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Effect of Various Concentrations of Rogor and Nuvan on Seedling Growth of *Vigna aconitifolia*

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Abstract

The current studies aimed to study effect of different concentrations of chemical pesticide rogor and nuvan on seedling growth of *Vigna aconitifolia*. A laboratory experiment was conducted with pesticide Rogor(Dimethoate) and Nuvan (dichlorovos). The sterilized seeds of *Vigna Aconitifolia* were washed and then transferred in petri dishes lined with filter paper. Different concentrations of rogor and nunanwere sprayed on seedlings. e.g 0.0%, 0.5%, 1.0%, 1.5%, 2.0%, 2.5%, 5.0%, 7.5%, 10.0% at alternate days. Samples were collected on $7^{th, 14th}$and21^{st} day of radicle emergence than root, shoot length, leaf area, fresh and dry weight were taken. *Vigna Aconitifolia* show almost same trends of responses to seedling growth with various concentrations of pesticides Rogor and nuvan, there is inhibition of seedling growth at higher concentration and less effect in lower concentrations. On increasing concentrations of pesticides the growth of seedlings were ceased. No growth of the seedlings took place at 10% concentration for both the pesticide i.e. rogor and nuvan.

Keywords: Pesticide, Vigna, Rogor, Nuvan, Seedling.

Introduction

The pesticides used to kill the pests of crops, no doubt has solved the problem of pests to some extent, but the use of such chemical pesticides gave rise to many side effects in physiology and ecology of these crop plants. The pesticides interfere with normal growth and yield of the crops. In legumes, the use of such chemicals perhaps caused problems in natural growth of legume plants as these chemicals affect physiology and metabolism of plants. The chemical pesticides also affect seed germination and growth of seedlings.

Many chemical pesticides also accumulate in plant tissues and cause harmful effects in other members of food chain at higher tropic levels. Such chemicals may also cause harmful effects to man also. For studying the effect of various concentrations of pesticides on seed germination and seedling growth of *Vigna aconitifolia* a laboratory experiment was conducted with two selected pesticides, i.e., Rogor and Nuvan.

Aim of Study

The current study is aimed to analyze the effect of chemical pesticide on the seed germination and seedling growth of *vigna aconitifola.*

Review of Literature

Asghar Ali, et.al in the year 2006 worked on the effect of different levels of potash on growth yield and protein content of Mung bean. Bahadur, B. and Sharma, B. K. (1988) found the effect of effluent onSeed germination and early seedling growth of Hordeum vulgare . In the year 1090 Becker M et.al worked on Growth and nitrogen fixation of two stem-nodulating legumes and their effect as green manure on lowland rice. Bhargava, A. K. (1983) gave the effect of zinc on seed germination, seedling growth and P distribution in Vicia faba.Bhumblae et.al in the year 1968) studied the effects of salt on seed germination.Chidambaram et.al (1996) found the effect of chemical industrial waste water on germination , growth and some bio chemical parameters of Vigna radiata L. Wilcseck and Vigna mungo.Gautam, Det.al (1992) gave the effect of dairy effluent on seed germination of Rabi and Kharif crop plants.Golakiya, B. A. (1989) worked on Drought response of groundnut seed germination.Handas, A. (1976) worked on water uptake and seed germination of leguminous seeds under changing external water potential in *osmoticum* solution.

Jabeen, S. and Saxena, P. K. in the year 1990 found the effect of industrial effluent on growth behaviour of Pisum sativum.Kannabrian B and Pragasam A (1993)gave the effect of distillery effluent on seed germination, seedling growth and pigment content of Vigna mungo .Maguire, J. D. (1973) worked on Physiological disorders in germination of seeds induced by the environment. Mehta A R and Johri S N (1985) Studied the tolerance of saline water irrigation on germination of oilseed crops.

Materials and Methods

The healthy seeds of both the legumes were selected for uniformity, surface sterilized and washed with running tap water and finally under distilled water. The seeds were then transferred in sterilized petri dishes lined with filter papers.

The selected pesticides (Rogor and Nuvan) were diluted with distilled water to prepare different concentrations, viz., 0.5%, 1.0%, 1.5%, 2.0%, 2.5%, 5.0%, 7.5% and 10.0%. The control concentration was distilled water alone. The seeds in the petri dishes were moistened with 5 ml of each concentration (control, 0.5%, 1.0%, 1.5%, 2.0%, 2.5%, 5.0%, 7.5% and 10.0%) of pesticides at alternate days.

