

EFFECT OF ETHREL ON THE GROWTH, YIELD AND SPROUTING BEHAVIOUR OF POTATO

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Field experiments carried out for two years at the Central Potato Research Station, Shillong have indicated the effect of Ethrel (2, chloroethyl phosphoric acid) on the growth, yield and sprouting behaviour of potato cv. Kufri Jyoti. Foliar spray of ethrel (100-800 ppm) at tuber initiation phase induced leaf epinasty and purple pigmentation of the apical meristem. The plants exhibited a wilted appearance at higher ethrel concentrations, which also inhibited plant growth and induced leaf abscission. These effects however, prevailed significantly during 1978 whereas in 1979 these responses were not observed as low concentration of ethrel was used. In both years, ethrel application resulted with significant abscission of flowers indicating that flowers were more sensitive to ethrel. Ethrel sprays increased the number of tubers per plant, but considerably reduced the tuber size. There was a significant reduction in tuber yield and sprout inhibition of harvested potato in ordinary room storage in both years.

Ethrel (2-chloroethyl phosphoric acid) is an ethylene releasing compound which produces characteristic effects in plant tissues. Inhibition of plant growth, increase in stem diameter, geotropic disturbances, leaf epinasty, abscission of plant parts, etc., are a few ethylene induced effects (Pratt and Goelshch, 1969). In potato, it has been reported that ethrel application increased the number of tubers and also the proportion of seed size tubers (Pandita *et al.*, 1981). Utheib *et al.* (1981) indicated that ethrel had no effect on the yield of tubers. Information on the effect of ethrel on tuber sprouting is based mainly on the post-harvest treatments, while the residual effect of sprayed ethrel on subsequent tuber sprouting behaviour is not precisely known. In two experiments, therefore, the effect of foliar application of varying levels of ethrel on the growth, yield and sprouting aspects of potato was studied.

MATERIAL AND METHODS

The experiments were conducted at Central Potato Research Station, Shillong during the main seasons of 1978 and 1979. Cultivar Kufri Jyoti was grown in ridges (alternating with furrows) with an inter and intra-row spacing of 50 and 20 cm respectively. All identical cultural, manurial and plant protection measures were given during the course of the experiments. Aqueous solution of ethrel was sprayed twice on the foliage at 100, 200, 400, 600 and 800 ppm levels one week prior to tuber initiation and another one week after the first spray during 1978. The stages of tuber initiation were determined by periodical pulling out of plants. In 1979, lower concentrations of ethrel (100, 150, 200 and 300 ppm) alone were sprayed only once synchronising with tuber initiation. The control plants received water spray. The treatments were replicated five times in a randomised block design.

Four plants per plot were selected at random and plant height, number of leaves and flowers were recorded 10 days after the treatment. Visual observations were made for plant disorders. At harvest, tuber number and yield were recorded and a set of tubers were kept replicationwise in perforated polythene bags in ordinary room storage to study the sprouting behaviour.

RESULTS AND DISCUSSION

Foliar application of ethrel at tuber initiation to cv. Kufri Jyoti significantly reduced the plant height and accelerated the abscission of leaves, particularly at higher concentrations during 1978. These effects were however not noticed in the 1979 experiment possibly due to the low concentrations of the chemical tried. There was a significant reduction in number of flowers which varied from 75 to 90 per cent in both years. This clearly indicated that flower abscission in response to ethrel is rapid and is comparatively more sensitive even at lower concentrations. Leaf epinasty, purple pigmentation of the apical meristem and wilted appearance of the plants occurred with ethrel spray, particularly at higher concentrations. The effects of ethylene on growth inhibition, abscission and multivarious plant responses were reported earlier (Hughes *et al.*, 1973).

Ethrel treatments increased the number of tubers, but the varying concentrations had not assumed statistical significance. Similar increase in tuberisation was reported by Garcia

and Gomez (1973). Irrespective of the increase in number of tubers, the tuber yield was significantly reduced in both years. The yield reductions varied between 11.3 and 77.8 per cent and were conspicuous at higher concentrations (Table 1). The yield depression is invariably brought out by considerable reduction in tuber sizes. It has been reported that ethylene controlled the tuber enlargement (Stewart and Freebairn, 1969) and also depleted endogenous levels of gibberellins and auxins (Valdovinos *et al.*, 1967).

Ethrel spray at tuber initiation significantly inhibited the subsequent sprouting of the harvested tubers in ordinary room storage (Table 1). Though there is no trend in sprouting behaviour in relation to varying ethrel concentrations, the sprout inhibition varied from 63.3 to 96.0 per cent as compared with the control in both the years. Contrary reports on sprouting behaviour stimulation (Vacha and Harvey, 1927) and inhibition (Elmer, 1932) by ethylene are available. The sprout inhibition of the harvested tubers in storage may be partly attributed to the reduced size of the tubers brought out by ethrel spray.

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Table 1 Effect of ethrel on plant height, number of leaves, flowers, tuber yield and sprouting in Kufri Jyoti

Treatment	Plant height (cm)	No. of leaves/plant	No of flowers/plant	No. of tubers/plant	Tuber yield q/ha	% yield reduction over control	% Sprouting in storage 90 days after harvest
1978							
Control	32.4	64.9	10.2	9.3	181.6	—	100.0 (90.0)
Ethrel 100 ppm	27.3	56.0	1.4	10.7	131.3	27.6	51.5 (45.9)
" 200 "	26.2	55.2	1.8	11.9	133.2	26.6	57.5 (49.3)
" 400 "	25.8	41.6	0.8	11.5	82.3	54.6	39.7 (39.1)
" 600 "	27.1	39.6	0.8	10.8	60.1	66.9	47.3 (43.4)
" 800 "	23.1	41.9	0.4	11.8	40.3	77.8	36.7 (37.3)
C.D. (P=0.05)	5.22	7.90	0.53	NS	28.54	—	21.72
1979							
Control	47.0	62.7	13.2	9.3	344.0	—	90.2 (71.8)
Ethrel 100 ppm	44.5	60.3	3.3	10.7	305.1	11.3	10.8 (19.2)
" 150 "	47.7	58.3	3.2	10.8	287.1	16.5	17.6 (24.8)
" 200 "	45.6	61.7	2.3	10.6	285.7	16.9	4.0 (11.5)
" 250 "	50.0	69.3	1.7	11.5	285.0	17.1	15.2 (22.9)
" 300 "	49.2	59.6	2.4	13.0	276.5	19.6	18.9 (25.8)
C.D. (P=0.05)	NS	NS	4.16	NS	34.37	—	3.91

Figures in parenthesis indicate transformed values