Michigan Experiment Station

PRESS BULLETIN NO. 15.

PROTECTION OF BUILDINGS FROM LIGHTNING

By Arthur R. Sawyer, B. S., E. E., Professor of Physics and Electrical Engineering.

This special bulletin is issued to answer the many inquiries which come to the college and station concerning the function of lightning rods and the proper methods of constructing them.

It is now supposed that lightning flashes are of two distinct characters, a vertical flash or main discharge between the cloud and the ground, and a side discharge between the cloud and the ground, precipitated as the immediate consequence of a main flash between two opposed clouds. An ordinary lightning rod properly put up is fairly sure to protect against the first flash mentioned, while to protect against the second class of flashes would require a complete "bird cage" well grounded, set down over the building. It is manifestly impossible to put such a bird cage over a building but we can approximate somewhat to that condition.

We have the words of eminent scientists to the effect that lightning rods, properly put up, do offer a very material protection, although they do not render the house absolutely immune to injury. Mr. Kellingworth Hedges, an eminent British authority, is of the opinion that modern methods of installing lightning conductors afford reasonable protection and that the amount expended on such protection should be proportional to the value of the property protected.

The following method of installing lightning rods is suggested: Let the rod start from one side, go up over the building and down the opposite side, thoroughly grounding both ends as indicated below. There should be one rod up each of the two opposite sides of any cupola or projection on the roof, the rods to go some two feet or more higher than the projection and be connected with the main rod. Horizontal conductors should inter-connect all vertical rods at the roof ridge level and also at the ground level. All large masses of metal in or on the building should be grounded as directly as possible. Gas pipes and all large masses of metal should be kept away from the lightning conductors. The efficiency of the lightning rod depends very materially on its being well grounded, which means that it should be in permanent connection with moist earth. The usual method of grounding is to dig a hole down to earth that is permanently moist. Solder the lightning rod to a piece of gas pipe or to an old wash boiler and imbed this larger metal in coke. There must be ample carrying surface from the surface of the ground down into this mass of coke. It is suggested that it is well to allow the eaves of the house to discharge the water through a drain tile into this mass of coke which is buried beneath the surface to keep it moist. The only objection to this suggestion is that when a thunder storm comes up after a long dry spell, the coke is apt to be dry in spite of this precaution. Any method that will keep the coke moist or secure adequate connection between the lightning rod and moist earth is sufficient.

As to the metal of which the lightning rod is to be made, it is suggested that the choice lies between iron and copper.

In any event it should have ample carrying capacity, if of iron, several number six galvanized wires may be used or a 3/8 inch galvanized cable such as telephone companies use in guying poles. An iron rod is somewhat more desirable than a copper one because of its inductance, but joints are liable to rust and the rod deteriorates more rapidly than does one made of copper unless very heavily galvanized and made of a continuous cable. The iron is the better while new but the copper is apt to be the more durable.

Michigan Agricultural College
EXPERIMENT STATION.

PRESS BULLETIN NO. 15.

Remedy for Smut in Wheat.

Formalin Treatment.—Take one pound or pint of Formalin—the druggists may call it 40 per cent Formaldehyde—and stir it into 50 gallons of water. This quantity will treat 50 or 60 bushels of wheat. If a smaller quantity is required less amounts may be used, by keeping the same proportions, which are practically an ounce of formalin to three gallons of water. The cost of formalin in small quantities is about five cents an ounce.

Sweep clean a place on the barn floor and sprinkle well with the formalin solution. Put the seed wheat on this sprinkled area and sprinkle or spray the wheat with the formalin solution and shovel it over until every kernel is thoroughly wet. Do not be satisfied with simply dampening the grain but apply the solution until every kernel is visibly coated with water. Allowing it to stand in a compact pile a couple of hours will insure the more complete action of the formalin. If the grain is to be sown broadcast by hand at once it need not be thoroughly dried before sowing. But if it is to be kept long before sowing, or is to be sown with a grain drill, a certain degree of caution which every farmer will understand must be exercised to dry it thoroughly so that it will not sprout and spoil nor be too wet to work well in the grain drill. In drying the grain and handling it afterward care should be taken to wet the floor, utensils, bags, etc., with formalin solution so as to kill every trace of the smut on the things with which the treated seed is to come in contact.

The above treatment is inexpensive and simple to apply. We have never heard of a case where it has failed to work.

Hot Water Treatment.—The following treatment has been used for years, and if carefully applied is practically sure. It is, however, more cumbersome and laborious than the formalin method though the expense for material may be a little less.

