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Hard Seeds in Legumes

HARD SEEDS IN LEGUMES cause a lot of concern among farmers and seed dealers. We receive many inquiries about the importance of hard seeds.

Hard seeds have a seed coat that keeps moisture from entering. They don't look any different than other seed and you can't separate them until the seed is dampened.

There seems to be two causes of hard seeds in alfalfa and sweetclover. As the seed matures, a waxy outer layer is formed around the entire seed. Also, the outer layer of cells of the seed coat forms a moisture-proof layer.

Just as soon as the moisture-proof layer is broken (pricked; scratched; reduced by action of acids, bacteria, fungi, or physical stress such as warming and cooling and wetting and drying, or by heat alone) the seed begins to absorb water.

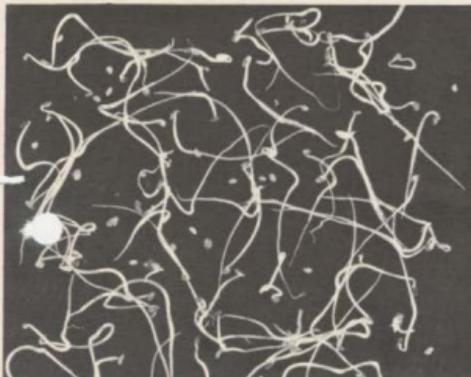
The hard seeded condition tends to lessen with age. The waxy material surrounding the seed and the organic materials that make up the seed coat probably break down in time. Heat helps speed up aging, while storing in a cool place slows it down.

As hard seed numbers decrease during the first year of storage, germination increases. After a year, though, germination is reduced. Loss of germination power is usually very marked after a year and a half of storage.

Hard seeds—in fact all dormant seeds—may be just one of the many ways a species is able to survive adverse environmental periods. Research in Michigan showed that later emergence of alfalfa seedlings from hard seeds (2 weeks to 2 months) provided considerable stand insurance. Dry weather came just after planting time in the tests. Then a hard rain crusted the soil, and a long rainy period promoted

By R. C. Kinch, professor of agronomy in charge of Seed Testing Laboratory, and Elmer E. Sanderson, associate Extension agronomist.

This is a standard 100-seed alfalfa germination test, showing normal and abnormal seedlings and hard and dead seeds.



Hard Seeds In Legumes

Cooperative Extension Service



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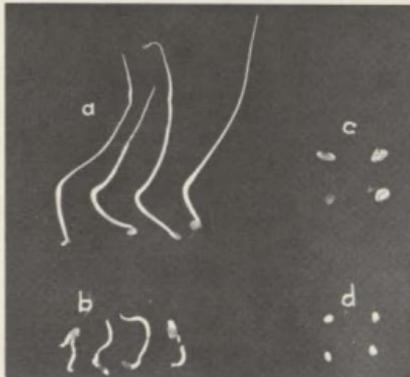
seedling blight diseases (damping off). Since hard seeds were slow in germinating, they were not seriously affected. Their later germination helped the stand when conditions improved.

Not all hard seeds are live seeds. The moisture-impermeable layer around the seed has no direct relationship to life in the seed embryo. However, most all plump, bright, normal-sized seeds of alfalfa, sweetclover, and red clover usually sprout when they become permeable. Immature, green shrunken, or discolored hard seeds may or may not sprout. Many such seeds are not capable of producing a sprout and quickly decay when they become permeable.

LABELING OF HARD SEEDS ON A SEED TAG

The South Dakota Seed Law requires that a seed label show the percentage of (1) germination and (2) hard seed, along with (3) month and year the test was completed. After germination and hard seed per-

Here are four examples each of (a) normal seedlings, (b) abnormal seedlings, (c) dead seeds, and (d) hard seeds.



SWEETCLOVER

centages, the additional statement "total germination and hard seed" may be added if desired.

The percent of hard seeds in a sample is determined by making a germination test of the seed. All seeds that remain hard and fail to absorb water after 6 or 7 days are counted and listed as hard seed. It is not known whether the seeds are alive or dead—only that they failed to absorb water during the germination test.

