

ETHREL EFFECTS ON SEX EXPRESSION, AND

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Total femaleness of flowers induced by applications of the plant growth regulator Ethrel resulted in smaller plant size, higher plant populations, and earlier maturity—all important factors in once-over mechanical harvesting of cucumbers for pickling.

THE NEW CHEMICAL, Ethrel (2-chloroethane phosphonic acid), is one of a new class of plant growth regulators which produces a variety of hormone-type responses in pickling cucumbers and other plants. Responses vary with the species of plant, the concentration of the chemical, and the time of application to one or more

of the customary growth sites (roots, buds, leaves, stems, flowers, or fruit). The ethylene released to these plant tissues by the chemical produces various physiological effects, and can be utilized to regulate various phases of plant metabolism, growth, and development.

The effects of Ethrel on sex expression and plant growth in pickling cucumbers were especially notable in both field and greenhouse experiments conducted at the University of California, Davis in 1968. The varieties SMR-58 (monoecious) and Piccadilly (gynoecious) were used in the field experiments and SMR-58 was used in the greenhouse experiments. A true gynoecious plant produces only female flowers. Several of the new gynoecious hybrids grown under commercial field conditions have produced up to 50 per cent

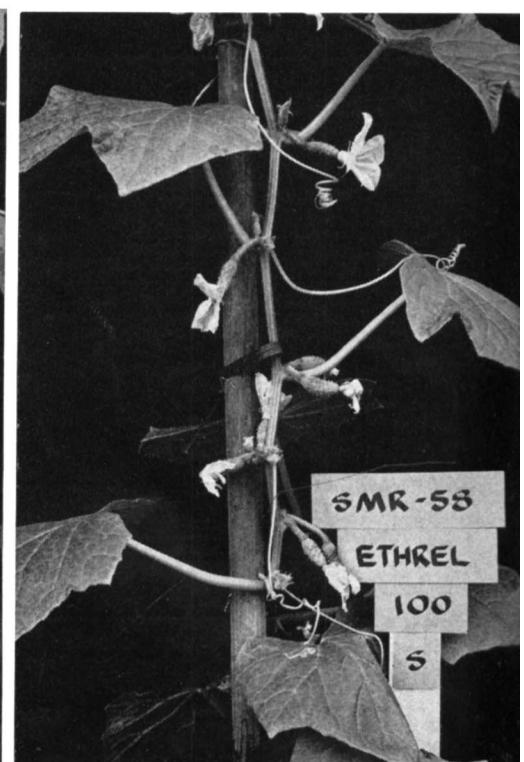
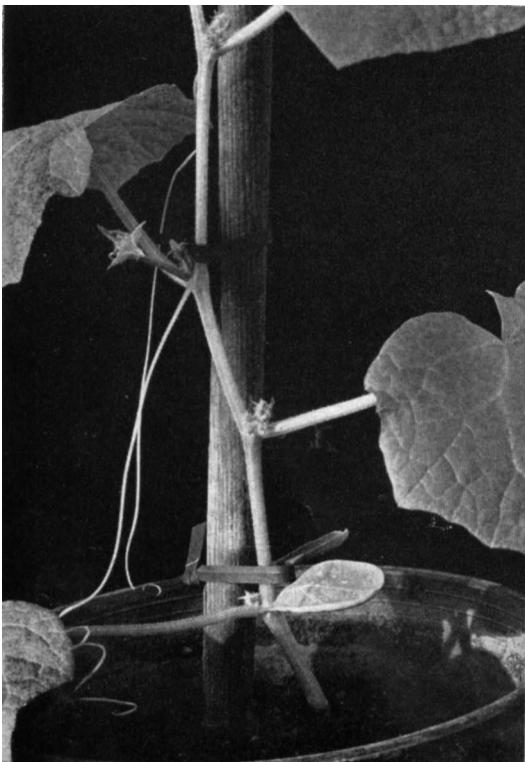
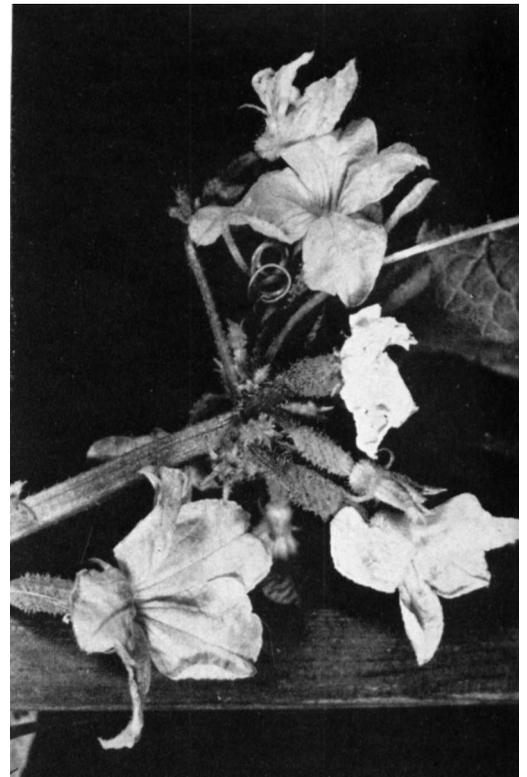
male flowers. This may have been partly because of such environmental conditions as temperature and length of day. When Ethrel was applied to young cucumber seedlings at the first fully expanded true-leaf stage, femaleness was induced in

