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COMPARATIVE PERFORMANCE OF PLASTIC MULCHING ON SOIL MOISTURE CONTENT, SOIL TEMPERATURE AND YIELD OF RAINFED COTTON

V.RAVI AND A.CHRISTOPHER LOURDURAJ

Department of Agronomy
Agricultural College and Research Institute
Tamil Nadu Agricultural University
Coimbatore 641 003

ABSTRACT

Field experiments were conducted on rainfed cotton at the Tamil Nadu Agricultural University, Coimbatore to study the effect of different mulching materials *viz.*, black LLDPE, coir pith and dried banana leaves. Mulching increased the soil moisture content, soil temperature, cotton yield attributes and kapas yield. Among the different mulches tried, LLDPE mulch proved to be the best in enhancing the soil moisture content and yield of cotton.

KEY WORDS : Rainfed Cotton, LLDPE Mulch, Organic Mulch, Yield

The arid and, semi-arid regions generally receive inadequate precipitation and so the moisture is one of the important limiting factors for successful crop production. Good yields could be obtained in dry regions if most of the precipitation is conserved and used for corp production. Therefore, mulching is undoubtedly one of the most important moisture conservation practices besides it has control on soil temperature, soil salinity and weed infestation. In the present study, an attempt was made to evaluate the effectiveness of different mulches in conserving the soil moisture and increasing the yield of cotton under rainfed condition in the western agro-climatic zone of Tamil Nadu.

MATERIALS AND METHODS

Field experiments were conducted at the Tamil Nadu Agricultural Universtiy, Coimbatore for two years during the *rabi* season of 1992-93 and 1993-94. The soil of the experimental plot was sandy loam in texture, low in available N (165 kg ha^{-1}), medium in available P (12.5 kg ha^{-1}) and high in available K (280 kg ha^{-1}). The rainfall received during the crop period was 485.4 mm in 24 rainy days in the year 1992-93 and 462.3 mm in 29 rainy days in the year 1993-94. The experiments were laid with cotton var. LRA 5166 in randomised block design with four replications. The treatments consisted of black LLDPE (Linear low density poly ethylene) 25 micron sheet mulch, coir pith at 12.5 T ha^{-1}, organic mulch with banana leaf at 10 T ha^{-1} and control. Soil temperature at 5, 10 and 15 cm depths was recorded and soil moisture content (%) in 0-30 cm soil layer was estimated. Data were collected on kapas yield, number of sympodia/plant and number of bolls/plant at harvest.

RESULTS AND DISCUSSION

Soil moisture content

In both years, soil moisture content was increased by all the mulches in 0-30 cm soil layer as a compared to control (Table 1). The maximum soil moisture content was recorded in black LLDPE

Table 1. Effect of different types mulches on soil moisture contet (%) in 0-30 cm soil layer

Treatments	1992-93						1993-94						Mean over 2 years
	At sowing	1 MAS	2 MAS	3 MAS	4 MAS	Mean	At sowing	1 MAS	2 MAS	3 MAS	4 MAS	Mean	
Black LLDPE mulch	20.8	19.6	21.8	19.4	17.8	19.4	18.4	20.1	20.6	19.0	18.2	19.5	19.5
Coir pith mulch	21.0	19.2	19.9	17.4	17.0	18.4	19.0	19.4	20.2	18.2	17.4	18.8	18.6
Organic mulch	19.8	18.6	19.2	17.0	16.3	17.8	18.6	19.1	19.4	17.8	17.1	18.4	18.1
No mulch	20.9	16.2	16.6	15.4	14.3	15.6	18.2	17.0	17.2	15.8	15.4	16.4	16.0
Rainfall (mm) during the interval of sampling	-	102.3	335.1	17.6	30.4	-	-	128.4	278.9	26.0	29.0	-	-

MAS : Month after sowing.

