

Effects of Tillage and Manuring on Growth and Yield of Cotton and Rabi Jowar Under Rainfed Conditions of Pune Region

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A long range experiment was started at Agricultural College Farm, Pune during the year 1932-33 to investigate the effect of tillage and manuring on growth and yield of rainfed cotton and *rabi* jowar, in rotation. The same experiment was taken for study during the year 1973-74 and 1974-75 in two sets of Plots. The results revealed that ploughing to a depth of 18 to 20 cm increased the plant height, number of bolls/plant during the year 1973-74 and seed cotton yield during the year 1974-75 compared with harrowing to a depth 8-10 cm. Manuring the crop at the rate of 5.6 tonnes of FYM/ha every year also increased the plant height, number of bolls/plant and seed cotton yield during both the years of experimentation. The grain and fodder yields of *rabi* jowar during the year 1974-75 were significantly higher with deep tillage as compared to shallow tillage. The significant increase in yield components *viz.* grain weight/earhead, 1000 grain weight and grain and fodder yields of *rabi* jowar was recorded by manuring the crop at the rate of 5.6 tonnes of FYM/ha every year when compared with no manure.

Tillage is an important agronomic practice essential to create and maintain proper soil condition. Proper preparatory tillage would help to minimise weed problem and also to maintain soil and surface conditions resistant to erosion. Due to this the number of research workers have paid the attention towards tillage practices *viz.*, deep tillage and shallow tillage, but the findings from the workers have resulted in divergence of opinions. Smierzohalski (1970), Hansen (1971) and Schnieder (1971) did not observe increase in crop yield with increase in the depth of ploughing.

Contrary to these workers Laskowski (1970), Novacek (1970), Moffatt (1971) and Podvoiskii (1972) found increase in yield of various crops with deep ploughing. These conflicting findings

on yield of crops appear to differ on account of differences in climatic conditions, depth and kind of ploughing, soil types and type of crop.

Besides tillage, addition of organic manures help to bring the soil in proper tilth. They improve the structure of the soil and thereby holding more moisture and maintaining a proper soil-air-water relationship. They also help in improving the soil fertility. The beneficial effects of manuring on crop yields have been reported by a large number of research workers, Singh and Srivastava (1971) Maurya and Ghosh (1972) and Ball (1973). In order to evaluate the effects of tillage and manuring an experiment on deep and shallow tillage with addition of 5.6 tonnes of farm yard manure/ha every year and without organic manuring was laid out in the year 1932-33 at the

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Agricultural College Farm, Pune (Maharashtra) on two important crops viz., cotton and *rabi* sorghum grown in rotation on medium black soils of the farm under dry land agriculture.

MATERIAL AND METHODS

The experiment laid out in the year 1932-33 was taken for study during the years 1973-74 and 1974-75, in which the cotton and *rabi* sorghum was grown on two separate plots in rotation. During the year 1973-74, on one plot cotton was grown, while on the second plot *rabi* jowar was grown. During the year 1974-75, on the plot of cotton, *rabi* jowar was taken and on *rabi* jowar plot, cotton was grown as rotation. The soil type was medium black with 8.3 pH. The treatments were:-

- i) Shallow tillage (8 to 10 cm depth) by Deccan blade harrow i. e. only harrowing.
- ii) Deep tillage (18 to 20 cm depth) by Kirloskar plough No. 9 i. e. only ploughing.
- iii) Shallow tillage with manuring @ 5.6 tonnes of FYM/ha and
- iv) Deep tillage with manuring @ 5.6 tonnes of FYM /ha

The experiment was laid out in a randomised block design with five replications. The size of each plot was 37.80X4.89 sq.m. The rainfed cotton Y-1 was dibbled on 8th July, 1974 and 27th June, 1975 at 60x23 cm spacing with two seeds/hill. The *rabi* sorghum M. 35-1 was dibbled on 14th September, 1974 and 21st September, 1975 at 45x45 cm spacing with 5 to 6 seeds/hill and only two plants were

kept/hill by thinning. The rainfall pattern during the years of experimentation is given in Table 1.

