

## Effect of Minimal Tillage in Deccan Hybrid Maize\*

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### ABSTRACT

Field experiments were conducted in two seasons to compare the efficiency of various types of tillage treatments combined with different weed control methods. There was no significant difference in yield among conventional tillage (two ploughing with country plough), minimal tillage (one cultivation either with country plough or mould board plough or power tiller) and no tillage. One ploughing with mould board plough (minimal tillage) combined with atrazine band application and intercultivation recorded the maximum yield.

### INTRODUCTION

With the development of new herbicides, several workers have investigated the possibility of reduced tillage or no tillage for corn production. It has been reported that corn yields from minimal tillage systems have been equal or greater than the yields from conventional tillage (Shear and Moschler, 1969; Gard and McKibben, 1973). Blevins *et al.* (1971) had attributed the increased yields in reduced tillage systems to higher soil water content and more efficient fertilizer use. The present investigation was taken up to study the different systems of tillage on growth and yield of corn in conjunction with the chemical weed control adopted for the crop.

### MATERIALS AND METHODS

The field experiments were conducted during *kharif* (July - November) 1974 and summer (January-April) 1975

in an alkaline soil with pH 8.2 and EC 0.7-1.2. The nutrient status of soil was low in available nitrogen and phosphorus and high in available potassium. Split plot design was adopted consisting five tillage treatments under column strips and four weed control treatments under row strips. The tillage treatments were: T1. two ploughings with country plough, T2. one ploughing with country plough, T3. one ploughing with mould board plough, T4. one cultivation with power tiller, and T5. no ploughing. The weed control treatments were; W1. hand hoeing and weeding twice, W2. atrazine at 0.5 kg/ha as pre-emergence application, W3. atrazine at 0.25 kg/ha as pre-emergence application followed by intercultivation, and W4. atrazine at 0.25 kg/ha as pre-emergence band application followed by inter-row directed post emergence application of paraquat at 1.0 lit/ha.

In no ploughing, the weeds originally present were killed ten days

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before planting, using an over-all application of paraquat at 1.5 lit/ha and 2, 4-D at 0.5 kg/ha. The band application of atrazine was made in 15 cm band on the seed row. The weeds in the inter-rows were hoed once on 30th day. The directed application of paraquat was also made on 30th day over the weeds.

The gross and net plot sizes were 4.2 x 3.6 m and 3.0 x 3.2 m respectively in the first season 4.8 x 4.2 m and 4.4 x 3.0 m in the second season. The seeds of Deccan Hybrid maize were sown in the beds with a spacing of 60 x 20 cm. The crop received eight and seven irrigations in the first and second season respectively.

## RESULTS AND DISCUSSION

Effect on weeds : The weed flora in the field in *kharif* and summer seasons were predominantly consisting of *Trianthema portulacastrum* L. In the first crop this weed formed about 50 to 60 per cent, while in the second crop it ranged from 85-90 per cent of total weed population. Other major weeds were *Cyperus rotundus*, *Lagasca mollis*, *Flavaria australasica* in the first crop, *Datura fastuosa* and *Cynodon dactylon* in the second crop.

All the tillage treatments were statistically on par with reference to weed number and dry matter production (Table). However, cultivation with power tiller recorded the maximum weed population (310 in *kharif* and 167 in summer per sq. m). The weed population was comparatively less in summer crop than in *kharif* in all the stages of

crop growth. The dry weight of weeds was the least in the no-tillage followed by gramoxone treatment (901 and 871 kg/ha during *kharif* and summer respectively) the entire vegetation present in the field initially were killed completely providing least competition of weeds. It is of interest to note that this treatment had recorded least weed number also as compared to other tillage treatments. This may be attributed to the low germination and growth of weeds in undisturbed soil as compared to disturbed soils under various tillage treatments. Bharadwaj and Verma (1965) have also reported that fresh weed seeds are brought to the surface by cultivation operations which hamper the crop growth. Evans (1962) found that disturbance of soil brought up dormant weed seeds to the surface and cause germination of weeds.

Among the different weeding methods, there was significant difference in weed population in *kharif* season only. Hand weeding and atrazine band application followed by intercultivation recorded lesser number of weeds (242 and 209/sq.m) than other treatments. As regards dry weight of weeds, hand weeding and band application of atrazine followed by inter cultivation were more efficient in both the seasons than over-all application and atrazine band application followed by gramoxone directed spray. The efficiency of weed control by using hoe as an effective method of controlling weeds has been reported by Ahlgran *et al.* (1951). Similarly Courson (1965) obtained excellent control of annual grasses

