

## EFFECT OF LONGTERM MANURIAL ADDITION ON THE YIELD OF CROPS AND NUTRIENT AVAILABILITY UNDER RAINFED VERTISOL

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### ABSTRACT

Field experiments were conducted during the *rabi* seasons of 1991-1992 to 1994-1995 in Vertisol to study the effect of continuous addition of organic and inorganic fertilisers on the yield of crops and nutrient availability. The application of recommended level of N (40 Kg/ha) 50% as urea and 50% as FYM registered the maximum grain and straw yield besides improving the soil fertility status.

**KEY WORDS :** Longterm effect, yield, organic and inorganic fertilisers

The targeted food production with high yielding varieties, high analysis fertilisers and modernised agricultural technologies besides exploitation of limited natural resources have added new dimensions to the problems for maintaining soil fertility and sustaining the productivity. The ever increasing and escalating prices of inorganic fertilisers leads to the use of organic fertilisers as supplements. Thus, the effective management of both organic and inorganic fertilisers is necessary to maximise the yield and to improve the soil fertility under rainfed black soil conditions. For evaluating the efficacy of continuous addition of organic fertilisers on the yield of crops and nutrient availability, an experiment was conducted in

Vertisol at the black soil farm of Agricultural Research Station, Kovilpatti with cotton (MCU 10) + black gram (K1) and sorghum (K8) + cowpea (C 152) as main and intercrops respectively in a crop rotation during the *rabi* seasons of 1991 - 1995.

### MATERIALS AND METHODS

The study was carried out during the *rabi* seasons of 1991 - 1995 in a Vertic Aquic Ustropepts with cotton and sorghum as main crops and black gram and cowpea as intercrops in the alternative years. The soil is clayey in texture with the pH and Ec of 8.2 and .72 dSm<sup>-1</sup> respectively. The soil is low in N (132 Kg/ha) and P (8.0 Kg/ha) and high in K (356 Kg/ha) status. There were 13

Table 1. Yield of Crops in Long Term Manurial Experiments

Treatments	1991-1992 yield (Kg/ha)		1992-1993 yield (Kg/ha)		1993-1994 yield (Kg/ha)		1994-1995 yield (Kg/ha)	
	Sorghum	Cowpea	Cotton	Black gram	Sorghum	Cowpea	Cotton	Black gram
T1 Control	824	30	88	146	571	43	191	61
T2 20 kg N as Urea/ha	1133	59	90	146	909*	53	282	82
T3 40 kg N as Urea/ha	1519	92	93	171	633	41	248	95
T4 T2 + 10 kg P <sub>2</sub> O <sub>5</sub> /ha	1470	56	106	195*	1258*	53	262	104*
T5 T3 + 20 kg P <sub>2</sub> O <sub>5</sub> /ha	1498	50	116*	175*	974*	53	296*	100*
T6 20 kg N as FYM/ha	1616	70	107	195*	1104*	69	292	100*
T7 40 kg N as FYM/ha	1771	61	121*	191*	1340*	57	256	91
T8 20 kg N as FYM + 10 kg P <sub>2</sub> O <sub>5</sub> /ha	1624	58	123*	171	1323*	53	280	95
T9 40 kg N as FYM + 20 kg P <sub>2</sub> O <sub>5</sub> /ha	975	73	126*	219*	1339*	73*	292	108*
T10 10 kg N as urea + 10 kg N as FYM/ha + 10 kg N as FYM/ha	1466	86	140*	199*	1462*	77*	227	85
T11 20 kg N as urea + 20 kg N as FYM/ha	1791	89	170*	227*	1984*	190*	337*	156*
T12 10 kg N as Urea + 10 kg N as FYM + 10 kg J248 p 20 5/ha	62	154*	215*	853	102*	250	102*	
T13 20 kg N as urea + 20 kg N as FYM + 20 kg P <sub>2</sub> O <sub>5</sub> /ha	1445	72	137*	215*	1089*	97*	264	110*
C.D.(P=0.05) =	NS	NS	25	44	344	30	102	36

Table 2. Mean yield of Crops over year in Long Term Manurial Experiment

Treatments	Mean yield in kg/ha				% increase over control			
	Cotton	Sorghum	Black gram	Cowpea	Cotton	Sorghum	Black gram	Cowpea
T1 Control	140.0	668	104	37	-	-	-	-
T2 20 kg N as Urea/ha	186.0	1021	114	56	32.9	52.8	9.6	51.4
T3 40 kg N as Urea/ha	171.0	1076	133	67	22.2	51.1	27.9	81.1
T4 T2 + 10 kg P <sub>2</sub> O <sub>5</sub> /ha	184.0	1364	150	55	31.4	104.4	44.2	48.6
T5 T3 + 10 kg P <sub>2</sub> O <sub>5</sub> /ha	206.0	1236	138	52	47.1	80.0	32.7	40.5
T6 20 kg N as FYM/ha	200.0	1360	148	70	42.9	103.6	42.3	89.2
T7 40 kg N as FYM/ha	189.0	1566	141	59	35.0	134.4	35.6	59.5
T8 20 kg N as FYM + 10 kg P <sub>2</sub> O <sub>5</sub> /ha	202.0	1474	133	56	44.3	120.7	27.9	51.4
T9 40 kg N as FYM + 20 kg P <sub>2</sub> O <sub>5</sub> /ha	209.0	1157	164	73	49.3	73.2	57.7	97.3
T10 10 kg N as Urea + 10 kg N as FYM/ha	184.0	1464	142	82	31.4	119.2	36.5	121.6
T11 20 kg N as Urea + 20 kg N as FYM/ha	254.0	1788	192	140	81.4	167.7	84.6	278.4
T12 10 kg N as Urea + 10 kg N as FYM + 10 kg P <sub>2</sub> O <sub>5</sub> /ha	1051	158	82	44.3	51.0	52.9	121.6	
T13 20 kg N as Urea + 10 kg N as FYM + 20 kg P <sub>2</sub> O <sub>5</sub> /ha	1267	163	85	43.6	89.7	56.7	129.7	

treatments composed of organic, inorganic and organic + inorganic fertilisers. The treatments were imposed as per the schedule and replicated in a randomised block design. The crops were sown in 2:1 paired rows. The necessary plant protection and cultural practices were taken up as per recommendations. The yields of both main and intercrops were recorded treatment wise and the yield data were analysed statistically (Table 1). The mean yield of crops over seasons was worked out (Table 2). The soil samples were collected at post harvest stage and analysed for their nutritional status.

