International Journal of Science, Environment and Technology, Vol. 5, No 5, 2016, 3147 – 3159
ISSN 2278-3687 (O)
2277-663X (P)

EFFECT OF DIFFERENT LEVELS OF POTASSIUM AND PLANT GROWTH REGULATORS ON DIFFERENT YIELD ATTRIBUTES OF CHILLI (*Capsicum annuum* L.)

[1]Bighnaraj Kar, [2]Chakradhar Patra*, [3]Aditya Kiran Padhiary and [4]Saroj Kumar Mohanty

[1]Ph. D. Research Scholar, [3]Ph. D. Research Scholar, [4]Professor& Head
Department of Seed Science & Technology, College of Agriculture,
Orissa University of Agriculture and Technology, Bhubaneswar, Odisha
[3]Farm Manager (Plant Physiology)
Krishi Vigyan Kendra, OUAT, Sambalpur
E-mail: chakradhar.agri@gmail.com (**Corresponding Author*)

Abstract: A field experiment was conducted during Rabi 2013-14 to study the response of different levels of potassium nutrition along with foliar application of plant growth regulators (PGRs) and their interaction effect on plant growth attributes, dry fruit yield, seed yield in chilli cv. Utkal Ava at Central Research Station, OUAT, Bhubaneswar. The experiment was laid out in split plot design with treatment combinations of three levels of potassium i.e. 90, 105 and 120 kg/ha in main plots and PGRs such as NAA (40ppm), GA_3 (50 ppm), Planofix (400 ppm), 2,4-D (5 ppm) and control (water spray) in sub plots. The growth regulators were sprayed at 30 and 45 days after transplanting. It was revealed from the study that all the growth regulators except 2,4-D along with potassium nutrition resulted in improvement of plant growth attributes like plant height and number of branches. The interaction effect of different levels of potassium with various growth regulators was found to be non-significant with respect to plant height. Significantly highest number of fruits per plant was obtained with 120 kg K_2O/ ha along with spraying of 50 ppm GA_3 followed by 40 ppm NAA. The highest fruit yield of 31.99 Q/ha and seed yield of 11.04 Q/ha were obtained with application of 120 kg K_2O/ha along with spraying of 40 ppm NAA. There was an increase of 25% and 15% in fruit yield with application of NAA 40ppm and GA_3 50ppm respectively as compared to control.

Keywords: Chilli (*Capsicum annuum* L.), potassium nutrient, plant growth regulators, yield attributes, fruit yield, seed yield.

INTRODUCTION

Chilli is one of the important commercial crops of India. Different varieties are grown for vegetables, spices, condiments, sauces, and pickles. Chilli being a major spice with tremendous export potential, the emphasis now lies on increasing the quality apart from productivity and both can be achieved by optimum supply of nutrients.

*Received Sep 2, 2016 * Published Oct 2, 2016 * www.ijset.net*

Kanwar (1974) pointed out the reasons for poor ratios in nutrient used as inadequate knowledge; subsistence farming and conservative attitude like supplies of K in the soil are adequate to meet the crop requirement for increased yields. However, the soil, where available potassium levels are considered adequate for the modern production technologies contributing to the higher crop removal of native K can quickly shift the soil K status from region of adequacy to region of deficiency. These evidences point to the accentuation of nutrients deficiencies with progressive intensification of agriculture, indicating greater need for external supplies of potassium. Apart from these potassium improves colour, glossiness and dry matter accumulation in chilli fruits (Subhani *et al.,* 1990).