TABLE 1. SUMMARY OF GREENHOUSE EXPERIMENTS SHOWING EFFECTS OF ETHREL ON SEX EXPRESSION IN MONOECIOUS PICKLING CUCUMBER VARIETY SMR-58

Node No.	Treatment					
	1	2	3	4	5	6
1	F	F	F	F	F	M
2	F	F	F	F	F	M
3	F	F	F	F	F	M
4	F	F	F	F	F	M
5	F	F	F	F	F	M
6	F	F	F	F	F	F*
7	F	F	F	F	F	M*
8	F*	F	F	F	F	M
9	F*	F	F	F	F	M*
10	F*	F	F	F	F	M*
11	F*	F	F	F		M
12	F*	F	F*			M
13		F	F*			M
14		F				F
15		F				

* Occasional flower of the opposite sex occurred at this node.

Multiple fruits (photo right, and cover) resulting from application of higher rates (250 ppm) of Ethrel in tests with pickling cucumbers at University of California, Davis. Photo left below, check plant showing usual male flowers at node axils, and normal internode length. Photo below center, result of 100 ppm Ethrel in a single application (treatment 3) showing female flowers at each node axil and shortened internode. Photo right below, complete femaleness evident on SMR-58 pickling cucumber variety (monoecious) resulting from a single application of Ethrel (100 ppm).



GROWTH DEVELOPMENT IN PICKLING CUCUMBERS

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both the monoecious variety and in the gynoeceous hybrid, and the size of the plant was reduced by a shortening of the internodes.

Greenhouse experiments

The greenhouse experiment consisted of five treatments with Ethrel and one check plot. Rates of applications were: (1) 50 ppm (one application), (2) 50 ppm (two applications), (3) 100 ppm (one application), (4) 100 ppm (two applications), (5) 250 ppm (one application), and (6) the check plot.

Each treatment consisted of 10 plants of the pickling cucumber variety SMR-58. Seeds were sown in 8-inch plastic pots containing a greenhouse soil mix. Plants were later thinned at the cotyledon stage to a single plant per pot. Seedlings emerged in five days. The first Ethrel treatments were applied when the first

true-leaf was fully expanded, and a second application was made six days later (treatments 2 and 4). The plants were sprayed to runoff.

Male flowers

Normally, the variety SMR-58, which is a monoecious plant, will produce male flowers at the first five or six nodes and then will start producing a certain ratio of female-to-male flowers depending on environmental conditions. The Ethrel-treated plants developed no male flowers until after the eighth node, when the effect of single applications at both 50 ppm and 100 ppm began to wear off (table 1). Normal behavior of a monoecious pickling cucumber plant is indicated in treatment 6, the check plot. The first laterals developed at varying points between the 2nd and 5th nodes. The first node on

laterals in treatments 2, 4, 5 and 6 produced female flowers and in treatments 1 and 3 produced male flowers. Multiple female flowers (as high as 9) formed at several nodes when higher concentrations of the chemical were used.