Table 3. Mean values of available nutrient status over years (Kg/ha).

Treatments	Pooled Mean Values over years		
	N	P	K
T1 Control	94	7.6	308
T2 20 kg N as Urea	107	8.8	340
T3 40 kg N as Urea	121	8.5	389
T4 T2 + 10 kg P	104	9.2	346
T5 T3 + 20 kg P	113	8.8	346
T6 20 kg N as FYM	110	8.7	360
T7 40 kg N as FYM	106	8.7	343
T8 T6 + 10 kg P	112	9.2	376
T9 T7 + 20 kg P	113	8.8	336
T10 10 kg N Urea + 10	108	9.1	353
T11 20 kg N urea + 20 kg N FYM	116	9.9	339
T12 T10 + 10 kg P	110	9.6	342
T13 T11 + 20 kg P			
CI ( $\alpha = 0.05$ )	7.38	0.79	27.2

## RESULTS AND DISCUSSIONS

The results of the experiments conducted during the *rabi* seasons of 1991 - 1995 revealed that the combined application of organic (FYM) and inorganic (urea) fertilisers to supply the recommended level of N in equal proportion registered the highest and significant mean seed cotton yield of 254 Kg/ha (T<sub>11</sub>). In sorghum and the intercrops black gram and cowpea, the highest grain yield of 1788 Kg, 192 Kg and 140 Kg/ha respectively was found to be associated with the same treatment. The minimum yields were observed in control plots.

The percentage yield increase over control was computed over years and it was found to be 81.4% and 167% in the main crops cotton and sorghum respectively where as in the intercrops black gram and cowpea, it was 84.6% and 278.4% respectively. The formation of metallo organic complexes and improved microbial activity due to the continuous addition of FYM might have resulted in the increased availability of native and applied nutrients which inturn increased the yield of crops. (Muthuvel *et al.*, 1989, 1990)

From the nutrient status of the soil at post harvest stage, it was inferred that the application of 40 Kg N as urea recorded the highest mean values of N (121 Kg/ha) and K (389 Kg/ha). The increased addition of N as inorganic fertilisers might have

enhanced the availability of nutrients. The positive effects of N fertilisation attributed to the increased nutrient status in soil (Jat and Nepalia, 1995). In addition, under rainfed conditions intercropping with pulses also enhanced the nutrient availability in soil (Balasubramanian *et al.*, 1982).

Thus it may be concluded that the combined application of organic and inorganic fertilisers in equal proportion to supply the recommended level of N (40 Kg/ha) not only increased the yield of crops but also enhanced the nutrient availability in the soil.

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## TOXICITY OF INSECTICIDES TO THREE SPIDERS IN RICE FIELDS

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### ABSTRACT

Determination of median lethal concentration values for different insecticides to various instars of *Lycosa pseudoannulata* Boes. et Str. showed the safety of ethofenprox to all the immature stages and adults of *L. pseudoannulata*. Chlorpyrifos, BPMC, phosphamidon and monocrotophos had comparatively higher LC<sub>50</sub> values than acephate. Determination of median lethal concentration values for different insecticides to *Oxyopes javanus* Thorell and *Argiope catenulata* (Dolleschall) revealed that BPMC, chlorpyrifos, acephate and ethofenprox had higher LC<sub>50</sub> values to *O. javanus* and *A. catenulata* than phosphamidon and monocrotophos which were comparatively more toxic.

**KEY WORDS :** Toxicity, insecticides, spiders, *Lycosa pseudoannulata*, *Oxyopes javanus*, *Argiope catenulata*, rice field

Of late, there has been an increased emphasis in the utilization of natural enemies, particularly predators for the regulation of rice insect pests. This is exemplified by several integrated pest management programmes developed against rice insect pest like *Nilaparvata lugens* Stal. (Delphacidae:Homoptera). In the present study, the effect of commonly used insecticides as well as some newer ones were tested for their toxicity to three common spiders in rice fields which are potential predators of hoppers. Among them, *Lycosa pseudoannulata* Boes. et Str. (Lycosidae:Araenida) and *Oxyopes javanus* Thorell (Oxyopidae:Araenida) are hunters and their chances of coming across pesticide residues are greater while the third, *Argiope catenulata* (Dolleschall) (Argiopidae:Araenida) is an orb

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weaver which has a greater chance of being directly exposed to pesticide spray.

### MATERIALS AND METHODS

The LC<sub>50</sub> of acephate, ethofenprox, BPMC, phosphamidon, chlorpyrifos and monocrotophos to third, fifth, seventh and ninth instars and adult stage of *L. pseudoannulata* and to adults of *O. javanus* and *A. catenulata* was determined using five graded concentrations of the insecticides in acetone. One l of each concentration was placed over the cephalothoracic region of each spiderling/adult with a micro-syringe applicator (Fabellar and Heinrichs, 1986). There were three replications and each replication had ten individuals. Acetone served as control. The