



EFFECT OF *IN SITU* SOIL MOISTURE CONSERVATION METHODS ON PERFORMANCE OF  
MEDICINAL PLANTS IN HILL ZONE OF KARNATAKA OF INDIA

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ABSTRACT

A study was conducted at Landakanahalli in hill zone of Karnataka during 2004-05 and 2005-06 to evaluate the performance of medicinal plants viz., Stevia, tulsi, ashwagandh and kalmegh. In this experiment four moisture conservation methods viz., ridge and furrow, broad bed and furrow and mulching along with control were imposed. Among the different moisture conservation methods, ridge and furrow method had influenced plant height and number branches in Tulsi (67.92 cm and 16.74), Ashwagandh (8.38 cm and 17.66) and Kalmegh (12.98 cm and 8.8). Yield levels in Stevia, Tulsi and Ashwagandh (304.4 kg/ac leaves, 351.7 kg/ac leaves, and 24.8 kg/ac root respectively) were significantly higher in ridge and furrow followed by broad bed and furrow. Among the different medicinal plants, the income generated was higher from Stevia followed by Tulsi, Kalmegh and ashwagandh.

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INTRODUCTION

In recent days demand for plant based medicines is increasing in both developed and developing countries because of their non-narcotic nature and easy availability for an affordable price (Tyagi *et al.*, 2005). India has 47,000 different plant species and 15,000 medicinal plants. The Indian systems of medicine have identified 1,500 medicinal plants, of which 500 species are mostly used in the preparation of drugs (Waldia and Puneet, 2005). India, with its diversified biodiversity has a tremendous potential and advantage in cultivation of medicinal plants in larger scale. Optimum soil moisture is very much essential for better growth of plants. The plant can tolerate little deviation from the optimum requirements but the higher deviations from normal may reduce plant growth or kill the plants completely. Whereas increased soil moisture content (saturation condition) blocks the micro and macro spores makes difficult for the plants roots to absorb moisture. To improve the soil moisture level, various soil moisture conservation methods were used. In high rainfall area plants suffer due to excess moisture. Soil moisture conservation methods act as moisture conservation structure and also act as drainage structure during heavy rainfall period and they help to create the optimum soil moisture condition. Hence, the study was undertaken to know the effect of different soil moisture conservation methods on performance of the medicinal plants.

MATERIAL AND METHODS

The study was carried out at Landakanahalli Joint Forest Management (JFM) area of Sirsi division during 2004-05 k 05-06. This area receives average rainfall of 1500 mm and has lateritic soil type. The area selected was open and uncultivated. Experiment was laid out in randomized block design with four treatments and five replications in each of the species. Each treatment had a size of 3 m x 5 m. The soil

moisture conservation treatments imposed were Broad bed and furrow, Ridges and furrow, Mulching and control. Broad beds of one meter width and 15 cm height with a furrow of 30 cm in between the beds were prepared before planting. Similarly ridge and furrows were also prepared with a spacing of 45 cm between tops of ridges. The available leaf litter was collected and spread as mulch. The medicinal plant species evaluated were Tulsi (*Ocimum sanctum*), Kalmegh (*Andrographis paniculata*), Stevia (*Stevia rebaudiana*) and Ashwagandh (*Withania somnifera*). These species were planted in the month of July. The spacing for Stevia, Ashwagandh, Tulsi and kalmegh was 30x30 cm, 30x30 cm, 45 x 45 cm and 15 x15 cm respectively. Only in case of ridge and furrow method, planting of all the species with 45 cm distance was maintained between rows. The observation on survival per cent, plant height, number of branches and economic yield was taken at the time of harvesting.

RESULTS AND DISCUSSION

The effect of different soil and moisture conservation methods on plant height and number of branches produced is represented in Table 1. All the species differed significantly for both plant height and number of branches. In Stevia significantly higher plant height (49.84 cm) was observed in Control and the minimum plant height was found in mulching. However the maximum number of branches were observed in the ridge and furrow and the lowest number of branches (3,26) were observed in control. The significantly higher plant height and number of branches for Tulsi, Ashwagandh and Kalmegh were found in ridge and furrow. There was significant difference in yield levels and the total income from the medicinal plants due to soil conservation methods (Table 2 and 3). The higher yield and income of Stevia leaves (304.4kg/acre and Rs. 27,397 respectively), Tulsi leaves (351.7kg/acre and Rs. 7034.0 respectively) and Ashwagandh roots (24.8kg/acre and Rs. 2234.4 respectively) was obtained in the ridge and furrow method. Whereas, broad bed and

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and income (Rs. 3730) in Kalmegh.