One of the major problems in chilli is heavy shedding of flower and fruits due to which the chilli yield is very less. About 50 to 95% flower and fruit drops have been reported depending on varieties, season, pest and disease attack (Yamgar and Desai 1987). Plant growth regulators are considered as new generation agro chemicals after fertilisers, pesticides and herbicides to augment seed yield and quality. The plant growth regulators are known to enhance the source-sink relationship and stimulate the translocation of photo assimilates there by helping in better retention of flowers and fruits, besides this the growth regulators have the ability to cause accelerated growth in plants. The growth regulators or promoters like GA_3, NAA stimulate vegetative growth and are involved in the initiation of cell division in the cambium. These plant growth regulators cause osmotic uptake of water which maintain a swelling force against the softening of cell wall (Arora *et al.* 1985). Efforts are made to reduce the flower and fruit drop in chilli by spraying NAA, GA_3, 2,4-D (Pandita *et al*. 1980, and Lata and Singh 1993). The information on influence of foliar spray of plant growth regulators on seed yield and quality in chilli is very scanty. Hence there is a need to exploit the possibility of increasing seed yield and quality through the application of PGRs in chilli.

Hence in view of the furnished particulars of the experiment to study the effect of different levels of potassium nutrition and plant growth regulators and their combined effect on different seed yield attributes of chilli cv. Utkal Ava released from OUAT is undertaken.

MATERIAL AND METHODS

A field experiment was conducted during Rabi 2013-14 with protective irrigation, to investigate the effect of various plant growth Regulators and different levels of potassium nutrition on seed yield and quality of chilli at Central Research station, Orissa University of Agriculture and Technology, Bhubaneswar.

The experiment was laid out in split plot design with three main plots (3 levels of potassium viz., 90, 105 and 120 kg/ha) and 5 subplots in each main plot i.e. control (water spray), NAA 40 ppm, GA_3 50 ppm, Planofix 400 ppm, and 2,4-D 5 ppm replicated thrice.

Table-1: List of main plots and amount of Potassium applied to chilli cv. Utkal Ava.

Sl. No.	Main plot	Doses
1	K_1	90 kg/ha
2	K_2	105 kg/ha
3	K_3	120 kg/ha

Table-2: List of Plant Growth Regulators and their concentration applied to chili, cv. Utkal Ava.

Sl. No.	Treatment	Concentrations (ppm)	Treatment symbol
1	Control	-	C
2	NAA	40	G_1
3	GA_3	50	G_2
4	Planofix	400	G_3
5	2,4-D	5	G_4

From the field experimentation different yield attributes like plant height, number of fruit per plant, fruit length, fruit girth, number of branches per plant, fruit yield and Seed yield etc. Laboratory experiments were conducted to assess the physiological quality of seeds of each treatment in terms of seed germination percentage, seedling length, seed vigour index-I, vigour index-II were calculated as per the formulae developed by Abdul-Baki and Anderson (1973). The data were recorded and interpreted by doing statistical analysis following the principles and procedures outlined by Panse and Sukhatme (1978).

RESULT AND DISCUSSION

From the field experiment, the effect of different levels of potassium nutrition and application of different growth regulators like NAA, GA_3, Planofix, 2,4-D and their combined effect on different seed yield attributes of chilli cv. Utkal Ava is observed. Observations were recorded on plant height, fruit characteristics, fruit yield and seed yield parameters.

Plant growth characteristics

Observations were recorded on plant height (cm) at different stages of the plant growth (30, 45, 60 DAT) at 60 DAT after spraying of growth regulators. It is evident from the results (Table 3 and 4) that there was significant difference in plant height at 30,45 and 60

DAT. Maximum plant height of 18.82cm, 49.14cm and 57.73cm was obtained by application of 120kg K_2O/ha (K_3) at 30,40 and 60 DAT respectively. Application of 120kg K_2O/harecorded highest plant height in tomato is reported by Nanadal *et al*., (1998). Application of growth regulators resulted in significant difference in plant height at 30, 45 and 60 DAT (Table 3). Spraying of $GA_3$50ppm resulted in maximum plant height i.e.62.35cm at 60 DAT followed by NAA 40 ppm. Application of 2,4-D resulted in growth retardation in comparison to control. 2,4-D at higher concentration (5-20 ppm) reduced the plant height and showed deleterious effect on height (Singh *et al*., 1990). Combined effect of different levels of potassium with growth regulators was non-significant for this character (Table 4). The increase in plant height may be attributed to the greater multiplication of plant cells and apical dominance which ultimately helps in root and shoot growth.

