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Quack Grass and Western Wheat Grass

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Quack Grass and Western Wheat Grass

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SUMMARY OF BULLETIN.

Quack grass possesses root-stocks of a distinctly brownish yellow color. In addition to the thickness and toughness of the covering, this color is helpful in distinguishing quack grass from other grasses, that also possess root-stocks. Page 497.

Any methods for eradicating quack grass must take into account: (1) the prevention of leaf growth, and (2) the destruction of root-stocks. Page 500.

Methods of Destruction.

(1) Hand digging. (2) Tarred-paper or mulching. (3) Summer fallowing. Page 500.

All of these men have followed some modification of the "summer-fallow system." The experience all supports the observation that July and August cultivation is more effective than cultivation at any other time. Page 507.

A cultivated crop (after such summer fallowing) is the logical final step, in completing eradication. Page 507.

By figuring the cost of continued cultivation all summer, it will be found that they expended $15.00 per acre. Page 506.

It should be borne in mind that a number of sheep could have been purchased with the amount of money invested by those farmers who worked on eradicating Quack grass from cultivated fields. Page 508.

Western wheat grass. Page 511.

CHARACTERISTICS OF QUACK GRASS (AGROPYRON REPENS) AND WESTERN WHEAT GRASS (AGROPYRON OCCIDENTALE, SCRIBN), WITH SPECIAL EMPHASIS ON THE ERADICATION OF QUACK GRASS.

By A. N. Hume and Sam L. Sloan (Student-Assistant in Agronomy)

Quack grass (Agropyron repens) or couch grass, or quitch grass as it is sometimes called, was introduced from Europe. It is quite prevalent in the North Central and Northeastern states and is spreading rapidly because of our present agricultural methods. It is one of the most troublesome of perennial weeds, with which the farmers of our state have to deal. Its troublesomeness and persistence are due to its nature and habits of growth.

It is a perennial. Moreover, quack grass produces seed abundantly which aids in the distribution of the pest, they being a common impurity in Brome grass and other grass seed. The seed is carried short distances in hay, by wheels of vehicles or in wool or hair of animals and longer distances by stock trains where it is often present in the hay or bedding, and also frequently in the hay or straw used to pack nursery stock.

Quack grass also, in common with Bermuda grass and Johnson grass, the most troublesome members of its class, extends long underground stems, rootstocks or rhizomes beneath the surface of the ground, which also aid in dissemination.

Grasses may be divided into two classes according to their manner in this habit of bearing rootstocks. The first class are known as "intravaginal", that is, the new shoots do not break through the lowest leaf sheath but grow erect within it, the second class embracing the creeping grasses of which Quack grass and Western Wheat are examples are known as "extravaginal", that is, the first shoots pierce the lowest sheath and for a longer or shorter distance develop as rootstocks or rhizomes below the surface of the ground or as stolons above the ground. The real roots in this case arise mainly from the joints of the rootstocks.

Mr. A. C. Army, Agronomist at Minnesota Experiment Station, has recently published from that station a most instructive bulletin entitled "Quack Grass Eradication," (Minnesota Bu. 151.) Attention is called in that bulletin, on page 8, to the peculiar character of leaf sheath of Quack Grass and specifically the auricles. In Quack, the latter are described as "well developed, clasping across opening in leaf sheath."

The final cause of the troublesomeness of Quack grass are these rootstocks, they being responsible for the persistent efforts needed to eradicate the weed.

The Rootstocks of Quack Grass.

The rootstocks or under-ground stems are the seat of the remarkable vitality of Quack grass. They differ from the upright stems in that the leaves are reduced to scales and the joints or nodes are brought closer together. These stems are often called roots tho they are not roots in the true sense but rootstocks or under ground stems, the distinction lying in the fact that rootstocks like stems have buds, while roots do not. Rootstocks also do not absorb material from the soil as do roots.

The rootstocks serve, as a store house for the material gathered from the soil by the real roots (fibrous) and from the air by the leaves, the reserve material serving to bridge the plant over drouths and conditions unfavorable to growth.

The rootstocks are brownish yellow in color and are about the exact size of the upright stems or culms. This color helps to distinguish Quack grass from other grasses that also possess rootstocks.

They range as an average from 1-16 to 3-32 inches in diameter. They are encased in a thick, tough brownish sheath which is discontinuous, arising at each joint, and in most cases overlapping the next joint out from the upright culm, and terminating in a number of points which give the rootstocks, especially when dry, a scaly appearance.

The thickness, toughness and distinct brownish color of the sheath is characteristic of Quack grass.

