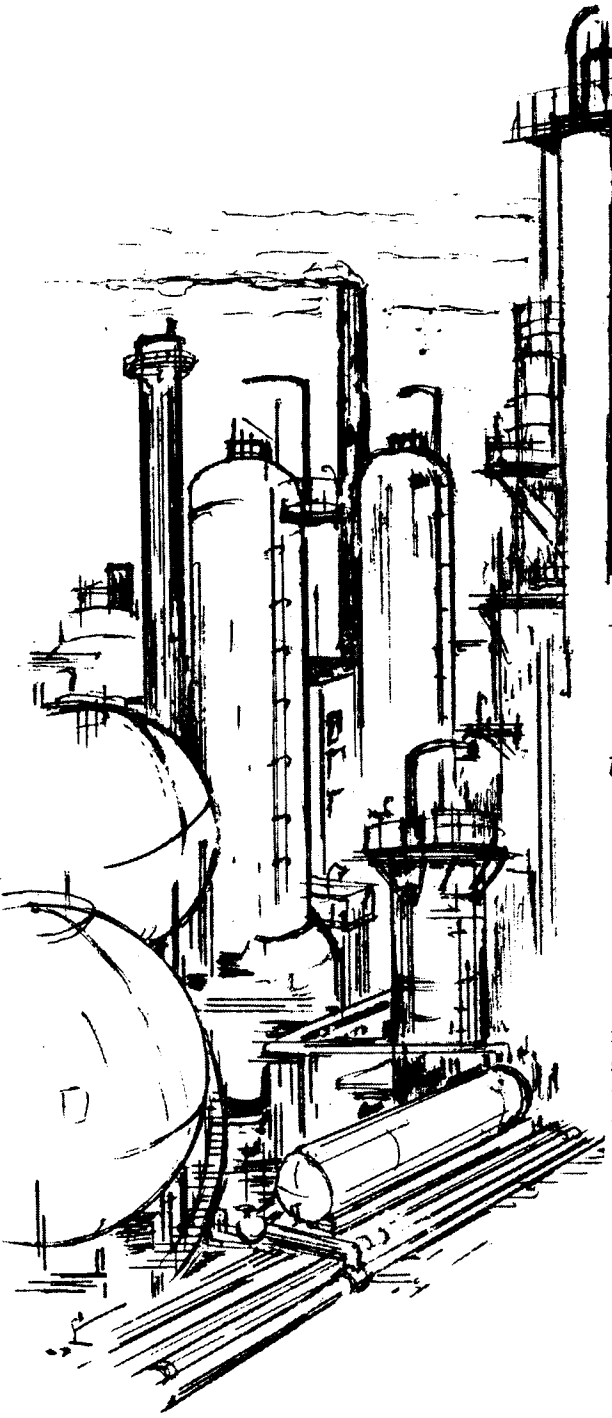

Petroleum Mulch

aids germination and stand establishment in preliminary vegetable crop studies

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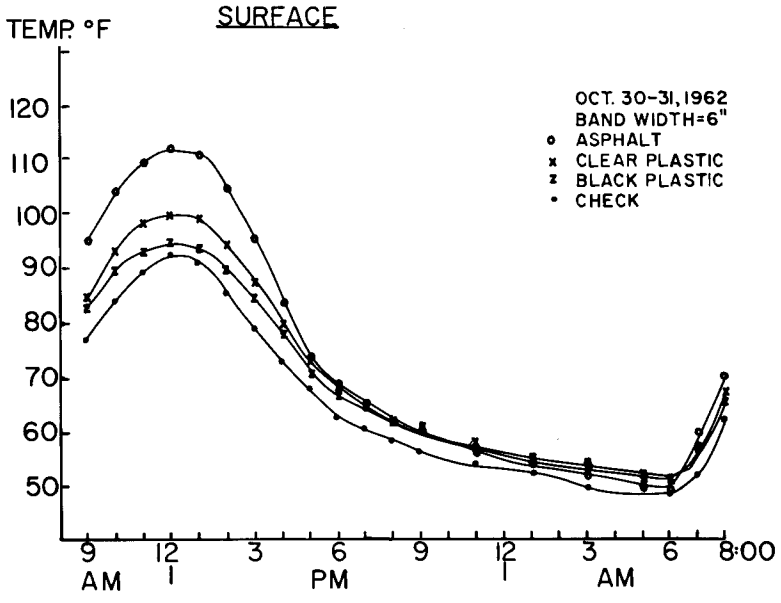
Soil mulching materials, ranging from plant debris to synthetic plastic films, have been used for years in agriculture to manipulate soil temperature, soil moisture and alter the physical structure of the soil. Application procedures, costs and availability of mulching materials are critical considerations to the grower. Relatively simple handling, application and disposal procedures possible with petroleum mulch offer definite advantages. Preliminary studies reported here indicate that petroleum mulch was beneficial in promoting early germination and establishing stands in a number of vegetable species.

PETROLEUM MULCH, formulated as a water emulsion of petroleum resins, is a dark-colored solution applied by spraying the soil surface in bands over the seed row. Upon drying, it forms a thin, black film becoming an integral part of the soil surface. The pliable texture permits penetration and emergence of seedlings.