Fruit length

Significant difference among the treatments in main plot i.e. application of different levels of potassium was observed on length of the fruit of chilli cv. Utkal Ava. Maximum fruit length of (5.36cm) was obtained in K_3treatment followed by K_2 (5.19cm).Minimum (5.06cm) fruit length was observed in K_1 (Table 3).Effect of PGRs on fruit length of chilli cv. Utkal Ava was recorded to be significant. Maximum fruit length (5.49cm) was recorded with two sprays of Planofix (400ppm), followed by $GA_3$50ppm (5.36cm). Minimum fruit length (4.75cm) recorded with 2, 4-D 5ppm (Table 3). It is reported that higher fruit length is obtained by the application of 75ppm NAA at pre bloom stage in chilli. Combined effect of different levels of potassium and PGRs on fruit length was found to be non-significant (Table 4).

Table 3: Effect of different levels of potassium and growth regulators on plant height, fruit length (cm) and fruit girth (cm)

Sl. No	Levels of K_2O	Mean Plant Height (cm)			Fruit length (cm)	Fruit girth (cm)
		30 DAT	45 DAT	60 DAT		
1	K_1 (90 kg$K_2$0/ha)	18.46 (III)	46.41(III)	54.29 (III)	5.06(III)	2.02(III)
2	K_2 (105 kg $K_2$0/ha)	18.64 (II)	47.19 (II)	55.92 (II)	5.19(II)	2.07(II)
3	K_3 (120 kg $K_2$0/ha)	18.82 (I)	49.14 (I)	57.73 (I)	5.36(I)	2.14(I)
	MEAN	18.64	47.58	55.98	5.20	2.07
	CD at 5%	0.1267	1.477	2.589	0.1869	0.0094
	SEM ±	0.0322	0.376	0.659	0.047	0.018

	Growth Regulators (G)	Mean Plant Height (cm)			Fruit length (cm)	Fruit girth (cm)
		30 DAT	45 DAT	60 DAT		
1	C- (Control)	18.47(IV)	46.55(IV)	53.02(IV)	5.19(IV)	2.05(III)
2	G_1-NAA(40ppm)	18.76(II)	50.75(II)	58.86(II)	5.21(III)	2.01(IV)
3	G_2 -GA_3 (50ppm)	18.37(V)	52.1(I)	62.35(I)	5.36(II)	2.07(II)
4	G_3 - Planofix (400ppm)	18.91(I)	47.20(III)	56.80(III)	5.49(I)	2.01(IV)
5	G_4-2,4-D(5ppm)	18.68(III)	41.20(V)	48.86(V)	4.75(V)	2.23(I)
	MEAN	18.64	47.58	55.98	5.20	2.07
	CD at 5%	0.312	1.372	1.868	0.249	0.033
	SEM ±	0.106	0.469	0.640	0.084	0.011

Table 4: Combined effect of different levels of potassium and growth regulators on plant height, fruit length (cm) and fruit girth (cm)

