Madras Agric. J. 79 (6) : 336 - 344 June 1992
https://doi.org/10.29321/MAJ.10.A01766

INFLUENCE OF METHODS AND INTERVALS OF IRRIGATION ON PHYSIOLOGICAL ATTRIBUTES AND YIELD OF SESAMUM (Sesamum indicum L.)

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ABSTRACT

An experiment was conducted during summer 1984 and 1985 at Tanjore and at Bhavanisagar respectively to study the effects of methods of irrigation on physiological attributes and yield of sesamum. Increase in dry matter production was noted with increasing levels of moisture supply. Maximum leaf area index was noticed at control and beds and channels irrigating once in 20 days followed by once in 30 days. Higher seed yield was recorded in alternate furrow-irrigating once in 20 days followed by ridges and furrows-irrigating once in 30 days at both the centers. Hence, irrigating in alternate furrows once in 20 days may be considered as optimum for sesamum.

KEY WORDS : Irrigation Methods, Sesamum Yield.

INTRODUCTION

Sesamum is an important oilseed crop often referred as the "Queen of oilseeds" in view of its high oil content and its keeping quality. Among the different countries growing sesamum, India ranks first in area having 23.84 lakh hectares covering one third of the world area under this crop. In sesamum, delayed or excessive irrigation affects the yield. Hence proper water management is essential against weather induced fluctuations. In general, seasamum is more efficient in water use and requires less water for production. Seasamum crop is mostly grown as rainfed but its yield could be boosted substantially if grown under irrigated conditions with suitable irrigation management.

The methods and intervals of irrigation are complementary to each other on the economic use of water for sesamum crop. There is paucity of agronomic research data under such situations in this crop. Hence, the present study was undertaken to investigate the effects of various methods as well as intervals of irrigation with the objectives namely (i) to fix a suitable method of irrigation for seasamum and (ii) to find out the optimum interval of irrigation.

MATERIALS AND METHODS

The experiments were conducted in randomized block design with 3 replications during summer 1984 and 1985 at Soil and Water Management Research Institute, Tanjore and at Agricultural Research Station, Bhavanisagar respectively. The 90 days duration variety of seasamum, TMV 3 was grown for the study at Tanjore and Co.1 for the study

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Treatments

Treatment symbols	Treatments
Control	Farmer's method (irrigating once in 15 days)
Irrigation methods,	
M_1	Beds and channels
M_2	Ridges and furrows
M_3	Alternate furrows
M_4	Broad bed (2 m apart)
Intervals of irrigation,	
I_1	Irrigating once in 20 days
I_2	Irrigating once in 30 days
The depth of irrigation was 5 cm.,	
Plot Size:,	
Gross:	5 x 4 m^2
Net :	4.2 x 3m^2

at Bhavanisagar. The details of the treatments are as above:

The seeds were treated with Bavistin at the rate of 2g/kg of seed against seed-borne diseases. Five to six seeds were dibbled per hole at a spacing of 30 x 30 cm. The quality of irrigation water used for is presented in Table - 1. One pre-sowing irrigation and another life saving irrigation on 4th day were given as common to all treatments to a depth of 5 cm to account 100 mm, depth of- irrigation. The plots were irrigated as per the schedule, with measured quantity of water through a par-shall flume at Tanjore and through a module at Bhavanisagar fixed in the experimental field. The recommended fertilizer application, after cultivation and plant protection measures were followed. The following bio-metric observations were recorded on five plants selected randomly in the net plots.

Dry matter production:

Two plants at random were taken at harvest for estimating dry matter production. The samples were initially air dried and then dried in a hot-air oven at 60°C till constant weight was attained and an average value expressed as dry matter production per plant.

Leaf area index (LAI):

Leaf area index based on dry matter weight method as suggested by Winter et.al. (1956) was recorded on 60th day of sowing.

Seed Yield:

After harvest, threshing was done and seed yield recorded from the net plot and expressed as Kg/ha.