RESULTS AND DISCUSSION

The data regarding plant height, spread, number of bolls/plant and yield of seed cotton as affected by type of tillage and manuring are presented in Table 2.

cotton :

Effect of tillage: The results presented in Table 2 revealed that the type of tillage did not show significant influence on cotton yield and components like plant height, spread and number of bolls/plant except plant height and number of bolls/plant during the year 1973-74 and seed cotton yield during the year 1974-75. The plant height number of bolls/plant and seed cotton yield were significantly more in deep tillage as compared to shallow tillage. Deep tillage (18 to 20cm depth) would have helped to conserve moisture in the soil encouraging root growth in deeper layers and ultimately absorption of nutrients from these layers. Thus, more height and number of bolls/plant were observed from deeper tillage which might have helped in increasing the yield of seed cotton when compared with shallow tillage. These results are in conformity with that of Jamison *et al.* (1952).

Effect of manuring: The plant height number of bolls/plant and seed cotton yields were significantly affected by annual application of farm yard manure when compared with no manure during both the years of experimentation. More height and number of bolls/plant seems to have helped to synthesize more carbohydrates and ultimately higher yields of seed cotton in F.Y.M. applied

plot as compared with no F Y M. plot. The yield of seed cotton was low during the year 1974-75, that might be due to heavy rains received in the month of October (217.8 mm) i. e. at flowering stage of the crop. Aparadh (1967) and Thorat (1969) also observed that the application of 5.6 tonnes of FYM/ha helped in producing more height, more number of bolls / plant ultimately resulted in higher yield of seed cotton. Mariakulandai and Morachan (1965), in their review stated that application of 22.5 cart loads of FYM/ha at cotton Breeding Station, Coimbatore increased the yield by 18 percent and at Central Farm, Coimbatore FYM at the rate of 37.5 cart loads/ha increased the yield by 22 per cent over no manure. The studies conducted by Mohamad Ali *et. al.* (1974) showed that the application of 12.55 tonnes of FYM/ha increased the kapas yield of MCU-1 by 37 percent over no manure at Coimbatore. Similar beneficial effects of application of F Y M. at the rate of 5.6 tonnes/ha in terms of seed cotton yield under rainfed condition were clearly indicated in the present study.

Interaction effects were found to be non-significant except plant height during the year 1973-74 and number of bolls/plant for both the years.

Rabi jowar: The data regarding plant height, grain weight / earhead, 1000 grain weight, grain and fodder yields of *rabi* jowar as affected by type of tillage and manuring are presented in Table 3.

Effect of tillage: It is evident from Table 3 that the plant height, grain

weight/earhad, 1000 grain weight, grain and fodder yields of *rabi* jowar were not affected significantly due to the type of tillage. However, the grain weight/earhead, during the year 1973-74 and grain and fodder yields during the year 1974-75 were increased significantly due to deep tillage. The values of yield components and yields were also higher in deep tillage compared with shallow tillage. Deeper cultivation with the help of Kirloskar plough No. 9 would have helped in conserving more rain water in the soil compared with shallow cultivation with Deccan blade harrow and ultimately proper utilization of available nutrients from deeper layers might have showed the beneficial effects on yield components and also grain and fodder yields of *rabi* jowar. At Manjri and Solapur (Maharashtra) there was increase in yields of sorghum due to ploughing as compared to harrowing (Anonymous, 1968).

Effect of manuring: The yield components of *rabi* jowar were affected significantly by annual application of FYM at the rate of 5.6 tonnes/ha over no manuring except plant height during both the years of experimentation and 1000 grain weight during the year 1973-74, but their values were higher in manuring compared with no manuring. The grain and fodder yields were also increased significantly by the application of F Y M. every year. The increase in yield components seems to have helped the plants to synthesize more carbohydrates and therefore, the general vigour and also the yield of *rabi* jowar of the manured plots increased. Similar

results were reported at Manjri and Solapur (Maharashtra) for *rabi* jowar under rainfed condition (Anonymous, 1968). These results are also in conformity with that of Aparadh (1967) and Thorat (1969).

