BARLEY SEED SURVEY

Shows Quality Problems

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Only 20% of the barley seed lots sampled in a two-year, 17-county survey—as reported in this study—met standards required of California certified barley seed. Fifty-four per cent of the samples contained excessive weed seed and 12% contained secondary noxious weeds. Forty per cent of the samples also contained an average of 72 seeds of other crops per pound of barley seed. Twenty-six per cent of the samples germinated less than 90%. Forty-nine per cent of the samples averaged 7.1% trashy, inert material and 43% were found to contain varietal mixtures.

FORTY-ONE different California farmers and seed firms produced certified seed barley on 9,824 acres in 1963. Assuming clean seed yields averaging 2,500 to 3,000 pounds per acre, there will be enough certified seed of the eight major varieties in 1963–64 to sow only about 250,000 acres—approximately 18% of the California acreage normally planted to barley. Consequently approximately 1,150,000 hundred weight of non-certified seed will be used in planting the remaining 1,150,000 acres to be sown this season. Much of this common seed will be of good quality but experience in the past has shown that at least a part of the common seed barley used will be substandard and is, in fact, one of the major causes of the cereal field weed problem in California. Random sampling of barley seed being used by some California farmers proved this point.

Over a recent 2-year period, with the voluntary cooperation of 92 growers, farm advisors in 17 different counties drew seed samples from farmers' grain drills or from seed ready for use for farm planting. A part of each sample was planted in University of California test plots at Davis, to determine varietal purity and freedom from seed-borne diseases. The remainder of each sample was analyzed by the California State Department of Agriculture Seed Laboratory, Sacramento, to determine the physical qualities of the seed sample.

Two facts must be considered when drawing conclusions from this study: (1) by chance alone, no certified seed samples were included in those drawn; (2) equal weight was given to each sample, regardless of the size of the seed lot represented by the individual sample. In general, more care probably is exercised in selecting planting seed for large acreages than for the miscellaneous small planting—even though good seed for small acreages is just as important. In discussing results of this study, standards established for certified seed have been used as a basis for comparison, since they represent a desirable (and attainable) measure of quality.

Weed seed content

Fifty-four per cent of the samples would not have met certification standards because of excessive weed seed. Twelve per cent of the samples contained secondary noxious weeds including wild morning glory, yellow star thistle and puncture vine. This high content of weed seed indicates either that much of the grain being used for seed had not been cleaned or that it had been improperly cleaned. The average weedy sample had 96 weed seeds per pound of barley seed. Thus the farmer using this seed was sowing an average of 9,600 weed seeds per acre along with his barley seed. The weedy samples ranged from 1,286 weed seeds per pound down to 4. Only one wild oat seed per pound is cause for rejection for certification purposes.

The 27 different common weeds also involved (in addition to the three secondary noxious weeds already named) in one or more of the samples included: blessed thistle, brodiaea, cleavers, coast fiddleneck, darnel, English catchfly, field mustard, godetia, goosefoot, gnawed canarygrass, knotted hedge parsley, little mallow, lupine, marsh elder, mayweed, medusa head, milk thistle, navarretia, rip gut, silversheath knotweed, Jim Hill mustard, soft chess, spikeweed, strawberryweed, watergrass, wild oats, and wild radish. The most frequently found and most abundant weed seed were wild oats (*Avena fatua* L.). Field mustard (*Brassic* sp.) and wild radish (*Raphanus sativus*) were next, with darnel (*Lolium temulentum*) and coast fiddleneck (*Amsinckia intermedia F&M* following.

Other crop seeds

Forty per cent of the samples averaged 72 seeds of other crops per pound of barley seed—indicating again that the grain had not been properly cleaned to acceptable seed standards. To meet California certified barley seed requirements, a maximum of 2 seeds of other crops is tolerated per pound. One of the test samples contained 1,339 seeds of ryegrass and sorghum per pound of barley seed. Another sample had 494 alfalfa, 9 wheat and 4 wheatgrass seeds per pound. Other crop seeds found in the samples included ryegrass, sorghum, oats, rice, safflower, sour clover, wheat, purple vetch, bur clover, cereal rye, alfalfa, tall wheatgrass, and beet.

Germination

Twenty-six per cent of the samples germinated less than 90%, the minimum standard for certified barley seed. Six per cent germinated below 80% and one sample only germinated 38%.

Inert material

When used for seed, barley grain which has not been properly harvested and cleaned may contain an excessive amount of inert, trashy material. To meet

certification standards, barley seed may not contain more than 1% inert material. Forty-nine per cent of the samples averaged 7.1% trashy, inert material. One sample contained 41.4% and another 25.2 % inert material. The farmer using such substandard seed cannot be sure how much live pure seed he is seeding per acre.

