Plant Archives
Journal home page: www.plantarchives.org
DOI Url: https://doi.org/10.51470/PLANTARCHIVES.2021.v21.no1.133

MOISTURE AND ECONOMICS STUDY BY THE EFFECT OF MULCHING AND METHODS OF IRRIGATION ON OKRA (*HIBISCUS ESCULENTUS* L. MOENCH)

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(Date of Receiving-18-12-2020; Date of Acceptance31-03-2021)

ABSTRACT

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. 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). Mulching is effective in reducing evaporation, conserving soil moisture and has been known to modify the hydrothermal regime of soil. The result of method of irrigation is found to be non significant due to continuous rainfall. Hence, there are no differences among the methods of irrigation. Mulching with plastic sheet in okra var. VRO-6 proved the best mulch practice which produced superior growth and yield attributing characters

Keywords: Irrigation, Mulching, water management, soil moisture

INTRODUCTION

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

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

Treatments	Water use efficiency (kg/ha/cm)
Methods of Irrigation (M)	
M1 (Check basin)	92.19
M2 (Drip irrigation)	92.42
M3 (Border strip)	92.10
SE(m)±	**2.316**
CD at 5%	**NS**
Mulching (MC)	
MS (Mulching with wheat straw)	98.60
MG (Mulching with grasses)	94.00
MP (Mulching with plastic sheet)	101.39
MN (No mulch)	74.94
SE(m)±	**2.421**
CD at 5%	**7.027**

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 260 13' North and longitude 760 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 mulching, 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

Table 2: Economics of the treatments

Treatment	Cost of cultivation (Rs./ha)	Additional cost of treatment (Rs./ha)	Gross expenditure (Rs./ha)	Gross income (Rs./ha)	Net income (Rs./ha)	B:C Ratio
M1MS	13744	2500	16244	144886	128642	8.92
M1MG	13744	1485	15229	140909	125680	9.25
M1MP	13744	3000	16744	147633	130889	8.82
M1MN	13744	0	13744	116667	102923	8.49
M2MS	13744	2500	16244	150620	134376	9.27
M2MG	13744	1485	15229	146075	130846	9.59
M2MP	13744	3000	16744	154978	138234	9.26
M2MN	13744	0	13744	118422	104678	8.62
M3MS	13744	2500	16244	139909	123665	8.61
M3MG	13744	1485	15229	133943	118714	8.80
M3MP	13744	3000	16744	142656	125912	8.52
M3MN	13744	0	13744	115666	101922	8.42

Note: Sailing rate of seed =Rs. 150/kg

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.

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