EFFECT OF NUVACRON-40 RESIDUE ON THE CELLULOSE DIGESTION OF MAIZE FODDER *IN VITRO*

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Nuvacron–40 (insecticide) was sprayed in 0.05 per cent concentration on maize crop in April-May, 1972. The effect of the insecticide residue on dry matter and cellulose digestiblity was determined by an *in vitro* technique. The effect was determined after the application of Nuvacron-40 at 1-day intervals upto 11 days.

One gram samples of dried maize fodder sprayed with Nuvacron–40 were digested in an all glass fermentation flask for 48 hours. After fermentation, the residue was dried, weighed and analysed for cellulose content. The *in vitro* technique for residual analysis was mainly dependent on the residual effect of the insecticide on the micro-organisms essential for digestion. The results indicated that the dry matter and cellulose digestibility of maize-fodder increased with the passage of time after spray, showing an inverse relationship to the amount of insecticide residue.

INTRODUCTION

Maize is an important crop fed as green fodder, silage or stover to dairy and beef cattle. A number of insecticides are being used in the field to check the attack of insect pests. Since maize constitutes an important item of food for human beings as well as animals, the residual effect of such insecticides on it cannot be ignored. The green maize fodder so treated when fed to animals may prove fatal. To avoid animal losses resulting from insecticide residue in fodder, the detection of such residue seems imparative. It was, therefore, planned to employ the *in vitro* (artificial rumen) technique based upon the consideration that the activity of the micro-organisms responsible

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for digestion in rumen is adversely affected under the influence of insecticide residue. The digestbility may be considered as an index for it.

MATERIALS AND METHODS

Maize for fodder was sown in two experimental plots (A & B). The maize crop of plot A was sprayed with 0.05 per cent of Nuvacron-40 at the age of two months. Plot B was kept as control. The fodder samples were harvested after every 24 hours for 11 days post spray period. The samples were weighed chopped and dried under the sun and were then completely dried in hot air oven at 60°C. The dried samples were ground in Buhler grinder through 40 mash screen.

Each sample was mixed thoroughly, out of which one gram was taken for *in vitro* fermentation. Six fermentation sets were run for each sample. The sample was taken in a 250 ml conical flask fitted in a thermostatically controlled electric water bath along with 30 ml of artificial saliva (McDougall, 1948) and 4.5 ml Ohio *in vitro* fermentation medium (Johnson, 1966).

Then 25 ml of the strained rumen liquor were poured in each flask as inoculum. The flask was gassed with carbon dioxide to create a mild pressure which was maintained throughout the experiment. The pH of the medium was maintained between 6.7 to 7.0 and the temperature of the artificial rumen was kept between 39.0 to 39.5°C. The samples were taken out from the water bath after 48 hours and 10 drops of ethanol (absolute) were poured into each flask and shaken well to stop the bacterial fermentative activity. The contents of the flask were strained through a cheese cloth and the residue was dried in hot air oven at 70°C to a constant weight.

$$\%\text{Dry matter Digestibility} = \frac{\text{Weight of the sample} - \text{Weight of the residue}}{\text{Weight of the sample}} \times 100$$

The dried residue was analysed for cellulose (Anonymous, 1965).

Digestibility coefficients of cellulose were worked out according to Crampton's formula (Crampton *et. al*., 1960) as given below :

$$\text{Digestibility coefficient of cellulose} = \frac{\text{Weight of the fodder X\% cellulose in the fodder} - \text{Weight of the residue X 100 cellulose in the residue}}{\text{Weight of the fodder X\%.....callulose in the fodder}}$$

RESULTS AND DISCUSSION

The dry matter digestibility on first day (24 hours) after the application of insecticide was the lowest but with the passage of time, the digestibility gradually increased. On the 11th day, the digestibility significantly increased but was not yet equivalent to that of the control samples. This indicated that the residual effect was still there. Similarly, the cellulose digestibility on the first day after the application of insecticide was the lowest and it increased with the passage of time. On the 11th day, the digestibility although significantly increased, yet did not reach the control level. As in the case of dry matter, this too was an indication of the persistency of the residual effect of the insecticide even after 11 days, though at a diminishing rate.

The comparative study of the various techniques revealed that as the interval after spraying increased the insect mortality decreased (Saeed, 1972). In contrast, the dry matter and cellulose digestibilities increased because the residue in the maize fodder gradually decreased. The results obtained by *In vitro* technique showed a close analogy with the results obtained on the basis of chemical analysis and insect mortality.

