

Home Course In Modern Agriculture

IV.—Water In Its Relation to Plant Growth

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We have already learned something of the value of water as a plant food. This is only one of its minor uses, however. In addition to the water which is decomposed by the plant and used in making starch and other products, many times as much is used for other purposes. One of the principal of these is dissolving plant food and carrying it upward to the leaves. After reaching the leaves most of the water is evaporated, leaving in the leaf cells the materials which it brought up.

The cells of which the leaves are made are very delicate and depend for their stiffness on the water which they contain. Without this water they would collapse in the same way a bicycle tire does when the air is let out.

This is the very thing that happens when the leaves wilt. The rise of water from the roots has been checked in some way, and as evaporation still continues the leaf cells become partly emptied and shrink up.

The leaves are not entirely helpless at such a time, however. On each side of the tiny pores on the underside of the leaf is a cell known as a guard cell. When the supply of moisture begins to fall, these guard cells shrink up and in doing so close the openings, thus checking evaporation. In some plants, like corn, the leaves curl up at such a time, thus still further lessening the rate of evaporation. Of course when a leaf is wilted in this manner the work of building up plant tissues is seriously checked. This often happens during the dry weather of July and August, when the soil becomes so dry that the roots have difficulty in obtaining the needed moisture.

The checking of development which results often reduces the yield of corn as much as twenty to thirty bushels per acre and that of other crops in proportion. For every pound of dry matter in a mature plant from 300 to 500 pounds of water have been brought up by the roots and evaporated from the leaves. One of the most important factors in the production of a plentiful water supply within easy reach of the roots.

There are three classes of water in the soil. The first is known as ground water and is that water which collects in a hole dug in a wet soil or runs off through the tile in drained land. The second is the capillary water and is that which is left between the soil particles after the ground water has been drawn off. The ground water is affected by gravitation, while the capillary water is not.

If a sample of soil that looks perfectly dry is placed in an oven and heated for some time it will be found that it has lost considerably in weight, owing to moisture being driven off. This is the third class, or hydroscopic moisture. This, of course, is of no value to the plant, since the roots cannot extract moisture from an air dry soil. Neither can they use the ground water. This is really a damage in the upper two or three feet of soil, since it so fills the spaces that the roots cannot get enough air.

During a rain the ground water passing through the soil draws considerable air with it. As soon as the

comes when a sudden dry period follows a few weeks of excessive rainfall. The abundance of moisture during the early part of the season has kept the plants from sending their roots down very deep. When dry weather does come, the soil bakes and cracks and evaporation goes on very rapidly. This, together with the demands made by the plants, lowers the water table so rapidly that root growth cannot keep pace with it. As a result the capillary moisture within reach of the roots is not replaced as fast as it is used, and the growth of the plants is seriously checked.

Fields with a clay subsoil withstand dry weather much better than those with a subsoil of sand or gravel. The latter, because of their looser texture,



FIG. IX.—COVERING THE TILE DITCH.

allow the water to filter down out of reach instead of retaining it for future use, as do the clay soils.

The farmer cannot influence the amount of rainfall, of course. After the rain has fallen, however, it belongs to him to do with as he sees fit. The way he handles it from this time on determines to a large extent the size of the crop he will harvest when fall comes.

The first problem is to get rid of the surplus ground water quickly, and the second is to waste as little of the capillary water as possible. An endeavor should be made to lower the water table to three or four feet below the surface as soon as possible after each rain. If this can be accomplished in two or three days the growth of the crop will be interfered with very little.

A few soils are so well drained naturally that little artificial drainage is necessary. On almost any farm there are hills and ridges where the natural drainage is sufficient. The hollows between these elevations, however, and all the flat fields will yield much larger crops if tiled.

The distance a line of tile will "draw" is in sandy soils often as far as 100 feet on each side, while in heavy clay soils it may not be more than sixteen feet. This distance is also affected by the depth of the tile. The deeper they are placed the farther they will draw. Tile are usually placed at an average depth of about three feet, though in many instances four would be better.

