Experimental Results

Experiment I

Effect of Different Concentrations of Cyolane on linear Growth and Dry Weight of Mats of Five Soil Fungi Raised in Presence of Two Different Nitrogen Sources at Various Incubation Temperatures.

This experiment was conducted to indicate the effect of different concentrations of cyolane on the growth of the five soil fungi under two variable experimental conditions, namely the temperature and the nitrogen source applied to the culture medium. The temperature levels used during this experiment were 20,25,30 and 35 ^{o}C. Sodium nitrate and ammonium sulphate were the nitrogen sources applied to the culture medium each applied in the rate of 350 p.p.m nitrogen. The pH of the medium was adjusted at 6 by using phosphate buffer as described by sharkas (1962) to avoid any possible hydrolysis of insecticide, In aqueous solution, cyolane was found to be relatively stable under neutral or slightly acidic conditions (Mostafa et al. 1982).

Since the growth of fungi are determined by different criteria, it was thought advisable to investigate the effect of different concentrations of cyolane on the

linear growth of the five examined fungi as well as on the mats dry weight.

A. **Effect of cyolane on the linear growth of five soil fungi under various incubation temperatures.**

The examined fungi Rhizoctonia solani, Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus and Fusarium sp. were maintained for 10 days on (Dox's) agar medium page. (19) in petri dishes at 29 ± 1 °C.

For each temperature and fungus 36 sterile petri - dishes (15 cm. diameter), were supplied each with 30 ml. of sterile (Dox's) agar medium page (19) in which the nitrogen source was changed. Before solidification (at 45 °C) triplicate dishes for each nitrogen source were treated by insecticide as follows:

Replicates	Concentration of cyolane (p.p.m)
3 dishes	- cyolane (control)
3 dishes	+ 100 p.p.m cyolane
3 dishes	+ 200 p.p.m cyolane
3 dishes	+ 300 p.p.m cyolane
3 dishes	+ 400 p.p.m cyolane
3 dishes	+ 500 p.p.m cyolane

Other sets of dishes for each fungus and temperature were prepared in the same way, after solidification of agar, discs of the tested fungi (8 mm diameter) were placed in the center of each dish, with their mycelial surface down wards, i.e. in contact with the agar medium. Each set of plates was then carefully incubated at the required temperature and every two days measurement of the linear growth (diameter of developed colony in mm on each dish) was recorded up to 10 days.

The linear growth (in mm) of Rhizoctonia solani grown on either sodium nitrate or ammonium sulphate at different temperatures in presence or absence of various concentrations of cyolane are recorded in Table (1) and graphically plotted in Fig. (1). It appears from the table that the growth of Rhizoctonia solani was measurable on all treatments by the end of 2 nd, day in presence of $NaNO_3$ or $(NH_4)_2$ SO_4 as nitrogen source in the growth medium. Gradual increase of colonies diameter were evident up to the 10 th, days for all treatments at the various incubation temperature. On all treatments the rate of growth of the fungus colonies was increased by increasing the incubation temperature from 20 to 30 ^{o}C to reach its maximum value

Table (1): Effect of Different concentrations of Cyolane on linear Growth of *Rhizoctonia solani* raised on presence of sodium nitrate or ammonium sulphate under various incubation temperatures for ten days and at pH-6.

Concentration of cyolane (p.p.m)	Nitrogen source	Growth diameter in mm at different incubation temperatures at the end of day																					
		20 °C						25 °C						30 °C						35 °C			
		0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th
Control	$NaNO_3$	8	28	47	65	86	104	8	30	50	70	90	111	8	32	58	84	110	132	8	25	40	58	75	90
	$(NH_4)_2SO_4$	8	28	48	68	87	105	8	33	50	70	90	110	8	34	53	80	107	126	8	18	32	46	62	76
100	$NaNO_3$	8	25	40	54	70	85	8	24	40	54	68	104	8	26	46	70	94	112	8	20	32	43	55	66
	$(NH_4)_2SO_4$	8	24	36	51	65	79	8	24	37	52	66	95	8	28	46	71	90	112	8	16	28	40	52	66
200	$NaNO_3$	8	20	30	45	57	70	8	20	30	42	54	64	8	19	34	50	66	80	8	14	25	34	44	56
	$(NH_4)_2SO_4$	8	20	30	40	51	61	8	20	33	44	56	67	8	25	40	60	73	94	8	15	24	34	45	54
300	$NaNO_3$	8	18	26	34	40	49	8	17	24	32	40	47	8	15	26	38	51	62	8	11	19	26	32	40
	$(NH_4)_2SO_4$	8	17	25	33	40	48	8	17	24	31	39	45	8	20	30	36	47	61	8	15	20	25	32	40
400	$NaNO_3$	8	15	19	20	25	30	8	14	20	24	27	32	8	17	28	43	54	65	8	10	13	18	20	25
	$(NH_4)_2SO_4$	8	14	20	25	30	35	8	14	20	26	30	36	8	17	26	34	44	55	8	11	14	20	23	27
500	$NaNO_3$	8	10	14	16	21	24	8	12	15	19	20	24	8	10	22	34	46	55	8	10	10	12	16	20
	$(NH_4)_2SO_4$	8	12	16	19	22	24	8	12	16	21	26	31	8	14	20	29	32	38	8	10	12	16	20	22

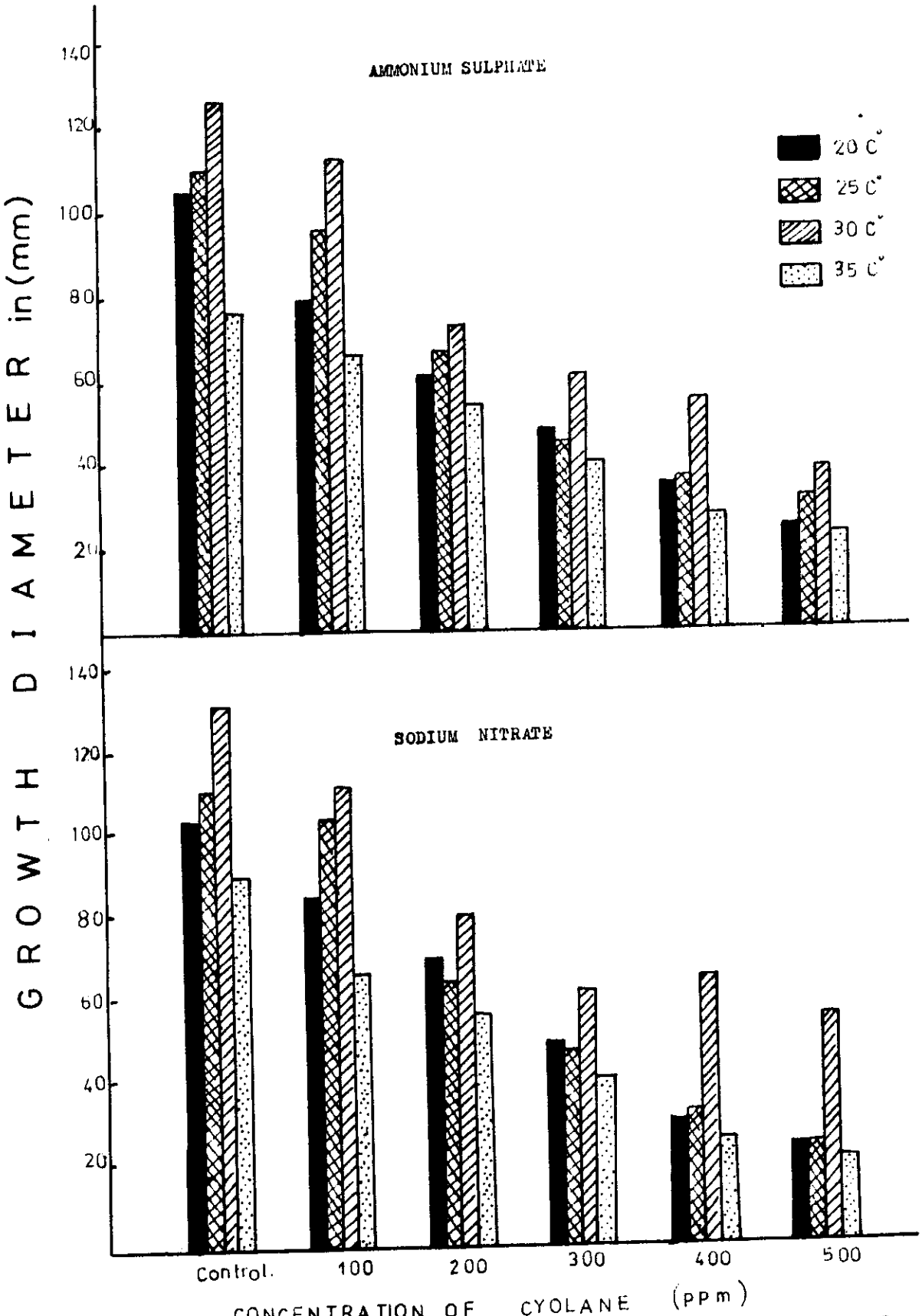

Fig. (1): Effect of different concentration of cyolane on linear growth of Rhizoctonia solani raised on presence of sodium nitrate or ammonium sulphate under various incubation temperatures for ten days at pH-6.

at the incubation temperature 30 °C. However, the incubation temperature of 35 °C showed the lowest growth rate of fungal colonies on all treatments as compared with other incubation temperatures. The same results indicated that the colonies diameter of Rhizoctonia solani at the various incubation temperatures and different nitrogen source were decreased by increasing the concentration of cyolane in the growth medium to show its minimum value at the highest concentration rate of 500 p.p.m. The percentage of colonies diameter of Rhizoctonia solani in presence of 500 p.p.m cyolane as compared with its controls (in absence of cyolane) in case of ammonium sulphate were about 22.86, 28.18, 30.16 and 28.95 % at the incubation temperature 20,25, 30 and 35 °C respectively. It is interested that the change of nitrogen source had no significant effect on the insecticide toxicity on all incubation temperature.

Table (2) and Fig. (2) includes the linear growth of Aspergillus niger in presence or absence of different concentrations of cyolane and raised in presence of sodium nitrate or ammonium sulphate in the growth medium and incubated at different incubation temperatures. These data showed that the growth of this fungus could be measured

Table (2): Effect of different concentrations of cyolane on linear growth of Aspergillus niger raised on presence of sodium nitrate or ammonium sulphate under various incubation temperatures for ten days at pH-6.

concentration of cyolane in (p.p.m	Nitrogen source	Growth diameter in mm at different incubation temperatures at the end of day																					
		20 °C						25 °C						30 °C						35 °C			
		0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th
Control	$NaNO_3$	8	23	40	59	77	92	8	26	44	64	82	103	8	30	52	76	96	117	8	26	46	63	80	100
	$(NH_4)_2SO_4$	8	24	40	55	76	92	8	26	45	70	90	110	8	25	49	70	97	118	8	27	45	69	86	110
100	$NaNO_3$	8	22	35	50	63	76	8	24	39	58	76	92	8	23	40	56	73	90	8	14	29	47	60	78
	$(NH_4)_2SO_4$	8	20	35	50	64	80	8	24	43	63	82	100	8	24	40	62	81	100	8	22	38	57	72	90
200	$NaNO_3$	8	20	32	42	52	64	8	21	34	48	62	72	8	23	36	46	62	78	8	20	33	44	56	63
	$(NH_4)_2SO_4$	8	18	30	43	54	67	8	22	40	60	77	84	8	20	35	56	75	95	8	21	36	50	66	80
300	$NaNO_3$	8	18	26	36	45	56	8	18	30	37	48	56	8	12	26	38	43	54	8	17	26	34	44	50
	$(NH_4)_2SO_4$	8	17	26	35	45	54	8	21	34	58	62	76	8	19	32	46	60	76	8	18	30	42	56	68
400	$NaNO_3$	8	14	22	28	33	39	8	14	22	29	35	42	8	12	22	32	38	50	8	13	20	26	34	40
	$(NH_4)_2SO_4$	8	12	20	26	32	40	8	18	28	40	50	60	8	17	30	43	58	70	8	16	24	32	40	48
500	$NaNO_3$	8	10	14	20	24	28	8	10	14	18	24	28	8	13	21	32	42	50	8	11	14	16	20	22
	$(NH_4)_2SO_4$	8	10	14	20	24	30	8	12	19	26	32	40	8	15	28	40	53	65	8	12	18	22	29	34

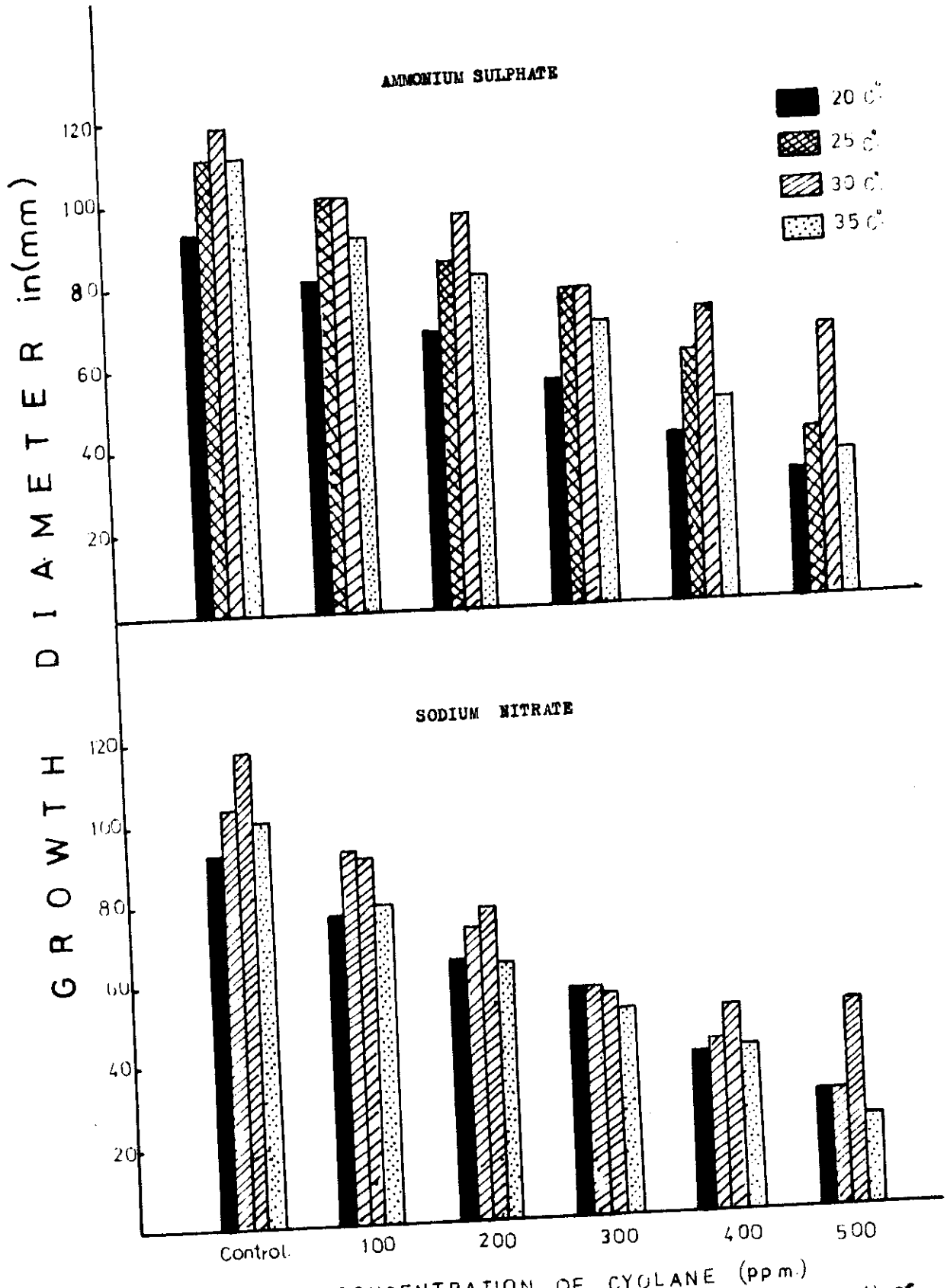

Fig. (2): Effect of different concentration of cyolane on linear growth of Aspergillus niger raised on presence of sodium nitrate or ammonium sulphate under various incubation temperatures for ten days at pH-6.

by the end of 2 nd, day on all treatments, gradually increased up to the 10 th, day on absence or in presence of the insecticide cyolane. The growth of this fungus was increased by increasing the incubation temperature from 20 to 30 °C in control treatment and in presence of cyolane on the concentrations of 300,400 and 500 p.p.m. At 35 °C a remarkable, significant decrease in fungal growth occured. However, lower concentration (100 p.p.m) shifted the optimum temperature from 30 to 25 °C. in presence of sodium nitrate or ammonium sulphate as nitrogen source in growth medium. This behaviour revealed that the optimum temperature for the growth of this organism is not constant, but changes with the variation in the cultural conditions.

With respect to the effect of different concentrations of cyolane on the linear growth of Aspergillus niger it appears that the rate of growth of this fungus decreased with the increase of the insecticide concentration within one and the same level of temperature. At all temperatures the colonies diameter of Aspergillus niger after different incubation periods in absence of cyolane was significantly higher than that shown by media treated with the insecticide at the respective temperature levels, and showed its lowest value of the highest

concentration of cyolane 500 p.p.m. Table (2) also indicated that the replacement of sodium nitrate with ammonium sulphate showed a significant protective action against the toxic effect of cyolane with respect of all insecticide concentrations at all incubation temperatures except 20 °C. This behaviour showed that toxic effect of cyolane is not constant, but change with the incubation temperature as well as type of nitrogen in the culture medium.