Each of the joints, which occur from ¾ to 1½ inches apart, has the power of sending up a new shoot which will in time develop into a strong plant. The rootstocks are known to commonly extend from three to five feet out from the main stalk and these may become so numerous as to form matted beds, two or three hundred joints may be found in a single square foot of soil. Segments of the rootstocks, including joints, are frequently broken off by cultivating machinery and carried from field to field thus starting new beds and accomplishing wider distribution of the pest.

Eradication: Any method intended to kill this troublesome pest will include, first, some method of procedure which will prevent to the largest possible extent the growth of leaves, for the reason that the rootstocks

are dependent for their growth upon the material absorbed by the roots and elaborated in the leaves in combination with the material which the leaves draw from the air. Thus by limiting development of the top in any way the amount of growth of underground stems is thereby limited.

The second factor which any method of eradication should include is the turning up of the rootstocks at such a time or season when they will be most likely to be desiccated and killed by the action of the sun.

It should be understood that there are no "short cuts" to the eradication of Quack grass and the success of any method must needs depend very largely upon thorough painstaking and rigorous work. The above two principles should be adhered to, no matter how much any general method be modified to suit local conditions.

Local conditions, the extent of infested areas, capital and machinery at hand and such factors will enter in to modify any suggested methods of eradicating Quack grass. The following tested methods will lead to success if strictly followed:

Hand Digging Method: When the pest is confined to small areas in a cultivated field the patches should be carefully avoided with all kinds of machinery and the crop planted around them. The only direct loss from their existence will be that of the absence of crop from these small areas and also probably on the land occupied by a narrow path leading to the patches. The method of eradication includes spading the infested areas, and raking up carefully and burning all the rootstocks. The work can be done any time during the season before the seed matures, but preferably during the

early summer. A close watch should be kept of the patch and whenever a shoot appears it should be uprooted entirely, and destroyed. This method requires faithful "follow up" work to be successful.

Tarred Paper or Mulching Method: The above mentioned methods depend for their success upon the same condition i. e. smothering out the grass. They may be followed in eradicating large patches, providing the grass, of course, grows in solid beds and is not scattered over the entire field. The patches to which the tarred paper method applies must of necessity be only a fraction of an acre in extent as the cost of tarred paper necessary to cover a whole acre would be prohibitive. Tarred paper of the cheapest grade necessary to cover an acre would cost at present prices about fifty-five dollars.

When this plan is to be employed the Quack grass should be cut as closely to the ground as possible, preferably in the early summer, and then carefully covered with tarred paper. The strips of paper should be lapped about four inches and carefully sealed or covered and also extended three or four feet beyond the borders of the patch. The paper should be weighted down with boards or dirt. Keep covered all season, examining occasionally to make sure that the paper has not blown off or cracked open.

Well rotted manure if evenly applied as a *deep* mulch may accomplish the same purpose as tarred paper, but cannot be as highly recommended.

Summer Fallow Method: United States Department of Agriculture, Bureau of Plant Industry, Circular No. 73 calls attention to the following apparent facts: (1) That the rootstocks of Quack grass growing in a cultivated field are scattered through the soil to a depth of seven inches. This may be attributed to deep prepa-

ration of the land and continual "turning down" of the stems to the bottom of the furrow. The grass is under these conditions in its worst form. (2) In a meadow which has been down for several years and especially if two cuttings of hay a year have been secured, the rootstock development is found to be about half the extent and depth of that found in cultivated land, i. e., three inches below surface. (3) That on closely grazed pasture land the underground growth finally becomes a few mere shreds of rootstocks and these very near the surface; two inches below.

These facts suggest a definite line of procedure in dealing with Quack grass when infesting a cultivated field and when infesting sod or pasture land. It has been demonstrated that it can be destroyed in one season and a crop produced at the same time (Bulletin 149 Vermont Station), but to accomplish this end with any certainty requires a very large amount of labor of a painstaking nature at a very busy season of the year. This would be especially true in South Dakota where the size of farms is relatively large. Under such conditions, the Vermont method very likely would result in failure on account of the work being neglected for some other seemingly more important line of farm work. On this account any method to have practical application, unless carried on separately from the other farm work, (separate horses, men and machinery) must be one that could be used when other farm work is not pressing, e. g., in midsummer after haying.

Infested areas, that is fields where the pest is generally distributed should be seeded down to grass, timothy preferable, and may be used to good advantage for hay or pasture several years before the final method of eradication is started. If the field could be closely pastured

by sheep for two or three years, the pest would be greatly weakened and the roots brought close to the surface. Quack grass is nutritious and the only precaution necessary is that it be grazed close enough or cut for hay early enough so that no seed is matured. It is clear that the use of the grass for hay would be the most certain method of avoiding this difficulty.

