

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.901.230>

Rainwater Management for Sustaining Groundnut Productivity under Dry Farming Conditions

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ABSTRACT

A field experiment was conducted during *kharif* season of 2011-12 to 2016-17 to study the rain water management for sustaining groundnut productivity in medium black soils under dry farming condition at Main Dry Farming Research Station, Junagadh Agricultural University, Targhadia of Nourth Saurashtra Agro climatic Zone of Gujarat. The experiment consisting 2 main plots (2 levels of tillage) and 5 sub plot treatments (Management practices) laid out in split plot design with four replications. Significantly higher pod yield and haulm yield was obtained under the application of FYM @ 10 t/ha and kaolin @ 4 % (M_1) spray and Ploughing every year up to 20 cm in set row (T_1) as compared to control, while it were found non significant in combined effect of tillage and management practice. Maximum rain water use efficiency and crop water use efficiency was recorded in ploughing carried out every year up to 20 cm in set row (T_1) practice and application of FYM @ 10 t/ha + Kaolin @ 4% spray (M_1) under tillage and management practices, respectively. On the basis of pooled result ploughing carried out in alternate year up to 20 cm in set row under tillage practices gave the maximum net returns (Rs.31904/ha) with B: C ratio of 1.99. While in Management practices, application of FYM @ 10 t/ha and kaolin @ 4% spray (M_1) gave the maximum net returns (Rs.36791/ha) with B: C ratio of 2.05 as compared to rest of treatments.

Keywords

Groundnut, FYM, Kaolin, Tillage, rain and crop water use efficiency, yield.

Article Info

Accepted:
15 December 2019
Available Online:
20 January 2020

Introduction

Groundnut is the important oilseed crop of the India and rank first among the edible oilseed group. The crop has its own importance due to its high edible oil and high nutritional value

of kernel as human food and haulm as rich feed for cattle. Groundnut kernel contains 45-50 % oil, 27 to 33 % protein as well as essential minerals, carbohydrates and vitamins. Success of dry farming depends on soil and crop management practices. The

medium black soils of this region are poor in structure. They are high in clay content (45 to 60 %) and are plastic. Organic matter content is low due to high temperature and low rainfall. Also due to high wind speed, rate of evaporation and transpiration is high. Soil cracking is common phenomenon in medium black soil due to which moisture loss is quit high and ultimately affect the crop production drastically. To handle the moisture stress conditions during dry spells mid drought corrections are also necessary to sustain the productivity of crops. Hence investigation was planned to evoke ideal tillage practices along with soil management for increasing the soil reserve in set row cultivation which is followed conventionally in this region and to minimize the loss of water through transpiration.

Materials and Methods

The field experiment was conducted at Main Dry Farming Research station, Junagadh Agricultural University, Targhadia (Dist.:- Rajkot, Gujarat, India) during six consecutive *kharif* season of 2011-12 to 2016-17. The physical measure of soil *viz.* field capacity (33.8%), Wilting point (17.0%), Infiltration rate (10.4 mm/hr), apparent specific gravity (1.34 g/cc), Maximum WHC (47.0%) and soil texture clayey.

The chemical properties of soil at 0-15 cm depth had EC 0.28 mmhos/cm, pH (7.75), organic carbon (OC) 0.497 %, Available P₂O₅ 24.4 kg/ha, Available K₂O 448 kg/ha. The experiment included total 10 treatment combinations *viz.* Main factor involve 2 levels of tillage T₁-Ploughing every year up to 20 cm in set row, T₂- Ploughing alternate year up to 20 cm in set row and sub factor involve five different management practices i.e. M₁- FYM @ 10 t/ha + Kaolin @ 4% spray, M₂- FYM @ 10 t/ha + Guar gum @ 0.3% spray, M₃- Gypsum@ 1 t/ha + Kaolin @ 4% spray, M₄-

Gypsum@1t/ha + Guar gum @ 0.3% spray, M₅- Control each replicate four times in split plot design with the plot size of (a) gross plot size: 5.0 m x 4.8 m, (b) net plot size: 3.2 m x 2.4 m. The spacing and seed rate were 60 cm x 10 cm and 100 kg/ha respectively. The crop was fertilized with 12.5:25.0:0.0 NPK kg /ha.

