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# RYE GROWING IN THE SOUTHEASTERN STATES

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**R**YE should be grown much more widely than at present in many parts of the Southeastern States.

In any consideration of the expansion of the acreage of bread grain and in any encouragement given for the production of home-grown bread in this section it is necessary to consider wheat and rye together. This is because rye can be sown safely on many fields with less risk than wheat. Further, rye can be used as a substitute for wheat as a bread grain by those who are accustomed to it. Rye succeeds on poorer and sandier soils and with less fertilizer than wheat. For these reasons it should be sown in preference to wheat where it has been proved a safer crop.

Rye is also the best grain in most of this section for use as a cover, green-manure, and grazing crop.

Home-grown seed is best. Northern-grown rye is not suitable for sowing in the South.

# RYE GROWING IN THE SOUTHEASTERN STATES.

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### INCREASE RYE PRODUCTION.

**I**N many parts of the southeastern section of the United States, including the States of Tennessee, North Carolina, Louisiana, Mississippi, Alabama, Georgia, South Carolina, Florida, and the southeastern half of Arkansas, rye should be grown much more widely than at present. Why and where and how this should be done are set forth in the following pages.

### RYE AS A SUPPLEMENT TO WHEAT.

Rye is raised less generally now than wheat in this section of the country. But rye is a bread grain used largely by many people of this and other countries. So, in any consideration of the expansion of the acreage of bread grain and in any encouragement given for the production of home-grown bread in this section it is necessary to consider wheat and rye together. For many soils and in many places rye is a safer crop than wheat. For some purposes it is better than wheat.

### WHEN TO RAISE RYE INSTEAD OF WHEAT.

Where conditions which make it preferable to raise rye rather than wheat are in effect and under what circumstances rye should be raised in place of wheat are specified below.

(1) Rye will grow on some lands not adapted to wheat. Sandy, exposed, poor, poorly prepared, or acid land will usually yield better crops of rye than of wheat. On large areas of sandy land in this section rye can usually be grown to better advantage than wheat. As rye uses less nitrogen, it can be grown on poorer lands. Rye should be sown on newly cleared timberland and drained marshland, as it is more resistant than wheat to the acid condition of the soil which is likely to exist.

(2) Rye may be sown later in the fall than wheat. If the land can not be prepared in time for wheat, owing to rush of work, seasonal conditions, or because some late-maturing crop is occupying the land, rye may well be sown. Rye will germinate more quickly than wheat and at a lower temperature. It will germinate and grow with the temperature but a few degrees above freezing, when wheat would be practically at a standstill. It can be sown after late-maturing crops are removed, thus furnishing a winter cover and allowing a grain crop to be grown. Since it can be sown late, it distributes labor on farms where wheat is grown, as the wheat can all be sown before rye sowing is begun.

(3) Rye is not so badly injured by insects and diseases as wheat. The Hessian fly seldom injures it badly. The rye crop usually matures before rust becomes severe.

(4) Rye produces a more profitable crop than wheat in at least some parts of this section. The 5-year (1911-1915) average estimated value per acre for rye is greater than for wheat in the States of South Carolina and Alabama. Rye is more profitable than wheat in southern Georgia.<sup>1</sup>

(5) Rye produces a straw more highly valued than that of wheat for bedding horses, stuffing horse collars, for use as packing material, and in paper making. Where there is a demand for the straw for such purposes, as, for instance, near the large cities and near nurseries, and special precaution is taken to preserve it, the straw may be as valuable as the grain. More straw per acre is produced on poor land by rye than by wheat.

(6) Rye will endure more acid in the soil than wheat, and can therefore be used where wheat would require liming. In such cases rye can be produced more cheaply.

(7) Rye uses less nitrogen, pound for pound of crop produced, than wheat, the amount in rye being about four-fifths that in wheat. It can therefore be grown on poorer lands, can be produced with less fertilizer, and does not exhaust the supply of nitrogen so much as wheat.

(8) Rye is generally a better crop for fall, winter, and spring pasture than wheat, as it makes a larger, earlier, and more upright growth than wheat.

