

Miscellaneous.

The Life History of Wheat Rust.

SUBSCRIBER:—"By giving the life-history of wheat rust (*Puccinia Graminis*) in a succeeding issue of the FARMER'S ADVOCATE, you will, I am sure, confer a favor on many readers of your valuable paper."

[The life-history of wheat rust (*Puccinia Graminis*) was first worked out in 1861 by DeBary, who showed conclusively that the rust fungus passed through three different stages of development. Prior to DeBary's discovery it was a well-known fact that the presence of barberry bushes had a very damaging effect on wheat, rye and oat crops growing nearby. And so rooted had this idea become that the Legislature of Massachusetts passed a by-law to the effect that every farmer must destroy every barberry bush on his farm. Much discussion has arisen as to the utility of such a drastic measure, and botanists of great repute can be found to have taken part in both sides of the discussion, but the prevailing opinion at the present day appears to favor the idea that the intensity of the rust in the vicinity of the barberry is much increased, that the total disappearance of the barberry would not prevent the rust, but would decrease its destructive effects.

The different stages in the life-history of rust are these: In early spring yellow circular spots appear on the leaves of the barberry. These spots indicate the presence of a mass of thread-like filaments (mycelium), from which arise the *Aecidia* or cluster-cups of the under surface, and the pycidia on the upper surface. These *Aecidia*-spores are ready to escape from the cluster-cups about July, and are carried to the leaves of wheat and other grasses, where they germinate and send a small tube through the stomata or breathing-pores into the interior of the leaves. These tubes send out branches among the soft cells, and absorb the nourishment intended for the plant. In about eight days reddish patches occur on the leaves, and the well-known reddish rust-colored spores break through the epidermis. These are blown about by the wind to other grass plants, new germinations take place, and soon the whole wheat field becomes infected. This process continues until the conditions are not favorable for the discharge of the spores through the epidermis, when a third kind of spore is produced on the same rupture spots, and from the same mycelium as the reddish summer spores. These are the winter spores, which are specially formed in late summer and autumn on the leaves and stubble of the grain—i.e., the uncut portion—and remain in place until spring. They first produce, by a kind of germination (while on the stubble or on the ground where they may have fallen at any time during winter or spring), a few small spores or *sporidia*, and it is these that find their way to the barberry leaves, where they germinate and produce the cluster-cups. This completes the cycle of its existence and the three stages of development.

It has been discovered, however, that the mycelium from which arise the red rust or summer spores may hibernates in winter wheat and continue its existence in spring by producing new spores without the intervention of either the winter spores or the *Aecidia* spores of the barberry. This discovery will explain the presence of rust in regions where there are no barberry bushes; yet the fact remains that the presence of the barberry aids materially in the spread of the rust. In climates without severe winters the winter state may be omitted, and, as stated above, the summer spore state may be perennial. It is a well-known fact that many fungi form resting spores only when conditions are unfavorable for rapid growth and propagation. They prepare for hard times.

When we bear in mind that other grasses besides wheat, such as sweet vernal, meadow fox-tail, couch grass, etc., act as host plants for this fungus, we should not be surprised at unexpected invasions of rust.

Again, it is very probable that other plants besides the barberry may act as host for the *Aecidia* stage. Many weeds, such as the blue weed and the hound's-tongue, serve as host plants for the other wheat rust (*Puccinia rubigo-vera*) which is so prevalent in many wheat sections.

Still another method of propagation of rust without the intervention of the barberry stage has been observed. Plowright found that the spores obtained on the germination of the winter spores infected wheat directly.

Such are the various modes of propagation of rust, and while all of these modes may operate under certain conditions, it is fair to assume that the three-stage development is the usual one, and that the destruction of the barberry is beneficial. With the aid of the wind the *Aecidia* spores of the barberry may be carried hundreds of miles, and wheat fields hundreds of miles from barberry bushes may become infected, but the greater the distance the less the chance of infection.

It is also fair to assume that with the complete destruction of the barberry on this continent, the rust might still be propagated by the method stated throughout this brief article.

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Balanced Ration for Dairy Cows.

W. F. STEPHEN, Huntingdon, Que.:—"Kindly answer the following through your paper: 1. Will 2 pounds each of pea meal, corn meal, oats (ground), and 3 pounds bran, 30 pounds good corn ensilage, with what good clover hay they will eat up clean, be a completely balanced ration for winter feed of milk cows? The aim is to get lots of cream of first quality from the milk. 2. Is it now a recognized fact that food has little or nothing to do with the quality of the milk produced?"

