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Soil Conditioners Improve Plant Emergence

Chemical weed control in the Southwest could turn millions of acres into productive pasture

Soil tests combined with field test data give better insight to writing fertilizer prescriptions

DALLAS.—Sodium carboxymethylcellulose (CMC) improves some physical properties of Ohio soils and increases plant emergence, reported G. S. Taylor of Ohio Agricultural Experiment Station and P. E. Baldridge, Ohio State University, at the annual joint meeting of American Society of Agronomy and Soil Science Society of America here Nov. 16 to 20. Increasing the substitution of sodium carboxymethyl groups from 0.32 to 1.28 per molecule resulted in greater soil aggregation, increased hydraulic conductivity (ability of saturated soil to transmit moisture), and larger plastic limits. Varying the rate of CMC up to 0.5% concentration significantly increased these soil characteristics. A liquid application of CMC sprayed on seedbeds containing soybeans, sweet corn, and radishes increased total plant emergence. At the end of one month sweet corn on treated plots was several inches taller and had a greener color than plants on untreated soil. Greater plant emergence is apparently related to reduced mechanical impedance and to better air and water relationship.

Nutrient content of crops grown on soils treated with a representative soil conditioner was affected significantly in greenhouse experiments reported by W. H. MacIntire, University of Tennessee Agricultural Experiment Station. Dr. MacIntire says the conditioner benefits plant response. Experiments were conducted on red clover and millet in seven silt loan soils, limed and unlimed, using upper and full depth placements of the conditioner at various rates—0.02, 0.05, and 0.10%. As a general trend, addition of the soil conditioner decreased both calcium and magnesium content and uptake and substantially increased the uptake of potassium and sodium. On the Clarksville soil used, the rate or placement did not significantly affect plant response, phosphorus content, or phosphorus uptake. In most cases, however, calcium content decreased, while potassium and sodium content of the vegetation increased with increasing rate of the conditioner. Magnesium content was not affected greatly by either the rate or placement.

J. C. Willard (right) of Ohio State, new ASA president, presents the Stevenson awards of $500 each. J. B. Page (left), Texas A&M got the soils award and H. H. Kramer of Purdue took the crops award

According to W. S. Chepil of USDA, Krilium is beneficial for producing good soil tilth and for increasing soil permeability. Both of these characteristics tend to reduce erosion by water and increase crop yields. Wind erosion is an entirely different matter. VAMA, a modified vinyl acetate–maleic acid compound, formed water stable aggregates to help prevent water erosion in soils tested at Kansas State College, but most of these aggregates are small enough to be readily erodible by wind. Soils treated with VAMA were loose and friable and had a granular surface. Untreated soils were more or less cemented together with a distinctly developed surface crust, which resists wind erosion despite its otherwise unfavorable characteristics. HPAN, a hydrolyzed polyacrylonitrile, was also ineffective in preventing wind erodibility.

HPAN increased the ability of soil to produce available nitrogen when applied with alfalfa residues, said T. M. McCalla of USDA. Applied with straw or without crop residues, HPAN's effect on nitrification rate is slight. McCalla applied HPAN with about 4% organic matter to Sharpsburg silty clay loam at varying rates—0.02, 0.1, 0.2, and 0.4%. "We incubated the samples at optimum moisture and temperature (75° F.) for two, four, eight, and 12 weeks," he stated. When alfalfa was mixed in the soil with HPAN, nitrate production increased at the eight- and 12-week intervals. A slight increase in nitrate production occured after eight and 12 weeks when straw was applied to the soil with HPAN. No measurable increase in nitrate production occurred with HPAN in the absence of residues.

Weed Control. Brush-choked land in the Southwest can be converted into productive pasture simply by removing the brush, indicated Harry Elwell, USDA. Practically all brushy land grows some bluestem, Indian grass, and

other native grasses, he said. Once the scrub oak, persimmon, and other brush are removed, the grass thrives, spreads, and soon is able to support far more livestock than before. Selective herbicides are the safest way of doing the job, he said. As a foliage spray, low-volatile ester formulations generally give the best results; they should be applied when the plants are approaching full leaf. They are also the most effective herbicides for basal-bark treatment; promising results, however, were obtained with CMU. An ester formulation of 2,4,5-T is the best for treating stumps.

Weeds in the Brazos Valley cotton fields can be controlled successfully with chemicals, announced Homer Rea, Texas Agricultural Experiment Station. Lateral postemergence applications of several oils (Lion 1, Esso 38, Lightfoot 23) give excellent control of seedling grass and annual weeds when less than three inches in height, without injury to cotton plants. Pre-emergence treatment with formulations of DNOSBP gave poor control, he said. Some of the same formulations, however, are excellent as contact herbicides for use on weeds and grasses late in the season. Careless weeds 18 inches or less in height were killed by lateral applications of Alanap 1 and 5. Foliage sprays of the former killed cockle burs on noncultivated areas. Fall applications of TCA eradicated Johnson grass rootstocks in infested fields without injury to the succeeding cotton crop. Repeated applications of Esso 38 and NoHo to the exposed crown of Johnson grass were excellent for controlling scattered infestations.

