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MARCH 16, 1916

THE FARMER'S ADVOCATE. Smuts, and How to Combat Them.

There is believed to be an annual loss of several millions of dollars to the farmers of this country, due to the ravages of loose smut of oats, and stinking smut or bunt of wheat. Loose smut of wheat and barley also exacts a heavy toll from the growers of these crops. Treatment for the prevention of the two former smuts has been recommended for years past and demonstrations conducted in different parts of the country proved that the treament was effective. However, the yearly loss from the smuts did not seriously affect the individual, consequently a vast majority of the farmers appeared to prefer risking a loss of a few bushels of grain by smut rather than treat the seed The main reasons for not treating have been lack of the main reasons for not treating have been lack of time during seeding, not having the material handy when the seed should be sown, and the belief that smut would not be bad "this" season because there was very little in the grain "last" year. So, year after year passed and the average farmer on one hundred acres of land allowed from ten to twenty dollars per year to slip out of his hands, which might have been saved at a cost of about one cent per bushel of seed sown.

When the season of 1915 opened up there appeared to be no special reason why smut should be any worse than it had been in former years, consequently, in the rush to get the seed in the ground only a small per-centage of the farmers treated their oats. The season must have been particularly suitable for the development of smut, especially on oats, and many who planted untreated seed suffered a loss varying in different sections from ten to as high as fifty per cent. of the The heavy loss came in a year when it was least expected, and should serve as a warning to every farmer to treat his oats and wheat to destroy the smut spores, before planting, every year. A description of how and when the smut spores

attack the plant may give the reader a more intelligent idea of how applying certain material to the seed be-fore sowing will prevent the development of smut heads. All smuts are fungous diseases, and are caused by minute colorless plants which have not the power of manufacturing their own food, and thus become parasites, obtaining their nourishment from other plants, and by so doing injure the host plants in various ways, causing the disease known as smut which occurs on the cereal grains. The minute fungous plants causing the smuts consist of exceedingly small, fine, delicate threads, which live between the cells of the grain plant, and draw the necessaries of life from the plant cells. Some of these threads change during the summer and become spores, for the purpose of carrying the disease over the winter and for reproduction. These spores usually form in the heads of the grain. Spores of the smut fungi are scattered by the wind, or at time of threshing, and cling to the kernels of grain. When the grain is planted, warmth and moisture necessary for its growth, are also suitable for the germination and growth of the smut spores. The fine fungous threads grow up through the plant and attack the dowers when they begin to develop. After the food stored in the developing kernels of grain becomes exhausted, spores are formed which compose the black masses of smut, as seen in the field. A single smutted wheat or pat grain may contain two million or more wheat or oat grain may contain two million or more spores, each capable of destroying a head of grain the following year. It is possible for a few diseased heads of grain to infect the seed for a whole field. Only a little smut showing in the field from which seed is obtained is no proof that the new crop will not be badly affected, as proven by many farmers with the 1915 crop.

THE LOOSE SMUT OF OATS.

The loose smut of oats is the most common, possibly causing a greater loss than any other of the grain smuts. It may be seen in the field as soon as the oats begin to head, and destroys not only the kernel but also the hull and chaff by changing them to a dark brown powder, which is a mass of smut spores. These spores may be scattered by the wind while the crop is still standing, and if they lodge on the oat kernel they may be carried over the winter in the dormant stage. Threshing may also aid in scattering the spores to grain that is not infected. If these spores resting on the kernel of grain, are not destroyed before the grain is sown, they germinate and the fungous threads produced, penetrate the young seedling plant at a time when it is most susceptible. This is believed to be the only time that infection can take place. The disease de-pends on the oat plant for its nourishment, and when the oat heads form it decours the substance being the oat heads form it devours the substance being formed therein and instead of bright, plump kernels of grain, nothing is left but a mass of worthless, sooty-like material. Various methods of treatment for prevention of smut have been tried with gratifying

wheat unfit for milling purposes. The disease is carried over the winter as spores on the kernels of grain. When the seed is planted and germinates, the spores also germinate and infect the plant in a similar manner as does the smut of oats. The formalin method of treatment is practical, economical, and most effective in the practical of the leave must of oats oats eather stinking in the prevention of the loose smut of oats and stinking smut, or bunt, of wheat. If the amount of smut seen in the grain last summer is any criterion of what will be produced this year, the farmer who does not treat his seed to prevent smut will reap a harvest that is worse than useless, rather than the life-sustaining grain.

