J. Phytol. Res. 8 (1): 77-82, 1995.

FOLIAR SPRAY OF SOME GROWTH REGULATORS EFFECTING PLANT GROWTH AND YIELD OF *VIGNA RADIATA*

D. SAMBAIAH* and K.JAGANMOHAN REDDY

Department of Botany, Kakatiya University, Warangal - 506 527 (A.P.) India.

* Department of Human Resources Development DIET, Karimnagar - 505 527 (A.P.) India.

The present study deals with the foliar application of growth regulators such as chamatkar, Microsol, GA3, 2,4-D and combination of chamatkar + Microsol, Chamatkar + 2,4-D; in different concentrations of 50, 150, 250, 500 and 1000 ppm on *Vigna radiata var K.851*. The observations with regard to shoot length, number of branches, nodular index, number of flower bunches, leaf area, stomatal index and yield components were considered.

Keywords: Growth regulators; Plant growth; Stomatal index; *Vigna radiata;* Yield components.

Introduction

Recently growth promoting effects of some growth regulators on yield and yield contributing components have been reported in Lentil[1-2]. Plant growth regulators are being increasingly used as an aid to enhance yield [3,4]. *Vigna* is one of the most important pulse crops and rich source of protein (22%). The present investigation was performed to study the effect of some growth regulators on growth and yield components of *Vigna radiata.*

Material and Methods

Vigna radiata var. K.851 (Mung) seeds were sown in the research field of Botany Department which was ploughed for two times during the year 1993-94. The plot size was 50x20 meters. Plants were raised in the thirty block designs using three replicates with 30 cms inter row spacing and 15 cms with in the plants. Simultaneously controls were also maintained.

The plants were sprayed at the time of first foliage started i.e. 15 days after sowing, with aqueous solutions of 50, 150, 250, 500 and 1000 ppm of Chamatkar (Mepiquat Chloride 5 AS), Microsol (N-Triacontanol), GA3 Gibberellic acid), 2,4-D (2,4-Dichloro phenoxy acetic acid) and in combinations with Chamatkar + Microsol, Chamatkar + 2,4-D. Plants sprayed with water served as control. Six sprays were done with a gap period of one week. The entire crop period was 65 days from the date of sowing to the harvest. The shoot and root length of plants were measured by the short-term harvest method[5]. And data on branching pattern in foliage and flowering bunches were considered at the time of flowering, Leaf area, number of pods, pod lengths, number of seeds per pod were collected at harvest from ten randomly selected plants of each treatment. Nodular and stomatal indices were also calculated at initiation of flowering. The data on all these parameters comprised in tables 1,2,3 are analysed statistically.

Results and Discussion

An increase in shoot length was noted with the application of Chamatkar at 150 and

250 ppm. Among the growth regulators Chamatkar was found to initiate early flowering. The increase in flower bunches was also correlated with increasing branches at 150 and 500 ppm concentrations. The nodular index (3.8) was more significant at 500 ppm of Chamatkar. Leaf area was enormously higher than the control at 500 ppm of this chemical. However stomatal index decreased at higher concentration (1000 ppm) than that of control. Many paracyticstomata and high frequency of single guard cells were observed at 250 ppm. Number of pods per plant, the pod length and number of seeds per pod increased gradually upto 500 ppm.

The spray of microsol at 50 and 500 ppm increased the shoot length and number of branches. Significant decrease in stomatal index and contiguous stomata were recorded at 1000 ppm of microsol. Pod length, number of pods and number of seeds per pod increased highly at 250 ppm (Table 1). Butterfly like bifoliate thick leaves were noticed with the 150 and 250 ppm of microsol.

However, with the application of GA, right from 50 ppm to 1000 ppm the shoot length, and the number of branches were higher than the control (Table 2). At 500 and 1000 ppm GA, tendrillar type of shoot growth was seen. Reduced nodular index and deformation of roots (curved) was recorded at 1000 ppm of GA. Decrease in stomatal index was observed in all the treatments of GA. At 1000 ppm, broad opening of stomatal pores with distinct bean shaped guard cells having more number of chloroplasts were examined under microscope.

2,4-D at different concentrations significantly reduced all the growth parameters studied (Table 2) except nodular index where it slightly increased at 50, 150 & 250 ppm. But stunted growth with more trichomous, thick leathery bifoliate leaves and abnormal stomata were observed at 500 ppm of 2,4-D. Flowering was almost completely absent with the treatment of 1000 ppm.

Chamatkar and microsol, in combination, did not show any increase with regard to the number of branches, nodular index, leaf area and number of pods per plant over their individual treatments. However, the increase was observed when compared with controls. Similarly the tendency of decreasing stomatal index was also noticed.

With the combination of Ch + 2,4-D the shoot lengths were effected along with the reduction in number of nodular index, flower bunches, leaf area, and stomatal index. More number of ruptured stomata were examined with the treatment of Ch + 2,4-D at 500 & 1000 ppm (Table 3).

The crop growth rate indicated a reduction with the increase in 2,4-D concentration. From the results it was apparent that Chamatkar at higher concentrations enhanced the number of branches,nodular index and leaf area.