Table (3) and Fig. (3) shows the effect of cyolane on the linear growth of Aspergillus flavus (in mm) at different incubation temperatures in presence of sodium nitrate or ammonium sulphate. It is clear from both table and figure that the growth of this fungus was measurable on all treatments by the 2 nd, day. The results reveal that replacement of sodium nitrate with ammonium sulphate did not change the general growth trend of this fungus on the control medium free from cyolane, or in presence of insecticide at all different concentrations. The growth vigour generally increased gradually from 20 up to 30 °C at which the colonies diameter reached its maximum. At 35 °C the colonies diameter were slightly lower than at 30 °C. Addition of cyolane to

Table (3): Effect of Different concentrations of cyolane on linear Growth of *Aspergillus flavus* rasied on presence of sodium nitrate or ammonium sulphate under various Incubation temperatures for ten days and at pH-6.

Concentration of cyolane (p.p.m)	Nitrogen source	Growth diameter in mm. at different incubation temperatures at the end of day																					
		20 °C						25 °C						30 °C						35 °C			
		0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th
Control	$NaNO_3$	8	24	40	58	75	95	8	28	46	64	85	102	8	23	47	69	91	110	8	27	48	68	87	107
	$(NH_4)_2SO_4$	8	28	46	64	80	100	8	28	48	67	87	106	8	30	50	71	92	110	8	26	45	65	84	104
100	$NaNO_3$	8	20	34	46	58	70	8	22	36	50	64	80	8	18	36	52	68	84	8	22	38	53	68	82
	$(NH_4)_2SO_4$	8	26	42	59	70	75	8	23	36	49	64	76	8	20	36	50	66	81	8	20	36	50	66	81
200	$NaNO_3$	8	18	30	39	48	60	8	20	30	40	51	60	8	17	30	45	59	71	8	20	31	42	53	63
	$(NH_4)_2SO_4$	8	25	38	48	55	65	8	19	30	40	50	62	8	12	25	41	56	71	8	16	30	42	56	68
300	$NaNO_3$	8	16	24	30	40	50	8	17	26	34	40	50	8	16	30	42	60	70	8	18	26	30	36	42
	$(NH_4)_2SO_4$	8	25	32	41	50	58	8	17	23	30	39	51	8	15	27	39	48	61	8	14	25	38	49	55
400	$NaNO_3$	8	15	20	25	30	35	8	14	22	28	33	36	8	15	26	36	48	59	8	16	21	25	28	31
	$(NH_4)_2SO_4$	8	23	28	35	40	48	8	14	19	22	25	28	8	12	24	35	45	57	8	12	20	27	33	42
500	$NaNO_3$	8	12	17	20	25	30	8	10	14	20	22	25	8	12	21	28	38	45	8	16	18	20	24	26
	$(NH_4)_2SO_4$	8	20	24	28	33	37	8	12	15	19	21	24	8	11	20	30	40	50	8	9	15	22	29	35

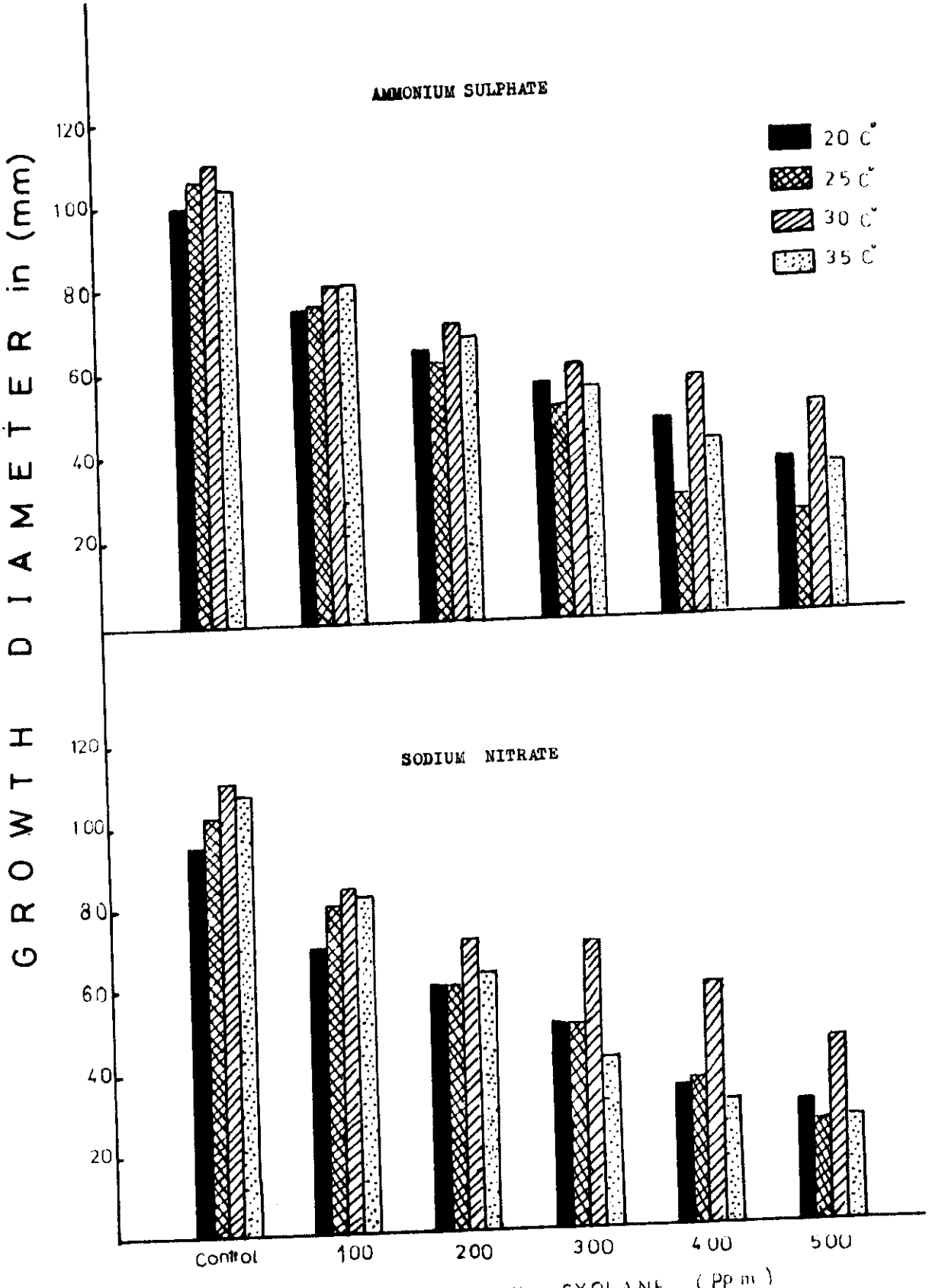

Fig. (3): Effect of different concentration of cyolane on linear growth of Aspergillus flavus raised on presence of sodium nitrate or ammonium sulphate under various incubation temperatures for ten days at pH-6.

the growth medium significantly decreased the growth rate of Aspergillus flavus at all incubation temperatures in presence of sodium nitrate or ammonium sulphate in growth medium. The colonies diameters decreased by increasing cyolane concentration to reach its minmum value at the highest concentration of insecticide 500 p.p.m.

The linear growth of Aspergillus fumigatus could be measured in all treatments in the 2 nd, day of incubation as indicated in Table (4). The growth of this fungus was gradually increased up to 10 th, day for all treatments. At all incubation periods the colonies diameter for all treatments increased by increasing incubation temperature from 20 to 30 °C, and then slightly decreased at 35 °C than at 30 °C. The same data indicate that the replacement of sodium nitrate with ammonium sulphate had no remarkable difference in colonies diameter in all treatments . At all incubation temperature the rate of growth of this fungus was inhibited by the addition of cyolane at different concentrations to the growth medium. The colonies diameter significantly decreased by increasing the concentration rate of cyolane to reach its minimum value at the highest concentration 500 p.p.m. Table (4) and Fig. (4).

Table (4): Effect of different concentrations of cyolane on linear growth of *Aspergillus fumigatus* raised on presence of sodium nitrate or ammonium sulphate under various incubation temperatures for ten days at pH-6

concentration of cyolane (p.p.m)	Nitrogen source	Growth diameter in mm at different incubation temperatures at the end of day																					
		20 °C						25 °C						30 °C						35 °C			
		0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th
Control	$NaNO_3$	8	24	40	56	78	94	8	26	46	62	84	101	8	22	44	65	88	105	8	25	42	58	71	88
	$(NH_4)_2SO_4$	8	26	45	61	79	95	8	34	50	70	86	106	8	20	46	70	95	117	8	22	38	50	66	82
100	$NaNO_3$	8	21	34	46	57	72	8	24	40	54	70	84	8	18	36	52	70	84	8	24	36	48	60	82
	$(NH_4)_2SO_4$	8	25	38	50	62	76	8	30	44	60	70	82	8	15	32	47	68	82	8	19	30	40	51	62
200	$NaNO_3$	8	20	30	38	48	57	8	22	32	40	51	60	8	15	21	32	46	60	8	23	32	40	48	56
	$(NH_4)_2SO_4$	8	23	33	44	56	62	8	28	40	50	55	66	8	13	22	38	52	69	8	18	25	33	40	48
300	$NaNO_3$	8	18	26	32	40	46	8	20	28	35	44	50	8	12	17	30	38	50	8	21	28	36	40	50
	$(NH_4)_2SO_4$	8	20	28	36	43	47	8	22	30	40	50	55	8	11	19	38	35	49	8	16	22	28	32	40
400	$NaNO_3$	8	16	22	26	28	32	8	17	24	30	36	43	8	10	16	29	38	45	8	20	24	28	30	36
	$(NH_4)_2SO_4$	8	18	24	30	37	42	8	16	23	32	37	42	8	10	16	25	30	40	8	14	18	20	24	28
500	$NaNO_3$	8	12	14	18	20	20	8	14	20	21	23	26	8	8	10	16	20	24	8	14	18	20	20	24
	$(NH_4)_2SO_4$	8	16	20	21	26	28	8	12	18	20	25	29	8	10	15	20	25	32	8	10	12	14	18	20

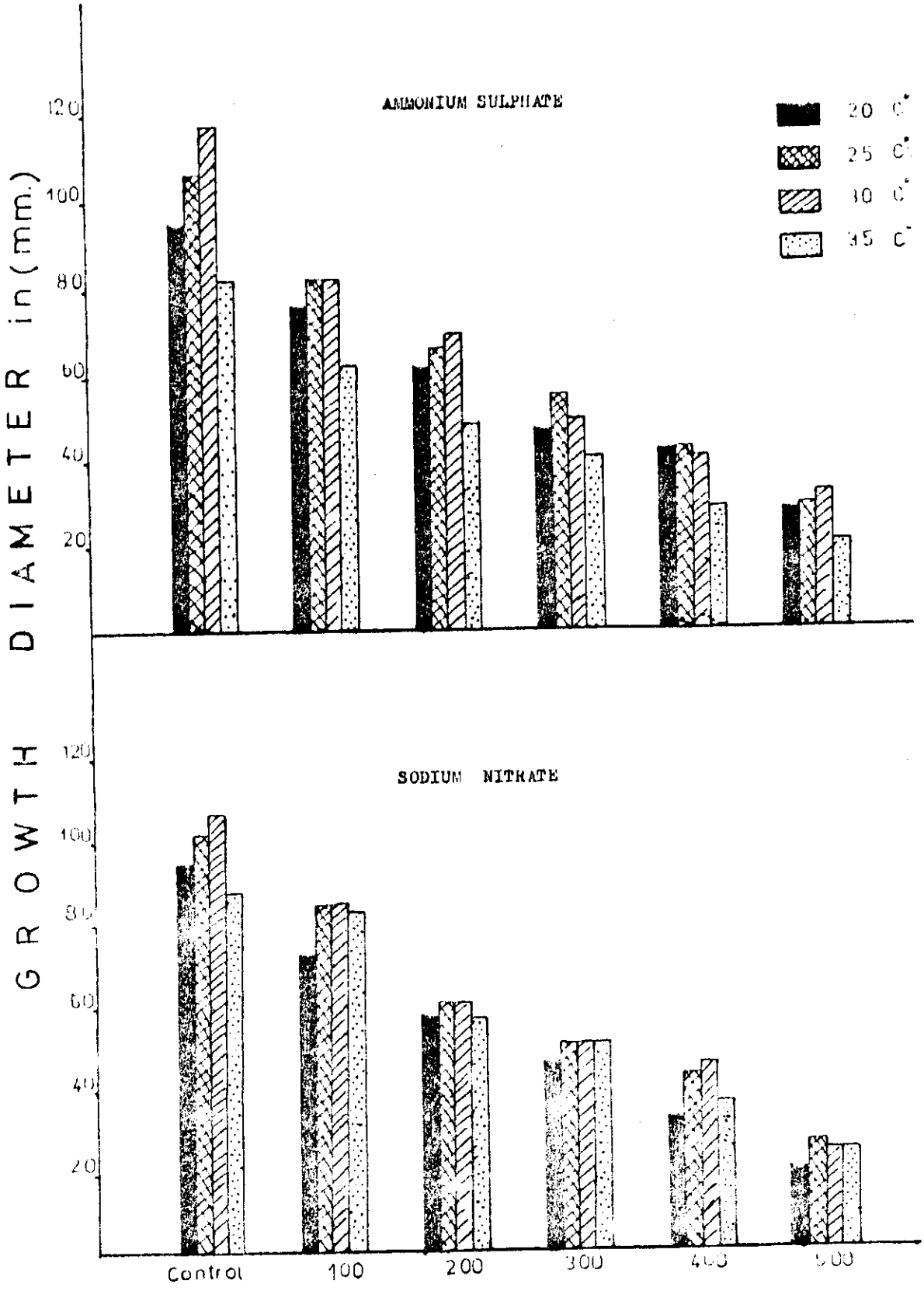

Fig. (4): Effect of different concentration of cyolane on linear growth of Aspergillus fumigatus raised on presence of sodium nitrate or ammonium sulphate under various incubation temperatures for ten days at pH-6.

Table (5): Effect of different concentrations of cyclane on linear growth of *Fusarium* sp. raised on presence of sodium nitrate or ammonium sulphate under various incubation temperatures for ten days at pH-6.

Concentration of cyclane (p.p.m)	Nitrogen source	Growth diameter in mm at different incubation temperatures at the end of day																					
		20 °C						25 °C						30 °C						35 °C			
		0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th
Control	$NaNO_3$	8	25	43	60	76	94	8	30	46	64	84	100	8	32	57	82	107	127	8	25	40	57	72	88
	$(NH_4)_2SO_4$	8	29	48	65	82	100	8	32	52	74	94	114	8	24	46	70	90	119	8	28	46	63	80	98
100	$NaNO_3$	8	23	36	50	65	78	8	25	40	52	66	80	8	20	42	66	81	104	8	18	30	44	57	70
	$(NH_4)_2SO_4$	8	27	40	51	64	76	8	20	36	52	68	83	8	27	45	66	83	104	8	24	35	46	60	71
200	$NaNO_3$	8	20	32	44	57	70	8	18	30	42	53	66	8	19	39	58	79	97	8	15	24	33	40	50
	$(NH_4)_2SO_4$	8	24	34	46	60	71	8	18	30	43	55	68	8	16	30	45	61	80	8	21	32	42	54	64
300	$NaNO_3$	8	17	26	33	42	52	8	14	24	35	46	58	8	16	34	54	68	86	8	13	20	26	32	40
	$(NH_4)_2SO_4$	8	20	30	40	50	60	8	16	24	34	43	51	8	12	26	41	55	72	8	13	23	31	38	44
400	$NaNO_3$	8	15	21	29	36	43	8	12	18	24	32	38	8	13	27	38	51	67	8	12	14	19	23	28
	$(NH_4)_2SO_4$	8	9	15	24	32	41	8	12	18	25	32	38	8	17	24	32	40	48	8	12	20	25	31	39
500	$NaNO_3$	8	12	16	20	26	30	8	8	12	17	23	28	8	10	20	30	39	48	8	8	10	12	14	17
	$(NH_4)_2SO_4$	8	9	12	19	22	25	8	10	14	20	26	30	8	14	20	26	33	39	8	10	12	14	22	28

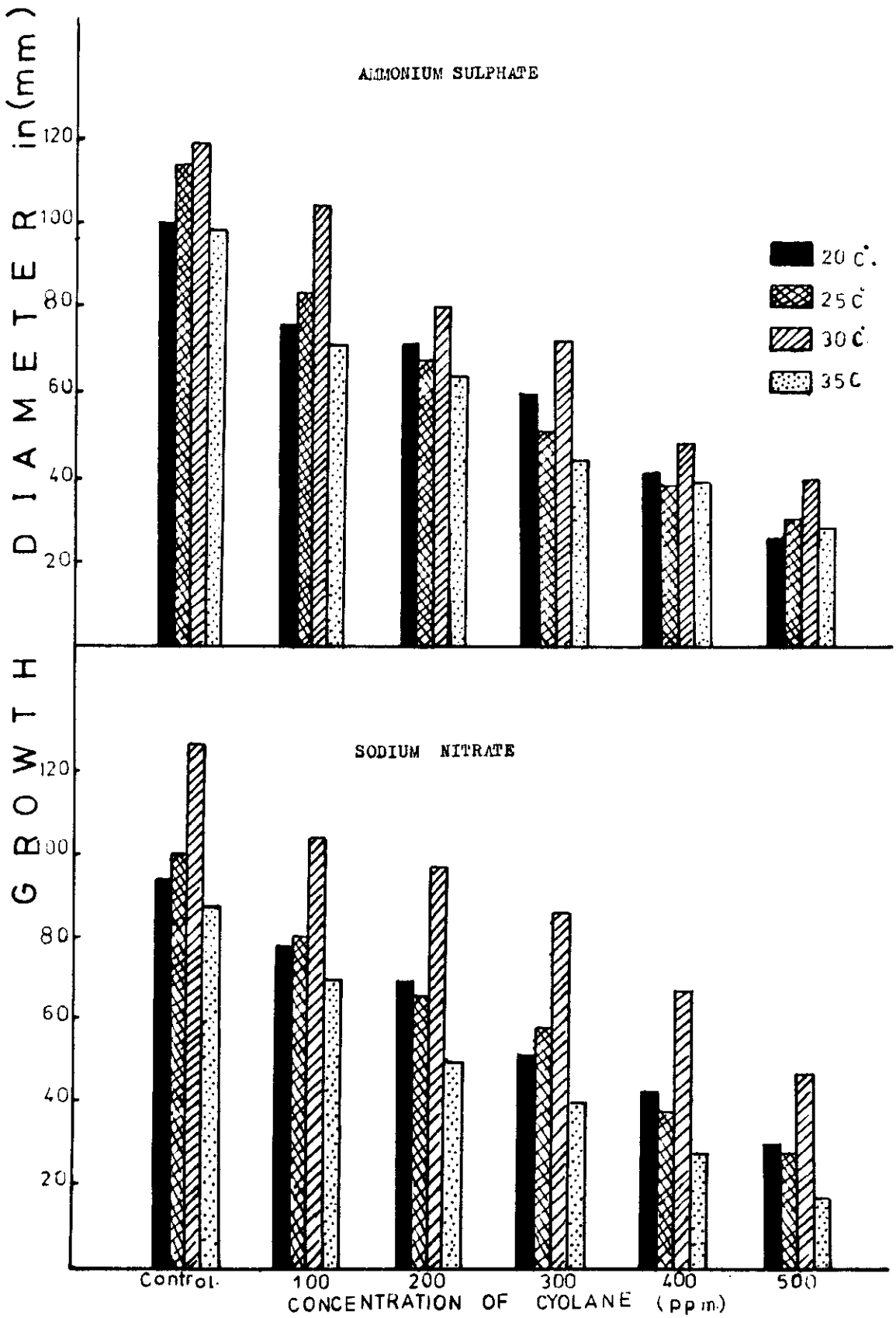

Fig. (5): **Effect of different concentration of cyolane on linear growth of** *Fusarium* **sp. raised on presence of sodium nitrate or ammonium sulphate under various incubation temperatures for ten days at pH-6.**

B. Effect of cyolane on dry weight of mats of five soil fungi under various incubation temperatures:

In this part of experiment, for each temperature and fungus, 36 Erlenmeyer conical flasks (250 ml. capacity) were supplied, each with 50 ml. of (Dox's) liquid medium (Page 19) in which the nitrogen source was changed. After sterilization, triplicates flasks for each nitrogen source were treated as follows:

Replicates	Concentration of cyolane (in p.p.m)
3 Flasks	- Cyolane (controls)
3 Flasks	+ 100 p.p.m Cyolane
3 Flasks	+ 200 p.p.m Cyolane
3 Flasks	+ 300 p.p.m Cyolane
3 Flasks	+ 400 p.p.m Cyolane
3 Flasks	+ 500 p.p.m Cyolane

The addition of cyolane after sterilization and cooling was preferred to eliminate any possible destruction of the insecticide by heat and pressure. Other sets of flasks for each temperature and fungus were prepared in the same way.

