

Executive Editor Ashok Yakkaldevi

Editor-in-Chief H.N. Jagtap



Welcome to ISRJ

RNI MAHMUL/2011/38595

ISSN No.2230-7850

Indian Streams Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial Board readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

International Advisory Board

Flávio de São Pedro Filho Federal University of Rondonia, Brazil Kamani Perera Regional Centre For Strategic Studies, Sr Lanka	Mohammad Hailat Dept. of Mathmatical Sciences, University of South Carolina Aiken, Aiken SC 29801 Abdullah Sabbagh	Hasan Baktir English Language and Literature Department, Kayseri Ghayoor Abbas Chotana Department of Chemistry, Lahore
Janaki Sinnasamy Librarian, University of Malaya [Malaysia]	Engineering Studies, Sydney Catalina Neculai University of Coventry, UK	University of Management Sciences [PK] Anna Maria Constantinovici AL. I. Cuza University, Romania
Romona Mihaila Spiru Haret University, Romania	Ecaterina Patrascu Spiru Haret University, Bucharest	Horia Patrascu Spiru Haret University, Bucharest, Romania
Delia Serbescu Spiru Haret University, Bucharest, Romania	Loredana Bosca Spiru Haret University, Romania	Ilie Pintea, Spiru Haret University, Romania
Anurag Misra DBS College, Kanpur	Federal University of Rondonia, Brazil	Xiaohua Yang PhD, USA Nawab Ali Khan
Titus Pop	Postdoctoral Researcher	College of Business Administration
	Editorial Board	
Pratap Vyamktrao Naikwade ASP College Devrukh,Ratnagiri,MS India	Iresh Swami a Ex - VC. Solapur University, Solapur	Rajendra Shendge Director, B.C.U.D. Solapur University, Solapur
R. R. Patil Head Geology Department Solapur University, Solapur	N.S. Dhaygude Ex. Prin. Dayanand College, Solapur	R. R. Yalikar Director Managment Institute, Solapur
Rama Bhosale Prin. and Jt. Director Higher Education, Panvel	K. M. Bhandarkar Proful Patel College of Education, Condia	Umesh Rajderkar Head Humanities & Social Science YCMOU, Nashik
Salve R. N. Department of Sociology, Shivaji University, Kolhapur	Sonal Singh Vikram University, Ujjain	S. R. Pandya Head Education Dept. Mumbai University, Mumbai
Govind P. Shinde Bharati Vidyapeeth School of Distance Education Center, Navi Mumbai	G. P. Patankar S. D. M. Degree College, Honavar, Karnataka	Alka Darshan Shrivastava Shaskiya Snatkottar Mahavidyalaya, Dhar
	Maj. S. Bakhtiar Choudhary	Rahul Shriram Sudke

Arts, Science & Commerce College, Indapur, Pune

Chakane Sanjay Dnyaneshwar

Director, Hyderabad AP India. S.Parvathi Devi

S.KANNAN

Ph.D.-University of Allahabad

Ph.D, Annamalai University, TN

Devi Ahilya Vishwavidyalaya, Indore

Awadhesh Kumar Shirotriya Secretary, Play India Play (Trust), Meerut Sonal Singh

Satish Kumar Kalhotra

Address:-Ashok Yakkaldevi 258/34, Raviwar Peth, Solapur - 413 005 Maharashtra, India Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.isrj.net



Mosmi Raina and Anil Raina

Govt M,A.M PG College, Jammu *Department of Environmental Sciences, University of Jammu, J&K

Abstract:

The present study has been conducted to work out the effect of a wide spectrum organophosphorous insecticide, chlorpyriphos (O, O-Diethyl O- 3, 5, 6-trichloro-2pyridyl phosphorothioate) on the morphological features of three commonly grown vegetables in the study area i.e. Cauliflower (Brassica oleracea L. var. botrytis, Variety: Snowball 16), Tomato (Lycopersicon esculentum Mill., Variety: Pusa Ruby) and Okra (Abelmoschus esculentus L., Variety: Pusa Sawani). Results revealed that on an average, the impact of chlorpyriphos on various morphological parameters of all the three vegetables have been statistically insignificant (using t- Test) except for height of the plants in cauliflower treated with double the recommended dose which exhibited a significant decrease and weight of the head in cauliflower treated with recommended dose of chlorpyriphos which showed a significant increase. Also in okra total number of flowers/plant at treatment with both the dosages along with total number of fruits/plant at treatment with the recommended dose has exhibited statistically significant increase.

KEYWORDS:

Chlorpyriphos, Morphological features, Cauliflower, Tomato, Okra.