**Table 1. Plant height and number of branches in medicinal plants as influenced by soil moisture conservation methods**

| Treatment                            | Stevia  |             | Tulsi   |             | Ashwagandh |             | Kalmegh |             |
|--------------------------------------|---------|-------------|---------|-------------|------------|-------------|---------|-------------|
|                                      | ht (cm) | No.branches | ht (cm) | No.branches | ht (cm)    | No.branches | ht (cm) | No.branches |
| T <sub>1</sub> -Control              | 49.84   | 3.26        | 28.58   | 6.56        | 7.34       | 2.32        | 10.88   | 4.10        |
| T <sub>2</sub> -Mulch                | 44.46   | 3.52        | 36.84   | 6.42        | 5.60       | 1.15        | 7.10    | 3.80        |
| T <sub>3</sub> -Ridge and furrow     | 47.74   | 5.18        | 67.92   | 16.74       | 17.66      | 8.38        | 12.98   | 8.80        |
| T <sub>4</sub> -Broad bed and Furrow | 46.48   | 4.36        | 53.14   | 13.64       | 8.88       | 2.42        | 11.44   | 7.60        |
| SEM ±                                | 2.71    | 0.43        | 4.95    | 1.28        | 1.32       | 1.62        | 1.70    | 0.38        |
| CD@5%                                | 6.83    | 1.10        | 12.48   | 3.35        | 3.33       | 4.11        | 4.29    | 0.96        |

**Table 2. Yields (kg/ac) levels of medicinal plants as influenced by different soil moisture conservation methods**

| Treatment                            | Stevia | Tulsi | Ashwagandh | Kalmeg |
|--------------------------------------|--------|-------|------------|--------|
| T <sub>1</sub> -Control              | 257.1  | 298.6 | 13.3       | 100.5  |
| T <sub>2</sub> -Mulch                | 264.2  | 291.2 | 8.6        | 83.7   |
| T <sub>3</sub> -Ridge and furrow     | 304.4  | 351.7 | 24.8       | 169.5  |
| T <sub>4</sub> -Broad bed and Furrow | 303.6  | 347.6 | 20.3       | 186.5  |
| SEM ±                                | 6.95   | 7.70  | 0.33       | 3.06   |
| CD@5%                                | 17.50  | 19.39 | 0.84       | 7.71   |

**Table 3. Income (Rs/ac) obtained from medicinal plants as influenced by soil moisture conservation methods**

| Treatment                            | Stevia | Tulsi  | Ashwagandh | Kalmeg |
|--------------------------------------|--------|--------|------------|--------|
| T <sub>1</sub> -Control              | 23,139 | 5972   | 1194       | 2010   |
| T <sub>2</sub> -Mulch                | 23,777 | 5824   | 775        | 1675   |
| T <sub>3</sub> -Ridge and furrow     | 27,397 | 7034   | 2234       | 3391   |
| T <sub>4</sub> -Broad bed and Furrow | 27,327 | 6953   | 1831       | 3730   |
| SEM ±                                | 762.36 | 180.45 | 61.87      | 48.38  |
| CD@5%                                | 1921.2 | 454.7  | 155.9      | 121.9  |

Note: Income was calculated using the rate of stevia, and ashwagandh at Rs. 90 per kg and Tulsi and kalmegh at Rs. 20 per kg.

Among the different treatments, ridge and furrow method was found better for the growth of these medicinal plants. The ridge and furrow method helps to conserve water when there was lower rainfall by holding water in ridges and when there was higher rainfall, this helps to drain the excess water thus avoiding the water logging situation. Since there was heavy rainfall in these years, the plants in control and mulching have suffered more as there was no mechanism to drain excess water. Singh *et al.* (2002) and Skaria (2004), have reported similar requirement of well drained condition for the good growth of Stevia. Even though there was a significant difference in yield and income of all the four medicinal plants with respect to different treatments, the income obtained in the Kalmegh and Ashwagandh was very less. This was mainly due to lower survival per cent of these plants. So Stevia and Tulsi were more suitable in this area with soil and moisture conservation structures such as ridge and furrow or broad bed and furrow to obtain more income. Nigam and Kandalkar (1995), have also reported about good growth of Ashwagandh in well drained soils. Stevia was a multi cut perennial plant, so it was possible to take 3-4 cutting in a year with irrigation facility. However in rain fed situation, it was possible to take up two cuttings.

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