Agric. Res J. Kerala 1988, 26 (2) 240-245

EFFECT OF APPLICATION OF PLANT GROWTH REGULATORS ON PEPPER *(PIPER NIGRUM L.)*

B. R. Salvi, A. G. Desai and M. J. Salvi

College of Agriculture, Dapoli 415 712, Ratnagiri, India

Spike shedding and berry drop are important factors attributed to the low yield of pepper. The extent of spike shedding and berry drop were found to be 29.2 and 40.0 per cent respectively in Panniyur-1 variety under Dapoli conditions (Gawade, 1982). The study was undertaken to verify whether some of the plant growth regulators have any positive influence in increasing the yield of pepper by reducing spike shedding and berry drop and to find out the most effective and economical method of application of growth regulators.

Materials and Methods

The trial was conducted during the period from June 1985 to March 1986 in Panniyur-1 variety of pepper by adopting a randomized block design with for replications. Two separate experiments were laid out. In one experiment, the growth regulators were applied by dip method and in the other by spray method. For the application of growth regulators by dipping, pepper vines of 13 years old, trained on erithrina standards were selected. For spray method, 9 years old pepper vines trained on arecanut standards were used.

The growth regulators like GA, NAA and 2,4-D were first dissolved separately in a little quantity of alcohol and then in distilled water. However, Ethephon and Planofix were directly dissolved in distilled water. Then stock solutions of known concentrations were made and the solutions of desired concentrations were prepared from the stock solutions by dilution. Application of growth regulators in both the experiments was followed when there was sunny condition. One or two drops of teepol was mixed with the solutions to increase its adhesive power. In dip method, solution of desired strength was taken in a glass vial and each panicle was dipped for one minute. Twenty five panicles were used per treatment under each replication. Spraying was given to a whole vine. One vine trained on the standard of arecanut was used per treatment. The treatments were repeated twice. The first treatment was given at initial berry setting stage and the second treatment was given 15 days after the first treatment.

The vines were maintained well by following the recommended cultural practices. Yield contributing factors were recorded at the time of harvest. The data were analysed statistically as per the methods given by Panse and Sukhatme (1978). Cost benefit ratio was worked out as per the methods given by Arora and Pratap (1983).

On an average 1111 standards per hectare were considered. For working out the cost benefit ratio, on an average, 352 spikes per standard were considered. This average was worked out by counting the total number of spikes

Table 1

Concentrations and cost of application of growth regulators

Treatment No.	Growth regulators	Concentration, ppm	Cost of chemicals Rs	Estimated cost per standard Rs
1	Giberellic acid	25	125/g	3.59
2	Giberellic acid	50	125/g	6.72
3	Giberellic acid	75	125/g	9.84
4	Naphthalene acetic acid	10	4/g	0.50
5	Naphthalene acetic acid	20	4/g	0.54
6	Naphthalene acetic acid	30	4/g	0.56
7	Ethephon	250	1.70/ml	1.46
8	Ethephon	500	1.70/ml	2.49
9	Ethephon	750	1.70/ml	3.49
10	2.4-Dichlorophenoxy acetic acid	10	3/g	0.47
11	2,4-Dichlorophenoxy acetic acid	20	3/g	0.47
12	2,4-Dichlorophenoxy acetic acid	30	3/g	0.48
13	Planofix (∝—NAA)	40	0.10/ml	0.51
14	Planofix (∝—NAA)	60	0.10/ml	0.54
15	Planofix (oc—NAA)	80	0.10/ml	0.58
16	Planofix (∝—NAA)	100	0.10/ml	0.62
17	Control	—	—	—

from all the standards in experimental plot and dividing this total by the total number of standards. Dry pepper was sold @ Rs 30 per kg.

Results and Discussion

i) Effect on weight of green berries

Table 2 shows that significantly higher weight of green berries was obtained under the influence of GA at all concentrations. NAA at 10 ppm, 2,4-D at 20 ppm in dip method. In spray method all the treatments except Ethephon at 500 ppm were significantly superior in increasing the mean weight of green pepper berries. These results are in conformity with the results of Daultta (1982) and Thillak (1983) in grape who reported increase in berry weight with 50 and 75 ppm GA, respectively. Similarly, Geetha (1981) obtained increased pepper berry weight with 20 ppm 2,4-D.

ii) Effect on mean recovery of dry pepper from green pepper

Highest recovery of dry pepper from green pepper was recorded in the treatment of 50 ppm GA (83.78 g) in dip method, while in spray method 100 ppm

Table 2

Effect of plant growth regulators on yield of pepper by dip and spray methods of application