INTRODUCTION

Chemicals have been used for pest control since the ancient Greek, Roman and Chinese civilization about 3 million years ago when the ability of sulphur dust to control insects was known by philosophers and other learned people (Freed, 1987). During the past three decades, indiscriminate use of chemical pesticides in agriculture has created serious health and environment problems in many developing countries (World Resources, 1998-99). Inappropriate application of pesticides affects the whole ecosystem by entering the residues in food chain and polluting the soil, air, ground and surface water (ICAR, 1967 and UN/DESA, 2002). Use of pesticides to control pests is unavoidable as pests cause heavy loss to yield and quality of the food items including the vegetables, which forms a very important component of agriculture in India. In tropical countries, crop loss due to pests is even more severe because prevailing high temperature and humidity are highly conducive to rapid multiplication of pests (Lakshmi, 1993). Worldwide about 2.3 million metric tones of these pesticides are used each year on an average of 0.45 kilogram for each person on earth. About 85% of all the pesticides are used in developing countries

Please cite this Article as :Mosmi Raina and Anil Raina , Impact Of Chlorpyriphos On The Morphological Parameters Of Cauliflower, Tomato And Okra : Indian Streams Research Journal (Sept. ; 2012)



(Joseph, 2005). A rough estimate shows that about one third of the world's agricultural production is lost every year due to pests despite the pesticide consumption which totaled more than 2 million tons. Various insect pests viz. shoot and fruit borer, leaf rollers, jassids, aphids, moths, mites, fruit flies, caterpillars, weevils and hoppers etc. cause considerable losses to the vegetables which along with fruits and spices have been estimated to be of Rs. 30,000 crores in India only (MOCF, 2002). Pesticides on one hand helped to control the diseases and pests etc, but on the other hand these have given rise to many serious problems. There are several research reports on the presence of pesticide residues in different food commodities like vegetables, fruits, cereals, pulses, edible oil, eggs, meat, fishes, tea, wheat flour, milk and bottled water etc (Vahab et al., 1991; Agnihotri, 1999; Rajendran, 2003; Down to Earth, 2000; Down to Earth, 2003). Considering the food losses caused by insect pests, it is not feasible to completely dispense with the application of pesticides. However, the use of pesticides can be regulated to ensure minimum residues on food, which can be considered safe for human consumption and for the environment, as well. The present study has been undertaken to work out the effect of a wide spectrum organophosphorous insecticide, chlorpyriphos (Chemical name: O, O-Diethyl O- 3, 5, 6-trichloro-2-pyridyl phosphorothioate) on the morphological features of three commonly grown vegetables in the study area i.e. tomato, okra and cauliflower at recommended (500g a.i. ha-1) and double the recommended doses (1000g a.i. ha-1).

MATERIALS AND METHODS

Field experiments were conducted for two consecutive years i.e. 2004 and 2005, at village Jassore of Tehsil R.S. Pura, District Jammu. (320 38/ N latitude and 740 45/ E longitude) which is located at an altitude of 217 meters above sea level in low- altitude subtropical agro climatic zone characterized by the monsoon concentration of precipitation, hot summers and relatively dry but pronounced winters and preponderance of alluvial soils. Three crops i.e. Cauliflower (Brassica oleracea L. var. botrytis, Variety: Snowball 16), Tomato (Lycopersicon esculentum Mill., Variety: Pusa Ruby) and Okra (Abelmoschus esculentus L., Variety: Pusa Sawani) were raised after procuring certified seeds from the Directorate of Agriculture, Talab Tillo, Jammu, J&K Govt, in field in their respective seasons for two consecutive years. Seven experimental plots, one control plot and three plots (size 5 X 5m) each for treatment with the recommended dose (500g a.i. ha-1) of chlorpyriphos 20EC and double the recommended dose (1000g a.i. ha-1), were prepared after ploughing the field thoroughly. Control plot was widely separated from the treatment sets so as to avoid drifting of pesticide while spraying. Each crop was grown according to the recommended agronomic practices. Chlorpyriphos 20EC, purchased from local market was sprayed twice at the rate of 500g a.i. ha-1 (recommended dose) and 1000g a.i. ha-1 (double the recommended dose) with knapsack sprayer. First spray was done after bud initiation stage in case of cauliflower and at the onset of flowering in case of okra and tomato followed by second spray at an interval of twenty days. Samples of parts of the selected vegetables were collected from each replicate starting from the day of the second spray. Data on morphological details i.e. Height of the plant (cm), Number of leaves, Area of leaves (cm2), Length of the root (cm), Root - shoot ratio, Total number of flowers and fruits in case of okra (85th day) and tomato (70th day) and weight of the head in case of cauliflower (110th day) of the vegetables crops after the maturity (okra and tomato: 70-85 days, cauliflower: 100-110 days) were recorded during both the years of the experiment.

