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COMPATIBILITY OF FOLIAR SPRAY OF INSECTICIDES AND FERTILIZERS AND THEIR INFLUENCE ON THE YIELD OF RAINFED COTTON

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ABSTRACT

Field experiments were conducted during the seasons of 1991-1992 to 1992-1994 to study the combined effect of foliar spray of 2% DAP, 0.5% zinc sulphate and endosulfan on the yield and yield attributes of rainfed cotton. Significant increase in seed cotton yield (305 kg ha^{-1}) was registered with the combined foliar application of insecticide (Endosulfan) and fertilizers (@% DAP and 0.5% zinc sulphate) on 45 DAS, following the recommended basal soil application of 40kg N ha^{-1} and 20 kg P ha^{-1}. The yield economics of the cotton also confirms the same treatment.

KEY WORDS : Foliar spray, insecticides, fertilizers, yield, yield attributes, economics.

In Tamil Nadu about 60% of the cultivable area is under rainfed and predominent soil type of this area is Typic Chromustert. Cotton is an important commercial crop grown in rainfed vertisol of southern districts of Tamil Nadu. In vertisols, foliar application constitutes the most effective means of fertilizer management.

Under dryland management, pesticidal spray is usually costly and separate sprays of nutrient solutions will increase the cost still more. Hence, the present investigations were undertaken to study the compatibility and combined effect of foliar spray of insecticides with plant nutrients.

MATERIALS AND METHODS

The experiments were conducted on cotton (Variety MCU.10) during rabi seasons from 1991-1992 to 1993-1994 at Agricultural Research Station, Kovilpatti on vertisol belonging to Kovilpatti soil series (Typic chromustert). The soil was clay, with a pH of 8.1, Ec of 0.2 dsm^{-1} and organic carbon 0.35%. It was low in available nitrogen (133 kg ha^{-1}). phosphorus (5.5 kg ha^{-1}) and medium in available potassium (310 kg ha^{-1}).

The experiment was laidout in plots of 5.4 m x 4 m with nine treatment combinations replicated thrice in a randomised block design.

T1 - Control

T2 - 0.5% zinc sulphate

T3 - 2% DAP

T4 - 2% DAP + 0.5% Zinc sulphate

T5 - 2% DAP + Endosulfan

T6 - 2% DAP + 0.5% Zinc sulphate + Endosulfan

T7 - 2% DAP + Phosalone

T8 - 2% DAP + Phosalone + 0.5% Zinc sulphate

T9 - Water spray

Foliar spray of plant nutrients and pesticides were given at 45 DAS. The recommended N and P (40 kg N ha^{-1} as urea, 20 kg P ha^{-1} as single super phosphate) were applied uniformly to all the treatments. Cotton was sown with a spacing of 45 cm x 30 cm. Totally four pickings were taken. Seed cotton yield from each plot was weighed separately. Observation and infestations of bollworm were recorded in each treatment. The economics of different foliar applications of insecticides and plant nutrients were also worked out.

RESULTS AND DISCUSSION

Yield attributes

Yield attributes viz., sympodial branches and number of bolls were significantly influenced with foliar application of 2% DAP, 0.5% zinc sulphate

Table 1. Effect of foliar sprays of insecticides and fertilizers on yield attributes and yield of cotton.

Treatments	Yield attributes		Seed cotton yield (kg ha^{-1}) (Pooled)
	No. of Symbodia plant (Pooled)	No. of Bolls/plant (Pooled)	
T_1 - Control	3.3	2.6	197
T_2 - 0.5% Zinc sulphate	4.0	3.6	222
T_3 - 2% DAP	4.6	4.0	251
T_4 - 2% DAP + 0.5% Zinc sulphate	4.0	3.3	233
T_5 - 2% DAP + Endosulfan	5.0	4.3	275
T_6 - 2% DAP + 0.5% Zinc sulphate + Endosulfan	6.6	6.3	305
T_7 - 2% DAP + Phosalone	4.0	3.3	235
T_8 - 2% DAP + Phosalone + 0.5% Zinc sulphate	4.0	3.6	252
T_9 - Water spray	3.6	3.3	233
CD at 5%	0.6	0.9	35

and endosulfan at 45 days after sowing (Table 1). The increased number of bolls per plant might be due to the foliar application of DAP which resulted in minimum shedding of flower buds, inturn increased the seed cotton yield (Basu, 1985). Since vertisols are expected to be largely deficient in available zinc, due to high pH and prevalence of high calcium in their exchange complex, foliar application of 0.5% zinc sulphate increased the yield attributes of cotton in all three years of study (Singh and Abrol, 1986).