For analyzing the seedling growth, the samples were collected on 7^{th}, 14^{th} and 21^{st} day of radicle emergence. First of all the shoot and root length were recorded and then plant fresh weight of samples was taken. Dry weight was taken after drying the plants in oven at 100°C for two days.

Results and Discussion

The effect of different pesticide concentrations on seed germination and seedling growth were studied on *Vigna aconitifolia.*

Seedling Growth

The results for the effect of different concentrations of Rogor on seedling growth of *Vigna aconitifolia* are shown in table 1 and figure 1.1. It is observed that as the concentration of Rogor is increased (0.5%, 1.0%, 1.5%, 2.0%, 2.5%, 5.0%, 7.5% and 10.0%), there is decrease in the growth of seedling at all sampling days (7^{th}, 14^{th} and 21^{st}). No growth is found at 10.0% pesticide concentration.

The results show shoot lengths (table 1 and fig. 1.1A) for sampling days (7^{th}, 14^{th} and 21^{st}) to be 5.20, 7.37, 9.21 cm, and 4.45, 6.21, 7.56 cm, and 3.35, 5.93, 6.65 cm, and 3.35, 4.77, 5.23 cm, and 3.00, 3.59, 4.22 cm, and 2.52, 3.21, 3.75 cm, and 2.11, 2.84, 3.21 cm, and 1.20, 1.98, 2.32 cm, respectively for 0.0%, 0.5%, 1.0%, 1.5%, 2.0%, 2.5%, 5.0%, 7.5% and 10.0% concentrations.

The root length for sampling days 7^{th}, 14^{th} and 21^{st} are 2.15, 2.82, 4.72 cm, and 2.13, 2.47, 4.11 cm, and 1.64, 2.12, 3.65 cm, and 1.56, 2.13, 3.12 cm, and 1.22, 1.72, 2.95 cm, and 0.75, 1.52, 2.12 cm, and 0.41, 1.21, 1.41 cm, respectively for 0.5, 1.0, 1.5, 2.0, 2.5, 5.0, 7.5 and 10.0% of pesticide concentrations, and the root length for control plants are 2.75, 3.40, 5.33 cm for respective sampling days. The leaf area (cm^2) for the sampling days 7^{th}, 14^{th} and $21^{st}$and Rogor concentrations 0.5%, 1.0%, 1.5%, 2.0%, 2.5%, 5.0%, 7.5% and 10.0% were recorded as 3.83, 4.41, 4.68 cm^2, and 3.12, 3.31, 4.12 cm^2, and 2.16, 2.95, 3.35 cm^2, and 1.97, 2.25, 2.82 cm^2, and 1.34, 1.95, 2.15 cm^2, and 0.96, 1.26, 1.54 cm^2, and 0.54, 0.99, 1.13 cm^2, respectively. No results were obtained for 10.0% Rogor concentration. The leaf area of control plants are 4.12, 5.14, and 5.31 cm^2 at respective sampling days. The data for fresh weight for the above values are 184.00, 235.00, 284.00 mg, and 162.00, 198.00, 246.00 mg, and 144.00, 168.00, 225.00 mg, and 132.00, 154.00, 195.00 mg, and 119.00, 132.00, 155.00 mg, and 92.30, 110.00, 122.00 mg, and 32.00, 68.00, 105.00 mg, respectively. No results were obtained for 10.0% concentration. The data for control values of fresh weight were 210.00, 274.00 and 320.00 mg. The data for the dry weight of plants for above parameter are 43.90, 52.90, 68.20 mg for control plant, 40.40, 47.60, 55.40 mg, and 32.20, 40.20, 45.30 mg, and 26.40, 35.60, 42.60 mg, and 21.30, 27.50, 31.40 mg, and 19.25, 24.20, 27.80 mg, and 14.23, 19.30, 22.50 mg, and 8.23, 14.40, 19.20 mg respectively. No results were obtained for 10.0% concentration.