Sl. No.	Interaction of K and G (K × G)	Mean Plant Height (cm)			Fruit length (cm)	Fruit girth (cm)
		30 DAT	45 DAT	60 DAT		
1	K_1C	18.16(13)	45.53(12)	52.13(12)	5.11(10)	2.01(8)
2	K_1G_1	18.67(7)	49.73(6)	57.60(7)	5.14(9)	1.96(10)
3	K_1G_2	18.16(13)	50.33(4)	58.80(4)	5.21(7)	2.02(7)
4	K_1G_3	18.63(9)	46.60(10)	56.00(9)	5.26(6)	1.92(11)
5	K_1G_4	18.66(8)	39.86(15)	46.93(15)	4.57(12)	2.18(2)
6	K_2C	18.56(11)	46.53(11)	53.13(11)	5.14(9)	2.08(5)
7	K_2G_1	18.73(5)	50.06(5)	58.13(5)	5.16(8)	1.96(10)
8	K_2G_2	18.36(12)	52.36(3)	63.53(2)	5.42(4)	2.06(6)
9	K_2G_3	18.93(2)	47.06(9)	56.46(8)	5.55(2)	2.00(9)
10	K_2G_4	18.63(9)	39.93(14)	48.33(14)	4.68(13)	2.25(1)
11	K_3C	18.70(6)	47.60(8)	53.80(10)	5.33(5)	2.08(5)
12	K_3G_1	18.90(3)	52.46(2)	60.86(3)	5.33(5)	2.13(3)
13	K_3G_2	18.60(10)	53.93(1)	64.73(1)	5.47(3)	2.12(4)
14	K_3G_3	19.16(1)	47.93(7)	57.93(6)	5.65(1)	2.13(3)
15	K_3G_4	18.76(4)	43.80(13)	51.33(13)	5.01(11)	2.25(1)

	MEAN	18.64	47.58	55.98	5.20	2.07
	CD at 5%	NS	NS	NS	NS	0.014
	SEM ±	0.048	0.210	0.286	0.038	0.005

K_1	90 kg K_20/ha	C	Control
K_2	105 kg K_20/ha	G_1	NAA (40ppm)
K_3	120 kg K_20/ha	G_2	GA_3 (50ppm)
		G_3	Planofix (400ppm)
		G_4	2,4-D(5ppm)

Fruit girth

The response of different levels of potassium on fruit girth was found to be significant. Highest perimeter of fruits (2.14cm) was observed in K_3treatment followed by K_2 (2.07cm).Minimum fruit girth (2.02cm) was obtained in K_1treatment (Table 3). The effect of PGRS on fruit girth was found to be significant. Maximum (2.07cm) perimeter of fruits was observed with application of 2,4-D 5ppm followed by $GA_3$50ppm.The fruit girth observed to be minimum (2.01 cm) with application of NAA 40 ppm and Planofix 400ppm (Table 3). The interaction effect of different levels of potassium and growth regulators was observed to be significant. The maximum perimeter (2.25cm) was obtained with K_3G_4 and K_2G_4 followed by K_1G_2 (2.18cm) which indicated pronounced effect of 2,4-D (5ppm) in increasing the girth of fruit (Table 4).

Number of branches per plant

Analysis of variance for number of branches per plant at 60DAT revealed significant difference among various levels of potassium nutrition (table 5). Maximum number of branches (7.76) was obtained in K_3treatmentfollowed by K_2 (7.34). Minimum number of branches was obtained in K_1treatment. Significant difference was observed in number of branches per plant with application of different plant growth regulators (Table 5). Maximum number of branches (8.33) was obtained with application of 2,4-D (5ppm) followed by control (7.68). With respect to number of branches per plant the interactive effect of different levels of potassium and various growth regulators was found to be non-significant (Table 6).

Number of fruits per plant

Number of fruits in the sampled plants were recorded for 2 plucking at red ripe stage and the data was analysed, results of which are presented in (Table 5 & 6). Significant differences

were observed with application of different levels of K_2O with respect to number of fruits per plant. Application 120 kg K_2O/ha (K_3) resulted in maximum number of fruits i.e. (106.40) per plant followed by K_2 (99.68). Minimum number of fruits i.e. (95.62) was recorded at K_1treatment. The treatment effects were significant with respect to application of PGRs on number of fruits per plant. Spraying of GA_3 50ppm resulted in production of maximum number of fruits (120.22) per plant followed by NAA 40ppm (112.48). Application of GA_3 increased the number of fruits per plant than the control (Sumiati 1987). The interactive effect of different levels of K_2O and PGRS on number of fruits per plant was observed to be significant. Application of K_3 along with two sprays of GA_3 50ppm produced maximum number of fruits per plant (132.33), followed by K_3 along with two sprays NAA 40ppm (115.66).Minimum number of fruits per plant was obtained with the treatment of K_1G_4 (Table 6).