The results obtained from *in vitro* rumen digestion revealed that dry matter and cellulose digestibilities were the lowest on the first day because of the high residual content of the insecticides. This could have adversely affected the activity of the rumen micro-organisms responsible for digestion. Smith *et al.* (1971), Wassermann *et al.* (1952) and O'Connor *et al.* (1970) reported that antibacterial, antifungal and antiprotozoal substances reduced the protozoal activity in the rumen. Saeed (1972) reported that the residual effect of Nuvacron-40 as measured by the mortality of *culex sp.* decreased after 6 days.

The residual effect of insecticide on fodder as determined by the *in vitro* artificial rumen technique was observed upto 11 days and it persisted beyond that period. However, on chemical assay the amount of insecticide was so negligible that it could not be determined beyond 8th day by the method used. *In vitro* digestibility of dry matter and cellulose from treated and untreated samples of maize fodder collected over 11 days post spray period have been shown in table 1. It may be noticed that digestibility of untreated sample decreased with the increasing age of the plant. The regression cofficient of dry matter digestibility on days post spray in untreated sample was —.0014 which is quite negligible for the period under study. The regression coefficient of dry matter digestibility in treated sample gave the value of +.61. The

TABLE 1 : *Nuvacron-40 Residue in Maize Fodder*

No. of days post spray	Insect mortality Percentage	Insect mortality Resude PPM	Chemical assay Total quantity of insecticide (PPM)	IN VITRO DIGESTIBILITY OF MAIZE FODDER — Dry matter per cent			Cellulose per cent		
				Untreated	Treated	Treated/untreated	Untreated	Treated	Treated/untreated
0	—	—	174.2	—	—	—	—	—	—
1	100	—	—	55.3	48.73	88.12	77.25	69.49	89.95
2	100	—	152.4	55.1	49.55	89.92	77.69	71.14	91.58
3	100	—	—	54.9	49.37	89.91	77.58	72.35	93.25
4	100	—	112.6	54.8	50.30	91.78	77.15	72.30	93.71
5	100	—	—	54.9	50.78	92.50	76.94	72.01	93.69
6	100	—	18.7	54.9	51.68	94.14	77.06	72.63	94.25
7	87.67	2.16	2.5	54.7	52.23	95.49	76.98	73.03	94.86
8	77.78	1.70	1.3	55.1	52.80	95.49	76.97	73.88	95.98
9	60.00	1.16	—	55.0	53.35	97.00	76.63	75.16	98.08
10	24.44	0.75	—	55.0	53.62	97.48	76.90	75.45	98.11
11	4.44	0.35	—	55.3	54.32	89.07	76.58	76.43	99.79

*(Saeed 1972)

regression coefficient of callulose digestibility on days post spray in untreated sample was —.088 where as this value was +.58 in treated sample. It means that digestibility of dry matter and crude fibre in treated plant increased by .61 and .58 per cent per day post spray, respectively.

The regression lines of treated and untreated samples for dry matter and cellulose digestibilities have been depicted in Figure 1 and 2, respectively. These lines were projected further and the parpendiculars were drawn from the point where these two lines met X-axis. It shows that the digestibilities of treated and untreated samples would be almost similar from 12th day onward. No sample for 12th day was, however, examined.

It may, therefore, be concluded that the *in vitro*. technique used in the study was equally useful for the measurement of residual persistence of Nuvacron-40 in fodders. This technique appeared to be more sensitive and provoked a better response of the residual effects even when the concentration of the insecticide residue was quite low and could not be detected by chemical assay. Of the two parameters employed for this investigation, dry matter digestibility *in vitro* was simpler because no chemical analysis was involved in this technique.