(9) For the reasons above cited, rye is generally better for a winter cover and green manure than wheat. It can be sown in cotton at the time of the first or second picking, or in standing corn, and it makes a good growth for plowing under in preparation for other crops. Rye should not be allowed to grow more than knee-high before it is plowed under.

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<sup>1</sup> See Ga. State Col. Agr. Bul. 136.

### VARIETIES OF RYE.

In a large part of the cotton belt the Abruzzes (Abruzzi) variety, introduced from Italy by the United States Department of Agriculture in 1900 and 1904, has given remarkably good results. On account of its rapid and vigorous growth even in cold weather it is very valuable for grazing and cover-crop purposes. It also produces good yields of grain—from 15 to 30 bushels per acre under ordinary farming conditions in the cotton belt. In the extreme southern portion of the cotton belt there is an excellent variety known locally as South Georgia rye. Beech Island and Florida Black-Seeded are other names applied to this same or, at least, a very similar variety. When sown in this section it is several days earlier and somewhat taller than the Abruzzes variety, but has yielded hardly as much grain as the Abruzzes rye in comparative tests. In the northern half of this section the North Georgia and Virginia rye gives good yields of grain, but it is not as good as the Abruzzes variety for a pasture and cover crop, as its manner of winter and early spring growth is low and spreading.

### USES OF THE RYE CROP.

#### RYE FOR BREAD.

Rye flour makes a nutritious, wholesome bread, somewhat heavier and darker than that from wheat flour, the color probably being due to the darker gluten it contains. The dough from rye flour often becomes too soft and falls or becomes soggy. To correct this, one-fourth to one-half the quantity of wheat flour is often added. The addition of the wheat flour improves the color and palatability of the bread as well as the working qualities of the dough, rye flour being very sticky and difficult to handle. Wheat and rye flour can, of course, be mixed in any proportion for baking.

#### RYE GRAIN AS A FEED.

As a feed for hogs, rye grain fed in combination with skimmed milk has about the same value as barley grain so fed. Neither is as good for fattening as corn, but the quality of pork produced is better. Rye shorts is not a satisfactory hog feed. Rye may be fed to work horses from 2 to 4 pounds daily in addition to other grain. Ground rye or rye bran may be fed to milch cows, not more than 3 pounds being used daily.

#### RYE AS A COVER, GREEN-MANURE, AND GRAZING CROP.

Rye alone or with hairy vetch or crimson, bur, or red clover is frequently sown in the cotton belt with good results as a cover or grazing crop. The crop should be sown early, in order to produce a

large amount of fall and winter pasture and to allow a good growth before plowing. A variety making a large early growth, such as the Abruzzes or South Georgia, should be used. Better results are secured by sowing rye with vetch or clover than by sowing it alone. Rye is the best grain to use for this purpose.

When grown as a cover and green-manure crop rye should be plowed under at or before the time it is knee high. If allowed to make more growth it may exhaust the soil moisture and decay slowly in the soil.

Rye being grown for grain will furnish a lot of fall and winter pasture. In this case it should not be pastured too closely or when the ground is wet.

#### RYE FOR SILAGE.

Rye makes silage of fair quality. It should be cut when the grain is in the late milk stage. It should be cut rather fine in the silage cutter and well trampled in the silo to force as much air as possible out of the hollow stems. It is not as good for milch cows as corn silage but makes a good feed to fill in during the summer between corn crops.

#### PRODUCTION OF THE RYE CROP.

##### SOILS ADAPTED TO RYE.

Rye can be grown on almost any of the well-drained soils of the Southeastern States. It is better adapted to the lighter loams and sandy soils than to the heavier clay soils. It yields best and produces the best quality of grain on well-drained loam soils in which there is a good supply of lime. It is not limited to such conditions, however, for it does nearly as well on acid as on nonacid soils and is generally the best grain for sandy soils; also for rough and exposed land. It is much better adapted to sandy and poor soils than wheat, and will endure a greater amount of acidity in the soil than wheat, oats, or barley. It is especially good for drained marshland and for cut-over land being brought under cultivation. Rye should generally be the first crop on such lands. It may often be grown in the sandy soils of the Coastal Plain where other cereals would not succeed. The growing of rye should not be attempted on lands subject to overflow or on which water stands after rains. On lands rich in nitrogen it is likely to lodge.