United States Department of Agriculture, Farmers Bulletin No. 464 gives the following tested method of eradicating Quack grass under the above conditions: After a cutting of hay has been removed the first step is to plow the sod in midsummer, cutting just under the turf, which is usually about three inches deep. To thoroughly turn over a stiff Quack grass sod as shallow as three inches it will be found convenient to use a special type of plow (Scotch bottom) having a very long gradually sloping moldboard. It has been found that with this type of plow the sod can be turned very shallow. The task can be accomplished, however, with a common plow. The next step is to go in a week or ten days later with a disk harrow and thoroughly disk the sod. Repeat this treatment every ten days or two weeks until late fall when the Quack grass will be completely killed out.

It is stated that the success of this method lies in the rigid fulfillment of two main conditions, first, that by allowing the land to remain in grass and by pasturing close or taking off two cuttings of hay, to so weaken the weed and bring the roots close to the surface, that it will be in a condition to succumb most easily to cultivation. The second condition is that the subsequent cultivation, be thorough and at or within the time limits prescribed.

The writer realizes that farming cannot always be carried on by schedule and to this cause can failures in

attempts to kill Quack grass be attributed. Whether the failure be from careless work or unavoidable delay the labor is always worse than lost if the pest be more completely distributed over the field and permitted to root more deeply in the loosened soil.

Attempts at Quack Grass Eradication in South Dakota. Knowing that Quack Grass is a serious pest in several parts of this state and that many farmers were going to a great deal of expense to combat the pest, the writer decided to consult with some of these men and include their experiences in this study. In one county in South Dakota, the writer found certain fields infested with Quack grass. The problem of eradication without a cultivated crop, except by the summer fallow system, has been very difficult in that county. Even when the pest is then in its worst form and if the season is moist, the large depth of earth which it is necessary to turn, in order to get under the roots holds the moisture and keeps the roots alive although thorough cultivation is practiced throughout the summer. These facts are evident in the experiences given below:

Mr. Chas. Kreger, of Watertown, started work on reclaiming a "gone back" quarter section of Quack grass land in July (1914). Plowing with a tractor was commenced July 10th and in a short time 25 or 30 acres were plowed rather shallow. The outfit was then delayed and the remainder of the field was not plowed until the last of August and first part of September. The last portion of the field was plowed to a greater depth than the first. One man and four or five horses were kept busy until late in the fall discing and harrowing (four or five times each) and then the whole field was plowed again with sulky plows. This spring (1915) it will be gone over twice with the Quack grass machine, harrowed and planted to corn.

On May 7th the writer was on this field and found that the 25 or 30 acres which was plowed shallow in July

was almost all killed out, remaining only an occasional plant and no continuous sod. On the remainder of the field not plowed in July, patches of sod still existed and the rootstocks over all of the remaining portion were by no means dead but were throwing out millions of new shoots. Mr. Kreger expects to put this field into corn this year and again next year in the hope that careful and thorough cultivation may eradicate the pest.

Colonel Lee Stover has given special attention to the killing of Quack grass upon certain fields during four years past. Complete eradication has not been accomplished but the continuous sod which previously existed has been destroyed. The experience of Mr. Stover has led him to the conclusion that trying to kill Quack grass by working it in the spring is useless, especially if it be moist, and that July and early August is the period when work counts for the most.

Mr. Stover has a rotation which he started on a cultivated field badly infested with Quack grass two years ago and which is apparently doing much to kill out the grass without the loss of crop. First a heavy seeding of buckwheat was made as a smother-crop on the land which had been fall-plowed, disked and harrowed. After this the land was fall-plowed and again cultivated in the fall and spring, and put into corn. This spring (1915) it was plowed and prepared for Sixty Day oats, which were sown immediately after preparation was complete. Oats have a short growing season and the plan is to get them off the ground as soon as possible, plow and cultivate until late fall then spring-plow and again put into corn and cultivate the corn carefully. Judging from what is now apparent, this system carefully carried out, will kill the grass.

Mr. Stein worked on the eradication of Quack grass from a twenty acre field in 1914 and is at work on another twenty acre field this year (1915). Of the twenty

acres which was worked on last year, 15 acres were plowed with a deep tillage machine to a depth of about eight to ten inches, the other five were plowed with a common sulky. The next spring (1914) the field was left fallow, plowed, and on account of the heavy rains which prevented getting on the field, was plowed a second time. From then on all summer and fall the field was double-disked and harrowed almost every week. Mr. Stein is of the opinion that the deep tillage machine gives no better results than the plow when used for turning down Quack grass sod. This twenty acre field has only an occasional shoot of Quack grass left on it. It will be in wheat this year and next year will be put into corn.