Mycelial discs (8 m m diameter) of ten days old culture at 30 °C of either Rhizoctonia solani, Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus or Fusarium sp., were used for inoculation of its respective set of flasks. After ten days incubation period at the required temperature, the developed mats were filtered and washed several tiaes using distilled water under suction on a Buchner funnel. The mats were oven dried at 80 °C till constant weight. At the end of the experimental period the average dry weight (in milligram) for each treatment was determined.

The dry weight (in mg.) of mats of Rhizoctonia solani grown in presence or absence of different concentrations of cyolane and raised in presence of sodium nitrate or ammonium sulphate at various incubation temperatures are indicated in Table (6) and represented graphically in Figure (6). The results indicate that in presence or absence of cyolane, incubation temperatures 30 °C, was the optimum temperature for growth of Rhizoctonia solani in presence of either $NaNO_3$ or $(NH_4)_2 SO_4$, while lowest dry weight for all treatment was evident at 35 °C. With respect to the presence of different concentrations of cyolane, it appears that dry

Table (6): Dry weight of fungal mats (in mg) of *Rhizoctonia solani* grown on either sodium nitrate or ammonium sulphate at various temperatures in presence or absence of different concentration of cyolane and after ten days incubation period at pH-6.

Nitragen source	concentration of cyolane in p.p.m	Dry weight of mats (in mg) at			
		20 °C	25 °C	30 °C	35 °C
Sodium nitrate	control	357	431	469	265
	100	259	286	309	178
	200	117	125	129	77
	300	58	64	68	36
	400	52	54	64	30
	500	25	29	35	17
Ammonium sulphate	control	605	636	673	153
	100	604	643	671	146
	200	580	636	657	153
	300	139	150	158	75
	400	126	147	143	51
	500	76	88	95	34

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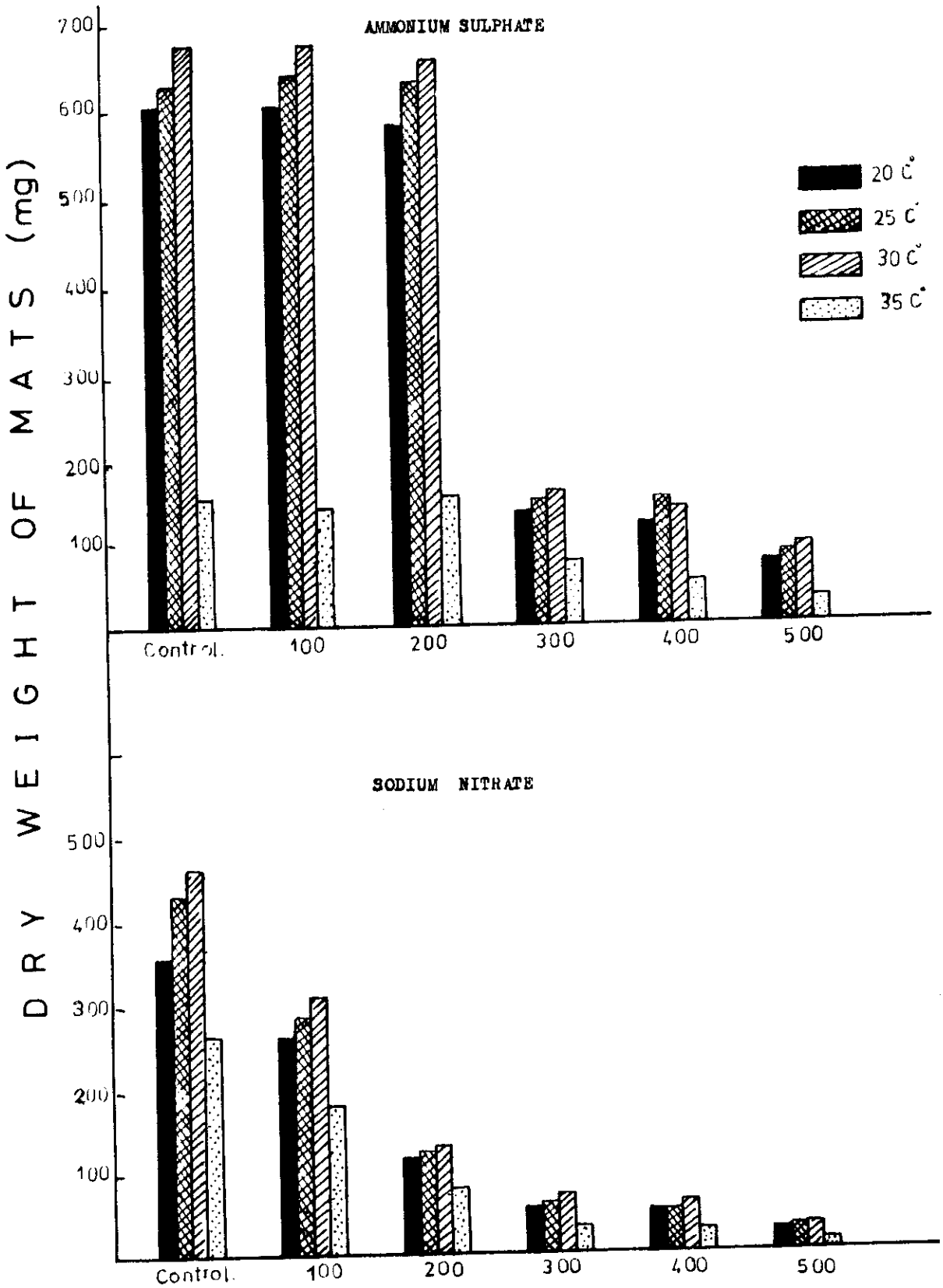

Fig. (6): Dry weight of fungal mats (in mg) of Rhizoctonia solani grown on either sodium nitrate or ammonium sulphate at various temperatures in presence or absence of different concentration of cyolane and after incubation period ten days at pH-6.

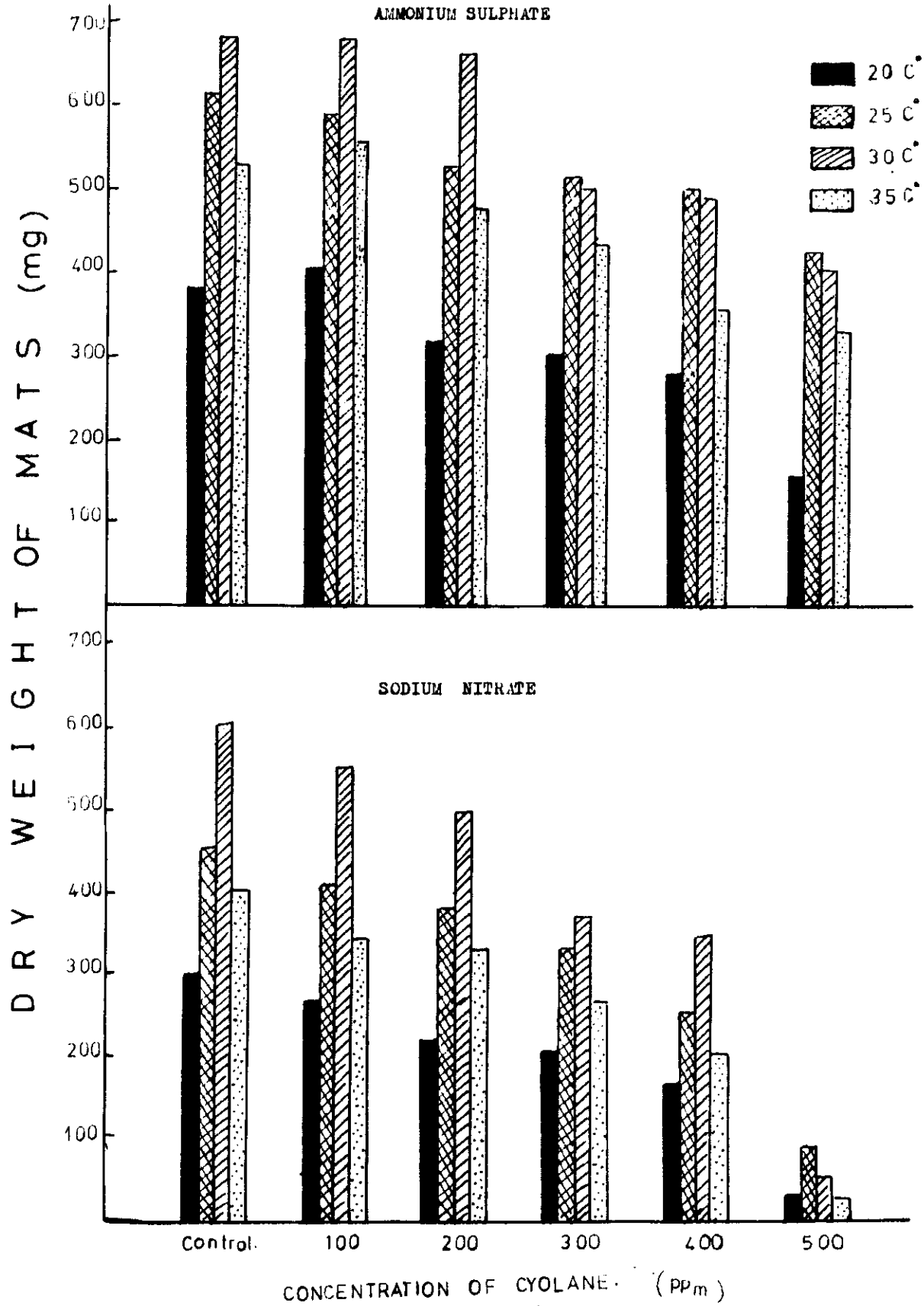

Fig. (7): Dry weight of fungal mats (in mg) of Aspergillus niger grown on either sodium nitrate or ammonium sulphate at various temperatures in presence or absence of different concentration of cyolane and after incubation period ten days at pH-6.

In presence of $NaNO_3$ the dry weight of mats gradually decreased by increasing cyolane concentrations up to 400 p.p.m, then sharp drop of fungal growth was obtained in presence of 500 p.p.m of cyolane on growth medium at all incubation temperature. On the other hand, in presence of $(NH_4)_2 SO_4$ the dry weight of Aspergillus niger mats gradually decreased by increasing the insecticide concentrations in growth medium without any sharp drop at the concentration of 500 p.p.m however the lowest concentration 100 p.p.m showed stimulation effect on fungal growth at both incubation temperatures 20 and 35 °C. Furthermore in general the dry weight of fungal mats in all treatments was higher in presence of $(NH_4)_2 SO_4$ than in presence of $NaNO_3$.

The dry weight of mats (in mg.) of Aspergillus flavus raised in presence of $NaNO_3$ or $(NH_4)_2 SO_4$ at different concentrations of cyolane at various incubation temperatures are indicated in Table (8) and Figure (8). The experimental results show that the presence of ammonium sulphate increased the dry weight of fungal mats at all treatments than in presence of sodium nitrate. The growth of this fungi reached its maximum at 30 °C and showed a clear drop at 35°C. The change of nitrogen

Table (8): Dry weight of fungal mats (in mg) of Aspergillus flavus grown on either sodium nitrate or ammonium sulphate at various temperatures in presence or absence of different concentration of cyolane and after ten days incubation period at pH-6.

Nitrogen source	concentration of cyolane in p.p.m	Dry weight of mats (in mg) at			
		20 °C	25 °C	30 °C	35 °C
Sodium nitrate	control	246	350	461	394
	100	235	325	408	345
	200	205	275	334	304
	300	196	260	314	294
	400	149	185	223	205
	500	65	90	153	84
Ammonium sulphate	control	380	595	630	618
	100	400	576	616	604
	200	410	586	595	503
	300	390	455	482	425
	400	390	408	429	420
	500	324	359	372	354

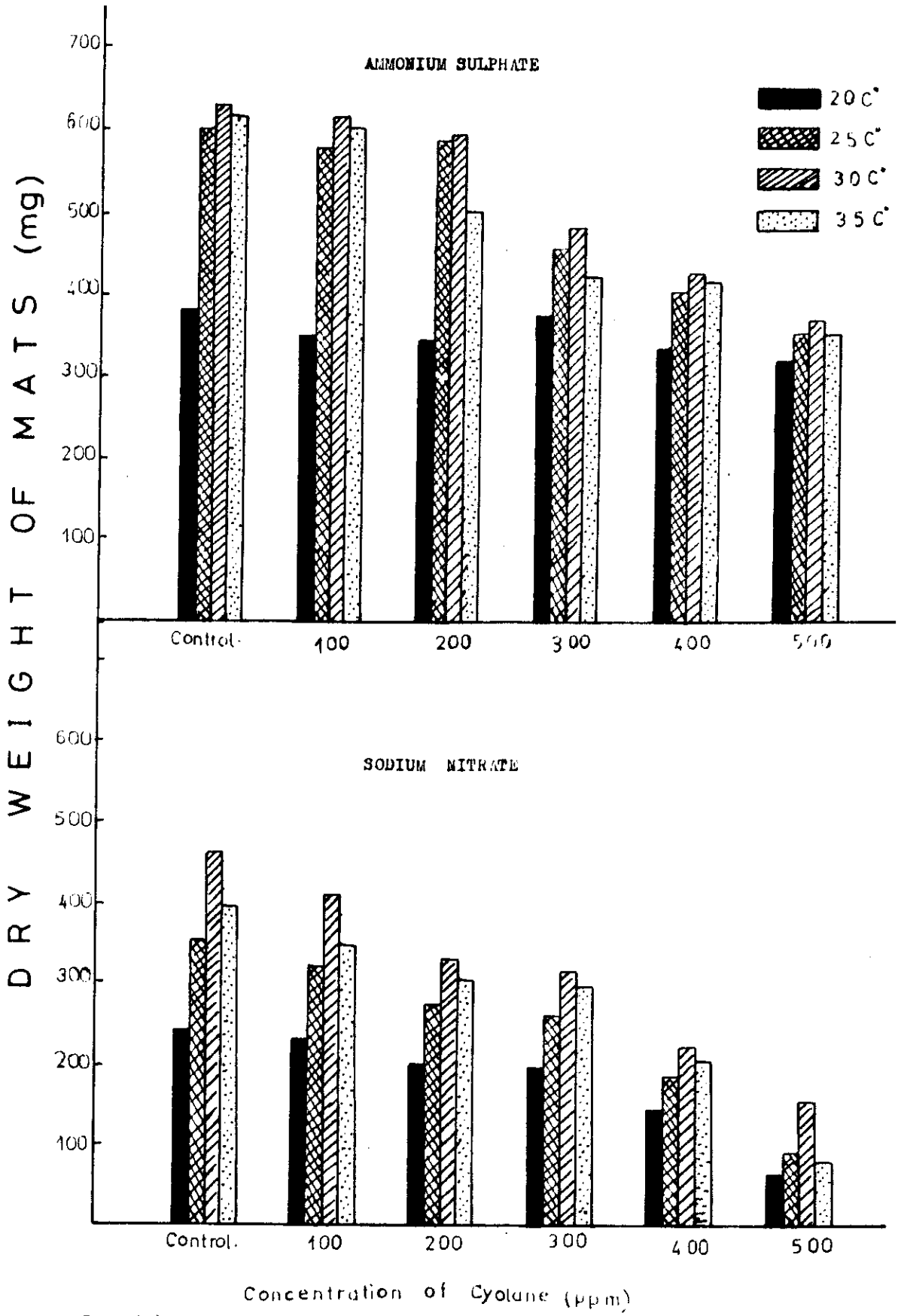

Fig. (8): Dry weight of fungal mats (in mg) of *Aspergillus flavus* grown on either sodium nitrate or ammonium sulphate at various temperatures in presence or absence of different concentration of cyolane and after incubation period ten days at pH-6.

source had no effect of these observation.

