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Original Research Article

Yield and Economics of Summer Groundnut as Influenced by Different Irrigation Level and Mulches

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A B S T R A C T

A field experiment was conducted during 2013-14 to study the response of summer groundnut (*Arachis hypogaea* L.) to different irrigation level and mulches under drip irrigation at the AICRP on Irrigation Water Management, VNMKV, Parbhani (M.S.). Soil of the experimental plot was clayey in texture and slightly alkaline in reaction. It was medium in total nitrogen and available phosphorus and fairly high in exchangeable potassium (K_2O). The experiment was framed out in split plot design with four irrigation level (I_1 - Irrigation at 0.6 PE, I_2 - Irrigation at 0.8 PE, I_3 - Irrigation at 1.0 PE and I_4 - Irrigation at 1.2 PE) in main plots whereas four mulches [M_1 - Black polythene mulch with drip, M_2 - Transparent polythene mulch with drip, M_3 - Soybean straw mulch with drip and M_4 - Control (drip)] were assigned in sub plots. Results of the experiments revealed that the irrigation at 1.0 PE provided congenial conditions for better yield resulting in to significantly higher dry pod yield and haulm yield per hectare under 1.0 PE than 0.6, 0.8 and 1.2 PE. The significantly maximum gross monetary return and net monetary return (Rs. ha^{-1}) was observed in irrigation level 1.0 PE (I_3) as compared to rest of the treatments. The gross monetary return and net monetary return (Rs. ha^{-1}) was recorded in transparent polythene mulch (M_2) over rest of the mulches.

Keywords

Groundnut, drip irrigation, mulches

Introduction

Groundnut (*Arachis hypogaea* L.) adorned as king of oilseeds is grown all over the world for its importance in food, medicine and industries. It is the world's fourth most important source of edible oil (51 per cent) and third most important source of high quality vegetable protein (28 per cent), minerals (2.5%) and carbohydrates (20%). Poor production of summer groundnut is the major problem faced by the groundnut growers due to high water requirement (800-1000 mm) of crop in summer involving 13 to14 irrigations associated with undependable water supply in major commands, limits the acreage. Moisture is the key factor of production but mismanagement of water like improper scheduling, lack of drainage etc. often leads to reduction in crop yield. For efficient utilization of applied water, scheduling of irrigation to the crop would be on the scientific manner (Damodaram and Hegde, 2000). Thus, to economize the use of water and to bring more area under irrigation, advanced method of irrigation like drip to groundnut crop is essential. Drip irrigation

saves considerable quantum of water that can be very well utilized for bringing more area under irrigation there by increasing the productivity.

As the soil and climatic conditions are suitable for groundnut cultivation, but due to insufficient moisture in summer creates more problems. To mitigate this problem mulching is very important because it prevents direct evaporation of moisture from the soil and thus limits the water losses and soil erosion over the surface. In this manner it plays a positive role in water conservation.

Groundnut grown as an irrigated crop to economize water through drip irrigation system during summer season and use of plastic film as mulch for agriculture is still at conceptual stage in Marathwada region, hence its agronomic practices are required to be standardized for realizing yield potential. Taking into consideration the above fact, the present research study was undertaken at AICRP on Irrigation Water Management, VNMKV, Parbhani during summer 2013-14.

Materials and Methods

A field experiment was undertaken at, AICRP on Irrigation Water Management, VNMKV, Parbhani during summer 2013-14 and 2014-15 to study the effect of different irrigation level and mulches on yield and economics of drip irrigated summer groundnut. Soil of the experimental field was clayey (52.25%) in texture, medium in organic carbon (%), poor in nitrogen (kg ha^{-1}), medium in available phosphorus (kg ha^{-1}), high in potash (kg ha^{-1}) and slightly alkaline in reaction.

The experiment was framed out in split plot design with four irrigation levels (I_1 - Irrigation at 0.6 PE, I_2 - Irrigation at 0.8 PE, I_3 - Irrigation at 1.0 PE and I_4 - Irrigation at 1.2 PE) in main plots whereas four mulches [M_1 Black polythene mulch with drip, M_2 - Transparent polythene mulch with drip, M_3 - Soybean straw mulch with drip and M_4 - Control (drip)] were assigned in sub plots and these treatment combination were randomly replicated thrice. The broad bed furrows with top width of 90 cm were laid out in the experimental plot with the help of bullock drawn ridger and thereafter one lateral was laid down in the centre of each bed. One common irrigation of 60 mm was applied to each bed to ensure good germination. Meanwhile holes were punched on 30 micron black and transparent polythene mulch by maintaining three rows at the spacing of 30cm × 8cm. Later on as per the treatment, different mulches viz. black polythene mulch (30 micron), transparent polythene mulch (30 micron) and straw mulch (5 ton ha^{-1}) were laid down on the bed. Sowing of groundnut was undertaken on 7th February 2014 and fertilizers were applied as per the recommended dose at the time of sowing. The pan evaporation was measured daily from the U.S.W.B. class 'A' open pan evaporimeter installed at the Agro meteorology observatory, Department of meteorology, VNMKV, Parbhani during the period of experiment. The volume of water to be applied was calculated as per the treatment of irrigation level by using the formula given below.