Table 5: Effect of different levels of potassium and growth regulators on number of Branches/Plant, number of fruits/plant, number of seeds/fruit

Sl. No.	Levels of K_2O	Number of Branches/Plant	Number of fruits/plant	Number of seeds/fruit
1	K_1 (90 kg K_20/ha)	6.85(III)	95.62(III)	33.20(III)
2	K_2 (105 kg K_20/ha)	7.34(II)	99.68(II)	33.79(II)
3	K_3 (120 kg K_20/ha)	7.76(I)	106.40(I)	34.689(I)
	MEAN	7.31	100.56	33.89
	CD at 5%	0.260	2.852	1.608
	SEM ±	0.067	0.726	0.409
	Growth Regulators (G)	Number of Branches/Plant	Number of fruits/plant	Number of seeds/fruit
1	C (Control)	7.68(II)	98.64(IV)	34.76(III)
2	G_1 -NAA(40ppm)	6.71(IV)	112.48(II)	38.789(I)
3	G_2 - GA_3 (50ppm)	7.22(III)	120.22(I)	37.85(II)
4	G_3 - Planofix (400ppm)	6.64(V)	101.46(III)	35.97(III)
5	G_4 2,4-D(5ppm)	8.33(I)	70.02(V)	22.07(V)
	MEAN	7.31	100.56	33.89
	CD at 5%	0.445	2.926	NS
	SEM ±	0.152	1.00	0.372

Table 6: Combined effect of different levels of potassium and growth regulators on number of Branches/Plant, number of fruits/plant, number of seeds/fruit

Sl. No.	Interaction of K and G (K × G)	Number of Branches/Plant	Number of fruits/plant	Number of seeds/fruit
1	K_1C	7.60(6)	95.33(12)	33.90(12)
2	K_1G_1	5.73(14)	108.80(6)	38.23(4)
3	K_1G_2	6.93(10)	113.66(4)	37.23(6)
4	K_1G_3	6.26(13)	99.40(10)	36.20(8)
5	K_1G_4	7.73(4)	60.93(15)	20.43(15)
6	K_2C	7.66(5)	99.00(11)	34.30(11)
7	K_2G_1	6.80(11)	113.00(5)	38.43(2)
8	K_2G_2	7.20(8)	114.66(3)	37.96(5)
9	K_2G_3	6.66(12)	100.46(9)	35.50(10)
10	K_2G_4	8.40(2)	71.26(14)	22.76(14)
11	K_3C	7.80(3)	101.60(8)	36.1(9)
12	K_3G_1	7.60(6)	115.66(2)	39.70(1)
13	K_3G_2	7.53(7)	132.33(1)	38.36(3)
14	K_3G_3	7.00(9)	104.53(7)	36.22(7)
15	K_3G_4	8.86(1)	77.86(13)	23.03(13)
	MEAN	7.31	100.56	33.89
	CD at 5%	NS	NS	NS
	SEM ±	0.068	0.448	0.166

K_1	90 kg K_20/ha	C	Control
K_2	105 kg K_20/ha	G_1	NAA (40ppm)
K_3	120 kg K_20/ha	G_2	GA_3 (50ppm)
		G_3	Planofix (400ppm)
		G_4	2,4-D(5ppm)

Number of seeds per fruit

The effect of different levels of potassium on number of seeds per fruit was found to be non-significant. Significant influence of growth regulators was observed with respect to number

of seeds per fruit (Table 5). The highest number of seeds per fruit was recorded with NAA 40ppm (38.78) followed by GA_3 (37.85). The minimum number of seeds was recorded when 2, 4-D (5ppm) was applied twice to chilli cv. Utkal Ava which is 37% less in number as compared to control. This may be attributed to production of abortive pollens or pistils. Biradar (1999) noticed highest number of seeds per fruit with 20ppm NAA. The interaction effect of different levels of potassium with growth regulators was found to be non-significant on number of seeds per fruit (Table 6).