RESULTS AND DISCUSSIONS:

The observations on the various morphological parameters viz. number of leaves, area of the leaves (cm2), height of the plant (cm), length of the root (cm), root-shoot ratio, total number of flowers and fruits in case of okra and tomato and weight of the head (g) of the cauliflower, treated with recommended, double the recommended dose and untreated control plots for both the years of study i.e. 2004 and 2005 have been presented in Tables 1 to 6. Average of two years of the study for morphological parameters of Cauliflower, Okra and Tomato has been presented in Table 7. The data has also been analyzed statistically by using t-test with the help of SPSS software and significant values have been marked by * in the tables. The observations recorded have been discussed as follows:

Number of leaves

Control plants of Cauliflower exhibited average(of 2004 and 2005) number of leaves as 20 while plants treated with recommended and double the recommended dose of chlorpyriphos showed average number of leaves as 20 and 18, respectively while corresponding values for Okra and Tomato plants have been recorded as 22, 22, 25 and 62, 65 and 62 respectively. Statistical analysis revealed observed values to

2



be insignificant.

Area of the leaves

Average area of the leaves of the Cauliflower plants from control plots, plants treated with recommended and double the recommended dose of chlorpyriphos exhibited values of 530.95 cm2, 592.35 and 555.77 cm2, respectively. Whereas average area of the leaves of the plants of Okra and Tomato from control plots and plants treated with recommended and double the recommended dose of chlorpyriphos exhibited values of 113.6 cm2, 118.01 cm2, 54.74 cm2 and 14.59 cm2, 15.56 cm2, 15.56 cm2 respectively. The observed values have been found statistically insignificant.

Height of the plants

Average height of the Cauliflower plants from control plots has been found to be 47.41 cm. whereas plants treated with recommended and double the recommended dose of chlorpyriphos exhibited average height of the 47.3 and 45.89 cm, respectively while corresponding values of height of the plants of Okra and Tomato have been observed to be 127.71 cm, 127.59 cm, 126.3cm and 43.45 cm, 43.46 cm, 44.79 cm respectively. Statistical analysis revealed observed values to be insignificant except for the height of Cauliflower plants treated with double the recommended dose where a significant decrease have been observed.

Length of the root

Control plants of Cauliflower exhibited average length of root as 19.73 cm while plants treated with recommended and double the recommended dose of chlorpyriphos showed average length of root as 19.92 and 18.25 cm, respectively while corresponding values for Okra and Tomato plants have been recorded as 52.3 cm, 51.6 cm, 51.46 cm and 15.6 cm, 15.85 cm, 15.65 cm respectively. Statistical analysis revealed observed values to be insignificant.

Root - Shoot ratio

Average root-shoot ratio in case of Cauliflower plants from control plots has been found to be 0.39 whereas plants treated with recommended and double the recommended dose of chlorpyriphos exhibited average value of the 0.37 and 0.39, respectively while corresponding values of root-shoot ratio of Okra and Tomato have been observed to be 0.46, 0.37, 0.44 and 0.35, 0.34, 0.34 respectively. Statistical analysis revealed observed values to be insignificant.

Weight of the head

Control plants of Cauliflower exhibited average weight of the head as 366.5g while the values recorded for plants treated with recommended and double the recommended dose of chlorpyriphos have been 455.5 and 411.5g, respectively. Statistically significant increase has been observed in the values of average weight of the head of plants treated with recommended dose of chlorpyriphos.

Total number of flowers / plant

Average total number of flowers/plant for the control plants of Okra has been recorded as 24 while these values for the plants treated with recommended and double the recommended dose of chlorpyriphos has been found to be 25 and 25, respectively whereas corresponding values for Tomato plants have been found to be 24,26 and 25 respectively. Statistical analysis revealed a significant increase in the observed values in case of Okra and Tomato plants treated with both the doses of chlorpyriphos.

Total number of fruits / plant

Control plants of Okra exhibited average total number of fruits/plant as 19 whereas corresponding values for plants treated with recommended and double the recommended dose of chlorpyriphos has been found to be 21 and 20 respectively while in case of Tomato average total number of fruits/plant in control, plants treated with recommended and double the recommended dose of chlorpyriphos has been recorded as 17, 20 an19, respectively. The observed values exhibited statistically significant increase in case of Okra

3



and Tomato plants treated with recommended dose of chlorpyriphos.

CONCLUSION

From the present study it can be concluded that although the impact of chlorpyriphos on the most of the morphological parameters have been found to be statistically insignificant in all the three crops i.e. Cauliflower, Okra and Tomato but the it has shown significantly increasing impact on the yield parameters viz weight of the head in case of Cauliflower and total number of flowers/plant and fruits/plant in both the crops of Okra and Tomato at the recommended dosages. Therefore chlorpyriphos should always be used at recommended doses on these crops to have an enhancing effect on the yield. Also taking into account the toxicological effects of pesticides and their residues in general, it is strongly recommended that pesticides should always be used in proper and recommended doses to avoid or minimize the health hazards.

BIBLIOGRAPHY

Agnihotri, N.P. 1999. Pesticide Safety Evaluation and Monitoring. AICRP (Pesticide Residues), IARI, New Delhi. pp. 173.

Down to Earth 2000. Contaminated Wheat. 9(7): pp22.

Down to Earth 2003. Bottled water has pesticide residues. 11(18): 27-34.