The same results (table 8 and Figure 8) indicate that ammonium sulphate does not only show a protective action against the toxic effect of cyolane at the lowest temperature 20 °C, but also indicates a stimulation effect on the fungal growth by increasing its mat dry weight in presence of four concentrations of cyolane 100, 200,300 and 400 p.p.m. At the other incubation temperatures 25,30 and 35 °C, the dry weight of fungal mats was gradual decreased by increasing the concentration of insecticides up to 500 p.p.m. Thus it appears that in presence of $(NH_4)_2 SO_4$ the toxic effect of different concentrations of cyolane were more evident at higher temperatures rates than at lower one. On the other hand in presence of $NaNO_3$ as nitrogen source in cultural medium, the dry weight of fungal mats gradually decreased by increasing the concentration of insecticide up to 400 p.p.m, then a sharp drop was obtained at the concentration of 500 p.p.m at the various incubation temperatures. This behaviour indicates the differential toxic effect between the lower and higher concentrations of cyolane.

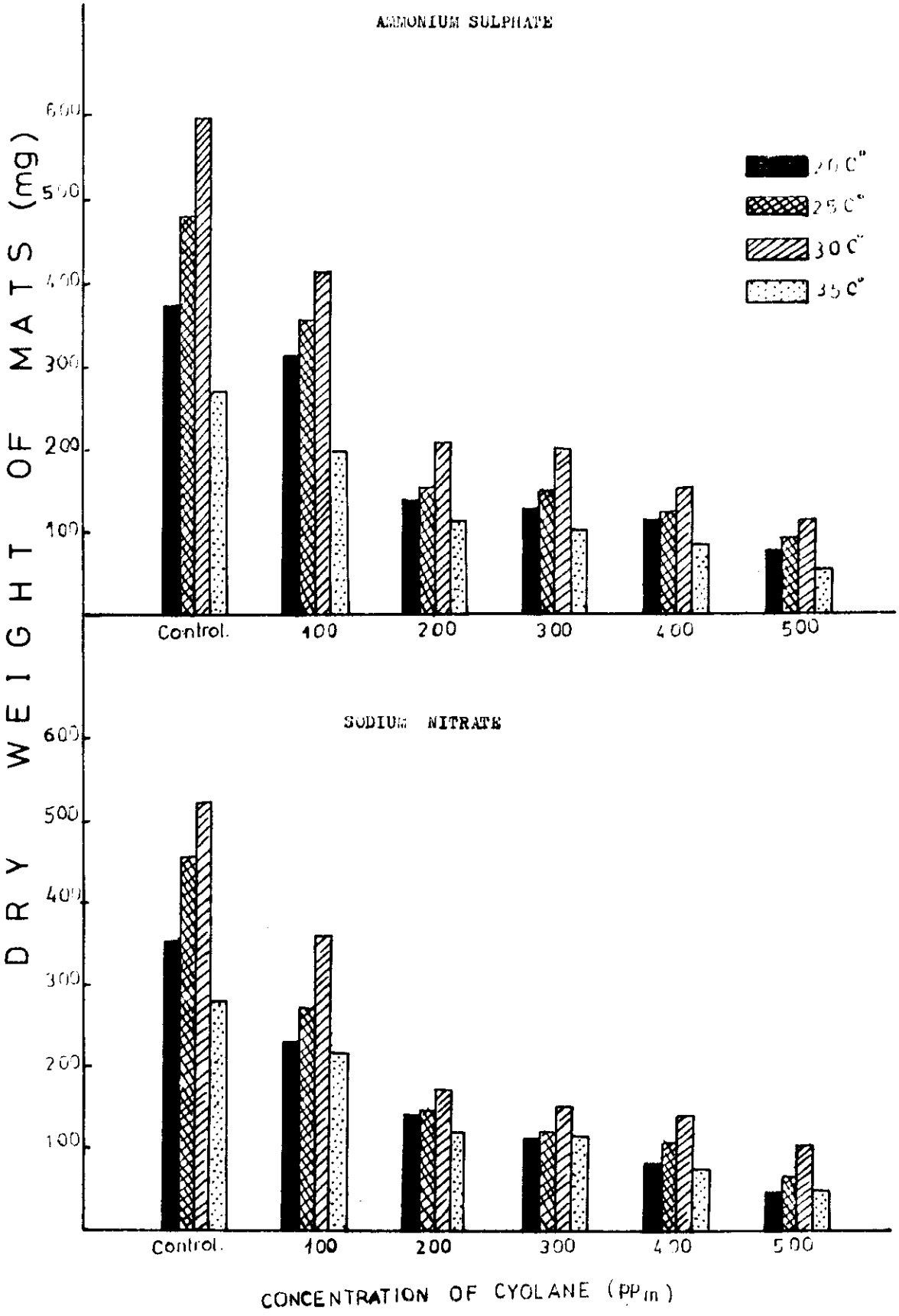

Fig. (9): Dry weight of fungal mats (in mg) of Aspergillus fumigatus grown on either sodium nitrate or ammonium sulphate at various temperatures in presence or absence of different concentration of cyolane and after incubation period ten days at pH-6.

Table (10) and Figure (10) indicate the effect of different concentrations of cyolane insecticide on the dry weight of mats of Fusarium sp., raised in presence of either $NaNO_3$ or $(NH_4)_2 SO_4$ at various temperatures. It appears from this data that the dry weight of fungal mats in control treatment (in absence of cyolane) was twice as much in presence of $(NH_4)_2 SO_4$ as compared in presence of $NaNO_3$. This trend was constant in all incubation temperatures 20,25,30 and 35 °C. On the other hand, in presence of either $NaNO_3$ or $(NH_4)_2 SO_4$ in growth medium in all treatments the dry weight of mats reached its maximum value at 30 °C, and its lowest value at 35 °C.

The same results shows that in presence of $NaNO_3$ the dry weight of Fusarium sp., mats gradually decreased by increasing concentration of cyolane at all incubation temperatures. When $NaNO_3$ changed by $(NH_4)_2 SO_4$ the lowest concentration of cyolane 100 p.p.m, showed high inhibition in fungal growth by increasing the dry weight of its mats by about 50% as compared with its control (in absence of cyolane) at all different temperatures. Then the higher concentrations of cyolane slightly decreased the dry weight up to concentration rate at 500 p.p.m. These observations indicate that $NaNO_3$ show a

Table (10): Dry weight of fungal mats (in mg) of Fusarium sp., grown on either sodium nitrate or ammonium sulphate at various temperatures in presence or absence of different concentrations of cyolane and after ten days incubation period at pH-6

Nitrogen source	concentration of cyolane in p.p.m	Dry weight of mats (in mg) at			
		20 °C	25 °C	30 °C	35 °C
Sodium nitrate	control	169	258	290	145
	100	136	184	205	114
	200	123	159	182	84
	300	85	124	137	69
	400	94	115	118	58
	500	86	103	106	49
Ammonium sulphate	control	365	551	580	301
	100	186	286	314	134
	200	179	279	285	150
	300	169	246	262	126
	400	178	228	254	118
	500	153	224	251	114

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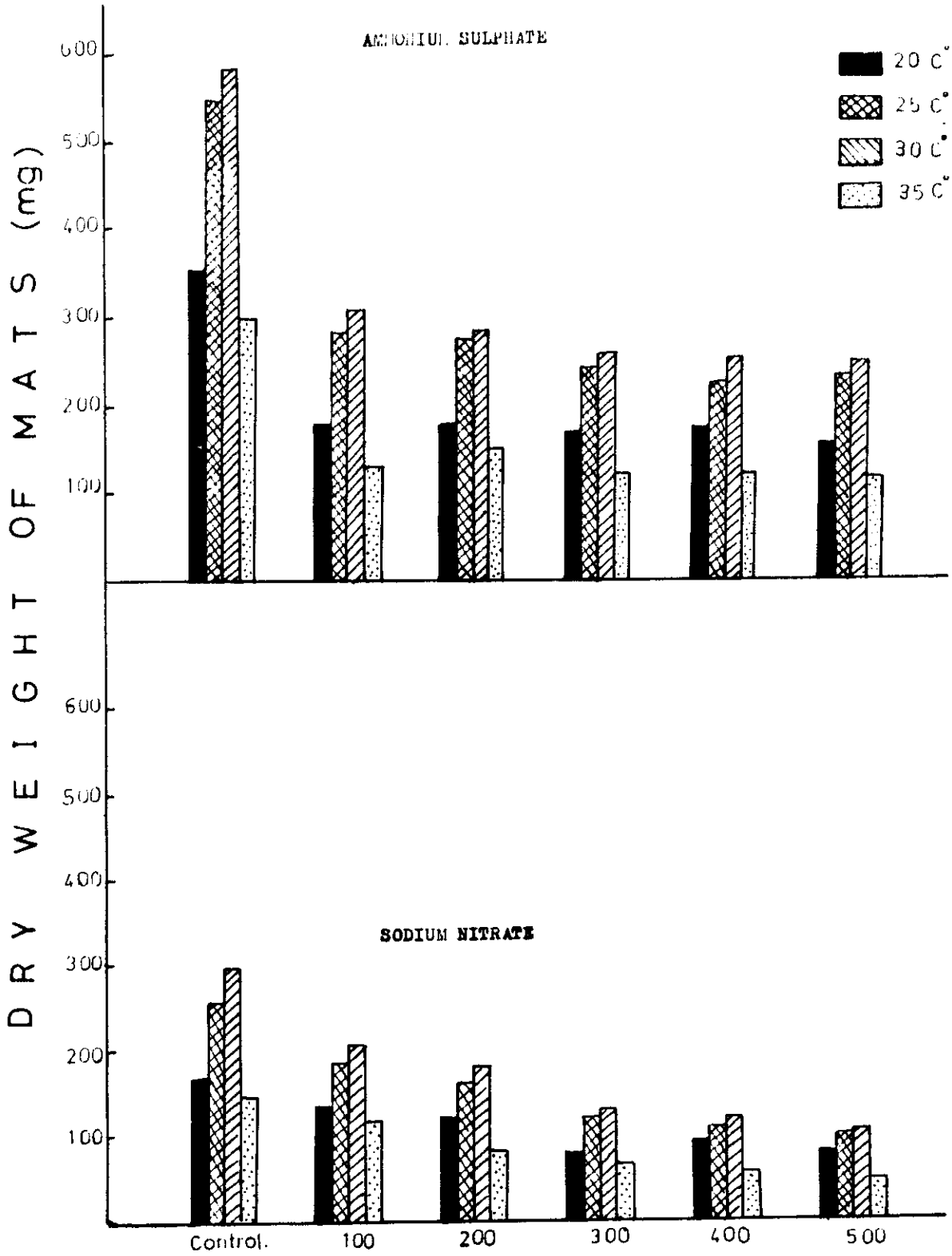

Fig. (10): Dry weight of fungal mats (in mg) of fusarium sp. grown on either sodium nitrate or ammonium sulphate at various temperatures in presence or absence of different concentration of cyolane and after incubation period ten days at pH-6.

protective action against the toxic effect of cyolane at all concentrations, while the lowest concentration of cyolane 100 p.p.m, reflect high toxic effect in the case of $(NH_4)_2 SO_4$ and then a protective effect was occured at the higher concentrations. Furthermore this indicates that the variation in toxic effect of different concentrations of cyolane were more occured in case of $NaNO_3$ rather than in case of $(NH_4)_2 SO_4$.

(Dox's) agar medium (Page 19) in which the nitrogen source was changed. Before solidification (at 45 °C) triplicate dishes for each nitrogen source were treated by insecticide as follows:

Replicates	Concentration of cyolane (p.p.m
3 dishes	- cyolane (controls)
3 dishes	+ 100 p.p.m cyolane
3 dishes	+ 200 p.p.m cyolane
3 dishes	+ 300 p.p.m cyolane
3 dishes	+ 400 p.p.m cyolane
3 dishes	+ 500 p.p.m cyolane

Other sets of dishes for each fungus and pH-value were prepared in the same way.

After solidification of agar, discs of the tested fungi (8 mm diameter) were placed in the centre of each dish, with their mycelial surface down wards, i.e in contact with the agar medium. Each set of plates was then carefully incubated at 30 °C, and every 2 days measurement of the linear growth (diameter of developed colony in mm on each dish) was recorded up to 10 days.

Table (11) and Fig. (11) show the linear growth (in mm) of Rhizoctonia solani which grown on presence of either sodium nitrate or ammonium sulphate in presence or absence of different concentrations of cyolane at various pH-values. It is clear from this table and Figure that the linear growth of this fungus was measurable on all treatments at pH-values 5,6 and 7 by the end of second day as well as in control treatment and in presence of 100 and 200 p.p.m at pHs 4 and 8. On the other hand at pH-values 4 and 8 the linear growth can be recorded only at the end of 4 th, day in the presence of sodium nitrate at three higher concentrations of cyolane 300, 400 and 500 p.p.m. Gradual increase of colonies diameter were occured up to the 10 th, day for all treatments. The same results indicate that colonies diameter reached its maximum value at pH-value 6 in control treatment (in absence of cyolane)in presence of either sodium nitrate or ammonium sulphate. At all pH-values the colonies diameter in the end of incubation period decreased by increasing cyolane concentrations to showed the lowest diameter in presence of 500 p.p.m cyolane. It is intersted that at all pH-values in control treatments a remarkable increase in fungal growth was observed in presence of sodium nitrate as compared with ammonium sulphate

Table (11): Effect of different concentrations of cyolane on the linear Growth of Rhizoctonia solani raised in presence of sodium nitrate or ammonium sulphate at various pH-values and incubated for ten days at 30 °C.

Concentration of cyolane in p.p.m	Nitrogen source	Growth diameter in mm at different pH-values at the end of day																									
		4						5						6						7						8			
		0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th
Control	$NaNO_3$	8	35	58	78	102	121	8	30	52	77	98	122	8	32	58	84	110	132	8	31	57	80	102	126	8	24	45	73	96	120
	$(NH_4)_2SO_4$	8	25	42	60	75	95	8	27	52	73	96	116	8	34	53	80	107	126	8	26	45	66	90	110	8	23	38	50	70	85
100	$NaNO_3$	8	20	28	45	62	80	8	20	42	68	90	110	8	26	46	70	94	112	8	26	48	68	88	108	8	19	35	54	72	91
	$(NH_4)_2SO_4$	8	20	35	49	60	78	8	25	37	55	72	84	8	28	46	71	90	112	8	20	35	56	70	85	8	20	30	44	57	70
200	$NaNO_3$	8	16	25	30	35	40	8	14	35	55	74	92	8	19	34	50	66	80	8	20	34	48	60	75	8	14	26	40	54	65
	$(NH_4)_2SO_4$	8	20	30	45	55	67	8	20	38	50	65	80	8	25	40	60	73	94	8	20	31	45	60	72	8	17	20	30	40	50
300	$NaNO_3$	8	8	10	12	20	24	8	14	30	46	65	81	8	25	36	48	61	74	8	14	28	40	54	62	8	8	14	22	29	36
	$(NH_4)_2SO_4$	8	15	25	34	46	55	8	17	27	37	46	56	8	20	36	49	55	67	8	18	30	38	45	52	8	10	16	20	29	34
400	$NaNO_3$	8	8	10	10	18	20	8	13	28	40	56	68	8	17	28	43	54	65	8	12	20	30	38	45	8	8	12	19	24	31
	$(NH_4)_2SO_4$	8	14	22	31	38	40	8	15	26	37	46	55	8	17	26	34	48	60	8	18	26	34	44	50	8	8	13	16	20	28
500	$NaNO_3$	8	8	10	10	12	14	8	10	21	27	38	44	8	10	22	34	46	55	8	8	12	16	22	28	8	8	10	15	18	20
	$(NH_4)_2SO_4$	8	14	20	26	30	35	8	14	20	24	38	45	8	14	20	33	41	50	8	18	23	28	30	38	8	8	10	12	16	20

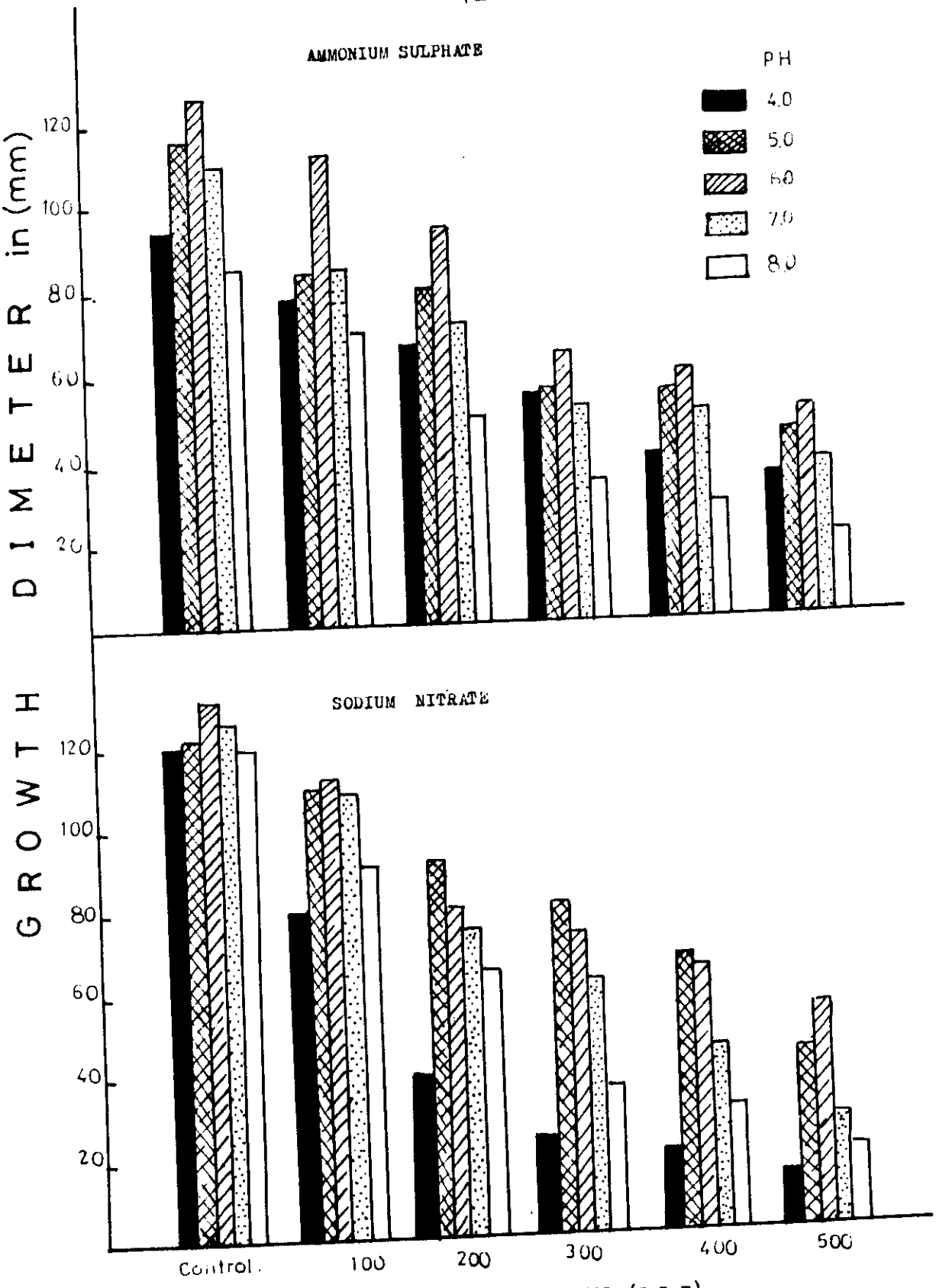

Fig. (11): Effect of different concentrations of cyolane on linear growth of Rhizoctonia solani raised in presence of sodium nitrate or ammonium sulphate at various pH-values and incubated for ten days at 30 °C.

however at pH-4 in presence of cyolane, the presence of sodium nitrate increased the toxic effect of insecticide while ammonium sulphate showed a protective action. This observation show that the toxic effect of insecticide and protective action of nitrogen source not constant at all pH-values, but changes by variation in other cultural conditions.