Varietal purity

Forty-three per cent of the samples were found to contain varietal mixtures, or were not the variety the farmer indicated he was planting. For this reason, the samples would not have qualified for certification. The mixtures varied from a trace to situations where the sample was a 50/50 mixture of two varieties, with traces of several other varieties. Eighteen per cent of the samples contained 10% or more of the varietal mixtures.

The importance of varietal purity in cereal crops is related to the local disease situation, varietal adaptation, maturity date and to the end use to which the crop is to be put. A 10% mixture with a disease-susceptible type or poorly adapted varieties could mean a considerable reduction in yield. Mixtures of early and late maturing varieties make it difficult to properly time harvest. Where end use is for other than livestock feed, varietal purity becomes very important. White barley varieties contaminated with blue barley lose their appeal when used for human food. In the case of malting varieties, such as Hannchen or Atlas 57, trace amounts of mixtures are unacceptable and can mean the loss of sales for malting. The many agronomic disadvantages already mentioned also tip the scales in favor of growing pure varieties even for feed purposes.

Summary

In this collection of randomly assembled common barley seed, only 20% or one-fifth of the lots met standards required of California certified barley seed. The 80% of lots not meeting standards for certified barley seed failed for the following reasons:

Reason	Per cent of samples involved
Excessive weed seed	54
Presence of secondary noxious weeds	12
Low germination	26
Excessive other crop seed	40
Excessive varietal mixture	43
Excessive inert material	49
Low laboratory purity	50

The information above was based on a comparatively small sample of the common barley seed used in California. All common barley seed used in the state cannot be judged from this sampling. However, there is room for considerable improvement in the quality of seed used by many California barley growers. This very brief study shows that at least a portion of the crop is unwisely planted with grain which has neither been cleaned nor treated to put it into seed shape.

Producers who grow and use their own seed need to pay much more attention to controlling their weeds by (1) crop rotation, (2) use of chemicals such as 2,4-D to control broadleaved weeds and barbane to control wild oats, and (3) having grain destined for seed purposes properly cleaned to remove weed seed before using the barley for planting purposes. If the seed cleaning job is thorough, not only will the weed seed be removed, but inert trash and thin barley will also be removed. The seed conditioning operation for grain should also include treatment with a fungicide to control seed-borne diseases. All of this should be followed by a laboratory test to insure that the well grown and processed seed germinates not less than 90% and otherwise meets acceptable standards for good seed.

For most barley growers a good safe way to insure that the seed used is the best is to use certified seed or seed processed to comparable standards by an experienced dealer. Certified barley seed must meet these standards: purity, not less than 99%; inert material, not more than 1%; other crop seeds, not more than two per pound; common weed seed, not more than 0.1%; noxious weed seed, none; wild oats, not more than one per pound; germination, not less than 90%; and bushel weight, not less than 45 pounds.

Fortunately in recent years many California growers and firms specializing in seed production and handling have added certified seed of most of the California barley varieties to their lists of seed for sale. Listings of specialists in production and distribution of top quality certified barley seed may be obtained from local farm advisors or the Department of Agronomy, University of California, Davis. However, there is now only enough certified barley seed to plant one-fifth of the barley acreage and a large quantity of non-certified seed must be used until the volume of certified seed expands.

Non-certified seed can be good seed. Usually the competent grain seed handler has sources of seed which he knows were grown from certified seed. If this seed is satisfactorily cleaned, treated and tested, such seed can often be planted with good results. The important facts to know about seed are: (1) varietal purity, (2) germination, (3) weed seed and (4) other crop seed content. Seed costs are an exceedingly small fraction (perhaps only 1/10 to 1/15) of the cost of producing barley. To gamble on cheap seed is a very dubious, and usually disastrous way to try to cut costs. Common barley seed containing weed seed can mean an expensive weed control bill for many years.

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Farm advisors in the following counties participated in portions of this study: Alameda, Contra Costa, Glenn, Kings, Lake, Lassen, Modoc, Napa, Orange, San Benito, San Bernardino, San Luis Obispo, Shasta, Siskiyou, Tehama, Ventura and Yolo.

PHYTOPHTHORA INVESTIGATIONS

RESEARCH ON A NUMBER of important aspects of the life cycles of plant pathogenic fungi in the genus *Phytophthora* is under way at Riverside with the financial assistance of a $61,500 grant received from the National Science Foundation. Various phases of the disease-producing activity of several species of this genus which cause considerable damage to California crops will be investigated. Included will be studies of factors affecting growth and spore production in the fungus causing Phytophthora root rot of avocado, and research on the factor in roots that attracts spores of the fungus to them. The species of Phytophthora causing root rot of alfalfa will also be investigated. The project also involves assembling a comprehensive collection and file of literature on this group of plant pathogens.—*George A. Zentmyer, Professor of Plant Pathology, and Donald C. Erwin, Associate Professor, University of California, Riverside.*