THE FORMALIN TREATMENT.

The formalin treatment is the one most in vogue, but different strengths and methods of using it have

been practiced with more or less satisfactory results. The success depends on having the solution of The success depends on having the solution of correct strength, and having every part of every kernel covered with this solution. Experiments conducted by Prof. C. A. Zavitz, at the Ontario Agri-cultural College, Guelph, showed that the smut mentioned can be controlled, but that there was a slight variation in yield of grain from using the sprinkling and immersing methods. The average yield of oats per acre for five years was 60.3 bushels from untreated seed, 61.3 bushels from seed sprinkled with formalin before sowing, and 68.3 bushels from seed immersed in the formalin solution previous to being sown. This would lead us to believe that immersing the seed was the most satisfactory method. A similar experiment was conducted with wheat, and the average yield per acre for three years was 38 bushels from untreated acre for three years was 38 bushels from untreated seed, 36.3 bushels from seed sprinkled with formalin solution before sowing, and 43.3 _bushels from seed immersed in formalin solution. Farmers who have tried both methods on their farms find that smut can be completly controlled by the formalin treatment when they do the work thoroughly.

Formalin can be purchased at any drug store for forty or fifty cents a pint. The immersion method for oats and wheat consists of mixing one-half pint of formalin in 21 gallons of water and soaking the seed grain in



A Successful Hunt.

the solution for 20 minutes, after which it is spread thinly on a clean floor or canvas, where it can be stirred and allowed to dry sufficiently to be sown. A bran sack, that is coarse in texture will admit water readily and is an excellent receptacle to use in holding the grain to be immersed. It will be necessary to raise and lower the sack several times in order that every kernel may come in contact with the solution. If the sack of grain is allowed to drain over the top of the barrel, it will be a saving on material. However, 21 gallons of the solution should be sufficient for treat-ing about 20 bushels of grain. Raising a bag of wet grain, especially wheat, out of a barrel is no light task. By having a pulley attached to a beam or pole above the barrel, and a rope run through it and attached to the bag, the work of treating the seed may be made much Care should be taken to have all receptacles, that the grain is liable to come in contact with, free from smut spores. The sooner the seed is sown after it is treated and dried the better. Where a considerable quantity of seed is to be treated, two barrels may be used. Remove the heads from both, then bore a hole at the bottom of one and fasten a screen over it on the inside, and arrange a tap on the outside. Place this barrel in the back of a wagon and the other barrel on the floor beneath it. The top barrel is partially fulled with grain and the formalin solution poured over After the solution has been in contact with the it. grain for the required length of time, the tap is opened and the solution drained off into the barrel beneath, and the grain is spread on the floor to dry. The process is repeated, by using the liquid drained off, for treating the next barrel of grain. In case of wheat the smut balls which float on the surface should be skimmed off. With the sprinkling method of treating seed, the solution is similar to that for immersing, viz-one-half pint of formalin to 21 gallons of water. The grain may be placed in a heap on a clean canvas or floor, and the formalin solution sprinkled over it with a watering can, or by any other means handy. The grain should be shovelled over and sprinkled again. Repeat

the shovelling and sprinkling until every kernel is moistened; then cover the pile with canvas or sacking, and leave for about two hours, after which the grain should be spread out to dry. Raking or turning the grain frequently will hasten drying. The sprinkling method has proven quite satisfactory and will require about as much of the solution as will immersing the seed. A strong point in favor of the sprinkling method. is that a considerable quantity of grain may be treated is that a considerable quantity of grain may be treated at once. This is an important factor when the work must be done during the rush of seeding. There are mechanical smut killers, on the market, which permit of a very fine spray of the formalin solution coming in contact with the grain as it passes over a cone. It is claimed that every part of the kernel is moistened by this method, and the seed may be sown immedi-