The effect of different concentration of cyolane in linear growth of Aspergillus niger at various pH-values in presence of either sodium nitrate or ammonium sulphate as nitrogen source in growth medium indicated in Table (12) and Fig. (12). The results showed that the colonies diameter for all treatment was measurable by the end of 2nd, day, except in presence of 400 and 500 p.p.m cyolane in growth medium when sodium nitrate used as nitrogen source at pH-4 that colonies diameter could be measured by the end of 4th, day. With few exception the optimum growth of this fungus was at pH- 6 in presence or absence of different concentrations of insecticide cyolane at the two different nitrogen sources. The same data indicate that in absence of insecticide (control treatment) the colonies diameter at the optimum (pH- 6) was more or less the same in presence of either sodium

Table (12): Effect of different concentrations of cyolane on linear growth of Aspergillus niger raised in presence of sodium nitrate or ammonium sulphate at various pH-values and incubated for ten days at 30 °C.

Concentration of cyolane in p.p.m	Nitrogen source	Growth diameter in mm at different pH-values at the end of day																									
		4						5						6						7						8			
		0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th
Control	$NaNO_3$	8	20	32	53	70	85	8	28	44	70	85	110	8	30	52	76	96	117	8	29	42	60	77	92	8	22	40	60	78	92
	$(NH_4)_2SO_4$	8	31	50	70	86	105	8	40	63	85	105	120	8	25	49	70	97	125	8	19	40	61	85	104	8	32	46	57	68	81
100	$NaNO_3$	8	16	29	40	55	70	8	22	41	57	74	95	8	23	40	56	73	90	8	25	37	50	61	75	8	20	33	52	65	80
	$(NH_4)_2SO_4$	8	25	41	60	75	90	8	34	51	70	88	105	8	24	40	62	81	100	8	13	32	46	63	78	8	26	38	50	59	69
200	$NaNO_3$	8	14	25	37	45	60	8	18	36	52	70	83	8	13	26	40	50	63	8	22	31	40	50	62	8	10	25	40	52	68
	$(NH_4)_2SO_4$	8	20	35	50	65	77	8	15	32	45	60	77	8	20	35	50	65	80	8	12	28	37	52	62	8	25	36	46	57	67
300	$NaNO_3$	8	13	20	29	40	50	8	15	32	47	61	75	8	12	26	38	43	54	8	18	25	30	41	45	8	10	20	32	47	54
	$(NH_4)_2SO_4$	8	17	27	40	49	60	8	14	28	42	59	72	8	19	32	46	60	76	8	10	23	33	43	52	8	14	22	33	43	55
400	$NaNO_3$	8	9	15	20	28	35	8	12	28	42	55	67	8	12	22	32	38	50	8	16	20	26	30	40	8	10	17	25	35	42
	$(NH_4)_2SO_4$	8	15	23	32	44	51	8	14	25	32	46	57	8	17	30	43	58	70	8	10	18	30	42	48	8	10	18	30	41	52
500	$NaNO_3$	8	9	12	17	21	27	8	12	25	37	48	60	8	13	21	32	42	50	8	14	18	22	26	30	8	10	13	20	25	33
	$(NH_4)_2SO_4$	8	10	16	26	33	40	8	10	18	29	40	50	8	15	28	40	53	65	8	10	16	28	39	45	8	10	16	26	37	50

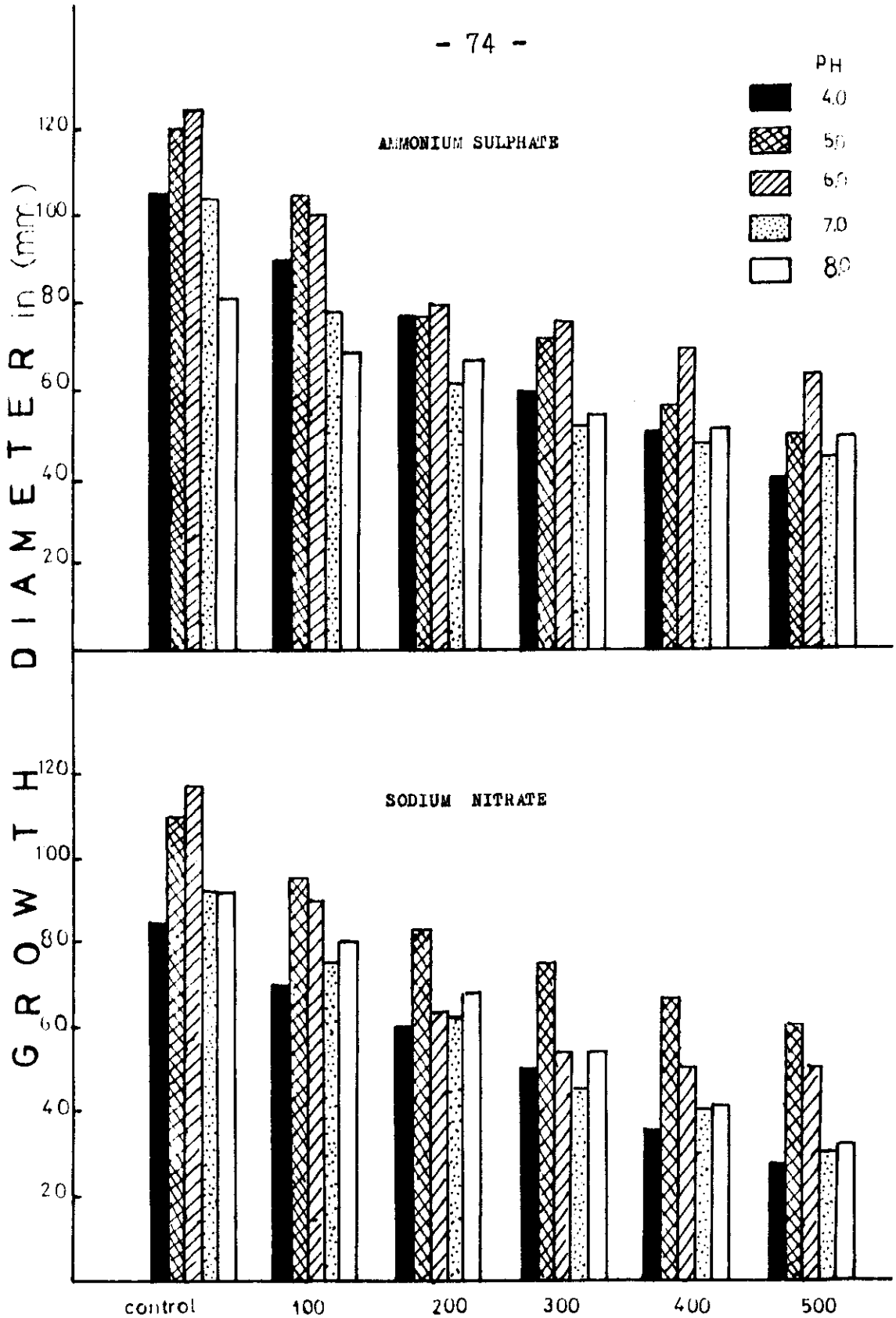

Fig. (12): Effect of different concentrations of cyolane on linear growth of Aspergillus niger raised in presence of sodium nitrate or ammonium sulphate at various pH-values and incubated for ten days at 30 °C.

nitrate or ammonium snlphate as nitrogen source. At the other pH-values the presence of ammonium sulphate increased the fungal growth in absence of insecticide especially at the lowest pH-values 4 and 5. On the other hand the colonies diameter of Aspergillus niger at all pH-values were decreased by increasing the insecticide concentration from 100 up to 500 p.p.m in presence of sodium nitrate or ammonium sulphate.

The linear growth of Aspergillus flavus could be measured by the end of 2nd, day at the various pH-values for all treatments as indicated in Table (13) and Fig. (13). The increasing of cyolane concentration in growth medium decreased gradually the colonies diameter of tested fungus in presence of sodium nitrate or ammonium sulphate at the various pH-values. In control treatment the optimum growth of Aspergillus flavus was at pH- 5, in presence of sodium nitrate or ammonium sulphate. The presence of cyolane in (Dox's) medium in concentration rate of 300,400 and 500 p.p.m shifted the optimum pH of fungal growth to pH-6 in presence of sodium nitrate while the optimum pH for fungal growth occured at pH-5 for all concentrations in the case of ammonium sulphate. The same table show that in control

Table (13): Effect of different concentrations of cyolane on linear growth of Aspergillus flavus raised in presence of sodium nitrate or ammonium sulphate at various pH-values and incubated for ten days at 30 °C.

Concentration of cyolane in p.p.m	Nitrogen source	Growth diameter in mm at different pH-values at the end of day																									
		4						5						6						7						8			
		0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th
Control	$NaNO_3$	8	36	55	75	96	115	8	29	50	75	96	120	8	23	47	69	91	110	8	25	46	68	87	108	8	22	42	61	78	95
	$(NH_4)_2SO_4$	8	22	42	60	78	95	8	28	52	78	105	128	8	30	50	71	92	110	8	23	39	59	78	100	8	30	45	60	72	85
100	$NaNO_3$	8	27	40	55	64	78	8	21	38	54	71	90	8	18	36	52	68	84	8	18	32	45	61	75	8	13	25	37	45	56
	$(NH_4)_2SO_4$	8	18	32	48	62	75	8	18	39	60	77	99	8	21	37	51	66	81	8	13	30	46	65	82	8	23	35	47	57	68
200	$NaNO_3$	8	23	36	50	58	66	8	16	34	48	63	78	8	17	30	45	59	71	8	12	24	33	40	50	8	11	19	26	34	40
	$(NH_4)_2SO_4$	8	16	30	43	56	65	8	14	28	43	64	75	8	12	25	41	56	71	8	20	32	45	54	68	8	20	28	34	44	50
300	$NaNO_3$	8	20	29	38	45	52	8	14	23	32	44	55	8	16	30	42	60	70	8	11	20	29	39	46	8	11	14	20	23	31
	$(NH_4)_2SO_4$	8	15	27	38	49	57	8	14	26	40	54	67	8	15	27	39	48	61	8	9	24	36	52	59	8	18	25	31	39	45
400	$NaNO_3$	8	18	25	33	40	48	8	12	21	30	39	49	8	15	26	36	48	59	8	10	18	26	35	40	8	10	12	18	21	29
	$(NH_4)_2SO_4$	8	14	23	34	44	53	8	14	24	38	48	60	8	12	24	35	45	57	8	9	20	35	48	55	8	17	25	31	38	44
500	$NaNO_3$	8	18	25	30	34	40	8	10	17	25	32	40	8	12	21	28	35	45	8	9	12	21	28	35	8	10	11	15	20	25
	$(NH_4)_2SO_4$	8	14	21	30	40	48	8	12	22	33	40	52	8	11	20	30	40	50	8	8	18	26	38	49	8	15	24	30	35	40

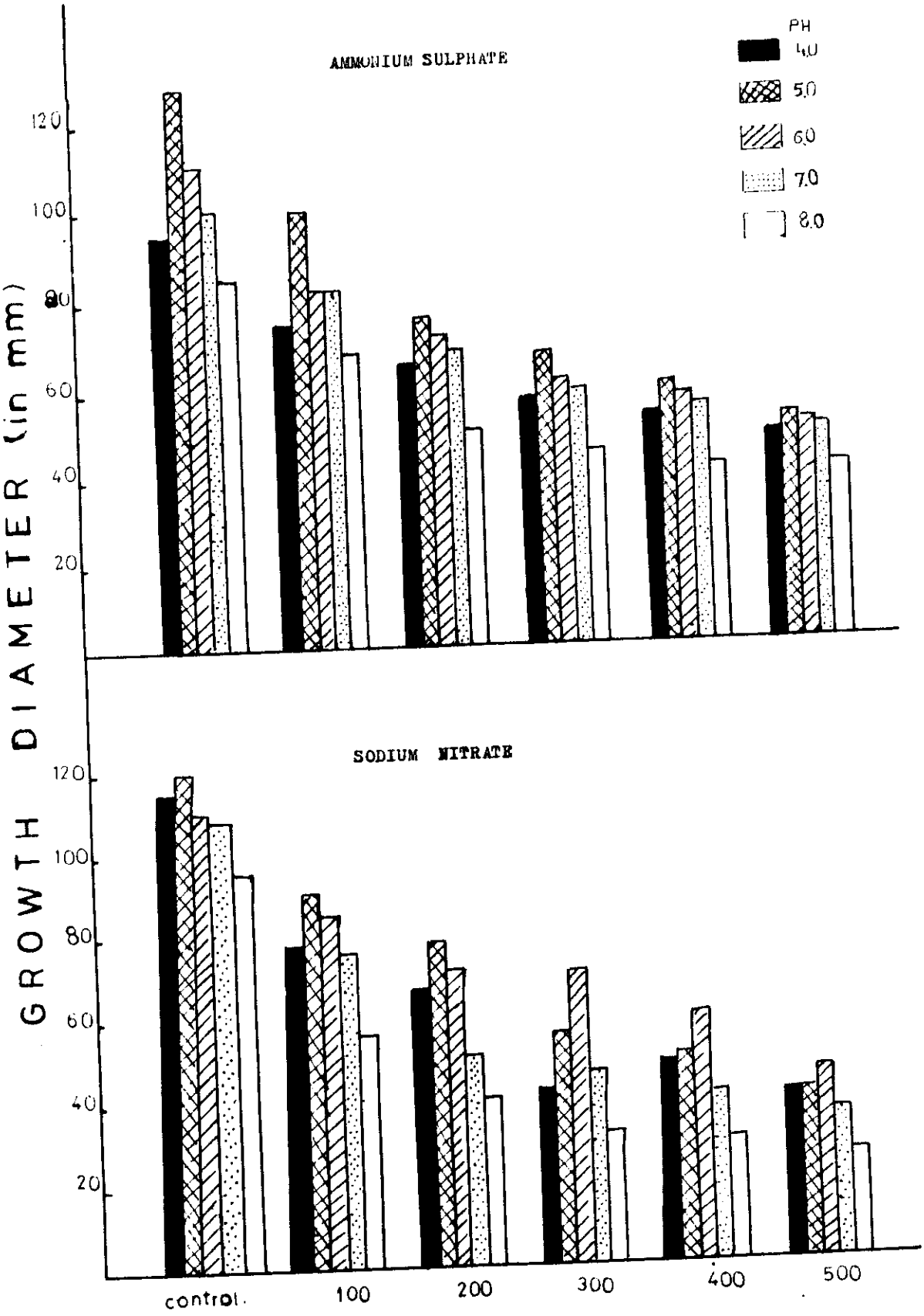

Fig. (13): Effect of different concentrations of cyolane on linear growth of Aspergillus flavus raised in presence of sodium nitrate or ammonium sulphate at various pH values and incubated for ten days at 30 °C.

treatment (in absence of cyolane) and at the two lowest concentrations 100 and 200 p.p.m of insecticide, the colonies diameter were more or less the same in presence of either sodium nitrate or ammonium sulphate at all pH-values. On the other hand, at the highest concentrations of cyolane (300,400 and 500 p.p.m), ammonium sulphate obtained a protective action against the toxic effect of insecticide especially at the lowest and highest pH-values. These results revealed that inclusion of different concentration of cyolane in the nutritive medium reflected variable effects on the fungal growth related to the type of nitrogen as well as the prevailing pH.