Table -1 Quality of irrigation water *-

Sl.No.	Properties	Quality	
		Tanjore '84	Bhavanisagar '85
1.	E.C.(m.mhos/cm)	0.7	0.6
2.	pH	7.0	6.8
3.	Anions (m.eq/liters),		
	(a) Carbonates	trace	trace
	(b) Bicarbonates	1.1	0.8
	(c) Chlorides	4.2	3.8
	(d) Sulphates	0.6	0.4
4.	Cations (m.eq/liters),		
	(a) Calcium	3.0	2.7
	(b) Magnesium	2.6	2.3
	(c) Sodium	1.7	1.3
	(d) Potassium	trace	trace
5.	Sodium absorption ration (SAR)	1.91	0.75
6.	Residual sodium carbonates (RSC)	4.7	4.2
7.	Water table of the field	Below 5 meters	Below 8 meter

* Tested by the method given by Jackson (1973).

Table - 2: Dry Matter Production (Kg/ha) at harvest

Treatments	Tanjore 1984					Bhavanisagar 1985				
	M_1	M_2	M_3	M_4	Mean	M_1	M_2	M_3	M_4	Mean
I_1	6204	5975	5310	5215	5676	6254	6025	5360	5265	5726
I_2	6082	5660	5200	5175	5529	6132	5710	5250	5225	5579
Mean	6143	5818	5255	5195	5603	6193	5868	5303	5245	5653
Control	-	-	-	-	6401	-	-	-	-	6451
	M	I	M xI	C x Rest		M	M	M x I	C x Rest	
SE	207	146	292	506		560	342	792	1371	
CD	NS	NS	NS	146.8		NS	NS	NS	397.5	

NS: Not Significant

Table - 3: Leaf Area Index (LAI) on 60th day of sowing

Treatments	Tanjore 1984					Bhavanisagar 1985				
	M_1	M_2	M_3	M_4	Mean	M_1	M_2	M_3	M_4	Mean
I_1	3.10	2.80	2.62	2.43	2.74	3.80	3.20	3.02	2.83	3.21
I_2	2.95	2.75	2.22	2.13	2.51	3.35	3.15	2.62	2.53	2.91
Mean	3.03	2.78	2.42	2.28	2.62	3.58	3.18	2.82	2.68	3.06
Control	-	-	-	-	3.20	-	-	-	-	3.89
	M	I	M x I	C x Rest		M	I	M x I	C x Rest	
SE	0.90	0.06	0.i	0.22		0.15	0.11	0.22	0.37	
CD	0.26	0.19	0.02	0.63		0.46	0.32	NS	1.12	

NS : Not Significant

Table - 4: Seed Yield (Kg/ha)

Treatments	Tanjore 1984					Bhavanisagar 1985				
	M_1	M_2	M_3	M_4	Mean	M_1	M_2	M_3	M_4	Mean
I_1	685	608	787	433	628	885	807	987	633	809
I_2	535	711	630	332	552	735	910	830	532	752
Mean	610	659	708	382	590	810	859	909	693	781
Control	-	-	-	-	447	-	-	-	-	648
	M	I	M x I	C x Rest		M	I	M x I	C x Rest	
SE	10.87	17.75	25.09	43.46		14.83	10.48	20.97	47.74	
CD	31.48	51.43	72.73	125.99		44.43	31.43	62.85	138.38	

RESULTS AND DISCUSSION

The methods of irrigation and intervals had no effect on dry matter production (DMP) both at Tanjore and at Bhavanisagar. There was also no interaction effect on the dry matter production in both the centers.

The farmer's method was superior to all the treatment combinations in both the places. Lower DMP was observed in broad bed and for wider interval. Thus, it is clear that the DMP was increased with higher moisture level. Similar increase in DMP was reported by Andhale and Kalbhor (1980) in sunflwer.