The extra cost of digging the ditch a foot deeper is something of an objection, but is balanced by the fact that the lines of tile do not need to be as close together. Deep tile are not as easily displaced by freezing, and a deeper feeding ground for the roots is provided.

A mistake made more frequently than that of not putting the drains in deep enough is that of using too small tile. The character of the soil, the fall and the amount of surface drained are the factors which largely determine the proper size to use. Almost every book or bulletin of tile drainage gives tables for figuring the size of the tile required under various conditions. If there is any doubt it always pays to get a size too large rather than a size too small, even if the cost is a little more.

It is usually better to let the job of tiling to a contractor rather than to attempt to do it yourself. There are reliable men in almost every locality who can be depended upon to lay the tile to grade and do a first-class job in every particular. Only the hard-baked tile should be used. These will last for a lifetime or longer if properly put in. When the tile are within fifteen or twenty feet of trees the joints should be cemented. Otherwise the tree roots will find their way through the joints and fill up the drains to such an extent that the flow of water will be cut off.

The most important part of a drainage system is the outlet. The tile should empty into a stream if possible. Water should not be allowed to stand over the mouth of the outlet if it can be avoided, as this checks the current and causes the drain to partly fill up with silt, thus reducing its capacity just that much.

With a thorough system of tile drainage in good working order the problem of getting rid of surplus water is solved. Tiling also helps to solve the problem of lack of water. The roots go down so much deeper in a tiled soil that they are in position to withstand a drought better than if they were a foot or two farther above the water table. Removing the surplus water by drainage also hastens the watering of the soil in the spring.

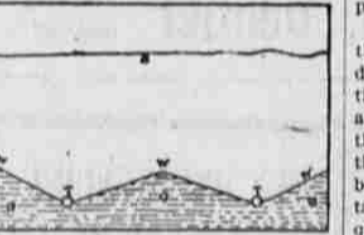


FIG. VIII.—HOW TILE DRAINS AFFECT THE WATER TABLE.

(A, surface of the ground; W, water table; G, ground water; T, tile drains.)

soil becomes saturated, however, so that the water is no longer moving, the air soon becomes used up, and the crop will turn yellow and cease to grow. The remedy, of course, is to provide drains to remove the ground water quickly.

The only kind of water which the roots can use is the capillary water. When this is present in the right amount, it fills about half of the spaces between the soil particles. The rest are filled with air. The water easily dissolves plant food from the soil grains which it surrounds. Thus the two essentials for rapid root development, air and plant food, are present in the proper amounts and in a readily available form. As fast as the water is taken up by the roots more is brought up by capillary from the supply in the subsoil in the manner noted in article No. 2.

The place where the capillary water joins the ground water is called the water table. If this water table is too high, the feeding ground of the roots is greatly restricted, since they cannot go below it. If, on the other hand, the water table is too deep, capillary cannot bring the water up as fast as it is used by the roots.

In dry weather the water table lowers rapidly, but the roots are also growing downward at the same time. The greatest damage from drought

Canby and Southern Clackamas

CANBY.

Several of the Canby boys went to the dance Saturday evening out near James Adkins' mill.

Mrs. Martin returned home from McMinnville and Oregona Friday, where she had been for some time. She was accompanied by her granddaughter.

Mr. Wang made a business trip to Portland the first of the week.

Saturday evening while Mr. and Mrs. Ed Bradt were at the latter's parents home for supper, their house was broken into. The intruders climbed through the back window and nearly every drawer in the house was gone through. Nothing was taken except a bracelet. It is probable that the thieves were frightened and the bracelet was thrown away as it was found by Arthur Seaton. Mrs. Bradt was told who found it and described her property.

E. Davenport visited his parents over Sunday.

William Gilmore left Monday for Washington, where he expects to spend the summer.

Victor Carothers assisted by some men of Barton, shipped a car load of tea from New Era Monday.

Mrs. Stillwell went to Portland Tuesday and expects to spend a few days.

Ruby Smith was an Oregon City visitor Sunday.

Mrs. Coleman was a Canby visitor Monday.

Mr. and Mrs. W. H. Bair were Woodburn visitors Saturday and Sunday, and while they were gone they had visitors. On Saturday evening some one broke into the house and turned things up-side down but did not take anything.