Seed Cotton Yield

Seed cotton yield under different combinations were recorded for all the three successive rabi seasons and pooled data was presented in Table 1. Foliar spray of 2% DAP, 0.5% zinc sulphate and endosulfan at 45 days after sowing significantly influenced the seed cotton yield. The highest seed cotton yield (305 kg ha^{-1}) was recorded by this treatment. This was closely followed by 2% DAP spray with endosulfan at 45 DAS. The increased seed cotton yield might be due to the effective utilisation of nutrients supplied through foliar application (Venkatakrishnan and Pothiraj, 1994 ; Annadurai and Palaniappan 1994). As zinc takes part in the metabolism of the plant, this might have contributed to increase the seed cotton yield (Katyal, 1985).

Table 2. Bollworm infestation as influenced by foliar sprays of insecticides and fertilizers.

Treatments	Damaged flower buds (%) (Pooled)	Damaged Bolls (%) (Pooled)
T_1 - Control	50.9	69.3
T_2 - 0.5% Zinc sulphate	40.7	66.3
T_3 - 2% DAP	39.2	66.0
T_4 - 2% DAP + 0.5% Zinc sulphate	40.5	66.1
T_5 - 2% DAP + Endosulfan	32.0	62.0
T_6 - 2% DAP + 0.5% Zinc sulphate + Endosulfan	30.9	59.8
T_7 - 2% DAP + Phosalone	33.1	62.5
T_8 - 2% DAP + Phosalone + 0.5% Zinc sulphate	31.9	61.1
T_9 - Water spray	49.9	68.4
CD at 5%	3.4	2.1

Efficacy of insecticides

Efficacy of insecticides used were assessed by recording the percentage of damaged flower buds and infected bolls. From the results, it was inferred that the foliar application of 2% DAP and 0.5 % zinc sulphate along with endosulfan reduced the percentage of damaged flower buds and bolls (Table 2).

Endosulfan being an organo chlorine compound and its pesticidal action being conact, its application at flowering stage of the crop might have reduced the entry of bollworm which inturn resulted in minimum percentage of damaged buds and bolls. Since endosulfan is an oil soluble compound it persists for a longer period and higher efficacy was obsreved when compared to phosalone (Gren *et al.*, 1977). There was no phytotoxic effect of endosulfan on plant growth. The present findings are in close agreement with earlier reports (Venkatanaryanan, *et al.*, 1974).

The effect was further enhanced when it was applied along with 2% DAP and 0.5% zinc

Table 3. Economics of Treatments

Treatments	Seed cotton yield (kg ha^{-1})	Gross income (Rs. ha^{-1})	Cost of treatment (Rs. ha^{-1})	Net gain (kg ha^{-1})	Realisation over control (Rs. ha^{-1})	Incremental cost benefit ratio
T_1 - Control	197	2960	Nil	-	-	-
T_2 - 0.5% Zinc sulphate	222	3330	325	25	370	1 : 1.0
T_3 - 2% DAP	251	3775	550	54	814	1 : 1.4
T_4 - 2% DAP + 0.5% Zinc sulphate	233	3495	570	36	535	1 : 0.9
T_5 - 2% DAP + Endosulfan	275	4135	920	78	1176	1 : 1.2
T_6 - 2% DAP + 0.5% Zinc sulphate + Endosulfan	305	4579	950	108	1620	1 : 1.7
T_7 - 2% DAP + Phosalone	235	3535	950	38	576	1 : 0.6
T_8 - 2% DAP + Phosalone + 0.5% Zinc sulphate	252	3784	960	55	825	1 : 0.9
T_9 - Water spray	233	3505	500	36	546	1 : 1.0

sulphate. Comparing the effect of two pesticides (Endosulfan and Phosalone) on bollworm control, Phosalone application also reduced the percentage of damage by bollsworms but the reduction was of lower magnitude. The slow action of organo phosphorus compounds resulted in inadequate protection against entry of bollworms (Sorathia and Chari, 1981). Maximum bollworm infestation was noticed in control and water sprayed plots.

Economics

The economics of the treatments were evaluated along with incremental cost benefit ratio. The results revealed that there was a distinct improvement in the net return and incremental cost benefit ratio (ICBR) with the foliar application of insecticides in combination with fertilizers during all the three years of study. However, the foliar spray of 2% DAP and 0.5% zinc sulphate along with endosulfan at 45 DAS accounted for the highest net return per hectare and ICBR among the treatments tried during the successive years of experimentation (Table 3).

From the results of the present study, it can be concluded that foliar spray of 2% DAP and 0.5% zinc sulphate in combination with endosulfan at 45 DAS can be advocated for getting increased seed cotton yield with lesser bollworm infestation.

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