The results for *Vigna aconitifolia* treated with pesticide Nuvan are depicted in table 2 and figure 2(A, B, C, D) and here also same trends of the responses of various concentrations of the pesticide Nuvan are shown by seedling growth parameters. The shoot length at sampling days 7^{th}, 14^{th} and 21^{st} and pesticide concentrations 0.5%, 1.0%, 1.5%, 2.0%, 2.5%, 5.0%, 7.5% and 10.0% show following trends. As compared to control plant shoot length, i.e., 4.90, 7.35, 9.57 cm at respective days, the length of shoot to different increasing concentrations were 4.35, 6.19, 7.29 cm, and 3.45, 3.91, 6.95 cm, and 3.25, 4.69, 5.40 cm, and 3.10, 3.49, 4.20 cm, and 2.49, 2.95, 3.10 cm, and 2.12, 2.85, 3.22 cm, and 1.21, 1.96, 2.30 cm respectively. No results were obtained for 10.0% concentration. The results of root growth parameters show parallelism with shoot parameters. As compared to control plants, i.e., 2.69, 3.39, 5.30 cm at respective sampling days, the values for increasing concentrations of pesticide were 2.13, 2.83, 4.65 cm, and 2.14, 2.46, 4.91 cm, and 1.63, 2.10, 3.69 cm, and 1.57, 2.13, 3.14 cm, and 1.21, 1.70, 2.91 cm, and 0.74, 2.53, 2.14 cm, and 0.42, 1.23, 1.43 cm respectively with increasing concentrations. No results were obtained for 10.0% concentration.

The leaf area as compared to the control values, i.e., 4.13, 5.10, 5.32 cm^2 at 7^{th}, 14^{th} and 21^{st} days respectively were 3.84, 4.42, 4.63 cm^2, and 2.99, 3.35, 4.15 cm^2, and 2.15, 2.94, 3.32 cm^2, and 1.98, 2.24, 2.83 cm^2, and 1.32, 1.90, 2.13 cm^2, and 0.95, 1.23, 1.51 cm^2, and 0.52, 0.91, 1.12 cm^2 respectively with increasing concentrations of pesticide. No results were obtained at 10.0% concentration. The data for fresh weight of plants were 183.00, 273.00, 329.00 mg for control value at respective sampling days while, 173.50, 237.00, 282.00 mg, and 163.00, 195.00, 249.00 mg, and 154.20, 169.00, 229.00 mg, and 148.00, 153.00, 194.00 mg, and 121.00, 126.00, 150.00 mg, and 92.40, 115.00, 121.00 mg, and 53.00, 97.00, 104.00

mg with respective concentrations of pesticide. No results were obtained for 10.0%. The dry weight shows parallel results with fresh weight as compared to control values, i.e., 42.9, 52.8, 69.1 mg at 7th, 14th and 21st days respectively while the values for further increasing concentrations were 40.3, 46.6, 54.4 mg, and 32.1, 40.3, 45.4 mg, and 26.4, 35.6, 42.7 mg, and 21.34, 27.51, 31.42 mg, and 19.26, 24.21, 27.9 mg, and 14.24, 19.33, 22.29 mg, and 8.24, 14.5, 19.3 mg respectively with increasing concentrations of pesticide. No results were obtained for 10.0% concentration.

Conclusion

The results for the present study show that *vigna aconitifolia* have almost same trends of responses to various seed germination and seedling growth parameters with different concentrations of pesticides (Rogor and Nuvan). There is general inhibition of seedling growth at higher concentrations of pesticides and less effect on growth is seen in lower concentrations, i.e., 0.5% and 1.0% pesticide. No seedling germination was observed at 10.0% pesticides concentration. The seedling growth gradually decreases after 0.5% pesticide with increasing concentrations of pesticides.

The inhibition of seedling growth may be due to inhibition of hydrolytic enzyme synthesis or the blocking of enzyme pathway in the seed during germination. Our results coincide with Gange et al. (1992) and other workers also. Inhibition of germination and seedling growth with high concentrations of pesticide may be due to one and/or more of the following reasons:

1. Inhibition of hydrolytic enzyme synthesis or the blocking of enzyme pathways in the seed during germination (Gange et al., 1992).
2. The pesticides are absorbed by different parts of plants like leaves, roots, etc. and inside the plants the pesticides are metabolized with the different metabolic pathways and thus reduce growth (Dauterman et al., 1960)

From the present study, it is concluded that pesticides like Rogor and Nuvan which are toxic to plants in high concentrations can be favorably used for agriculture crop protection in low concentrations only like 0.5% which affects plant growth very less and has wide spread effect on insect pests. On the basis of present study, it is assumed here that toxic concentrations of pesticides cause decrease to germination and growth of plants.