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ately after treatment. The man treating his seed must be sure that the formalin used is of the required strength—40 per cent. solution of formaldehyde gas in water. By using material that is too strong, or allowing the grain to remain in a pile or bags too long may result in impairing the vitality of the seed to such an extent as to ruin a crop. One instance will show the result of leaving the treated seed in a pile too long. On a Saturday noon the seed was treated and spread out to dry'. During the afternoon a few bags of the grain were sown and the remainder left in the pile over Sunday. That which was sown Saturday germinated and gave a splendid crop, but what was sown on Monday never grew. No doubt the vitality of the seed was injured by it not being thoroughly dried when left in the pile Care must be taken to get the seed sufficiently dry before sowing, and allowance should be made for the swelling of the seed due to cooking or a light seeding swelling of the seed, due to soaking, or a light seeding may result. If treated seed cannot be sown immed-iately after becoming sufficiently dry to sow, it should be spread out thinly and raked occasionally.

THE BLUESTONE METHOD

Other methods, of treating the seed to destroy smut, have been experimented with. Bluestone solution is also used for controlling smuts. A solution made by dissolving 1 pound of bluestone in 25 gallone of water, and soaking the seed for twelve hours destroys the smut spores, but has not proven as satisfactory with oats as it has with wheat. Apparently germination of oats is more or less injured by the bluestone Sprinkling the grain with bluestone solution made of 1 pound of bluestone dissolved in ten gallons of water controlled the smut satisfactorily in wheat, but cannot be very highly recommended for treating oats. While bluestone may be used effectively for controlling the smut the formalin treatment is considered to be more satisfactory.

LOOSE SMUT OF WHEAT AND BARLEY.

There are two kinds of smut which cannot be treated with either formalin or copper sulphate, but respond to the hot water treatment. These are a loose smut of wheat and loose or naked smut of barley. While these smuts have exacted rather a heavy toll in the past, there is no practical method of treating the seed for a whole field. The spores are produced the seed for a whole field. The spores are produced as soon as the heads begin to form, and are soon broken up and blown away by the wind. These spores lodge on the flowers. Here they germinate and produce delicate fungous threads which penetrate the develop-ing grain. Once established inside the grain any surface treatment cannot destroy them. They remain surface treatment cannot destroy them. They remain dormant in the seed, but germinate and grow in the spring similar to the other smute described. The only practical method of reducing a loss from this disease is to secure seed from a district where the loose smut of wheat or loose smut of barley is not present. If it is impossible to secure seed from clean fields, the hot water system of treatment may beused for a small amount of seed which may be sown, and seed from this secured another war. Material required from this secured another year. Material required would be two large kettles or tubs, coarse sacks or wire baskets, a reliable thermometer, and a supply of hot and cold water. In the one tub the exact temperature of the water required should be maintained, and the other one used for bringing the grain to the temperature of the water used for treatment, so as not to lower the temperature of the water in the other tub when the grain is immersed. Grain may be placed in wire baskets or sacks. For treating barley placed in wire baskets or sacks. For treating barley the temperature should be 125 degrees F. and the grain allowed to remain in the water for fifteen minutes. If the temperature should be 129 degrees F., five minutes would be the limit of time at which it would be safe to leave the seed in the water. For wheat it may be left ten minutes in water at a temperature of 129 degrees E. For either grain 124 degrees F. and the grain F. For either grain 124 degrees F. would be ineffective on the smut organisms, and under no circumstances should a temperature of 131 degrees be allowed. This treatment is effective against both smuts but it is rather a delicate one to carry out, as there is a very close margin of temperature to work on. Should the grain get too hot, its germinating power would be destroyed. If the temperature is not high enough, there will be no effect on the disease. The seed treated should be planted as far away as possible from other wheat or barley fields.

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BUNT.

Stinking smut, or bunt, is the most objectionable amut of wheat. Unlike the oat smut, it only attacks the kernels, causing them to become short, plump, light in weight, and filled with a black, oily-like powder possessing a disagreeable odor. Although the chaff is not directly affected, it presents a bleached appearance. These "smut balls" are broken at time of handling the grain or threshing and the spaces produced from a the grain or threshing, and the spores produced from a comparatively few heads are liable to be the source of infection for the spore fold. Not only infection for the grain from a large field. Not only does the smut decrease the yield of wheat, but a small quantity of the grain field of wheat, but a small quantity of the stinking smut is claimed to render

CORN SMUT.

Corn smut may not be so destructive as the other smuts, but nevertheless the annual loss caused by it