Soak the seed wheat for ten minutes in water at 133 degrees F. Use a tested thermometer only. Provide two vessels large enough to hold twenty gallons each, if possible. One should contain warm water at about 120 degrees F., the other scalding water at 133 degrees. Into the first vessel plunge the seed wheat in a burlaps sack or wire basket. Keep it there until warm, then plunge into the second vessel, lifting it out occasionally and shifting it about in the scalding water until every kernel has been exposed to the temperature. Remove from the second vessel, at the end of ten minutes, and cool immediately, either by spreading on a clean floor in a thin layer or plunging into a barrel of cold water. Dry and sow, or sow broadcast at once.

Seed once treated successfully by either of the above methods will grow smut-free grain for a number of years. In fact, if every farmer in the state would treat his seed wheat carefully this fall and keep smutted wheat from coming into the state there is no reason why we should ever be troubled again with this pest.

VARIETY TESTS.

The table below gives the results of our field trials of varieties for 1900 and the average for 1899 and 1900 of those varieties which were grown both years. The 1899 yields were obtained from plots of nearly an acre or more. The 1900 yields are from one-tenth acre plots of summer fallow liberally treated with a commercial fertilizer. The seeding of all the varieties, except Marshall's Triumph, was done Sept. 29 and 30. The Marshall's Triumph was not sown until Oct. 5.

None of the varieties entirely escaped the attacks of the Hessian Fly although the Dawson Golden Chaff stood up the best of all at the time of harvest, the other varieties being about equally affected. The Winter Fife seemed to be the least affected by the fly, but this variety was not sown until Oct. 7.

Names of Varieties.	Yield in 1900, per acre.	‡Average 1899 and 1900, per acre.	Color of wheat.	Description.
*Dawson Golden Chaff..	32.73	32.64	White	Bald Red Chaff.
Gold Coin.....	30.75	31.42	"	" " "
International, No. 6....	29.29	30.60	"	" " "
Jones Longberry.....	27.50	.....	"	Bearded Red Chaff.
White Clauson.....	27.92	26.	"	Bald " "
Long Amber.....	24.17	21.10	"	" White "
Jones Square Head....	32.25	29.58	"	" " "
Harvest Queen.....	29.54	.....	"	" " "
Early Genesee Giant..	30.50	.....	"	Bearded Red "
Hybrid Beechwood....	26.25	.....	Red	Bald "
Poole.....	32.33	.....	"	" "
Harvest King.....	26.42	.....	"	" "
Fultzo-Mediterranean..	27.75	.....	"	" White
Russian.....	28.00	28.95	"	Bearded "
Buda Pesth.....	29.66	25.59	"	" "
Fulcaster.....	19.42	23.72	"	" "
†Marshall's Triumph....	22.	.....	White	Bald "

* Average of four plots. † Sown Oct. 5. ‡ Yields in 1899 are found in Bulletin 181.

In addition to the above varieties Early Arcadian, Earle's Velvet Chaff, Plymouth Rock, Red Clauson, Rudy Currell, Winter Fife and a new Russian variety were grown. The First three named made very satisfactory growth but the area was too small to give reliable figures of yields for acre areas. A portion of the plots of the other varieties was winter killed, though the Rudy, Red Clauson and Russian varieties made growths on the higher portions of the plots that would compare favorably with the best yielding varieties. The Winter Fife is a new red bearded variety, donated by Northrup, King & Co. of Minneapolis, Minn., but was received so late that a satisfactory crop was impossible. All the above varieties will be tested again the present year.

AGRICULTURAL COLLEGE, MICHIGAN,

July 26, 1906.

Dear Editor:

The topics covered by the bulletins to be sent you will be of great and immediate importance to your readers. Will you kindly give them space in your columns?

THE DIRECTOR.

Michigan Experiment Station

PRESS BULLETINS NOS. 14 AND 15.

SPRAYING APPLE TREES AGAINST CODLING MOTHS.

Bulletin 222 of the Michigan Experiment Station reports investigation made by Prof. R. H. Pettit on the several broods of the codling moth. His conclusions point to the advisability of spraying apple trees with bordeaux mixture and some form of arsenic, not only just after the apple blossoms fall, but also during the first week of August and possibly again ten days later. The crop is greatly enhanced in value both in quantity and quality. Full directions are given in the bulletin and in a spray calendar issued by the same station. If you have not these bulletins remember that they are to be had for the asking. Write to the Secretary, Agricultural College, Michigan, and secure them at once, as the spraying should be done now.