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Table 1 Effect of Various Concentrations of Rogor on *Vigna acontifolia* Seedling Growth

Seedling part	Concentration of Rogor in percentage																											
	0%			0.5%			1.0%			1.5%			2.0%			2.5%			5.0%			7.5%			10.0%		
	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21
Shoot length (cm)	5.20 ±0.07	7.37 ±0.03	9.21 ±0.02	4.45 ±0.04	6.21 ±0.11	7.56 ±0.75	3.55 ±0.05	5.93 ±0.97	6.65 ±1.89	3.35 ±0.02	4.77 ±0.02	5.23 ±0.04	3.00 ±0.02	3.59 ±0.04	4.22 ±0.03	2.52 ±0.01	3.21 ±0.02	3.75 ±0.03	2.11 ±0.05	2.84 ±0.07	3.21 ±0.01	1.20 ±0.03	1.98 ±0.04	2.32 ±0.05	0.00	0.00	0.00
Root length (cm)	2.75 ±0.02	3.40 ±0.03	5.33 ±0.05	2.15 ±0.03	2.82 ±0.02	4.72 ±0.01	2.13 ±0.05	2.47 ±0.04	4.11 ±0.04	1.64 ±0.02	2.12 ±0.01	3.65 ±0.05	1.56 ±0.02	2.13 ±0.06	3.12 ±0.04	1.22 ±0.01	1.72 ±0.03	2.95 ±0.04	0.75 ±0.05	1.52 ±0.07	2.12 ±0.02	0.41 ±0.03	1.21 ±0.04	1.41 ±0.02	0.00	0.00	0.00
Leaf Area (cm^2)	4.12 ±1.2	5.14 ±1.1	5.31 ±1.3	3.83 ±1.5	4.11 ±0.96	4.68 ±0.25	3.12 ±1.1 ±	3.31 ±1.3	4.12 ±1.5	2.16 ±1.4	2.95 ±0.35	3.35 ±1.5	1.97 ±0.96	2.25 ±1.2	2.82 ±1.3	1.34 ±1.5	1.95 ±1.4	2.15 ±1.3	0.96 ±0.96	1.26 ±0.85	1.54 ±0.98	0.54 ±1.2	0.99 ±1.1	1.13 ±1.3	0.00	0.00	0.00
Fresh Weight (mg)	210.00 ±1.64	274.22 ±2.95	320.00 ±5.36	184.00 ±6.32	235.00 ±4.56	284.00 ±2.35	162.00 ±2.45	198.00 ±2.65	246.00 ±5.42	144.00 ±4.56	168.00 ±7.12	225.00 ±5.12	132.00 ±4.32	154.00 ±4.56	195.00 ±12.6	119.00 ±14.1	132.00 ±11.3	155.00 ±12.6	92.00 ±2.75	110.00 ±3.65	122.00 ±3.54	52.00 ±5.41	68.00 ±5.12	105.00 ±5.24	0.00	0.00	0.00
Dry Weight (mg)	43.90 ±0.04	52.90 ±0.05	68.20 ±1.56	40.40 ±0.13	47.60 ±3.31	55.40 ±3.56	32.20 ±1.23	40.20 ±2.04	45.30 ±3.95	26.40 ±0.05	35.60 ±0.05	42.60 ±1.13	21.33 ±0.04	27.50 ±0.08	31.40 ±0.09	19.25 ±0.05	24.20 ±0.06	27.80 ±0.07	14.23 ±1.23	19.30 ±1.56	22.30 ±1.45	8.23 ±1.45	14.40 ±2.45	19.20 ±6.54	0.00	0.00	0.00

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Table 2 Effect of various concentrations of Nuvan on *Vigna aconitifolia* seedling growh