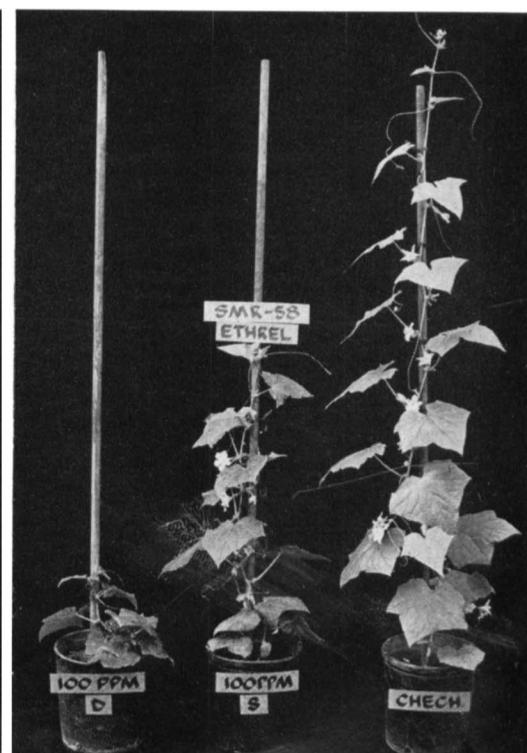
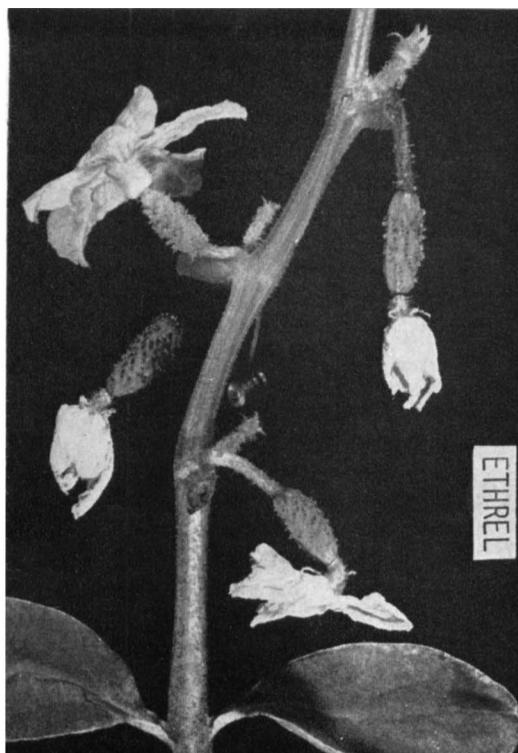
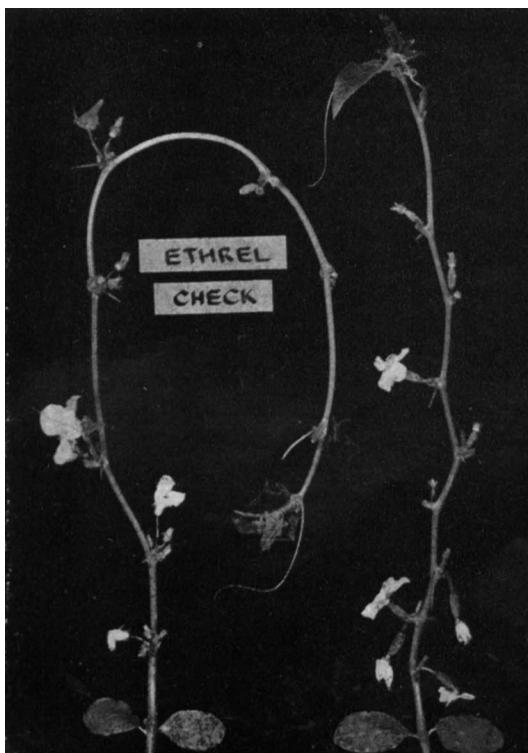
Lasting effect

The experiment was discontinued 46 days after emergence (two weeks after the first blossoms had opened). The average length of internodes and length of vine for various portions of the main stem are shown in table 2. The lasting effect of the concentration is also clearly demonstrated at the transitional lengthening of the internode. The plants in treatments 4 and 5 began to show dwarfism, and plants in treatments 1, 2 and 3 began to show shortened internodes within one week after treatment. The plants in treatment

TABLE 2. SUMMARY OF GREENHOUSE EXPERIMENTS SHOWING EFFECTS OF ETHREL TREATMENT ON LENGTH OF INTERNODES FOR VARIOUS SECTIONS OF THE MAIN STEM AND LENGTH OF VINE IN PICKLING CUCUMBERS