In general, interaction between type of tillage and manuring did not show significant influence on the yields of *rabi* jowar.

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EFFECT OF TILLAGE ON CROP YIELDS

TABLE 1

Rainfall distribution during the years of experimentation.

Month	Rain fall (mm)	
	1973-74	1974-75
June	67.2	20.7
July	327.2	212.8
August	94.6	88.3
September	120.8	165.5
October	94.3	217.8
November	Nil	Nil
December	Nil	Nil
January	Nil	Nil
February	Nil	Nil
March	Nil	Nil
April	14.0	Nil
May	61.0	103.2
Total	779.1	788.3

TABLE 2
Yield components and seed cotton yield (q/ha) as affected by type of tillage and manuring.

Treatments	Height (cm)		Spread (cm)		No. of bolls/plant		Seed cotton yield (q/ha)	
	73-74	74-75	73-74	74-75	73-74	74-75	73-74	74-75
<i>Type of tillage</i>								
Harrowing	95.30	80.90	36.30	34.10	6.65	6.07	5.08	1.11
Ploughing	106.10	84.80	37.70	34.90	7.13	6.04	5.27	1.59
S. E. \pm	2.81	3.39	1.15	1.48	0.13	0.10	0.39	0.11
C. D. at 5%	8.65	—	—	—	0.39	—	—	0.33
<i>Manuring:</i>								
F. Y. M.	107.60	94.50	38.30	35.60	7.70	6.72	5.19	1.88
No F. Y. M.	93.80	71.20	35.70	32.40	5.98	5.39	4.16	0.81
S. E. \pm	2.81	3.39	1.15	1.48	0.13	0.10	0.39	0.11
C. D. at 5%	8.65	10.44	—	—	0.39	0.30	1.21	0.33
<i>Interaction (Txm):</i>								
S. E. \pm	3.98	4.79	1.62	2.09	0.18	0.14	0.56	0.15
C. D. at 5%	12.27	—	—	—	0.56	3.40	—	—

TABLE 3
Yield attributing characters, grain and fodder yields (q/ha) of *rabhi* jowar as affected by type of tillage and manuring

Treatments	Height (cm)		Grain wt./earhead (gm)		1000 grain weight (gm)		Grain yield (q/ha)		Foddering, ieldy (q/ha)	
	73-74	74-75	73-74	74-75	73-74	74-75	73-74	74-75	73-74	74-75
<i>Type of tillage :</i>										
Harrowing	191.90	189.90	26.12	23.47	34.90	33.80	11.60	6.54	42.43	46.72
Ploughing	192.40	194.80	27.08	24.55	35.40	34.50	11.81	7.52	45.88	47.65
S. E. \pm	2.19	2.80	0.26	0.38	0.38	0.78	0.57	0.47	1.62	1.43
C. D. at 5%	-	-	0.80	-	-	-	-	1.43	-	4.40
<i>Manuring :</i>										
F. Y. M.	194.40	196.40	28.07	25.42	35.60	36.20	13.58	7.97	49.83	63.63
No F. Y. M.	189.90	188.30	25.13	22.60	34.70	32.00	9.71	6.08	34.48	35.34
S. E. \pm	2.19	2.80	0.26	0.38	0.38	0.78	0.57	0.47	1.62	1.43
C. D. at 5%	-	-	0.80	1.17	-	2.40	1.77	1.43	5.00	4.40
<i>Interaction (T \times M) :</i>										
S. E. \pm	3.12	3.96	0.37	0.54	0.55	1.10	0.81	0.67	2.29	2.02
C. D. at 5%	-	-	1.14	-	-	-	-	-	-	-