The growth regulator microsol application at various concentrations increased the number of seeds per pod, significantly at 250 ppm.

All the treatments of growth regulators, except 2,4-D, resulted in better plant growth in terms of plant height and

Table 1.

Concentrations in ppm	Shoot length in cms	No. of branches	Nodular Index	No. of flower bunches	Total Leaf Area per plant in Sq. cms.	Stomatal Index	No. of pods	pod length in cms	No. of seeds per pod
1	2	3	4	5	6	7	8	9	10
Control O	16.6	2.8	1.4	3.0	120.0	55.0	6.3	4.6	9.3
	±1.01	±0.52	±0.20	±0.61	±0.81	±0.23	±0.74	±1.01	±1.22
Chamatkar	14.5*	6.0*	1.5	4.0	135.0	60.0	8.0	6.0*	12.0*
50 ppm	±1.21	±0.52	±0.28	±0.71	±1.01	±1.22	±0.15	±0.28	±1.21
150 ppm	25.0**	7.5*	1.6	8.0**	360.0**	65.0	9.0*	6.5*	13.0*
	±0.52	±0.78	±1.21	±0.77	±1.21	±1.31	±1.74	±1.92	±1.21
250 ppm	30.1**	5.6*	1.8	6.5*	600.0**	45.0	12.5**	8.1*	14.0*
	±1.54	±1.23	±1.04	±1.51	±1.24	±1.51	±1.04	±1.21	±1.31
500 ppm	22.0*	8.0**	3.8**	9.0**	1008.0**	50.0	15.0**	8.5*	15.1**
	±1.81	±1.23	±1.05	±1.11	±0.78	±0.76	±1.24	±1.76	±1.91
1000 ppm	18.1	7.0*	3.0*	7.1*	720.5**	35.4*	6.0	5.2	10.2
	1.23	1.71	1.41	1.23	1.45	1.22	1.41	0.54	1.82
Microsol	30.4**	7.1*	2.0	4.0	180.5*	33.6*	13.0*	6.0*	15.1*
50 ppm	±1.91	±1.28	±1.21	±0.51	±0.71	±0.91	±1.02	±1.71	±2.11
150 ppm	24.6*	6.2*	1.5	5.2*	300.0*	40.0*	12.1*	5.6*	13.0*
	±1.81	±0.09	±0.19	±0.29	±1.02	±1.21	±1.22	±1.31	±1.21
250 ppm	20.2*	5.1*	2.1	3.5	350.0**	35.0*	14.0**	6.5*	15.5**
	±0.41	±0.51	±1.11	±1.21	±1.04	±0.31	±1.21	±1.21	±1.08
500 ppm	30.5*	6.5*	1.6	6.5**	250.5*	33.0*	8.0*	4.5	8.2
	±1.01	±1.21	±0.77	±0.18	±0.12	±1.09	±1.31	±0.71	±1.02
1000 ppm	17.2	5.0	3.0*	5.0	192.0	30.0*	6.0	4.0	6.0*
	±1.05	±1.21	±0.71	±0.99	±0.71	±1.02	±1.01	±1.54	±1.02

Table 2.

Concentrations in ppm	Shoot length in cms	No. of branches	Nodular Index	No. of flower bunches	Total Leaf Area per plant in Sq. cms.	Stomatal Index	No. of pods	pod length in cms	No. of seeds per pod
1	2	3	4	5	6	7	8	9	10
GA 50 ppm	18.1	5.2*	3.0*	5.0*	270.0*	45.0	8.2*	4.8	8.9
	±1.02	±1.23	±0.28	±0.34	±1.23	±1.01	±1.23	±0.58	±1.23
150 pmm	21.0*	5.3*	3.1*	5.5*	225.0*	42.0*	9.0*	5.0	12.0*
	±1.21	±1.12	±0.51	±0.52	±1.21	±1.21	±1.56	±1.20	±1.21
250 Pmm	30.0*	5.5*	1.9	4.5*	200.5*	40.5*	9.1*	7.5*	13.1*
	±1.02	±1.51	±0.28	±1.01	±1.24	±1.04	±1.22	±1.05	±1.52
500 Pmm	32.4**	5.6*	1.7	7.0*	300.5**	38.5*	6.2	5.1	10.1
	±1.02	±1.28	±1.91	±1.21	±1.54	±0.05	±1.02	±1.02	±1.23
1000 ppm	54.0**	6.1**	1.1	5.0*	240.0*	35.0*	5.0	5.0	9.8
	±1.02	±1.07	±1.28	±1.01	±1.24	±1.54	±1.04	±1.45	±1.51
2,4-D	11.5*	3.0	2.0	2.5	135.0	25.0**	4.0	3.0*	8.0
50 ppm	±1.05	±1.51	±1.22	±1.41	±1.56	±1.66	±1.51	±1.64	±0.56
150 ppm	13.0	3.0	3.0*	3.1	108.0	32.0*	3.8*	5.1	10.5
	±0.56	±2.3	±2.11	±1.08	±1.09	±0.06	±1.02	±0.56	±0.76
250 ppm	15.5	3.1	1.6	2.0*	81.1*	34.0*	3.0*	4.1	8.0
	±1.02	±1.56	±1.44	±1.56	±1.61	±0.16	±1.06	±1.51	±1.61
500 ppm	12.1*	2.0	0.7*	1.0*	+60.5*	36.0*	2.0*	2.5**	5.4**
	±0.54	±1.05	±1.02	±0.56	±1.02	±1.56	±1.21	±1.51	±0.54
1000 ppm	10.0**	-	0.5**	-	48.1**	40.0*	-	-	-
	±0.51		±1.51		±0.52	±1.02			

Table 3.