Freed, V.H. 1987. Pesticides: global use and concerns. In: Silent Spring Revisited. (Eds. G.J. Marco, R.M. Hallingworth and W. Durham.) American Chemical Society, Washington D.C. pp 85-112. ICAR, 1967. Report of the special committee on harmful effects of pesticides, ICAR, New Delhi, PP 78. Joseph, B. 2005. Environmental studies. Tata Mc Graw-Hill Publishing Company Ltd, New Delhi. pp 53. Lakshmi, A., 1993. Pesticides in India: risk assessment to aquatic ecosystems. Sci. Total Environ. 134: 243-253

Ministry of Chemicals and Fertilizers. 2002. 37th Report of the standing committee on petroleum and chemicals. Rajendran, S. 2003. Environment and Health Aspects of Pesticides Use in Indian Agriculture. In: Proceedings of the Third International Conference on Environment and Health, Chennai, India. (Eds. Martin J.B., V. M. Suresh and T.V. Kumaran). pp 353-373.

UN/DESA, 2002. Changing unsustainable patterns of consumption and production, Johannesburg plan on implementation of the world summit on sustainable Development, Johannesburg, Chapter III.

Vahab, M.A., V.P. Balagangadharan and M.R. Beegum. 1991. Hazards of chemical pesticides and alternative to dirty dozen. In: Proceedings of the national seminar on sustainable agriculture development. VHAI, New Delhi. pp 70-71. World resources 1998-1999. World Resources Institute, UNEP, UNDP, The World Bank. Environmental Change and human Health.

Table 1: Morphological parameters of Cauliflower during 2004.

S.	Morphological			Recomn	nended d	ose		Doub	le the r	ecomme	nded dos	e				Co	ontrol		
No	Parameters	1	2	3	4	5	Mean	1	2	3	4	5	Mean	1	2	3	4	5	Mean
1	Number of leaves	20	18	16	19	16	17.8~1 8 <u>+</u> 1.78	18	14	16	20	16. 4	16.4~ 16 <u>+</u> 2.61	20	16	14	18	16	$16.8 \sim 1$ 7 $\frac{+}{2.28}$
2	Area of the leaves (cm ³)	574.77	621 .46	680.5 7	579.1 5	660.3 4	623.25 <u>+</u> 47.33	615. 98	602 .34	525.9 8	578.6 4	646 .40	593.86 <u>+</u> 45.16	411. 26	558 .15	718 .69	570. 42	528 .76	557.45 <u>+</u> 109.95
3	Height of plant (cm)	49.8	50. 6	47.8	44.6	41.7	46.9 <u>+</u> 3.72	45.7	50. 8	41.6	45	47. 7	$46.10 \\ \frac{+}{3.4}$	43	44. 9	45. 6	50.8	52. 1	47.3 <u>+</u> 3.95
4	Length of the root (cm)	20.1	14. 3	15.3	18.6	15.8	16.82 <u>+</u> 2.43	13.4	14. 3	18.8	16.6	12. 9	15.2 <u>+</u> 2.46	19.6	14. 6	15. 8	20.9	16. 6	17.5 <u>+</u> 2.69
5	Root-shoot ratio	0.38	0.3 1	0.31	0.32	0.38	0.34 <u>+</u> 0.04	0.30	0.2 9	0.36	0.34	0.2 8	0.31 <u>+</u> 0.03	0.37	0.3 2	0.3 2	0.40	0.3 5	0.35 <u>+</u> 0.03
6	Weight of the head (g)	350	410	525	500	450	447 <u>+</u> 70.14	385	440	410	520	400	431 <u>+</u> 53.66	450	425	350	250	370	369 <u>+</u> 77.81

Indian Streams Research Journal • Volume 2 Issue 8 • Sept 2012



4

Table 2: Morphological parameters of Cauliflower during 2005.

			R	ecomme	nded dos	se		Double	the re	commen	;				C	ontrol	l		
S. No	Morphologica l Parameters	1	2	3	4	5	Mean	1	2	3	4	5	Mean	1	2	3	4	5	Mean
1	Number of leaves	21	22	25	24	23	23 <u>+</u> 1.58	20	22	20	21	18	20.2~2 0 <u>+</u> 1.48	21	25	20	23	24	22.3~2 2 <u>+</u> 2.07
2	Area of the leaves (cm ³)	548.7 4	572.7 4	494.4 8	482.6 4	589.1 3	537.4 2 <u>+</u> 47.15	417.9 2	512 .04	639.5 4	470.6 9	548 .21	517.68 <u>+</u> 83.63	45 7. 18	448 .57	525 .49	531 .64	559 .08	504.38 <u>+</u> 48.78
3	Height of plant (cm)	53.1	42.2	48.4	45.6	49.2	47.7 <u>+</u> 4.07	51.2	46. 2	43.4	42.1	45. 5	45.68 <u>+</u> 3.49	49	45. 1	43. 4	54. 1	46	47.52 <u>+</u> 4.20
4	Length of the root (cm)	24.1	23.4	22.3	25.3	25.1	24.04 $\frac{+}{1.24}$	21.3	22. 1	18.4	20.9	21. 3	20.8 $\frac{+}{1.59}$	22 .3	21. 6	19. 2	25. 3	21. 4	21.96 <u>+</u> 2.19
5	Root-shoot ratio	0.44	0.42	0.39	0.39	0.42	0.41 <u>+</u> 0.02	0.46	0.5 1	0.44	0.52	0.4 7	0.48 <u>+</u> 0.03	0. 43	0.4 4	0.4 1	0.4 3	0.4 9	0.44 <u>+</u> 0.03
6	Weight of the head (g)	480	500	470	350	520	* 464 <u>+</u> 66.56	350	390	420	350	450	392 <u>+</u> 43.82	45 0	320	350	290	410	364 <u>+</u> 65.42