[1. In answering this question we assume that the cows average 1,000 pounds live weight, and that they will consume 12 pounds clover hay each per day in addition to other fodders. They may consume rather more hay than this, but 12 pounds is a reasonable estimate. Estimating the digestible constituents and total organic matter in the ration as given, we obtain the following:

	Digest. Protein.	Digest. Carbohydrates.	Digest. Fat.	Total Organic Matter.
	Lbs.	Lbs.	Lbs.	Lbs.
2 lbs. Peas.....	.390	1.120	.018	1.738
2 " Corn.....	.142	1.251	.084	1.752
2 " Oats.....	.182	.894	.082	1.730
3 " Bran.....	.378	1.323	.087	2.472
30 " Ensilage.....	.390	4.200	.210	7.260
12 " Clover hay.....	.780	4.182	.192	9.420
Total.....	2.292	12.973	.673	21.363

The German standard for dairy cows is as follows: A cow in full milk should receive per day per 1,000 pounds live weight, 2.5 pounds digestible protein, 12.5 pounds digestible carbohydrates, .4 pounds fat, and 21 pounds total organic matter. The ration submitted by your correspondent varies but slightly from this standard, and may be counted an exceptionally well-balanced ration. 2. The investigations made by all the leading experimenters and scientists in this connection go to prove most conclusively that food has very little, if any, effect upon the per cent. of fat in milk. It affects the quantity, flavor, etc., of the milk, but not its composition. Very wide variations in composition sometimes occur when cows are receiving the same ration. In the milking competitions at the different fairs the cows almost invariably test much lower in butter-fat than they do at home, in spite of every effort on their owners. This shows that there are forces at work which affect the composition of milk independently of the food, and that the composition of milk is not under the control of the feeder.

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Reduction of Bones for Fertilizer.

R. NICHOLSON, Middlesex Co., Ont.:—"I have read 'Gyra's' remarks in the FARMER'S ADVOCATE of October 1st on ashes and rage, and agree with every word. Now, there is a similar matter that is worthy of attention; that is, in regard to bones. They are shipped away periodically by the carload. This, in my judgment, is as reprehensible as the sending away of ashes. On one occasion I noticed a car of bones being shipped away. I was moved to write to the principal machine makers both in Galt and Brantford to enquire if they made a machine for grinding bones, as I have steam power. I thought if such a machine could be got, not too expensive, I would invest and make use of it to grind enough, at least, for my own use. I received an answer from both firms that they did not make such a machine and could not say where I could get it. Can you, Mr. Editor, tell me and others through the FARMER'S ADVOCATE where such a machine could be procured? By doing so you will confer a favor. 2. Can you tell me if air-slaked lime is of any benefit on a poor, sandy soil? Any information regarding the grinding and preparing of bones for fertilizing purposes would be very acceptable."

[1. What Mr. Nicholson writes regarding the loss that occurs by shipping away bones from the farms contains more truth than poetry; in fact, the matter of fertilizing our farms is given far too little consideration. The question concerning a power bone-grinder we will have to refer to manufacturers of such machines to settle, as we know of none for that purpose that we can recommend. Even though one could get the grinding done conveniently the meal would have to be treated before applying it to the land, and that can be done almost as well when the bones are simply broken up with a hammer on a stone. The trouble with fresh bone meal is that it usually contains so much fat that its decomposition is very slow in the soil. The most approved treatment for the reduction of bones to fertilizer is as follows: Break one hundred pounds of bones into small fragments and pack them in a tight cask or box with one hundred pounds of good wood ashes which have been previously mixed with twenty-five pounds of dry water-slaked lime and twelve pounds of powdered sal soda. Twenty gallons of water will saturate the mass, and more may be added as required. In two or three weeks the bones will be soft enough to turn out on a platform and be mixed with two bushels of road dust or ordinary dry soil ready for use.

2. This question will be better answered by referring to the action of lime, which is really to disintegrate or hasten the decomposition of vegetable matter so as to make it available for plant food. When a soil contains but little vegetable matter an application of lime would be injurious,

as it will cause the vegetable matter to decompose too quickly, thus nourishing the crop in its earlier stages and starving it later in the season. It will thus be seen that a poor, sandy soil is not the place to use lime. Sour, heavy, damp soils are benefited by applications of lime, which has a sweetening effect, but even here continued applications would tend to exhaust the fertility in time.]