Table 2. Effect of different types of mulches on mean monthly soil temperature (°C)

Treatments	At soil depth (cm)	1992-93						1993-94					
		Sep	Oct	Nov	Dec	Jan	Mean	Sep	Oct	Nov	Dec	Jan	Mean
Black LLDPE mulch	5	29.3	30.4	30.3	31.5	31.4	30.6	31.0	29.3	30.2	30.0	30.4	30.2
	10	29.5	32.5	31.4	32.0	32.4	31.5	32.2	29.9	30.9	30.6	30.8	30.9
	15	32.1	33.4	31.8	32.0	32.6	32.4	32.3	30.0	30.9	30.9	31.4	31.3
	Mean	30.3	32.1	31.2	31.8	32.1	31.5	31.8	29.7	30.6	30.6	30.8	30.7
Coir pith mulch	5	28.2	29.2	95.5	30.8	29.8	29.5	29.4	29.0	29.8	29.4	29.6	29.4
	10	30.5	31.3	30.4	31.0	30.9	30.8	30.6	29.4	30.4	29.8	30.0	30.0
	15	31.4	32.6	31 4	31.9	32.0	31.9	32.1	29.8	30.5	30.8	31.4	30.9
	Mean	30.0	31.0	30 4	31.2	30.9	30.7	30.7	29.4	30.2	30.0	30.3	30.1
Organic mulch	5	27.2	28.6	29.9	29.3	29.4	29.3	28.6	28 6	29.4	28.9	29.0	28.9
	10	30.6	31.4	29.8	30.4	30.2	30.5	29.4	29.0	29.9	29.4	29.4	29.4
	15	31.9	32.2	31.0	31.4	31.8	31.7	31.9	29.7	30.0	30.6	31.2	30.7
	Mean	29.9	30.7	30.2	30.4	30.5	30.5	30.0	29.1	29.8	29.6	29.9	29.7
No mulch	5	26.7	27.5	27 8	28.5	28.4	27.9	28.2	27.5	28.6	28.4	28.5	28.2
	10	27.1	30.6	28 6	29.6	29.6	29.1	28.9	28.1	29.0	28.9	29.0	28.8
	15	30.0	32.0	30.7	31.4	31.2	31.1	31.2	29.4	29.9	30.4	31.0	30.4
	Mean	27.9	30.0	29.0	29.8	29.7	29.4	29.4	28.3	29.2	29.2	29.5	29.1

mulch during the period of crop growth in both years (19.5%) which has followed by coir pith (18.6%) and organic mulch (18.1%), whereas the lowest soil moisture content (16.0%) was observed in control. The higher level of soil moisture maintained in the black LLDPE mulched plot might be due to the fact that water that evaporates from the soil under plastic film condenses on the lower surface of the film and falls back as droplets. Chovaita *et al.* (1992) observed a positive ralationship between mulches and increased soil moisture content and the rate of depletion was minimum in black polythene mulch. The higher moisture status of the soil in the black polythene mulched plot may be due to reduction in evaporation and weed population.

Soil temperature

Significant increase of soil temperature at different depths due to mulching was observed (Table 2) in both years. The influence of mulching on soil temperature at 10 and 15 cm soil depth was higher as compared to 5 cm depth. The black LLDPE mulch had higher soil temperature (31.1°C) as compared to no mulch which might have been achieved by interception of the sunrays and hot air through its layer formed on the soil surface. The next best treatments were coir pith and organic mulch which increased the soil temperature by 3°C and 2°C respectively as compared to control.