Zech Brothers have at the present time (1915), in the home farm 600 acres of land which is all badly infested with Quack grass. Last year (1914) they worked on reclaiming one quarter section by a modified summer fallow system. This quarter was badly covered with the weed and a crop could no longer be grown upon it with profit. This field was fall-plowed and the next spring and summer was disked three times, worked six times with Quack grass machines and harrowed five times, alternating with the other two operations. The spots where the sod was the toughest were always given extra work at each operation. This spring (1915) this field was gone over once more with the Quack grass machine, harrowed and put into wheat. Small bunches of the persistant pest still existed, scattered over the entire field. Zech Brothers will fallow another quarter section in the same manner during the summer of 1915.

By figuring the cost of the work performed by each of these men who continued the cultivation all summer, it was found that they expended, as an average, a minimum of $15.00 per acre in getting the grass under control and that to accomplish actual eradication it will in most cases require a great deal of additional patient, careful

work. This fact and also the fact that much good land in different sections of this state is actually lying unfarmed on account of Quack grass, it being impossible to rent it and in many cases even sell it except at a very great sacrifice, should be sufficient warning to everyone who has the pest on his land, to take steps for its eradication, before it acquires a firm foothold on any land.

In the second place, it will be noted that all of these men have followed some modification of the "summer fallow system" heretofore given. The first 20 to 30 acres of Mr. Kreger's field was treated most nearly to the prescribed method; that is, it had been in sod, was plowed shallow during the first part of July and disked and harrowed (but not as often as every ten days) until late fall. The results were all that could be expected.

The experience of both Mr. Kreger and Mr. Stover support the observation that July and August cultivation is more effective than at any other time.

It should be borne in mind that those men who attempted eradication of quack grass in cultivated fields were dealing with the pest in its worst form, that the great depth of soil which it was necessary to turn up, in order to get under the rootstocks, prevented to a large degree the drying and killing action by the sun. A large amount of their work, then especially during the early spring had little or no beneficial effect.

In view of the fact that all of the farmers whose experiences are given above, after carrying out their work of eradication still have Quack grass left in their fields, it seems that the cultivated crop, under their conditions, is the logical final step in completely eradicating the pest.

Corn when employed for such purposes should be cultivated to a slightly greater depth than would be otherwise advisable and the cultivators should be equipped with broad "scoop" shovels with sharp cutting edges

(kept sharp). The acreage should not be so large that the work cannot be carefully done. The corn, of course, should be checked, cultivated weekly, if possible, and enough of hand work done to keep the pest from developing leaves without which there can be no elaboration of food material, this resulting in the final death of the plant.

These last suggestions apply to a grain system. Where stock is raised the hay on even large areas could be used to advantage or the land pastured closely with sheep and then the "Summer Fallow Method" carried out. It should be borne in mind that a large number of sheep could have been purchased with the amount of money invested by those farmers who worked on eradicating Quack grass from cultivated fields. With this system an entire crop would not be lost either, as the work would be commenced in July after the hay had been removed or the pasture used up to that time.

Spikelets of Agropyron repens (Quack grass) have 3-7 flowers, as an average (Britton) compare with those of A. Smithii (Western Wheat) which have 6-12.

Spikelets of Agropyron Smithii (Western Wheat) have 6-12 flowers as an average. (Britton) compare with those of A. repens (Quack grass) which have 3-7.

Western Wheat Grass.

Agropyron Occidentale, Scribn., is a native rootstock producing grass of the same genus as Quack grass and greatly resembling it. Western wheat grass, or Colorado Bluestem as it is sometimes called, is quite generally distributed throughout the central and western states from Wisconsin to Iowa and westward to Washington, Texas and Arizona. It is a common prairie grass of South Dakota, especially of the western part of the state where it does well even under the rather arid conditions, furnishing excellent pasturage. It deserves study in this connection more because of the fact that it is so often mistaken for Quack grass which is regarded as a dangerous and injurious weed, than from the fact that it is itself sometimes considered a bad weed. This mistake of the two grasses one for the other leads to confusion on the part of those who are asked to identify them and often to unnecessary expense on the part of the farmer.