significant t-values at 0.05% level of significance.

Table 3: Morphological parameters of Okra during 2004.

					Recomm	ended do	se				D	ouble the	recomm	ended o	iose				Cor	ntrol		
S. No	Parameters	Plot no.	1	2	3	4	5	Mean	Total mean	1	2	3	4	5	Mean	Total mean	1	2	3	4	5	Mean
		1	20	22	21	25	17	21	22.4	23	28	25	26	29	26.2	24.06						21.4~2
1	Number of	2	21	26	18	21	20	21.2	~ 22	38	21	16	18	25	23.6	~24	22	25	21	23	16	1 <u>+</u>
•	leaves	3	27	25	28	29	16	25	2.25	26	18	25	27	16	22.4	1.94						3.36
		1	143.32	115.43	92.44	173.60	90.07	122.98		69.75	113. 04	109.8 3	97.55	127. 02	103.4 3							109 70
2	Area of leaves	2	99.66	100.06	106.45	124.41	115.44	109.20	110.1 3+	97.81	87.4 6	115.5 9	69.16	132. 35	100.4 7	99.50 +	119.1 9	95.25	115. 59	110 .00	108.4 8	9 15
	(()	3	107.52	108.60	91.35	101.23	82.40	98.22	12.40	131.58	75.6 0	122.2 9	65.84	77.7 2	94.60	4.49					,	
		1	135.13	125.73	131.06	122.43	117.09	126.29		109.13	125. 48	135.1 3	115.06	157. 99	128.6 8							128 27
3	Height of plant	2	119.63	118.14	141.22	115.32	130.05	124.86	126.6 7 <u>+</u>	155.19	107. 95	130.0 5	110.49	115. 32	123.7 9	125.14	130.5 6	132.8 4	122. 68	130 .05	125.2	$\frac{\pm}{417}$
	(em)	3	117.35	125.47	122.68	134.87	144.02	128.88	2.03	109.73	117. 35	125.2 2	129.79	132. 59	122.9 4	3.09						-117
		1	50.8	47.7	53.59	63.75	54.86	54.15	57.04	41.99	46.2 3	54.10	46.99	66.2 9	51.11							57.26
4	Length of the	2	55.37	54.35	58.67	59.44	64.00	58.36	37.94 <u>+</u> 3.50	53.59	46.9 9	38.61	45.47	52.0 7	47.35	47.29 <u>+</u>	54.61	45.97	60.8 0	65. 02	59.94	$\frac{+}{722}$
	root (cm)	3	59.44	71.37	54.10	65.02	56.64	61.32	3.39	50.55	42.9 3	46.23	40.39	37.0 8	43.43	3.83						1.32
	Total number	1	24	21	32	19	19	23	23.6~	22	26	26	24	29	25.4	25.4~						24.40~
-	of flowors/plont	2	20	24	28	21	28	24.2	24 <u>+</u>	28	24	29	26	27	26.8	25 <u>+</u>	26	25	24	23	24	24 <u>+</u>
3	of nowers/plant	3	29	19	26	19	26	23.8	0.61	20	22	28	24	26	24	1.4						1.14
		1	19	25	26	18	24	22.4	21.06	22	18	32	15	17	20.8	20.4~						19.2~1
	Total number	2	21	20	16	26	21	20.8	~21+	19	22	26	16	18	20.2	20+	19	16	22	18	21	9 +
6	of fruits/plant	3	17	16	25	23	19	20	1.22	27	16	17	15	26	20.2	0.35						2.38
		1	0.34	0.36	0.40	0.47	0.49	0.41		0.46	0.41	0.43	0.50	0.41	0.44							
	Root-shoot	2	0.40	0.38	0.35	0.42	0.46	0.40	0.40 <u>+</u>	0.48	0.49	0.48	0.44	0.49	0.47	0.46 <u>+</u>	0.46	0.41	0.5	0.5	0.49	0.47 <u>+</u>
7	ratio	3	0.47	0.42	0.35	0.36	0.36	0.39	0.01	0.54	0.48	0.41	0.48	0.42	0.46	0.01			0	2		0.04
		1 °																		1		

5



 Table 4: Morphological parameters of Okra during 2005.