Robert Coe, of Portland, was in Canby on Sunday and took his family home with him, who have been visiting with Mr. and Mrs. R. S. Coe.

Everything is in readiness for the poultry show to be given in the Knight building opposite the depot, under the auspices of the Clackamas and Marion County Association. An admission of County Association. An admission of 15 cents will be charged for adults, and 10 cents for children. Premiums and ribbons will be awarded by the Judge, Elmer Dixon, of Oregon City, on Friday morning.

Mark Robbins has returned from Arizona, and has brought with him some of his fast horses, which are at present in McMinnville. It is probable that Mr. Robbins will purchase property in Canby and use the race track on the fair grounds. Before going to Arizona he owned a farm at Marquam, but disposed of that before leaving.

George Knight went to Portland on business Tuesday.

G. W. Kesseling and R. S. Coe were among the Oregon City visitors on Tuesday.

C. N. Wait was in Oregon City on a business trip Wednesday.

Mr. and Mrs. A. Kocher were in Portland on Tuesday.

Millard Lee, the promoter of the Canby Canal company made a business trip to Oregon City Tuesday.

Notice.

Beginning February 1, 1909, the Photograph Studio will be open daily except Tuesday and Thursday of each week. C. W. DAMM, Canby, Oregon.

NEW ERA.

Joseph Sevelk, Jr., was a Portland visitor Tuesday.

Miss Laura Eiken, of Oregon City, came home Friday, returning Sunday.

C. G. Tall, Henry Gilbertson and Bernard Berg, were visiting in Portland Sunday.

Mrs. Lindahl, of Woodburn, was visiting Mrs. Quint Sunday, Mrs. An-

CANBY.

visitor Tuesday.

Robert J. Brown has sold his 275 acre farm to a Mr. Riverman, recently from California for \$20,000 cash.

Robert will spend considerable time traveling and sight-seeing.

Wallace Woodcox was an Oregon City visitor Monday.

Charles Bradt, Joe Sevelk and Frank Wirts attended the shooting match at Hubbard Sunday and came home with five geese and some pot money.

Mr. and Mrs. Pagel, of Portland, Mr. and Mrs. August Bremer of Needy and others gave Mr. August Bremer Sr., a surprise Sunday in honor of his birthday.

Mrs. Bengt, nee Miss Daisy Phelps, well-known here, died at the home of her parents, Mr. and Mrs. Phelps of Portland and was buried at Mount View cemetery on Sunday afternoon.

Messrs. Wink and Solle are building a wire partition fence between their farms.

A sneak thief stole some tools from the Japs that are cutting wood for Herman Mader recently.

A bounding boy arrived at the home of Mr. Hanson on the 4th inst. Grandpa Kyle is wearing a 19x12 smile nowadays.

Elmer Veteto is ceiling the interior of the W. C. T. U. hall.

Mrs. Kate Schaver and her brother Martin Stauber, left Tuesday for Chehalis, Wash., where the former will join her husband who is conducting a barber shop.

Several from here attended the basket social at Central Point church last Friday and report a splendid time, with the exception of a shortage of coffee, as a pot of coffee was pressed into service as a fire extinguisher overhead in the church. No damage was done by the fire.

Mrs. Burgoyne and daughter Carrie are visiting in Portland this week.

Miss Lilah Dustin is having some dental work done in Oregon City.

Mr. and Mrs. James Pitts, of Milwaukee, are visiting the latter's parents, Mr. and Mrs. D. McArthur, this week.

Robert Eastman, of Firwood, was seen on our streets last Friday.

Ernest Critser was in Oregon City Tuesday on business.

J. L. Hoffman went down to Warrenton last week to look at a span of horses that was offered for sale, but did not buy.

Charles Bradt wants to buy a good work horse.

BARLOW.

James Erickson has bought 37 acres of Jake Reuck's farm, including the buildings, and will move onto his new place this week.

Fred Armstrong left Wednesday for Eastern Oregon, where he will remain for the year.

Will Jesse and wife, of Pullman, Wash., arrived in Barlow, Tuesday evening to visit Will's parents.

