https://doi.org/10.29321/MAJ.10.A02181

Madras Agric J. 74 (6-7) : 296-301 June-July, 1987

EFFECT OF SOME GROWTH RETARDANTS AND ETHREL ON FRUIT SET AND YIELD IN PUMPKIN *Cucurbita Moschata* DUCH. EX POIR.)

V.K VERMA[1], N. SINGH[2] and B. CHODHURY[3]

The effect of application of growth retardants like CCC, SADH and morphactin along with ethrel at two concentrations on fruiting and yield in pumpkin (*Cucurbita Moschata* Duch. ex Poir.), Selection-124), all the growth retardants at different stages induced the first fruit set at the lower nodes between 8.6 and 14.0, while ethrel treatment produced the fruit set between 3.3. and 4.3. Ethrel at 100 ppm at the initial stages proved to be the best treatment in increasing the number of fruits. Ethrel developed smaller size of fruits, which can commercially be exploited. The 2+4 leaf stage gave better yield with CCC 400 ppm and morphactin, while at 2-leaf and 2+4+6 leaf stage ethrel and SADH proved promising The increase in yield of 4.0 kg per vine is a spectacular increase in case of pumpkin, where fruit is carried to maturity on vine itself.

It is apparent that synthetic growth regulating chemicals are becoming extremely important and valuable in the commercial control of crop growth. There has not been much recorded evidence of testing different growth retardants on pumpkin. The pumpkin is widely grown as commercial crop and consumed throughout India and other countries. Commercial growers are getting one to two fruits per vine and that too of very big size and consumers have to depend on cut fruits. Moreover, it requires wider spacing as it has very vigorous vegetative growth. Keeping these points in view, this study was initiated to observe the differential response of chemicals on fruiting and yield. Das and Swain (1977) observed increase in yield of pumpkin by Alar 200 ppm and ethrel 200 ppm. Howthrone and Hopping (1977) also reported higher yield in pumpkin with ethral. Dean and Baker (1980) showed increase in yield of cucumber by 50 to 100 ppm morphactin. The present investigation was undertaken to compare the effect of chemicals at different stages of the plant growth and ultimately to assess the best chemical and stage of plant for early and increased fruiting.

MATERIAL AND METHODS

The study was conducted on pumpkin (*Cucurbita moschata* Duch. ex Poir.) Selection 124 in two seasons. The field experiment was laid out in split-plot design with three replications in summer seasons (March-July) with a mean temperature of 28 ± 5°C, relative humidity of 45–75%. There were nine treatments and four stages of plant growth. Total treatments were thirty six per replication. Each treatment comprised of three plants for observations.

Solutions of 2-Chloroethyl trimethyl ammonium chloride (CCC), succinic acid 2, 2-dimethyl hydrazide (SADH), morphactin and 2-chloroethyl phosphonic

1 & 2 Scientists-Division of Vegetable Crops, Indian Agricultural Research Institute New Delhi-110012

3 Head of the Division of Vegetable Crops, IARI, New Delhi

acid (Ethrel) in two different concentrations were applied on the plants at (1) 2-leaf stage; (2) 2 and 4-leaf stage (3) 2, 4 and 6-leaf stage; (4) 2, 4, 6-leaf and before flowering stage. Distilled water was applied on control plants. The stages. of plant were taken as main-plots and the treatments as sub-plots. Statistical analysis was done at 5% level of significance following Panse and Sukhatme (1978), Interactions were worked out to test the overal performance of the treatments and the stages of plant growth The observations were recorded on the node number of first fruit set, total number of fruits per vine, average weight of fruit and yield per vine The average data of two seasons are presented in the tables.

RESULTS AND DISCUSSION

Node number of first fruit set

It is obvious from Table 1 that treatments and interactions were highly significant. All treatment means produced fruit at lower node. At 2-leaf stage CCC 400 and 800 ppm developed first fruit at 11.3 and 8.6 node, while ethrel treatments at 4 3 and 4.0 nodes respcetively. At 2+4 leaf stage similar results were observed except morphactin treatments, In addition to 2 leaf and 4-leaf, when another dose was applied at 6-leaf stage, CCC. treatments developed first fruit at a higher node. When fourth application was given just before flowering, ethrel treatments further lowered the node number of first fruit set. SADH gave similar results at all the stages. All the chemicals at different stages inferred the first fruit set at the lower nodes as compared to control. The first fruit set among all the chemical treatments besides ethrel was observed between 8.6 and 14.0 node. These results are in agreement with that of splitt-stoesser (1970) who observed the fruit set in pumpkin at the lowest nodes with ethrel. Similar findings were also noticed by Hopping and Mawthorne (1979) in pumpkin. Hawthorne and George (1979) reported that in commercial practice, the use of ethrel could increase the value of pumpkin crop because fruits could be set on the lower nodes. It is always ensured to keep few rows of pumpkin plants free of ethrel treatment and planted few days in advance in order to ensure sufficient pollen.

