Gypsum in Irrigation

effective use governed by application and ratio of salts in the water

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Certain types of irrigation water may be harmful eventually to plant growth.

One of these types constitutes an unfavorable sodium-calcium ratio which may cause a sealing of the surface soil preventing the water from penetrating into the lower root zone. This dry condition results in wilting of the plants between irrigations. Even if wilting is prevented by frequent irrigations, the growth of the plant is somewhat retarded due to the limited volume of wet soil from which plant nutrients may be absorbed.

Well water, or underground water, contains minerals in varying proportions, depending upon the type of material through which the water percolates. If the minerals dissolved are in the form of calcium and magnesium salts, the water is known as hard water, and common soaps do not form suds in it readily. This type of water usually is considered good for irrigation purposes, as only occasionally do the calcium and magnesium salts reach a concentration toxic to plant growth.

On the other hand, the so-called soft water may come from either of two sources: (1) rain water that contains very few minerals, which usually will include runoff waters from melting snow or excessive rains which have not had sufficient contact with soil or rock to dissolve appreciable quantities of minerals; and (2) water containing a high percentage of sodium salts. These salts may reach a concentration toxic to plants, but even at low concentrations they cause deterioration of the soil structure, and with their continued use the surfaces of all but extremely sandy soils will seal and prevent the wetting of deeper layers. To counteract this condition, gypsum is applied to the land, and in some localities it is a general practice to apply one to 15 tons per acre.

A study was made with irrigation waters of low salt content, but with most of the salts in the form of sodium, in an area of extremely low infiltration rates. In other words, the rate of water intake by the soil was very slow. Even with half-mile furrows and small flows, a large percentage of the irrigation water was run off at the lower end of the field.

A large number of infiltration tests were made by continuously dissolving varying quantities of gypsum in the irrigation water. Upon adding the gypsum, the irrigation showed only a small increase but continued to increase with succeeding irrigations, and gave an over-all increase of 40% to 160% over the untreated irrigation water. This work was carried on over a number of soil types but the principal ones were Delano, Hesperia and Madera sandy loams.

The infiltration rate of the high sodium waters can be increased by dissolving gypsum in the water. The addition of calcium in the form of gypsum decreases the proportion of sodium salts to the total salt content. Only a small quantity of gypsum is required as compared to amounts customarily applied directly to the soil.

Application

Direct application to the soil should be beneficial for the first few irrigations early in the season. While being effective in increasing penetration of water, the gypsum will be dissolved and leached from the bottom and sides of the furrows. After dissolving and removing the gypsum from the surface of the furrow, the high per cent sodium water again will cause this soil to seal and prevent deep percolation.

Even though the mass of soil between the furrows contains large quantities of gypsum, it will be of little use in preventing sealing adjacent to the furrows. To increase infiltration, it will be necessary to rework the soil and refurrow the land to bring soil containing gypsum in contact with the water.

Gypsum applied directly to the land should be a pulverized dust. Coarse, lumpy gypsum, even the size of a pea, is not as effective as the finely ground material. Gypsum is slowly soluble in water and the coarse, lumpy materials do not dissolve sufficiently to be very beneficial. When lumps of gypsum are plowed up several years after application, they have not been active in promoting penetration of water.

Gypsum dissolved in irrigation water containing a high percentage of sodium before the water reaches the irrigation furrow corrects the trouble at its source. This should be more economical and efficient than adding large quantities of gypsum to the land.

Quantities

The correction of high sodium water is limited to relatively low salt concentrations. A high total salt and high sodium percentage require a large amount of gypsum to make the correction. Difficulty will be experienced in dissolving the gypsum at these higher concentrations and the cost of such large quantities will be high.

It is desirable that a water analysis be made before the addition of gypsum is made a common practice. The analysis should show both the amount and the percentage of sodium present in the water. This will prevent the use of excess gypsum, and make it possible to calculate the gypsum required to reduce the sodium percentage a definite amount.

A grower with a water penetration problem should consult the local farm advisor as to whether the area is suspected of having a high percentage sodium water; for advice on the soil conditions and analysis of the water; and the quantity of gypsum to apply in the case of a water high in sodium.

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PEARS

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breakdown in fruit after midharvest season was observed. During the past season's trials, the napththaleneacetic acid spray was considerably more effective than one and two ppm of 2,4-D.

The results of the low concentrations of 2,4-D sprays upon ripening and early breakdown were less marked and inconclusive but in one of the three orchards late picking of the sprayed fruit showed considerably more breakdown after 30 days in storage than did the unsprayed.

Somewhat more breakdown occurred in pears sprayed with the solution of two ppm than those sprayed with half this concentration.

No significant differences appeared in the results from the use of the three forms of the 2,4-D used.

At least another year's work is regarded as necessary before any recommendations are justified for the use of 2,4-D on Bartlett pears.

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