The Synod Lutheran Ladies' Aid meets with Mrs. Ekern Wednesday.

The Busy Bee Sewing Society met with Miss Cora Berg February 4.

Mr. Rymerson has traded his farm for a store in Pendleton, and expects to leave Barlow with his family in about two weeks. We wish Mr. Rymerson success, but are sorry to have them leave.

Mr. and Mrs. Jas. Erickson were Oregon City visitors Tuesday.

Miss Laura Eiken, of Oregon City, came home Friday, returning Sunday.

C. G. Tall, Henry Gilbertson and Bernard Berg, were visiting in Portland Sunday.

Mrs. Lindahl, of Woodburn, was visiting Mrs. Quint Sunday, Mrs. An-

na B. Wooster also visited Mrs. Quint one day last week.

Mrs. Sheppard and daughter Bessie, are visiting relatives in Oregon City and Portland.

Mrs. Quint's daughter, Mrs. Chase and granddaughter, Mrs. Correll, encountered a very severe storm before they arrived home. The wind blew so hard going from Omaha, Neb., to Sioux City, Iowa, that it rocked the train, and they expected every moment to be blown over. They were badly scared and probably thought that Oregon is not the worst place in the world. They at last arrived home safe. Mrs. Quint had not seen her daughter for ten years and Mrs. Irwin had not met her sister for 17 years.

Charles Harding made a business trip to Portland Tuesday.

D. O. Freeman made a business trip to Salem last week.

For that Terrible Itching. Eczema, letter and salt rheum keep their victims in perpetual torment. The application of Chamberlain's Salve will instantly allay this itching and many cases have been cured by its use. For sale by Huntley Bros. Co.

Bishop Scadding's Lectures to Begin Next Monday.

The course of lectures by Bishop Scadding, which was postponed on account of the severe storm in January will begin next week. The first lecture will be given Monday evening, February 15; the second on Tuesday evening, February 16, and the third on the following Monday, February 22. The lectures will all be given at Willamette Hall.

"I have sold Chamberlain's Cough Remedy for the past eight years and find it to be one of the best selling medicines on the market. For babies and young children there is nothing better in the way of cough syrups," says Paul Allen, Plain Dealing, La.

This remedy not only cures the coughs, colds and croup so common among young children, but is pleasant and safe for them to take. For sale by Huntley Bros. Co.

ESTRAYED—East of Meldrum, about January 1, one light Jersey yearling heifer, with white spot on right shoulder, some white on left flank. Reward for information leading to return. Phone Pacific Farmers 63. Mrs. Anna Hayes, Milwaukee R. D. No. 1.

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THE LEGISLATURE

Oregon Lawmakers in Session Four Weeks and Accomplish but Little.

FEW MEASURES ARE PASSED

Propose Tax of 1 Per Cent on Gross Earnings of Railroads—State May Build Own Railroads Where Necessary—Water Bill Agreed to—Bills Before Legislature Total \$5,500,000—Anti-Statement Measure Killed—Flat Salary for Printer.

Salem, Feb. 9.—The legislature has now been in session four weeks, but, aside from the election of a United States senator, little or nothing of real importance to the state has been accomplished. Practically the only legislation the two houses seem to have interested themselves in is in passing the so-called "salary grab" bills. These salary grabs have affected only counties, however, and have not dipped into the state treasury.

One very apparent reason why the house does not accomplish much is the inclination of so many members to stand in the limelight and talk on all measures. If some method could be devised to apply a little gag rule and stop the constant flow of words business might be expedited.

In the senate the number of orators seems to be more limited. The motion for the "previous question," which shuts off debate, is made frequently, and this enables the senate to keep up with its work. Except while the proportional representation bill was being killed and the governor's vetoes discussed, the flow of oratory has been about normal in the senate.

The session will close February 20, so but ten working days remain. Much, however, may be accomplished in the remaining days of the session if both houses get down to systematic business-like methods and eliminate the oratory.

Few Bills Are Passed.