Number of fruits.

All the growth retardants and ethrel significantly increased the number of fruits per vine as compared to control. At 2-leaf stage more than 65 per cent increase in the number of fruit per vine was achieved over control with ethrel 100 ppm (Table 1). It was occasionally observed that ethrel produced two fruits at consecutive nodes, Subsequet application of chemicals at different stage of plant growth showed similar results. SADH 1500 ppm was observed to set four fruits on each primary laterals at a time.

It will be highly advantageous even if one fruit per vine is increased in case of pumpkin, as the fruit is harvested at full maturity, which does not allow more fruits to develop. Ethrel treated plants prouduced fruits which matured much earlier and allowed more number of fruits to be set on a vine The other growth retardants also proved effective. Das and swain (1977) reported increase in number of fruit with alar in pumpkin. Hawthorne and Hopping

(1977) observed similar results with ethrel. The findings are in conformity with those reported by Dean and Baker (1980). watkins and Cantliffe (1980) with morphactin in different cucurbits,

weight of fruit.

At 2-leaf stage CCC 400 and morphactin 50 ppm significantly reduced the fruit weight over control. The most promising reduction in fruit size was obtained with ethrel treatments and morphactin 25 ppm (Table 2). Another application of ethrel at 4 leaf stage further reduced the fruit weight to 2.28 kg. Similar results were obtained with the application of chemicals at later stages. Churata-Mesca *et al.*, (1974) reported that ethephon increased the number of fruit but reduced the fruit weight in cucumber. Singh (1980) inferred the probable reason of increased fruit set as an increased endogenous level of neutral auxins by ethrel applications.

Yield of fruit

The results in respect of fruit yield given in Table 2 revealed that all the four stages had more or less an even effect The average yield in control was 8.18 kg. The highest yield at 2-leaf stage was recorded with SADH 1500 and ethrel 100 ppm as 12.36 and 12.23 kg per vine This showed an increase in yield of 4,18 kg per vine over control. At 2+4 leaf stage morphactin treatment enhanced the yield to 13 09 kg. This was closely followed by CCC 400 and ethrel 200 ppm At 2+4+6 leaf stage a favourable response with SADH and ethrel was recorded At fourth stage. ethrel recorded decrease in yield. The results obtained in this study are in conformity with the findings of Splittstoesser (1970) and Hawthrone and George (1979) showing increased yield in pumpkin with ethrel application. The results are also in accordance with those reported by Cantliffe (1974). Dean and Baker (1980) and Nerson *et. al*, (1982) with morphactin in different cucurbits. Das and Swain (1977) reported increase in number of fruit and yield with alar in pumpkin.

It is significant to point out that the reversal of staminate pistillate sequence is possible in pumpkin. The length of initial pistillate phase can be extended upto higher nodes. This finding enables the use of ethrel spray in practical terms in hybrid seed production.

A comparative study of cost of chemicals and percentage yield increase over control per hectare was estimate Although the growth retardants viz. SADH, CCC and morphactin have produced very encourage results and yield increase over control but the of chemicals involved comparatively was much higher. The application of ethrel at 100 to 200 ppm at 2- leaf and 2+4 leaf stage was adjuldged as the most promising treatment. The net return was much higher than the cost of chemical involved The approximate cost of ethrel chemical (single spray) was estimated to be Rs. 20.00 to Rs 25.00 per hectare.

Table 1 Node number of first fruit set and number of fruit per vine

Treatment (ppm)	Node number of first fruit set					Number of fruit				
	2-leaf stage	2+4 leaf stage	2+4+6 leaf stage	2+4+6 leaf + before flowering	Mean	2-leaf stage	2+4 leaf stage	2+4+6 leaf stage	2+4+6 leaf + before flowering	Mean
CCC 400	11.33	11.00	12.33	9.33	11.00	3 83	4.17	3.83	3.83	3 92
CCC 800	8.67	9.67	13.00	11.33	10.67	3.83	4.00	3.83	4 00	3.92
SADH—1000	12.67	12.83	12.33	11.33	12.29	3.50	3.83	4.00	4.00	3.83
SADH—1500	12.00	13 33	12.33	12.67	12.58	3.83	3 83	4.00	4.33	4.00
Ethrel 100	4 33	4 00	3.67	3.67	3.92	5 00	4.83	4.83	4.83	4.88
Ethrel 200	4.00	3.67	3.67	3.33	3.67	4.67	4.63	5.00	4.50	4.70
Morphactin 25	8 67	12.00	11.33	12.67	11.42	3.83	4 40	4.33	4.00	4.14
Morphactin 50	8.67	9 33	12.33	13.67	11.00	4.00	4.17	3.83	3.83	3.96
Control	18.00	19.67	17.33	17.00	18.00	2.67	3.00	2.83	2.67	2.79
Mean	9.93	10,61	10 93	10.56	10.50	3.91	4 10	4.06	4.00	4,01

