were detrimental to infiltration both on the initial run and the rerun. The rerun pattern suggests that the wetting agent dissolves in water to create a situation similar to the initial solution. The decreased infiltration on the untreated sand was probably a result of reduced surface tension, which was not overcome by a more favorable contact angle since water wets sand at a fairly low angle.

On the treated sand, the wetting agents increased infiltration, especially on sand treated to be least wettable. In these cases, the decreased surface tension effect was surpassed by the creation of a more favorable contact angle. The rerun on treated sand resulted in even better infiltration than the original. This indicates that if some of the wetting agent did dissolve in the added water, the surface tension was not reduced to that of the original solution, and the wetting agent had a favorable effect on the surface, reducing the contact angle.

These results show that much depends upon the contact angle between the soil and water, and that wetting agents are most likely to be beneficial when the surface is hydrophobic. Further studies of contact angles existing under natural conditions should indicate whether widespread use of wetting agents to promote better infiltration of irrigation water would be practical.

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SOIL NUTRIENTS after BRUSH BURNING

Tests with greenhouse plants show that burning increases supply of nitrogen, phosphorus, and sulfur in soil

J. VLAMIS • K. D. GOWANS

A program of brushland conversion from chaparral cover to the more useful cover of grass and clover has been in progress in California for several years. In many situations, prescribed burning is used to accelerate brush disposal. Because of the hazards involved, prescribed burning is performed under specified conditions of temperature, humidity, season of the year, and with approved fire-crew supervision.

Burning the vegetative cover of brushland increases the soil supply of nitrogen, phosphorus, and sulfur available to subsequent vegetative types more suitable for livestock grazing.

Greenhouse pot tests with Romaine lettuce and Atlas barley as indicator plants were conducted to determine the effect of broadcast brush burning on the nutrient supply of a soil as measured by plant growth.

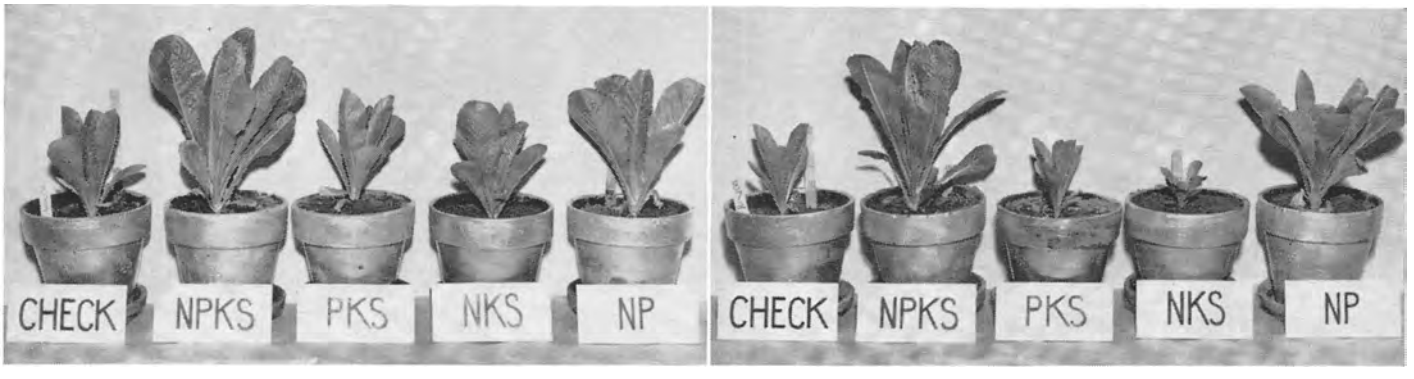
The soil tested was a Parrish loam taken from the east slope of the Coast Range in western Tehama County at an elevation of 1,700′ where the average annual rainfall is about 30.″

The Parrish soils, developed from hard sedimentary rocks, have brown, slightly acid, medium textured surface soils, and reddish brown, slightly to medium acid, fine textured subsoils. Parrish soils are 2′–3′ deep and occur on hilly to steep foothills with a dense stand of shrubs. The area sampled supported a dense cover of chamise and buckbrush about 6′ high. The soil samples were collected shortly after an autumn burn. Test soil was taken from an 8″ depth in the burned area and check soil was taken from an unburned area located about 200′ distant but similar to the burned site in soil, slope, and vegetative cover.

The soils were sieved and put into painted 6″ pots holding 1,600 grams of soil each.

A check series of pots was set up to measure the inherent fertility of the soil. Appropriate chemicals were added to other pots to give a complete treatment containing nitrogen, phosphorus, potassium, and sulfur. Further treatments omitted one nutrient at a time to measure the soil supplying power for each element

Lettuce growth on Parrish soil sampled from (left) burned, and (right) unburned areas.



in the presence of adequate amounts of the others.