Fruit yield per plot

The average dry fruit yield per plot of chilli cv. Utkal Ava (Table 7) indicated considerable variation among application of different levels of potassium. The treatment K_3 produced maximum fruit yield per plot (1.95kg) followed by K_2 (1.79kg) while the lowest dry fruit yield per plot was recorded in K_1.Chilli cv. Utkal Ava responded significantly to application of various plant growth regulators. Response of spraying of NAA 40ppm was highest on per plot fruit yield (2.08kg) which is 25% higher than the control, followed by $GA_3$350ppm (1.91kg). Minimum fruit yield of (1.37kg) was obtained from 2,4-D 5ppm (Table 7). Combined effect of different levels of potassium and PGRs on fruit yield per plot was found to be highly significant. Maximum fruit yield of (2.30kg) was obtained with K_3G_1which was 45% higher than the fruit yield of K_1C (1.58kg). The treatment K_2G_1 (2.18kg) resulted in 37% higher yield as compared to K_1C followed by K_3G_2 (2.06kg). Minimum fruit yield of 1.15kg was obtained with K_1G_4 (Table 8).

Fruit yield/ha

Fruit yield per hectare is an important attribute in any field or vegetable crop, relating to seed production. The maximum fruit yield of (2719.82kg) was obtained intreatment K_3 which is 24 % higher than K_1 (table 7).The effect of application of different PGRs on fruit yield per hectare was found to be highly significant. Maximum fruit yield of (2888.70kg) was obtained with application of NAA 40ppm which is 25% higher than control followed by application of GA_3 50 ppm (2655.38kg). Minimum dry fruit yield of (1910.98kg) was recorded from 2, 4-D 5ppm. Combined effect of different levels of potassium and PGRs on fruit yield per hectare was found to be highly significant. The values of fruit yield per hectare ranged from 1599.89kg/ha to 3199.79 kg/ha (table 8).

Table 7: Effect of different levels of potassium and growth regulators on fruit Fruit yield/Plot (kg), Fruit yield/ha (kg), Seed yield/Plot (kg) and Seed yield/ha (kg)

Sl. No.	Levels of K_2O	Fruit yield/Plot (kg)	Fruit yield/Ha (kg)	Seed yield/Plot (kg)	Seed yield/Ha (kg)
1	K_1 (90 kg K_20/ha)	1.56(III)	2179.86(III)	0.431(III)	600.64(III)
2	K_2 (105 kg K_20/ha)	1.79(II)	2486.50(II)	0.531(II)	739.29(II)
3	K_3 (120 kg K_20/ha)	1.95(I)	2719.82(I)	0.612(I)	851.81(I)
	MEAN	1.76	2462.06	0.524	730.58
	CD at 5%	0.0115	45.95	0.009	12.47
	SEM ±	0.022	11.704	0.0023	3.175
	Growth Regulators (G)	Fruit yield/Plot (kg)	Fruit yield/Ha (kg)	Seed yield/Plot (kg)	Seed yield/Ha (kg)
1	C (Control)	1.66(IV)	2310.96(IV)	0.506(IV)	703.92(IV)
2	G_1 -NAA(40ppm)	2.08(I)	2888.70(I)	0.684(I)	951.85(I)
3	G_2 - GA_3 (50ppm)	1.91(II)	2655.38(II)	0.6159(II)	855.97(II)
4	G_3 - Planofix (400ppm)	1.83(III)	2544.28(III)	0.582(III)	809.38(III)
5	G_4 2,4-D(5ppm)	1.37(V)	1910.98(V)	0.238(V)	331.78(V)
	MEAN	1.76	2462.06	0.524	730.58
	CD at 5%	0.039	54.38	0.0127	17.61
	SEM ±	0.013	18.63	0.004	6.03

Table 8: Combined effect of different levels of potassium and growth regulators on Fruit yield/Plot (kg), Fruit yield/ha (kg), Seed yield/Plot (kg) and Seed yield/ha (kg)