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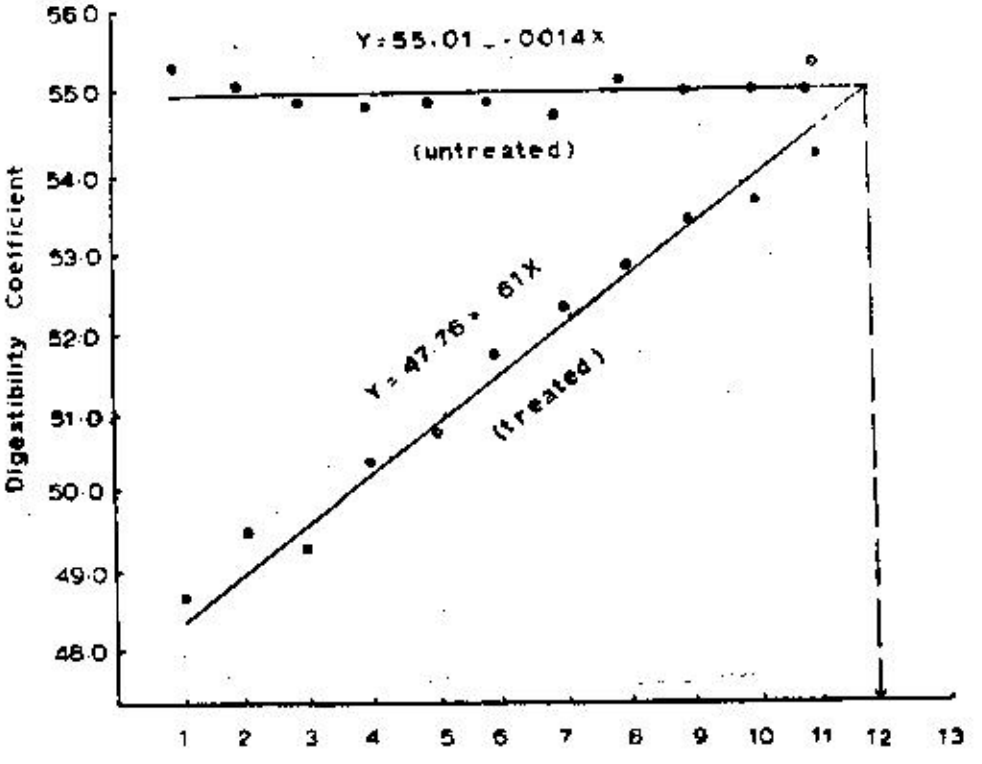

Fig 1 Regression of dry matter digestibility on days among treated and untreated maize fodder

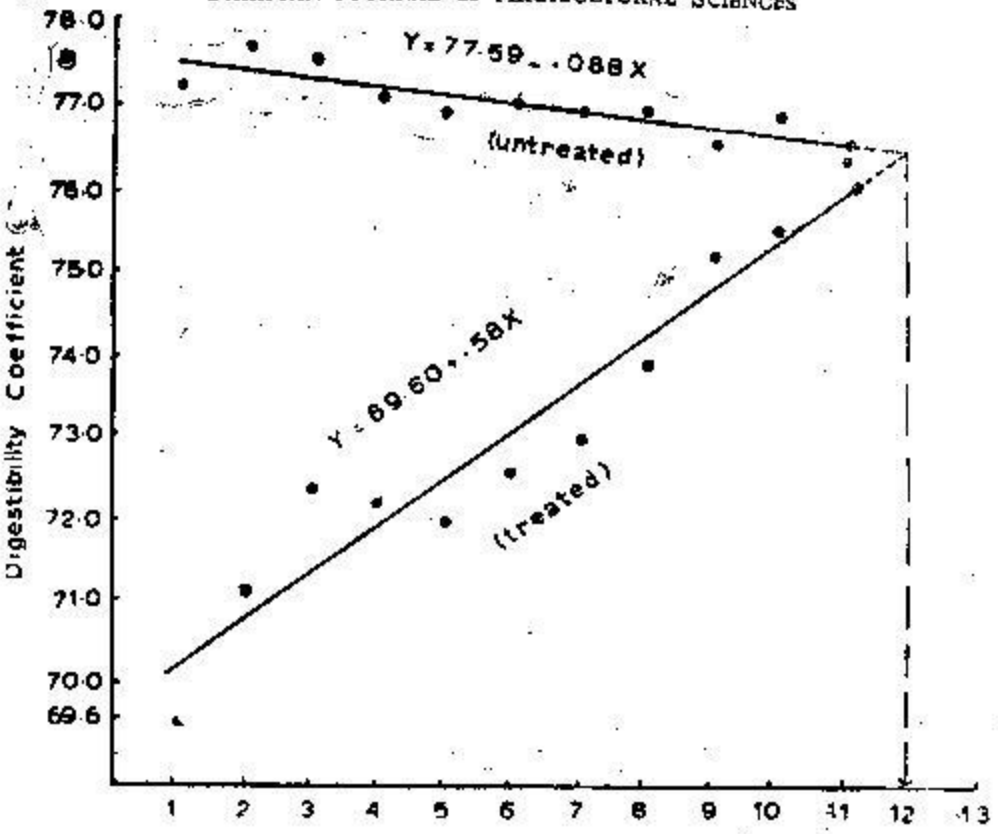

Fig.2 Regression of crude fiber digestibility on days among treated and untreated maize fodder