Okra (Hibiscus esculentus L. Moench) or Lady’s finger is one of the important vegetables grown throughout the tropics and subtropics. It is one of the most important vegetable grown commercially almost during the year in India. Green fruits are cooked curry and soup. High iodine content of fruit help control goiter while leafs is used to inflammation and dysentery. The fruit also help in cases of renal colic, leucorrhoea and general weakness. It has yet multiple uses; the dry seed contains 13-22% good edible oil and 20-24% protein. The crushed seed is fed to cattle for milk production and the fibre is utilized in jute, textile and paper industry. Mehta (1959) reported that okra leaves are used in turkey for preparation of medicament while ripe seeds powder sometimes used as a substitute of coffee and soups. Mucilaginous material present in okra fruit is used for preparation of ice-cream is glycoprotein. The nutritional value of 100 g of edible portion of okra contains 1.9 g protein, 0.2 g fat, 6.4 g carbohydrate, 0.7 g minerals and 1.2 g fiber (Gopalan et al., 1989).

India is the leading country in okra production having an area of 4.32 lakh, production 45.28 lakh and productivity 10.5 mt/ha (FAO, 2009). Irrigation scheduling is considered as a vital component of water management to produce higher irrigation efficiency under any irrigation system, as excessive or sub-optimum irrigation both have detrimental effects on productivity parameters of okra (Aiyelaagbe and Ogbonnaya, 1996). Moreover, scheduling irrigation is influenced by many complex factors such as soil, crop, environment, water supply and cultivation practices. Thus, it is essential to develop an efficient irrigation scheduling under prevailing local conditions. Various methods based on estimated crop evapo-transpiration rate (Jaikumaran and Nandini, 2001), ratio of irrigation water to cumulative pan evaporation (Aiyelaagbe and Ogbonnaya, 1996 and Batra et al., 2000), open pan evaporation rate (Singh, 1987 and Manjunath et al., 1994) and soil moisture depletion (Home et al., 2000) are widely used for scheduling irrigation in okra.

Mulching is effective in reducing evaporation, conserving soil moisture and has been known to modify the hydrothermal regime of soil. Walter (1988) reported that the bad effects of water deficit could be overcome by irrigation or adopting in-situ moisture conservation techniques, such as use of mulches. Mulching has also been identified by many workers as a method to provide a favorable soil environment by minimizing crusting at the soil surface and keep it stable (Mehta and Prihar, 1973). Influence of mulching for tomato production has been reported by many researchers (Hooda et al., 1999 and Monks et al., 1997).

Several studies reported mulch to conserve soil moisture and improve crop yield (Singh and Gangwar, 1972; Singh et al., 1976). The assumption driving this experiment was that although crop plants vary in terms of their water requirements for growth and development, such water requirements however can be met by supplying water corresponding to amounts evaporated from the adjacent land surfaces. We tested this assumption by applying irrigation water at three levels of evaporation. The present
study was undertaken with following objectives:-

1. Water use efficiency (kg/ha/cm) as influenced by mulching and methods of irrigation on okra.

2. To work out the economics of the treatments.

**MATERIAL AND METHODS**

A field experiment was during the kharif season of 2012 under the edaphic and climatic condition of Gwalior (M.P.). Geographically, Gwalior is situated at the latitude of 26°13' North and longitude 76°14' east with an altitude of 211.52 meters above mean sea level. The experimental soil is sandy clay loam in texture (By Bouyoucos hydrometer method as described by Bouyoucos (1951), with pH 7.82, EC 0.36 dSm⁻¹, Organic carbon 0.42% (Rapid Titration method proposed by Walkeley and Black’s (1934) with available N (182.8 kg ha⁻¹) (Alkaline permanganate method (Subbiah and Asija, 1956), P (13.6 kg ha⁻¹) (Olsen’s method ,Olsen et al., 1954) and K (216 kg ha⁻¹) (Flame Photometer) (Jackson, 1973). The experiment was laid out in split plot design with 4 replications. Treatments number is 12 with (combination of 3 methods of irrigation and 4 methods of mulching). Three methods of irrigation M1= check basin, M2= Drip irrigation, M3= Border strip considered as main plot treatments and the subplot consists MS=Mulching with wheat straw, MG=Mulching with grasses, MP = Mulching with plastic sheet, MN = No mulch. Total number of plot is 48.Gross plot size is 5.0 m x 3.6 m m.Net plot size is 4.4 m x 3.0 m. Replication border is 1.0m. Distance between rows is 60 cm. Sowing was done at the rate of 15 kg/ha on 05 July 2012 and all other cultivation practices were adopted as per recommendations. Data which were to be computed are water use efficiency (%), net return (Rs/ha), B:C ratio.