Rye does not grow as well as wheat in a wet soil. In drier soils it is more winter resistant than wheat. On poor lands rye generally does better than wheat, but on rich lands this condition is reversed.

##### ROTATIONS.

Rye should be grown as a grain crop only in rotations including legumes and cultivated crops. Local conditions should determine

the rotation and the particular crop to be used. It may take the place of wheat, oats, and barley in rotations.

In the southern part of the cotton belt, where the boll weevil is a serious pest, the following rotation is giving good results:

*First year.*—Cotton. The cotton stalks plowed under early and rye sown.

*Second year.*—Rye, followed by cowpeas or soy beans, to be cut for hay.

*Third year.*—Corn and velvet beans. Beans and cornstalks pastured and turned under in early spring for cotton.

Good farm practice under boll-weevil conditions requires that the cotton stalks be plowed under as soon as the bolls are all open and picked, care being taken to cover the stalks completely in order to destroy the insects. The land should then be gone over with a roller and the rye sown with a disk drill. Harrowing is not advisable, as it unearths the buried stalks.

When velvet beans are grown with corn, which is the common practice in much of the southern half of the cotton belt, rye can not be sown in the standing corn; neither can the crop be removed in time for fall seeding. It is necessary, then, that rye follow some other crop than corn. Fortunately, better yields of rye can be expected following cotton than after corn.

For the northern part of the cotton belt the rotation may be as follows:

(1) Cotton, with crimson clover sown at the last cultivation and plowed under the following spring.

(2) Corn, with cowpeas sown between the rows at the last cultivation, plowed under for rye.

(3) Rye, followed by cowpeas, followed by rye to be turned under in the spring. The cowpeas following the rye crop may be cut for hay, or they may be disked in or plowed under as green manure.

In tobacco-growing sections rye may follow tobacco in the rotation.

One advantage of the rye crop is that it can be used to fill gaps between other crops. It can be sown early or late in the fall, on land either rough or well prepared, and it will practically always make a good growth, conserving fertility and preventing washing during the winter. The farmer can then decide in the spring whether to use it as pasture, as a soiling crop, as a green-manure crop to plow under, or as a straw and grain crop.

It is good farm practice in the northern part of the Southeastern States to sow rye where possible, following a cultivated crop. An excellent seed bed can then be made as soon as the cultivated crop is off the ground by using a disk harrow, followed by a spike-tooth harrow. The grain is thus seeded with a minimum of labor. If sown early, grass and clover seed can be put in at the same time.

VOLUNTEER RYE.

Rye will often reseed itself for several years in fields where conditions are favorable after it is sown. This volunteer rye is objection-



able if wheat follows, as the grains of rye and wheat can not be separated by cleaning machinery. If rye is present in wheat used for flour making in amounts as high as 2 per cent or more, it lowers the quality of the bread.<sup>1</sup> On this account millers and grain dealers frequently make a considerable discount in the price of wheat containing rye. Special efforts should be made, therefore, to prevent the mixing of rye with wheat. For this reason wheat should not follow in the rotation rye that has been grown for grain. Sowing mixed seed should be avoided, and volunteer rye should not be allowed to grow in wheat fields.

#### PREPARATION OF THE SEED BED.

When rye follows a cultivated crop, such as corn, tobacco, or cowpeas cut for hay that is removed sufficiently early, the soil can usually be prepared for seeding by use of a disk and ordinary harrow. As soon as the crop is harvested the land should be gone over with the disk to prevent the growth of grass and weeds. A second disking, followed by harrowing, is given just before the grain is sown. A better seed bed can be prepared in this way than by plowing, and it takes much less time and work. If weeds are plentiful, plowing 3 or 4 inches deep may be necessary. Harrowing with an ordinary harrow should follow the plowing. When rye follows cotton the stalks should be plowed under as soon as the bolls are all open and picked. Plowing in this case should be deep enough to bury the stalks completely in order to destroy the boll weevil. The land should then be firmed with a roller and the rye sown with a disk drill. Disking or harrowing is not advisable, as it unearths the buried stalks.