Plant growth and kapas yield

Kapas yield, number of sympodia/plant, number of bolls/plant showed significant increase due to mulching which might be due to the availability of higher level of moisture (Table 3). The lower soil moisture in no mulched soil might have retarded the root growth and consequently reduced the uptake of dissolved nutrients (Chhangani, 1993). There was significant increase in kapas yield, number of sympodia/plant and number of bolls/plant in the black LLDPE mulch. The two years mean data on yield performance showed that black LLDPE mulch produced significantly higher kapas yield (673 kg ha^{-1})

Table 3. Effect of different types of mulches on yield attributes and yield of cotton

Treatments	Mean no. of symbodia $plant^{-1}$			Mean no. of bolls $plant^{-1}$			Kapas yield kg ha^{-1}		
	1992-93	1993-94	Mean	1992-93	1993-94	Mean	1992-93	1993-94	Mean
Black LLDPE mulch	6.0	8.0	7.0	6.4	9.2	7.8	604	742	673
Coith pith mulch	5.0	6.0	5.5	5.8	7.4	6.6	523	608	565
Organic mulch	5.0	5.0	5.0	5.1	5.8	5.8	428	590	509
No mulch	3.0	4.0	3.5	4.4	5.1	5.1	370	508	436
CD at 0.05%	0.75	1.65		0.40	1.48		66.79	88.32	

which was 19, 32 and 54 per cent higher over coir pith, organic mulch and control respectively. The higher kapas yield in black LLDPE mulch may be due to better conservation of soil moisture and nutrient availability. Similar findings were reported by Chovaita *et al.*, (1992) in *ber*. The next best treatment was coir pith which recorded a kapas yield of 565 kg ha^{-1}. Application of organic mulch was also found to increase the kapas yield considerably over control.

From this study, it may be concluded that mulching has got influence in improving the soil moisture content and maintaining higher level of soil temperature. Among different type of mulches, the black LLDPE mulch was found to improve the soil moisture content and increase the plant growth and yields of cotton under rainfed condition.

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COMBINING ABILITY STUDIES FOR FODDER ATTRIBUTES IN SWEET PEARL MILLET

A. LOGASUNDARI AND A.K. FAZLULLAH KHAN

School of Genetics
Tamil Nadu Agricultural University
Coimbatore 641 003

ABSTRACT

Ten sweet pearl millet genotypes were crossed in a partial diallel and the resultant 45 hybrids were evaluated for their combining ability for 10 different fodder attributes. The results indicated that juice volume, leaf-stem ratio, number of tillers and plant height were largely under the influence of additive genes. The characters, green fodder yield, dry matter yield, days to 50 per cent flowering, number of leaves, leaf length and crude protein were influenced equally by both additive and dominant genes. Among the parents, Co-7, ICMV 87111 and TNSC-1 were the best general combiners for green fodder yield, and dry matter yield. AFB-48-1 was found to be the best general combiner for crude protein. Among the hybrids AFB 48-1 x PCB 87-24, AFB 48-1 x HC-4 and APFB 2 x Co-7 were found to be the best specific combiners for green and dry fodder yield.

KEY WORDS : Sweet Pearl Millet, Fodder Attributes, Combining Ability

Pearl millet is gaining importance as a fodder crop in India of late, though such an use is widely prevalent in Australia, USA, Korea and other European countries for a very long time. In developing pearl millet varieties or hybrids with high forage yield coupled with high quality parameters, the choice of parents is of prime importance, together with their nature of combining ability, gene action and expression of heterosis. Recently a number of new sweet pearl millet genotypes with sweet juicy stalks have been introduced in Tamil Nadu and studied for their use in grain improvement (Jayaraman 1989, Karthigeyan 1994). The present study is an attempt in evaluating the combining ability of some of these sweet pearl millet genotypes for different fodder yield related traits so as to select the best parental lines for further fodder improvement.

MATERIALS AND METHODS

Ten different sweet pearl millet genotypes selected on the basis of their fodder quality attributes were crossed in a partial diallel during summer '94. The resultant 45 crosses were evaluated during *kharif* '94 in a randomised block design replicated thrice for ten quantitative fodder traits. Each genotype was sown in two rows of three metre length, with a spacing of 30 x 10 cm. At flowering eight different fodder attributes were recorded and the crop was harvested. The juice volume and crude protein content were recorded after harvest. The data were analysed by the