Table (14) and Fig. (14) showed that the linear growth of Aspergillus fumigatus at all pH-values in presence of either sodium nitrate or ammonium sulphate in all treatments was gradually increased by increasing the incubation period up to 10 days. On the other hand in presence of sodium nitrate or ammonium suplphate at all pH-values the increasing of cyolane concentration in nutritive medium showed significant decreased on the linear growth of Aspergillus fumigatus. The table and figure show that the linear growth of Aspergillus fumigatus at the end of incubation period in control treatment (in

of different concentrations of cyolane on linear growth of Aspergillus fumigatus raised in presence of sodium nitrate or
m sulphate at various pH-values and incubated for ten days at 30 °C.

ogen rce	Growth diameter in mm at different pH-values at the end of day																							
	4						5						6						7						8					
	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th
NO_3	8	14	34	58	78	97	8	27	44	65	86	104	8	22	44	65	88	106	8	26	40	54	68	83	8	26	45	60	76	90
$)_2 SO_4$	8	29	48	66	90	105	8	15	35	58	82	100	8	20	46	70	95	117	8	14	35	57	80	101	8	26	38	48	60	71
NO_3	8	10	24	45	58	74	8	18	30	44	52	62	8	18	36	52	70	84	8	18	27	38	48	59	8	11	20	32	39	50
$)_2 SO_4$	8	19	32	47	58	72	8	12	27	45	59	80	8	15	32	47	68	82	8	12	26	42	56	73	8	17	26	35	41	46
NO_3	8	8	20	30	44	58	8	12	18	26	30	40	8	15	21	32	46	60	8	12	20	28	34	43	8	10	16	24	32	38
$)_2 SO_4$	8	15	26	38	47	58	8	12	23	36	47	70	8	13	22	32	42	61	8	12	22	35	48	59	8	17	25	29	32	35
N_3	8	8	18	24	30	40	8	10	14	16	20	21	8	12	17	30	38	50	8	11	16	20	21	23	8	10	13	20	30	35
$)_2 SO_4$	8	15	24	33	41	48	8	11	20	32	42	56	8	11	19	28	35	47	8	8	17	29	43	52	8	15	20	25	29	31
NO_3	8	8	15	20	26	32	8	10	12	16	18	20	8	10	16	29	38	45	8	9	10	14	18	20	8	8	12	17	20	30
$)_2 SO_4$	8	10	18	26	35	40	8	10	15	20	26	32	8	10	16	25	30	40	8	8	15	26	39	46	8	13	19	22	25	29
NO_3	8	8	12	18	23	28	8	10	12	14	18	18	8	8	10	16	20	24	8	8	10	10	15	18	8	8	8	10	16	25
$)_2 SO_4$	8	9	12	18	26	30	8	9	12	15	20	26	8	10	15	20	25	32	8	8	15	24	34	41	8	12	17	18	21	26

Table (15): Effect of different concentrations of cyolane on linear growth of *Fusarium* sp. raised in presence of sodium nitrate or ammonium sulphate at various pH-values and incubated for ten days at 30 °C.

Concentration of cyolane in p.p.m	Nitrogen source	Growth diameter in mm at different pH-values at the end of day.																									
		4						5						6						7						8			
		0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th	0	2nd	4th	6th	8th	10th
Control	$NaNO_3$	8	31	49	67	89	107	8	35	58	76	99	119	8	32	57	82	107	12[illegible]	8	30	51	70	91	110	8	32	48	64	80	92
	$(NH_4)_2SO_4$	8	22	42	68	86	104	8	22	46	68	92	116	8	24	46	70	90	119	8	26	48	72	94	118	8	19	39	60	78	94
100	$NaNO_3$	8	18	32	50	60	79	8	15	36	56	72	90	8	20	42	66	81	104	8	19	34	47	68	80	8	16	34	50	66	80
	$(NH_4)_2SO_4$	8	15	33	50	66	83	8	27	42	61	75	95	8	27	45	66	83	104	8	24	38	55	69	86	8	20	32	45	54	67
200	$NaNO_3$	8	15	32	50	66	78	8	12	26	33	48	60	8	19	39	58	79	97	8	16	30	44	58	75	8	12	26	39	50	62
	$(NH_4)_2SO_4$	8	19	34	48	62	80	8	15	29	42	53	66	8	16	30	45	61	80	8	21	33	45	53	67	8	15	25	38	50	60
300	$NaNO_3$	8	12	24	36	46	58	8	10	18	25	35	45	8	16	34	54	68	86	8	12	23	36	47	56	8	10	19	24	33	40
	$(NH_4)_2SO_4$	8	12	23	34	47	55	8	12	22	32	42	55	8	12	26	41	55	72	8	14	24	34	43	55	8	12	22	31	42	52
400	$NaNO_3$	8	11	22	33	45	55	8	10	16	24	33	42	8	13	27	38	51	67	8	10	18	26	35	42	8	10	15	22	28	35
	$(NH_4)_2SO_4$	8	12	19	26	34	41	8	9	16	20	25	35	8	9	15	24	32	41	8	11	19	28	39	48	8	10	18	26	33	42
500	$NaNO_3$	8	9	18	26	34	40	8	9	14	22	30	39	8	10	20	30	39	48	8	8	10	16	20	22	8	9	12	18	22	25
	$(NH_4)_2SO_4$	8	10	16	22	28	35	8	8	13	20	28	33	8	9	12	18	22	25	8	9	16	26	37	45	8	10	16	22	28	36

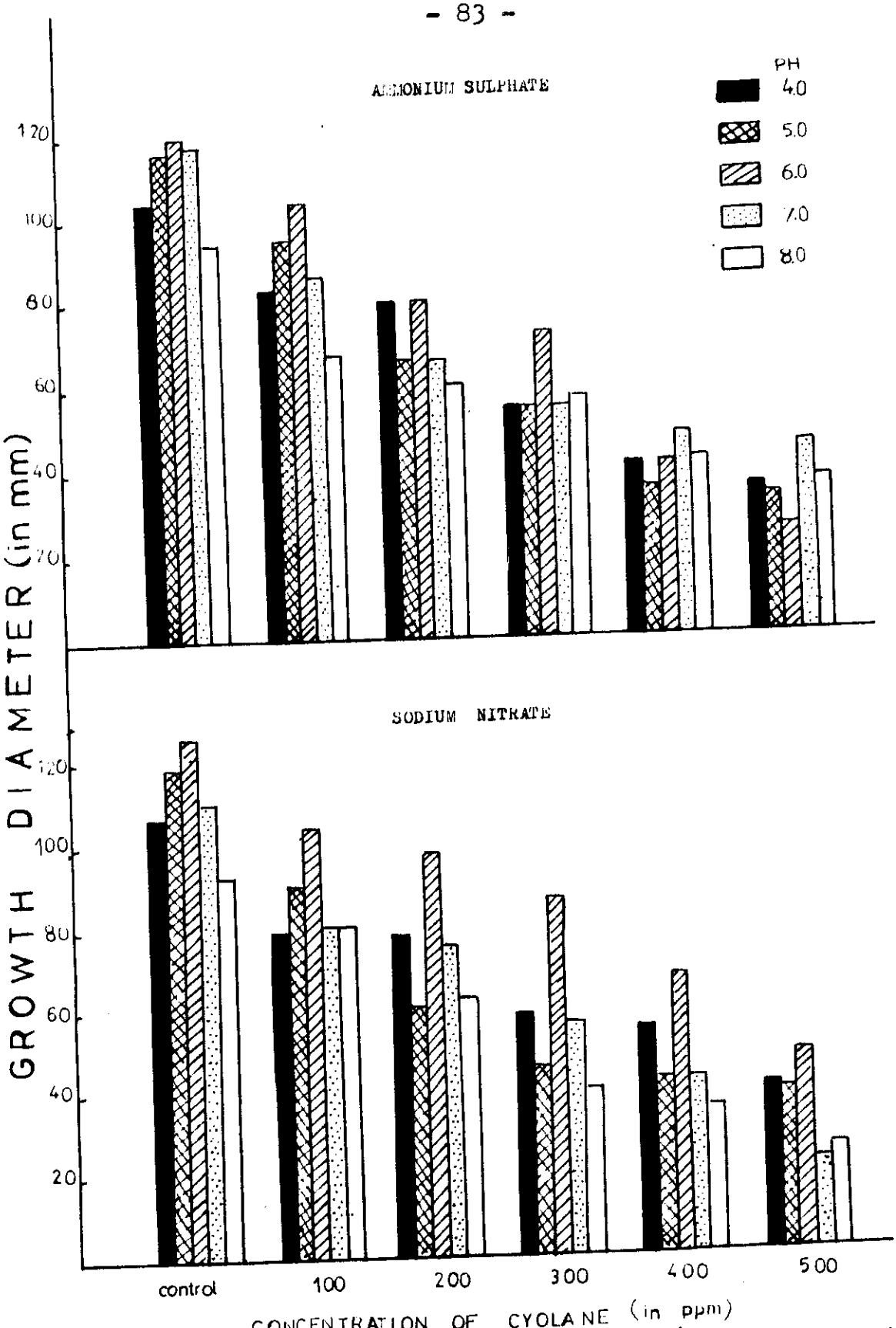

Fig. (15): Effect of different concentrations of cyolane on linear growth of Fusarium sp. raised in presence of sodium nitrate or ammonium sulphate at various pH-values and incubated for ten days at 30 °C.

of either sodium nitrate or ammonium sulphate in growth medium the highest colonies diameter obtained at pH-6 in control treatment (in absence of cyolane) as well as in presence of insecticide at the concentrations rate from 100 up to 300 p.p.m. However, at concentrations rate of 400 and 500 p.p.m the optimum pH was shifted to be 7 in the presence of ammonium sulphate . This observation indicate that the optimum pH not constant for the same type of nitrogen but change according to the other variable conditions in the nutritive medium. It is clear also from table (15) and Figure (15) that the colonies diameter were more or less the same in presence of either sodium nitrate or ammonium sulphate at the same pH-level in control treatment. The same behaviour was obtained in presence of cyolane at the two lowest concentrations 100 and 200 p.p.m. On the other hand at the higher concentrations 300,400 and 500 p.p.m the presence of sodium nitrate in nutritive medium indicated a protective action against the toxic effect of cyolane at pH-values 4,5, and 6, however this protective action obtained in presence of ammonium sulphate at the highest pH-values, 7 and 8. The previous results revealed that inclusion of cyolane in growth medium reflected that the variable effects on linear growth of Fusarium sp. was related to the type of nitrogen as well as to the various pH-value of nutritive medium.

B. Effect of cyolane on dry weight of mats of Five soil fungi under various pH-values:

For each pH-value and each fungus 36 Erlenmyer conical flasks (250 ml. capacity) were supplied, each with 50 ml of (Dox's liquid medium (described on page 19) in which the nitrogen source was changed After sterilization, triplicates flasks for each nitrogen source were treated as follows:

Replicates	Concentration of cyolane in (p.p.m)
3 Flasks	- cyolane (controls).
3 Flasks	+ 100 p;p.m cyolane
3 Flasks	+ 200 p.p.m cyolane
3 Flasks	+ 300 p.p.m cyolane
3 Flasks	+ 400 p.p.m cyolane
3 Flasks	+ 500 p.p.m cyolane

The addition of cyolane after sterilization and cooling was preferred to eliminate any possible destruction of the insecticide by heat and pressure. Other sets of Flasks for each pH and fungus were prepared in the same way. Discs of fungal mycelium (8 mm. diameter) of ten days old culture at 30 °C, of either Rhizoctonia solani, Aspergillus

niger, Aspergillus flavus, Aspergillus fumigatus and Fusarium sp., were used for inoculation of its respective set of flasks. After ten days incubation period at 30 °C, the developed mats were filtered and washed several times nsing distilled water under suction on a Buchner funnel. The mats were oven-dried at 80 °C, till constant weight. The average dry weight (in milligram) for each treatment was determined.

Table (16) and Figure (16) shows the effect of different concentrations of cyolane on dry weight of Rhizoctonia solani mats raised in presence of either sodium nitrate or ammonium sulphate as nitrogen source at different pH-values. The table and figure reveal that the growth of this fungus (which indicated as dry weight of mats) was significantly higher in presence of ammonium sulphate than in presence of sodium nitrate at pH-values 4,5,6 and 7. In presence of sodium nitrate the fungal dry weight reached its maximum amount at pH-6 in control treatment and at the lower concentrations of cyolane 100 and 200 p.p.m. The higher concentrations of cyolane in growth medium (300,400 and 500 p.p.m) shifted the optimal pH from 6 to 7 also in presence of soidum nitrate. On the other hand in case of ammonium sulphate the mats

Table (16): Dry weight of fungal mats (in mg) of Rhizoctonia solani grown on either sodium nitrate or ammonium sulphate at various pH-values in presence or absence of different concentrations of cyolane insecticide after ten days incubation period and at 30°C

Nitrogen source	concentration of cyolane in p.p.m	Dry weight of mats (in mg) at various pH-values				
		pH-4	pH-5	pH-6	pH-7	pH-8
Sodium nitrate	control	24	65	469	351	334
	100	20	36	309	132	91
	200	19	25	129	93	83
	300	12	22	68	73	63
	400	12	20	64	71	53
	500	6	01	35	52	43
Ammonium sulphate	control	334	528	673	392	59
	100	40	95	671	93	57
	200	37	91	657	78	55
	300	36	79	158	52	54
	400	31	73	143	52	42
	500	29	51	95	43	41

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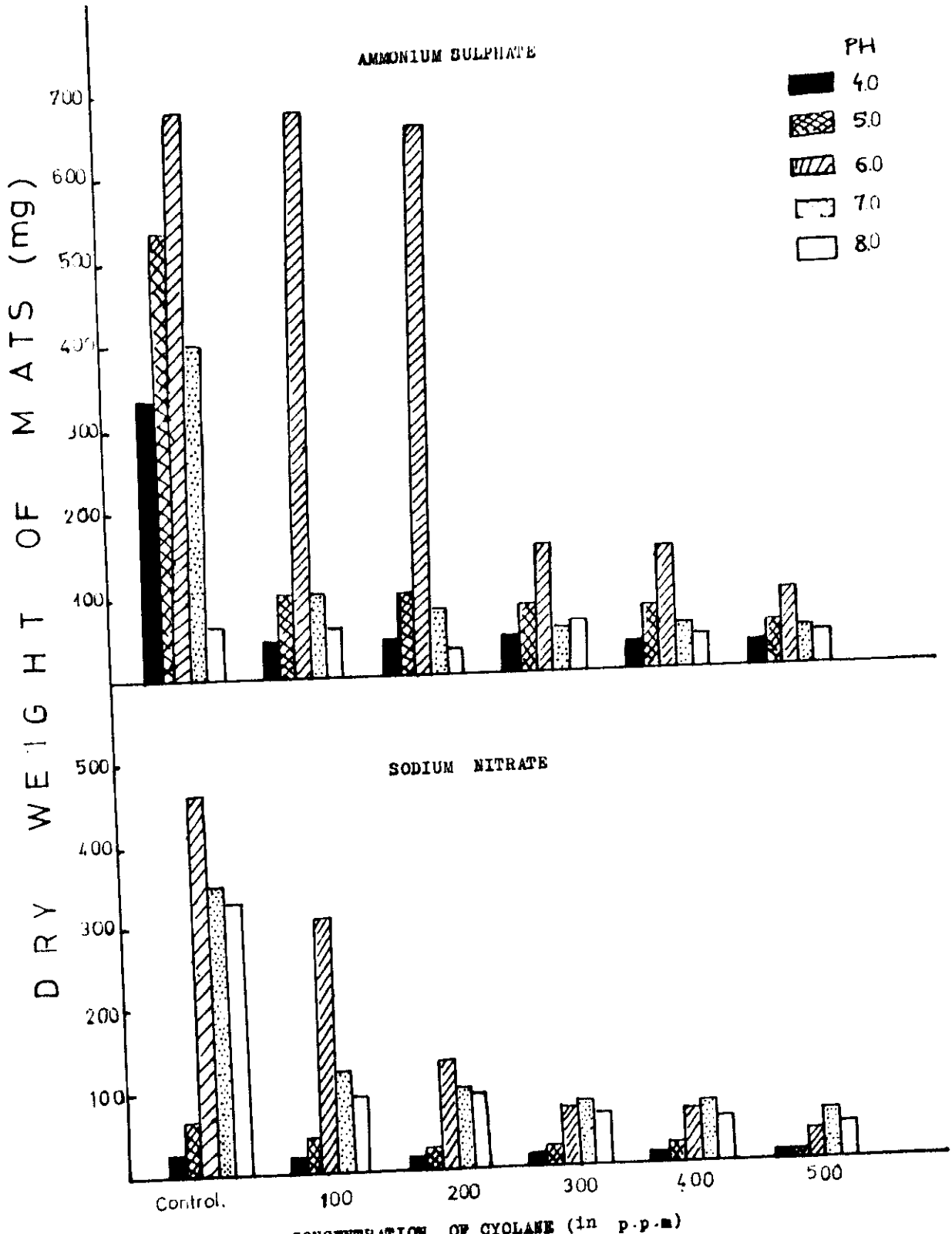

Fig. (16): Dry weight of fungal mats (in mg) of Rhizoctonia solani grown on either sodium nitrate or ammonium sulphate at various pH-values in presence or absence of different concentration of cyolane insecticide after incubation period ten days at 30 °C.

dry weight reached its maximum amounts at pH-6 at all treatments. The lowest dry weight of fungal mats in presence of sodium nitrate showed its lowest amount in presence or in absence of different concentrations of cyolane at the lowest pHs-4 and 5. The dry weight of fungal mats gradually decreased by increasing the insecticide concentration at pH-6 in presence of either sodium nitrate or ammonium sulphate. This gradual inhibition of dry weight occured also at pH-4 in presence of sodium nitrate and at pH-8 in case of ammonium sulphate. However, sharp drop obtained at the lowest concentration of cyolane 100 p.p.m in all other treatment followed by gradual decreased in the mats dry weight up to the highest concentration 500 p.p.m. These variable effects on the growth of this fungus reflected that the prevailing of pH had a very strong effect on the fungal growth in presence or absence of cyolane as well as the alternation of type of nitrogen

The dry weight (in mg) of mats of Aspergillus niger grown in presence or absence of different concentrations of cyolane and raised in presence of either sodium nitrate or ammonium sulphate at various pH-values are indicated in Table (17) and represented histogramm_atically in Figure (17). The results showed that pH-6 was the

Table (17): Dry weight of fungal mats (in mg) of Aspergillus niger grown on either sodium nitrate or ammonium sulphate at various pH-values in presence or absence of different concentrations of cyolane insecticide after ten days incubation period and at 30 °C.