When rye follows other than a cultivated crop, the seed bed should be prepared by plowing the land to a depth of 6 or 7 inches several weeks before seeding. It should then be harrowed at once and afterwards worked down with harrow, disk, drag, or roller in such a manner as to kill all weeds that start to grow after rains and to settle the subsoil and keep the topsoil well broken up. When it is necessary to plow just before seeding, as when a catch crop of cowpeas is plowed under, the soil should be compacted by rolling and harrowing several times before seeding. In any case, when it is time to sow the grain a fine, mellow seed bed should be prepared, by using the harrow or other tools if necessary.

Rye may be sown broadcast in cotton, corn, or other standing crops without previous soil preparation, but it should be covered after sowing. A broad sweep, double shovel, or cultivator is a suitable implement for covering, passing once between every two rows. Cot-

<sup>1</sup> For further information on the effect of rye flour in wheat flour, see U. S. Department of Agriculture Bulletin No. 328, entitled "Milling and baking tests of wheat containing admixtures of rye, corn cockle, kinghead, and vetch," by R. C. Miller.

ton or corn is not injured by this treatment. A 1-horse, 3 to 5 hole drill is much better and will readily pass between the rows of the standing crops.

#### FERTILIZERS FOR RYE.

Although rye will grow on very poor soils, large yields of forage or grain may be expected only on soil that is of good fertility. Rye for grain production should not be sown on very rich land; neither should large quantities of fertilizers containing nitrogen be applied to the crop. Stable manure is the best fertilizer for general use with rye, but phosphorus should generally be applied in connection with it. The addition of 40 to 50 pounds of acid phosphate or rock phosphate to each ton of manure and the application of 2 to 4 tons per acre of this combination should be generally profitable on poor land. Larger applications may be made on very poor land.

When commercial fertilizers only are available, an application of acid phosphate, 16 per cent goods if possible, at the rate of 150 to 250 pounds per acre when the crop is sown is generally advisable. A small amount of cottonseed meal may also be used to supply nitrogen, this being applied two or three weeks before seeding or at the time of seeding, but not in contact with the seed. Nitrate of soda may often be used to good advantage. This should be applied with discretion, however, as an excess of nitrate will result in serious loss from lodging. Rye requires considerably less nitrogen for good results than wheat. On the poorest soils, 25 pounds of nitrate of soda may be applied at seeding time and 50 to 75 pounds used as a top-dressing after growth starts in the spring. On richer soils the spring application is generally sufficient. On soils that are naturally rich, or that have been fertilized for preceding crops, fertilizers for the rye crop may be omitted.

In place of these applications, 150 to 250 pounds of a 10-3-3 fertilizer (that is, a fertilizer containing 10 per cent of phosphorus and 3 per cent each of nitrogen and potassium<sup>1</sup>) may be used. If some other fertilizer of about the same composition is more readily obtainable, it may be used, the principal requirement being a comparatively large amount of phosphorus.

Where rye is grown for pasture, for soiling purposes, or for the straw, larger applications of nitrogenous and other fertilizers may be made. If the land is not especially fertile, six to eight loads of barnyard manure should be applied after plowing and harrowed in thoroughly. Commercial fertilizer rich in phosphorus should be used if manure is not available.

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<sup>1</sup> It is not advisable to pay the present (1917) prices for potash for the rye crop. This recommendation is for normal conditions.

**PREPARATION OF THE SEED.**

Seed rye should be thoroughly cleaned and all immature kernels removed before it is sown. As rye loses its germinating power much more rapidly and readily than other cereals, all seed should be tested for germination before sowing and the rate of seeding regulated accordingly.

To make a germination test, several lots of 100 grains each should be counted out and placed between clean blotters or Canton flannel or in sand, where they must be kept moist and at a temperature of about 70° F. for several days. The number of seeds which show strong sprouts should then be counted. Seed that is weak in vitality or low in germination should be discarded or sown at a higher rate per acre than that commonly employed.