TREATING SEED WHEAT FOR SMUT.

There is no smut in the wheat harvested on the College plots this year. As a rule the wheat throughout the state is fairly free from smut. Because of this fact farmers are tempted to neglect to treat their seed this fall. This will be a mistake. A pound of formalin costs little. Buy it and mix with thirty-five to forty gallons of water. Spread part of the seed on a clean barn floor, sprinkle the formalin mixture over it and shovel until each kernel is wet on every side with the formalin solution. After twenty-four hours dry and sow when needed. If more convenient, treat just before sowing and omit the drying. This method is past the experimental stage, it is a recognized success.

MICHIGAN AGRICULTURAL COLLEGE

EXPERIMENT STATION

PRESS BULLETIN NO. 15.—THE WHEAT JOINT-WORM.

R. H. PETTIT.

Just at this time, before the regular sowing of fall wheat, a few timely hints in relation to the joint-worm may prove of interest to wheat growers. The joint-worm is a periodical visitor in this state, but fortunately the intervals between visits are rather long. Of course, they are present all the time but in very small numbers. Whenever the parasites lose control, then the pests multiply and an infestation is the result. About twenty-two years ago we had a serious outbreak in Michigan. These outbreaks usually last for several years and then the pests gradually disappear to come again after another period. From the very nature of the case it has been difficult to collect facts bearing on the proper treatment of the joint-worm. It comes and goes and one has to do his experimenting on the wing as it were, however, every time the insect appears we are able to find out something which adds to the sum of our knowledge. As in the case of most grain insects, it is impossible to spray or to do anything except to minimize the injury by certain farm practices.

The joint-worm is the larva of a small wasp-like insect considerably smaller than a mosquito, the eggs of this creature are laid in the stalk of the wheat just above the joints, usually the lower joints, although in bad cases the writer has seen all of the joints infested. The young larvae or grubs which come from these eggs burrow into the stem, usually from four or five to a dozen above a joint. They cause the stalk to become woody and hard in the vicinity of their burrows. Here they attain their full growth and change to pupae, which stage corresponds to the cocoon stage of many insects. In these hardened woody sections they remain all winter, coming out in the spring to perpetuate their race. The thickening of the stem in this way, of course, interferes with the proper ripening of the berry and for this reason wheat from infested stalks is likely to be shriveled. Furthermore, the grain is apt to lodge or go down if there is much wind and wet weather just before harvest. The loss is often very serious as the yield is cut down often one-half. We have examined, during the present year, samples of more than a score of the popular varieties of wheat and can find no evidence thus far that any variety is imumne to the attacks of the pest.

As before stated, the winter is passed in the woody sections of straw. These are brought out in the spring with the barnyard manure and spread over the fields. The adult insects come out and if wheat is near at hand they lay their eggs and provide for the next crop of the pests. It is quite likely that a thorough soaking of these woody sections in the stable liquids would kill many of their inmates. However, we shall need to know a little more about it before we can say this with confidence. In order to gather statistics the writer has inquired of representative wheat growers in various parts of the state for information regarding their methods of growing the wheat and also for estimates as to the damage sustained from the attacks of the joint-worm. From these replies it would seem that the worst infestations in most cases follow the application of stable manure just before the wheat is sown, very often this is applied on clover sod. Of course, there are many cases where the application of manure is not followed by the joint worm, but such cases are usually outside of the worst infested districts. On the other hand sometimes bad infestations follow commercial fertilizers which could not have been responsible for the trouble. In such cases we shall have to look for other sources, perhaps these fields were near old wheat fields or perhaps quantities of stable manure were used in the near vicinity of the wheat.

To sum up the situation, the insects pass the winter in the hardened sections of the straw. All methods of control look to the destruction of the straw and especially of these hardened sections. If all of the straw could be destroyed in the fall it follows that the insects would disappear on the instant. The following recommendations are made with the view of preventing the straw from getting where it can supply the adults for fresh infestations.

Do not keep over until spring more straw than is absolutely necessary.

Plow stubble in the fall, unless seeded with clover and harrow at least not later than early spring for the adults are able to crawl out of the soil if only covered loosely.

Place new wheat fields at a distance from any old unplowed ones.

Do not apply barnyard manure just before wheat on any account. Put it on at some other point in the rotation, after clover and before corn or at least not just before wheat.

Separate out and burn the woody sections of straw which get in with the grain at threshing time.

R. H. PETTIT,
Entomologist, Exp. Sta.