Sl. NO	Interaction of K and G (K × G)	Fruit yield/Plot (kg)	Fruit yield/Ha (kg)	Seed yield/Plot (kg)	Seed yield/Ha (kg)
1	K_1C	1.58(12)	2199.85(13)	0.436(12)	607.04(12)
2	K_1G_1	1.75(8)	2433.17(8)	0.551(8)	766.12(8)
3	K_1G_2	1.72(9)	2399.84(9)	0.517(9)	719.87(9)
4	K_1G_3	1.63(11)	2266.51(11)	0.487(11)	677.38(11)
5	K_1G_4	1.15(14)	1599.89(14)	0.167(15)	232.81(15)
6	K_2C	1.64(10)	2283.18(10)	0.512(10)	711.43(10)

7	K_2G_1	2.18(2)	3033.13(2)	0.709(2)	985.37(2)
8	K_2G_2	1.94(5)	2699.82(5)	0.636(5)	884.18(5)
9	K_2G_3	1.83(6)	2549.83(6)	0.593(6)	825.37(6)
10	K_2G_4	1.34(13)	1866.54(13)	0.2089(14)	290.09(14)
11	K_3C	1.76(7)	2449.84(7)	0.570(7)	793.30(7)
12	K_3G_1	2.30(1)	3199.79(1)	0.794(1)	1104.08(1)
13	K_3G_2	2.06(3)	2866.48(3)	0.693(3)	963.84(3)
14	K_3G_3	2.02(4)	2816.48(4)	0.666(4)	925.40(4)
15	K_3G_4	1.63(11)	2266.51(11)	0.339(13)	472.45(13)
	MEAN	1.76	2462.06	0.524	730.58
	CD at 5%	0.0175	24.31	0.0056	7.87
	SEM ±	0.006	8.33	0.002	2.69

K_1	90 kg K_20/ha	C	Control
K_2	105 kg K_20/ha	G_1	NAA (40ppm)
K_3	120 kg K_20/ha	G_2	GA_3 (50ppm)
		G_3	Planofix (400ppm)
		G_4	2,4-D(5ppm)

Seed yield per plot

Significant effect of different levels of potassium nutrition was observed on seed yield per plot of chilli cv. Utkal Ava. Highest seed yield of (0.612kg) was recorded with K_3treatment followed by K_2 (0.531kg) (Table 7). Seed yield per plot was influenced significantly by application of different growth regulators. Highest seed yield per plot (0.684kg) was recorded with application of NAA 40ppm, followed by GA_3 (0.615kg). Minimum yield of 0.238kg per plot was recorded with application of 2,4-D 5ppm. The interaction effect of different levels of potassium with various growth regulators was found to be highly significant. The range of seed yield per plot was observed to be 0.167 kg per plot to 0.794 kg per plot. The highest per plot seed yield was recorded with K_3G_1 (0.794kg) followed by K_2G_1 (0.709kg) and K_3G_2 (0.693kg). The minimum seed yield of (0.167kg) was recorded with K_1G_4 (Table 8).

Seed yield/ha

Significant effect on seed yield per hectare was observed. Highest seed yield of 851.81kg/ha was recorded in K_3treatment followed by K_2 (739.23kg). The analysis of yield data indicates that there is 23% and 41% increase in yield with application of K_2 and K_3 as compared to K_1 (Table 7). Growth regulators exhibited significant influence on seed yield per hectare, in chilli cv. Utkal Ava (Table 7). The highest seed yield of 951.85 kg/ha was obtained with application of NAA 40ppm followed by GA_3 50ppm (855.97 kg/ha), while application of 2,4-D recorded the lowest seed yield of 331.78kg/ha, which is 53% less than control (703.92 kg/ha). There is an additional yield of 14, 21 and 35 % obtained with application of planofix, GA_3 and NAA respectively. Increase in seed yield may be due to increase in number of flowers and fruits per plant and growth regulators might have brought certain changes in metabolism during fruit and seed development due to which there might have been greater accumulation of food reserves which resulted in higher seed yield. The interactive effect of different levels of potassium with spraying of various growth regulators was found to be highly significant. Highest seed yield of 1104.08 kg/ha was obtained with K_3G_1 followed by K_2G_1 (985.37 kg/ha) and K_3G_2 (963.84 kg/ha). The effect of treatment $K_3G_1$is found to be maximum i.e. 81% more than K_1C followed by K_2G_1 (62%). Increased application of potassium along with spraying of growth regulators might have augmented better translocation of photo assimilates which might have been resulted in increased production of seed.