The application and handling procedures for using petroleum mulch are relatively simple. Another advantage is that this film disintegrates within a period of several months, or it can be incorporated into the soil by cultivation, thereby eliminating manual removal.

Extensive studies were initiated in 1962 to gain information on the functional properties of petroleum mulch. The material was applied in variable

GRAPH 1. INFLUENCE OF MULCHING MATERIALS ON THE SURFACE TEMPERATURE OF THE SOIL.



band widths and compared with black and clear plastic films as to their influence on soil temperature and retention of soil moisture. The application of petroleum mulch was made at the rate of 3, 6, 12, and 24 gallons per 1000 linear ft. of row for 3, 6, 12, and 24-inch bands respectively.

Soil temperatures were measured with copper constantin thermocouples at the surface, under the mulching material, and at 0.75, 1.5, 3, 6, and 12-inch depths. Soil moisture was determined at 0–2 and 2–4 inch depths from soil cores sampled at three-day intervals.

Soil temperature

As shown by the data in graph 1, soil temperatures were higher under petroleum mulch than under either clear or black plastic films. Clear plastic film was superior to black plastic film and intermediate between petroleum mulch and the unmulched soil. The difference in response between petroleum and the plastic films appears to be a function of mulch-to-soil contact. Petroleum mulch forms a film in intimate contact with the soil, whereas the air spaces that develop under plastics may act as insulation.

As petroleum mulch band width increased, soil temperature increased markedly up to the 6-inch width, as shown in the table. The differences in soil temperature between the 6, 12, and 24 inch bands were small and for most practical purposes were insignificant.

INFLUENCE OF BAND WIDTH OF PETROLEUM MULCH ON MAXIMUM SOIL TEMPERATURE, OCT. 30, 1962.

Band width (inches)	Soil temperature[1] at various depths (in.)			
	Surface	1.5	3.0	6.0
Check	92	83	77	70
3	103	90	80	72
6	110	95	85	74
12	111	98	88	76
24	110	98	89	78

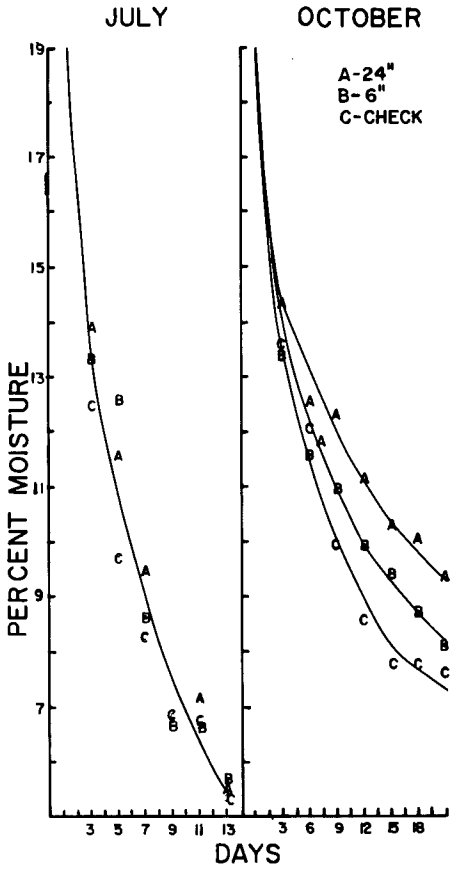
[1] Degrees F.

Conduction of heat into the soil with mulching material was appreciable to a depth of approximately 3 inches. Under a 6-inch band, soil temperature was increased by 12° at the 1.5-inch depth and by 8° at the 3-inch depth. Little increase in soil temperature was obtained below this depth.

Soil temperature responses by petroleum and plastic film mulches were largest during daylight hours. The loss of soil heat due to radiation was rapid during the evening with little retention of heat during hours of darkness.

Soil moisture

The effect of mulches on soil moisture retention was studied in July under rapid drying conditions and in October when the conditions for moisture loss were much less severe. Both clear and black plastic film retained soil moisture better than petroleum mulch or unmulched soils. In the July tests, the loss in soil moisture for the unmulched and petroleum mulched plots was rapid, dropping from 19% after irrigation to around 6% in 14 days. During the same interval of time the moisture content for the 12-inch plastic mulched plot dropped to 10% (graph 2).



GRAPH 2. INFLUENCE OF PETROLEUM MULCH ON MOISTURE RETENTION OF THE SOIL.

Studies made in October, 1962, indicate that some retention of moisture was obtained with petroleum mulches; however, the rate of moisture loss was greater than for the plastics.

Data obtained in spring trials at the South Coast Field Station and the Citrus Research Center in 1962 show that petroleum mulch was beneficial in promoting early germination and establishing stands in a number of vegetable species. Further studies are in progress to determine the effects of seasonal variation, soil types, and on the functional properties of petroleum mulch.

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Petroleum mulch EAP 2000 was supplied by Esso Research and Engineering Company, Linden, New Jersey, for these tests.

Test plots for comprison of petroleum mulch with other materials at Riverside.