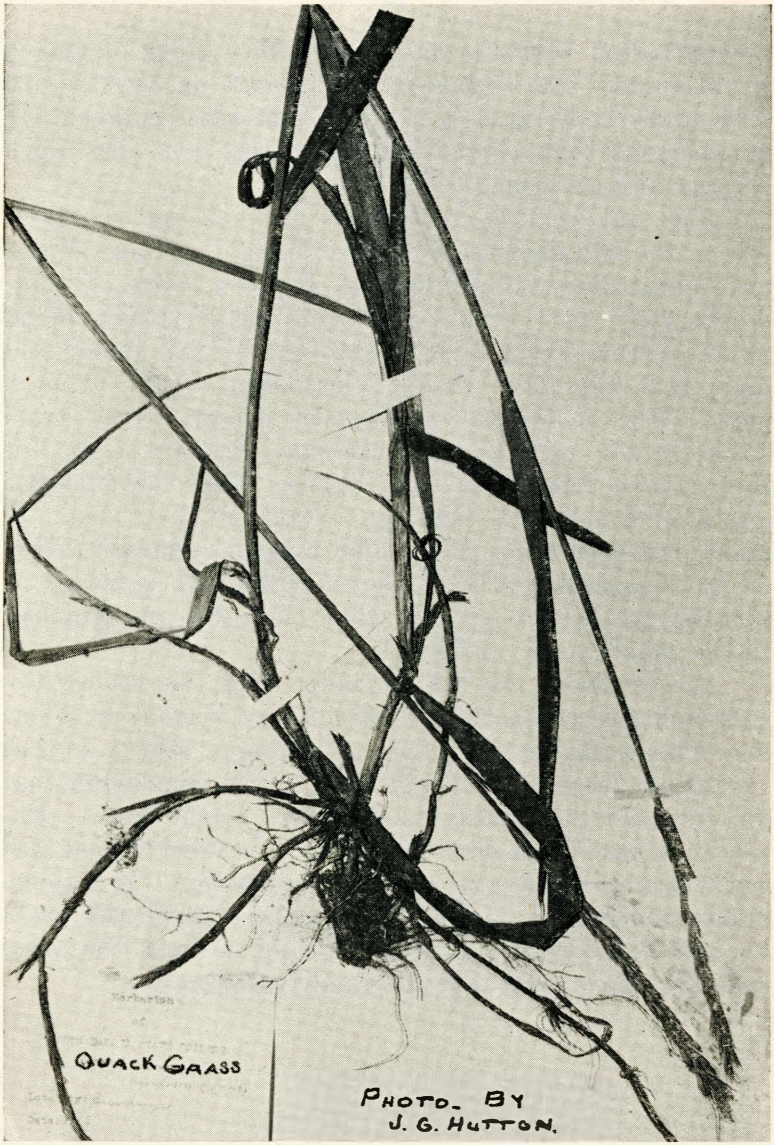
Western Wheat, like Quack grass, is spread by seed and also by means of the creeping rootstocks. The seeds are found as an impurity in grass seeds as are the seeds of Quack grass and are scattered about in the same manner. It is rather difficult to definitely distinguish the two kinds of seed and as this is an important consideration because of the fact that a sample of grass seed containing Quack grass seed should be condemned, the differences will be considered later.

The root system of Western Wheat grass resembles very closely that of Quack grass. The fibrous roots are more numerous in proportion to the creeping rootstocks, in the former, and have their rise more generally at the base of the stalk, while in Quack grass the fibrous roots arise more generally from the joints of the rootstocks. The rootstocks of Western Wheat are light straw-color,

as contrasted with the brownish yellow color of Quack grass roots. The discontinuous sheath or husk which surrounds the roots of Western Wheat grass is much less conspicuous than that of Quack grass, it is also much thinner and not nearly so tough.

The outstanding distinction between the root system of the two grasses is, however, one of extent. Western Wheat does not produce as great a mass of rootstocks, they are not so sturdy as those of Quack, being as an average from 1-32 to 1-16 inches in diameter and extending only about one-half the distance from the main stalk. The rootstocks of Western Wheat extend from 1½ to 3 feet out from the main stock and are jointed at intervals of from ¾ to 1½ inches. The characteristic size of the rootstalks and the extent of their development, together with their color and the characteristics of the sheath as outlined above, will prove a means of identifying the two grasses when the roots are attached to the plants to be identified.

Eradication. It will be noted from the above description and comparison that the root system of Western Wheat grass is not nearly as strong or sturdy as that of Quack grass; this would lead to the conclusion that the former is not nearly as persistent as the latter. Experience has shown this to be true: Western Wheat will not withstand ordinary thorough cultivation. It is sometimes troublesome on land that has been carelessly broken, but if subsequent careful plowing is done, the grass will disappear even without a cultivated crop.



The leaves of Agropyron repens (Quack grass) plants remain flat when the plants are dried, but those of Agropyron Smithii (Western Wheat) in contrast roll inward from their margins. The spike, (head) of Quack grass is more compact than that of Western wheat grass.

The leaves of Agropyron Smithii (Western Wheat) roll inward from their margins when the plants are dried, in contrast with those of Quack Grass which remain flat. The spikes (heads) of western wheat are less compact than those of Quack grass.

