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RESULTS OF PETROLEUM PRODUCTS ON CROPS AND SOILS

B. B. Tucker and L. W. Reed

Extension Agronomist and Professor, Agronomy

Recently, a number of studies have been conducted to determine the influence of propane on plant growth. It was postulated that a hydrocarbon like propane might furnish energy for plant growth. Research work on the addition of propane to soils has been conducted in Illinois, Iowa, Nebraska, and Oklahoma. The Iowa tests were conducted on corn, the Illinois tests on corn and soybeans, the Nebraska tests on corn, sorghum, and soybeans and the Oklahoma tests on sorghums. The tests at the Panhandle Research Station, Goodwell were conducted on irrigated sorghums.

What Happens When Propane is Added to Soils

Propane is a hydrocarbon and its chemical formula is C₃H₈. When it is added to soil it is decomposed by biological action. Bacteria of many kinds attack the propane and use it as a source of energy. If sufficient nitrogen and moisture is present the bacterial population increases. The same type of reaction occurs when carbonaceous materials are added to the soil such as crop residues and manure.

It is possible that hydrocarbons added to soils can be indirectly responsible for improved plant growth, by causing improvement in the soil physical properties and perhaps release of plant nutrient elements.

Any hydrocarbon added to soils also results in increased nitrogen requirement. Bacteria utilizing the carbon for energy also need nitrogen. While organic residues, whether wheat straw, sorghum stalks, or propane are increasing bacterial populations, the available soil nitrogen is being utilized by the soil organisms and rendering it unavailable for plant growth. Therefore, the addition of any carbonaceous material or hydrocarbon to the soil increases the soil nitrogen requirement.

Results from Propane and Butane Applied to Sorghums

A summary of sorghum grain yields in 1967 as influenced by liquified petroleum gas and rates

of nitrogen application at the Panhandle Research Station is reported below:

Rate of Gas Gal/A	N Lbs/A	Grain Yield Propane	Lbs/A Butane	None
0	0			3741
0	120			7419
20	0	3422	3852	
20	120	7670	6969	
40	0	3124	3737	
40	120	6568	6768	
60	0	3595	2995	
60	120	7463	6824	

Research conducted by H. E. Reeves, J. P. Alexander and L. W. Reed

As the data indicates, all responses were due to nitrogen application and no yield increases or improvement in crop characteristics occurred as a result of propane or butane application.

Dr. R. A. Wiese, Extension Agronomist, University of Nebraska¹, summarized data from Illinois, Iowa, and Nebraska. Dr. Wiese's summaries were:

1. Treating corn and soybean fields with varying amounts of liquid propane failed to show increased yields over untreated fields in first-year experiments of Southern Illinois University.

2. Several experiments carried out by the Northern Gas Products Company with propane and butane at varying rates show likely yield reductions with post-emergence applications while pre-emergence applications had no damaging effects.

3. No corn yield responses from propane were obtained at 5 locations according to Iowa State University tests.

¹From Agronomy Views, No. 225, May, 1968. University of Nebraska Extension Service.

4. Very good corn yield increases were reported by the Northern Gas Products Company tests in 1965 at Oelwein, Iowa, and at Lexington, Nebraska. The 1966 test at Lexington, Nebraska, gave no yield increase. Reported results are variable.

5. Propane treatment of corn, sorghum, and soybeans showed no yield gains in University of Nebraska studies for 2 years at the Mead Field Laboratory.

From the data accumulated to date it must be concluded that; the addition of liquified petroleum products to soils results in no beneficial effects on crop production.

Results of Other Oil and Gas Products on Soils

When natural gas and oil penetrate soils invariably the area becomes devoid of vegetation. The length of time required for recovery depends upon many factors. The most important of which are: 1) amount of hydrocarbons in the soil, 2) kind of hydrocarbon material, 3) soil type and 4) reclamation treatments employed.

The concentration and depth of penetration of the petroleum product has a bearing on recovery. The hydrocarbon material must be oxidized and the rapidity of oxidation decreases with depth. Also the kind of material is highly important in length of time required for recovery. The lighter

oils such as distillates penetrate the soil more readily and seem to be more difficult to treat. Some oils (around oil fields) contain considerable quantities of salt water and this complicates reclamation efforts. The more coarse the soil texture the more rapid is reclamation usually achieved.

Treatments - No general prescription can be given for treating petroleum damaged soil due to the above factors, however, some generalized statements can be made which are common to all types of reclamation efforts.

1. Plant growth may be inhibited for a period of a few to several years.

2. Applications of large amounts of nitrogenous fertilizers helps speed decomposition of the hydrocarbons. Applications of barnyard manure induces large micro-organism populations, thereby speeding up decay.

3. Frequent stirring by tillage helps to speed oxidation and microbial activity.

4. After friability of the soil improves decreased stands are often noted for a few years.

Due to the wide variability in petroleum damaged soils each situation must be treated according to its needs, depending primarily upon the factors important to each particular case.