**RESULTS AND DISCUSSION**

### MOISTURE STUDIES

**WATER USE EFFICIENCY (kg/ha/cm)**

The statistical analysis of data pertaining to water use efficiency (kg/ha/cm) has been summarized in Table 1.

The result of method of irrigation is found to be non significant due to the continuous rainfall.

All the practices of mulching increased the water use efficiency significantly over no mulch. Minimum water use efficiency was noted under no mulch, which was significantly less than noted under any of the treatment. The maximum water use efficiency was recorded under mulching with plastic sheet followed by mulching with grasses, but it was at par with wheat straw mulching. Mulching with plastic sheet significantly influenced the water use efficiency. The maximum WUE (101.39%) were recorded with the treatment of mulching with plastic sheet and minimum WUE (74.94%) was recorded with the no mulch. The reason for this increased WUE is contributed to more extraction of water due to greater root density and proliferation Monks et al., 1997; Rekha et al., 2009 Tiwari et al., 1998 were also reported similar results.

### Economics Of The Treatments

The data on net return and B:C ratio from various treatments are presented in Table 2. The maximum net profit of Rs. 1,38,234/ha was obtained when the Mulching with plastic sheet (M2MP) followed by M3MP (Rs. 1,33,376/ha) and M1MP (Rs. 1,30,889/ha). But, highest B:C ratio was obtained with the treatment of grass mulch (9.59) closely followed by wheat straw (9.27) and plastic mulch (9.26).

The maximum net profit of Rs.57552/ha was obtained.

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**Table 1:** Water use efficiency (kg/ha/cm) as influenced by mulching and methods of irrigation on okra

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Water use efficiency (kg/ha/cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Methods of Irrigation (M)</strong></td>
<td></td>
</tr>
<tr>
<td>M1 (Check basin)</td>
<td>92.19</td>
</tr>
<tr>
<td>M2 (Drip irrigation)</td>
<td>92.42</td>
</tr>
<tr>
<td>M3 (Border strip)</td>
<td>92.10</td>
</tr>
<tr>
<td><strong>SE(m)±</strong></td>
<td>2.316</td>
</tr>
<tr>
<td><strong>CD at 5%</strong></td>
<td>NS</td>
</tr>
<tr>
<td><strong>Mulching (MC)</strong></td>
<td></td>
</tr>
<tr>
<td>MS (Mulching with wheat straw)</td>
<td>98.60</td>
</tr>
<tr>
<td>MG (Mulching with grasses)</td>
<td>94.00</td>
</tr>
<tr>
<td>MP (Mulching with plastic sheet)</td>
<td>101.39</td>
</tr>
<tr>
<td>MN (No mulch)</td>
<td>74.94</td>
</tr>
<tr>
<td><strong>SE(m)±</strong></td>
<td>2.421</td>
</tr>
<tr>
<td><strong>CD at 5%</strong></td>
<td>7.027</td>
</tr>
</tbody>
</table>
Moisture and economics study by the effect of mulching and methods of irrigation on okra (*Hibiscus esculentus* l. Moench)

when with plastic mulching (M2MP) followed by M1MP (Rs.55699/ha) and M3MP (Rs.55268/ha). Similar results were obtained by Ameena et al., 2006; Singh et al., 2010; Lourduraj et al., 1997; Sanders et al., 2002. But, highest B:C ratio was obtained with the treatment combination of M2MG (4.5) and least B:C ratio was found with treatment M2MN (3.75) due to comparatively less cost of cultivation under these treatment combinations.

**CONCLUSION**

1. Mulching with plastic sheet in okra var. VRO-6 proved the best mulch practice which gave superior WUE.

2. Mulching with plastic sheet was found best for getting higher production of okra and net return.

3. Soil moisture extraction increases with the increase in depth of soil and is highest in 40-60 cm depth, moisture extraction in plastic mulch is 9.82% followed by wheat straw, grass and no mulch.

**REFERENCE**