Concentrations in ppm	Shoot length in cms	No. of branches	Nodular Index	No. of flower bunches	Total Leaf Area per plant in Sq. cms.	Stomatal Index	No. of pods	pod length in cms	No. of seeds per pod
1	2	3	4	5	6	7	8	9	10
Chamatkar +	13.0	3.1	3.0*	5.0*	135.0	25.0**	7.0	5.0	10.0
Microsol 50 ppm	±1.01	±0.51	±0.29	±1.51	±1.23	±0.51	±0.67	±0.92	±1.05
150 ppm	11.0*	3.0	2.0	2.0	180.0*	28.0*	8.0	6.0*	12.1*
	±1.51	±0.57	±0.63	±0.71	±1.22	±1.03	±1.05	±1.56	±1.27
250 ppm	13.6	3.5	1.5	3.0	190.0*	30.0*	9.0*	7.0*	13.0*
	±1.05	±1.21	±1.36	±0.71	±0.66	±0.71	±1.23	±1.51	±1.61
500 ppm	14.1	3.6*	3.0*	4.5*	240.0*	33.0*	6.0	4.8	8.9
	±0.56	±0.61	±1.21	±1.31	±1.56	±1.61	±1.24	±1.51	±1.61
1000 ppm	10.2**	3.0	3.5*	4.1	300.0*	35.1*	5.5	4.1	7.9
	±0.51	±0.62	±1.51	±0.56	±1.51	±0.61	±1.23	±1.61	±1.51
Chamatkar +	12.1*	2.5	1.1	1.5*	180.5*	33.4*	5.1	3.1*	7.0
2,4 -D ppm	±0.0	±1.01	±1.20	±1.51	±0.78	±.61	±21	±1.30	±1.21
150 ppm	15.5	1.0*	2.5	1.0*	90.0*	20.0**	5.0	3.0*	8.0
	±0.56	±0.79	±0.51	±0.71	±0.16	±.23	±51	±1.02	±0.39
250 ppm	15.9	1.0*	1.3	1.0*	80.0*	24.1**	4.0	3.1*	7.1
	±0.56	±1.21	±.01	±56	±0.97	±0.76	±0.71	±0.29	±1.04
500 ppm	14.0	1.0**	1.5	1.0**	60.0**	35.0*	2.0**	1.5**	3.5**
	±0.56	±0.56	±0.21	±0.61	±0.23	±0.61	±0.31	±0.51	±0.61
1000 ppm	12.0*	-	0.9*	-	36.0**	40.0*	-	-	-
	±0.51		±0.61		±0.51	±1.02			

* Significant at 5% level of significance

** Significant at 1% level of significance

number of branches. These results were corroborated with the data of Mollrath and Engle[6] . The different concentrations of Ch + Mi were distinctly shown with mixed competency of growth parameters.

Plant growth regulators are known to modify the growth and development pattern of plants by exerting profound effect on various physiological processes and hence regulating the productivity[7-10].

Acknowledgement

Authors are thankful to Dr. Digamber Rao, Professor & Head, Department of Botany, Kakatiya University, Warangal for providing facilities.

References

1. Setia N, Setia R C, Kaur D and Malik C P 1988, *Lens Newslett.* **15** 18
2. Setia N, Setia R C, Kaur D and Malik C P 1989, *Lens Newslett.* **16** 36
3. Nickell L G 1982, *Plant growth regulators Agricultural uses.* Springer - Verlag, Berlin.
4. Malik C P, Grewal M K, Parmer U, Bhatia D S and Singh P 1988, In: *Purohit S S (Ed.) Harmonal regulation of plant growth and development* Vol IV 123-152. Agro Botanical Publishers, Bikaner, India.
5. Odum E P 1960,*Ecology* **41** 34
6. Mollrath W J and Ergle D R 1953, *Bot. Gaz* **114** 461
7. Brenner M L 1987, In: *plant hormones and their role in plant growth and development (Ed)* P J Davies. Martinus Nijhjoff, Dordrecht, P 475.
8. Clifford P E, Offler C E and Patrick J W 1986, *Plant Physiol* **80** 635
9. Patrick J W 1988, *Hort. Sci.* **23** 33
10. Setia R C, Setia N and Malik C P 1991, *In: Recent advances in plant Biology (Edn.)* C P Malik and Y P Abrol. Narendra Publishers, Delhi P 47-75.