Comparative Height. By means of an array a careful study of height of the two grasses found in this region was made, the measurements being taken from the ground level to the bottom of the spike. Only those main stalks producing heads were measured in both instances. The mean height for Quack grass was 31.78 inches, for Western Wheat grass it was 20.8 inches. The Quack grass measured grew either in or along the border of cultivated fields, while the Western Wheat measured grew mainly in the sod or road sides or in meadows.

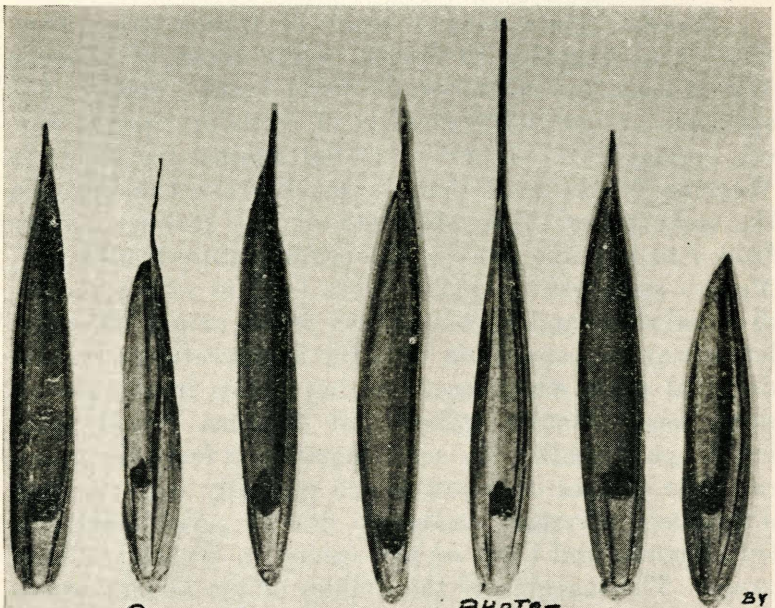
The distance between nodes of Quack grass was found, as an average, to be 4.7 inches and of Western Wheat 4.5 inches.

Leafy Growth. The proportion of leaf to plant is apparently greater of Quack grass than of Western Wheat. The leaves of the former are wider ¼ - ½ inches and longer, 6 - 10 inches, and come more abruptly to a point than those of Western Wheat. Those of the latter being 4 - 8 inches long and ⅛ to ⅜ inches wide gradually tapering and finely pointed. The leaves of Western Wheat arise more generally at or near the base of the plant and thus make up a rather dense undergrowth, the seed stalks towering above forming another level. The leaves of this latter grass are also more upright and stiffer, less succulent and more harsh to the touch. The leaves of Quack grass generally bend downward at the tip. Western Wheat is differentiated by the decided grayish-green or bluish color of its foliage, this characteristic being especially noticeable even at a distance when the grass is growing in a patch of considerable proportions. The foliage of Quack grass is dark green in color. Another leaf characteristic of Western Wheat which is generally diagnostic is the tendency of the leaf to curl or roll up into a tight roll longitudinally, in dry weather or when uprooted and allowed to lie exposed to the air for a short time. Quack grass will roll or curl spirally but does not show the above tendency.

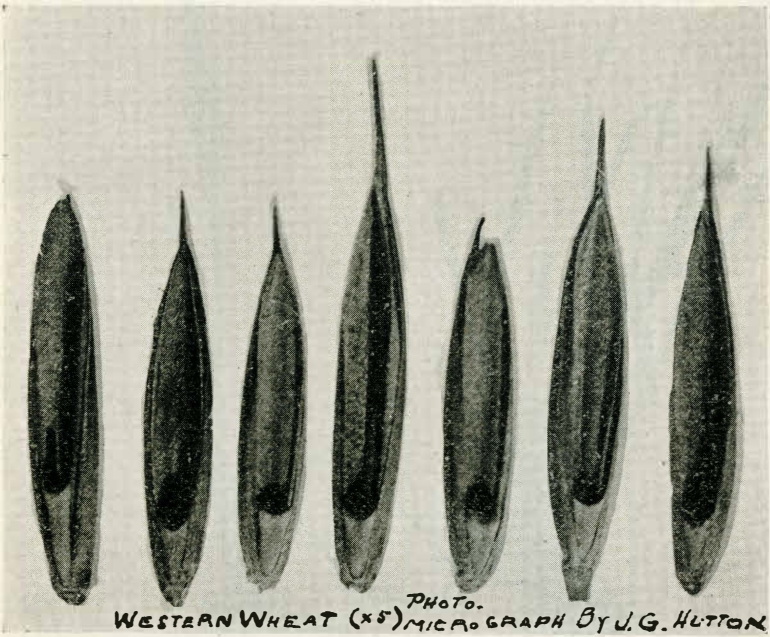
of the two grasses, which can be detected by careful observation with the naked eye or better with a small hand glass. The furrows of the leaves of Western Wheat are deeper, narrower and more abrupt than those of Quack; the ribs or ridges of the latter are more flattened on top. The midrib of Western Wheat is raised to or above the level of the ridges, while in Quack grass it is generally depressed and flattened. These characteristics appear to best advantage on the fresh leaves.