Nitrogen source	Concentration of cyolane in p.p.m	Dry weight of mats (in mg) at various pH-values				
		4	5	6	7	8
Sodium nitrate	control	118	544	607	117	90
	100	102	520	554	92	86
	200	100	490	498	79	72
	300	78	435	374	68	72
	400	70	410	346	66	63
	500	62	250	50	40	21
Ammonium sulphate	control	314	856	682	421	253
	100	236	788	677	415	125
	200	127	779	664	383	83
	300	87	725	501	306	79
	400	60	699	490	248	61
	500	45	692	407	214	59

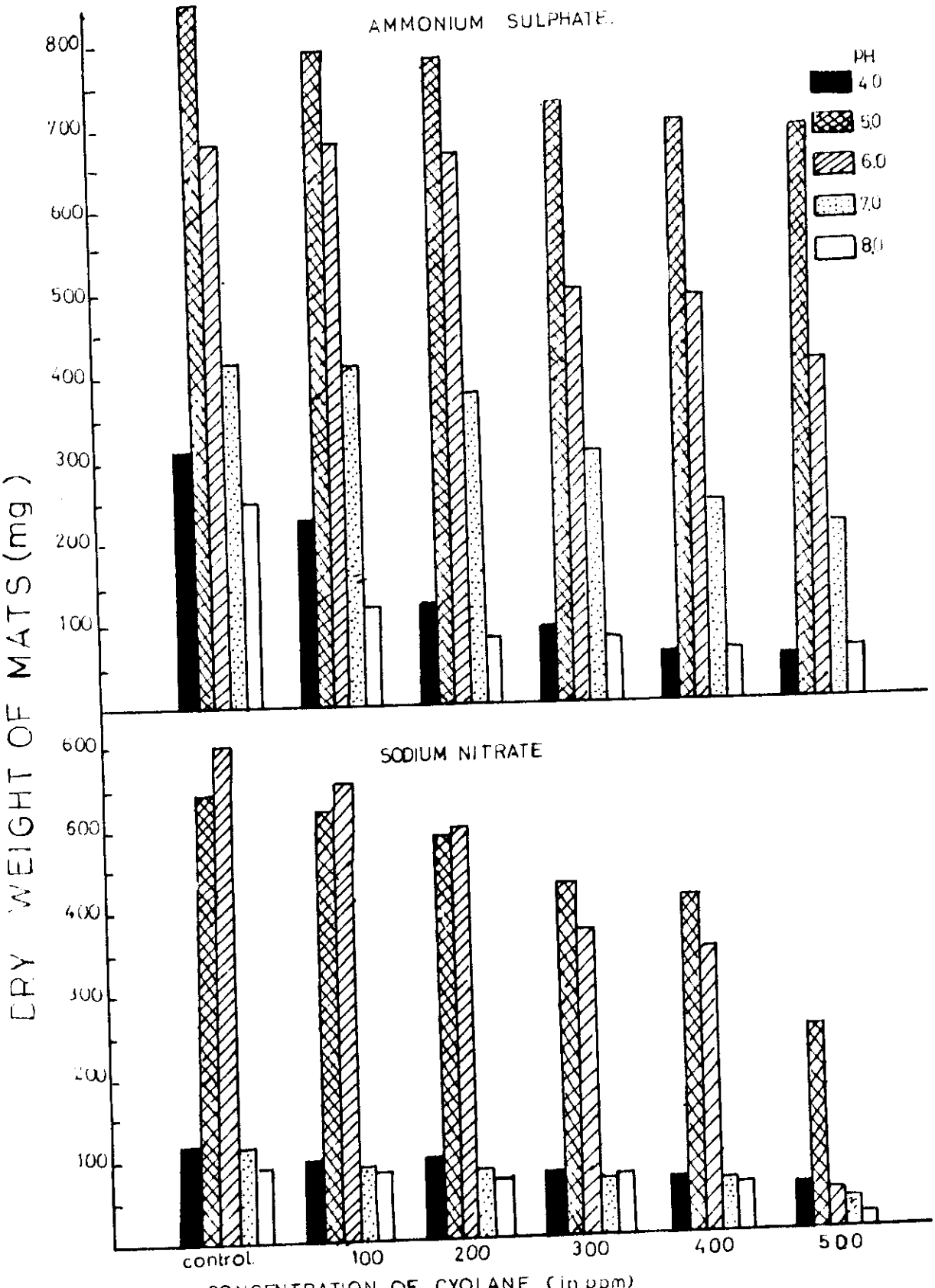

Fig. (17): Dry weight of fungal mats (in mg) of Aspergillus niger grown on either sodium nitrate or ammonium sulphate at various pH-values in presence or absence of different concentrations of cyolane insecticide after incubation period ten days at 30 °C.

optimum pH for fungal growth in presence of sodium nitrate in control treatment (in absence of cyolane) and at the lower concentrations of cyolane 100 and 200 p.p.m, while the higher concentrations 300,400 and 500 p.p.m, shifted the optimum pH from 6 to 5. On the other hand in presence or absence of cyolane the fungal growth reached its maximum values at pH-5 when raised in presence of ammonium sulphate as nitrogen source. The same table, figure indicated that in all treatments the mat dry weight was much higher in presence of ammonium sulphate than in presence of sodium nitrate. This reflect the high ability of Aspergillus niger to uptake and utilize ammonium radicals than nitrate radicals in presence or absence of insecticide. With respect to cyolane concentrations, it appears from the same data that at all applied pH-values the increasing of cyolane concentrations significantly decreased the mats dry weight when the fungus raised in presence of either sodium nitrate or ammonium sulphate.

The growth of Aspergillus flavus in all treatments (indicated as mat dry weight in mg.) was much higher, in general, when raised in presence of ammonium sulphate than in presence of sodium nitrate as indicated from

Table (18): Dry weight of fungal mats (in mg) of *Aspergillus flavus* grown on either sodium nitrate or ammonium sulphate at various pH-values in presence or absence of different concentrations of cyolane insecticide after ten days incubation period and at 30 °C.

Nitrogen source	concentration of cyolane in p.p.m.	Dry weight of mats (in mg) at various pH-values				
		4	5	6	7	8
Sodium nitrate	control	132	592	461	436	405
	100	119	431	408	353	346
	200	93	335	334	349	160
	300	79	330	314	196	96
	400	77	287	223	162	92
	500	52	193	153	92	78
Ammonium sulphate	Control	362	914	630	455	409
	100	131	795	616	443	311
	200	118	664	595	391	305
	300	71	614	482	363	152
	400	67	642	429	289	96
	500	60	631	372	248	85

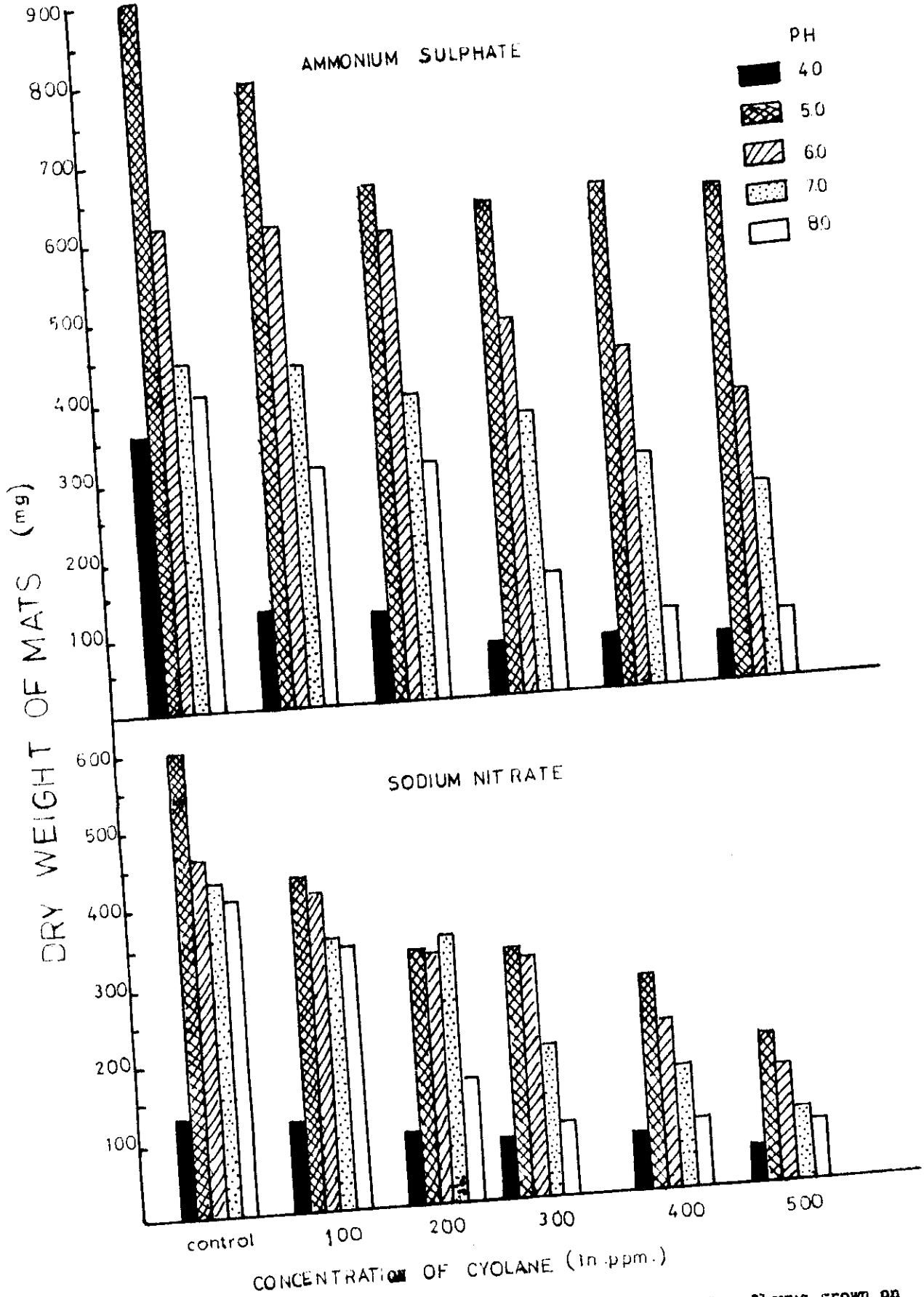

Fig. (18): Dry weight of fungal mats (in mg) of Aspergillus flavus grown on either sodium nitrate or ammonium sulphate at various pH-values in presence or absence of different concentrations of cyolane insecticide after incubation period ten days at 30 °C.

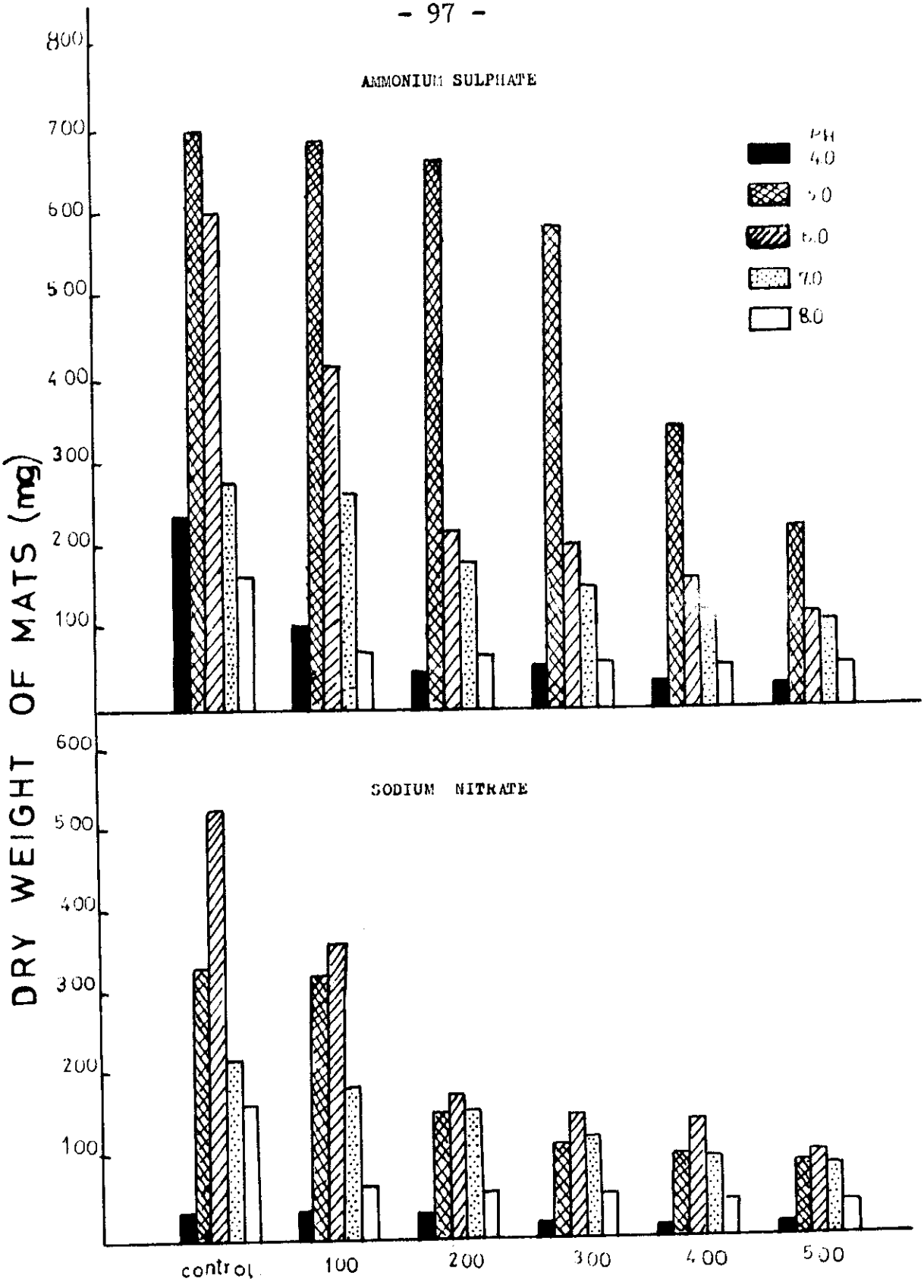

Fig. (19): Dry weight of fungal mats (in mg) of Aspergillus fumigatus grown on either sodium nitrate or ammonium sulphate at various pH-values in presence or absence of different concentrations of cyolane insecticide after incubation period ten days at 30 °C.

weight of mats in presence or absence of cyolane at all pHs were higher in presence of ammonium sulphate than at such treatment in presence of sodium nitrate. The lowest concentration of cyolane 100 p.p.m, in growth medium revealed a sharp drop of mats dry weight if compared with its controls at pH-4 in presence of ammonium sulphate, and at pH-8 in presence of any one of nitrogen source. On all other treatments at all pH-values, inclusion of different concentrations of cyolane in the nutritive medium, generally led to a significant decrease in growth of Aspergillus fumigatus as compared to control value, the higher the concentrations the lower was the developed mycelial growth.

Table (20) and Figure (20) indicates the effect of different concentrations of cyolane insecticide on the mats dry weight of Fusarium sp., grown on either sodium nitrate or ammonium sulphate at various pHs. The table and figure reveal that on sodium nitrate, the optimum pH for growth was 6 in presence or absence of cyolane. In presence of ammonium sulphate on growth medium the optimum pH for growth was 5 in control and in presence of lower concentrations 100,200 and 300 p.p.m, while it was shifted to be 6 in presence of higher concentrations of

500 p.p.m) on liquid (Dox's) growth medium, were finally powdered and used in biochemical analysis of protein -N- total coluble sugars, polysaccharide, and total lipid contents. Since the optimum pH-value and incubation temperature for growth of almost examined fungi were pH-6 and at 30 ^{o}C respectively, the pH- of growth medium was adjusted at pH-6 and all treatments incubated at 30 ^{o}C for 10 days. Either sodium nitrate or ammonium sulphate were applied to the culture medium in the rate of 350 p.p.m nitroge.

Table (21) and Figure (21) indicate the average values of protein -N- content in the mats of the five soil fungi. Rhizoctonia solani, Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus and Fusarium sp . There was little if any difference in the protein -N- content of fungal mats in presence or absence of different contentrations of cyolane for all examined fungi in presence of either sodium nitrate or ammonium sulphate. The same results reveal that no significant difference in protein -N- of mat between various examined fungi.

The effect of different concentrations of cyolane in the average values of total soluble sngars (T.R.V.) and polysaccharide contents of mats of the five examined fungi

Table (21): Effect of different concentrations of Cyolane on the average values of total protein (mg protein-N /gram dry weight) of mats of five soil fungi raised in presence of sodium nitrate or ammonium sulphate at pH-6 and incubated for 10 days at 30 °C.