Seedling part	Concentration of Nuvan in percentage																										
	0%			0.5%			1.0%			1.5%			2.0%			2.5%			5.0%			7.5%			10.0%		
	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21
Shoot length (cm)	4.90 ±0.06	7.35 ±0.03	9.57 ±0.03	4.35 ±0.03	6.19 ±0.12	7.29 ±0.65	3.54 ±0.04	5.91 ±0.76	6.95 ±1.87	3.25 ±0.03	4.69 ±0.03	5.40 ±0.02	3.10 ±0.04	3.49 ±0.02	4.20 ±0.02	2.49 ±0.03	2.95 ±0.02	3.10 ±0.04	2.10 ±0.04	2.85 ±0.06	3.22 ±0.02	1.221 ±0.02	1.96 ±0.03	2.30 ±0.06	0.00	0.00	0.00
Root length (cm)	2.59 ±0.03	3.39 ±0.04	5.30 ±0.04	2.13 ±0.02	2.83 ±0.03	4.65 ±0.02	2.14 ±0.03	2.46 ±0.02	4.91 ±0.03	1.63 ±0.02	2.10 ±0.01	3.69 ±0.05	1.54 ±0.03	2.13 ±0.05	3.14 ±0.04	1.21 ±0.02	1.70 ±0.04	2.91 ±0.05	0.74 ±0.04	2.54 ±0.06	2.14 ±0.03	0.42 ±0.04	1.23 ±0.03	1.43 ±0.02	0.00	0.00	0.00
Leaf Area (cm^2)	4.13 ±1.3	5.10 ±1.2	5.32 ±1.4	3.84 ±1.41	4.42 ±0.93	4.63 ±0.31	2.99 ±1.21	3.35 ±1.31	4.15 ±1.52	2.15 ±1.42	2.94 ±0.37	3.32 ±1.52	1.98 ±0.94	2.24 ±1.21	2.83 ±1.33	1.32 ±1.52	1.90 ±1.42	2.13 ±1.31	0.95 ±0.96	1.23 ±0.84	1.51 ±0.93	0.52 ±1.21	0.91 ±1.15	1.12 ±1.31	0.00	0.00	0.00
Fresh Weight (mg)	183.00 ±1.63	273.00 ±2.93	329.00 ±5.35	173.50 ±6.30	237.00 ±4.54	282.00 ±2.32	163.00 ±2.41	195.00 ±2.60	249.00 ±5.44	154.00 ±4.52	169.00 ±7.12	249.00 ±4.98	148.00 ±4.50	153.00 ±4.65	194.00 ±12.6	121.00 ±14.2	126.00 ±11.4	150.00 ±12.5	92.40 ±2.74	115.00 ±3.6	121.00 ±3.52	53.00 ±5.69	97.00 ±5.11	104.00 ±5.23	0.00	0.00	0.00
Dry Weight (mg)	42.90 ±0.03	52.80 ±0.04	69.10 ±0.57	40.30 ±1.07	46.60 ±3.29	54.40 ±3.45	32.10 ±1.24	40.30 ±2.03	45.40 ±3.96	26.40 ±0.04	35.60 ±0.05	42.70 ±1.14	21.34 ±0.03	27.51 ±0.02	31.42 ±0.08	19.26 ±0.04	24.21 ±0.07	27.90 ±0.06	14.24 ±1.24	19.33 ±1.57	22.29 ±1.46	8.24 ±1.47	14.50 ±2.44	19.30 ±6.53	0.00	0.00	0.00

P: ISSN No. 0976-8602 RNI No.UPENG/2012/42622 VOL.-V, ISSUE-IV, October-2016

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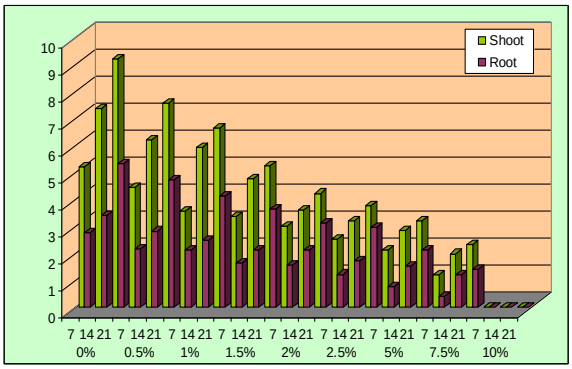

Fig.1A. Effect of various concentrations of Rogor on seedling length of *Vigna aconitifolia.*

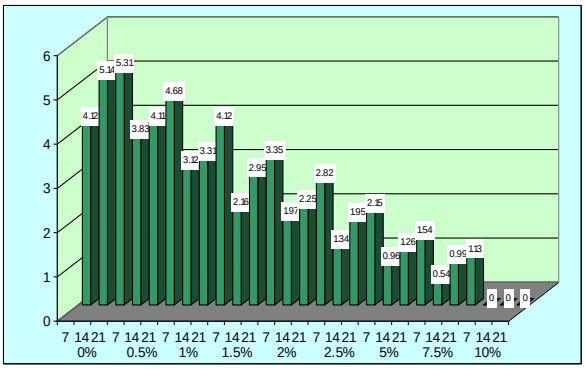

Fig.1B. Effect of various concentrations of Rogor on leaf area of *Vigna aconitifolia.*