CONCLUSION

In the present investigation it was mostly apparent that application of 120 kg K_2O/ha enhanced the plant growth characters as well as fruit yield, seed yield and seed quality attributes as compared to 90kg and 105 kg K_2O/ha in chilli cv. Utkal Ava. Among the treatments studied application of 120 kg K_2O/ha along with NAA 40ppm resulted in maximum enhancement of fruit and seed yield. Most of the treatments had also enhanced the plant growth characteristics fruit and seed yield except 2,4-D (5ppm). Application of 120 kg K_2O/ha along with spraying of GA_3 (50ppm) enhanced the seed quality attributes i.e. germination percentage, seedling length, seed vigour index-I and seed vigour index-II.

References

[1] Abdul-Baki, A.A. and Anderson, J.D., 1973, Vigour determination in soybean by multiple criteria. *Crop Sci.,* 13: 630-633.

[2] Arora, S.K., Pandita, M.L. and Baswana, K.S., 1985, Effect of growth regulators on flowering and fruiting of bottle gourd. Harayana Agril. Univ. J. Res., 25 (1): 36-41.

[3] Biradar, B.R., 1999, Investigations of seed technology aspects in chilli (*Capsicum annuum* L.). Ph. D. Thesis, Uni. Agric. Sci., Dharwad (India).

[4] Kanwar, J.S., 1974, Assessment of potassium fertilization in the tropics and subtropics of Asia: Potassium research and agricultural production. *Proc. Congr. Int. Potash.Inst.,* 10: 261-282.

[5] Lata, S. and Singh, R.P., 1993, Effect of nitrogen levels and growth regulators on growth, yield and quality of chilli (*Capsicum annuum* L.) variety Pant C-L. *Veg. Sci.,* 20: 40-43.

[6] Nanadal, J.K., Ramesh, V. and Pandey, U.P., 1998, Effect of phosphorus and potassium on growth, yield and quality of tomato. *J. Potas. Res.,* 15(1-4): 44-49.

[7] Pandita, M.L., Pandey, S.C., Mangal, J.L. and Singh, G.P., 1980, Effect of various concentrations of planofIx as foliar spray on plant growth and fruit yield of chillies. *Haryana J. Hortic. Science,* 9: 170- 174.

[8] Panse, U.G. and Sukhatme, 1967, Statistical methods for agricultural workers. ICAR publication, New Delhi, India.

[9] Singh, D.K., Gulshan Lal and Singh, R.P., 1990, Effect of synthetic auxins on the performance of chilli *(Capsicum annuum* L.). cultivars under tarai conditions of UP during winter season. *Prog. Horticu.,* 22: 191-197.

[10] Subhani, P.M., Ravishankar, C. and Narayana, N., 1990, Effect of graded levels and time of application of N and K2O on flowering, fruiting and yield of irrigated chilli. *IndianCocoa Arecanut Spi. J.*, 14(2): 70-73.

[11] Sumiati, E., 1987, Effect of plant growth regulators on flowering and yield of tomatoes in the Lembang Highlands. *Bull. Pene. Hortic*., 15 (1): 134-143.

[12] Yamgar, V.T. and Desai, V.T., 1987, Effect of NAA and planofix on flowering, flower and fruit drop and fruit set in chilli. *J. Maha. Agril. Univ*., 12 (1): 34-38. of chilli (*Capsicum annuum* L.). *South Indian Hort.,* 52(1-6): 158-163.