Treatment	Shortened internodes		Transition internodes		'Normal' internodes		Vine Ave. length
	Nodes	Ave. length inches	Nodes	Ave. length inches	Nodes	Ave. length inches	
1	1-6	1.60	6-12	2.30	12 →	3.50	52.7
2	1-8	0.70	8-13	1.40	13-15	2.81	22.5
3	1-7	1.25	7-10	2.33	10-11	3.25	30.5
4	1-6	0.31	6-10	1.38	7-8	2.44	14.2
5	1-6	0.50	6-8	1.50	8-9	3.00	21.0
6					varied from 3" to 4.5" throughout growth		56.2

Photo below, check plant to left, showing usual length of pickling cucumber plant at this stage, as compared with shortened plant to right resulting from a single application of Ethrel (100 ppm). Photo below center, closeup of Ethrel-treated vine in left photo, showing flowers. Photo below right, dwarfing of plant on left resulted from double application of Ethrel at 100 ppm, compared with center plant treated with a single application, and check plant with no treatment to right.



4 remained dwarfed and stunted for several weeks and developed abnormally small and misshapen leaves.

Field tests

The field tests consisted of two experiments. In the first experiment the treatments included Ethrel applications at (1) 250 ppm, and (2) 500 ppm; as well as the (3) check plot. Treatments 1 and 2 received two applications of Ethrel (66-329). The first application was made at the time of the first fully expanded true leaf and the second application was made one week later. The plant variety was SMR-58 (monoecious). There were 12 plants in each treatment and each treatment was replicated three times. The plants were thinned to 5 inches between single plants.

The Ethrel treatments produced complete femaleness. The 500 ppm concentration was too high and caused dwarfism, and abortion of flowers at the first three nodes. It was also concluded that a double application of 250 ppm was too high, as indicated by length of vine (growth). A second field experiment was designed consisting of five treatments and the check plot: (1) check, (2) 250 ppm (one application), (3) 100 ppm (one application), (4) 100 ppm (two applications), (5) 50 ppm (one application), and (6) 50 ppm (two applications).

Piccadilly

The variety used was Piccadilly (a gynoeocious hybrid). The timing of applications, number of plants per treatment and replications were the same as in the first field experiment. The experiment was terminated after the formation of the eighth node—due to a late planting. The effect of Ethrel on sex expression was the same as in the other experiments in that femaleness was induced in all treatments. Plant size was also reduced with treatment and dwarfism was produced by the doubled 100 ppm application rate (treatment 4). Results of the second field experiment were as follows:

Treatment	Average No. female flowers	Average No. male flowers	Average length of vine inches
1	2.1	5.3	13.5
2	8	0	9.5
3	8	0	10.5
4	8	0	10.1
5	6.4	1.1	12.7
6	8	0	10.2

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MONTEZUMA

OAT VARIETY

produces high test weight, and good yields

C. A. SUNESON • C. O. QUALSET • J. D. PRATO

J. T. FEATHER • W. H. ISOM

HIGH TEST WEIGHT and good grain yield can both be obtained by California's oat growers with Montezuma, a new oat variety released by the University of California Agricultural Experiment Station at Davis in cooperation with the U. S. Department of Agriculture.

High quality

Montezuma's test weight, consistently high compared with other oat varieties fall-planted in California, indicates that this variety has high-quality grain with a relatively low amount of crude fiber. Test weight (in pounds per bushel) is a measure of kernel plumpness and Montezuma has shown a 16 per cent higher test weight than Sierra in three years of experiments (table 1). One reason for the high test weight of Montezuma is its relatively high proportion of large, plump kernels compared with both Curt and Sierra (see photo). The variety Kanota also has a high test weight, but, unlike Montezuma, it is susceptible to shattering.

Montezuma is suitable for direct combine harvesting.

Montezuma (formerly CAS 5022) was selected in 1965 from a group of 88 lines derived from oat Composite Cross II which involved crosses of cultivated oats with wild oats (*Avena fatua* L.). Described as a spring type red oat, Montezuma's early growth habit is semi-prostrate with a high tillering capacity. The leaf blades are mid-wide, panicle type, mid-sized, and equilaterally compact with matured lemmas mid-long to long. It has numerous spikelets per panicle and awns are common on the primary florets.

Grain yield

The average grain yield of the new variety was 3,460 lbs per acre after three years of testing compared with 3230 lbs for Sierra and 3140 lbs for the Curt variety. Yield data by location are summarized in table 1.

The relative maturity and phenotypic characteristics of Montezuma compared