

Influence of Some Pesticides on the Availability of Plant Nutrients to Sorghum (*Sorghum vulgare*)

P. SINGARAM¹ and T. S. MANICKAM²

A study of the influence of pesticides applied through soil to control sorghum pests on the availability of plant nutrients revealed that there was no reduction in the contents of nitrate and ammoniacal nitrogen while there was some reduction in the case of available phosphorus and sulphur. The results revealed that when the pesticides are used at recommended doses, there is no deleterious effect on the availability of plant nutrients to the growing crops.

Pesticides are applied through soil or as foliar spray in increasing quantities to control insect pests. Since the pesticides are toxic to the insects, they may be also toxic to the soil micro-organisms affecting mineralisation of plant nutrients resulting in the reduced availability to crop plants. To study the trend of availability of major plant nutrients to field crops in the presence of soil applied pesticides, the present study has been taken up.

MATERIAL AND METHODS

Sorghum (cul. 699) was sown in five plots with a spacing of 45 X 15cm in field No : 76 of the Eastern Block of the Tamil Nadu Agricultural University Farm, Coimbatore. Calculated quantities of pesticides viz., aldicarb, carbendazim, di-syston and phorate at the rate of one kg a.c./ha were applied to plot, around the seedlings after 7 days of sowing by keeping a distance of 7.5cm from the seedlings. The fifth plot was kept as control. Soil samples

from each plot were collected at random at different places of the plot separately and mixed thoroughly and from this, representative samples were drawn for analysis. Sampling was done before the application of the pesticides, immediately after application third, seventh, fifteenth, thirtieth and sixtieth day after the application. The samples were analysed for nitrate and ammonium nitrogen, available phosphorus and available sulphur by standard methods.

RESULTS AND DISCUSSION

The results for ammonium and nitrate nitrogen, available phosphorus and sulphur are presented in Table.

Ammonium nitrogen :

Maximum and minimum contents (102 and 41 ppm) of ammonium nitrogen were observed with phorate in the periods 1 and 3 respectively. While comparing the mean values for pesti-

¹ and ². Chemistry, Tamil Nadu Agricultural University, Coimbatore - 641 003.

des, maximum and minimum contents (80 and 70 ppm) were recorded with aldicarp and disyston respectively. Regarding the periods, maximum and minimum contents were recorded (257 and 146 ppm) in the periods 2 and 7 respectively. The increase or decrease as well as periods.

Nitrate nitrogen :

Maximum and minimum contents of nitrate nitrogen (156 and 67 ppm) were observed with phorate and disyston respectively. While comparing the mean values for the pesticides, maximum and minimum (90 and 83 ppm) contents were observed in disyston and control plots respectively. Regarding the pest periods, maximum and minimum (104 and 71 ppm) values were recorded in the periods 6 and 4 respectively. The results were found to be significant with periods and non-significant with pesticides.

The results of ammonium and nitrate nitrogen contents revealed that, contrary to the belief that soil application of pesticides may reduce the availability, there was no reduction in the contents and in some cases there was increase in the contents of ammonium and nitrate nitrogen with the soil application of pesticides for the crop sorghum. Thus, there was no inhibitory effect of the pesticides on the nitrogen mineralising microorganisms. These findings agreed with the results of Shin - Chasiang Lin *et al* (1972). In the present study, all the pesticides

behaved alike and the availability reduced after 60 days which might have been due to the increased plant uptake as the plant growth advanced.

Available phosphorus :-

Maximum and minimum contents of available phosphorus (20 and 3.2 ppm) were recorded with disyston in the period 6 and with phorate in the period 2 respectively. While comparing the mean values for pesticides, maximum and minimum (8.4 and 5.9 ppm) availability were recorded with disyston and aldicarp respectively. Regarding periods, maximum and minimum (11.6 and 5.5 ppm) availability were recorded in the periods 6 and one respectively. The results were significant with pesticides and periods.