Treatments No.	Mean weight of green berries (g)		Mean recovery of dry pepper from green pepper (g)		Mean total yield of dry pepper per standard (g)		Mean increase in yield of dry pepper per standard over control (g)		Mean increase in yield of dry pepper per standard over control (g)	
	Dipping	Spraying	Dipping	Spraying	Dipping	Spraying	Dipping	Spraying	Dipping	Spraying
1	200.8	43.58	74.40	16.88	814.6	470.4	99.08	41.27	108.99	45.39
2	221.7	50.10	83.78	19.05	847.7	489.5	137.10	60.35	145.31	66.40
3	185.0	44.33	71.51	17.89	804.7	479.3	89.16	50.16	98.07	55.17
4	192.9	57.69	74.93	23.83	816.5	527.2	100.95	98.03	111.04	107.83
5	146.4	44.37	63.98	17.22	778.0	473.4	62.41	44.26	68.65	48.69
6	135.2	41.34	49.03	17.71	725.3	477.7	9.78	48.57	10.76	53.43
7	122.0	50.17	44.43	21.90	709.1	514.6	6.40	85.44	7.04	93.99
8	139.6	37.12	47.88	14.68	721.3	451.1	5.73	21.91	6.31	24.10
9	94.5	42.06	37.45	17.93	684.6	479,7	30.97	50.51	-34.07	55.56
10	127.4	54.58	51.55	18.25	734.2	482.5	18.65	53.32	20.52	58.66
11	192.5	64.13	75.20	23.21	817.5	526.1	101.90	96.97	112.09	106.67
12	111.3	61.09	40.75	22.22	696.2	517.4	—19.36	88.26	—21.29	97.09
13	116.0	58.64	50.23	20.28	729.6	500.3	14.01	71.19	15.41	78.31
14	118.8	60.69	51.38	20.35	733.6	500.9	18.05	71.80	19.86	78.98
15	140·9	61.55	51.08	21.98	732.6	515.3	17.00	86.15	18.70	94.76
16	—	58.72	—	24.68	—	539.1	—	109.91	—	120.90
17	139.1	35.41	47.25	12.19	715.6	429.1	—	—	—	—
'F' test	**	**	**	**	**	**	*»	»*	**	**
SE ±	3.048	1.565	1.893	0.790	5.54	2.59	1.116	1.625	1.294	0.934
CD (0.05)	3.710	4.448	5.410	2.247	12.94	7.14	3.330	4,464	3.698	2.668
(0.01)	11.660	5.934	7.240	2.998	17.27	9.52	4.457	6.214	4.948	3.570

*» = Significant at 1% level

Dipping observations are based on average of 25 spikes
Spraying observations are based on average of 10 spikes.

Planofix recorded the highest recovery (24.68 g) as against the control. These results are in agreement with the results reported by Hariharan and Unnikrishnan (1985). They observed increase in dry weight of pepper berries of vines with 2,4-D at 1 ppm over those of untreated vines. Similarly, Pillai *et al.*, (1977) reported that recovery of dry pepper from green pepper was increased with the application of 90 ppm Planofix.

iii) Effect on mean total yield of dry pepper per standard

In dip method, highest total yield was recorded in the treatment of 50 ppm GA (847.71 g) as against control (715.60 g), while in spray method highest total yield per standard was recorded by 100 ppm Planofix (539.10 g) as against control (429.19 g). These results are in agreement with results reported by Kadam and Warke (1980). They observed that the treatment of GA at 100 ppm produced the maximum yield (146.5 kg) in Mudakhed seedless mandarin.

iv) Effect on mean increase in yield of dry pepper per standard over control

It is evident from Table 2 that most of the treatments, except 250 and 750 ppm Ethephon and 30 ppm 2,4-D were significantly superior to the control in increasing the yield of dry pepper per standard in dip method. However, in spray method, all the treatments were significantly superior to control. Maximum increase was recorded by 100 ppm Planofix (109.912 g.) These results are in conformity with the report of Geetha (1981) who reported increased yield of dry pepper per standard by 575 g and 375 g with 2,4-D at 5 ppm and Planofix at 50 ppm, respectively.

v) Effect on mean increase in yield of dry pepper per hectare over control

In dip method significantly increased yield of dry pepper per hectare over control was observed in all the concentrations of GA, NAA, Planofix, 10 and 20 ppm 2,4-D and 500 ppm Ethephon. While in spray method, all the treatments significantly increased the yield of dry pepper per hectare over the control.

Cost - benefit ratio

It is revealed from the data presented in Table 3 that in both the methods of application highest estimated cost per standard was recorded by GA at 75 ppm, while minimum cost was recorded by 10 ppm 2,4-D over control. Highest profit in dip method was shown by 2,4-D at 20 ppm (Rs 2.42/standard), while in spray method 100 ppm Planofix recorded highest profit (Rs 3.77/standard) over control. Present findings are in agreement with the report of Geetha (1981) who observed that the additional net return per standard was Rs 5.50, 4.25, 3.50 and 3.50 in the case of IAA at 50 ppm, 2,4-D at 5 ppm, Planofix at 50 ppm and Zinc at 0.5 per cent, respectively. With regard to cost-benefit ratio, in dip method highest was recorded by 2,4-D at 20 ppm (1.46). Similarly in spray method also it was 7.19.