Manuring Land for Roots—"Farmer's Advocate" Worth \$1 a Copy.

H. N. BINGHAM, Simcoe Co., Ont.:—"I am greatly pleased with the FARMER'S ADVOCATE, and would not be without it for twice the subscription price, as I consider every number is worth \$1 to me. 1. I would like your advice about the best time to haul manure on clover sod intended for turnips. Do you think it would be best to manure it in the fall and plow it down, or haul in the spring on the last snow and gang plow it in as soon as possible? Or would it be better to wait until near time to sow the turnips and then haul and plow in immediately? 2. I would also like your opinion about preparing the soil for mangels. Would the following be a good plan in moderately strong ground: Plow the ground in the fall, after being well manured with well-rotted barnyard manure, harrow down well, and in the spring work thoroughly with the gang plow and disk harrow? When ready to sow, drill in about 300 pounds per acre of superphosphate in the rows with the seed. Would that be a proper amount of fertilizer? I have heard it said that it was a good plan to put the mangel seed in boiling water for about two minutes. By giving your opinion on the foregoing you will greatly oblige."

[1. It is becoming very general practice to get manure into the land as soon after it is made as possible, for the reason that the waste by loss of ammonia by volatilization, and nitrates, etc., by leaching, are then reduced to a minimum. Not only that, but the action of the decomposing manure tends to render soluble inert plant food in the soil. It is well when applying manure at any time, but especially when it long precedes the sowing of the crop, to cover it quite shallowly, as the tendency is for the fertility to work down into the subsoil. What we have said has special reference to making the most of the manure when one has it ready to apply, but so far as the turnip crop is concerned, applying it in early spring, as suggested by Mr. Bingham, should suit well, especially if the manure is fresh, but if the manure is well rotted the crop would make about as good use of it applied in May for June planting. So far as getting the sod worked down is concerned, it will be better plowed this fall, especially if at all tough, but if of 1897 seeding down, early spring plowing should get it into nice form for drilling by the time for sowing the crop. 2. The plan outlined for the mangel ground appears to be all right so far as the farmyard manure and cultivation are concerned, but it does not seem necessary to apply such a heavy dressing of superphosphate. From 100 to 150 pounds should give excellent results, but we would strongly recommend an application of 200 pounds of salt per acre. Mangels respond perhaps better than any other crop to saline applications. While we believe mangel seed will germinate more quickly and evenly after soaking, we would not consider it safe to apply water at a scalding temperature. Twelve hours' soaking in warm water and then dried in land plaster before planting is ordinarily practiced.]

Cows Slow to Breed—Slow Churning—Sheep Rearing.

D. H. McA., Ottawa Co., Ont.:—"I would thank you very much for a solution of the following difficulties which have presented themselves to me on different topics:

"1. We have several cows turned out on pasture with calves 'on them,' but find that none of them have 'come round.' Does this always occur when the calves are left sucking? Can it be remedied?"

"2. In churning of late it has taken us from one to two hours to 'bring' the butter. What is the reason of this? We conduct the operation in the usual manner after leaving the cream 24 hours at least to ripen. If the ripened cream registers more than 60° when ready for the churn, should it be lowered in temperature with cold water?"

"3. Why do not farmers raise sheep more extensively when they show such large profits—at least theoretically? Is this industry not practicable on a much larger scale in this country—that is, Quebec Province? I am contemplating investing in this branch, but there would appear to be some barrier to its success of which I am not aware. Could you suggest some good practical work on the subject, applicable to this district?"

"I enclose stamped envelope, and would be much pleased to have your opinion on above matters."

[1. This question touches on a very important subject, and below we give the opinions of several breeders, all of whom agree that the practice of letting calves run with the cows all the time works disadvantageously to the cows coming in heat and to their breeding. Mr. John I. Hobson, Guelph, writes: "Cows are more difficult to get in calf when the calves are allowed to suck them. I have always thought it an advantage to allow them together only when the cows are brought in for milking; that is, twice a day." Mr. Jas Bowman, while he has had no trouble to speak of in getting the cows to come in season while suckling calves, only allows them to be together at regular milking hours. His cows generally come in heat about a month or six