TABLE. Effect of minimal tillage on weeds, plant growth and yield

| Treatments     | Weed number<br>sq m. at 30<br>days |                | Weed dry wt<br>kg/ha at<br>harvest |      | Plant dry wt<br>kg/ha at<br>harvest |      | Cob length<br>(cm) |      | 1000 grain<br>wt (gm) |      | Grain yield<br>(kg/ha) |      |
|----------------|------------------------------------|----------------|------------------------------------|------|-------------------------------------|------|--------------------|------|-----------------------|------|------------------------|------|
|                | K                                  | S              | K                                  | S    | K                                   | S    | K                  | S    | K                     | S    | K                      | S    |
| <b>Tillage</b> |                                    |                |                                    |      |                                     |      |                    |      |                       |      |                        |      |
| T <sub>1</sub> | 221<br>(14.79)                     | 104<br>(9.81)  | 895                                | 948  | 11700                               | 9858 | 13.0               | 13.2 | 309                   | 291  | 4232                   | 3571 |
| T <sub>2</sub> | 272<br>(16.21)                     | 103<br>(9.61)  | 1073                               | 1054 | 11475                               | 9633 | 12.3               | 12.6 | 298                   | 277  | 3893                   | 3548 |
| T <sub>3</sub> | 262<br>(16.04)                     | 109<br>(10.21) | 966                                | 982  | 11150                               | 9642 | 12.8               | 12.7 | 306                   | 287  | 4134                   | 3559 |
| T <sub>4</sub> | 310<br>(17.41)                     | 167<br>(12.50) | 1120                               | 1128 | 11067                               | 3275 | 12.2               | 11.2 | 296                   | 284  | 3791                   | 3270 |
| T <sub>5</sub> | 216<br>(14.89)                     | 82<br>(8.67)   | 901                                | 871  | 11683                               | 9708 | 13.0               | 13.0 | 299                   | 289  | 4189                   | 3698 |
| C. D. (5%)     | N.S.                               | N.S.           | N.S.                               | N.S. | N.S.                                | N.S. | N.S.               | N.S. | N.S.                  | N.S. | N.S.                   | N.S. |
| <b>Weeding</b> |                                    |                |                                    |      |                                     |      |                    |      |                       |      |                        |      |
| W <sub>1</sub> | 242<br>(15.54)                     | 107<br>(9.98)  | 750                                | 807  | 11492                               | 9808 | 13.3               | 13.0 | 313                   | 300  | 4485                   | 3794 |
| W <sub>2</sub> | 347<br>(18.38)                     | 125<br>(10.92) | 1268                               | 1034 | 10667                               | 9133 | 12.3               | 12.3 | 287                   | 284  | 3268                   | 3095 |
| W <sub>3</sub> | 209<br>(14.30)                     | 101<br>(9.67)  | 828                                | 739  | 11708                               | 9892 | 13.9               | 13.2 | 319                   | 307  | 4896                   | 3869 |
| W <sub>4</sub> | 259<br>(16.11)                     | 119<br>(10.46) | 1103                               | 946  | 10875                               | 9467 | 12.5               | 12.4 | 282                   | 289  | 3640                   | 3455 |
| C. D. (5%)     | 1.83                               | N.S.           | 215                                | 135  | 806                                 | 444  | 0.76               | 0.60 | 25                    | 23   | 680                    | 670  |

K : Kharif, 1974

S : Summer, 1975

Figures in parentheses are transformed values

and broad leaved weeds throughout the season in corn with an application of atrazine 2.0 kg/ha. The present results are in line with these earlier findings.

**Effect on Crop:** None of the tillage measures had significant influence on plant dry matter production, cob length, seed weight or grain yield in both the kharif and summer seasons. In kharif, the grain yield decreased in the order of conventional tillage (4232 kg) followed by no-tillage (4189 kg), ploughing once

with mould board plough (4134 kg), ploughing once with country plough (3893 kg) and cultivation with power tiller (3791 kg/ha) (Table). In the summer, the order was the same except the no-tillage treatment occupying the first place.

There was significant difference in the dry matter production of crop, cob length, seed weight and yield due to weeding treatments in both kharif and summer seasons. Atrazine band application followed by intercultivation recorded the maximum yield (4896 and

3869 kg/ha) in first and second season crops. The reasons for maximum yield was due to the maximum dry weight of crop (11708 and 9892 kg/ha), cob length (13.9 and 13.2 cm) and seed weight (319 and 307 gm/1000) as compared to the rest of the weeding treatments. Gupta and Jain (1971) have brought out the superiority of atrazine band application followed by intercultivation in increasing the yield of corn when compared with broadcast application of herbicide alone. The results obtained in the present study corroborate the above findings.

Among the different tillage methods the cost of cultivation was maximum for conventional tillage and minimum for the treatment involving ploughing with mould board plough once. Atrazine band application followed by intercultivation recorded the least cost of weeding while the maximum was for hand hoeing and weeding treatment. The maximum net income was recorded under a combination of ploughing with mould board plough and atrazine band application followed by intercultivation.

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