Results and Discussion

Pod and haulm yield of groundnut

Effect of tillage practices

The pooled results of six years presented in (Table 1) revealed that maximum pod yield (1110 kg/ha) was recorded under the ploughing every year up to 20 cm in set row (T₁) over the ploughing alternate year up to 20 cm in set row(T₂). These results confirm the findings of Bhatnagar *et al.*, (1983) and G. S. Sutaria *et al.*, (2010). The haulm yield of groundnut was not affected significantly due to tillage practices. On the basis of pooled results, it was recorded higher (3863 kg/ha) under ploughing alternate year up to 20 cm in set row (T₂).

Effect of management practices

Results in table 1 shows that pod yield of groundnut were affected due to management practices. On the basis of pooled results maximum pod (1257 kg/ha) and haulm (4023 kg/ha) yield of groundnut was obtained under application of FYM@10 t/ha and kaolin @4% spray (M₁) as compared to rest of management practices. The findings are close with findings of Balasubramanian *et.al.*(1997) and Naveen *et. al.* (1992).

Interaction effect

Interaction effect of tillage and management practices (T X M) was found non-significant during all the six years and pooled results in respect of pod and haulm yield of groundnut.

Table.1 Effect of different treatments on yield, water use efficiency and economics of groundnut crop (Pooled result of six years)

Sr . N o.	Treatments	Pod yield (kg/ha)	Haulm yield (kg/ha)	Rain water use efficiency (kg/ha- mm)	Crop water use efficiency (kg/ha- mm)	Net returns (Rs./ha)	B:C ratio
A Tillage practices (T): Two							
1.	Ploughing every year up to 20 cm in set row (T ₁)	1110	3683	2.04	3.27	31218	1.95
2.	Ploughing alternate year up to 20cm in set row (T ₂)	1083	3863	2.01	3.18	31904	1.99
	S. Em.±	21	86	-	-	-	-
	C.D.at 5%	NS	NS	-	-	-	-
	C.V.%	16.95	13.42	-	-	-	-
B. Management practices (M): Five							
1.	FYM @ 10 t/ha + Kaolin @ 4% spray (M ₁)	1257	4023	2.31	3.68	36791	2.05
2.	FYM @ 10 t/ha + Guar gum @ 0.3% spray (M ₂)	1134	3840	2.11	3.43	31703	1.92
3.	Gypsum @ 1 t/ha + Kaolin @ 4% spray (M ₃)	1110	3855	2.05	3.26	31888	1.96
4.	Gypsum@ 1 t/ha + Guar gum@ 0.3% spray (M ₄)	1058	3698	1.96	3.11	29858	1.93
5.	Control (M ₅)	923	3449	1.67	2.73	27544	1.99
	S.Em.±	23	48	-	-	-	-
	C.D.at 5%	64	133	-	-	-	-
C. Interaction Effect of TxM :							
	S.Em.±	32	67	-	-	-	-
	C.D.at 5%	NS	NS	-	-	-	-
	C.V.%	11.76	8.75	-	-	-	-

Rain water use efficiency and crop water use efficiency

Rain water use efficiency and crop water use efficiency (Table 1) was also calculated under different treatments of tillage and management practices during all the years. In case of tillage practices maximum rain water use efficiency (2.04 kg/ha-mm) and crop water use efficiency (3.27 kg/ha-mm) was obtained in ploughing carried out every year up to 20 cm in set row (T₁), while in

management practices the application of FYM @ 10 t/ha + Kaolin @ 4% spray (M₁) recorded maximum rain water use efficiency (2.31 kg/ha-mm) and crop water use efficiency (3.68 kg/ha-mm). These results confirm the findings of Raskar and Bhoi (2003) and Kumar and Rana (2007)

Economics

The data in table 1 indicated that ploughing carried out in alternate year up to 20 cm in set

row under tillage practices gave the maximum net returns (Rs.31904/ha) with B: C ratio of 1.99. While in Management practices, application of FYM @ 10 t/ha and kaolin @ 4% spray (M₁) gave the maximum net returns (Rs.36791/ha) with B: C ratio of 2.05 as compared to rest of treatments. Similar results were reported by Trivedi *et.al.* (1994)

It is concluded that application FYM @ 10 t/ha and kaolin @ 4% spray (400gm/10 liter water) at dry spell gave higher productivity and net returns as well as maximum rain and crop water use efficiency under dry farming conditions.

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How to cite this article:

Vekaria. P.D., V.D. Vora, T.J. Patel, J.T. Patel, G.R. Sharma, H.R. Vadar and Hirpara. D.S. 2020. Rainwater Management for Sustaining Groundnut Productivity under Dry Farming Conditions. *Int.J.Curr.Microbiol.App.Sci.* 9(01): 2033-2036.
doi: <https://doi.org/10.20546/ijcmas.2020.901.230>