ETHREL FOR BREAKING DORMANCY OF STRAWBERRY SEEDS*

C. P. A. IYER, ELIAS K. CHACKO AND M. D. SUBRAMANIAM

Institute of Horticultural Research (ICAR), 255, Upper Palace Orchards, Bangalore-6

FRESHLY harvested seeds of strawberry are in a state of dormancy and their rate of germination is extremely slow taking months to complete germination. Consequently, in addition to the total time lag, hybrid seedlings thus obtained from same crosses tend to be of different ages, complicating correct assessment. Although considerable work has been done to overcome the dormancy and to speed up the germination of strawberry seeds (Borgaman, 1950; Scott and Ink, 1955; Bringhurst and Voth, 1950; Adam and Wilson, 1967; Thompson, 1969), Thompson (1969) has rightly pointed out that most of the chemical treatments so far tried gave erratic results and could not replace the usual low temperature stratification. On the basis of his extensive studies, Thompson (1969) recommended stratification of strawberry seeds at 2° C. for 6 to 8 weeks which gave 80% germination within 14 days after sowing. This procedure would necessitate waiting for nearly 10 weeks from the time of extraction of achenes for obtaining hybrid seedlings. The present study was, therefore, taken up to find out more efficient and faster means for breaking the dormancy of strawberry seeds.

Fruits of the cultivar Gorella, introduced from Netherlands, were used for the seed germination study. The usual procedure of separating the seeds from the pulp by disintegration using a blender followed by decantation was employed. Three chemicals, namely, Gibberellic acid (25, 50 and 75 ppm), Thiourea (0·1 and 0·2%) and Ethrel (1,000, 2,500 and 5,000 ppm) were used in the study. Seeds were soaked for 24 hours in chemical solutions and distilled water for treatments and control respectively. These were washed with distilled water before they were sown in petri dishes on moist filter-paper kept at room temperature (20–22° C.). The filter-papers were kept moist by adding few drops of distilled water everyday. Three replications of 20 achenes were taken for each treatment. Visible emergence of the radicle was taken as the criterion of germination and counts were made everyday taking out the germinated achenes and planting them elsewhere.

The extent of germination under different treatments is given in Table I. The results show that, in general, all the chemical treatments stimulated seed germination as compared to control. However, the most outstanding results were obtained in case of seeds treated with Ethrel.

Pre-treatment with Ethrel at the three concentrations used, *viz.*, 1,000, 2,500 and 5,000 ppm induced 30, 50 and 90% germination

TABLE I

Effect of different chemical treatments on strawberry (c.v. Gorella) seed germination

Treatment	Concentration	Cumulative percentage of germination*					
		Within 5 days	Within 10 days	Within 15 days	Within 20 days	Within 25 days	Within 30 days
1. Control ..		..	..	5·0	10·0	10·0	20·0
2. Thiourea ..	0·1%	..	5·0	20·0	35·0	35·0	45·0
	0·2%	..	10·0	10·0	20·0	20·0	30·0
3. Gibberellic acid ..	25 ppm	..	5·0	15·0	25·0	25·0	25·0
	50 ,,	..	10·0	20·0	25·0	25·0	35·0
	75 ,,	..	10·0	10·0	30·0	30·0	30·0
4. Ethrel ..	1,000 ,,	..	10·0	15·0	20·0	30·0	30·0
	2,500 ,,	..	..	5·0	15·0	45·0	50·0
	5,000 ,,	..	45·0	65·0	70·0	70·0	90·0

* Data based on germination counts from three replications.

* Contribution No. 37, Institute of Horticultural Research (ICAR), Hessaraghatta, Bangalore.

respectively in a period of four weeks. At the highest concentration used, 45% of the seeds had germinated within ten days' time as compared to the control in which seeds did not germinate at all within this period.

The growth-regulating properties of Ethrel (2-Chloroethane phosphonic acid) is known to be due to its ability to stimulate ethylene production in plant tissues (Edgerton and Blanpied, 1968). Earlier studies have revealed that ethylene is associated with the germination process of non-dormant seeds and participates in breaking of seed dormancy in dormant peanut varieties (Ketring and Morgan, 1969). Stimulation of seed germination and seedling growth by ethylene treatment have also been reported in a number of non-dormant seeds (Balls and Hale, 1940; Haber, 1926). However, it is not known from the present study whether the breaking of dormancy and subsequent early seedling emergence in strawberry seeds treated with Ethrel is due to the effect of ethylene released by the chemical in the seeds or due to some other unknown phenomenon. Extensive studies are under way to understand this point by using a number of ethylene-producing chemicals and also to investigate the effect of Ethrel and similar compounds on the content of abscisic acid present in strawberry fruits and seeds (Rudnick *et al.*, 1968) whose presence is generally correlated with seed dormancy (Lipe and Crane, 1966).

Considering the short period in which a high percentage of germination of strawberry seeds is obtained without adverse effects on the seedling establishment, a recommendation on the usage of Ethrel at 5,000 ppm can be made from the present study. This could obviously replace the low temperature stratification suggested by Thompson (1969), since the method proposed by the latter takes a total period of eight to ten weeks to obtain 80% germination in contrast to the procedure mentioned in the present studies which takes only four weeks, obtaining 90% germination.

The authors are grateful to Dr. G. S. Randhawa, Director, for his constant interest in this experiment and for encouragement. They wish to thank Amchem Products, Inc., for a gift sample of Ethrel used in the experiment.

1. Adam, J. and Wilson, D., "Factors affecting the germination of strawberry seed," *Rep. Long Ashton Res. Stn. for* 1966, 1967, p. 90.

2. Balls, A. K. and Hale, W. S., "The effect of ethylene on freshly harvested wheat," *Cereal Chemistry*, 1940, **17**, 490.

3. Borgman, H. H., "Die involved Van een Koudbehandeling op de kieming van aardbic 'Zaad'," *Meded Dir. Tuinb.*, 1950, **13**, 13.

4. Bringhurst, R. S. and Voth, V., "Effect of stratification on strawberry seed germination," *Proc. Am. Soc. Hort. Sci.*, 1957, **70**, 144.

5. Edgerton, L. J. and Blanpied, G. D., "Regulation of growth and fruit maturation with 2-chloroethane phosphonic acid," *Nature*, 1968, **219**, 1064.

6. Haber, E. S., "A preliminary report on the stimulation of growth of bulbs and seeds with ethylene," *Am. Soc. Hort. Sci.*, 1926, **23**, 201.

7. Ketring, D. L. and Morgan, P. W., "Ethylene gas as a component of emanations from germinating peanut seeds and its effect on dormant virgenia type seeds," *Pl. Physiol.*, 1969, **44**, 326.

8. Lipe, N. W. and Crane, J. C., "Dormancy regulation in peach seeds," *Science*, 1966, **153**, 541.

9. Rudnicki, R. J., Pieniazek and Piemiazek, V., "Abscisio 11 in strawberry plants at two different stages of growth," *Bull. De L' Academic Polonaise Des Sciences*, 1968, Cl. V, **16** (2), 127.

10. Scott, D. H. and Ink, D. P. "Treatments to hasten the emergence of seedlings of blueberry and strawberry," *Proc. Am. Soc. Hort. Sci.*, 1955, **66**, 237.

11. Thompson, P. A., "The use of chilling and chemical treatments to promote rapid germination of strawberry achenes," *J. Hort., Sci.*, 1969, **44**, 201.