**TIME OF SEEDING.**

The time of seeding rye depends upon the use to be made of the crop. When intended for grain production it should be sown from about October 15 in the northernmost part of the Southeastern States to the latter half of November or later in the southern section.

Rye may be sown a week or two weeks later than wheat unless wheat sowing is unusually delayed, as rye germinates more quickly and makes a more rapid early growth, especially if the weather is cool.

If intended as a pasture crop, as a cover and green-manure crop, or as a combination of these, rye should be sown from two weeks to a month earlier than if it is to be used for grain.

In the northern part of the Southeastern States it should be sown for pasture, cover crop, and green manure between September 15 and October 15, and about two weeks later in the southern part. A satisfactory time to sow in the cotton fields is just after the first or second picking, about the middle of September.

It is desirable to sow rye sufficiently early for the plant to become well established before winter begins. Where a deep root system is formed early the plant starts growth earlier in the spring. Rye can be sown with success on fertile land in a good seed bed later than it can on poor land in a poor seed bed.

**METHOD OF SEEDING.**

Rye is best sown in drills 6 to 8 inches apart, using a regular grain drill and covering the seed one-half inch to 2 inches deep, depending on the texture and moisture content of the soil. Less seed and labor are required, and a more even and uniform stand is thus secured than by any other method. When a drill is not available, rye may be sown broadcast by hand or with a broadcast seeder and covered by harrowing. The person sowing the seed may save labor

and can sow more evenly and rapidly by standing or sitting on the rear end of a wagon as it is drawn slowly back and forth across the field. When sown in a standing crop, such as corn or cotton, rye may be sown broadcast and covered with a plow, sweep, or 1-horse cultivator, passing once between rows, or, still better, with a drill made for sowing between rows of standing crops. Some farmers when sowing in standing corn or cotton rows sow the grain from horseback.

#### RATE OF SEEDING.

The usual rate of seeding rye in the Southeastern States is from 3 to 4 pecks per acre. Too thick seeding upon fairly fertile soil will produce soft culms, which are likely to lodge or crinkle. On the sandy loam soil in the central cotton belt sowing 2 pecks of Abruzzes rye on good soil and 3 pecks on light soil has given the best yields of grain from November 15 seeding. For later sowings more seed is required.

When intended for soiling purposes, more seed should be sown per acre than when the rye is intended for grain. Two bushels per acre is the usual seeding.

#### HARVESTING THE CROP.

##### DATE OF RIPENING.

At the northern boundary of Florida rye ripens about May 10. At the northern boundary of Georgia it ripens about June 1. These figures indicate that as one passes northward from Florida rye ripens approximately one day later for each 15 miles traveled, allowance being necessary, however, for increased elevation.

Rye is generally a few days earlier than wheat in ripening. Rye cutting may begin a few days before it is fully ripe, or while there is still a slight green tinge about the plant. This is especially desirable when the straw is to be marketed, as a bright, heavier straw results.

##### CUTTING.

Rye is cut and bound like wheat. The straw of rye commonly grows to a height of 5 feet and frequently reaches 6 feet. On fertile soil it may reach or even exceed 7 feet in height. On account of this long, slender growth it is likely to be more or less lodged and tangled at harvest time, especially on rich soils. It is then extremely difficult to harvest with a self-binder. Even when the grain is standing, it is difficult to cut a heavy crop in this way, as many machines do not have sufficient capacity for such long straw. If there is no special object in saving the straw, the cutter bar may often be raised sufficiently to allow the machine to handle the crop. If the rye is grown principally for the straw, however, a tall crop must often be cut with

a self-rake reaper and bound by hand. This requires about four extra men and is necessarily very expensive. The old-fashioned cradle may also be used in cutting heavy or lodged and tangled rye.

#### SHOCKING, STORING, AND STACKING.

Rye is generally shocked in the same manner as wheat and other cereals. Special care should be taken to have the shocks well built and capped, so that as much as possible of both grain and straw will be protected from the weather. As soon as the crop is well cured in the shock, which will ordinarily be in about 10 days after cutting, it should be stacked or put under cover until thrashing time. As the straw is often quite as valuable as the grain, and as its value depends largely on its condition, care in handling between cutting and thrashing is usually well repaid.