According to D. W. Staniforth and A. L. Bakke, Iowa State College, applications of 2,4-D to soil shortly after corn planting permit a delay of the start of cultivation and greatly increase efficiency of later cultivations. Staniforth and Bakke applied ester-type 2,4-D shortly after corn planting at rates of one and two pounds of chemical per acre. Based on five years' results, they said the weed killers slow germination and early growth of the grass seeds. Corn grown on plots receiving the chemical treatment and delayed cultivation produced yields equal to or greater than those of corn on ground not treated and cultivated early. In many cases, corn on treated plots approached the yields of weed-free plots. Where moderate to heavy rains followed application of 2,4-D some damage to corn roots in sandy soil resulted at the two-pound rate. There was no damage to roots for either rate on other soils. Treatments applied eight to 10 days after the corn came up gave good control, but often reduced corn yield.

Transportation of enough 2,4,5-T from the leaves to affect the sprouting tissues on the underground stems largely determines the effectiveness and economy of controlling the spread of mesquite.

Paul Truitt (left), president of the American Plant Food Council, and Gerald Metcalfe (right), student activities chairman, present the National Agronomy achievement award to D. L. Nitzel, who received it on behalf of the University of Nebraska chapter of the Klod and Kernel Club

C. E. Fisher of Texas A&M says the chief factors which influence translocation include the stage of plant growth, plant condition, type of growth, soil type, and the amount of chemical applied per acre.

Soil Tests. Soil tests do not give all the answers needed to plan a fertilizer program. Tests reveal only the amount of different plant food elements present, and do not tell how much a crop can digest. This warning came from Emil Troug, K. C. Berger, L. E. Engelbert, and A. E. Peterson, University of Wisconsin. In 1952, these experts wrote fertilizer prescriptions for 173 Wisconsin corn fields. Those fields averaged 125 bushels per acre. They hastened to add that it isn't merely a matter of learning how much of the food elements are in the soil, then adding the remainder a crop needs in the form of fertilizer or manure. In one crop year corn can take up only 30% of the total nitrogen and phosphorus and about half the potassium from manure. About 60% of the available nitrogen in fertilizer can be used, but only 30% of the available phosphorus, and half the available potassium.

Applications of some phosphate fertilizers accumulate at higher levels of availability in the soil than others. And the amount remaining in available form in any year is greater. These findings were reported by John Pesek and J. R. Webb of Iowa State College. Superphosphates and calcium metaphosphate left more available phosphorus in the soil than did rock phosphate and fused tricalcium phosphate. Ordinary superphosphate, concentrated superphosphate, and calcium metaphosphate seemed to have an equal effect upon the residual level of available phosphorus and the yield of oats at Ames, Iowa. Fused tricalcium phosphate compared favorably on acid soil but was less effective on a calcareous soil in western Iowa. Rock phosphate applied at equal or higher rates was less effective, they reported.

Soil microorganisms selectively absorb ammonium nitrogen and reject nitrate nitrogen when both are available, reported S. L. Johnson, M. J. Hallan, and W. V. Bartholomew, Iowa State College. This discovery was made by the use of tracer techniques with nitrogen-15. Three nitrogen fertilizer compounds were added to oat straw before decomposition: ammonium nitrate, sodium nitrate, and ammonium sulfate. When ammonium nitrate was supplied, the ammonium was used and the nitrate rejected as long as the ammonium supply was adequate. However, the organisms adjust their appetites and consume nitrate when it alone is supplied as sodium nitrate. The ammonium form of nitrogen led to most rapid decomposition in separate tests with sodium nitrate and ammonium sulfate. Where equivalent amounts of nitrogen were added as sodium nitrate and ammonium sulfate to the same straw samples, little nitrate was used, while the ammonium was used rapidly. Ammonium and nitrate nitrogen should not be considered equally available to plants and to microbes.

Fungicides Preserve Hay. Chemicals that kill fungi have definite possibilities for preserving moist hay in storage, but no cheap and safe fungicide has been developed to date, reported W. K. Kennedy and R. U. Schenk of Cornell University. The most promising chemical so far in stopping mold growth in moist hay is 2,4,6-trichlorophenol. Storage losses are minimized and mold growth is prevented when hay is sprayed just prior to raking. Experiments show that treated hay is palatable to dairy cattle and is not injurious when fed, but residue problems and high cost prohibit general use at this time.