Table 3

Cost-benefit of dip and spray method of application of growth regulators

Treatments No	Estimated cost per standard, Rs.		Additional net return per hectare, Rs.		Additional net return per hectare, Rs.		Cost-benefit ratio	
	Dipping	Spraying	Dipping	Spraying	Dipping	Spraying	Dipping	Spraying
1	7.15	3.59	– 3.18	—1.94	— 3498	—2134	0.45	0.54
2	12.65	6.72	– 7.36	-4.30	— 8756	4730	0.58	0.64
3	18.15	9.84	-14.58	—7.83	—16038	—8613	0.80	0.80
4	1.70	0.50	2.34	3.42	2574	3762	1.38	6.84
5	1.75	0.53	0.75	1.24	825	1364	0.43	2.34
6	1.80	0.56	— 1.41	1.38	— 1551	1518	0.78	2.46
7	3.34	1.46	– 3.59	1.16	— 3949	1276	1.08	0.80
8	5.15	2.49	— 4.92	-1.61	— 5312	—1771	0.96	0.65
9	6.95	3.51	— 8.18	—1.49	— 8998	-1639	1.18	0.43
10	1.65	0.47	— 0.91	1.66	— 1001	-1826	0.55	3.53
11	1.65	0.47	2.42	3.41	2662	3751	1.46	7.19
12	1.66	0.47	— 2.43	3.05	— 2673	3355	1.46	6.39
13	1.66	0.51	– 1.10	2.34	— 1210	2574	0.66	4.59
14	1.73	0,54	— 1.60	2.33	— 1100	2563	0.58	4.32
15	1.79	0.58	– 1.13	1.6S	— 1210	1826	0.62	2.86
16	—	0.62	—	3.77	—	4147	—	6.08
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Summary

Different growth regulators when used in proper concentrations have a promise in increasing the yield of pepper. GA, NAA, 2, 4-D (20 ppm) and Planofix (100 ppm) seem to be promising in both the methods of application i.e., either by spraying or dipping. Though, application of GA increased the yield significantly better than the other treatments, its high cost does not permit its economic use. Cost benefit shows that application of plant growth regulators by dipping is rather costly as compared to spraying. Spraying of pepper vines with Planofix at 100 ppm, NAA at 10 ppm and 2,4-D at 20 ppm seems to be more effective in increasing the net return per hectare of pepper cultivation. The additional net returns per hectare over control was recorded by these concentrations are Rs. 4,147; 3,762, and Rs. 3,751, respectively.

Acknowledgements

This paper forms a part of M. Sc. (Agri.) thesis of the senior author submitted to the Konkan Krishi Vidyapeeth, Dapoli, 1986.

References

Arora, S. K. and Pratap. R. S. 1983. Economics of use of growth regulators in cucurbitaceous vegetables crops production. *Farmer and Parliament* 18(6) : 15-16 and 22-24.

Daulta, B. S. 1982. Effect of GA_3, pinching and ringing on the improvement of bunch, berry size and quality of grapes (*Vitis vinifera*) delight cultivar. *Prog. Hort.* 14 (2/3) : 141-143.

Gawade, T. D. 1982. Studies on growth, flowering and fruiting in pepper *(Piper nigrum* L) M. Sc. (Agri.) thesis, Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri.

Geetha, C. K. 1981. Investigations on spike shedding in pepper *(Piper nigrum* L.) M. Sc. (Hort.) thesis, Kerala Agric. Univ., Vellanikara, Trichur.

Hariharan, M. and Unnikrishnan, K. 1985. Application of a low dose of 2, 4-D to promote fruit development in *Piper nigrum* L *Seed Sci. Techno.* 13 (1) : 257-264.

Kadam, B. A. and Warke, D. C. 1980. Influence of plant growth regulators on size and yield in mandarin organge cv. Mudakhed seedless. *J. Mah. Agric. Univ.*, 5 (1) : 17-19.

Panse, V. G. and Sukhatme, P. V. 1978. *Statistical Methods for Agricultural Workers,* 3rd ed. Indian Council of Agricultural Research, New Delhi.

Pillai, V. S., Sasikumaran, S. and Nambiar, P. K. V. 1977, Studies on effect of Planofix application on pepper *(Piper nigrum* L.) *Agric. Res. J. Kerala* 15 (1) : 56-58.

Thillak, K. S. 1983. Effect of gibberellic acid on development and quality of berries of grapes, cvs. Gulabi and Thompson seedless. *Thesis Abstract, Haryana Agric. Univ. 9* (1): 62-63.