Tested fungi	Total protein in fungal mats in mg / 100 mg Dry weight											
	Sodium nitrate as nitrogen source						Ammonium sulphate as nitrogen source					
	Concentration of cyolane in p.p.m						Concentration of cyolane in p.p.m					
	0 control	100	200	300	400	500	0 control	100	200	300	400	500
Rhizoctcnia solani	14.90	15.40	15.05	15.48	14.20	14.66	15.20	16.50	15.10	15.40	16.20	16.40
Aspergillus niger	16.05	15.70	14.25	15.67	15.40	16.70	15.30	15.60	15.40	15.80	15.10	15.20
Aspergillus flavus	14.70	14.90	15.05	15.20	15.35	15.10	15.60	15.20	15.30	15.70	15.60	15.80
Aspergillus fumigatus	15.80	14.91	15.32	16.20	14.35	15.11	15.20	14.30	15.40	15.00	16.20	16.40
Fusarium sp.,	15.10	15.21	14.90	15.59	15.32	15.00	15.00	14.70	15.50	14.20	14.20	16.00

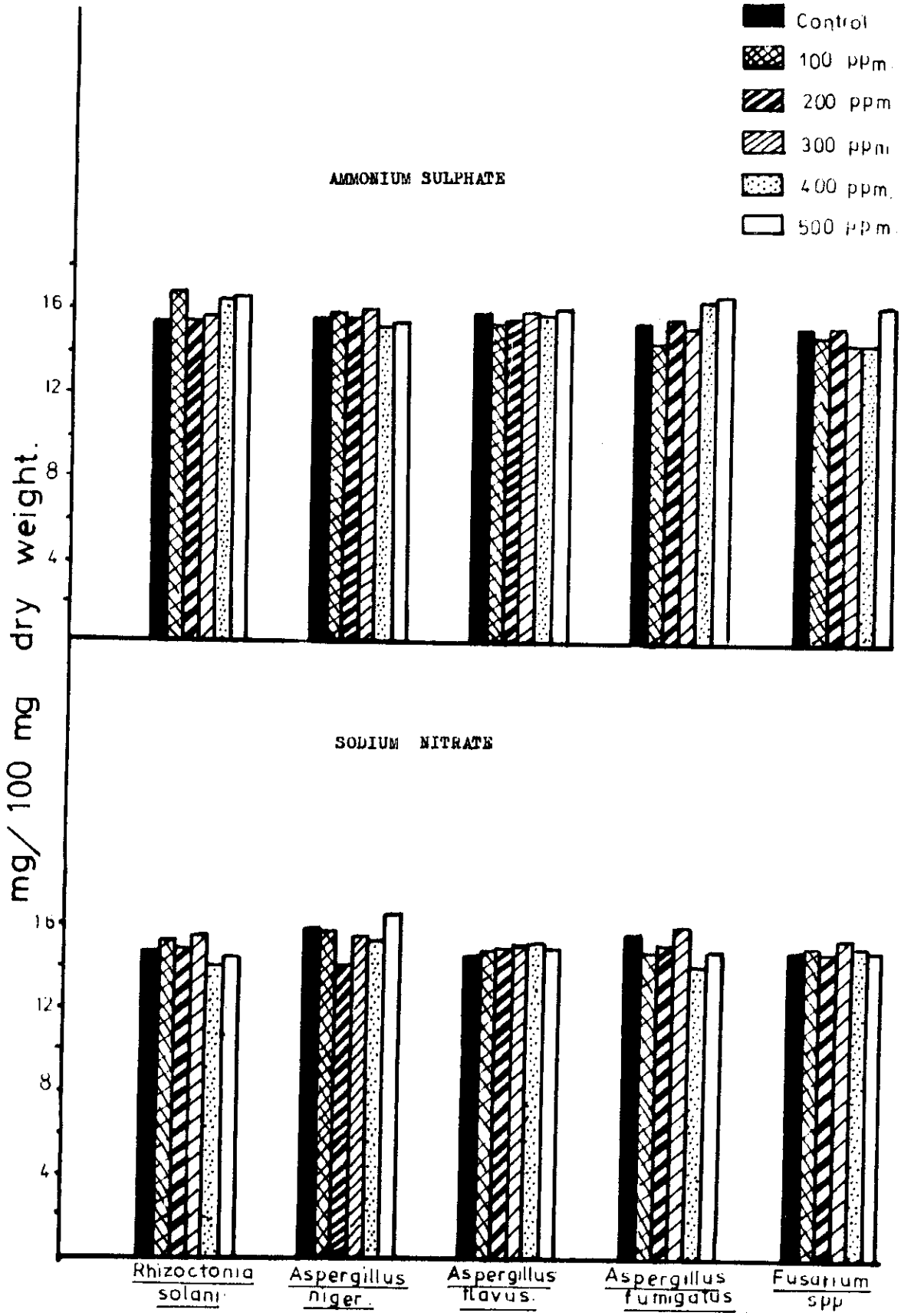

Fig. (21): Effect of different concentrations of cyclane on the averages values of total protein (mg protein -N- per gm dry weight) of mats of five soil fungi raised in presence of sodium nitrate or ammonium sulphate at pH-6 and incubated for ten days at 30 °C.

which raised in presence of either sodium nitrate or ammonium sulphate indicated in Table (22) and represented histo-grammatically in Figure (22). It is clear from the results that the total soluble sugars showed low amounts ranged from (9 to 46 mg/gm dry weight) in all examined fungi in presence of sodium nitrate or ammonium sulphate on growth medium. The mat of examined fungus Aspergillus flavus was contain the highest amount of poly-saccharide and the lowest amount of soluble sugars in control treatment (in absence of cyolane) as compared with control treatments of other examined fungi. The same data indicate that the polysaccharide content of mats (in mg/ gm. dry weight) for all examined fungi, gradually decreased by increasing the concentration of cyolane in nutritive medium from 200 p.p.m up to 500 p.p.m in presence of any one of applied nitrogen sources. In presence of sodium nitrate on growth medium the two tested fungi Aspergillus flavus and Fusarium sp. showed the lowest amount of poly-saccharide in presence of the highest concentration of cyolane (500 p.p.m). On the other hand in presence of ammonium sulphate the lowest amount of polysaccharide at the same concentration of cyolane (500 p.p.m) obtained in the mats of Aspergillus fumigatus and Fusarium sp.

Table (22): Effect of different concentrations of Cyolane on average values of total soluble sugars (T.R.V) and total polysaccharide (mgm glucose per gm dry weight) of mats of five soil fungi raised in presence of sodium nitrate or ammonium sulphate at pH-6 and incubated for 10 days at 30 °C.

Tested fungi	Nitrogen source	Total soluble sugars (T.S.S) and total polysaccharide in fungal mats in mgm / gm dry weight											
		Concentration of cyolane in p.p.m.											
		Control		100		200		300		400		500	
		T.R.V.	Polys.	T.R.V.	Polys.	T.R.V.	Polys.	T.R.V.	Polys.	T.R.V.	Polys.	T.R.V.	Polys.
Rhizoctonia solani	$NaNO_3$	33	216	37	240	24	180	37	161	26	142	28	131
	$(NH_4)_2SO_4$	18	217	19	220	12	200	15	168	20	170	19	150
Aspergillus niger	$NaNO_3$	12	184	16	181	11	170	36	120	27	112	27	118
	$(NH_4)_2SO_4$	15	200	20	191	18	181	38	170	30	165	33	160
Aspergillus flavus	$NaNO_3$	9	248	8	240	7	230	8	180	13	103	20	100
	$(NH_4)_2SO_4$	11	255	8	260	10	240	13	230	18	210	16	170
Aspergillus fumigatus	$NaNO_3$	46	201	46	210	42	202	41	182	43	170	40	122
	$(NH_4)_2SO_4$	40	200	39	160	35	120	38	110	40	101	38	99
Fusarium sp.	$NaNO_3$	18	237	15	183	17	172	19	168	16	100	19	96
	$(NH_4)_2SO_4$	17	232	13	173	19	180	14	172	16	143	22	112

Polys. = Polysaccharide.

T.R.V. = Total Reducing value

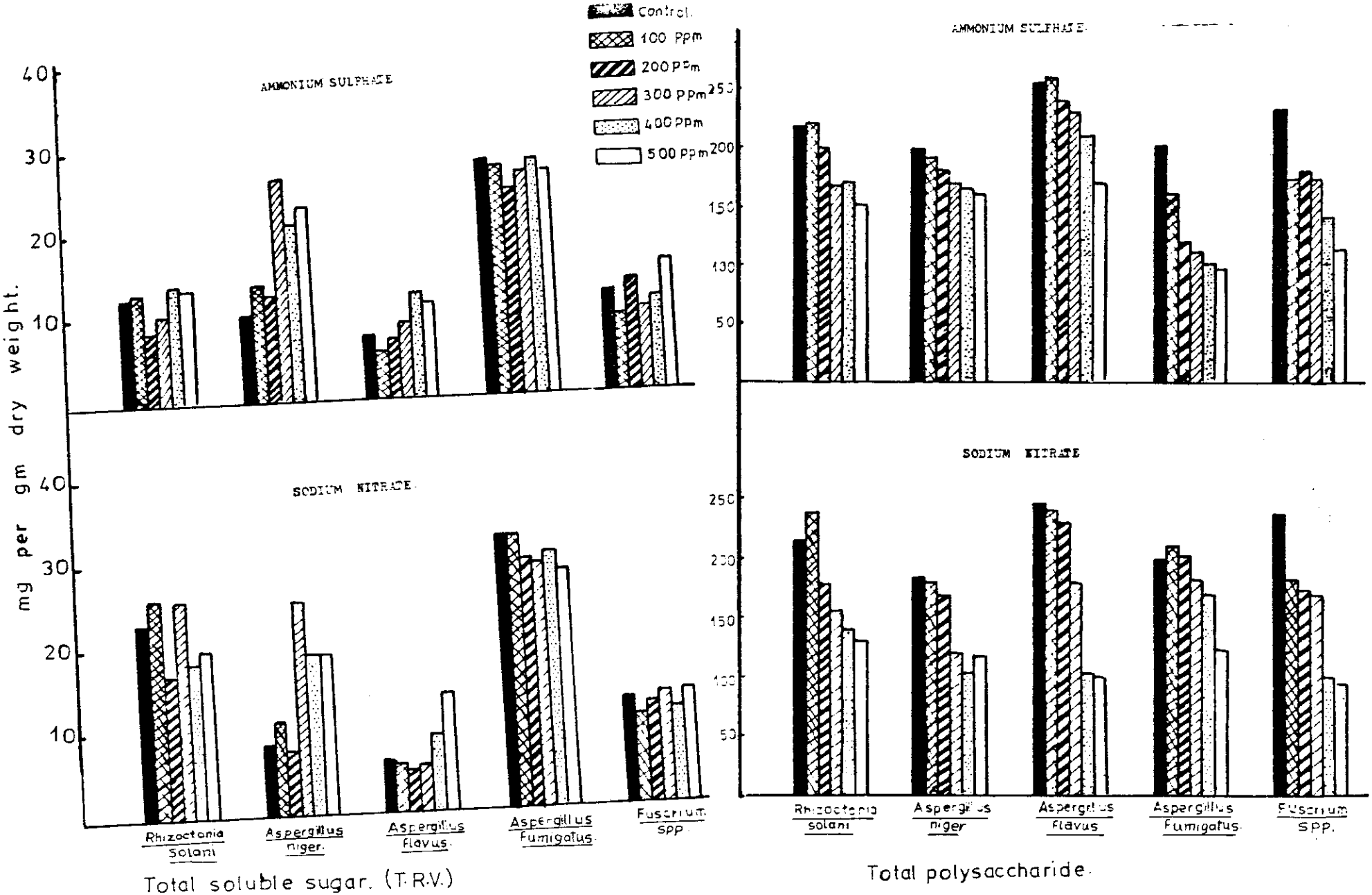

Fig (22): Effect of different concentration of cyclane on average values of total soluble sugar (T.R.V.) and total polysaccharide (mg per gm dry weight) of mats of five soil fungi raised in presence of sodium nitrate or ammonium sulphate at pH 6 and incubated for ten days at 30 C°.

We should mention here that the three examined fungi Aspergillus flavus, Aspergillus fumigatus and Fusarium sp. were more resistant to cyolane in the presence of the highest concentration (500 p.p.m) in culture medium with respect to its mats dry weight, as compared with the two other examined fungi Rhizoctonia solani and Aspergillus niger in presence of any nitrogen source. The same data show that the amount of soluble sugars (mg per gm dry weight) in fungal mats in presence of any nitrogen source were more or less the same as its control in presence of the concentrations 100,200 and 300 p.p.m of cyolane in culture medium, while the two highest concentrations 400 and 500 p.p.m increased the total soluble sugar of mats of Aspergillus niger which reflect the inhibition of accumulation process of soluble sugars by fungal mats.

Table(23) and Figure (23) reveal the effect of different concentrations of cyolane on average values of total lipids (in mg per gm dry weight) of mats of five soil fungi raised in presence of sodium nitrate or ammonium sulphate . It is clear from the table and figure that the amount of lipids in control treatment (in absence of cyolane) was more or less the same in presence of any nitrogen source for each examined fungus. Also in control treatments Aspergillus fumigatus showed the lowest amounts

Table (23): Effect of different concentrations of Cyolane on average values of total lipids (in mg/ gram dry weight) of mats of five soil fungi raised in presence of sodium nitrate or ammonium sulphate at pH-6 and incubated for 10 days at 30 °C.

Tested fungi	Total lipids in fungal mats in mg/gram dry weight.											
	Sodium nitrate as nitrogen source						Ammonium sulphate as nitrogen source					
	Concentration of cyolane in p.p.m						Concentration of cyolane in p.p.m					
	0 control	100	200	300	400	500	0 control	100	200	300	400	500
Rhizoctonia solani	29.3	20.6	20.1	21.4	17.6	15.1	30.1	28.6	26.4	24.3	16.4	15.3
Aspergillus niger	24.1	15.7	15.6	11.3	12.2	11.3	30.2	21.0	20.1	11.2	14.1	10.8
Aspergillus flavus	30.4	18.8	14.0	11.7	12.0	18.5	29.7	27.1	10.8	18.2	16.4	15.5
Aspergillus fumigatus	20.8	14.8	16.5	17.1	14.8	11.4	21.5	16.4	10.8	11.2	16.2	11.00
Fusarium sp.,	28.1	10.3	12.0	12.1	18.8	17.1	29.8	14.6	12.3	11.9	14.2	11.2

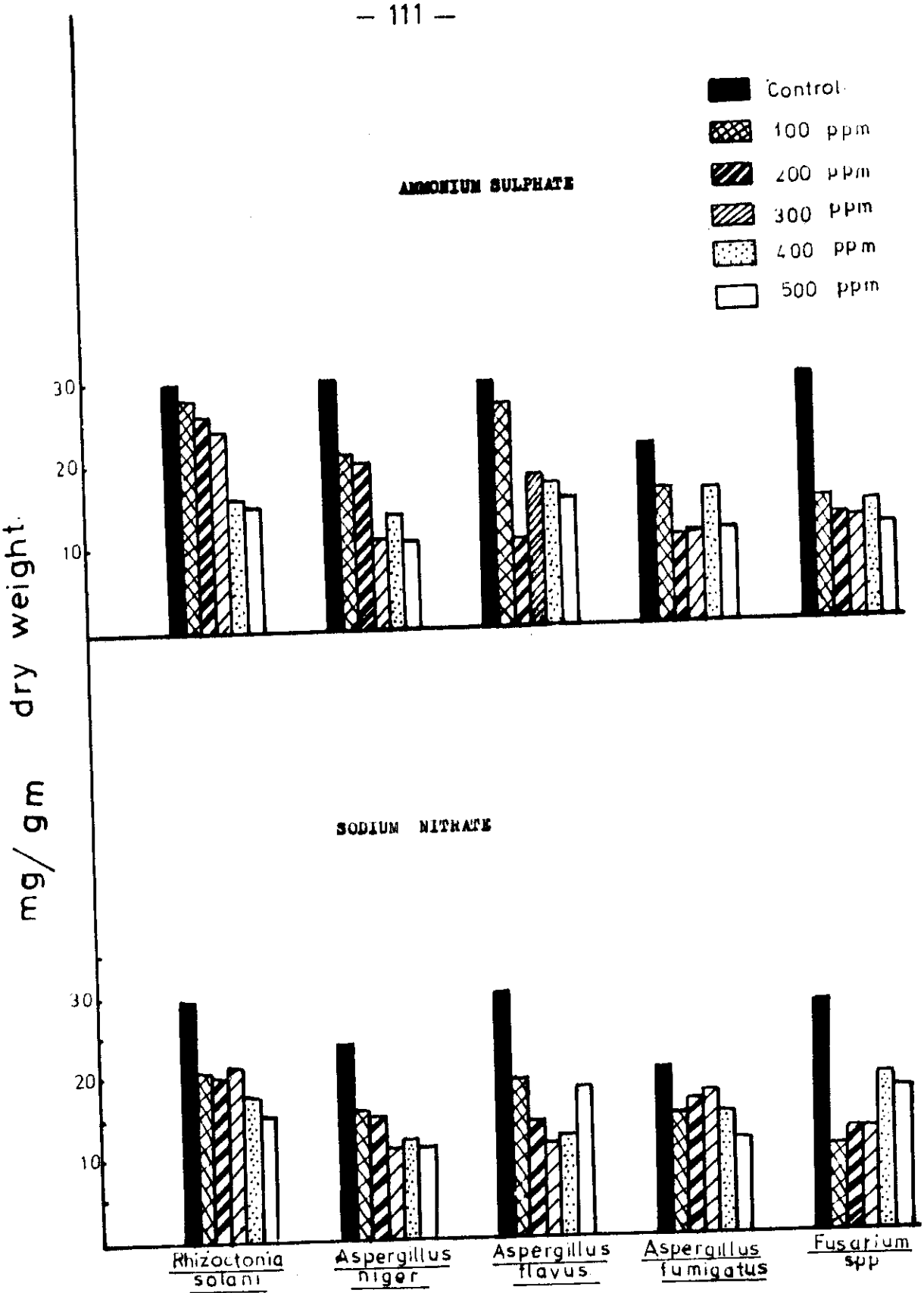

Fig. (23): Effect of different concentrations of cyclane on average values of total lipids (in mg per gm dry weight) of mats of five soil fungi raised in presence of sodium nitrate or ammonium sulphate at pH-6 and incubated for ten days at 30 °C.

of total lipids of mats as compared with other fungi in presence of either sodium nitrate or ammonium sulphate. In presence of sodium nitrate in culture medium the lowest concentrations of cyolane (100 p.p.m) indicated significant drop in total lipids on the mats of all examined fungi, then slight decreased obtained by increasing cyolane concentration up to 500 p.p.m. On the other hand, in presence of ammonium sulphate the increasing of cyolane concentrations on nutritive medium, gradually decreased (in general) the amount of total lipids of mats for all examined fungi.

The reached picture of biochemical analysis in the present experiment by the estimation of protein -N- content, total soluble sugars and polysaccharide in presence or absence of different concentrations of insecticide cyolane of fungal mats as well as the estimation of its total lipids contents could not interpret the variation in the toxicity of cyolane on the examined fungi: Rhizoctonia solani, Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus and Fusarium sp . Furthermore, the presence of different concentrations of cyolane in culture medium revealed significant decreased in total polysaccharide and lipids content of mats for all examined fungi and had no effect on protein -N- content of its mats.