6	Morphological				Recomm	ended do	se				1	Double th	e recom	mended	dose				C	ontrol		
No	Parameters	Plot no.	1	2	3	4	5	Mean	Total mean	1	2	3	4	5	Mean	Total mean	1	2	3	4	5	Mean
		1	25	27	22	19	25	23.6		29	22	26	18	24	23.8	*						21.0
1	Number of	2	19	20	23	18	25	21	22.2~2	28	31	22	26	25	26.4	25.46~2	22	20	19	26	22	21.8~ 22+
	leaves	3	28	18	19	22	23	22	2 <u>+</u> 1.31	19	28	32	25	27	26.2	5 <u>+</u> 1.45		20		Introl 4 5 26 22 104 145 105 166 22 .33 52 51. 30 25 21 25 22 19 0.5 0.4	2.89	
		1	142.74	152.44	107.19	127.66	127.89	131.58		118. 27	84.95	136.1 5	136.5 0	119. 21	119.0 5							
2	Area of leaves	2	145.56	113.64	118.04	132.02	123.78	126.60	125.89 +	123. 42	141.0 4	131.8 2	141.6 5	77.7 4	123.1 3	119.47 <u>+</u>	3.	119. 97	104 .46	104 .07	145 .67	117.5 +
	(cm)	3	131.76	102.90	128.38	114.03	120.43	119.5	6.07	75.5 6	138.8 8	139.8 8	134.7 7	92.3 5	116.2 8	3.44	04			26 2; 104 14,07 .07 .6 125 11 .22 .3 52, .51 30 .2 21 .2; 22 .1'		13.00
		1	140.21	123.44	132.84	130.05	124.21	130.15		153. 16	132.8 4	115.0 6	130.0 5	109. 47	128.1 2		12					105.15
3	Height of plant	2	121.41	125.3	117.60	116.59	135.89	123.34	128.52	143. 0	141.9 8	132.3 3	115.0 6	118. 8	130.2 5	127.46 <u>+</u>	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	116 .33	127.15			
	(cm)	3	117.6	121.41	126.75	143.26	151.38	132.08	4.59	121. 41	125.2 2	115.0 6	128.0 2	130. 30	124.0 1	3.17	/0					7.33
		1	37.85	49.02	36.32	46.48	38.86	41.71		54.1 0	48.77	56.13	36.07	56.6 4	50.34							47.34
4	Length of the	2	46.48	48.77	45.97	57.15	52.07	50.08	45.26 +	57.1 5	59.44	56.64	55.37	40.3 9	53.79	55.64* <u>+</u>	45	42.2 9	45. 47	52. 30	51. 25	4.26^{+}
	root (cm)	3	38.86	46.74	44.19	41.40	48.77	43.99	4.33	59.4 4	72.39	56.89	66.55	58.6 7	62.79	6.42	0					
		1	22	21	28	16	21	21.6		25	27	24	24	26	25.2							24.6~
5	Total number	2	21	24	28	19	22	22.8	23.5~2	25	26	27	25	28	26.2	25.26~2	22	27	28	21	25	25+
	of flowers/plant	3	26	28	22	26	29	26.2	3 <u>+</u> 2.38	24	23	27	22	26	24.4	5 <u>+</u> 0.90						3.05
		1	23	25	28	27	16	23.8		20	18	16	17	16	17.4							19.4~
6	Total number	2	16	21	22	20	19	19.6	21.06~	18	21	26	18	16	19.8	19.13~1	18	20	18	22	19	19+
	of fruits/plant	3	19	17	24	21	18	19.8	2.36	25	26	15	17	18	20.2	1.51						1.67
		1	0.27	0.37	0.29	0.34	0.35	0.32		0.47	0.41	0.44	0.33	0.40	0.41							
7	7 Root-shoot	2	0.34	0.38	0.33	0.42	0.39	0.37 0.34*	0.45	0.46	0.48	0.38	0.31	0.41	0.43 <u>+</u>	0. 46	0.43	0.4	0.5	0.4	0.46 <u>+</u> 0.03	
	ratio	3	0.30	0.37	0.34	0.31	0.35	0.33	0.02	0.52	0.51	0.39	0.50	0.46	0.47	0.03						

* significant t-values at 0.05% level of significance

Table 5: Morphological parameters of Tomato during 2004.