C. D. at 5% for:			
	M.P means	— 0.629	0.268
	S.P. means	— 0.988	0.302
	S.P. meas at same M.P.	— 1.977	0.606
	M.P. means at same S.P.	— 1.964	0.629

Table 2. Mean weight of fruit and yield per vine (kg)

Treatment (ppm)	Weight of fruit (kg)					Total yield per vine (kg)				
	2-leaf stage	2+4 leaf stage	2+4+6 leaf stage	2+4+6 leaf + before flowering	Mean	2-leaf stage	2+4 leaf stage	2+4+6 leaf stage	2+4+6 leaf + before flowering	Mean
CCC 400	2.47	3.01	2.85	2.65	2.81	10.48	12.53	10.87	10.15	11 01
CCC 800	2.94	2.85	2.63	2.92	2.84	11 26	11.35	10 08	11.67	11.09
SADH-1000	3.02	2.93	3 02	2.99	2.99	10.39	11.18	12.03	11.90	11.38
SADH-1500	3.22	3 04	3.03	2.77	3.02	12.36	11.66	12.07	11 82	11.98
Ethrel 100	2.45	2.28	2.46	2.18	2.34	12 23	10.98	11.84	10.53	11.40
Ethrel 200	2.47	2,53	2.40	2.23	2.41	11.52	11.70	12.02	9 98	11.30
Morphactin 25	2.44	2.89	2 85	2 89	2 77	9.32	12.73	12.25	11.55	11.47
Morphactin 50	2.75	3.14	3.00	3.01	2.98	10.94	13 09	11.49	11.53	11.76
Control	3.10	2.78	2.90	2.97	2.94	8.28	8,33	8.18	7.92	8.18
Mean	2.79	2.83	2,79	2.73	2.79	10.75	11.51	11.20	10.78	11.06

C. D. at 5% for :	M. P. means	0.165	0.816
	S. P. means	0.19(	0.713
	S. P. means at same M. P.	0.38'	1.426
	M. P. means at same S. P.	0.39!	1.568

REFERENCES

CANTLIFFE D.J. 1974. Alternation of growth and flowering habit in cucumber by chloreflurenol. Canadian J. plant Sci , 54 (4) : 771-76.

CHURATA-MASCA, M.G.C., R P.C. CASTRO and M. AWAD. 1974. The influence of ethephon on the modification of sex expression and on the yield of cucumber. Revista de Agriculture, 49 : 7-14 (cf. Hort. Abstr. 1975: 3206).

DAS, R.C. and S.C. SWAIN. 1977. Effect of growth substances and nitrogen on the growth, yield and quality of pumpkin (*Cucurbita moschata Duch*). Indian J. Hort., 34 : 51-5.

DEAN, W.B. and L.R. BAKER. 1980. Use of chloreflurenol for increasing yields of cucumber. No. 297-Washington State Univ. Pullman, U.S.A. (cf. P.G.R. Abstr. 1980: 1473).

HAWTHRONE, B.T. and R. GEORGE. 1979. Influence of plant density and ethrel on yield of pumpkin and squash N.Z.J. Expt. Agril. (In press).

HAWTHRONE B.T. and M.E. HOPPIN C. 1977 pumpkins ; ethrel and fruit number. N.Z. Comm. Grower, 32(5) : 21.

HOPPING, M.E. and B.T. HAWTHRONE. 1979. Effect of ehrel-48 on sex expression and yield in pumpkin. N.Z.J. Exptl. Agril , 7(4) : 399-30.

NERSON, M , H.S. PARIS, Z. KARCHI and D.J. CANTLIFFE. 1982. Yield concentration in muskmelon as affected by the genotype and application of ethrel and chlorflurenol. Hort. Sci , 17 : 78-9.

PANSE, V.C. and P.V. SUKHATME. 1978. Statistical methods for agricultural Workers. I.C.A.R. publication, New Delhi.

SINGH, R.K. 1980. Chemical regulation of sex expression in different genera of cucurbits. Ph. D. Thesis, I.A.R.I., New Delhi

SPLITTSTOESSER, W.E. 1970. Effects of 2-chloroethyl phosphonic acid and Gibberellic acid on sex expression and growth of pumpkin. Physiol. Plant 23 . 762-68.

WATKINS, J.T. and D.J. CANTLIFFE. 1980. Regulation of fruit development in cucumber by an auxin and chlorflurenol. No. 298 Univ Florida Gainesville, U.S.A. (Cf. P.G.R. Abstr. 1980 : 1474).