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AGRO-TECHNIQUES TO OVERCOME DROUGHT STRESS FOR YIELD MAXIMIZATION IN PEARLMILLET (*PENNISETUM GLAUCUM*) UNDER RAINFED CONDITIONS

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Abstract

An experiment was conducted during rainy season (*Kharif*) 2003, 2004 and 2005 at Kalai (Aligarh), Regional Research Station of C. S. Azad University of Agriculture and Technology, Kanpur (U.P.), India to find out agro-techniques to overcome drought stress for yield maximization in pearlmillet (*Pennisetum glaucum*) under rainfed conditions. The highest grain yield was obtained in paired row planting with dead furrow of 60 cm space closely followed by dust mulching. On an average, the grain yields were 14.7 and 13.9% higher over control, respectively. Regardless of stages on an average application of thiourea increased grain yield by 10.7% over control. The highest net returns (Rs. 11571/ha) and benefit: cost ratio (2.19) was recorded in paired row planting with dead furrow in 60 cm space followed by foliar application of thiourea. Thiourea has been found cheaper and effective in low quantity.

Key words : Mulching, thiourea, kaolin, pearlmillet.

Introduction

Pearlmillet is an important crop of semi-arid region. inadequate and erratic rainfalls are the main reasons for low productivity of pearlmillet in this region. It generally encounters soil moisture deficit during critical growth stages such as active tillering, flowering and grain development, which results in significant reduction in grain yield (Begg and Turner, 1976). Therefore, it is important to explore some agro-techniques to mitigate adverse effect of moisture stress that can be used by farmers, with this view a study was undertaken to evaluate the response of agro-techniques to overcome drought stress for yield maximization in pearlmillet under rainfed condition.

Materials and Methods

The experiment was conducted during rainy season (*Kharif*) 2003, 2004 and 2005 at Kalai (Aligarh), Regional Research Station of C.S. Azad University of Agriculture and Technology, Kanpur (U.P.), India. The experimental soil was sandy-loam in texture having pH 7.5, organic carbon 0.46% and available P and K contents as 17.5 and 163.5 kg/ha, respectively. The experiment was conducted in randomized block design with three replications having ten treatments *viz*., $\mathbf{T_1}$- control, $\mathbf{T_2}$ - dust mulching, $\mathbf{T_3}$ - paired row (30/60 cm) planting with opening of dead furrow in 60 cm space, $\mathbf{T_4}$ - planting at 60 cm row space with ridge and furrow after interculture operation, $\mathbf{T_5}$ - removal of alternate row at physiological drought, $\mathbf{T_6}$ - removal of one row after every two rows at physiological drought, $\mathbf{T_7}$ - spray of 6% kaolin at flowering, $\mathbf{T_8}$ - spray of 0.1% thiourea at tillering, $\mathbf{T_9}$ - spray of 0.1% thiourea at flowering, $\mathbf{T_{10}}$ - spray of 0.1% thiourea at tillering + flowering. Crop was sown in second fortnight of July. Common dose of fertilizer 60 kg N + 40 Kg P_2O_5/ha was applied to all treatments. Plants were thinned at 15 cm plant space after 15-20 days of sowing normal planting was done at 45 cm row spacing. The statistical analysis was carried out according to standard method.

Results and Discussion

The data presented in table 1 revealed that grain yield in 3 years of experimentation showed significant variation to different treatments. The highest grain yield was obtained in paired row planting with dead furrow of 60 cm space closely followed by dust mulching. On an average, the grain yields were 14.7 and 13.9% higher over control, respectively. The extended period of

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Table 1 : Effect of treatments on yield and economics of pearlmillet.

Treatments	Grain yield (q/ha)				Stover tield (q/ha)				Economics (Average of 3 years)	
	2003	2004	2005	Mean	2003	2004	2005	Mean	Net return (Rs/ha)	B:C ratio
T_1	2494	3955	2309	2919	60.77	101.16	57.21	73.05	9041	1.95
T_2	2975	4172	2824	3324	72.01	102.28	69.62	81.30	8618	1.70
T_3	3006	4184	2858	3349	81.16	102.30	70.30	84.59	11571	2.19
T_4	2515	4081	2320	2972	61.72	101.54	68.02	77.09	3713	1.24
T_5	2503	4081	2309	2964	70.87	101.91	58.30	77.03	9469	2.00
T_6	2435	4047	2292	2925	64.01	101.54	58.30	74.62	9150	1.96
T_7	2926	4161	2772	3286	73.15	102.29	68.59	81.34	9991	1.92
T_8	2869	4150	2629	3216	69.72	102.30	68.59	80.20	10472	2.05
T_9	2812	4138	2601	3184	72.01	102.27	68.02	80.76	10336	2.04
T_{10}	2915	4161	2812	3296	73.15	101.29	69.64	81.36	10497	2.01
CD (P=0.05)	**205**	**135**	**101**	**-**	**10.61**	**NS**	**1.63**	**-**	**-**	**-**
Rainfall (mm) during crop season (July-November)					**806**	**478**	**375**	**-**	**-**	**-**

Average market price of grain and stover was Rs. 510/q and Rs. 50/q, respectively.

moisture availability to crop specially during water stress due to moisture conservation practices resulted in higher dry matter accumulation and ultimately resulted with higher yield. Kaushik and Lal (1997) also reported similar results. The experimental results indicated that spray of thiourea at tillering + flowering stages was found more effective than spray at tillering or at flowering stage alone during rainy season (*kharif*) of 2005, but the differences between 2 and 1 spray in 2003 and 2004 were not pronounced probably because of higher rains during crop seasons (table 1). Regardless of stages on an average application of thiourea increased grain yield by 10.7% over control. The improvement in yield could be ascribed to improved plant metabolism and translocation of assimilates from source to sink. The beneficial effect of thiourea on maize was also reported by Sahu and Solanki (1991). The effect of foliar application of thiourea and kaolin was at par. The spray of kaolin found effective probably because of its anti-transpirant properties. In the first and third year stover yield followed the trend of grain yield whereas in second year the response was not realized.

The highest net returns (Rs. 11571/ha) and benefit: cost ratio (2.19) was recorded in paired row planting with dead furrow in 60 cm space followed by foliar application of thiourea. Though, dust mulching and foliar application of kaolin recorded higher yield but could not fetch higher net return due to higher input cost (table 1).

On the whole study revealed that paired row planting with opening of dead furrow in 60 cm space and foliar spray of 0.1% thiourea at critical growth stages proved better techniques to mitigate adverse effect of drought stress under rainfed conditions. In view of the information generated there appears to be a vast potentiality of augmenting production of pearlmillet under rainfed conditions. Thiourea has been found cheaper and effective in low quantity. This information may fruitfully be utilized by farmers facing water shortage and concerned scientists for further investigation.

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