					Recomm	ended dos	2					Double the	e recomme	nded do	se				Co	ntrol		
S.	Morphological	Plot	1	2	3	4	5	Mean	Total	1	2	3	4	5	Mean	Total	1	,	3	4	5	Mean
No	Parameters	no.		-	3	•	5	wiean	mean		-	3	1	5	Mean	mean		- ⁻			3	wican
		1	62	54	65	61	59	60.2	60.5~6	56	48	55	57	60	55.2	55.8~5						55.6~5
1	Number of leaves	2	68	62	58	60	57	61	1 <u>+</u>	49	55	47	59	65	55	6 <u>+</u>	56	59	60	51	52	6 <u>+</u>
		3	62	56	58	65	61	60.4	0.42	50	49	62	64	61	57.2	1.22						4.04
		1	11.2	19.85	12.15	15.38	16.99	15.08		18.88	20.4	20.26	17.25	15.5	18.48							
											3			8								
	Area of leaves	2	17.58	13.33	16.20	16.51	19.71	16.66	16.69 <u>+</u>	19.36	16.8	21.64	20.63	19.5	19.59	18.96 <u>+</u>	16.9	12.1	17.6	13.9	15.8	15.32 <u>+</u>
2	(cm ²)								1.63		1			1		0.57	9	5	3	3	8	2.26
		3	19.49	17.13	19.27	16.51	19.36	18.35		17.98	19.9	19.63	17.41	19.1	18.82							
		1	28.6	25.4	45.2	42.8	44.2	41.24		40.2	20.4	42.8	20.2	40.1	40.26							
	Hoight of plant	2	30.0	20.7	45.2	42.0	44.2	41.24	39.46 <u>+</u>	49.5	39.4	42.0	30.2	40.1	40.30	38.62 <u>+</u>	28.2	22.4	26.5	20.4	40.2	37.56 <u>+</u>
3	(cm)	2	37.0	40.6	41.2	40.9	41.0	20.22	1.67	37.2	34.5	37.0	22.6	29.5	40.5	2.96	30.2	55.4	50.5	3774	40.5	2.72
-	(((((((((((((((((((((((((((((((((((((((1	12.8	15.1	16.2	13.1	12.5	13.94		12.7	15.2	11.6	11.2	12.3	12.6							13.66+
	Length of the	2	12.3	15.7	14.6	13.7	11.2	13.5	13.55 <u>+</u>	15.6	16.1	14.1	10.2	11.9	13.58	12.94+	14.2	13.4	14.1	13.0	13.6	0.49
4	root (cm)	3	10.2	12.8	12.2	15.6	15.2	13.2	0.37	11.2	12.9	13.4	10.3	15.5	12.66	0.55						
		1	25	27	26	29	24	26.2	25.26~	29	27	28	25	23	26.4	25.13~						
	Total number of	2	27	26	22	20	27	24.4	25+	23	27	26	22	25	24.6	25+	20	23	28	24	25	24 <u>+</u>
5	flowers/plant	3	28	26	25	26	21	25.2	0.90	26	30	21	22	25	24.4	1.10						2.91
		1	20	19	21	23	20	20.6	20.06~	19	20	15	20	18	18.4	19+						16.8~1
	Total number of	2	24	20	18	15	22	19.8	20 <u>+</u>	19	18	16	18	22	18.6	0.87	15	12	19	21	17	7 <u>+</u>
0	fruits/plant	3	21	20	23	19	16	19.8	0.46	24	27	15	18	16	20							3.49
		1	0.36	0.33	0.31	0.36	0.33	0.36	2444	0.31	0.34	0.29	0.28	0.29	0.30	0.220.						0.20.
1	Bast shart anti-	2	2 0.31 0.33 0.36 0.33 0.34 0.33	.34* <u>+</u>	0.34	0.33	0.30	0.31	0.33	0.32	0.03*+	0.37	0.37	0.36	0.37	0.45	0.38+					
7	Root-snoot ratio	3	0.34	0.31	0.31	0.39	0.36	0.34	0.01	0.34	0.32	0.41	0.33	0.39	0.36	0.03						0.04

* significant t-values at 0.05% level of significance

6



 Table 6: Morphological parameters of Tomato during 2005.