Besides the "salary grab" bills a small number of unimportant ones have been passed by the house and senate and a few measures of real consequence have passed one body, but not the other. The bill to abolish compulsory pilotage at the mouth of the Columbia river has got through the house, but has not reached the senate. This will meet little or no opposition in the upper body. The measure is backed by the Portland Chamber of Commerce. The bill to create ports has passed and the free-lock bill will be with amendments.

The water code, one of the big measures, is fought by the corporations, although it is reported a tentative agreement has been reached by the conflicting interests. Other big measures are extending power of the railroad commission to street railways; the bill compelling railroads to connect with industry switches and the bill declaring long-distance telephone companies common carriers and compelling them to give service to local independent companies. There is a measure taxing the gross earnings of railroads, and another providing for a constitutional convention, neither of which have received full action. The fish legislation for the Columbia will probably pass, despite the lobby which will fight it.

Tax on Railroad Earnings.

Railroad legislation is becoming more prominent during the past few days. A piece of legislation to make E. H. Harriman, and other railroad interests, sit up and notice Oregon, has appeared in the legislature. A bill has been introduced in the house which proposes a tax of 1 per cent on the gross earnings of all railroads in Oregon on the business done within the state. It is with the exception of the amendment to the inheritance tax law, the first substantial attempt to raise new revenue for the state. Revenue-producing measures rarely receive as much consideration as appropriation bills.

The bill follows closely the law in New York, Pennsylvania, Delaware, Minnesota, Vermont, Maine, Maryland and Ohio.

In view of the statutes in Eastern states, where similar laws are enforced, and a late decision of our supreme court upholding the law taxing the earnings of telegraph and telephone companies, there is very little doubt but that the proposed law would be held constitutional.

There are two sections of particular interest in the bill. The first imposes the tax, or license fee, and the second is the definition of what constitutes a railroad corporation, and, therefore, is liable to the taxation under the act.

State May Build Railroads.

Another bill said to be aimed at Harriman is a proposed constitutional amendment and bill introduced by Speaker McArthur, authorizing construction of new railroads by the state and its credit, or by

any county or city or district the legislators may create. This comes near being government ownership, inasmuch as it is state ownership.

The constitutional amendment is to be submitted to the people in November, 1910, so as to remove present prohibitions against the state's aiding any railroad through state credit. The bill creates a "commission of highways" of nine members, appointed by the governor, to prepare a plan of railroad construction, ownership, operation and financing, so as to supply the state with railroads where Harriman and other railroad magnates have failed to build. The commission is to report to the governor and the next legislature. The bill appropriates \$5000 for the work of the commission.

The conflicting interests that have been at war over the question of water legislation have reached a practical agreement, and it is expected that the conservation commission's bill, with a few amendments, will be passed. Upon the proposition that there must be legislation there was no discussion.

While the owners of power plants and the commission have not finally agreed upon one section of the bill, that protecting vested rights, it was said that there is no doubt that an agreement will be reached. This section will define vested rights so as to protect the use of water where already put to beneficial use by riparian owners or lessees, or where riparian owners or lessees are proceeding in good faith to develop their powers, or where appropriators are proceeding in good faith to put the water to beneficial use.

It is stated from what seems an authoritative source that Governor Chamberlain will take steps to help the passage of the water code if the legislature should seem unwilling to pass it, and this, it is thought, had an effect in bringing the conflicting interests together.

Justice Bill May Fail.

It is very evident that the bill increasing the number of justices of the supreme court to five will have hard sailing, especially if an attempt is made to rush it through with an emergency clause, which would prevent the use of the referendum on the measure.

One thing which complicates the situation is the fact that the people of Oregon declared themselves by a large majority against increasing the number of justices.

It is the early expiration of the official life of the two supreme court commissioners, appointed in 1907 to relieve the congestion in the supreme court, which is made by the proponents of the emergency clause on the bill their chief argument for sending it through both houses in its present form. This is their only substantial argument for doing something which the people have said they do not want, and for doing it in such a manner that the people will have nothing to say about it.

Call for Money Appalling.