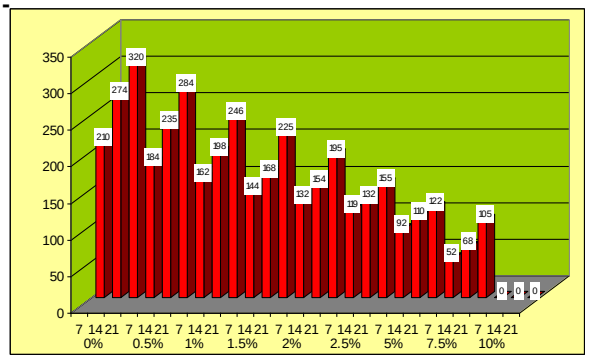

Fig. 1C. Effect of various concentrations of Rogor of Rogoron fresh weight of *Vigna aconitifolia.*

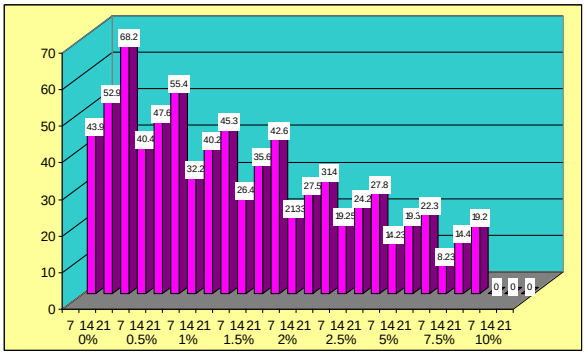

Fig. 1D. Effect of various concentrations on dry weight of *Vigna acontifolia*.

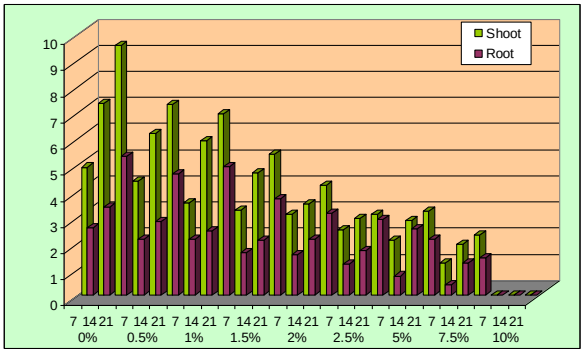

Fig. 2A. Effect of various concentrations of Nuvan on seedling length of *Vigna aconitifolia*

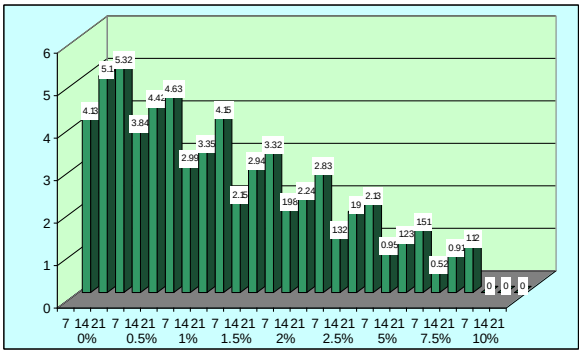

Fig. 2B. Effect of various concentrations of Nuvan on leaf area of *Vigna aconitifolia*

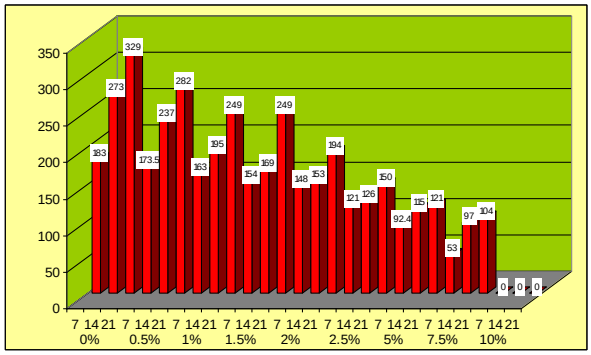

Fig. 2C. Effect of various concentrations of Nuvan on fresh weight of*Vigna aconitifolia.*

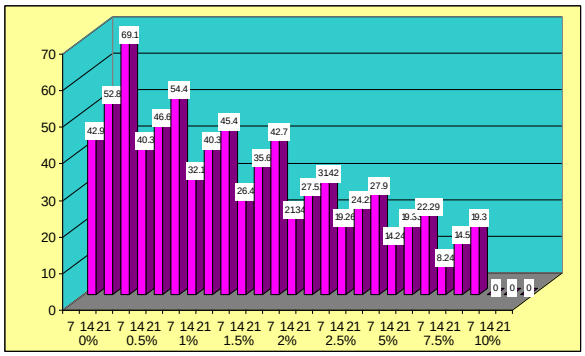

Fig. 2D. Effect of various concentrations of Nuvan on Dry weight of*Vigna aconitifolia.*