#### THRASHING.

When no special use is to be made of the straw, the method of thrashing rye is the same as that for wheat and other grains. When rye straw is intended for a particular purpose, such as packing material for nursery stock or stuffing for horse collars, an ordinary thrashing machine can not be used, as it breaks and twists the straw too much. The flail was long used for thrashing rye and may still be utilized, but special machines are in use by means of which the grain can be removed without injuring the appearance of the straw.

These machines, sometimes known as "beaters," differ from the ordinary grain separator in that the cylinder is from 5 to 6 feet long and the straw is fed into the cylinder lying parallel to its axis rather than at right angles, as is usually the case. There is no concave, and the cylinder contains no teeth. It is made up of bars with shallow corrugations diagonally across the face, the corrugations on adjacent bars being at different angles. The straw from the unbound bundles is carried over the cylinder, which is run at very high speed, and the grain is beaten out between the cylinder and the top of the machine. The straw is then dropped upon a long inclined shaker, which consists of a number of bars with teeth. These teeth push the straw to the rear of the machine, where it is tied in small bundles by means of a binding attachment similar to those used on binders.

#### YIELD OF RYE.

The 10-year (1907-1916) average yields in bushels per acre of rye for several of the Southeastern States have been as follows: Tennessee, 11.3; North Carolina, 9.9; Alabama, 11.2; Georgia, 9.3; South Carolina, 10.1.

Comparative yields of wheat and rye obtained at several points in Georgia in cooperative tests made by the Bureau of Plant Industry

and the Georgia State College of Agriculture are contained in Georgia State Agricultural College Bulletin 136.

The legal weight per bushel of rye in each of the States of this section is 56 pounds.

### PESTS.

#### WILD ONION, OR GARLIC, IN RYE.

Wild onion, or garlic, is a pest in many of the Southeastern States. The onion bulblets are about the same size and shape as rye grains and reach maturity at the same time. They are therefore harvested with the crop and can be separated from the thrashed grain only with much difficulty. When such rye is sold it is docked severely, often 15 cents or more a bushel. A small percentage of onion bulblets will spoil flour made from the grain, giving the bread a disagreeable odor and flavor. If only a few onions are present in the growing crop, they should be dug out and burned. Land badly infested should, if possible, be used for some other crop than small grains. Rye, however, lends itself to the more or less complete eradication of the wild onion, as the crop may be sown late on land plowed and prepared just before planting.<sup>1</sup>

#### OTHER WEEDS IN RYE.

Cockle, chess or cheat, and peppergrass plants may be present in rye fields and their seeds in the thrashed grain. Good farming methods will largely eliminate them from farms. This task is much more easy if the seeds are not added with the grain sown.

#### INSECT ENEMIES OF RYE.

Rye has no special insect enemies, but is attacked more or less by the same insects, such as chinch bugs, grasshoppers, and army worms, which feed on the other small-grain crops. The Hessian fly does not affect rye as badly as wheat. The granary weevil and the Angoumois grain moth in both the larval (worm) and adult stages live within the stored kernels and may be very destructive.

The most effective means of combating the Hessian fly is by late sowing. Where this insect is very troublesome, rye may be sown in place of wheat, since the insect does not injure it so badly and since rye can be sown with success later than wheat. Detailed information concerning the Hessian fly and methods of combating it are contained in Farmers' Bulletins 640 and 835 and other publications of the United States Department of Agriculture.

Insects present in grain stored in bins and barrels may be destroyed by the use of liquid carbon disulphid.

<sup>1</sup> For further information on methods of eradicating wild onion, see Farmers' Bulletin 610, entitled "Wild onion: Methods of eradication," by H. R. Cox.

