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ALBEDO AND TEMPERATURE EFFECTS OF MULCH MATERIALS

Mulch materials conserve soil moisture and regulate soil temperature. Different types of mulch materials such as tree leaves, coconut husk, saw dust etc are commonly used under perennial tree crops. The reflection coefficients of crops like oil palm and cocoa were reported to be 0.18 and 0.19 (Ling and Robertson 1982). Reduction in soil temperature up to 1° to 7° C at 5 cm depth by the use of mulch materials under coconut and banana was reported by Varadan and Rao (1983). The present study was taken to quantify the albedo of mulch materials available in this region and their effect on soil temperature.

2. The materials used in the study were coconut husk, coconut leaves, palmyra leaves, tree (*Eupatorium odarata*) leaves, saw dust, gravel, charcoal and lime. These materials were spread on one square metre area and albedo was observed using albedometer of Middleton Instt. Co., Australia. Lime was used at 200, 300 and 500 g per square metre. The thickness of spread of different materials are 5 cm except for lime where the quantities referred are spread uniformly with 2 mm sieve. Soil temperature at 5 cm was observed using soil thermometers. The period of observations was confined to dry summer, 1983. The soil temperature observations reported here were taken at 14.00 hr. The results of reflection coefficients were mean values of observations continuously taken with integrating recorders.

3. The albedo values and soil temperature at 5 cm depth are given in Table 1. Lime reflects 29 to 30 per cent of the incoming radiation. The differences in the albedo values for various rates of lime tested are not significant. Lime has the highest albedo value among the materials used for the study.

The mean albedo of coconut leaves, tree (*Eupatorium adarata*) leaves and palmyra leaves were 0.22 to 0.21 and that of saw dust and coconut husk were 0.25 and 0.20 respectively. Gravel has a value of 0.18 compared to bare soil with 0.20. The gravels which are mostly made of iron concretions has higher heat capacity and hence absorbs more radiation than bare soil. For purpose of comparison, the albedo of charcoal was also observed and its mean value was 0.12.

TABLE 1

Soil temperature and albedo values under different mulch materials

Materials	Albedo values at time (IST)									Mean albedo value (09-14) IST	Mean S.T. at 5 cm 1400 IST
	09	10	11	12	13	14	15	16	17		
Lime (500 g/m²)	0.206	0.257	0.298	0.344	—	0.266	—	0.387	0.389	0.31	—
Lime (300 g/m²)	0.357	0.316	0.209	0.311	0.315	0.298	0.276	0.319	0.295	0.29	—
Lime (200 g/m²)	0.333	0.294	0.280	0.235	0.240	0.290	0.294	0.347	0.292	0.29	—
Saw dust	0.325	0.256	—	0.239	0.259	0.254	0.241	0.279	0.168	0.25	31.4
Coconut leaves	0.198	0.214	—	—	0.201	0.217	0.214	0.265	0.230	0.22	31.5
Tree leaves (*Eupatorium odarata*)	0.209	—	—	0.197	0.216	0.169	0.183	0.265	0.230	0.21	33.3
Palmyra leaves	0.222	0.225	0.200	0.227	0.213	0.161	—	—	0.207	0.21	—
Coconut husk	0.222	0.203	—	0.197	0.205	0.177	0.192	0.238	0.194	0.20	35.2
Bare soil	0.301	0.262	0.200	0.206	0.208	0.201	0.178	0.136	0.133	0.20	36.7
Gravel (>2.0 mm dia.)	0.206	0.182	0.187	0.155	0.169	0.161	0.156	0.211	0.212	0.18	32.1
Charcoal	0.159	0.144	—	0.176	—	0.085	0.076	0.109	0.097	0.12	—

4. The soil temperature at 5 cm depth increases from 31.4° to 36.7°C with the decrease in albedo from 0.25 to 0.20 for the materials observed. The tree leaves and coconut husks retain higher soil temperature as compared to saw dust. It may be possible that saw dust having porous nature of packing over the soil loses most of the long wave radiation absorbed and hence maintains a lower temperature. In the case of gravel the heat absorbed may not be transmitted to the soil because of loose packing and discontinuity with the medium.

It may be concluded that characterisation of mulch materials for its reflection coefficients will be useful approach to evaluate their effectiveness as a soil cover.

5. The authors are thankful to the Executive Director and Head, Water Management (Agriculture) Division of the Centre for encouragement. The field assistance of S/Shri K. Lakshmanan and V. Sundararajan are thankfully acknowledged.

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10 July 1986