$V = PE \times A$

Where,

V= Volume of water to be applied (litre/day/plot)

PE = Daily pan evaporation (mm) multiplied by irrigation level i.e. 0.6/0.8/1.0/1.2

A = Area of the plot (m^2).

After calculating the volume of water to be applied, the operating time of drip unit (t) was calculated by using the following formula given by Pawar (2001).

$$t = \frac{V}{q \times N e} \times 60$$

Where,

t = Operation time of system, min

V = Volume of water to be applied (litre/day/plot)

q = Average emitter discharge, lph

Ne = Number of emitters, per plot

The experimental data were statistically analyzed as per the method described by Panse and Sukhatme (1985).

Results and Discussion

Effect of irrigation level on yield and economics

In groundnut, the increase in yield proportionately with the increased in irrigation level upto 1.0 PE. Irrigation level 1.0 PE (I_3) gave significantly highest dry pod yield (kg ha^{-1}) and dry haulm yield (kg ha^{-1}) as compared to rest of the irrigation level.

It was attributed to the fact that in case of groundnut pegging and early pod formation as well as pod formation to maturity stages is most sensitive to moisture stress and during these stages the crop obtained sufficient moisture at irrigation level 1.0 PE and hence it has produced higher yield. Similar results were reported by Suresh *et al.,* (2013) and Dabasree and Gunri (2014).

The highest gross monetary returns was recorded by the treatment irrigation at 1.0 PE which was 1,87,532 Rs. ha^{-1} while lowest gross income was in the irrigation treatment 0.6 PE 1,55,173 Rs. ha^{-1} which was associated with higher and lower groundnut yield respectively.

The highest net monetary returns was recorded by the treatment irrigation at 1.0 PE which was 1,02,949 Rs. ha^{-1} while lowest gross income was in the irrigation treatment 0.6 PE 70,966 Rs. ha^{-1} which was associated with higher and lower groundnut yield respectively.

Effect of mulches on yield and economics

Transparent polythene mulch (M_2) recorded significantly highest dry pod yield and dry haulm yield over rest of the treatments.

The higher availability of available soil moisture, better temperature conditions under transparent polythene mulch has resulted into superior nutrient uptake, more vegetative growth, thereby creating more source, which has resulted into creation of more sink in the form of yield attributes and finally significantly superior dry pod yield and dry haulm yield in transparent polythene mulch than rest of mulches treatments. These findings are on similar line with findings of Bhure (2010) and Debasree Saha and Gunri (2014) (Table 1).

The highest gross monetary returns and net monetary returns was recorded by the treatment transparent polythene mulch which was 1,96,130 Rs. ha^{-1} while lowest gross income was in the treatment control and 1,45,659 Rs. ha^{-1} which was associated with higher and lower groundnut yield respectively. These results are in line with those reported by Subrahmaniyan *et al.*, (2008) (Table 2). The highest net monetary

returns was recorded by the treatment transparent polythene mulch which was 95,881 Rs. ha^{-1} while lowest net income was in the treatment control 84,579 Rs. ha^{-1} which was associated with higher and lower groundnut yield respectively.

Table.1 Effect of irrigation level and mulches on dry pod yield and dry haulm yield (kg ha^{-1}) of summer groundnut

Treatments	Dry pod yield (kg ha^{-1})	Dry haulm yield (kg ha^{-1})
Irrigation level		
I_1- 0.6 PE	3342	3726
I_2- 0.8 PE	3713	3968
I_3- 1.0 PE	4211	4534
I_4- 1.2 PE	3508	3904
S.E. ±	102	119
C.D. at 5 %	354	412
Mulches		
M_1- BPM	3932	4282
M_2- TPM	4370	4647
M_3- SSM	3492	3823
M_4- Control	2979	3380
S.E. (m) ±	105	134
C.D. at 5 %	364	463
Interaction		
S.E. ±	191	261
C.D. at 5 %	NS	NS
G.M.	**3693**	**4033**

Table.2 Gross monetary returns and net monetary returns (Rs. ha^{-1}) as influenced by various treatments

Treatments		
	GMR (Rs. ha^{-1})	**NMR(Rs. ha^{-1})**
Irrigation level		
I_1 - 0.6 PE	155173	70966
I_2 - 0.8 PE	173263	88855
I_3 - 1.0 PE	187532	102949
I_4 - 1.2 PE	168363	84010
S.E. ±	5209	4102
C.D. at 5 %	18025	14196
Mulches		
M_1 – BPM	187063	90720
M_2 – TPM	196130	95881
M_3 – SSM	155478	75600
M_4 – Control	145659	84579
S.E. ±	4310	3633
C.D. at 5 %	14917	12572
Interaction (I × M)		
S.E. ±	6506	5630
C.D. at 5 %	NS	16729
G.M.	**171083**	**86695**

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