Romaine lettuce, planted three in each pot as 21 day old seedlings, and Atlas barley, planted as seed and thinned to five plants per pot, were selected as the test plants. The plants were irrigated with distilled water and grown for six weeks before they were harvested, ovendried, and the dry weights taken.

When tabulated, the average dry weights of plants from the control soil indicated distinct deficiencies of nitrogen, phosphorus, and sulfur. The deficiencies were shown by poor growth on the check soil and on the treated soil when one of the nutrients was omitted. The treatments which received the combination of nitrogen, phosphorus, and sulfur gave satisfactory yields and produced plants healthy in appearance. The addition of potassium seemed to make no difference.

Test soil from the burned area also showed deficiencies of the same three elements but of a much smaller magnitude. The ratio of the dry weights from the burned soil to the dry weights from unburned soil was greater than one in each case, indicating that the effect of brush burning was to increase the supply of nitrogen, phosphorus, and sulfur.

Undoubtedly the potash also was increased but would not be shown by a growth test on the Parrish test soil which is well supplied with potassium.

Some of the stimulating effect of burning is attributed to increased nitrogen and phosphorus in the soil. Also, the supply of sulfur was found to be greater as a result of the burn.

The unburned soil was acutely deficient in nitrogen, phosphorus, and sulfur as indicated by both lettuce and barley since the yield where nitrogen, phosphorus, and sulfur were added in combination was substantially higher than each case with one of these elements missing.

From these and other studies it is apparent that burning a vegetative cover releases a measurable amount of nitrogen, phosphorus, and sulfur to the soil. This is bound to have a stimulating effect on the succeeding crop, especially where the soil was initially deficient in these nutrients.

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The addition of fertilizers to a soil directly following a burn may be unnecessary and application of fertilizer would be more useful the following year, when the stimulating effect of the burn has worn off and the soil is returning to a lower fertility level.

Results of these pot tests with the Parrish loam indicate that on the unburned area applications of nitrogen, phosphorus, and sulfur would be needed for maximum growth of lettuce and barley. However, after the burn, the lettuce responded to both phosphorus and nitrogen, whereas barley responded primarily to nitrogen.

Because grasses, rather than lettuce, would be grown on this soil, the prognosis given by the barley plants probably would be more applicable. Therefore, this situation would appear to call for a light nitrogen application following a burn even though soil supplies of nitrogen, phosphorus, and sulfur available for plant growth are increased following a burn.

BRIEFS

short reports on current agricultural research

CITRUS VIRUS DISEASES
other than tristeza and psorosis.

Several virus diseases destructive to citrus — including exocortis, cachexia, xyloporosis, stubborn disease, and vein enation—have been found widely distributed in California in the past decade. After years of careful indexing, some citrus clones were found apparently virus-free and some were found carrying single viruses. Such clones are used in current studies on the effects of single and multiple virus infections, at several locations in California.

Research objectives are: more basic information on citrus viruses, on their sources and means of distribution, and on the diseases they cause; improved methods for virus detection; determination of virus susceptibility and tolerance of citrus varieties and scion-rootstock combinations; and acquisition of citrus selections free of all known viruses.

Several citrus selections which are apparently free of viruses are now being grown experimentally. After adequate trials, promising selections will be released to the citrus industry, as primary sources of propagative materials by which most virus diseases will be avoided. Vein enation and tristeza, carried by aphid vectors, can not be prevented in this way.—*E. C. Calavan, Dept. of Plant Pathology, Riverside.*

SHELL BARK
of lemon trees

The recent discovery that exocortis virus is associated with shell bark of lemon trees opens up the possibility of controlling shell bark in future plantings by using exocortis-free planting stock.

Current long-term studies on shell bark are designed to determine: the cause of the disease—especially the role of exocortis virus in its incidence and development—and possible means of spread; tolerance and susceptibility in commercial lemon strains, including exocortis-free nucellar lines; and the importance of inheritance and bud selection.—*E. C. Calavan, Dept. of Plant Pathology, Riverside.*

WATER USE BY RICE
studied in tanks

Evapotranspiration of water from a Caloro rice crop growing on Stockton clay adobe, gray phase, during a 160 day season, from date of flooding to harvest, was between 2.8 and 3.0 acre feet in a two-year study near Richvale.

The study was made in a commercial type rice field with 150 pounds of seed and 40 pounds of nitrogen as ammonium sulfate per acre applied by air. Weekly water loss measurements were made in metal tanks buried in the field prior to sowing, fertilization and flooding. Rice growing in the tanks yielded the same as the surrounding field.

However, the water requirement for field production of a rice crop always exceeds three acre feet because of water volumes required to balance percolation losses downward and laterally and water spilled at the outfall weir.—*Franklin C. Raney, Dept. of Irrigation, Davis, and Dwight C. Finfrock, Dept. of Agronomy, Biggs Rice Expt. Sta.*