Place the grain in air-tight bins holding from 30 to 40 bushels. Place 1 pound of carbon disulphide in a shallow vessel on top of the grain and cover the top of the bin as tightly as possible. The liquid readily vaporizes and the fumes being heavier than air pass down through the grain, destroying all insects. This method is effective only when the temperature is above 60° F.<sup>1</sup>

#### RYE DISEASES.

Rye is subject to attacks of both stem and leaf rust. These diseases manifest themselves by the appearance of orange-yellow to reddish brown pustules, which in the one case affect the leaves and in the other the leaves and stems of the attacked plant. The crop is seldom badly injured by these diseases. The flag smut of rye sometimes occurs on the flag, or uppermost leaf, though usually it affects the neck, causing this portion of the stem to split and break over. Losses of as much as 3 to 5 per cent are sometimes caused by this smut. The occurrence of loose smut of rye has been reported four times in three years and is of no economic importance.

A disease called anthracnose is prevalent in some parts of the rye-growing area. The attacks of this disease are shown by the premature dying of those portions of the heads above the point of its attack, resulting in the almost total loss of the grain in these dead portions. The disease also attacks the roots and lower portions of the stems, resulting in a blackened appearance of the attacked parts and in the loss of vigor of the diseased plant, which therefore produces only shriveled grains. Treatment of the seed with formaldehyde (1 part of formaldehyde to 50 parts of water), as is common for oat and wheat diseases, is a preventive.

A serious and destructive disease of rye is ergot. In this, one or more kernels of the head are replaced by a horny violet or purplish structure, usually somewhat larger than the kernel. Where ergot is present rye should not follow rye in the rotation, and seed free from ergot should be sown. It is dangerous to feed rye containing ergot to live stock.

Ergot may be completely separated from rye by passing the grain through a 20 per cent solution of common salt, in which the ergot will float and the rye will sink. This treatment does not affect germination, and the rye can be sown as soon as the excess water has drained off.

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<sup>1</sup> Detailed information concerning these pests in stored grain and complete directions for destroying them are contained in Farmers' Bulletin 799, entitled "Carbon Disulphid as an Insecticide."

**OTHER PUBLICATIONS OF THE UNITED STATES DEPARTMENT  
OF AGRICULTURE OF INTEREST IN CONNECTION WITH THIS  
BULLETIN.**

**AVAILABLE FOR FREE DISTRIBUTION BY THE DEPARTMENT.**

- Oats: Growing the Crop. (Farmers' Bulletin 424.)  
Winter Oats for the South. (Farmers' Bulletin 436.)  
Barley: Growing the Crop. (Farmers' Bulletin 443.)  
The Smuts of Wheat, Oats, Barley, and Corn. (Farmers' Bulletin 507.)  
Winter Barley. (Farmers' Bulletin 518.)  
The Culture of Winter Wheat in the Eastern United States. (Farmers' Bulletin 596.)  
Winter-Wheat Varieties for the Eastern United States. (Farmers' Bulletin 616.)  
The Hessian Fly. (Farmers' Bulletin 640.)  
Growing Hard Spring Wheat. (Farmers' Bulletin 678.)  
Varieties of Hard Spring Wheat. (Farmers' Bulletin 680.)  
Marquis Wheat. (Farmers' Bulletin 732.)  
Culture of Rye in the Eastern Half of the United States. (Farmers' Bulletin 756.)  
Shallu, or "Egyptian Wheat." (Farmers' Bulletin 827.)  
How to Detect Outbreaks of Insects and Save the Grain Crops. (Farmers' Bulletin 835.)  
Wheat Growing in the Southeastern States. (Farmers' Bulletin 885.)  
Oats in the Great Plains Area. (Department Bulletin 218.)  
Barley in the Great Plains Area. (Department Bulletin 222.)  
Alaska and Stoner, or "Miracle," Wheats; Two Varieties Much Misrepresented. (Department Bulletin 357.)  
Experiments with Marquis Wheat. (Department Bulletin 400.)  
Improvement of Ghirka Spring Wheat in Yield and Quality. (Department Bulletin 450.)  
Hard Wheats Winning Their Way. (Separate 649 from Yearbook 1914.)  
Rye in the Cotton Belt. (Secretary's Special, December 2, 1914.)  
Winter Wheat in the Cotton Belt. (Secretary's Special, November 21, 1914.)

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