Leaf area index differed significantly due to methods of irrigation. Among the methods, beds and channels were on par with ridges and furrows and superior to all the other methods at both the places. Regarding the intervals, shorter interval wa significantly superior to wider interval at Tanjore, while at Bhavanisagar there was no difference. The interaction of beds and channels - irrigating once in 20 days could influence the leaf area index at Tanjore compared to other interaction, while at Bhavaniagar no interaction effect was noticed.

The farmer's method had significantly increased the leaf area index as compared to alternate furrows - irrigating once in 30 days and broad bed irrigating once in 20 to 30 days at both the centres. Leaf area index was higher in farmer's method, beds and channels -irrigating once in 20 and 30 days, and ridges and furrows - irrigation once in 20 and 30 days. The probable reason might be that due to the more uptake of nitrogen resulted in excessive vegetative growth and altered physiological status of the plant under higher levels of moisture in the soil. Similar findings were reported by Patel and Singh (1980) in sunflower and Rao and Brarduraj (1982) in Wheat.

Seed yield differences was significant due to methods of irrigation, intervals of irrigation and the interaction due to methods and intervals. Among the methods, the seed yield under alternate furrows was on par with ridges and furrows and superior to other methods under Tanjore condition, while at Bhavanisagar it was significantly superior to all the other methods, since the crop is very sensitive to higher moisture regimes. The findings are in confirmity with the findings of Erie and French (1969) in safflower, Balci (1973) in sesamum, Singh et.al. (1974) in oilseed crops, Chahal et.al. (1980) in various crops, Dev et.al. (1980) in Indian rape and Patel and Singh (1979) in sunflower.

The seed yield under the shorter interval was significantly higher than wider interval at both the centres. The reduced growth and yield in wider interval may be due to non-availability of nutrients leading to lower uptake and improper crop growth and development under water stress. Similar findings were reported by Sandhu and Khera (1977).

The interaction between methods and intervals of irrigation was significant at both the centers. Irrigating the field

once in 20 and 30 days in the alternate furrows, once in 20 and 30 days in ridges and furrows and once in 20 and 30 days in beds and channels induced more seed yield over farmer's method at Tanjore and Bhavanisagar.

The treatments, alternate furrows - irrigating once in 20 and 30 days, ridges and furrows - irrigating once in 20 and 30 days and beds and channels - irrigating once in 20 days were recorded significantly higher seed yield over farmer's method at both the centers. Irrigating the filed in the alternate furrows once in 20 days influenced the seed yield to the highest level compared to other methods and intervals as well as farmer's method at both the places. This may be due to high moisture conservative capacity of the alternate furrow system and making the conserved moisture available to the crop growth and development. Similar findings were reported in maize (Anon., 1983).

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Madras Agric. J. 79 (6) : 344 - 347 June 1992

RESEARCH NOTES :

PREVALENCE OF PROTEOLYTIC BACTERIA IN DIFFERENT SOILS

Proteolytic bacteria encountered in the soil aids in the cycling of nitrogen in nature, as the proteases digest waste proteins and the aminoacid pool thus formed acts as a reservoir for uptake by plants. Members of various heterotrphic bacteria are known to be protease producers and their activity is influenced by various factors (Alexander, 1961). In the present investigation, occurrence of proteolytic bacteria in cultivated and uncultivated soil and their metal resistance have been described.

Fifteen soil samples were collected from cultivated, uncultivated and sewage irrigated soil sites and were analysed for total aerobic heterotrophic bacteria and proteolytic bacteria. Metal sensitivity of proteolytic bacteria was tested following the method of Austin et al. (1977). Two of the isolates *Bacillus* sp (p46) and *Aeromonas* sp (p82) were grown under various environmental conditions such as temperature (20, 25, 30, 40 and 45°C) pH (6, 7, 8, 9 and 10) and sodium chloride concentration (0.0, 0.1, 0.5, 1.0 and 1.5%) and combined effect of temperature, pH and sodium chloride concentration on the growth of these isolates were also carried out at above conditions in various combinations.

Proteolytic bacteria ranged from $5x10^4$ to $85x10^4$/g of soil (Table 1). Maximum and minimum were found in Kottamedu sewage soil and uncultivated