The availability of phosphorus was observed to be decreased only to some extent when compared to the mean values of pesticides with that of control. This clearly showed that the pesticides did not have any significant influence in reducing the availability of soil phosphorus under field conditions at the recommended doses of the pesticides. A small reduction in the availability may be due to some antagonistic effect of the pesticides or probably due to the root exudates from the sorghum crop in the initial stages of the crop growth acting on the soil phosphorus compounds. Since out of four pesticides tried, aldicarp and disyston recorded increased availability and phorate and carbofuran decreased availability, the

TABLE Available Nutrients (ppm)

Crop: Sorghum

	P ₁	P ₂	P ₃	Periods			P ₇	Mean
				P ₄	P ₅	P ₆		
Ammoniacal nitrogen								
Aldicarp	75	81	105	74	80	87	60	80
Carbofuran	93	74	76	67	69	79	70	74
Di-syston	75	75	74	60	67	80	63	70
Phorate	102	90	41	64	64	77	72	72
Control	76	76	60	66	66	73	74	70
Mean	84	79	71	66	68	79	67	—
	1. Pesticides		F			S. E.		C. D.
	2. Periods		N. S.		
			N. S.		
Nitrate nitrogen								
Aldicarp	90	81	108	77	118	88	73	90
Carbofuran	113	84	86	71	80	90	67	84
Di-syston	84	97	74	64	83	156	73	90
Phorate	117	82	116	74	89	95	70	89
Control	96	96	71	73	71	94	79	83
Mean	100	88	91	71	84	104	72	—
	1. Pesticides		F			S. E.		C. D.
	2. Periods		N. S.		
			2.55**			11.00		18.83
Available phosphorus								
Aldicarp	5.6	6.3	3.1	6.5	4.8	7.5	7.9	5.9
Carbofuran	6.1	8.4	6.1	8.8	6.6	9.7	9.3	7.8
Di-syston	4.4	6.5	7.6	4.2	5.6	20.0	10.7	8.4
Phorate	6.2	3.2	7.7	7.7	8.1	8.5	7.8	7.0
Control	5.1	5.1	8.9	8.6	7.4	12.5	10.3	8.2
Mean	5.5	5.9	6.6	7.1	6.5	11.6	9.1	—
	1. Pesticides		F			S. E.		C. D.
	2. Periods		25.36**			0.60		1.03
			18.07**			0.71		1.22
Available sulphur								
Aldicarp	255	514	1020	360	681	2132	664	803
Carbofuran	335	394	482	557	422	996	467	521
Di-syston	346	365	542	533	682	3545	370	912
Phorate	354	531	774	516	631	1439	486	675
Control	483	483	1405	1012	1172	3366	349	1181
Mean	354	457	844	595	717	2296	467	—
	1. Pesticides		F			S. E.		C. D.
	2. Periods		11.67**			275.5		471.3

P₁ .. before application of pesticides
P₂ .. immediately after application
P₃ .. After 3 days
P₄ .. After 7 days
P₅ .. After 15 days
P₆ .. After 30 days
P₇ .. After 60 days

variations in the availability could not only be attributed to the influence of crop but also to the nature of pesticides. Detailed investigations are necessary with reference to the chemical nature of pesticides and their reaction with the plant nutrients.

d. Available sulphur :

Maximum and minimum (3545 and 255 ppm) contents of available sulphur were recorded with disyston in the period 6 and with aldicarp in the period 1 respectively. While comparing the mean values for pesticides, maximum and minimum availability (2531 and 1665 ppm) were recorded for aldicarp and carbofuran respectively. Regarding periods maximum and minimum availability (3936 and 746 ppm) were recorded in the periods 6 and 1

respectively. The results were found to be significant with pesticides.

When sorghum is grown, available sulphur decreases with the application of pesticides. But more sulphur was found to be in the available form for 30 days after application of pesticides. This may be due to some inhibitory effect of these pesticides on the sulphur mineralising microbial population and this effect would have been there for a period of about 20 to 30 days only and subsequently the activity would have been normal as shown by way of increased available sulphur content.

REFERENCE

- SHIN-CHASIANG LIN, B.R. FUNKE, and J.T. SCHUZZ, 1972. Effect of some organophosphate and carbamate insecticides on nitrification and legume growth. *Pl. Soil* 37 : 489-96.