Heads. The spikes or heads of Quack grass vary from 3 to 8 inches in length, while those of Western Wheat grass fall commonly between 4 and 6 inches. The spikelets or individual clusters of seeds or ripened florets, spread more (do not lie as flat against the stem) in Western Wheat grass than in Quack grass, thus making the spike wider. The spikelets of the former mature from 7 to 13 while those of the latter mature from 4 to 7. Mature spikelets of Quack grass tend to retain the individual seeds and in consequence whole or partial spikelets always appear along with the comparatively few individual seeds which occur as impurities in samples of grass seed. Mature spikelets of Western Wheat grass break apart readily, the seeds separating from the glumes. The glumes or scales which partially surround the alternately arranged seeds are five or seven veined in Quack grass and three or five veined in Western Wheat grass. The margins of the glumes of the former usually merge abruptly into the pointed or awned tip, while of the latter they taper gradually to the pointed apex. I

I. F. H. Hillman—U. S. Dept. of Agri.

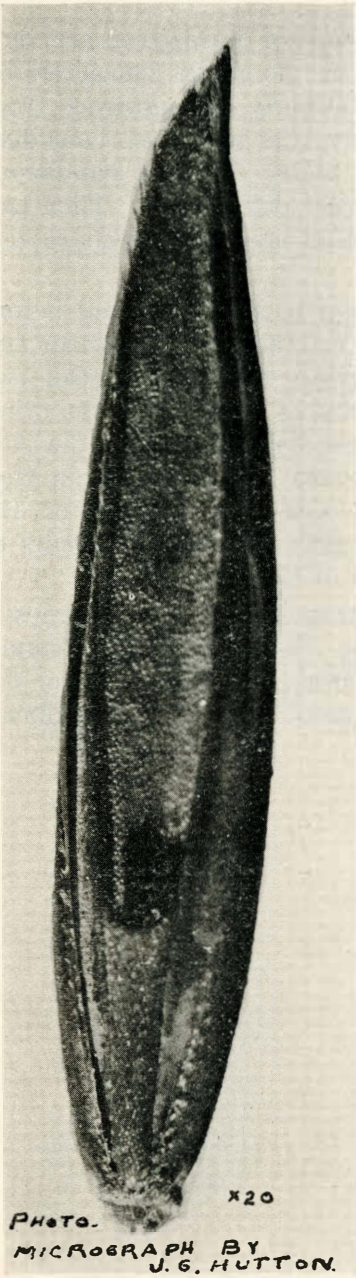


QUACK GRASS - (×5) PHOTO-MICROGRAPH - J.G. HUTTON



Seeds of Quack Grass (Agropyron repens) and Seeds of Western Wheat Grass (Agropyron Smithii) are very similar. When the seeds are mixed in bulk, they cannot be distinguished without the aid of a miscroscope for enlarging them at least 20 diameters.

The rootstocks of Quack grass, help to distinguish it from similar grasses by their yellowish brown color, by their tough covering, and by their scales. The rootstocks send up new plants, as at x.

