*) or 1% (**) level.

6. Plants treated with cycocel matured at very nearly the same time, irrespective of the concentration used. The seed soak may therefore be having some physical effect early on in the life of the plant which ultimately causes earlier maturity. No difference in time of germination or percentage germination between treated and untreated seed was noted. The introduction of a small amount of chemical to the seed could also be having some yet unexplained effect on maturity. An investigation soaking onion seed in cycocel for longer than was done for these experiments would appear to be warranted.

It is suggested that cycocel could be applied to any onion crop as an insurance against possible late maturity, because of the ease with which it can be applied.

The time of maturity in treated plants of a recognised late cultivar, Pukekohe Longkeeper, was the same as the time of maturity in a recognised early cultivar, N.Z. Hybrid 30, in the June sowings of 1968 and 1971 (Table 1) and in the August sowing of 1968 (Table 2). The effect of cycocel in causing earlier maturity can therefore be considered commercially significant.

TABLE 2 : TIME TO MATURITY (DAYS FROM SOWING)
AUGUST SOWINGS 1968-71

Cultivar	Cycocel	1968	1969	1970	1971	Mean
PLK	0 M	168	142	147	140	149
	0.25 M	158**	140*	146	137*	145
	0.5 M	164*	140*	142*	138*	146
	1.0 M	162**	140*	143*	136*	145
Porters	0 M	154	126	128	133	135
	0.25 M	143**	126	128	133	133
	0.5 M	146**	126	127	133	133
	1.0 M	150*	126	128	134	135
Hybrid 30	0 M	158	126	136	134	139
	0.25 M	151**	126	136	132	136
	0.5 M	152**	126	136	133	137
	1.0 M	154*	126	136	133	137

Maturity significantly earlier at the 5% (*) or 1% (**) level.

TABLE 3 : YIELD (T/ha) FROM JUNE SOWINGS. MEAN YIELDS FROM ALL YEARS IN JUNE AND AUGUST SOWINGS. 1968-71.

Cultivar		1968	1969	1970	1971	June Mean	August Mean
PLK	0 M	79.6	75.3	60.3	39.2	63.6	67.2
	0.25 M	70.9	72.6	63.7	38.7	61.6	62.0
	0.5 M	69.8	78.1	60.2	40.8	62.2	64.8
	1.0 M	87.3	85.7*	62.8	47.8	70.9	65.8
Porters	0 M	49.4	79.7	55.8	34.0	54.7	47.6
	0.25 M	46.0	70.0*	58.5	43.3	54.5	48.3
	0.5 M	44.7	67.6**	55.4	45.7	53.3	49.3
	1.0 M	49.6	77.1	57.1	47.7	57.8	53.0
H 30	0 M	88.8	77.0	54.5	42.1	65.6	61.2
	0.25 M	71.4	74.1	56.2	41.9	60.9	61.8
	0.5 M	81.3	73.9	54.4	41.8	62.8	59.8
	1.0 M	85.5	73.6	56.2	43.5	64.7	59.4

Yield significantly different from untreated at 5% (*) or 1% (**) level.

TABLE 4 : PERCENTAGE OF SOUND BULBS LEFT AFTER NINE MONTHS IN STORE.
JUNE AND AUGUST SOWINGS. 1968-1969.

Cultivar		June Sowing			August Sowing		
		1968	1969	Mean	1968	1969	Mean
Plk	0 M	6.8	51.7	29.3	16.2	44.2	30.2
	0.25 M	13.7	59.9	36.8	21.1	55.8	38.5
	0.5 M	6.7	56.0	31.4	17.2	54.8	35.5
	1.0 M	9.6	64.4	36.5	18.9	60.4	39.7
Porters	0 M	13.8	65.5	39.7	10.0	46.0	28.0
	0.25 M	12.6	62.8	37.7	19.5	57.5	38.5
	0.5 M	13.0	67.2	40.1	21.6	60.0	40.8
	1.0 M	18.3	58.8	38.6	11.3	53.3	32.3
H 30	0 M	12.5	77.9	45.2	21.5	65.2	43.4
	0.25 M	21.1	83.9	52.5	19.1	67.7	43.4
	0.5 M	16.0	79.1	47.6	26.9	74.8	50.9
	1.0 M	13.1	80.5	46.8	19.8	75.3	47.6

(2) Yield:

Although yield varied from year to year in each cultivar there were, except in the June 1969 sowing, no significant differences in yield of treated and untreated plants (Table 3). The mean yield over four years in both sowings tended to be slightly lower in plants treated with 0.25 M and 0.5 M cycocel than those treated with 0 M and 1.0 M cycocel (Table 3).

(3) Keeping Quality:

Bulbs kept better from the 1969 sowing than from the 1968 sowing (Table 4). There were no significant differences in keeping quality between treated and untreated plants (Table 4).

Ethrel Experiments:

Ethrel treatment led to earlier maturity, six to ten days earlier in treated compared with untreated plants, when it was applied at 500 ppm or 1000 ppm at the three or four leaf stage, or at 5000 ppm or 10000 ppm three weeks before the expected time of maturity. All other treatments caused either no difference or a delay in time of maturity.

Yield in plants treated with concentrations above 500 ppm was always significantly lower than in untreated plants. In bulbs of treated plants, the outer leaf bases developed into thick scales, giving the bulbs a poorer appearance than untreated bulbs. Keeping quality was similar in treated and untreated plants.

Thus, although ethrel application at certain times and at certain concentrations caused maturity to be earlier, the reduction in yield and the poorer quality of the bulbs after treatment, limits its use in accelerating onion maturity.

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