0					Recomm	ended dos	е				1	Double the	recomme	nded dos	se				Co	ntrol		
No	Morphological Parameters	Plot no.	1	2	3	4	5	Mean	Total mean	1	2	3	4	5	Mean	Total mean	1	2	3	4	5	Mean
		1	72	79	76	68	64	71.8	60 22-	74	72	70	72	64	70.4							67.8~6
	Number of	2	70	76	64	68	60	67.6	69+	68	62	76	62	65	66.6	69 <u>+</u>	63	70	65	72	69	8 <u>+</u>
1	leaves	3	72	76	67	66	62	68.6	2.19	65	68	76	72	69	70	2.08						3.70
		1	10.74	15.64	15.50	13.42	16.51	14.36		10.49	12.4 6	10.20	8.56	12.7 8	10.89							
2	Area of leaves	2	16.51	20.38	14.94	14.19	12.58	15.72	14.43 <u>+</u> 1.25	12.92	17.2 8	18.56	9.9	10.0	13.73	12.10 <u>+</u> 1.46	12.7 2	13.6 1	11.8 6	14.5 4	16.5 6	13.86 <u>+</u> 1.81
	(em)	3	12.94	15.08	12.06	12.73	13.27	13.22		9.08	13.7 8	13.76	9.18	12.6 4	11.69							
		1	55.2	50.7	51.8	46.2	48.6	50.5	47 46+	48.9	46.7	55.4	52.8	51.7	51	50.97+						49 34+
3	Height of plant	2	53.6	45.2	44.3	47.8	39.5	46.08	2.64	48.2	49.5	51.5	46.7	48.9	49.02	1.94	52.1	50.3	48.2	49.7	46.4	2.16
-	(cm)	3	57.8	46.4	49.7	38.5	36.6	45.8		56.5	54.2	52.7	51.9	49.2	52.9							
		1	22.1	18.5	20.1	19.8	15.3	19.16	18.16+	15.6	19.2	21.2	18.5	20.5	19	18,36+						17.54+
4	Length of the	2	13.2	15.8	17.2	15.1	17.4	15.74	2.11	15.4	16.2	21.5	20.1	21.2	18.88	0.99	21.3	18.5	19.2	16.2	12.5	3.35
	root (cm)	3	15.2	18.7	21.4	20.1	22.5	19.58		22.1	20.2	14.5	15.2	14.1	17.22							
		1	29	24	26	27	30	27.2	26.6~2	26	27	24	26	27	26	25.06~						23.6~2
5	Total number	2	23	24	27	30	27	26.2	7+	25	29	28	21	23	25.2	25+	20	21	23	28	26	4 <u>+</u>
	of nowers/plant	3	24	20	24	28	31	20.0	0.50	29	24	17	20	20	19.6	1.01						3.30
	Total number	2	22	18	16	10	20	18.8	20.06~	21	23	21	19	16	19.0	18.20~	15	16	19	18	21	1/.8~1
6	of fruits/plant	3	19	17	20	22	24	20.4	1.14	21	16	15	17	15	16.8	1.33						2.38
		1	0.38	0.37	0.36	0.44	0.32	0.37		0.32	0.34	0.40	0.37	0.47	0.38							
	Root-shoot	2	0.23	0.35	0.35	0.37	0.38	0.33	0.35 <u>+</u>	0.32	0.39	0.32	0.38	0.38	0.35	0.36 <u>+</u>	0.38	0.35	0.38	0.31	0.26	0.33 <u>+</u>
7	ratio	3	0.33	0.37	0.39	0.34	0.35	0.35	0.02	0.40	0.38	0.30	0.32	0.37	0.35	0.01						0.05

Table 7: Average morphological parameters of Cauliflower, Okra and Tomato during two years of the study.

S.	Average	C.	AULIFLOWE	ER		OKRA			TOMATO	
No.	parameters	Control	R.D.	D.R.D	Control	R.D.	D.R.D	Control	R.D.	D.R.D
1	Numbers of Leaves	19.55	20.4	18.3	21.6	22.3	24.76	61.7	64.91	62.4
2	Area of leaves (cm ²)	530.95	592.35	555.77	113.6	118.01	54.74	14.59	15.56	15.53
3	Height of the plants (cm)	47.41	47.3	45.89 [*]	127.71	127.59	126.3	43.45	43.46	44.79
4	Length of the root (cm)	19.73	19.92	18.25	52.3	51.6	51.46	15.6	15.85	15.65
5	Root-Shoot ratio	0.39	0.37	0.39	0.46	0.37	0.44	0.35	0.34	0.34
6	Weight of the head (g)	366.5	455.5 [*]	411.5	-	-	-	-	-	-
7	Total number of flowers/plant	-	-	-	24.5	23.5*	25.33*	23.8	25.93*	25.09*
8	Total number of fruits/plant	-	-	-	19.3	21.06*	19.76	17.3	20.06*	18.63

R.D. = Recommended dose., D.R.D = Double the recommended dose., * significant t-values at 0.05% level of significance.

7



Publish Research Article

International Level Multidisciplinary Research Journal For All Subjects

Dear Sir/Madam,

We invite original unpublished research paper. Summary of Research Projetc, Theses, Books and Books Review of publication, You will be pleased to know that our journals

are..

Associated and Indexed, India

• OPEN J-GATE

• International Scientific Journal Consortium Scientific

Associated and Indexed, USA

- 🔴 Google Scholar
- 🔴 DOAJ
- EBSCO
- Index Copernicus
- 🔴 Academic Journal Database
- Publication Index
- 🥚 Scientific Resources Database
- Recent Science Index
- 🔴 Scholar Journals Index
- Directory of Academic Resources
- 🔴 Elite Scientific Journal Archive
- Current Index to Scholarly Journals
- Digital Journals Database
- Academic Paper Database
- Contemporary Research Index Indian Streams Research Journal 258/34, Raviwar Peth Solapur-413005, Maharashtra Contact: 9595359435
 - E-Mail- ayisrj@yahoo.in / ayisrj2011@gmail.com