The ways and means committees are appalled by the enormous call for appropriations. Senate appropriation bills aggregate \$1,200,000 and house bills \$1,800,000, while the secretary of state's recommended budget amounts to \$2,400,000. The total of all cash calls is \$5,500,000, making allowance for duplications of the house, the senate and the secretary of state.

The largest single item is an estimated \$600,000 for Johnson's road bill. The committees have hardly yet got down to the meat of the subject. They have been devoting their time mostly to necessary items for state departments and institutions.

Anti-Statement Measure Killed.

After two hours' debate, the anti-statement bill, introduced by Representatives Brooke and Bean, failed to pass the house by a vote of 27 to 33, one absent.

With the exception of Brady and Richardson, the 25 Statement Republican members voted with the seven Democrats against the bill. The opposition was further strengthened by Farrel and Lelienweber, unpledged representatives. The other 25 anti-statement Republicans voted solidly for the bill which made it a misdemeanor for any candidate for office to make a pre-election pledge, the performance of which would be in violation of the state or federal constitutions.

Flat Salary for State Printer.

Threatened punishment of State Printer Dunlavy by the anti-statement forces in the legislature for his Statement One activity, made its appearance in the house when Representative Bean introduced a bill placing the state printer on a flat salary.

The bill provides that a state printing board shall be created, consisting of the governor, state treasurer and chief justice of the supreme court, which shall serve without additional compensation.

Provision is made in the bill by which the present incumbent of this office shall, after July 1, next, receive a salary of \$4000 per annum in full payment of his services during the remainder of the term to which he has been elected.

After a spirited debate the bill was referred to the judiciary committee, the revision of laws committee and the printing committee, to be reported jointly, with instructions to present a report to the house.

Concert and Dance.

The "Concert Band," an organization of Oregon City music lovers, has caroled out for its first concert and ball to be given on Tuesday evening, February 23, at the armory hall for the benefit of McLoughlin Institute. In addition to the works of the masters by the band, several vocal numbers by local talent will be rendered. The grand march will start at 9:30.

The committee in charge consists of Dr. Clyde Mount, E. G. Roberts, B. T. McBain.

Tom Trembath Candidate for Assistant Fire Chief.

The Columbia Hook & Ladder Company met at its headquarters on Friday evening, and after business of importance was brought up for discussion, the nomination for an assistant fire chief was taken up. Tom Trembath was nominated. The election, which takes place on the first Monday in March, promises to be lively.

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WIND UP

OF Our Great Money Raising Sale. The story of this Great Sale no doubt you have heard. Unprecedented values have been given the public and as a final closing of this great bargain event which closes Saturday February 20th at 10 P. M. We will call your attention to the exceptional big bargains we are offering:

\$8.35	the choice of any mens' or young mens' \$12.50 to \$15 Suits or Overcoats.
\$13.25	the choice of any mens' or young mens' \$18.00 to \$20.00 Suits or Overcoats.
\$16.25	the choice of any mens' or young mens' \$22.50 to \$25.00 Suits or Overcoats.
\$19.25	the choice of any mens' or young mens' \$27.50 to \$35.00 Suits or Overcoats.
\$3.35	the choice of any mens' or young mens' \$5.00 pure worsted pants.
\$2.45	the choice of any mens' or young mens' \$4 corduroy, peg-top pants.
\$2.45	the choice of any mens' or young mens' \$4.00 worsted or cassimer pants.
\$1.95	the choice of any mens' or young mens' \$3.00 pants.
\$1.35	the choice of any mens' or young mens' \$2.50 pants.
\$1.90	the choice of any mens' or young mens' \$3.00 guaranteed Hats.
\$2.35	the choice of any mens' or young mens' \$4.00 guaranteed Hats.
25c	buys four pair sock regular 20 cents per pair value.
75c	buys a Monarch \$1.00 Shirt.
\$1.40	buys an Oregon City blue flannel Shirt, regular \$2.25 value.
\$1.10	buys a Cluett \$1.75 Shirt.
\$3.05	buys a pair of W. L. Douglas' Famous \$3.50 Shoes.

Bargains too numerous to mention. Those who know the high character of our merchandise will take immediate advantage of these remarkable offerings. Be one of them.

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