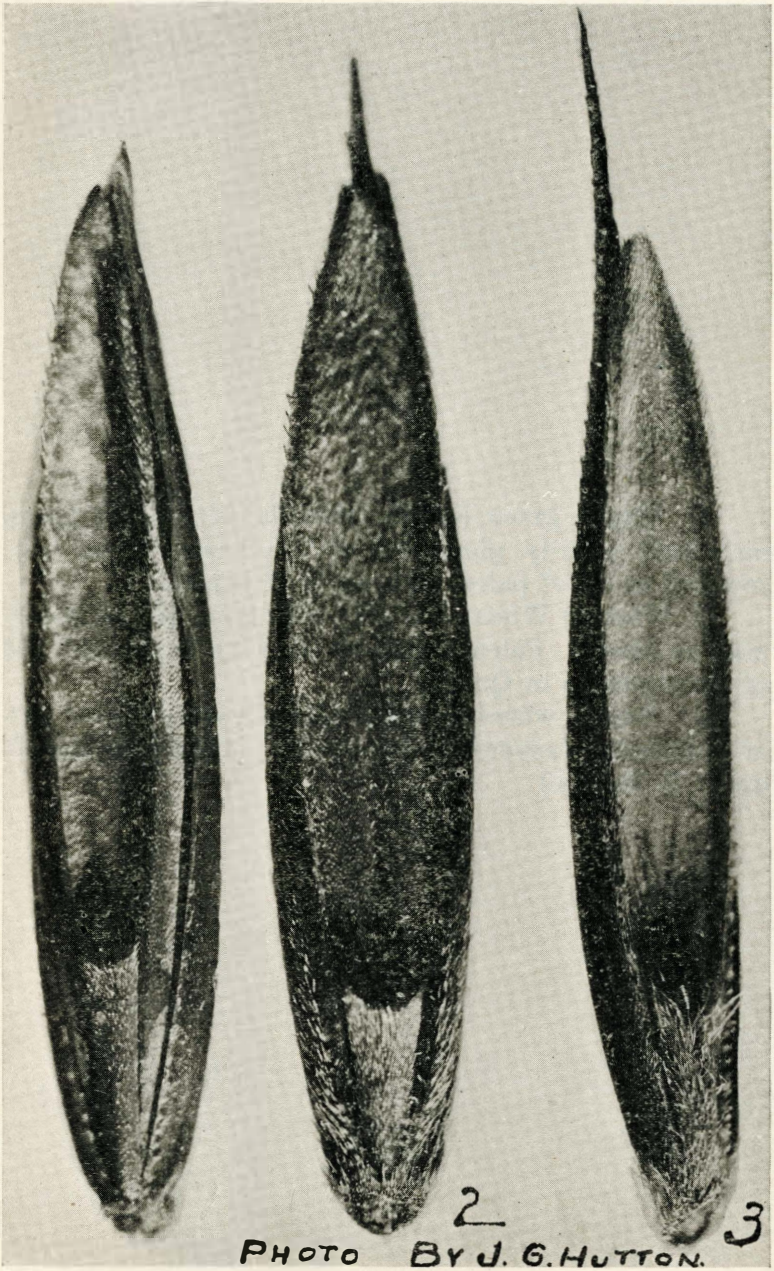


Seed of Quack Grass: Palea with glands, but without hairs except at the tip.

Seeds. The individual seeds of Agropyron are very similar so much so that there are no single characters by which one species may be unfailingly distinguished from the species. This is especially true when one considers the fact that seeds growing under different conditions and in different localities exhibit differences. Then too, seeds are often mutilated so that one or more characteristics are obscured.

The following parts should be fixed in mind before identification is attempted: The individual seeds or ripened florets consist of the grain inclosed between two scales, one of which, the lemma, is larger than the other the palea. The seeds are broadly grooved on the side bearing the palea (ventral side) and rounded on that bearing the lemma (dorsal side). A portion of the cluster axis, termed the "rachilla segment" appears at the base of the grooved palea of the seed.

The following table summarizing the diagnostic differences of Agropyron spp. considering the lemma, palea and rachilla, is taken from "Identification of the Seeds of Species of Agropyron" by R. C. Dahlberg, University of Minnesota.



For explanation see page 523.

1. Quack grass (x 20), rachilla with short hairs, each hair usually glandular at the base. Hairs pronounced at tip of palea, and inside of lemma.

2. Western Wheat; rachilla with hairs not as glandular as above. Palea hispid all over its front, and not as glandular as in Quack.

3. Annual wheat; rachilla villous (hairy) tip of palea puberulent (covered with down). (Classification after J. T. Sarvis.)

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DIAGNOSTIC DIFFERENCES OF AGROPYRON SPP.
(TABLE BY DAHLBERG.)

Character	A. REPENS	A. SMITHII
Shape of Seed	Boat shaped	Boat shaped
Rachilla	Sides approximately parallel. Hairs few short and stout	Sides divergent. Hairs numerous. stout. but longer than those which characterize A. Rep ns
Palea Face	Puberulent at tip; otherwise glabrous	Hirsute over entire face
Edges	Characterized by short. stout. and blunt hairs	Hairs stout but longer than those of A. Repens
Tip	Rounded or indented	Cleft
Lemma	Smooth and shiny at base on ventral side	Usually with a break in the line of hairs on ventral side at base of seed

Terms defined:

Puberulent, minutely pubescent or covered to slight extent with short, soft down-like hairs.

Hirsute, pubescent with rather coarse or stiff hairs.

"In the identification of seeds of Agropyron spp. it is advisable to use a magnification of about 32 diameters for the best results. The Greenough binocular giving the stereoscopic view has proved very satisfactory."

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