

VEGETATIVE GROWTH IN SOILS CONTAINING CRUDE PETROLEUM

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The writer had occasion during the past year to make some investigations concerning the effect upon vegetative growth of crude petroleum oil mixed with soil. The occasion for the oil coming in contact with the soil was due to breaks in cross-country pipe lines which permitted some oil to escape to the surface of the ground and spread, or be carried by high water, and later backed over the lower lands. Investigations of the soil and crops said to be damaged by oil were made with a view to using the data in a land damage suit. There is plenty of evidence of the killing effect of crude oil when in contact with growing plants, but the writer was unable to get data on the damaging effect of varying amounts of crude oil which had been incorporated in the soil from any cause, and the following year this soil was prepared for growing a crop. It was claimed by one witness in the course of the damage suit that the soil was "killed" by the oil, whatever that may mean. It might be supposed the killing referred to meant destroying bacterial life in the soil and making it useless in further crop production.

VEGETATION EXPERIMENTS

Since no data bearing directly on this problem were available, it was thought to be worth while to carry on some vegetation tests to determine how much oil may be incorporated with the soil and not render it useless for crop production or kill all the bacterial life in the soil.

Plan of experiment

Unglazed earthen pots, holding about one gallon, were filled (8.8 pounds) with air-dry, sandy peat soil similar to that under litigation, and tests were run in duplicate. The oil was thoroughly mixed with the soil, only 5 drops being added at a time, and then well stirred. The soil was then wet with water containing soybean bacteria. After standing for 2 days soybean seeds were planted. Table 1 gives some details of their growth and maturity.

TABLE 1

Growth of soybeans in soil containing varying amounts of crude oil

POT NUMBER	OIL PER GALLON OF SOIL	TOTAL NUMBER OF PODS PRO- DUCED	TOTAL WEIGHT OF PODS	AVERAGE WEIGHT PER POD	NUMBER OF STALKS	NODULES PER STALK	DRY WEIGHT OF 3 STALKS	PER CENT OF OIL ADDED TO SOIL	OIL ADDED PER ACRE (2,000,000 LBS.)
	cc.		gm.	gm.			gm.		lbs.
1	Blank	40	14.0	0.35	3	25	25	0	0
2	5	39	16.0	0.41	3	20	26	0.12	2,200
3	10	32	12.1	0.38	3	30	24	0.25	4,400
4	20	33	12.5	0.38	3	28	24	0.50	9,000
5	30	84	38.0	0.45	3	108	61	0.75	13,400
6	40	35	14.0	0.40	3	48	26	1.00	18,000
7	50	33	12.5	0.38	3	48	24	1.25	22,400
8	60	32	13.0	0.41	3	96	23	1.50	27,000
9	70	25	8.0	0.32	3	29	14	1.75	31,400
10	80	18	4.5	0.25	3	23	15	2.00	36,000
11	90	31	10.0	0.32	3	32	26	2.25	40,400
12	100	15	5.0	0.33	3	12	9	2.50	45,000
13	120	15	4.3	0.29	3	30	9	3.00	54,000
14	160	3	0.4	0.13	3	7	8	4.00	72,000

DISCUSSION

It will be noted from the table that the growth of soybeans was apparently improved through the addition of small amounts of oil (30 cc. per gallon, 0.75 per cent) and that rather large amounts may be mixed with the soil (160 cc. per gallon, 4.0 per cent) before the soybean plant succumbs to the oil treatment. The damage seems to be due in part to the plant's inability to secure water rapidly enough to meet its needs.

It would appear from the table that a small amount of oil is even desirable in nodule development in the soybean plant as compared with the check pots, and where the amount of oil was increased to the extent of damaging the plant, there was still some nodule formation.