Seedlings are considered abnormal when seeds that start to germinate are weak, broken, or missing some essential parts. These seeds can't establish a normal plant and do not contribute to a field stand. Dead seeds show no signs of life and start to decay during the germination tests. Abnormal and dead seeds are not shown on a seed label but are reflected in lower germination percentages.

ALFALFA

The average percent of hard seeds in alfalfa varies greatly with the area of production, severity of threshing, and age of the seed. A recent study showed California had the lowest average hard seed count (8%) while Wyoming had the highest (50%). South Dakota was intermediate with an average of 25% hard seeds.

In many studies, it has been found that hard seeds contribute to the field stand. In Montana two lots of seed were compared—one with 79% germination and 6% hard seed, the other with 45% germination and 46% hard seed. Both lots of seed produced equal stands, with 47% of all the seeds planted producing seedlings. In October, only 1% of the seeds planted in May remained hard. This indicates a high percentage of the hard seed germinated and evidently contributed to the total stand.

Alfalfa seed with a high percentage of hard seeds is probably mature, well developed, fresh, carefully threshed seed. Immature, shrunken, old seed generally has a low hard seed count. If alfalfa seed is severely threshed or if it is scarified by a "bran duster" or some other type of scarifying equipment, the hard seed count may be reduced to 10% or lower. Careful adjustment of machines used in these operations will increase germination because of the lower hard seed content. However, over-threshing or over-scarification cause mechanical injury to the seed. When a germination test is made, this damaged seed becomes noticeable and shows up with broken sprouts and cotyledons. Such seeds must be counted as dead.

Any scratching or rubbing of the seed coat reduces the keeping quality of the seed. The seed will not retain its ability to grow as long as unscarified seed.

A normal planting rate of 10 pounds of alfalfa per acre gives you about 51 seeds per square foot. This is sufficient for producing a good stand of alfalfa without depending on hard seeds. If a third or a fourth of your seeds are hard, you have considerable stand insurance, as the hard seed will produce seedlings for the following 2 or 3 months.

Sweetclover seeds are much harder than alfalfa seeds. They will stand more mechanical abuse without breaking. It is not unusual to find a carefully threshed sample of sweetclover seed averaging from 65 to 95% hard seeds.

Seed companies usually scarify all sweetclover seed they handle. This completes the threshing of the sweetclover and reduces hard seed count. Most sweetclover seed sold through seed trade channels is reduced to 15% or less hard seed. A large number of commercial seed lots tested showed average germination of 75% with 10% hard seeds.

Montana research showed that hard seeds were associated with low stands—that is, a high hard seed content produced a low number of plants. It was found that 82% of the hard seeds planted in May were still hard in October, compared with only 1% in the alfalfa experiments.

The hard seed in sweetclover will stay dormant for several years in soil. This results in volunteer sweetclover plants in a field several years after sweetclover is removed. Therefore, you should plant only scarified sweetclover seed, to prevent volunteer plants from becoming weeds in later crops.

Because of the need for scarification, sweetclover seed has poor keeping quality. Year-old or carry-over seed is lower in germination. The rapid drop in germination in carry-over sweetclover seed causes a real problem in accurate seed labeling. A germination test as listed on a seed tag may be considerably higher than the actual germination of the same seed 2 months later.

RED CLOVER

Red clover is about intermediate between alfalfa and sweetclover in percentage of hard seeds. The experiment in Montana showed that 56% of the hard seeds of red clover were still hard after having been in the soil all summer.

Field threshing or hulling to remove the seed from the hull usually does an excellent job of scarification. Very few commercial lots of red clover have more than 10% hard seed. An average of a large number of South Dakota red clover samples showed a germination of 87% and a hard seed content of 6%.

Since most red clover seed lots have high germination and low hard seed count, neither the seed dealers or farmers are too concerned with hard seed in this legume.

IN SUMMARY

- Hard seed in alfalfa gives you stand insurance. Most hard seeds will germinate during the summer and keep filling in the stand.
- Hard seed in sweetclover will cause you problems. Most of the hard seeds remain dormant for several seasons and will come in as volunteer "weeds" in later crops on the same field. Always plant scarified sweetclover seeds.
- Hard seed doesn't seem to be much of a problem in red clover.